Labour Market Effects of European Intergration in the Bavarian and Czech Border Regions

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Veröffentlichungsversion / Published Version
Dissertation / phd thesis

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W. Bertelsmann Verlag

Empfohlene Zitierung / Suggested Citation:
Moritz, M. (2009). *Labour Market Effects of European Intergration in the Bavarian and Czech Border Regions.* (IAB-Bibliothek (Dissertationen), 321). Bielefeld: W. Bertelsmann Verlag. https://doi.org/10.3278/300682w

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Michael Moritz

Dissertationen

gewidmet
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Bibliografische Information der Deutschen Nationalbibliothek

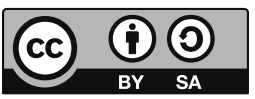
Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über http://dnb.ddb.de abrufbar.

Dissertation der Wirtschaftswissenschaftlichen Fakultät der Universität Regensburg

Berichterstatter: Prof. Dr. Dr. h. c. Joachim Möller

Prof. Dr. Uwe Blien

Tag der Disputation: 16.02.2009



Herausgeber der Reihe IAB-Bibliothek: Institut für Arbeitsmarkt- und Berufsforschung der Bundesagentur für Arbeit (IAB), Regensburger Straße 104, 90478 Nürnberg, Telefon (09 11) 179-0 ■ **Redaktion:** Martina Dorsch, Institut für Arbeitsmarkt- und Berufsforschung der Bundesagentur für Arbeit, 90327 Nürnberg, Telefon (09 11) 179-32 06, E-Mail: martina.dorsch@iab.de ■ **Gesamtherstellung**: W. Bertelsmann Verlag, Bielefeld (www.wbv.de) ■ **Rechte:** Kein Teil dieses Werkes darf ohne vorherige Genehmigung des IAB in irgendeiner Form (unter Verwendung elektronischer Systeme oder als Ausdruck, Fotokopie oder Nutzung eines anderen Vervielfältigungsverfahrens) über den persönlichen Gebrauch hinaus verarbeitet oder verbreitet werden.

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ISBN 978-3-7639-4013-4 (Print)
ISBN 978-3-7639-4012-7 (E-Book)
ISSN 1865-4096
Best.-Nr. 300682 www.iabshop.de www.iab.de

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Vorwort und Danksagung

Das bayerisch-böhmische Grenzgebiet ist eine Region, die über Jahrhunderte hinweg vom enormen Austausch in kultureller, politischer und wirtschaftlicher Hinsicht geprägt wurde. Über vierzig Jahre verhinderten die Folgen des Zweiten Weltkrieges und die künstliche Barriere an der Demarkationslinie zweier politischer Systeme eine Fortsetzung des gemeinsamen Weges in der Geschichte. Als „Kind dieser Grenzregion" konnte ich hautnah miterleben, welche Auswirkungen das Hemmnis der Grenze auf das gesellschaftliche und wirtschaftliche Leben in der nördlichen Oberpfalz hatte. Die damalige Tschechoslowakei war in meiner Jugendzeit ein unbekanntes Land. Nachdem ich nach dem Fall des Eisernen Vorhangs die Gelegenheit hatte, auch in Westböhmen beruflich tätig zu sein, war dies – neben dem allgemeinen Interesse an der Ökonomie der Arbeitsmärkte – Motivation genug für mich, diese Dissertationsschrift auszuarbeiten.

Für die Ermöglichung, dieses Thema wissenschaftlich abzuhandeln, möchte ich mich zunächst bei meinen Betreuern, Prof. Dr. Dr. h. c. Joachim Möller und Prof. Dr. Uwe Blien, bedanken. Beide sind dem gewählten Thema von Anfang an mit hohem Interesse und Aufgeschlossenheit gegenübergestanden und haben mir stets das Gefühl vermittelt, mich mit einem wichtigen Forschungsgegenstand zu beschäftigen.

Besonders betonen möchte ich weiterhin die Unterstützung durch das Institut für Arbeitsmarkt- und Berufsforschung der Bundesagentur für Arbeit (IAB) in Nürnberg. Die Bewerkstelligung der vorliegenden Dissertation wurde im Rahmen des IAB/WiSo-Graduiertenprogramms (GradAB) mit einem Stipendium gefördert.

Großer Dank gebührt in erster Linie auch den Kolleginnen und Kollegen am IAB, insbesondere jenen im Forschungsbereich „Regionale Arbeitsmärkte". Durch die enge Zusammenarbeit vor Ort konnte ich permanent auf kompetente und wertvolle Ratschläge zurückgreifen.

Gleiches gilt für die Stipendiatinnen und Stipendiaten im GradAB. Außerordentlich möchte ich dabei Herrn Dr. Roman Lutz und Herrn Dr. Gerhard Krug hervorheben, mit denen ich mich kontinuierlich über fachliche Fragestellungen austauschen konnte.

Eine wichtige Hilfe stellten auch die Mitarbeiterinnen und Mitarbeiter am Lehrstuhl von Prof. Dr. Claus Schnabel an der Wirtschafts- und Sozialwissenschaftlichen Fakultät in Nürnberg dar, die stets ein offenes Ohr für Problemstellungen beim Verfassen dieser Arbeit hatten.

Herr Doc. Ing. Daniel Münich, Ph.D. (CERGE-EI) hat einen großen Anteil am Zustandekommen der Analysen über die regionale Entwicklung des tschechischen Arbeitsmarktes, indem er mir den Zugang zu den dazu notwendigen Datensätzen ermöglichte und mir bei deren Aufbereitung enorm half.

Zu Dank verpflichtet bin ich ebenso Herrn Johannes Schäffler, der mich im Rahmen seines Praktikums am IAB bei der Anfertigung von Grafiken unterstützte.

Für die äußerst sorgfältige Durchsicht und Korrektur des englischen Manuskripts danke ich Frau Rachel Teear.

Nicht zuletzt und vor allem aber möchte ich mich bei meiner Familie bedanken, besonders bei meinen Eltern Christa und Martin Moritz und meiner Frau Martina, die das Vorhaben stets in jeder Hinsicht voll unterstützt und mir in dieser sehr arbeitsintensiven Zeit den Rücken freigehalten haben. Ihnen widme ich diese Arbeit.

Neumarkt in der Oberpfalz, Oktober 2009
Michael Moritz

1 Introduction: Analysis of Labour Markets in Border Regions

1.1 Motivation

In the course of globalisation European countries are facing new challenges, which is particularly evident on the labour market. While employees in Western European countries are exposed to growing pressure from low-wage transition and developing countries primarily situated in Eastern Europe and Asia, the workers in these upcoming economies are also having to cope with the rapid changes. An idiosyncratic situation is arising in this regard at the direct frontier of "old" EU member states with the 2004 accession countries. From the Baltic to the Adriatic Sea a considerable number of EU citizens are affected by the economic integration process.

In principle, border regions play a special role in an integration process, since effects of transnational competition should be stronger in the absence of the deterrence of costs incurred in order to overcome distance. Only in these regions do "some border crossing activities like commuting, shopping abroad or the cross-border rendering of services (e.g. in construction and crafts) make sense economically due to the short distance to the border" (Mayerhofer 2004: 74). However, though impediments are decreasing, mental and language barriers still exist, leading to a special economic situation in border regions (Houtum 1999), as national borders still matter even in highly integrated areas (McCallum 1995; Bröcker 1998; Nitsch 2000; Gil-Pareja et al. 2006). According to McCallum (1995), all things being equal, trade between two regions within one country is about 20 times greater than cross-border trade.

After the accession of the ten mostly Eastern European states, 25 % of the population in the EU25 countries are living in border regions, rising from 15 % in the EU15 countries. In the accession countries, as much as 58 % of the total population live in border regions[1] (Resmini 2003). In the economic sense a border constitutes an institution which imposes (sometimes prohibitive) transaction costs on the exchange of goods and services between regions or countries (Büttner/Rincke 2007). The opening of a border, in this case the fall of the Iron Curtain, leads to a sizable decline in the transaction costs which only then allows the mobility of goods, capital and labour. In the long run border regions are expected to benefit from growing trade opportunities, but with respect to labour markets, problems of adjustment are highly visible in the short term. After decades of locational disadvantages due

1 Defined as NUTS 3 regions in the EU countries eligible for INTERREG III-A or the PHARE-CBC program (European Commission 2001b).

to a restricted market potential these regions are affected by the opening of borders to a higher degree than interior regions. Furthermore many of the affected districts face structural adjustment processes (Barjak/Heimpold 2000b).

Generally, the demand for more highly skilled workers is increasing throughout the world, not only in industrial countries but also in developing and transition countries (Airola/Juhn 2005; Skuratowicz 2005), a stylised fact which is explained by technological change as well as by globalised trade. In the 1980s and 1990s this led to an augmented wage inequality most notably in the Anglo-Saxon countries or alternatively to higher unemployment rates of low-skilled workers in continental Europe (Fitzenberger 1999). Recent studies suggest that wage inequality also increased rapidly in Germany in the 1990s and the early years of the new millenium, above all concerning the low-wage sector (Kohn 2006; Gernandt/Pfeiffer 2007; Möller 2008; among others). Though the overall wage dispersion is smaller in Germany than in the United States, this is mainly due to the high-wage sector in the U.S. (Schettkat 2007). There is no evidence for the hypothesis that an overly compressed wage structure destroys jobs in Germany. According to Dustmann et al. (2007) technological change leads to higher skill premia for high-skilled employees in western Germany, while the rising wage inequality at the bottom of the distribution is caused by the loss of union power and supply shocks. However, the question of the degree to which the reduction of trade impediments – i.e. in the first instance the liberalisation of product markets, but also capital markets – plays a role concerning growing wage differentials has not been satisfactorily resolved. With respect to spatial developments structural changes in labour demand and their effects should emerge outstandingly in the regions which are close to the areas featuring the new trade opportunities, as long as transportation costs play a decisive role.

In this thesis, the impact of the fall of the Iron Curtain on the labour market in the Bavarian-Czech border regions will be highlighted in detail. The unexpected fall of the Iron Curtain in 1989 meets the criteria of a natural experiment. Besides this, one of the world's highest wage differentials exists in this area. Due to a lack of data there are few studies on European integration effects using statistics from more than one country, let alone studies on border effects. Moreover, there has been little research done on foreign outsourcing in Eastern Europe (Cheng/Kierzkowski 2001; Egger/Egger 2002). With respect to Germany's eastern neighbours the development in the eastern German and Polish border regions is analysed in several studies (Barjak/Heimpold 2000a, 2000b; Kaczmarek/Stryjakiewicz 2000; Laczak 2002), while the situation in the eastern Bavarian and Czech border regions is – with the exception of rare contributions (e.g. Gröger 2007) – quite an open topic in research.

1.2 Research Questions

Against this background, the question arising concerns the degree to which the developments on the labour market in the districts close to the border were influenced by the fall of the Iron Curtain in 1989 and the ongoing integration process hitherto, climaxing in the accession of the Czech Republic to the EU in May 2004. The central question of my study is which consequences the opening of the German-Czech border has had on the economic structure as well as on the qualification structure and wage differentials in eastern Bavaria and the Czech Republic. As German-Czech trade and Foreign Direct Investment (FDI) of German companies in the Czech Republic rapidly increased as of 1990 (see Figures A 1.1–1.4 in the appendix to this chapter with figures on German-Czech and in particular Bavarian-Czech economic relations), it seems quite clear that labour demand will have been affected especially in the border districts. The German-Czech Chamber of Industry and Commerce collected information about roughly 1,400 German companies which are actively operating in the Czech Republic, either in the form of a subsidiary, a participation or a joint venture. This dataset represents nearly 40 % of all actively operating German companies in the Czech Republic.[2] Figure A 1.5 in the appendix shows the regional distribution of the holding companies in Germany. It becomes apparent that apart from Baden-Württemberg and North Rhine-Westphalia a large part of the holding companies are based in Bavaria, and that above all in the northeastern districts. On the other hand, the affiliated companies in the Czech Republic are – except for Prague – by an above-average rate located in the NUTS 3 level regions close to Germany (Figure A 1.6). Beside the regions bordering on Germany, only the Southmoravian (*Jihomoravský*) region including the country's second largest city, Brno, plays a prominent role in terms of German-owned firms (Figure A 1.6a). Regarding only firms affiliated to Bavarian companies, Figure A 1.6b shows the important position of the Westbohemian (*Plzeňský*) region around Pilsen. Figure A 1.7 depicts the distribution (by year) of the market entry of German companies in the Czech Republic. Though the figures are potentially biased, since probably older cooperations have a higher probability to be included in the dataset, it becomes clear that a sizable part of German companies entered the Czech market in the early transition years. Figure A 1.8 shows that all economic sectors (manufacturing, trading and services and combinations thereof) are significantly represented.

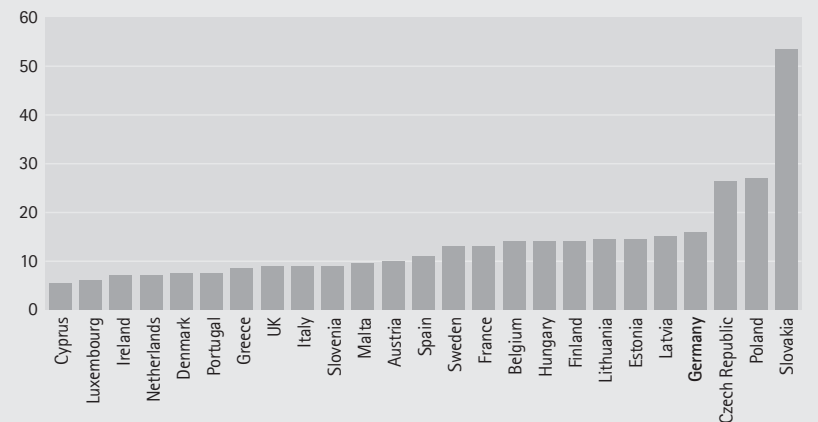
2 Around 9,500 German companies are officially recorded in the Czech Commercial Register, according to the German-Czech Chamber of Industry and Commerce thereof are only 3,500–4,000 operating actively.

In this study, I tackle the following questions, in each case with respect to the ongoing integration process after the opening of the border:

- Is the speed of structural change in the border regions of Bavaria and the Czech Republic higher than in the rest of the country?
- Do the border regions become more specialised?
- Does the distribution of skills or the qualification trends regarding the workforce and unemployed people in the border regions differ from the development in non-border regions?
- Are significant changes observable in the wage differentials between border region and non-border region employees?

I particularly observe the development and performance of low-skilled workers. According to some economic theories, this skill group runs the highest risk of losing out due to integration. Interestingly, according to an ILO survey, the German unemployment rate of low-skilled workers in 2005 was only topped by the Czech Republic, Poland and Slovakia (Figure 1.1). On the one hand, there may be some bias in the results –the huge problems with the integration of the large Roma minority into the labour market may give rise to the outstanding figure for Slovakia, for instance – but on the other hand it is striking that three countries neighbouring Germany and/or Austria – and with highly intensive trade relations with the two Western European countries which are expected to be affected most by the EU integration process – exhibit the highest rates. Poland and the Czech Republic share a long common border with Germany and Austria respectively. The Slovakian-Austrian border is actually only 106 km long, but the two economic centres of Bratislava and Vienna are both close to the frontier.

Figure 1.1: Unemployment rate of low-skilled persons in EU25 countries (as %, 2005)



Source: ILO Labour Statistics, low-skilled: ISCED level 0–2.

In order to tackle these topics I will have to bear some limitations: since there is still very little data available for the period after the accession of the new member states I restrict my analysis to the effects of the opening of the border in 1989 until the early years of the 21st century. For the analysis of unemployment in the Czech Republic, however, I have data for the period up to 2006. Due to the fundamentally different background and deployment of the eastern German region bordering the Czech Republic, I restrict the German region under review to the Bavarian districts located near the Czech Republic.

In the case of Bavaria and the Czech Republic it is important to note that the opening of the border increased the possibilities of trade and international outsourcing, but until now the integration of labour markets has been largely constrained. Germany made use of a limited transition period (2+3+2 model) which restricts the free movement of workers from EU accession countries and will probably last until 2011. However, even without transnational labour mobility the integration of product and capital markets affects the labour markets. Furthermore, in the Bavarian border region a special regulation allows Czech commuters to work in Bavaria under certain circumstances. The effect of this arrangement, which led to a considerable number of Czech employees coming to the Bavarian border districts in the early to mid 1990s should be of particular interest. Did Czech commuters replace domestic workers or at least push their wages down?

In the framework of this case study it is interesting to discover what implications can be derived for the continuing liberalisation of labour markets between old and new EU member states. Moreover, the answers to the above research questions could provide an informative basis for regional policy.

1.3 The Approach and the Structure of the Thesis

The aim of this study is twofold: First, I wish to shed light on the economic development on *both* sides of the border – in contrast to most of the other studies dealing with this research topic. Second, I wish – as far as possible – to apply identical methods in working with the German and the Czech data. Since I have access to micro-level datasets comprising regional information for Germany as well as for the Czech Republic, a common basis for empirical investigation exists. However, there are only appropriate data available for the time before and after the opening of the border for the German case. The IAB employment sample (IABS) enables a comparison of the period in which trade relations were largely restricted (the 1980s) with the situation of free trade and capital mobility (from 1990 onward). Regarding the Czech Republic, there are no adequate data for the time under the Communist regime. Nevertheless, it pays to explore the development in the tran-

sition years. The main focus of this thesis clearly lies on the empirical analysis. However, in order to be able to derive hypotheses, the theoretical background will be dealt with in sufficient detail.

This work is structured as follows: in Chapter 2 I present a survey of the literature on economic integration and border region studies. To begin with I address the main theoretical approaches, which can be used for generating hypotheses. After a short recap of traditional location, I focus on trade theory and New Economic Geography, which emanated from the former two strands of theories (Krugman 1991a, 1993). I concentrate explicitly on two models: first, the trade model by Feenstra/Hanson (1996a), which was developed against the background of Mexican trade liberalisation, and second, the NEG model by Brülhart et al. (2004), which deals with economic integration in the course of EU enlargement. Both models are largely used as a theoretical basis in borderland studies.

Chapter 3 places emphasis on the analysis of the Bavarian border region. After showing some descriptive figures about the economic changes at the border before and after the fall of the Iron Curtain, I apply econometric models in order to analyse qualification trends and wage differentials in the eastern Bavarian border region. It is possible to add an extract from the employment register (BeH), which contains all observations (100 % instead of 2 %) from the border region, to the IABS. Thus, I am able to perform several sensitivity analyses applying advanced econometric methods (propensity score matching, DID, fixed effects) in order to estimate wage differentials.

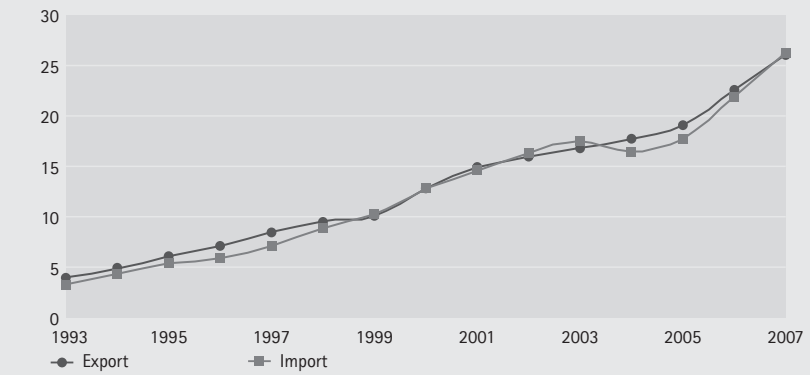
Chapter 4 investigates spatial effects of the transformation of the Czech Republic from a state-directed to a market economy and – similarly to the investigation on the German side – analyses the development of labour market indicators differentiating between districts close to Bavaria/Austria and non-border districts.

In Chapter 5 I summarise the main findings of the thesis and integrate the results with the ongoing EU integration process and the further liberalisation of markets.

It should be noted that the term "border region" is used in my thesis as a synonym for eastern Bavaria (the districts close to the Czech Republic) and/or the Czech districts close to Bavaria and/or Austria. Of course, both countries have districts bordering on other countries or federal states. Naturally, in the framework of my thesis these districts belong to the non-border (or interior) region, i.e. the rest of the country. After defining the outline of the regions in the respective chapter it is clear from the context which region is meant.

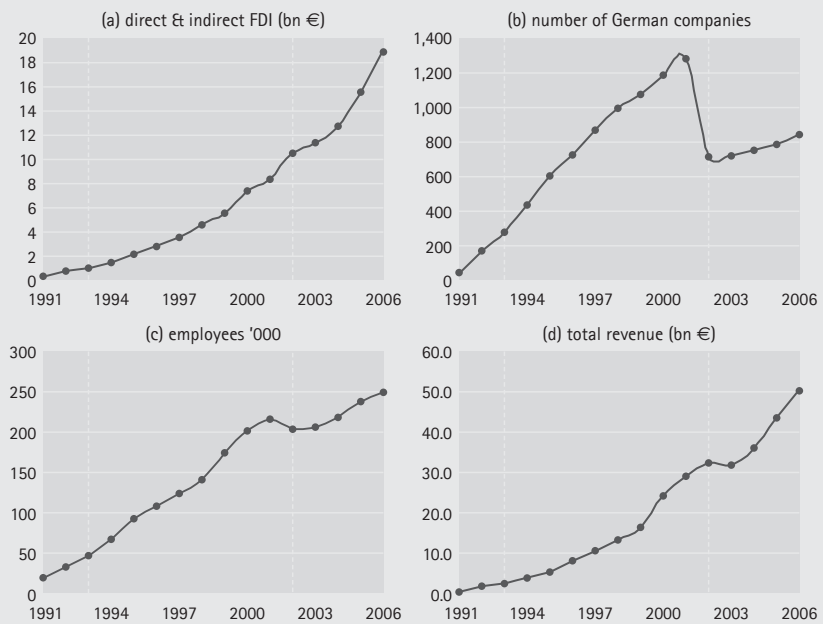
Appendix to Chapter 1

Figure A 1.1: German exports to and imports from the Czech Republic (bn €, 1993–2007)



Source: Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung.

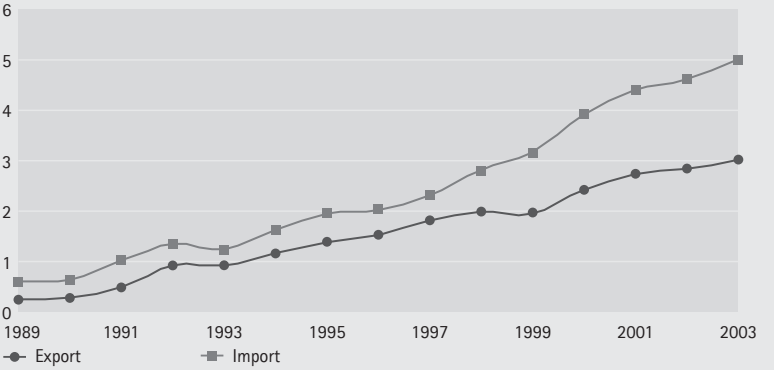
Figure A 1.2: FDI figures of German companies in the Czech Republic (1991–2006)



Source: Deutsche Bundesbank.

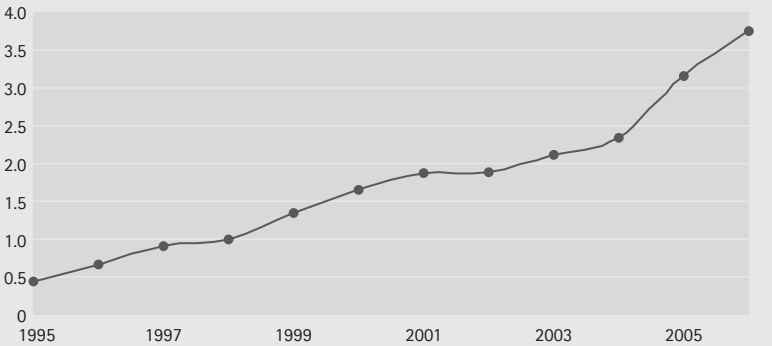
Notes: Until 1992 former Czechoslovakia; without dependent holding companies; due to adjustments to the reporting exemption limits in 1993 and 2002 a considerable number of enterprises were relieved of the obligation to report (Deutsche Bundesbank 1995, 2004).

Figure A 1.3: Bavarian exports to and imports from the Czech Republic (bn €, 1989–2003)



Source: Bavarian Ministry of Economic Affairs, Infrastructure, Transport and Technology.
Notes: Until 1992 former Czechoslovakia.

Figure A 1.4: FDI of Bavarian companies in the Czech Republic (bn €, 1995–2006)



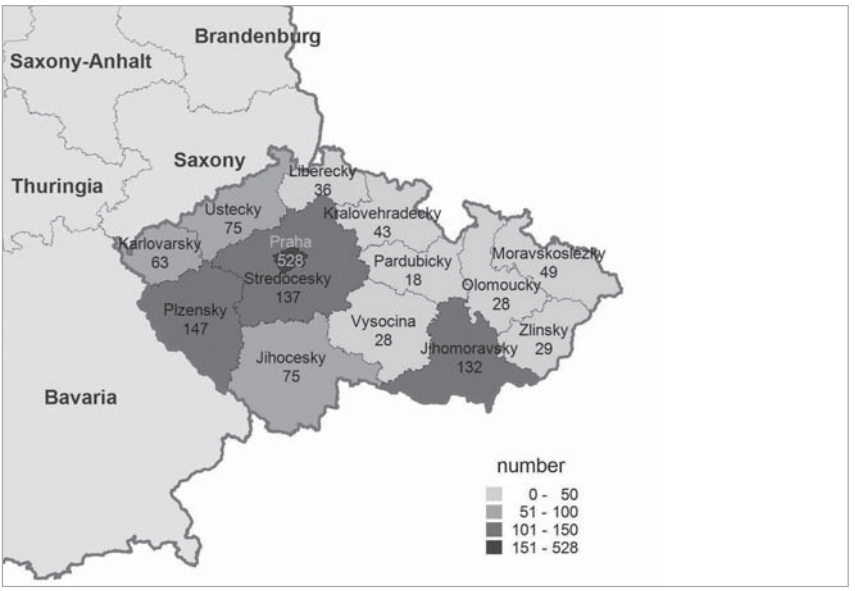
Source: Deutsche Bundesbank.
Notes: Direct and indirect FDI.

Figure A 1.5: Regional distribution of German holding companies operating in the Czech Republic

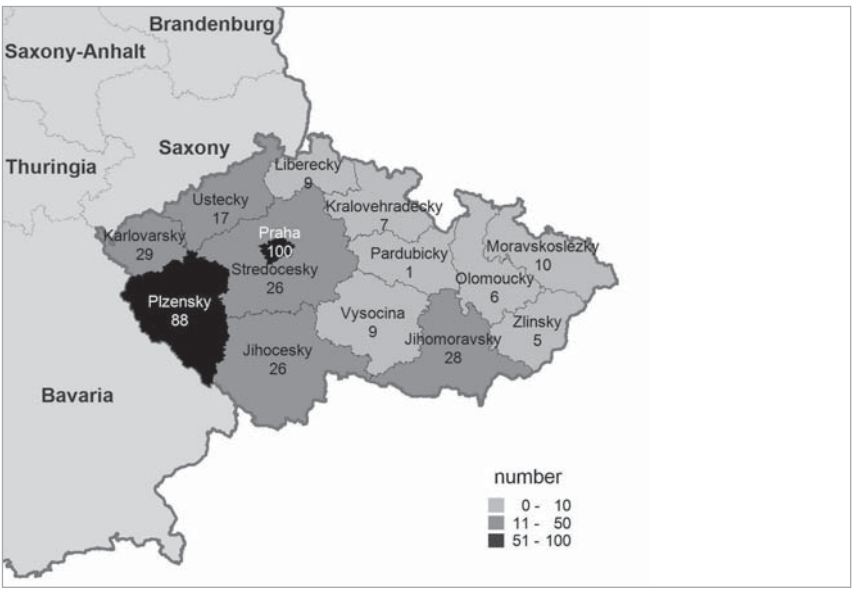
Source: Author's own calculations; German-Czech Chamber of Industry and Commerce.
Notes: Regional classification on the basis of 4-digit postcode boundaries.

Figure A 1.6: Regional distribution of affiliated firms in the Czech Republic: (a) affiliated to German companies and (b) affiliated to Bavarian companies

(a) affiliated to German companies

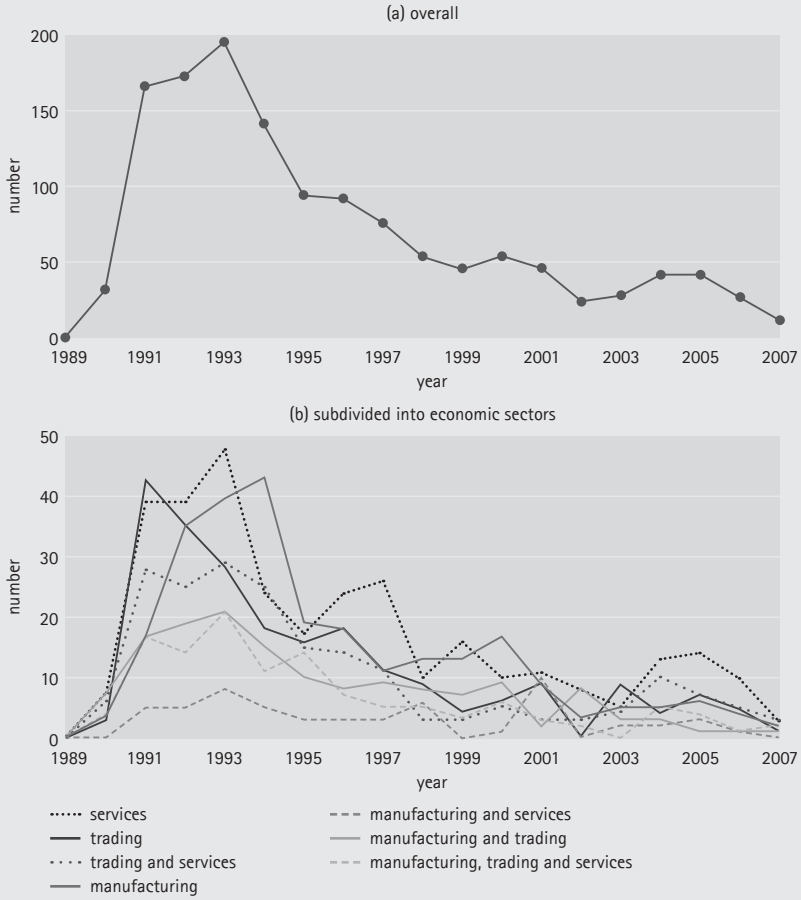


(b) affiliated to Bavarian companies



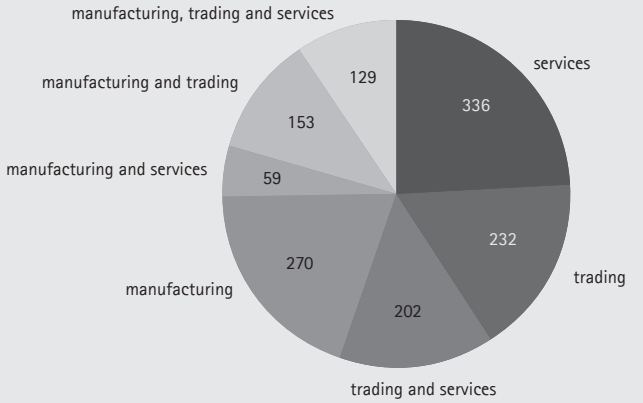
Source: Author's own calculations; German-Czech Chamber of Industry and Commerce.

Figure A 1.7: Market entry of German companies in the Czech Republic: (a) overall and (b) subdivided into economic sectors



Source: Author's own calculations; German-Czech Chamber of Industry and Commerce.
Notes: Regarding economic sectors multiple responses were possible.

Figure A 1.8: Distribution of affiliated firms between manufacturing, trading and service sector



Source: Author's own calculations; German-Czech Chamber of Industry and Commerce.
Notes: Regarding economic sectors multiple responses were possible.

2 A Survey of the Literature

2.1 Theoretical Background: Integration Effects in Border Regions

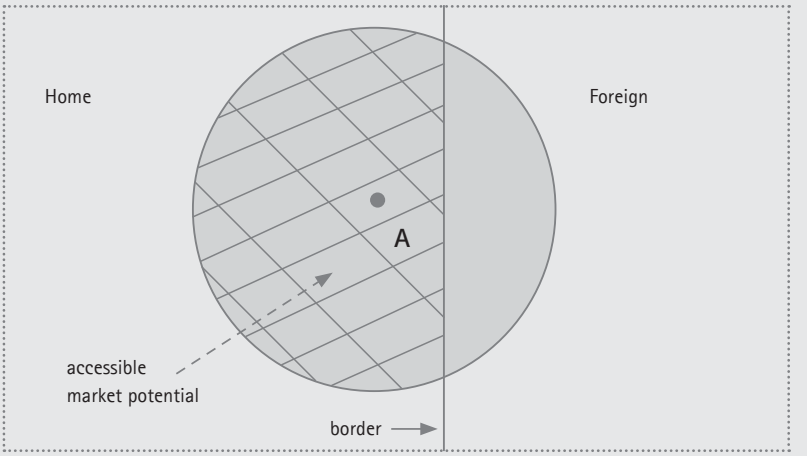
There is no independent theory regarding the effects of the opening of borders on labour markets in frontier regions. However, empirically testable hypotheses with respect to border regions can be derived from traditional location theory as well as international trade (e.g. the model by Feenstra/Hanson 1996a) and New Economic Geography (NEG) models. In the model by Brülhart et al. (2004) extensions with explicit reference to border regions are elaborated. A review of theoretical approaches concerning integration effects in border regions is given by Niebuhr/Stiller (2004) and the studies compiled in the course of the transnational project "Preparity" by Mayerhofer (2004) and Riedel/Untiedt (2001). In the next subsections I address the most relevant approaches and models, i.e. traditional location theory, both traditional and new trade theory and New Economic Geography.

2.1.1 Traditional Location Theory

The economic situation of border regions and the effects of diminishing trade impediments are already stressed by Lösch (1962). Assuming transport costs directly proportionate to distance, a circular distribution area evolves around a central location in a homogeneous plain. Beyond this circle transport costs are prohibitive, so that there are no sales at all. The radius depends on the respective supply and demand functions of the specific products. As a consequence of a supposed frontier the circle is cut, e.g. as a result of impediments preventing any trade. Consequently, border regions do not attract enterprises in search of large market areas as long as the locational disadvantage is not compensated through lower costs (e.g. wages, rents etc.). After the opening of the border the distribution area expands: compared to non-border regions the improved market access should boost the attraction of the border region and lead to the establishment of enterprises, which are now able to supply the full market area. In other words the market potential – in simple terms the purchasing power inversely dependent on the distance (this term is also used in the New Economic Geography models) – of a firm increases (Figure 2.1).[3]

3 Furthermore, concerning traditional location theory, border region aspects are addressed by Giersch (1949/50), among others.

Figure 2.1: Market potential in a border region



Source: Lösch (1962).

2.1.2 Trade Theory

2.1.2.1 Traditional Trade Theory

In the course of the economic integration of border regions, traditional trade theory plays a role when the potential structure of the intensified trade between formerly relatively closed countries can be predicted. In order to analyse effects of reduced trade costs regarding the European Union, old and new member states are each embraced as one country, so that the basic two-country, two-sector models can be applied. In Ricardo's model (1817) every country will specialise in producing the commodity where it has a comparative advantage, accruing from different technologies. The different labour productivity in two sectors leads to different real wage costs and consequently to a competitive advantage in one sector and a competitive disadvantage in the other. In the Heckscher-Ohlin model (1919, 1933), as a result of different relative factor endowments a country has a comparative advantage in the sector which intensively uses the relatively abundant factor (labour or capital). Capital also comprises the endowment of a country with technology as well as human capital, i.e. highly qualified employees. With respect to the enlargement of the European Union, this implies that a comparative advantage for the Western European capital-abundant EU countries can still be assumed regarding the production of high quality products. The Eastern European countries possess a comparative advantage in the production of goods which uses intensively low-skilled labour. This pattern is valid for all accession countries, but is declining most notably for the CEEC-5 countries (Hungary, Poland, Czech Republic, Slovak

Republic, Slovenia) (Zarek 2006). The production factors are assumed to be totally mobile within the countries and between the sectors, but completely immobile between the countries, i.e. the factor endowments are fixed for the countries. After the introduction of trade, structural adjustments emerge through a reallocation of the production factors between the sectors. Concerning the development of wages, the specialisation on the activities with comparative advantages leads to effects according to the Stolper-Samuelson theorem. Assuming constant returns to scale and continuing production of both commodities, an increase in the relative price of a commodity will lead to a rise in the real return to the factor used relatively intensively in its production and to a fall in the real return to the other factor (Stolper/Samuelson 1941). With respect to the Western European countries, the implementation of distinctive trade relations with the accession countries suggests a relatively rising demand for more highly educated employees and consequently a deepening of the wage gap between high- and low-skilled workers. In contrast, wage differentials are supposed to be diminished in the Eastern European countries. According to the factor-price-equalisation theorem, free trade in commodities will equalise wage and interest rates in the participating countries. Trade works as a substitute for the mobility of production factors. Though the Heckscher-Ohlin-Samuelson (HOS) framework fails to explain important trade developments over the past decades, it is still used as a background for some significant studies on open border effects (see Chapter 2.2).

One of the major problems in traditional trade theory is the assumption of factor immobility between countries, which is unrealistic at least with regard to capital. Moreover, in the traditional models, intra-industry trade, which accounts for a large majority of trade between industrial countries, cannot be explained. Thus, new models responding to this fact have been developed, summarised under the term "new trade theory", which I comment on in the next subsection. In terms of regional science the absence of transport costs and the consideration of countries as "dimensionless points in space" without spatial diversification pose a striking drawback.

2.1.2.2 New Trade Theory

Since the 1960s new trade models have tried to explain intra-industrial trade, taking into account increasing returns to scale, countries' different technological skills and imperfect competition. In the next subsections the most important models are described briefly.

If the assumption of constant returns to scale is lifted, trade between countries can be explained without referring to comparative advantages. As scale economies generally do not fit in general equilibrium models, a more complex analysis must

be used (Markusen et al. 1995). An exception to this topic is the relevance of external economies of scale, i.e. decreasing average costs in the presence of perfect competition, which was emphasised by Adam Smith (1776). A larger market and a higher degree of specialisation in one region lead to so-called "knowledge spillovers", which economies of scale are based on (Marshall 1920), and to inter-industrial trade between identical regions. More important with respect to spatial effects of economic integration are internal economies of scale, i.e. a proportionate increase of input results in a disproportionate growth of output and decreasing average costs. Models focusing on intra-industrial trade in homogeneous goods were developed by Brander (1981) and Brander/Krugman (1983). In these approaches the existence of fixed costs leads to internal economies of scale, resulting in monopolies and oligopolistic competition. With regard to models of monopolistic competition and horizontal product differentiation, i.e. the production of many varieties of one commodity it is possible to distinguish between the "ideal variety" approach (Lancaster 1979, 1980; Helpman 1981), which I do not address further, and the "love of variety" approach (Krugman 1979, 1980, 1981; Helpman/Krugman 1985). The groundwork of models assuming monopolistic competition and product differentiation lies in the Dixit-Stiglitz model (1977), which also forms the basis for the New Economic Geography (NEG). Hence, models encompassing spatial allocation also thematically belong to the NEG framework presented below. In the course of globalisation, not only horizontal trade in finished products increased, but especially production sharing of the companies involved, also referred to as international outsourcing.[4] Hummels et al. (2001), for instance, found evidence that in the past decades trade in intermediate inputs has increased faster than trade in final goods. Therefore I illuminate this issue in detail within the scope of the Feenstra-Hanson model.

2.1.2.3 Trade in Intermediate Goods: Model by Feenstra/Hanson

Excursus: The Causes of Labour Demand Shifts – Skill-Biased Technological Change or International Trade?

Besides the abovementioned shortcomings of the traditional trade models, researchers increasingly doubt, whether the rising wage differentials between skill groups in industrial countries are due to international trade. While wage dispersion increased distinctly in the U.S. and Great Britain in the 1980s and '90s, some countries, e.g. Germany, experienced only moderate shifts in rela-

4 Alternative terms for outsourcing are, for example, de-localization, fragmentation and vertical specialisation (Feenstra 2004).

tive wages (Freeman/Katz 1995; Fitzenberger 1999).[5] The simultaneous disproportionate rise in the unemployment rate of low-skilled workers is traced back to the rather rigid German labour market. Regarding the causes of the indisputably rising demand for more highly skilled employees, basically two hypotheses exist. One approach is driven by the abovementioned Heckscher-Ohlin and Stolper-Samuelson theorems. In the course of globalisation and the growing international trade, goods are increasingly imported from low-wage countries. Thereby it is assumed that the imported products and services are goods requiring mainly low-skilled labour, in which developing and transition countries have a comparative advantage (Wood 1994; Borjas/Ramey 1995; Leamer 1998). The other possible origin of the labour demand shift towards skilled workers is the technological progress presupposing the input of modern technologies and production methods as well as well-trained personnel ("skill-biased technological change"; Bound/Johnson 1992; Lawrence/Slaughter 1993; Berman et al. 1994). Trade effects are rejected as the mainspring of the surge in the wage differentials, since the rise in the demand for skilled workers took place *within* industrial sectors and considerable employment shifts *between* sectors, which would have been the consequence of the Heckscher-Ohlin model, did not occur (Berman et al. 1994). Furthermore, according to the Stolper-Samuelson theorem, the relative wage gains for skilled employees suppose a relative price increase for goods produced by using relatively intensively skilled labour. This was verified for the 1970s, which is why Leamer (1998) denominated these years the "Stolper-Samuelson decade", whereas in the 1980s these price trends did not emerge (Lawrence/Slaughter 1993). Moreover, developing and transition countries, in which, according to traditional trade models, low-skilled workers should gain a relative benefit from the reduction of trade impediments, registered growing wage gaps, e.g. Mexico (Feenstra/Hanson 1997) and Poland (Skuratowicz 2005). Within Europe, Germany has one of the highest unemployment rates among low-skilled workers, only coming behind Slovakia, Poland and the Czech Republic (Statistisches Bundesamt 2006, see also Figure 1.1). To some extent this also contradicts the predictions of traditional trade theory and its implications that the demand for low-skilled workers should show a relative rise in those Eastern European countries close to the West.

5 For the period from the mid 1990s onwards, however, recent studies conclude that the wage dispersion has considerably risen in Germany (Bergmann 2004; Berger 2005; Hradil 2005; Kohn 2006; Dustmann et al. 2007; Gernandt/Pfeiffer 2007; Möller 2008).

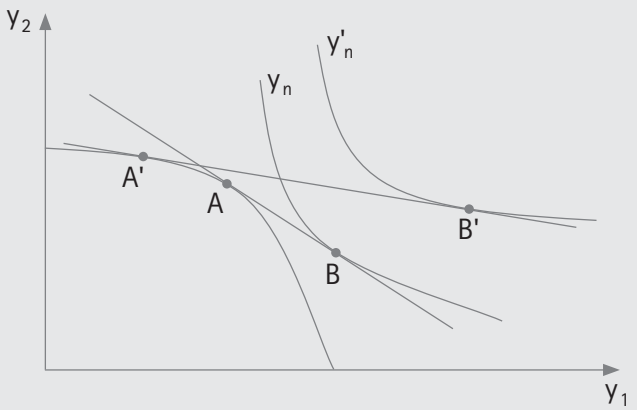
Feenstra/Hanson (1996a) developed a model in which increasing wage differentials in industrial as well as in developing and transition countries are explained by international trade.[6] In contrast to the Heckscher-Ohlin model, Feenstra/Hanson assume different factor intensities not *between* but *within* sectors producing intermediate inputs. These inputs are traded internationally and combined into a final commodity. Under the assumption of capital mobility (foreign direct investment, international outsourcing) the increase in the demand for more highly educated workers within one sector can be explained. The drop in prices of imported inputs has identical effects like "skill-biased technological change", and the relative size of the effects has to be estimated empirically. In the Feenstra-Hanson model two intermediate inputs are produced using unskilled labour (L_i), skilled labour (H_i) and capital (K_i) with concave and linearly homogeneous production functions $y_i = f_i(L_i, H_i, K_i), i = 1,2$. The factor prices are given by the wage for unskilled labour, w_i, the wage for skilled labour, q_i, and the rental on capital, r_i. One of the two inputs (y_1) uses unskilled labour relatively intensively, while the other (y_2) uses skilled labour relatively intensively. For example, y_1 could denote manufacturing activities, while y_2 could indicate R&D or marketing activities. Assuming that a proportion of the activities can be imported from abroad or outsourced, $x_1 < 0$ denotes the imports of input 1. Contrariwise, $x_2 > 0$ denominates R&D activities that are exported to foreign countries. The input prices are denoted by $p_i, i = 1,2$, letting $p = (p_1, p_2)$ denote the price vector. The production function of the final commodity $y_n = f_n(y_1 - x_1, y_2 - x_2)$ is also concave and linearly homogeneous. Disregarding the input of labour and capital required to combine the inputs into the final commodity, the total usage of input factors is as follows: $L_1 + L_2 = L_n$, $H_1 + H_2 = H_n$, $K_1 + K_2 = K_n$. Under perfect competition the value of the final commodity and the traded inputs is maximised subject to

$$\begin{aligned} &G_n(L_n, H_n, K_n, p_n, p) \equiv \max_{x_i, L_i, H_i, K_i} p_n f_n(y_1 - x_1, y_2 - x_2) + p_1 x_1 + p_2 x_2, \text{ subject to} \\ &y_i = f_i(L_i, H_i, K_i), \; i = 1,2, \\ &L_1 + L_2 = L_n, \quad H_1 + H_2 = H_n, \quad K_1 + K_2 = K_n, \end{aligned} \tag{2.1}$$

thereby letting p_n denote the price of the final product and p the price vector of the inputs. G_n can be understood as added value in industry n, i.e. the value of the final product plus the exports minus the value of the imports.

6 In this thesis I outline the basic design of the Feenstra-Hanson model. For a more detailed description of the model, see Feenstra (2004).

Figure 2.2: Production-possibility frontier between inputs 1 and 2



Source: Feenstra (2004).

Figure 2.2 depicts the production-possibility frontier of y_1 and y_2. For purposes of illustration it is assumed that $p_1x_1 + p_2x_2 = 0$, which is actually not necessary for the single industry. As in the Heckscher-Ohlin model, inputs are produced in point A at initial prices and trade leads to point B. At world prices – that means a drop in the relative price of y_1 – production shifts towards the skilled-labour-intensive activity and takes place at point A'. Trade leads then to a shift to point B'. Contrary to the Heckscher-Ohlin case, the production shifts occur *within* a single industry. Under the zero-profit assumption regarding the production of inputs 1 and 2, $p_i = c_i\,(w, q, r)$, the percentage change in factor prices $\hat{w}, \hat{q}, \hat{r}$ depends on the percentage change in prices $\hat{p}_i$:[7]

$$\hat{p}_i = \Theta_{iL}\hat{w} + \Theta_{iH}\hat{q} + \Theta_{iK}\hat{r}, \tag{2.2}$$

where Θ_{ij} represents the cost share of factor j in input i, with $\sum_j \Theta_{ij} = 1$. In order to be able to make propositions about the sign of factor price changes (treating $\hat{p}_i$ as exogenous gives two equations for the determination of three unknown factor price changes), it is assumed that capital has an equal cost share in both intermediate inputs, so that $\Theta_{1K} = \Theta_{2K}$. Consequently, the cost shares of labour are also equal: $(\Theta_{1L} + \Theta_{1H}) = (\Theta_{2L} + \Theta_{2H}) \Rightarrow (\Theta_{1L} - \Theta_{2L}) = -(\Theta_{1H} - \Theta_{2H})$. Therefore, it holds that the difference between the two equations in formula 2.2 yields

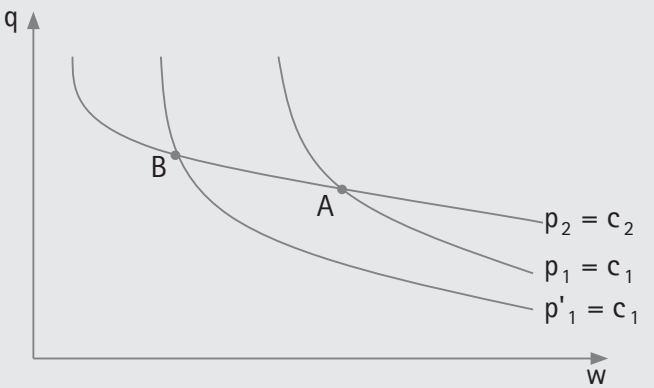
$$\hat{p}_1 - \hat{p}_2 = (\Theta_{1L} - \Theta_{2L})\hat{w} + (\Theta_{1H} - \Theta_{2H})\hat{q} = (\Theta_{1L} - \Theta_{2L})(\hat{w} - \hat{q}) \tag{2.3}$$

7 Formula 2.2 is the result of total differentiation of $p_i = c_i\,(w, q, r)$ and using "Jones' algebra" (Jones 1965).

Input 1 uses unskilled labour relatively intensively, so that $\Theta_{1L} - \Theta_{2L} > 0$. From this it follows that a relative drop in the price of the imported input $(\hat{p}_1 - \hat{p}_2 < 0)$ leads to a decline in the relative wage for unskilled labour, $(\hat{w} - \hat{q}) = (\hat{p}_1 - \hat{p}_2)/(\Theta_{1L} - \Theta_{2L}) < 0$.

Figure 2.3 illustrates the cost curves of y_1 and y_2 in a w-q diagram holding r constant. After a decline in price p_1 of input 1 – the activity using unskilled labour relatively intensively – the isocost curve of this activity shifts inwards, resulting in a fall in the relative wage of unskilled labour, w, (the equilibrium shifts from point A to point B). Since the change in the rental on capital leads to an equiproportional shift in the two iso-cost curves, it is irrelevant for the relative wage (w/q) which declines with the drop in the price of the imported inputs.

Figure 2.3: Isocost lines of input activities



Source: Feenstra (2004).

The model can be expanded from two inputs to a continuum of inputs (Feenstra/Hanson 1996a, 1997). Then $z \in [0,1]$ denotes the many different activities which are necessary for the production of a final commodity. $x(z)$ represents the quantity of each of the intermediate inputs produced, $a_L(z)$ and $a_H(z)$ stands for the quantity of unskilled and skilled labour required to produce one unit of x(z). The activities are ordered such that $a_H(z)/a_L(z)$ is non-decreasing in z. A higher value of z is thus equivalent to an input that uses skilled labour more intensively. Considering two countries with Cobb-Douglas production function and Hicks-neutral productivity parameter, the composite production factor labour is based on a Leontief production function. Values for the foreign country are marked with an asterisk *. In the home country the produced quantity of an input is

$$x(z) = A\left[min\left\{ \frac{L(z)}{a_L(z)}, \frac{H(z)}{a_H(z)} \right\} \right]^{\theta} K^{1-\theta}, z \in [0,1] \qquad (2.4)$$

The foreign country applies the same production function with the exception of a differing productivity parameter A^*. The parameter Θ denotes the share of labour in the production costs of an activity. The cost function is

$$c(w,q,r,z) = B\left[wa_L(z) + qa_H(z)\right]^{\theta} r^{1-\theta}, \tag{2.5}$$

where $c(w,q,r,z)$ represents the production costs of one unit of $x(z)$ given the wage of unskilled labour, w, the wage for skilled labour, q, and the rental on capital, r. Inputs can be produced in each of the two countries and are combined into a final commodity. Regarding this final commodity, its production needs no additional input of labour or capital and a Cobb-Douglas production function is assumed:

$$lnY = \int_0^1 \alpha(z) \ln x(z) dz, \; with \int_0^1 \alpha(z) dz = 1 \tag{2.6}$$

Since in formula 2.6 labour is not included as an input, the final commodity is assembled from the individual inputs $z \in [0,1]$ incurring no additional costs. Thus, it is irrelevant in which of the countries the final commodity is produced, as, regarding this activity, value added is zero.

Regarding the inputs, it is reasonable to assume that production will take place in the location where costs are minimal. The following assumptions are made:

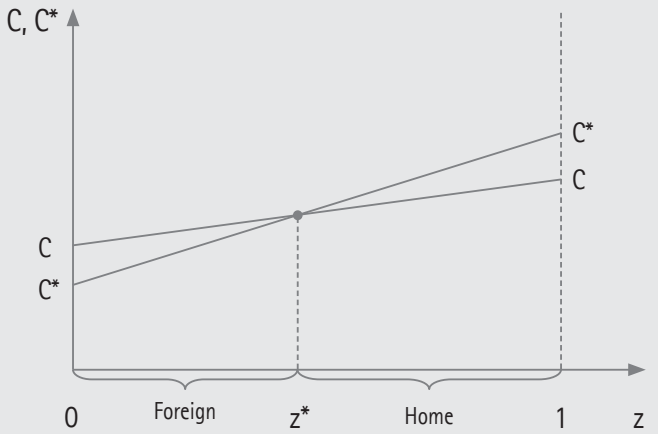
$$\frac{q}{w} < \frac{q^*}{w^*} \; and \; r < r^* \tag{2.7}$$

The first assumption states that the home country is skilled-labour abundant. This seems realistic if the U.S. or Western European countries are regarded as the home country, while the role of the foreign country is assigned to Mexico or Eastern European countries. As a consequence of the relative scarcity of unskilled labour in the home country, its relative wage w is higher at home than abroad. Besides, the rental on capital r, that is, according to the second assumption, lower in the home country, reflects the relative abundance of capital at home. If international capital mobility is possible, capital will move abroad, which is also realistic provided the above-mentioned assignment of countries.

Figure 2.4 illustrates the distribution of inputs between the home and the foreign country in the case where there is no capital mobility. For the sake of simplicity, average unit costs $c(w,q,r,z)$ subject to z are assumed to be a continuous function. CC represents the cost curve of the home country, while C^*C^* depicts the cost curve of the foreign country. If all unit costs were lower at home, so that $C<C^*$ for any z, all inputs would be produced in the home country, and vice versa. If the

cost curves *CC* and *C*C** intersect, it comes to a fragmentation of production with *c(w,q,r,z*) = c(w*,q*,r*,z*)* for input *z**. Activities *z'>z** require skilled labour relatively intensively. Since the relative wage of skilled employees is lower in the home country according to the above assumption, all activities *z'>z** can be produced advantageously at home. On the other hand, all activities *z'<z** can be produced at a cheaper rate in the foreign country. Feenstra/Hanson (1996a) proved that *CC* and *C*C** can intersect once at most. As a consequence the foreign country specialises in activities *[0, z*)*, whereas the home country specialises in activities *(z*, 1]*.

Figure 2.4: Feenstra-Hanson model without capital mobility



Source: Feenstra (2004).

Hence, the relative demand for skilled and unskilled labour can be calculated for each country. In the home country it holds that

$$D(z^*) = \frac{\int_{z^*}^{1} \frac{\delta c}{\delta q} x(z)\,dz}{\int_{z^*}^{1} \frac{\delta c}{\delta w} x(z)\,dz} \tag{2.8}$$

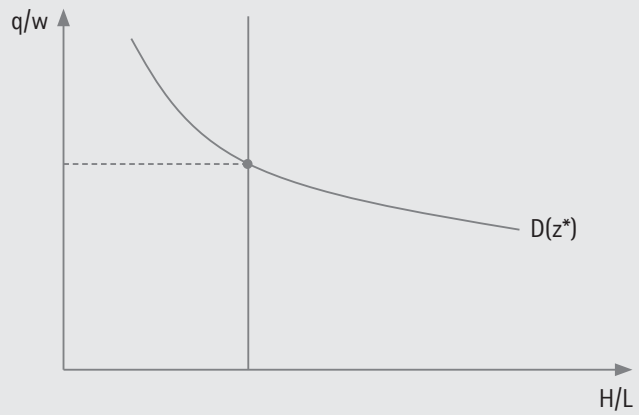
In the foreign country it holds that

$$D^*(z^*) = \frac{\int_{0}^{z^*} \frac{\delta c^*}{\delta q^*} x(z)\,dz}{\int_{0}^{z^*} \frac{\delta c^*}{\delta w^*} x(z)\,dz} \tag{2.9}$$

Since the final commodity as a composition of the intermediate inputs requires no additional costs, it is not significant where it is produced, as mentioned above. The

demand for skilled and unskilled labour depends on the factor prices. Figure 2.5 shows the gradient of $D(z^*)$ subject to the ratio of skilled and unskilled labour. Relative labour demand depends on factor prices which affect the prices for intermediate inputs influencing the equilibrium demand for $x(z)$. In each country the gradients $D(z^*)$ and $D^*(z^*)$ are decreasing in the relative wage of skilled/unskilled labour. If each country produces the range of activities which it has a comparative advantage in, equilibrium will be reached in the markets for both skilled and unskilled labour and capital (z^* in Figure 2.4).

Figure 2.5: Relative labour demand without capital mobility



Source: Feenstra (2004).

The wage bill in the home country is represented by $wL + qH$. Since wages account for the share Θ of total costs, GDP in each country is $(wL + qH)/\Theta$. Multiplied by the cost share of capital it follows that

$$\frac{(wL+qH)}{\Theta}(1-\Theta) = rK \tag{2.10}$$

Assuming a fixed capital endowment, the rental on capital r will in this manner be determined in the home as well as the foreign country.

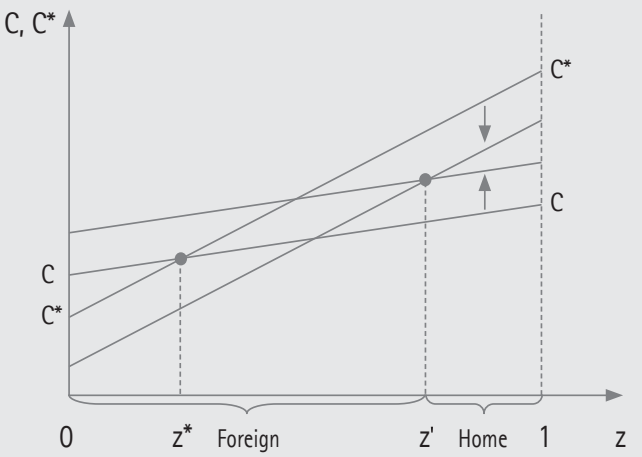
Assuming $r<r^*$ and capital mobility between the two countries, capital moves from the home to the foreign country, so that K decreases and K^* increases. This results in a rising r and a shrinking r^*, leading to an upward parallel shift of the CC curve and a downward parallel shift of the C^*C^* curve (Figure 2.6).

Consequently, the equilibrium value of z increases from z^* to z'. The foreign country specialises in an expanded range of activities $[0, z')$, while the home country specialises in a contracted range of activities $(z', 1]$. Regarding the demand for

labour, this has the following implications: The production activities which are outsourced from the home to the foreign country *(z*, z')* use skilled labour less intensively than the activities which are still produced at home. Hence, the relative demand for unskilled labour drops in the home country, while the relative demand for skilled labour rises. The relative labour demand curve shifts to the right from *D(z*)* to *D(z')* (Figure 2.7). In the foreign country the relocated activities use relatively more skilled labour than was used hitherto, leading to a growing demand for skilled labour there too. In contrast to the implication of the Heckscher-Ohlin-Samuelson framework, relative wages of skilled labour are expected to rise in both countries.

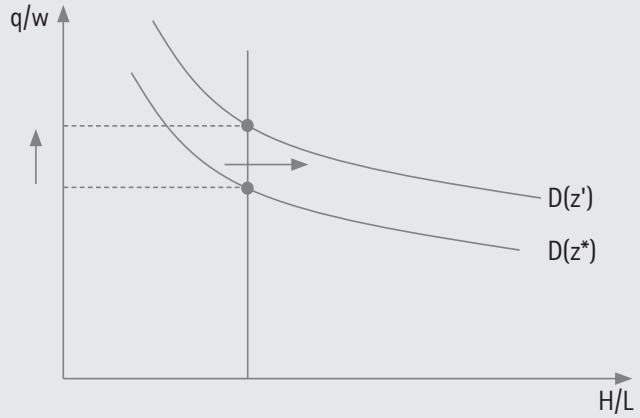
The conclusion from this theoretical model for border regions is that the presumed effects appear in the course of integration of economic markets in regions close to the frontier to a greater extent. This means that the rise in the demand for skilled labour is above average in border regions compared to the rest of the country, i.e. low-skilled workers residing close to the frontier should suffer extraordinarily losses, while, vice versa, more highly skilled workers there should particularly benefit from the opening of the border. The advantage of this model is the explicit proposition concerning the effects of integration on skill groups. The special effects on border regions, however, are derived indirectly assuming that distance should matter in cross-border trade relations. In order to focus also on models which by principle consider distance costs, I now turn to the strand of literature which is currently widely applied for regional analysis.

Figure 2.6: Feenstra-Hanson model including capital mobility



Source: Feenstra (2004).

Figure 2.7: Relative labour demand with capital mobility



Source: Feenstra (2004).

2.1.3 New Economic Geography

In New Economic Geography (NEG) elements of location theory are combined with new trade theory. As one strand of new trade models, in which intra-industrial trade is explained through monopolistic competition, New Economic Geography also has its microeconomic basis in the Dixit-Stiglitz model, enriched by components of traditional location theory. Unlike conventional partial spatial models, in NEG models analysis is carried out in a general equilibrium model. Goods are not only heterogeneous with respect to their spatial availability, but also regarding their physical constitution and psychological perception and are produced under increasing returns to scale (Schöler 2005).

2.1.3.1 The Basic Approach by Krugman

Krugman's seminal model (1991b) introduces interregional mobility of part of the workforce in his trade model (1980). Basically, he tackles the question of why the manufacturing sector is concentrated in some regions (*core*), whereas other regions lag behind (*periphery*), i.e. both firms and people migrate to larger agglomerations. In Krugman's basic NEG model the development of a core-periphery structure depends on the relationship between three parameters: transport costs, economies of scale (or the elasticity of substitution among differentiated goods) and the share of mobile workers in the population as a whole. Regarding my research topic I focus on the question of what happens to border regions according to NEG when transport costs (or trade costs) fall after the opening of a border. Does the basic model give any hints about this issue?

The fundamental elements of the Krugman model are two regions and the two sectors agriculture and manufacturing. Agricultural goods are produced under perfect competition and constant returns to scale, while manufacturing goods are produced under monopolistic competition and with increasing returns to scale. Transport costs only accrue for manufacturing goods. The immobile peasants are symmetrically distributed between the two regions, whereas the workers in the manufacturing sector are interregionally mobile and locate in the region where the higher real wage is paid. The decisive parameters with respect to the development of a core-periphery structure are the share of manufacturing workers μ, the elasticity of substitution σ and the inverse index of transport costs τ.

In the short run equilibrium, manufacturing workers are immobile, too, so that the distribution of the population between the two regions is given. If the manufacturing workers are equally distributed between the regions, wages are also equal in the regions. If the share of manufacturing workers in region 1 increases, two opposing effects influence the relative wage rate: on the one hand, according to the "home market effect"[8], the wage rate tends to be higher in the larger market. On the other hand, there is less competition in the region with the smaller share of manufacturing workers, so that the reaction concerning the relative wage rate is ambiguous.

In the long run equilibrium, it is important to distinguish between nominal and real wages. Due to transport costs, manufacturing workers pay a lower price for manufacturing goods in the larger market. Migration of manufacturing workers from region 2 to region 1 leads to a lower price index in region 1 and a higher price index in region 2, so that the divergence between the regions accelerates. The reaction of the real wage rate ω_1/ω_2 after a shift in the share of manufacturing workers in region 1 (denoted by f) is therefore decisive whether or not a core-periphery structure develops. If ω_1/ω_2 decreases with f, manufacturing regions will migrate out of region 1 until the share is equal in both regions. If ω_1/ω_2 increases with f, eventually all manufacturing workers will migrate into region 1 and only the immobile peasants will stay in region 2. With two factors working towards divergence ("home market effect" and the price index effect) and one factor working towards convergence (degree of competition in the smaller region), the determination of which effects dominate depends on the ratio of the values of μ, σ and τ. High transport costs, i.e. a relatively small value of τ, a low share of mobile workers (μ relatively small) and low (positive) returns to scale (thus a high elasticity of substitution σ) favour convergence. Decreasing transport costs (apart

8 Assuming increasing returns to scale, the "home market effect" denotes the tendency of companies to produce in countries in which there is a large domestic demand (Krugman 1980).

from zero, where distance does not matter at all), an increase in the number of mobile workers and increasing scale economies will lead to a concentration process in one region, which (by chance) has a head start. In Krugman's basic model (1991b) this results in a 'bang-bang' solution, i.e. the complete agglomeration of the mobile workforce in one region if transport costs sufficiently decrease. In this context, it is important to mention the so-called "no-black-hole-condition" which rules out that agglomeration always prevails, even if transport costs were infinite. Therefore it is necessary to assume that $\frac{\sigma-1}{\sigma} > \mu$, i.e. increasing returns to scale and/or the budget share of manufacturing workers are sufficiently low (Fujita et al. 1999). The catastrophic outcome of total agglomeration in the basic model has been criticised in the literature and subsequently several models were developed trying to explain partial agglomeration and an equal allocation of mobile workers across the two regions (Ottaviano/Puga 1998; Puga 2002; Ottaviano/Thisse 2004; Pflüger/Südekum 2008).

The factors which pull economic activities together are characterised as centripetal forces (e.g. larger markets, spillover effects etc.). The factors which push economic activities apart are subsumed under centrifugal forces (e.g. higher stress of competition, labour costs, rents etc.). Venables (1996) referred to the generation of centripetal forces as forward linkages (workers as consumers prefer to be close to the producers) and backward linkages (producers prefer to concentrate where the market is larger). The key figure with respect to the attractiveness of a region for the potential settlement of firms is the relative impact of centripetal and centrifugal forces. The opening of a border or the abolition of trade impediments between two countries reduces the cross-border transaction costs and facilitates factor mobility, which could lead to a reallocation of economic activities not only *between* the countries, but also *within* the countries (Niebuhr/Stiller 2004). In the former case, migration leads to a spatial reallocation of people and firms at the international level. However, more important for research on border regions is the second case. While activities in a closed economy are inwardly orientated, after the opening of a border the domestic market loses its predominant role (Krugman/Elizondo 1996). The centre becomes less important, and the periphery becomes more attractive due to the improved trade and distribution opportunities. The settlement of firms then leads to the immigration of workers, and a self-reinforcing circular process begins. Even if cost differentials between regions are not explicitly modelled, positive effects on border regions are implied in the literature (Hanson 1996). Border regions move from the periphery to the centre, and their "home market" and market potential increases.

Thus, concerning the unequal development of regions the level of transport costs plays a central role. With regard to the question as to which effects a de-

crease in transport (transaction) costs has on employment growth, the structure of economic activities, the qualification and the wage structure, results can hardly be derived from most NEG models. In the presence of multiple equilibria, the direction of effects depends on the parameter values of the variables. However, "New Economic Geography has come of age" (Neary 2001) and in recent years models have been developed which make it easier to constitute hypotheses for the economic deployment of border regions. There are several NEG models differentiating between regions and countries and thus dealing with increasing international integration (e.g. Krugman/Elizondo 1996; Monfort/Nicolini 2000; Behrens et al. 2006, 2007). In the next subsection I dwell on the model of Brülhart et al. (2004), which provides a basis for border region studies (Niebuhr 2006b, 2008) and from my point of view corresponds best to my research questions.

2.1.3.2 A Three-Region Model by Brülhart/Crozet/Koenig

One of the main problems of the basic NEG model with respect to my research questions is that it is not analytically solvable despite its restrictive assumptions. The equilibria can only be found by numerical computer simulations, with the consequence that hypotheses are hardly testable. A three-region model by Brülhart et al. (2004), which is derived from Krugman's basic model and the analytically solvable core-periphery model of Pflüger (2004) based on it, differentiates between a foreign country (0) and two regions in the home country: an interior region (1) and a border region (2). As in the basic model there are two sectors: the perfectly competitive agricultural sector (*A*) uses only the immobile production factor labour (*L*). The monopolistically competitive manufacturing sector (*X*) produces differentiated goods and uses labour (*L*) as a variable input and human capital (*K*) as a fixed cost, which leads to increasing returns to scale. Manufactured goods are assumed to incur transport costs of the iceberg type, i.e. a fraction of a shipped commodity melts away and only the part $1/T$ arrives at its destination, increasing the price of the unit received to pT. Transport costs arise in interregional domestic trade (with $T_{12} = T_{21}$) and in each domestic region's trade with the foreign country.

The utility function for an individual has – in contrast to Krugman's model – the quasi-linear form

$$U = \alpha \ln C_X + C_A \quad with \ \alpha > 0, \tag{2.11}$$

where C_X represents the consumption of the different varieties of the manufacturing commodity and C_A the consumption of the agricultural commodity.

The Index C_X is defined by a CES function

$$C_X = \left[\sum_{i=1}^{n} x_i^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \tag{2.12}$$

where x represents the consumption of variety i of the manufacturing commodity and n the number of varieties which are potentially available in a region, n being proportionate to the region's endowment with human capital. The elasticity of substitution between two varieties is denoted by σ. In zero-profit equilibrium the term $\sigma/(\sigma-1)$ represents the relation between the marginal and the average product of labour, thus the level of returns to scale. Production factors are assumed to be immobile between countries, so that L_0 and K_0 are exogenous. In the domestic regions the supply of the immobile factor labour is also fixed by L_1 and L_2. Human capital is mobile between the domestic regions and migrates according to the indirect utility differentials. The regional shares of human capital are denoted by $K_1/K = \lambda$ and $K_2/K = 1-\lambda$.

The budget constraint of an individual is given by

$$Y = C_A p_A + \sum_{i=1}^{n} x_i p_i, \tag{2.13}$$

where Y represents the income, p_A is the price of the agricultural good and p_i is the price of variety i of the manufactured good. Therefore, the demand of consumers in region s for variety i in region r is

$$x_{i,rs} = p_{i,rs}^{-\sigma} \frac{\alpha}{\sum_i p_{i,rs}^{1-\sigma}}, \qquad r,s = 0,1,2 \tag{2.14}$$

Each of the three regions produces n_r varieties of the manufacturing commodity. Due to the iceberg transport costs the price for variety i produced in region r, which is sold in region s, is expressed by $p_{irs} = p_r T_{rs}$.

Finally, the price index of the varieties of the manufacturing commodity which are sold in region s can be written in the form

$$P_s = \left[\sum_{r=0}^{R} n_r (p_r T_{rs})^{1-\sigma} \right]^{\frac{1}{1-\sigma}}, \tag{2.15}$$

and an individual's demand is

$$x_{rs} = \frac{\alpha (p_r T_{rs})^{-\sigma}}{P_s^{1-\sigma}} \qquad r,s = 0,1,2 \tag{2.16}$$

The agricultural sector (A) produces goods under perfect competition using only the immobile factor labour (L). Transaction costs are not incurred for agricultural goods interregionally or internationally, so that $p_{A1} = p_{A2} = p_{A0}$. It is assumed that in each region $p_A = w_A$. Since the agricultural commodity is used as a numéraire, $w_A = 1$. According to these assumptions, a representative firm in region r will set the following profit-maximising price:

$$p_r = \left(\frac{\sigma}{\sigma - 1} \right) \tag{2.17}$$

Market clearing for each variety leads to an equilibrium output of a firm producing in r:

$$X_r = \sum_{s=0,1,2} (K_s + L_s) T_{rs} x_{rs} \tag{2.18}$$

and the profits of the firm are given by

$$\pi_r = p_r X_r - X_r - R_r, \tag{2.19}$$

where R_r represents the remuneration for human capital in region r.

While in the short term human capital is also immobile between the domestic regions, in the long run it depends on the level of indirect utility whether domestic human capital owners will locate in region 1 or region 2.[9] Finally, not nominal but real wages are essential for a higher utility of workers. The indirect utility function, derived from (2.11), has the form

$$V_r = -\alpha ln(P_r) + Y + [\alpha (ln \alpha - 1)] \tag{2.20}$$

and the consequential utility differential is

$$V_1 - V_2 = \alpha ln(P_2 / P_1) + (R_1 - R_2), \tag{2.21}$$

which depends on the distribution of human capital between the regions and the parameters of the model. Human capital owners migrate towards region 1 if the price index for manufacturing goods in region 2 and the compensation for human capital in region 1 respectively are sufficiently high.

Brülhart et al. now distinguish between two scenarios: in the basic model the trade costs of the domestic regions with the foreign country are equal ($T_{01} = T_{02}$).

9 For a detailed description of the short run equilibrium, see the appendix of Brülhart et al. (2004).

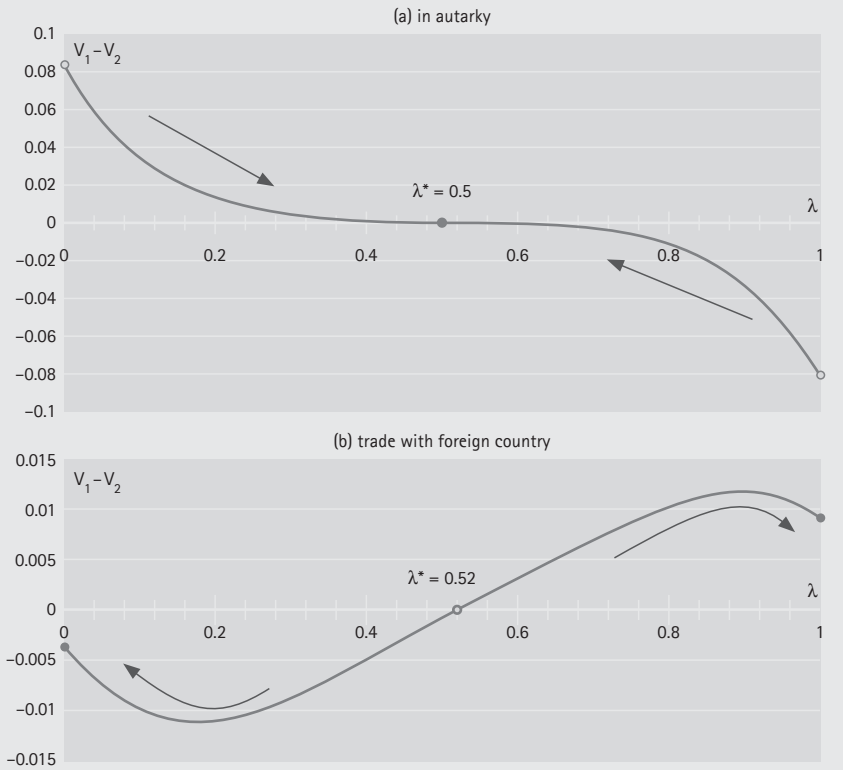
Shrinking trade impediments cause two opposing effects: on the one hand, centripetal forces become weaker, because due to the new market in the foreign country the incentive to locate near domestic consumers is reduced. Besides, the income and also the supply from the foreign country become more important, lowering the domestic agglomeration force. On the other hand, centrifugal forces diminish, too. The higher competition from the foreign country relativises the possibility of evading domestic competition by locating in the periphery. It can be shown that with decreasing trade costs the effect on the centrifugal forces generally dominates, i.e. the probability of a core-periphery structure grows, although it is not determined which region will be the core. The same effect occurs if the foreign country gets bigger in economic terms.

In the second scenario, which is more interesting and also more realistic with regard to spatial differences, the domestic regions are asymmetric. The trade costs between region 1 and the foreign country are higher ($T_{01} > T_{02}$). Thus, region 1 is called the interior region, while region 2 is denoted as the border region. Hence, with respect to the growing market potential, the incentive for domestic firms to locate near the foreign consumers – thus in the border region – increases. Otherwise, as the domestic dispersion force is weakened by foreign supply, the interior region attracts domestic firms by reason of the distance to the foreign competitors. Though the model offers no clear-cut results, it can be concluded from simulations that for most parameter configurations the border region benefits from the abolition of trade impediments. Figure 2.8 shows the indirect utility differentials ($V_1 - V_2$ in equation 2.21) dependent on the share of manufacturing workers in the interior region (λ). An equilibrium of the allocation of manufacturing exists if either the indirect utilities are equalised or in the case of total agglomeration in one region and a lower potential indirect utility in the other region.

Assuming $L_1/(K_1+K_2) = L_2/(K_1+K_2) = 1$, Figure 2.8a illustrates autarky for the parameter values $\sigma = 6$, $\alpha = 0.3$, $T_{12} = 1.46$ and $T_{01} = T_{02} = \infty$. In this configuration the only stable equilibrium is the symmetrically dispersed location of manufacturing. If the share of manufacturing workers is higher in one region, indirect utility is higher in the other, leading to migration until the share is balanced. Reduced trade costs with the foreign country lead to a completely different graph, above all regarding equilibria. In Figure 2.8b the effects of trade are depicted with $T_{01} = 1.55$ and $T_{02} = 1.5$. In addition to the preconditioned relation of labour and human capital in the domestic country in the previous figure, it is assumed that, with regard to the foreign workforce, $L_0/(K_1+K_2) = K_0/(K_1+K_2) = 1$. In this case only the complete agglomeration in one of the two regions constitutes a stable equilibrium. The implication of this outcome is that trade liberalisation increases the attractiveness of the border region, as the effect of an increased market potential is larger than the

effect of enhanced competition with the near foreign country. Manufacturing will concentrate in the border region, i.e. the effect of proximity to the foreign demand dominates, unless the share of manufacturing in the interior region was relatively large prior to trade liberalisation (generally if λ lies between the intersection of the curve with the x axis and $\lambda = 1$, and in this example if λ exceeds 0.52). Simulations show that the incentive to locate in the border region rises if ceteris paribus the foreign country or its agricultural sector is larger (additional demand without additional competition compared to autarky) or the manufacturing sector in the domestic country is larger.

Figure 2.8: Utility differential: (a) in the case of autarky and (b) in the case of trade with the foreign country



Source: Brülhart et al. (2004).

What conclusions can I derive from this model regarding the Bavarian-Czech border regions?

The model refers explicitly to the EU enlargement process and the increasing integration of product markets. Transnational labour mobility is not incorporated in the model, which is also consistent with the situation in the Bavarian-Czech

borderlands. The distribution of economic activities before trade liberalisation plays a role in the model, i.e. different reactions regarding border regions in the course of integration can be explained. If the border region lags behind economically and is only sparsely populated, integration with a foreign country can even worsen the economic performance in the region close to the foreign country. The situation in the eastern German districts near Poland and the Czech Republic is a good example of such a process. On the other hand, if a border area is already relatively large – like for instance the area between Vienna and Bratislava – cross-border trade can lead to an upswing of this region (OECD 2003). With respect to winners and losers of integration there is no differentiation between skill groups in the model, but Brülhart et al. (2004: 8) conclude that "... this result could be interpreted to imply that EU enlargement will favour the location of industry in regions proximate to the new accession countries, particularly in those sectors where direct import competition from accession countries is unlikely to be strong." With respect to differences in skill, this means that in the Bavarian border region more highly skilled employees should benefit from trade with the Czech Republic. Low-skilled workers should also profit from the attained attraction of the border region, but since import competition probably affects them to a higher degree, they could also lose out in relation. In contrast, in the Czech border region close to Bavaria and Austria low-skilled workers should especially profit, since import competition from Western European countries is probably relatively weak for them.

2.1.4 Summary: Hypotheses for the Empirical Analysis

The essential conclusion of the theoretical models is that even without explicit consideration of peripheral and border regions, it can be derived that, in general, border regions benefit from economic integration, and/or labour market effects are especially large there. Border regions reap the benefits of lower transaction costs regarding foreign trade and outsourcing. If transaction costs, i.e. transportation costs as well as other costs like the facilitated formation and maintenance of networks, play a decisive role, after the abolition of trade impediments "[f]rontier regions, such as border areas and port cities, have relatively low-cost access to foreign markets and hence are natural production sites" (Hanson 1996: 942). Backward and forward linkages which are relatively strong in an inwardly oriented, closed economy are weakened by the opening of a border and forces strengthening the position of former peripheral regions increase. Borders lose their disruptive function and become contact points between nations.

However, there are no clear-cut predictions with regard to how different skill groups are affected by the opening of a border. It is possible that a specific skill

group will lose out due to integration. The least controversial category is that of high-skilled workers in the country that is relatively well endowed with human capital, i.e. in my case eastern Bavaria. All strands of trade theory, explicitly the model by Feenstra/Hanson and the NEG model by Brülhart et al. forecast gains for this sort of employee. This standpoint is reflected in the European Commission's report on EU15 border regions (European Commission 2001a: 10): "In general, human capital-intensive and technologically advanced sectors in the border regions are likely to benefit from enlargement, while labour-intensive sectors are likely to face increased competition from cheap labour." By contrast, according to traditional and new trade theory, low-skilled workers will suffer above-average losses in eastern Bavaria due to their comparative disadvantage and outsourcing, respectively. According to the NEG model, however – assuming that the eastern Bavarian economy is not too small –, they can also profit from the generally increasing market potential.

Regarding the transition country, i.e. the Czech Republic in my research, the Feenstra-Hanson model clearly stands in opposition to the traditional trade forecasts. While the Stolper-Samuelson theorem predicts relative gains for low-skilled workers and relative losses for high-skilled workers as a result of the comparative advantage, the Feenstra-Hanson model, in contrast, forecasts a skill upgrading in the transition country as well. If distance matters, the trade effects should work above all in the border region. Assuming that the Czech border region including the cities Pilsen, Budweis and Brno is not too small, the market potential in the districts close to Bavaria and Austria will also increase according to the NEG model. However, with respect to import competition from nearby EU countries, low-skilled workers are in an especially favourable position and high-skilled workers can also lose if the import competition effect is too large.

In a nutshell, which effects dominate and which skill groups benefit from the opening of the border is an empirical question. Nevertheless, I can derive the following hypotheses concerning the border region in Bavaria and the Czech Republic:[10]

(i) Compared to the rest of the country, structural change and specialisation of the economy should be stronger in both the eastern Bavarian and Czech border region after the fall of the Iron Curtain.

(ii) Similar to the border areas of the USA and Mexico (Hanson 2001), which became more attractive after trade liberalisation, European integration should lead

10 For an overview of the implications of the trade model by Feenstra/Hanson (1996a) and the NEG model by Brülhart et al. (2004) see Table A 2.1 in the appendix.

to an increased market potential in eastern Bavaria and the western and southern parts of the Czech Republic and therefore lead to an increase in the relative employment share of the border regions.

(iii) In eastern Bavaria the demand for more highly skilled labour above all should increase at an above-average rate. This should be reflected in the shares of skill groups for employed and unemployed people. Moreover, the wages in the border region for more highly skilled employees should also rise at an above-average rate. With respect to low-skilled workers opposing effects exist (international outsourcing vs. higher market potential), so that they could gain from integration or lose out.

(iv) In the Czech Republic the border region should also profit from integration. Which skill group will profit most depends on the strength of the effects (outsourcing of intermediate inputs, import competition). According to Feenstra/Hanson the relocation of production activities to the Czech Republic should favour more highly skilled employees. In contrast, according to the Brülhart et al. NEG model the lower import competition should benefit especially unskilled and low-skilled workers.

(v) Additionally, I investigate the effects of Czech commuters on the Bavarian labour market. The employment of Czechs in Bavaria, which was relatively easy in the early 1990s, could have led to a substitution of less productive low-skilled domestic workers.

In order to investigate the changes in the economic structure in Bavaria and the Czech Republic, I calculate indices of structural change and specialisation for both cases. The relative shifts in labour demand with respect to different qualifications should be observable in the distribution of skill groups of both employed and unemployed people and in the spatial wage differentials. Using German and Czech datasets in Chapters 3 and 4 of my thesis, I first take a look at the descriptive figures and then apply different econometric models. Before I come to my own research, however, I give an overview of the most important studies on integration effects in the literature, some of which have a special focus on border regions.

2.2 Empirical Studies on Integration Effects

In recent years several studies have been published which discuss the increasing integration of labour markets and provide empirical results. With respect to the research into cross-border regions exhibiting large wage differentials, the number of

similar investigation areas is limited. Apart from the Hong Kong-China case, which is analysed by Hsieh/Woo (2005), two major geographical areas remain: on the one hand, the surveys referring to the cities and districts along the U.S.-Mexican frontier above all are very informative. On the other hand, along the former Iron Curtain the borderlands of the Western European industrial countries face the pressure of the Eastern European transition countries analogously. In both cases, parts of the workforce in the high-wage countries fear the loss of jobs due to free trade and outsourcing with low-wage countries. Moreover, both the United States and Western European countries have imposed restrictions on the transnational free movement of labour. Interestingly, the phrase "giant sucking sound", which was used by an U.S. presidential candidate in 1992 in order to describe the expected outsourcing of jobs to Mexico after the introduction of the North American Free Trade Agreement (NAFTA), was also stressed by a European Union representative worrying "about the giant sucking sound from Eastern Europe" (Landler 2004). In the next two subsections I first give an overview of the literature concerning the integration process between the United States and Mexico and then refer to studies examining the development in old and new EU member states.

2.2.1 Studies on the U.S.-Mexican Integration Process

The trade and capital market liberalisation in Mexico represents an interesting paradigm for an integration process without transnational labour mobility. In the south of the United States four federal states have a common border with Mexico: California, Arizona, New Mexico and Texas. Interestingly, the U.S.-Mexican borderland has historically been one of the least developed U.S. regions (Hanson 1996), similar to some districts in eastern Bavaria. However, not only the changes in the U.S. regions, but also the shifts on the Mexican side are worth investigation. According to the results of Hummels et al. (2001), the growing importance of maquiladoras in Mexico's trade is reflected by the significant increase in the share of exports which can be assigned to vertical specialisation. Regarding shifts in the labour demand caused by integration, a considerable proportion of the literature refers to the Feenstra-Hanson model. According to Feenstra/Hanson (1996a), the rise in the relative demand for skilled labour cannot be attributed solely to technological progress but also to outsourcing to low-wage countries. Since both effects act in the same direction according to their view, the question of which impact is larger is more empirical than theoretical.

As in the theoretical field for the matter of empirics, the studies by Feenstra and Hanson constitute substantial contributions in favour of the research on border regions. In the case of Mexico, the effects of trade liberalisation since the mid 1980s

are analysed in detail. The empirical results of Hanson (1996, 2001) suggest that the expansion of export manufacturing in the Mexican border region significantly contributed to the employment growth in U.S. border manufacturing industries. Thereby, trade liberalisation led to a decentralization process away from Mexico City towards the regions near the U.S. border (Krugman/Elizondo 1996; Hanson 1998). In 1998 the maquiladora industry, i.e. factories mostly at the U.S.-Mexican border importing materials and equipment for assembly or manufacturing and then re-exporting the assembled intermediate products to the U.S., accounted for 45 % of all Mexican exports and received 47 % of foreign direct investment (FDI) flows into Mexico. In studies about the impacts of trade liberalisation and the introduction of capital mobility, Feenstra/Hanson (1996b, 1997) find evidence that the relative wages of high-skilled workers (persons employed in the non-production sector) increased compared to those of low-skilled workers (persons employed in the production sector) not only in the United States but also in Mexico.[11] Using data for the U.S., Japan, Hong Kong and Mexico, Feenstra/Hanson (2003) estimate the demand for skilled labour, zero-profit conditions and an economy-wide GDP function, concluding that outsourcing can account for a significant amount of skill upgrading in these countries.

In recent years some papers have provided results for the 1990s which challenge the conclusion of Feenstra and Hanson that outsourcing is the driving force behind increasing wage differentials in developing countries. Chiquiar (2008) finds consistency with the Stolper-Samuelson theorem in a paper exploiting regional data and focusing on the different development of skill premiums. Though he also observes a nationwide rise in the Mexican skill premium between 1990 and 2000, he finds that unskilled wages particularly increased in regions highly integrated with the U.S. Airola/Juhn (2005) confirm the results of Feenstra/Hanson (1997) regarding the skill-upgrading in the border region containing a high proportion of maquiladoras in the 1980s, but find evidence that the growth in skill demand in the 1990s was much slower there compared to other Mexican regions. Since 1996 the wage bill share for more highly educated workers – a proxy for relative labour demand – has even fallen in the border region.

2.2.2 Studies on the European Integration Process

On the other side of the pond some analyses on economic integration also refer to the Feenstra-Hanson model. Examining nationwide wage differentials Skurato-

11 The assignment of low- and high-skilled workers to the categories of production and non-production workers is not quite clear-cut, but, as Geishecker (2004) points out, can be justified by the high correlation between non-production and high-skilled workers.

wicz (2005) finds a growing wage gap between high- and low-skilled workers in Poland. While Lorentowicz et al. (2005) – like Feenstra/Hanson working with non-production/production shares – confirm higher skill premiums in Poland caused by outsourcing as a result of fixed effects estimations for the period from 1994 to 2002, they surprisingly, and contradicting theory, also have estimates for Austria, pointing to lower skill premiums in the high-wage country due to international outsourcing. While this strong argument is not backed up by the literature, it is quite evident that skill upgrading also took place in the EU accession countries (Bruno et al. 2004). However, the question remains whether international outsourcing and trade in intermediates are the driving force behind this.

According to Geishecker/Görg (2008), international outsourcing in German manufacturing increased between 45 and 60 % from 1991 until 2000. In one of the rare micro-level studies the effects of outsourcing on the wages of different skill groups are estimated by allowing for individual fixed effects. Geishecker/Görg (2008) find evidence for low-skilled workers being the losers in globalised production, since outsourcing reduced the real wages in this skill group by up to 1.8 %. On the other hand, high-skilled workers benefited from trade by increased wages of up to 3.3 %. These results are in line with the findings of Geishecker (2004), who states that with nearly stable relative wages in the 1990s, the decline in the relative demand for low-skilled labour can be explained to up to 24 % by international outsourcing.

One of the most common measures used in studies on integration effects is the market potential, which goes back to Harris (1954) and for which several definitions exist in the meantime. Basically, according to this measure, the higher the sum of the purchasing power around a location (weighted by transport costs), the higher the demand for goods produced in a location, suggesting that economic activities in a region flourish as access to markets increases. In order to capture the effects of EU enlargement, Brülhart et al. (2004) use the market potential as their main explanatory variable. The market potential function in their version is defined as

$$M_{i,J} = \sum_{j} Y_i / d_{ij}, \quad j \in J, \tag{2.22}$$

where *i* and *j* represent regions out of a set of *J* regions, *Y* denotes the economic weight of a region (e.g. GDP or number of employees) and *d* denotes the distance between *i* and *j*. The estimated values of the market potential are incorporated as an exogenous variable in a regression model estimating per capita GDP or the share of the population employed in the manufacturing sector. The results of the simulations suggest that EU enlargement only caused small effects on per capita income

in Objective 1 regions[12], but a significant rise in manufacturing employment, above all in the regions neighbouring the new member states. In a cross-section analysis of European regions by Niebuhr (2006a) covering the period between 1985 and 2000, the relationship of regional wages rising with an increasing market potential is confirmed, though – compared with other studies (e.g. Roos 2001; Brakman et al. 2000, 2004; Hanson 2005) – the geographic scope of demand linkages is significantly larger than in the previous studies and market access seems to become less important over time. Interestingly, the estimates in the study, which includes only Western European countries, suggest that there are no substantial border impediments affecting the regional wage structure, indicating the high integration of the European Union. In two further studies Niebuhr investigates the impacts of an increased market access on per capita income, explicitly referring to border regions, against the background of the Brülhart et al. model. Concerning only EU15 regions (Niebuhr 2006b) the simulation analysis suggests that integration benefits for internal EU border regions are significantly higher than for non-border and external EU border regions. Investigating integration effects at the EU27 level, Niebuhr (2008) concludes that the Eastern European countries above all will benefit from the reduction of trade impediments. The impact of enlargement seems large even on the market potential of CEEC external border regions. Though the estimated effects on per capita income remain small, at least the CEEC regions along the former Iron Curtain exhibit a significant increase through enlargement. The results of these studies are corroborated by Huber et al. (2006). By explicitly modelling border effects, they find that regions in the accession countries which are close to the EU15 countries are especially gaining from enlargement, with the Czech Republic being most affected. However, EU15 regions close to the accession countries are also predicted to benefit from the abolition of trade impediments.

In a study that focuses on border regions, Mayerhofer (2004) finds that the Austrian regions close to the EU accession countries have developed favourably since the opening of the border. However, he concludes that this positive process does not stem from integration with Eastern European countries, but from the decentralisation and de-concentration process which proceeded in Austria in the 1990s. Barjak/Heimpold (2000b) explore the economic development of the regions situated along the German-Polish border, finding that below-average rates of exports, sales and investments in the manufacturing sector do not provide evidence for positive locational effects of integration on the labour market in eastern German border districts. In contrast, three out of four Polish border regions register a

12 Objective 1 regions are EU areas lagging behind in their development where the gross domestic product (GDP) is below 75 % of the Community average.

rise in the share of nationwide per capita investments. Regarding the unfavourable development in the New Laender the authors do not blame the opening of the border but refer to specific locational disadvantages, such as inappropriate traffic infrastructure and the lack of qualified personnel. Riedel/Untiedt (2001) estimate the trade potential of the German federal states (*Bundesländer*) using a gravitation model for the years 1991 to 1997. They conclude that exports from Bavaria to the Czech Republic are disproportionately high, expressing the benefits of the shorter distance. In the eastern German states, though the rate of exports coming from former COMECON connections is above-average, this effect is only marginal, and, added to that, decreases over the years. However, for eastern German border regions export activities increase from 1993 on, indicating a positive integration process. Concerning the imports, the federal German states that have a common border with Poland and/or the Czech Republic exhibit higher growth rates, also signifying the higher importance of foreign trade to these regions.

Some studies focus on the development at the former inner-German border. Blien et al. (2003) place special emphasis on the eastern German districts close to western Germany, among other regions. Using a shift-share approach for the period from 1993 to 1999, they find that – compared to other eastern German regions – these districts exhibit a relatively positive employment trend. However, this favourable development can only partly be attributed to the geographical position, but mainly to the firm size structure and special influences like above-average government aid. Using a difference-in-differences approach, Büttner/Rincke (2007) compare western German regions situated close to the former German-German border with other western German regions after re-unification. They come up with the result that cross-border mobility led to an increase in employment, a drop in the relative wages and higher local unemployment rates in the western German border regions. According to Redding/Sturm (2005), the western German cities close to the inner-German border suffered substantially in the aftermath of the German division due to the loss of market access. Controlling for the industrial structure and war-related destruction, population growth was significantly lower in the border cities compared to other West German cities. After the German reunification the border cities experienced a relative recovery. Fuchs-Schündeln/Izem (2007) inquire into the causes of the low labour productivity in eastern Germany. Differentiating between job and worker characteristics, they analyse unemployment rates in the eastern German districts. Since the unemployment rates increase with the distance to the former inner-German border, they conclude that East Germans living close to the border can easily commute and find jobs in western German districts. Thus, there are indications that the eastern German workforce does not have a lack of human capital, but job characteristics in eastern Germany are less favourable than

in the western part. Besides this, they confirm the results of Büttner/Rincke (2007), finding that western German districts close to the East suffer significantly higher unemployment rates after reunification than the rest of western Germany.

Generally, as far as the implications of international trade and outsourcing are concerned, the focus of most studies is on the effects on the developed countries. Both theoretical and empirical analyses with respect to the consequences on the labour market in transition or developing countries are rather scarce. Egger/Egger (2002) investigate the impact of trade in both final and intermediate manufacturing goods on gross wages in seven CEEC countries and find surprising results. According to their analysis, trade in final goods does not have a significant effect on wages. Interestingly, the impact of intermediate goods exports is clearly negative, whereas the effect of intermediate goods imports is significantly positive. The rather unexpected signs of the wage effects can be explained by two opposing effects. On the one hand, outsourcing to CEEC low-wage countries potentially raises the demand for low-skilled workers and thus the remuneration for low-skilled labour probably increases. On the other hand, as an effect of the shift in labour demand, the composition of the work force concerning skill groups may be pushed towards low-skilled labour, which in turn can lead to an overall shrinking wage bill.

2.2.3 Summary

Recapitulating the empirical results from the different integration areas it can be said that there are no clear-cut results. Unfortunately, in many cases the analyses are related to whole countries, while there is no reference to regional information, often due to a lack of available data. However, in both the U.S.-Mexican case and regarding the European integration process, the basic message of the bulk of the studies is that border regions are either not exposed to special changes or border regions benefit from integration to a higher than average degree. Many studies refer to the higher market potential after trade liberalisation which should lead to a favourable position of border regions. Only few studies show negative effects for specific skill groups in border regions. Interestingly, the studies which contradict the Feenstra-Hanson model refer to Stolper-Samuelson effects, i.e. in the so-called low-wage country it is not high-skilled workers who gain from integration, but low-skilled workers due to their comparative advantage. Though it is beyond all doubt that skill premiums went up in both Western and Eastern European countries, the main cause of this is controversial. Since it is above all the effects of free trade and international outsourcing on the development of skill structures and wage differentials that are disputed, I will focus on these topics in Chapters 3 and 4.

Appendix to Chapter 2

Table A 2.1: Implications of the Feenstra-Hanson trade model and the Brülhart et al. NEG model

	Feenstra/Hanson	Brülhart/Crozet/Koenig
Eastern Bavaria	activities which are offshored to the Czech Republic are least skill-intensive	relative increase in sectors where import competition from the Czech Republic is supposed to be relatively low
	increasing structural change and specialisation	increasing structural change and specialisation
	lower relative labour demand for unskilled and low-skilled workers	change in labour demand for unskilled and low-skilled workers depends on strength of opposing effects (import competition vs. higher market potential)
	higher relative labour demand for more highly skilled workers	higher relative labour demand for more highly skilled workers
Czech border region	activities, which are offshored from high-wage countries, are relatively skill-intensive in the Czech Republic	relative increase in sectors where import competition from Germany and Austria is supposed to be relatively low
	increasing structural change and specialisation	increasing structural change and specialisation
	lower relative labour demand for unskilled and low-skilled workers	higher relative labour demand for unskilled and low-skilled workers
	higher relative labour demand for more highly skilled workers	change in labour demand for more highly skilled workers depends on strength of opposing effects (import competition vs. higher market potential)

3 Labour Market Effects in the Bavarian Border Region

3.1 Introduction

The fall of the Iron Curtain fundamentally changed the economic relationships between Western and Eastern European countries. The regions situated on the border with the new EU member countries are particularly affected by reduced restrictions in trade and an increased division of labour, which lead to intensified attention and multitudinous syndicates within the EU countries. Remarkable examples are the working community of chambers of economy in the EU regions bordering the Central and Eastern European candidate countries (ARGE28), the SPIRIT initiative of the German labour unions and the association of European border regions (AEBR). Due to the unexpected events of 1989 the labour market along the border between the Federal State of Bavaria (western Germany) and the Czech Republic, which has one of the world's largest wage differentials, can be regarded as a natural experiment. Despite existing restrictions on labour mobility, which for Czech employees will probably be limited until 2011, effects of international trade have been obvious since the opening of the border. Just as the introduction of the North American Free Trade Association (NAFTA) led to cross-border linkages along the U.S.-Mexico border (Hanson 2001), a gradual integration process is leading to transnational outsourcing of economic activities in the Bavarian-Czech borderland. As a result of trade and outsourcing I expect structural shifts in the labour demand, especially in the border region, and therefore changes in the skill and wage structures which are more distinctive than those at national level. There is controversial debate as to whether or not economic integration positively influences the development of border regions. Basically I distinguish between integration of product markets and free movement of capital and above all labour. Regarding fully integrated economic areas Büttner/Rincke (2007) show significant results concerning negative labour market effects in western German regions near the former German-German border, which suffer from a fall in the relative wage position and higher unemployment rates than other western German regions. Blien et al. (2003) investigate eastern German regions along the former inner-German border, concluding that though the situation on the labour market in these regions is better than in the remaining eastern German regions, this positive development is only partly caused by the favourable geographical location. Redding/Sturm (2005) provide results about western German border cities before and after reunification. The decline in population growth due to the reduced market potential during the period when Germany was divided was followed by a recovery after reunification. Contrary to the abovementioned studies, Barjak/Heimpold (2000b) and Stiller (2004) analysed

German-Polish border regions, where full liberalisation of labour mobility has not yet happened, and do not find specific effects on the labour market there. Riedel/ Untiedt (2001) conducted investigations on several economic factors with respect to German regions bordering on new EU member states. Studies by Niebuhr (2006b, 2008) provide findings about higher integration benefits for border regions caused by declining trade impediments. Surprisingly few studies use individual-level data to estimate spatial effects in regions situated along the former Iron Curtain.

In this chapter I investigate the development on the Bavarian side of the border. After providing some descriptive figures I analyse the shifts in skill group shares of employed and unemployed people comparing the eastern Bavarian border region to the other western German districts. Furthermore I apply several econometric methods in order to estimate spatial wage effects which I expect to be more distinctive in the region close to the Czech Republic. Even without transnational labour mobility I established hypotheses backed by trade theory and New Economic Geography predicting a higher demand for more highly skilled labour in the eastern Bavarian borderland. Thus, the central object of investigation in this chapter is which skill group benefits from the opening of the border: low-skilled, skilled or high-skilled workers?

The paper is organised as follows: section 3.2 provides a description of the regional classification and the dataset I use for my investigations. Section 3.3 contains descriptive evidence of the labour market in the Bavarian border region before and after the fall of the Iron Curtain, compared with the development at national level in parts. In section 3.4 I apply a balanced panel model in order to estimate qualification trends. In section 3.5 I introduce econometric models to estimate wage differentials and present the results. Section 3.6 concludes.

3.2 Data and Basic Definitions

I use micro data from the IAB Employment Sample (IABS) for the years 1980 to 2001, which are provided by the Institute for Employment Research (IAB) and contain information about a two percent random sample of all employees covered by the German social security system (for a description of the dataset see Hamann et al. 2004; Hamann 2005). Two versions of the IABS are available: The scientific use file (I use the regional file) and the weakly anonymous version. Both versions, which differ, for instance, in some content characteristics (e.g. classification of industries, occupation, employment size, average remuneration), are in line with the requirements used in my analysis. In order to avoid there being too few and insufficient observations for robust estimates for the border region, I include an extract from the employment register (*Beschäftigtenhistorik BeH*) in some estimation versions

which covers all observations that pertain to social insurance contributions in the eastern Bavarian border region (i.e. 100 % instead of 2 %). For all estimations I eliminate from the data apprentices, marginal part-time and part-time workers, homeworkers and all observations where information about education and/or professional status is missing. I concentrate on full-time employees, aged 16 to 65, who will have been employed for at least one year on June 30 (the reference date). I distinguish between the following three skill groups of workers (Table 3.1):[13]

Table 3.1: Classification of German skill groups

Skill group	Qualification
low-skilled	people with no occupational qualification regardless of the educational level reached, i.e. with or without a certificate of upper secondary education (*Abitur*)
skilled	people with an occupational qualification whether or not they have a certificate of upper secondary education (*Abitur*)
high-skilled	people with upper secondary education and a degree from a university or polytechnic

According to the regulation regarding foreign commuters in German border regions (*Anwerbestoppausnahmeverordnung ASAV* 1997, regulation on the granting of employment permits to foreigners), the Bavarian borderland consists of the eastern parts of the regions of *Oberfranken* (Upper Franconia), *Oberpfalz* (Upper Palatinate) and *Niederbayern* (Lower Bavaria) including the university towns of Bayreuth and Passau and the towns with polytechnics (*Fachhochschulen*) Hof, Weiden, Amberg and Deggendorf (16 districts and seven autonomous municipal authorities, Figure 3.1). In contrast to the border region in ASAV, § 6 para. 1, my analysis covers the city and district of Regensburg. Taking into account the differences between urban and rural areas I use the classification scheme of the Federal Office for Building and Regional Planning (*Bundesamt für Bauwesen und Raumordnung BBR*), which differentiates between regions with large agglomerations (BBR 1-4), regions with features of conurbation (BBR 5-7) and regions of rural character (BBR 8-9) (Table 3.2). As a control group I only use the observations from the remaining western German districts (without Berlin), since the inclusion of data from the eastern German states (which are available from 1992 onwards) would lead to biased results. This reduces the basic dataset to around 100,000 observations per year from 265 regions, some of which consist of aggregated districts.

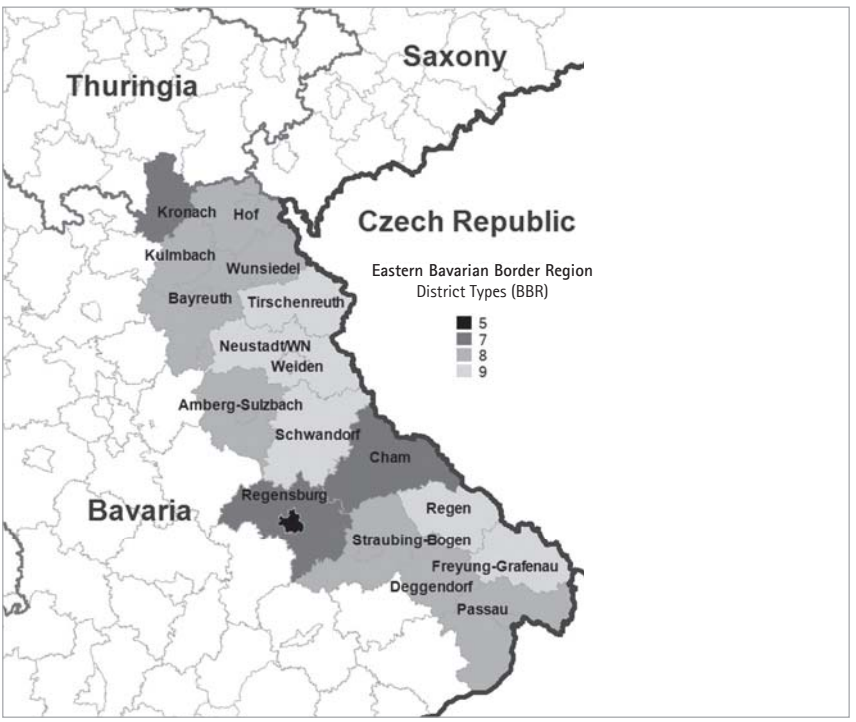
13 The education variable in the IABS has shortcomings in the form of missing values and inconsistencies. Nevertheless, I use the original IABS data in my calculations and do not apply imputation procedures, which are proposed e.g. by Fitzenberger et al. (2006).

Table 3.2: Regional classification scheme based on BBR classification

Structural region type	District type	Description of district type (BBR)
Regions with large agglomerations (basic type 1)	BBR 1	Core cities
	BBR 2	Highly urbanised districts in regions with large agglomerations
	BBR 3	Urbanised districts in regions with large agglomerations
	BBR 4	Rural districts in regions with large agglomerations
Regions with features of conurbation (basic type 2)	BBR 5	Central cities in regions with intermediate agglomerations
	BBR 6	Urbanised districts in regions with intermediate agglomerations
	BBR 7	Rural districts in regions with intermediate agglomerations
Regions of rural character (basic type 3)	BBR 8	Urbanised districts in rural regions
	BBR 9	Rural districts in rural regions

Source: Federal Office for Building and Regional Planning (*Bundesamt für Bauwesen und Raumordnung BBR*).

Figure 3.1: Eastern Bavarian border region



3.3 The Labour Market in Eastern Bavaria: Some Descriptive Evidence

3.3.1 Selected Figures of VALA

A comparative study of labour markets in German federal states (*Vergleichende Analyse von Länderarbeitsmärkten VALA*) carried out by the regional research unit of the IAB investigates the differences between regional employment growth in Germany. In a separate study for eastern and western Germany the employment growth from 1993 until 2001 is broken down into several economic determinants using a two-step shift-share regression model. Besides the impact of the structure of economic activity, the firm size, the skill level and the wage level on the development of regional employment growth, a regional fixed effect is also identified, which accounts for idiosyncratic characteristics of the respective district that cannot be explained by the other variables. For instance, a particularly favourable combination of industrial sectors possibly leads to spillover effects with profits for the overall economy. Specific skills which are not represented by the formal qualification structure, the closure or settlement of large companies, the geographical location and not least the opening of a border can also play an important role for the economic performance of a district. In short, it turns out that these locational effects are a very essential source of regional disparity. In Table 3.3 I present some outstanding results for some Bavarian districts, which are described in detail in Böhme/Eigenhüller (2005).

Table 3.3: Locational fixed effects for Bavarian districts (as percentage points)

Munich (city)	–0.72	Schwandorf	2.01
Munich (district)	2.45	Cham	1.71
Nuremberg (city)	–1.82	Passau (district)	–0.67
Freising	5.28	Hof (district)	0.99
Regensburg (city)	2.14	Tirschenreuth	–1.22
Regensburg (district)	2.66	Wunsiedel	–1.86

Source: Böhme/Eigenhüller (2005).

The overall locational effect for the Federal State of Bavaria is 0.53 percentage points. As in the rest of western Germany, the core cities in Bavaria, Munich and Nuremberg (both BBR1), also exhibit negative locational effects, an indication of

negative agglomeration effects. Freising, pushed by a newly built airport and the proximity to Munich, achieves the highest value of all western German districts. As far as eastern Bavaria is concerned, the districts basically do not differ from the non-border Bavarian districts. Alongside districts with clearly above-average values (Regensburg, Schwandorf, Cham), some districts have a distinctively below-average locational effect (Tirschenreuth, Wunsiedel). Although there are some exceptions (districts of Passau and Hof), the districts in the south-east of the border region perform better than the northern border districts. This means that it is not only the unfavourable role of the industrial structure, e.g. the decline of the glass and china industry, which accounts for the poor labour market situation there. Since this factor is controlled for by a separate industrial structure effect, the reason for the negative development must lie in some idiosyncratic characteristics which contribute to the disadvantageous state of affairs. However, so far there is no evidence for fundamental disparities between border and non-border districts.

3.3.2 Structural Change and Specialisation

According to my hypothesis, the integration of markets should lead to a stronger economic specialisation of regions, particularly in border regions. A look at the changes of employment shares in 16 industries in eastern Bavaria and western Germany supplies evidence that the structural change in the Bavarian border region in the 1980s and 1990s proceeded in conformity with the nationwide shifts (Figure 3.2 and Table 3.4). Solely the metal construction and engineering industry in eastern Bavaria exhibits a fundamental trend in the opposite direction, which can be explained by the favourable development of this sector in the city and district of Regensburg. Besides this, the above-average decline in the eastern Bavarian consumer goods industry is striking. The secondary sector remains overrepresented in the border region by about 9 percentage points, while the share of the tertiary sector is correspondingly lower.

A structural change indicator for 95 industries also contradicts the expectations of possible shifts in an increasingly globally linked economy. The indicator of structural change (formula 3.1) for *N* industries adds the sum of all absolute deviations of the employment shares *a* in year *t+1* ($a_{i,t+1}$) from the employment shares in year *t* ($a_{i,t}$). Divided by 2, the ISC equals exactly 0 if the shares in *t+1* are identical to the shares in *t* and equals exactly 1 if the economic structure in *t+1* deviates maximally from the structure in *t*.

$$ISC_{t,t+1} = \frac{1}{2} \sum_{i=1}^{N} \left| a_{i,t+1} - a_{i,t} \right| \qquad (3.1)$$

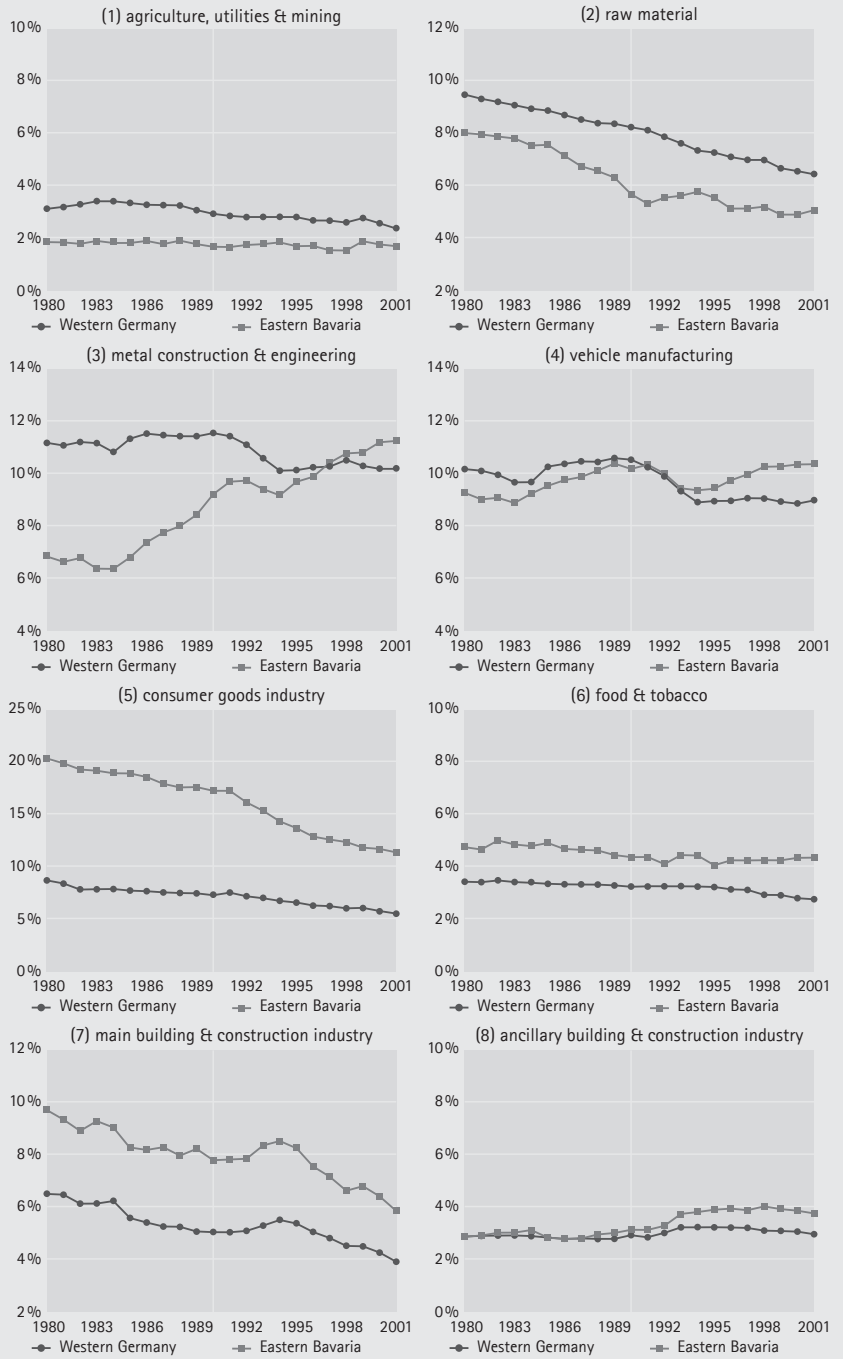
Though the results show higher outcomes for the border region, which can be traced back to the relative smallness of the area, the basically analogue gradient in both areas of investigation is observable before and after the opening of the border (Figure 3.3).

The Krugman specialisatiom index (KSI) is defined as the sum of the absolute deviations of the employment shares in the border region ($a_{i,t,\ easternBavaria}$) from the employment shares in the rest of the country ($a_{i,t,\ westernGermany}$) for all industries i in year t (formula 3.2). Divided by 2, the index equals 0 if the employment shares in the two areas are identical and equals 1 if the eastern Bavarian economic structure deviates maximally from the structure in the rest of western Germany.

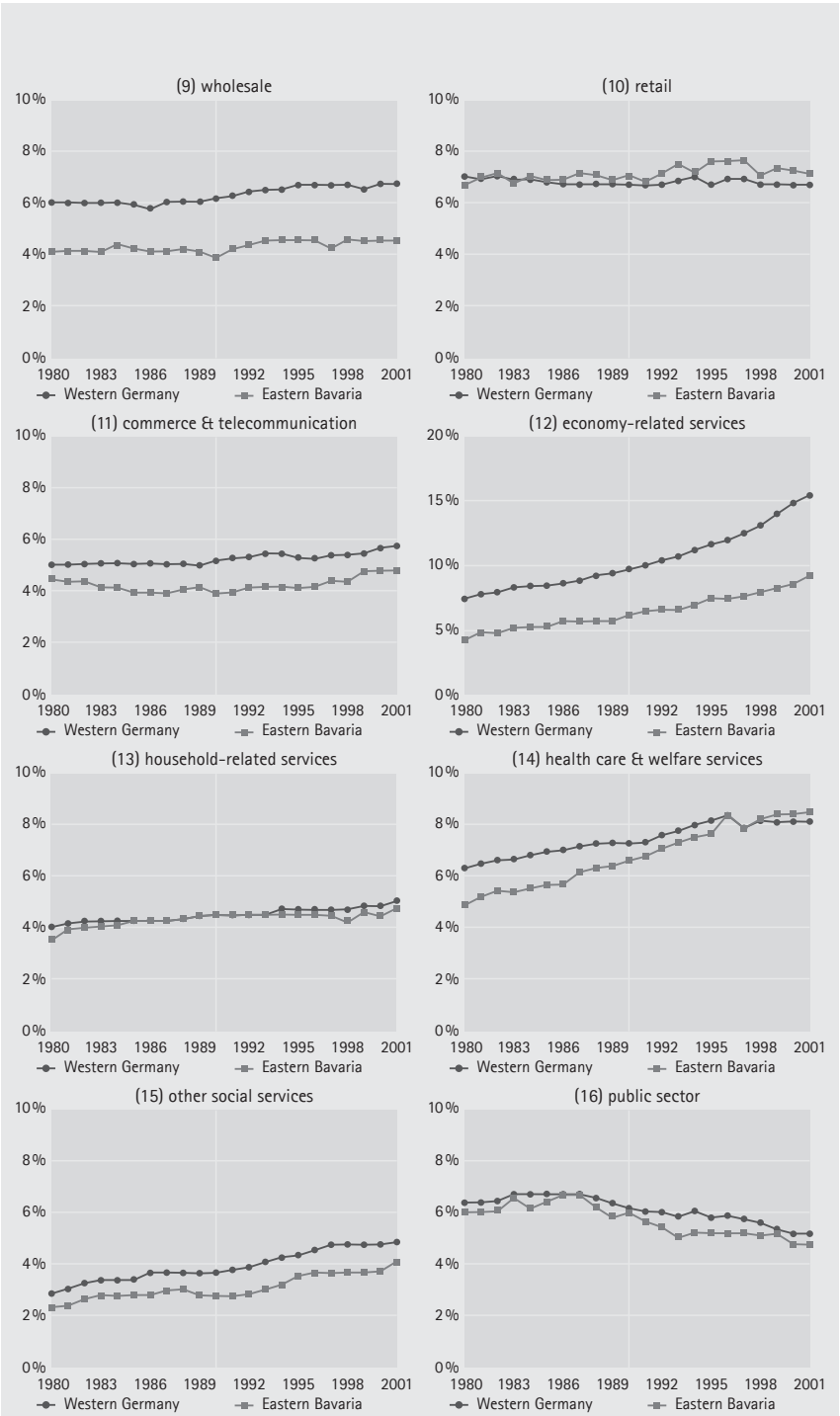
$$KSI_t = \frac{1}{2} \sum_{i=1}^{N} \left| a_{i,\,t,\,easternBavaria} - a_{i,\,t,\,westernGermany} \right| \qquad (3.2)$$

As shown in Figure 3.4, the KSI almost continuously falls, i.e. in the 1980s and 1990s the distribution of economic activities in eastern Bavaria conforms to the economic structure in western Germany. A structural break after the opening of the border is not observable. In Figure 3.5 the differences between the growth of the relative employment shares in eastern Bavaria and western Germany are plotted against the differences in the relative employment shares in 1980. The negative correlation reveals that industries that were represented below average in eastern Bavaria in 1980 featured a higher growth than at the aggregated western German level and vice versa (referred to as β-convergence (Sala-i-Martin 1990), see below). Some outstanding branches of economic activity are marked in the figure.

Figure 3.2: Employment shares of 16 industries in eastern Bavaria and western Germany (as %, 1980–2001) (continued on next page)



Source: Author's own calculations using the regional scientific use file of the IABS.



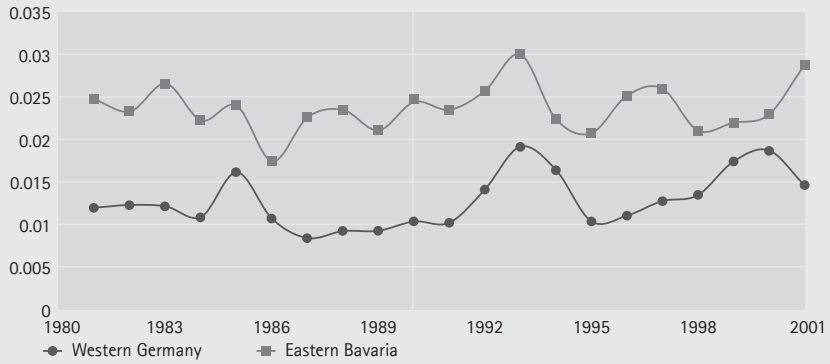
Source: Author's own calculations using the regional scientific use file of the IABS.

Table 3.4: Change in the employment shares in eastern Bavaria and western Germany (as %, 1980–2001)

			1980	1985	1990	1995	2001	Δ abs 90/80	Δ abs 01/90
1	agriculture, utilities & mining	Eastern Bavaria	**1.74**	**1.75**	**1.56**	**1.57**	**1.51**	**-0.18**	**-0.05**
		Western Germany	*3.07*	*3.09*	*2.68*	*2.45*	*2.12*	*-0.39*	*-0.57*
2	raw material	Eastern Bavaria	**7.51**	**7.10**	**5.34**	**5.05**	**4.41**	**-2.18**	**-0.92**
		Western Germany	*9.12*	*8.50*	*7.72*	*6.78*	*5.80*	*-1.40*	*-1.92*
3	metal construction & engineering	Eastern Bavaria	**6.40**	**6.31**	**8.41**	**8.70**	**9.67**	**2.01**	**1.27**
		Western Germany	10.66	10.62	10.73	9.29	9.06	0.08	-1.68
4	vehicle manufacturing	Eastern Bavaria	**9.03**	**9.49**	**9.84**	**8.86**	**9.45**	**0.81**	**-0.40**
		Western Germany	9.80	9.71	9.76	8.31	8.14	-0.04	-1.62
5	consumer goods industry	Eastern Bavaria	**20.81**	**18.85**	**16.59**	**12.86**	**10.27**	**-4.21**	**-6.33**
		Western Germany	8.63	7.63	7.03	6.12	5.12	-1.60	-1.90
6	food & tobacco	Eastern Bavaria	**4.50**	**4.54**	**4.16**	**3.89**	**4.20**	**-0.34**	**0.04**
		Western Germany	3.25	3.15	2.99	2.99	2.57	-0.26	-0.42
7	main building & construction industry	Eastern Bavaria	**9.22**	**7.75**	**7.22**	**7.25**	**4.83**	**-2.00**	**-2.39**
		Western Germany	6.14	5.15	4.61	4.68	3.40	-1.53	-1.22
8	ancillary building & construction industry	Eastern Bavaria	**2.58**	**2.54**	**2.90**	**3.53**	**3.10**	**0.32**	**0.21**
		Western Germany	2.60	2.55	2.59	2.87	2.55	-0.01	-0.04
9	wholesale	Eastern Bavaria	**4.22**	**4.21**	**3.74**	**4.22**	**4.00**	**-0.48**	**0.26**
		Western Germany	5.93	5.76	5.97	6.31	6.17	0.03	0.21
10	retail	Eastern Bavaria	**7.42**	**7.70**	**8.28**	**8.61**	**8.86**	**0.86**	**0.58**
		Western Germany	7.93	7.73	7.76	8.04	8.04	-0.17	0.28
11	commerce & tele-communication	Eastern Bavaria	**4.50**	**3.95**	**3.80**	**4.14**	**4.62**	**-0.70**	**0.83**
		Western Germany	4.80	4.91	4.97	5.03	5.33	0.17	0.36
12	economy-related services	Eastern Bavaria	**4.73**	**5.53**	**6.72**	**7.99**	**9.50**	**1.99**	**2.78**
		Western Germany	7.62	8.47	9.87	11.60	15.20	2.25	5.33
13	household-related services	Eastern Bavaria	**3.28**	**4.03**	**4.34**	**4.38**	**4.65**	**1.06**	**0.31**
		Western Germany	3.79	4.08	4.27	4.40	4.63	0.48	0.36
14	health care & welfare services	Eastern Bavaria	**5.40**	**6.44**	**7.46**	**9.09**	**10.58**	**2.06**	**3.12**
		Western Germany	7.11	8.06	8.51	9.85	10.63	1.40	2.12
15	other social services	Eastern Bavaria	**2.45**	**2.80**	**3.20**	**3.98**	**4.73**	**0.75**	**1.53**
		Western Germany	3.03	3.58	3.98	4.89	5.48	0.94	1.51
16	public sector	Eastern Bavaria	**6.22**	**7.00**	**6.44**	**5.90**	**5.60**	**0.22**	**-0.83**
		Western Germany	6.53	7.00	6.57	6.39	5.77	0.04	-0.80
	primary sector	Eastern Bavaria	**1.74**	**1.75**	**1.56**	**1.57**	**1.51**	**-0.18**	**-0.05**
		Western Germany	3.07	3.09	2.68	2.45	2.12	-0.39	-0.57
	secondary sector	Eastern Bavaria	**60.04**	**56.59**	**54.46**	**50.13**	**45.94**	**-5.58**	**-8.52**
		Western Germany	50.20	47.31	45.43	41.04	36.64	-4.76	-8.80
	tertiary sector	Eastern Bavaria	**38.21**	**41.66**	**43.98**	**48.29**	**52.55**	**5.76**	**8.57**
		Western Germany	46.73	49.60	51.88	56.50	61.25	5.15	9.36
	total	Eastern Bavaria	**100**	**100**	**100**	**100**	**100**		
		Western Germany	100	100	100	100	100		

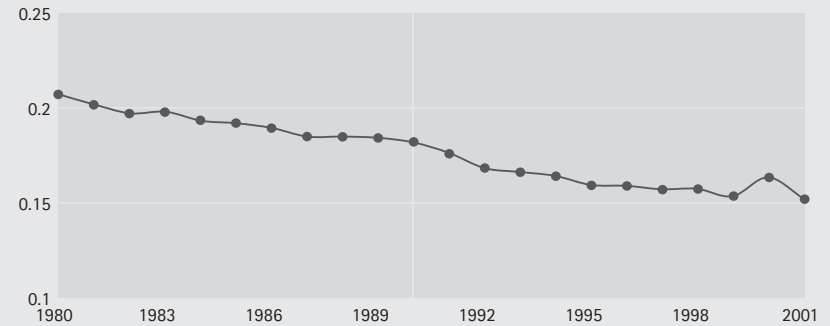
Source: Author's own calculations using the regional scientific use file of the IABS.

Figure 3.3: Structural change indicator in eastern Bavaria and western Germany



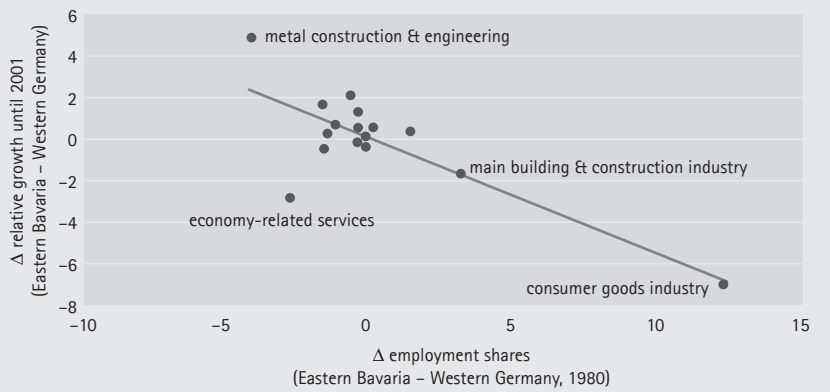
Source: Author's own calculations using the weakly anonymous version of the IABS.

Figure 3.4: Krugman specialisation index for eastern Bavaria



Source: Author's own calculations using the weakly anonymous version of the IABS.

Figure 3.5: Correlation of the differences between the growth of the relative employment shares in eastern Bavaria and western Germany (from 1980 until 2001) and the differences in the relative employment shares in 1980 (as percentage points)

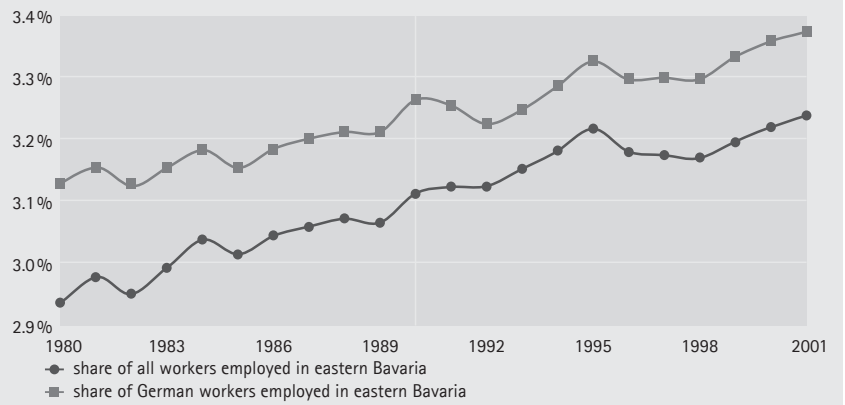


Source: Author's own calculations using the regional scientific use file of the IABS.

3.3.3 Relative Employment Share and Czech Employees in Eastern Bavaria

Calculating the share of employees in eastern Bavaria shows the virtually continuous growth of the relative size of the economy in this region (Figure 3.6). While around 2.9 % of all workers in western Germany were employed in the eastern Bavarian border region in 1980, this proportion increased to 3.2 % by 2001. Only in the mid 1990s can a temporary decline be observed. Altogether this was not a substantial rise, but the figures show that the opening of the border did not stop the trend. Bearing in mind that German workers could possibly be substituted by Czechs, I only calculate the share for German workers, but, as the graph shows, the development proceeds analogously, i.e. the relative size of the economy in the border region also grew in this respect.

Figure 3.6: Employment share of workers employed in eastern Bavaria (as %, 1980–2001)

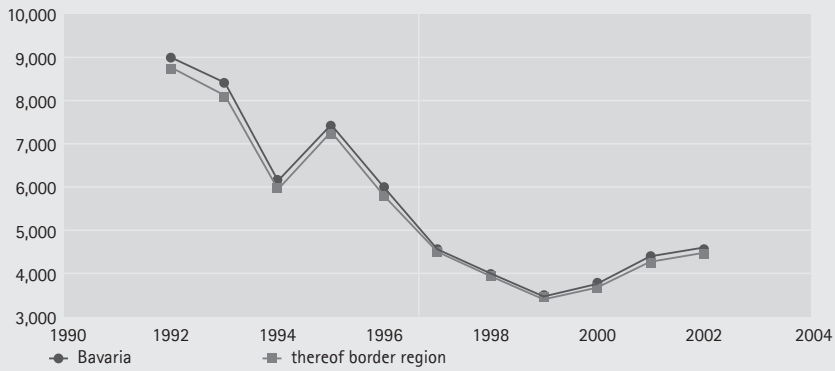


Source: Author's own calculations using the regional scientific use file of the IABS.

According to the abovementioned *Anwerbestoppausnahmeverordnung* (ASAV), Czech commuters, i.e. people who cross the border every day or work no more than two days per week in Bavaria, have a facilitated access to the Bavarian labour market compared to other German regions and to conventional migrants. The ASAV came into force in 1997. In the early 1990s it was even easier for Czechs to work in Bavaria. However, due to rising unemployment rates in Germany in the mid 1990s, residence and work permits were then only granted or renewed if no German worker could be found for the job. As a consequence the estimated number of Czech commuters working in Germany declined from 16,000 in 1993 to 5,000 in 2000 (Andrle/Dupal 1997; Prager Zeitung 2001). The employment figures for Czech workers in Bavaria developed correspondingly – apart from the trend in the hotel and catering industry with an obvious lack of qualified German personnel. Fig-

ure 3.7 depicts the absolute number of Czech commuters in Bavaria, which shows that naturally most of them were employed in the Bavarian border region.

Figure 3.7: Czech commuters in Bavaria covered by the German social security system (persons '000, 1992–2002)



Source: IAB data base.
Notes: Reference date: June 30, place of residence/nationality: Czech (Republic), place of work: Bavaria.

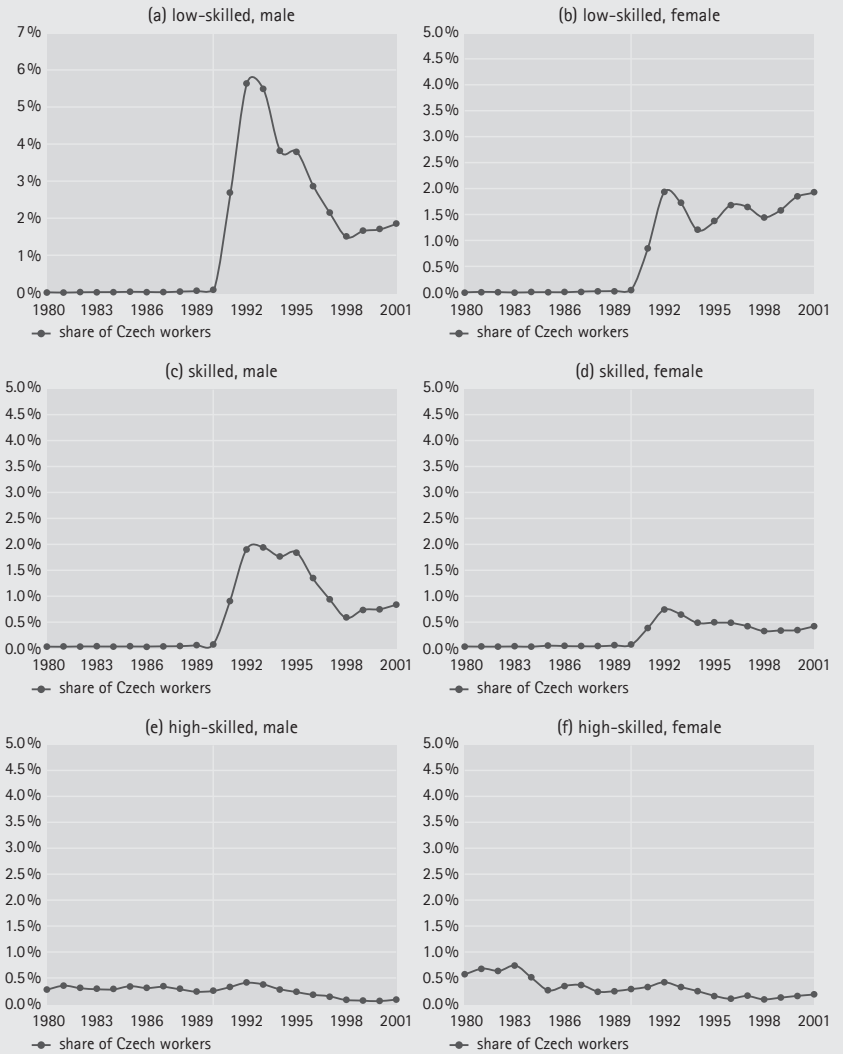
Table 3.5: Czech commuters in the Bavarian employment office districts in 1995

employment office district	total	employment office district	total
Ansbach	0	Deggendorf	1,510
Aschaffenburg	0	Donauwoerth	1
Bamberg	4	Freising	0
Bayreuth	127	Ingolstadt	0
Coburg	3	Kempten	0
Hof	1,078	Landshut	6
Nuremberg	6	Memmingen	0
Regensburg	8	Munich	4
Schwandorf	1,806	Passau	2,063
Schweinfurt	0	Pfarrkirchen	4
Weiden	829	Rosenheim	0
Weissenburg	0	Traunstein	0
Wuerzburg	1	Weilheim	0
Augsburg	1	**Bavaria**	**7,451**

Source: IAB data base.
Notes: Reference date: June 30, place of residence/nationality: Czech (Republic), place of work: Bavaria.

Table 3.5 shows, exemplified for the year 1995, that the Czech commuters were almost exclusively employed in five of the 27 Bavarian employment office districts overall, many of them in the building industry, the hotel and catering industry and the wholesale and retail industry.

Figure 3.8: Share of Czech employees in the eastern Bavarian workforce (as %, 1980–2001)



Data source: Author's own calculations with employment register *(Beschäftigten-Historik BeH).*

Concerning the qualifications of the commuters, many of them do not have an occupational qualification. This can be discerned by taking a look not only at the commuters, but at all Czech employees in Germany covered by the social security system

(Figure 3.8). Using the employment register (*Beschäftigten-Historik* BeH) I calculate the share of Czech workers among all workers in the eastern Bavarian border region by including those reported as Czechoslovak (due to the common state until 1992), Czech or Slovak (since a lot of Slovak people still live in the Czech Republic). Plausibly, the share was close to zero before the fall of the Iron Curtain. Only a small number of Czechoslovaks who are identified as highly skilled worked in the Bavarian border region. Not surprisingly, the picture changes at the beginning of the 1990s. More than 5 % of the eastern Bavarian male, low-skilled workforce was reported Czech (Czechoslovak, Slovak) in 1992 and 1993.[14] Corresponding to the development of commuters, the figures decline in the mid 1990s. Regarding female, low-skilled and male, skilled workers the share did not increase to such a large extent, but still reaches 2 %. While only a small upswing in the share of female, skilled, Czech workers is observable, the proportion does not increase for high-skilled workers at all.

3.3.4 Skill Structure of Employed People[15]

In order to evaluate the shifts in the skill structure in eastern Bavaria, my analysis is motivated by the need to contrast the development in the border region with the average level in western Germany. The absolute deviation (as %) of skill group shares in the border region from the national averages is shown in Figure 3.9. It has to be emphasised that the shares of the single district types in the border and the non-border region are different.

Figure 3.9: Deviation of skill group shares for workers in the eastern Bavarian border region from the averages in western Germany (as %, 1980–2001)

Source: Author's own calculations using the regional scientific use file of the IABS.

14 To simplify matters from now on I use only the term "Czech".

15 Parts of this chapter have been published in Moritz/Gröger (2007).

The share of low-skilled workers, which stood at 6.58 % above the national average in 1980, was virtually equal to the national level in 2001 (0.39 % above the national average). In contrast to this development I observe a sharp rise in the share of skilled employees in eastern Bavaria, which, starting from a disproportionately low value (–4.41 % below the average in 1980), reached the national level at the beginning of the 1990s and stood at 4.31 % above the average in 2001. The shortfall of high-skilled employees in the border region compared with the national level increased from –2.16 % (1980) to –4.70 % (2001). Though the growth rate of the high-skilled share is higher in the border region, the absolute difference between eastern Bavaria and the rest of western Germany increases due to the low base level. This result indicates the presence of β-convergence, i.e. the share in the region lagging behind grows faster than the share in the region being ahead in the beginning. But there is no tendency towards σ-convergence concerning high-skilled employees, i.e. the standard deviation of the shares in the borderland and in the rest of the country is not decreasing over time.[16]

Figure 3.10: Deviation of skill group shares for workers in the eastern Bavarian border region from the averages in the district types 5–9 in western Germany (as %, 1980–2001)

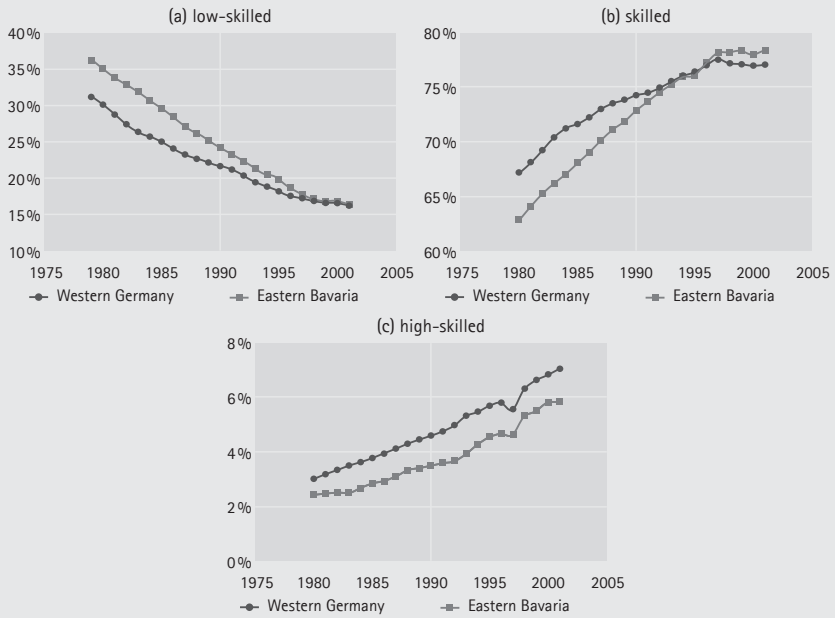
Source: Author's own calculations using the regional scientific use file of the IABS.

Taking the rather rural structure of eastern Bavaria into consideration and comparing the regional values only with district types 5-9 at national level results in a similar diagram (see Figure 3.10). From 1980 to 2001 the share of low-skilled workers in eastern Bavaria approximates the level of district types which are typical for this region. The share of skilled workers, which was distinctly below the average in 1980, exceeded the national level moderately in 2001. In contrast to the values in Figure 3.9, the deficit of high-skilled workers in eastern Bavaria compared

16 The concepts of β- and σ-convergence were introduced by Sala-i-Martin (1990).

with the average level of the district types 5-9 increased only marginally. It seems that the growing negative deviation of the share of high-skilled workers in eastern Bavaria from the national level can be explained by the structure of centrality and population density. Border region effects resulting from the fall of the Iron Curtain are obviously not observable at the descriptive level. For an overview of absolute differences see Figure 3.11.

Figure 3.11: Shares of skill groups for workers in eastern Bavaria and western Germany (as %, 1980–2001)[17]



Source: Author's own calculations using the regional scientific use file of the IABS.

3.3.5 Skill Structure of Unemployed People

The IAB Employment Sample (IABS) not only covers information about employment relationships, but also contains the periods in which people who were once employed were unemployed and received benefits, respectively. Though there are far fewer unemployment spells in the dataset, I also compare the skill group shares for unemployed people in eastern Bavaria with the shares in the district types 5-9 at the national level (Figure 3.12: for an overview of absolute differences see Figure 3.13). Hereby, in spite of there being no obvious structural break in the development of skill group shares of employed people, I explore whether there are inappropriate shifts in

17 The low value for high-skilled employees for 1996 can be traced back on the lack of registration of doctors in this year.

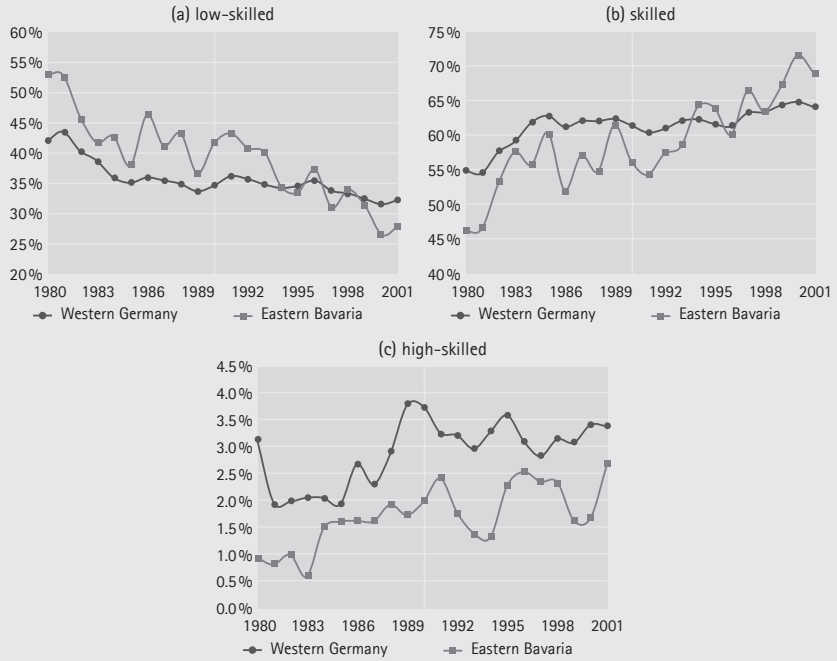
the skill group shares of unemployed people. Naturally, due to the dependence on a former employment relationship, these shares are strongly correlated with the employment shares in former years. However, it is possible to investigate, for instance, whether the share of low-skilled unemployed in eastern Bavaria rose dramatically after the opening of the border or at least did not decrease further. In line with my hypothesis, the relative labour demand for low-skilled workers should above all fall in the border region. However, there is no evidence of above-average job losses of low-skilled workers in the Bavarian borderlands. Figure 3.12 corresponds to the results for employed people exhibiting the relatively falling share of low-skilled, and rising share of skilled workers in eastern Bavaria. Taking into consideration the fact that the share of low-skilled people generally shrinks over the years, it comes as no surprise that the share of unemployed low-skilled people also decreases from 1980 to 2001. Interestingly, while the nationwide share fluctuates around 35 % in the early and mid 1990s, the share in the border region diminishes continuously (Figure 3.13a). Figure 3.13b shows that the share of skilled unemployed people in the border region exceeds the nationwide reference proportion, while Figure 3.13c displays the constantly lower share of high-skilled unemployed people in the border region.

Summarising the descriptive figures, there are no hints for particular border effects after the fall of the Iron Curtain. The labour market trends in eastern Bavaria proceed in the 1990s without a structural break. I do not find any indications that low-skilled employees in the border region lose out relatively speaking from increased trade relations with the Czech Republic. In the next subsection I analyse the qualification trends by means of an econometric model. First I estimate the influencing factors for the employees, and afterwards, although there are few observations in the dataset, I turn towards the unemployed people.

Figure 3.12: Deviation of skill group shares for unemployed people in the eastern Bavarian border region from the averages in the district types 5–9 in western Germany (as %, 1980–2001)

Source: Author's own calculations using the regional scientific use file of the IABS.

Figure 3.13: Shares of skill groups for unemployed people in the district types 5–9 in eastern Bavaria and western Germany (as %, 1980–2001)



Source: Author's own calculations using the regional scientific use file of the IABS.

3.4 Econometric Analysis of Qualification Trends

3.4.1 Employed People[18]

In order to investigate the changes in the skill structure of employees I use the following econometric approach: for each of the 265 regions I calculate the shares of the skill groups for each year so that I obtain a "balanced panel" from 1980 to 2001. Then I split the dataset according to the skill groups and estimate three equations using the standard OLS method, i.e. I have 5,830 observations in each of the estimations (265 regions times 21 years).

$$\begin{aligned} SHARE_{rt} = {} & \alpha + \beta\, BAYERN_r + \gamma_1\, DRTYP2_r + \gamma_2\, DRTYP3_r + \delta\, BORREG_r \\ & + \lambda_1\, TREND_t + \lambda_2\, TREND\_BORREG_{rt} + \lambda_3\, TREND\_BAYERN_{rt} \\ & + \lambda_4\, TREND\_DRTYP2_{rt} + \lambda_5\, TREND\_DRTYP3_{rt} \\ & + \tau_1\, TRENDOPENB_t + \tau_2\, TRENDOPENB\_BORREG_{rt} + \varepsilon_{rt} \end{aligned} \tag{3.3}$$

18 Parts of this chapter have been published in Moritz/Gröger (2007).

$SHARE_{rt}$ stands as a placeholder for the share of low-skilled ($LOWSK_{rt}$), skilled ($SKILLED_{rt}$) and high-skilled ($HIGHSK_{rt}$) workers in region *r* in year *t* (as %). My estimation approach includes (0.1) dummy variables for the Federal State of Bavaria (*BAYERN*), since the proportion of school leavers with an upper secondary education in Bavaria is significantly smaller than the proportions in other federal states. Furthermore, I include dummy variables for the district types (*DRTYP2*: district types 5-6; *DRTYP3*: district types 3-4 & 7-9) and the eastern Bavarian border region (*BORREG*). Using *TREND* and *TRENDOPENB* I control for temporal trends. *TREND* = 1,...22 if $1 \leq t \leq 22$, *TRENDOPENB* = 0 if $t \leq 10$ (until 1989) and *TRENDOPENB* = 1,...12 if $11 \leq t \leq 22$ (since 1990). In addition, interaction variables of *TREND* and the dummy variables are included. The interaction term of *TRENDOPENB* and *BORREG* represents the most important variable in the estimation. The coefficient of this variable provides information about the changes in the skill differentials in eastern Bavaria after the opening of the border. According to my hypothesis I expect negative values for low-skilled employees and positive values for skilled and high-skilled workers, i.e. low-skilled workers in eastern Bavaria should lose compared to low-skilled workers in the rest of the country after the fall of the Iron Curtain, more highly skilled workers in the border region should benefit by the opening of the border.

Table 3.6 contains the results of the estimates. The adjusted R^2 ranges between 0.32 for skilled workers and 0.44 for low-skilled ones. The signs of the coefficients for the dummy variables correspond with my theoretical expectations: positive values in the estimation with low-skilled workers, negative signs in the cases of more highly skilled workers – with the exception of *DRTYP3* in the regression for skilled workers and *BORREG* in the regression for high-skilled workers. The coefficient for *TREND* being significantly negative for low-skilled workers and significantly positive for skilled and high-skilled workers shows a general trend towards higher qualifications. The results for the interaction terms of *TREND* and the dummy variables indicate the trend towards decreasing shares of low-skilled workers in the border region, in general in Bavaria and in more peripheral areas. In accordance with these estimates, the coefficients for the interaction variables exhibit a positive effect in the estimation for skilled employees. In the case of high-skilled workers I observe differentiated results.

Table 3.6: Estimation results for the share of low-skilled, skilled and high-skilled workers

	low-skilled		skilled		high-skilled	
Variable	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
BAYERN	0.0251***	0.0035	–0.0234***	0.0032	–0.0017	0.0022
DRTYP2	0.0110***	0.0037	–0.0037	0.0034	–0.0073***	0.0016
DRTYP3	0.0055	0.0034	0.0124***	0.0032	–0.0180***	0.0017
BORREG	0.0401***	0.0099	–0.0415***	0.0090	0.0014	0.0023
TREND	0.0081***	0.0003	0.0057***	0.0003	0.0025***	0.0002
TREND_BORREG	–0.0016	0.0013	0.0019	0.0012	–0.0003	0.0003
TREND_BAYERN	–0.0007***	0.0002	0.0001	0.0002	0.0006***	0.0002
TREND_DRTYP2	–0.0006**	0.0003	0.0013***	0.0002	–0.0007***	0.0002
TREND_DRTYP3	–0.0005**	0.0002	0.0021***	0.0002	–0.0015***	0.0002
TRENDOPENB	0.0040***	0.0004	–0.0047***	0.0004	0.0007***	0.0002
TRENDOPENB_BORREG	–0.0008	0.0019	0.0006	0.0016	0.0002	0.0005
Constant	0.2941***	0.0026	0.6685***	0.0023	0.0374***	0.0012
Test statistics						
Number of observations	5,830		5,830		5,830	
R-squared	0.4425		0.3229		0.3681	
Root MSE	0.0471		0.0450		0.0278	

Source: Author's own calculations using the regional scientific use file of the IABS.
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

What is more striking and even stands in contrast to the theoretical predictions is the significantly positive sign of the coefficient for *TRENDOPENB* for low-skilled workers and the significantly negative value for skilled employees. This suggests a trend towards low-skilled labour in the years after the opening of the border. The coefficient of the variable in the focus of my analysis, *TRENDOPENB_BORREG*, lies close to 0 and is not statistically significant in all cases. Therefore, I am not able to identify an effect of the opening of the border on the skill structure in eastern Bavaria. Though I observe an upward movement in the skill structure in general, I find no evidence of the theoretically predicted increase in skilled labour in the region under review, which is in line with the descriptive results.[19]

19 The estimation was also carried out using Seemingly Unrelated Regression (SUR) methodology, yielding no fundamental changes in the results.

3.4.2 Unemployed People

In a similar manner I run regressions analysing the skill group shares of unemployed people. Due to the composition of the dataset, the configuration of the control variables is slightly different from the configuration for employed people. Since the unemployment spells in the IABS come from those who were formerly employed, the share of unemployed people for a specific skill group obviously depends on the share of workers for this skill group in earlier years. Hence, I include a variable which controls for the employment share in the foregoing period (*EMP_SHARE*$_{t-1}$). Furthermore, as the unemployment rates differ enormously in the German federal states, I not only control for Bavaria as in the estimations above, but introduce a set of dummy variables for all but one of the western German federal states (*FED_STATE*). Otherwise, I resume the control variables of the estimations in section 3.4.1. The regression equations now take the following form:

$$\begin{aligned} SHARE_{rt} = {} & \alpha + \rho\, EMP\_SHARE_{rt-1} + \sum_{j=1}^{J=9} \beta_j FED\_STATE_r + \gamma_1 DRTYP2_r + \gamma_2 DRTYP3_r \\ & + \delta\, BORREG_r + \lambda_1 TREND_t + \lambda_2 TREND\_BORREG_{rt} \\ & + \lambda_3 TREND\_BAYERN_{rt} + \lambda_4 TREND\_DRTYP2_{rt} + \lambda_5 TREND\_DRTYP3_{rt} \\ & + \tau_1 TRENDOPENB_t + \tau_2 TRENDOPENB\_BORREG_{rt} + \varepsilon_{rt} \end{aligned} \tag{3.4}$$

Table 3.7 shows the results of the separate estimations for the three skill groups. As expected, the share of employees in a specific skill group in period *t-1* has a highly significant influence on the share of unemployed people in this skill group in period *t*. The coefficients for the federal state dummies (not displayed in Table 3.7: some positive as well as some negative values at the 1 % significance level with Schleswig-Holstein as the reference state) reveal the differences within the western German labour market. The variables controlling for the district types are all insignificant, but the signs indicate that the share of low-skilled unemployed people is higher in less densely populated areas. The variables estimating trends and effects in the border region exhibit the following results: accounting for the dependency on the employment spells, the share of skilled unemployed people decreases over the years in contrast to the descriptive figures. On the other hand, the share of low-skilled and high-skilled unemployed people increases (*TREND*). After the opening of the border this trend reverses with significant values for skilled and high-skilled people (*TRENDOPENB*). However, the coefficients for the border region dummy and the appendant interaction terms are all at an insignificant level. Therefore, I can draw the conclusion that, corresponding to the results for employees, the outcome of the regressions for unemployed people also shows no evidence of a divergent development of the

skill structure between eastern Bavaria and the rest of the country after the fall of the Iron Curtain.

Table 3.7: Estimation results for the share of low-skilled, skilled and high-skilled unemployed people

	low-skilled		skilled		high-skilled	
Variable	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
EMP_SHARE_{t-1}	1.1152***	0.0372	1.0014***	0.0427	0.4979***	0.0278
FED_STATE* (dummies for 9 western federal states)	yes		yes		yes	
DRTYP2	0.0033	0.0077	–0.0083	0.0078	–0.0030	0.0026
DRTYP3	0.0035	0.0115	–0.0101	0.0116	–0.0015	0.0037
BORREG	0.0091	0.0295	–0.0100	0.0291	–0.0072	0.0059
TREND	0.0042***	0.0008	–0.0025***	0.0008	0.0005**	0.0003
TREND_BORREG	0.0027	0.0035	–0.0023	0.0036	–0.0002	0.0007
TREND_DRTYP2	–0.0005	0.0005	–0.0004	0.0005	0.0006***	0.0002
TREND_DRTYP3	–0.0015*	0.0008	0.0008	0.0009	0.0001	0.0002
TRENDOPENB	0.0002	0.0011	0.0021*	0.0011	–0.0023***	0.0004
TRENDOPENB_BORREG	–0.0085	0.0055	0.0079	0.0056	0.0008	0.0012
Constant	0.0656***	0.0128	-0.0838***	0.0321	0.0035	0.0031
Test statistics						
Number of observations	5,565		5,565		5,565	
R-squared	0.2359		0.1900		0.1496	
Root MSE	0.1110		0.1137		0.0393	

Source: Author's own calculations using the regional scientific use file of the IABS.
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

3.5 Econometric Analysis of Wage Differentials

3.5.1 Estimating Wage Differentials

Regarding changes in income, the aim of my analysis is to estimate whether the opening of the border between Germany and the Czech Republic had a significant effect on the development of wages of employees in the eastern Bavarian borderland compared to employees in other western German regions. In principle, different methods of estimation are available. The development of relative wage differentials can be estimated for every year by conventional regression analysis.

Accounting for the yearly varying censoring threshold of earnings at the upper ceiling in the German social contribution system, I use the Tobit estimation method. Focusing on full-time working employees I estimate a Mincerian wage equation (Mincer 1974) for every year between 1980 and 2001 using two versions of the IAB employment subsample (IABS). First, I use the regional scientific use file, and second, I use the (original) weakly anonymous IAB employment subsample combined with an extract from the employment register (*Beschäftigten-Historik*), obtaining not only 2 % but all observations in the border region. Since this conventional method has some drawbacks which can be avoided by using advanced estimation methods, I also impute wages and apply propensity score matching, a difference-in-differences approach and a fixed effects approach and compare the results.

3.5.2 Estimation Methods and Results

3.5.2.1 Tobit Regressions of Cross Sections (IABS Regional Scientific Use File)[20]

In order to estimate border region effects with respect to changes in wage differentials for employees in eastern Bavaria, I use a Tobit model, taking into account the censored (top-coded) income thresholds of the data, which vary yearly. I split the dataset into three subsamples according to the three skill groups. For each skill group I estimate the following wage equation for each year:

$$lnWAGE_i = \alpha + \beta\, DFEM_i + \gamma_1 EXPER_i + \gamma_2 EXPER_i^2 + \gamma_3 EXPER\_F_i + \gamma_4 EXPER^2\_F_i + \sum_{j=1}^{J=3} \delta_j BBR_{ji} + \sum_{k=1}^{K=15} \lambda_k DWZWG_{ki} + \tau\, BORREG_i + \varepsilon_i \quad (3.5)$$

For a detailed definition of the variables see Tables 3.8 and 3.9.

Table 3.8: Variables of the wage equation (Germany)

ln WAGE	logarithm of individual wage
DFEM	dummy for sex (female = 1)
EXPER (≥5)	potential job experience
EXPER²	potential job experience²/100
EXPER_F	potential job experience, female
EXPER²_F	potential job experience²/100, female
BBR*	dummies for BBR district types 5,7 and 8
DWZWG*	dummies for industries 2-16
BORREG	dummy for border region
_cons	constant

20 Parts of this chapter have been published in Moritz/Gröger (2007).

Table 3.9: Values of EXPER (Germany)

Qualification	Potential experience	Skill group
no occupational qualification	EXPER = AGE – 6 – 10	low-skilled
occupational qualification, without upper secondary education	EXPER = AGE – 6 – 12.5	skilled
no occupational qualification, with upper secondary education	EXPER = AGE – 6 – 13	low-skilled
occupational qualification, with upper secondary education	EXPER = AGE – 6 – 15	skilled
polytechnic degree	EXPER = AGE – 6 – 16	high-skilled
university degree	EXPER = AGE – 6 – 18	high-skilled

Notes: The workers' potential on-the-job experience (*EXPER*) is measured in years as age minus average duration of education minus six. I impose 10 years as the average duration of education for low-skilled workers without upper secondary education, 13 years for low-skilled workers with upper secondary education, 12.5 and 15 years for skilled workers without and with an upper secondary education respectively, 16 years for high-skilled workers holding a degree from a polytechnic and 18 years for high-skilled university graduates.

The dependent variable $\ln WAGE_i$ denotes the logarithm of individual *i*'s daily wage. In addition to the conventional variables of the Mincerian wage equation (sex: *DFEM*, potential job experience: *EXPER*, $EXPER^2$, interaction terms with sex) I use dummies for the district types (*BBR*) and the industries (*DWZWG*). Since the district types 1-4 and 6 do not appear in the border region I exclude observations for these districts from the estimation. In order to avoid estimations for a reference group of job entrants I include only individuals with at least five years of work experience. The coefficient of *BORREG* τ estimates the wage effect (as percentage) of the respective skill group in the border region compared with the national level. According to my hypothesis I expect decreasing values of τ for low-skilled workers and increasing values for skilled and high-skilled workers for the years following 1989.

The results for the control variables are sensible. In all skill groups, females earn significantly less then males. One additional year of potential experience yields a significant wage increase in the first instance, but the benefit declines over time (coefficients of *EXPER* +, $EXPER^2$ –). This experience effect is not so distinctive for females (*EXPER_F* –, $EXPER^2\_F$ +). The significant coefficient values for most of the dummies for district types and industries provide evidence of both an agglomeration wage premium and inter-industrial wage differentials. Concerning the border region dummy I obtain the following results for τ (Table 3.10), separately depicted for low-skilled workers (Figure 3.14), skilled workers (Figure 3.15) and high-skilled workers (Figure 3.16) and supplemented by 95 % confidence bounds (upper and lower limit). I regress the estimated values of τ on *TREND* and *TRENDOPENB*, so

that I obtain a broken trend line and can distinguish the development before and after the opening of the border. In accordance with the preceding estimation in section 3.4 *TREND* = 1,...22 if $1 \leq t \leq 22$. *TRENDOPENB* = 0 if $t \leq 10$ (until 1989) and *TRENDOPENB* = 1,...12 if $11 \leq t \leq 22$ (since 1990).

Table 3.10: Results for the coefficient τ of BORREG in the wage equation for three skill groups

	BORREG (low-skilled)		BORREG (skilled)		BORREG (high-skilled)	
Year	Coef. τ	Std. Err.	Coef. τ	Std. Err.	Coef. τ	Std. Err.
1980	–0.0275***	0.0064	–0.0472***	0.0052	–0.0494	0.0317
1981	–0.0268***	0.0064	–0.0446***	0.0050	–0.0394	0.0359
1982	–0.0274***	0.0062	–0.0407***	0.0049	–0.0274	0.0354
1983	–0.0351***	0.0065	–0.0394***	0.0050	–0.0215	0.0303
1984	–0.0350***	0.0070	–0.0379***	0.0053	–0.0789**	0.0356
1985	–0.0299***	0.0067	–0.0419***	0.0053	–0.0637*	0.0330
1986	–0.0357***	0.0073	–0.0330***	0.0053	–0.0307	0.0322
1987	–0.0303***	0.0076	–0.0413***	0.0051	–0.0448	0.0307
1988	–0.0210***	0.0075	–0.0390***	0.0051	–0.0455	0.0287
1989	–0.0322***	0.0078	–0.0371***	0.0050	–0.0204	0.0283
1990	–0.0348***	0.0070	–0.0365***	0.0050	–0.0310	0.0266
1991	–0.0320***	0.0072	–0.0353***	0.0049	0.0325	0.0263
1992	–0.0308***	0.0074	–0.0433***	0.0049	– 0.0129	0.0281
1993	–0.0330***	0.0074	–0.0400***	0.0048	0.0080	0.0256
1994	–0.0251***	0.0078	–0.0341***	0.0050	0.0120	0.0223
1995	–0.0265***	0.0084	–0.0334***	0.0048	–0.0010	0.0244
1996	–0.0301***	0.0084	–0.0302***	0.0047	0.0018	0.0219
1997	–0.0346***	0.0091	–0.0318***	0.0048	–0.0193	0.0209
1998	–0.0423***	0.0099	–0.0265***	0.0051	–0.0266	0.0291
1999	–0.0357***	0.0103	–0.0321***	0.0053	–0.0130	0.0225
2000	–0.0498***	0.0105	–0.0303***	0.0054	0.0005	0.0235
2001	–0.0460***	0.0106	–0.0343***	0.0054	0.0255	0.0241

Source: Author's own calculations using the regional scientific use file of the IABS.
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

Figure 3.14: Wage effect for low-skilled workers in the border region (as %, 1980–2001)

Source: Author's own calculations using the regional scientific use file of the IABS.

Figure 3.15: Wage effect for skilled workers in the border region (as %, 1980–2001)

Source: Author's own calculations using the regional scientific use file of the IABS.

Figure 3.16: Wage effect for high-skilled workers in the border region (as %, 1980–2001)

Source: Author's own calculations using the regional scientific use file of the IABS.

Figure 3.14 shows that the wage differential of low-skilled workers in the border region oscillated around –3% until the mid 1990s and then deepened to about –5 % in the year 2000. This means that on average low-skilled workers in eastern Bavaria initially earned approximately 3 % less than their counterparts in the rest of western Germany. From 1994 onwards the wage gap tended to grow to 5 %. Though I observe that the wages in the border region were significantly below the wages at national level in the whole period under review, the trend line does not indicate a significant widening of the wage differential after the opening of the border. For this purpose, the upper confidence bound in the 1990s had to drift below the 1980s' values of the lower confidence bound.

The results for skilled and high-skilled employees are shown in figures 3.15 and 3.16.

During the period under observation the wage differential of skilled workers narrowed from nearly –5 % in the early 1980s to about –3 % in the late 1990s, i.e. a general catching-up process in favour of skilled employees took place in eastern Bavaria in the 1980s and 1990s, despite setbacks in some years (Figure 3.15). The coefficient for *BORREG* declined noticeably in 1992 and 1993, but in general no consistent open-border effect is identifiable.

Regarding high-skilled employees in eastern Bavaria I observe similar results but on a larger scale (Figure 3.16). Due to there being far fewer people with higher education in the dataset, the results vary to a greater extent than in estimations with low-skilled or skilled employees. While the wage differential of people employed in the border region was permanently negative during the 1980s, positive values have appeared sporadically since 1991. As in the estimation for skilled employees I do not observe an effect caused by the opening of the border.

3.5.2.2 Sensitivity Analyses: Weakly Anonymous IABS Version and BeH Extract

In order to check the robustness of the results in the previous subsection I apply some sensitivity analyses. To do this I use the weakly anonymous original IABS version. In contrast to the scientific use file this version contains information about the firm size and the country of origin (not only divided into natives and foreigners). Besides, the branches of economic activity are not aggregated into 16 industries, but are available on the basis of a 3-digit code (WZ 73). I transform this very detailed classification into a scheme of 28 industries. Since the eastern Bavarian border region is rather small and the IABS provides only few observations for some years and skill groups, I use all observations from the employment register (*Beschäftigten-Historik BeH*) for the border region and combine this extract with the weakly anonymous IABS version. In order to avoid a bias in the results I weight the observations adequately according to their representativeness and estimate wage

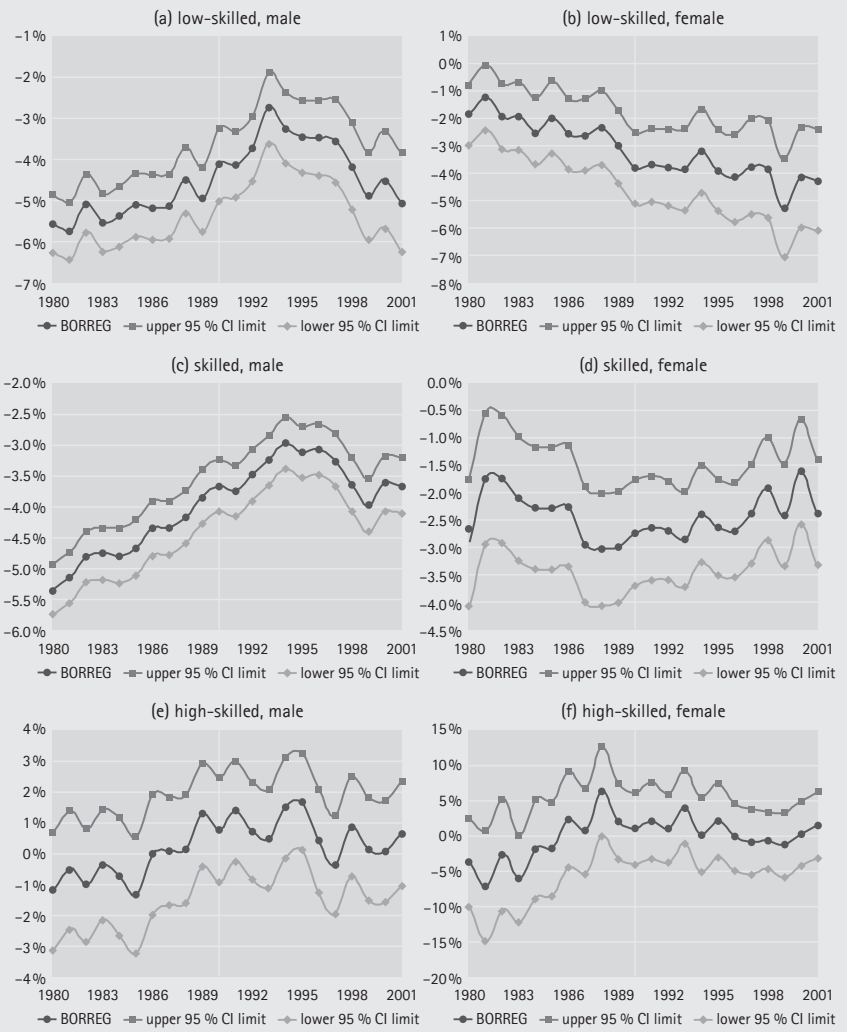
equations. Contrary to the regressions in the previous subchapter I do not now estimate a Tobit model, but use wages that, in the case of censoring, are imputed on the basis of Tobit estimates of the distribution parameters (Gartner 2005), so that I can then apply the standard OLS method. The results from the larger dataset do not differ in principle from the outcomes using only the weakly anonymous IABS, but are naturally less fluctuating. Thus, I only present the results obtained using the BeH extract.

Including the firm size in the equation as an exogenous variable does not yield a substantial change in the results. Since the effect of this variable is far from being significant, I remove it from the regression. In an alternative specification I split the skill groups according to sex and include a dummy variable for nationality (*FOREIGN*), which equals one if the employee is not German. Moreover, in order to control for the Czech commuters who are allowed to work in the Bavarian borderlands, I interact the nationality dummy with the border region dummy (*BORREG_FOREIGN*). The coefficient of this variable measures the wage effect of foreigners in the border region relative to foreigners in the rest of the country.

As in the previous regressions the estimation results of the control variables are sensible. The coefficient of the additional variable controlling for foreign workers exhibits negative values for all male skill groups and for low-skilled female workers during the observation period. This means that foreigners belonging to these groups earn less than the relevant domestic German workers, notably evident for male skilled employees with a rather constant wage differential for foreigners of –16 % to –11 %. Positive wage differentials for non-Germans are identified for female skilled workers in the 1990s and in some years for female high-skilled workers. Regarding the interaction term between foreign workers and the border region I return to this variable below.

Due to the highly divergent number of observations in the skill and sex groups, the scaling of the results for *BORREG* in Figure 3.17 varies. In the case of domestic low-skilled workers, an interesting difference between males (Figure 3.17a) and females (Figure 3.17b) is observable. In the 1980s male low-skilled employees in the eastern Bavarian border region earn about 5 % less than their colleagues in the non-borderlands. This wage differential considerably narrows at the beginning of the 1990s to around –3 %. Until the end of the decade the wage gap widens again, approaching the original level of –5 %. In contrast to this surprising development there is no similar trend for low-skilled female workers in the border region. Starting from a far smaller wage gap of approximately –2 %, the difference increases to about –4 % in the 1980s. This level stabilises during the 1990s, with only one negative outlier in 1999.

Figure 3.17: Gender-specific wage effect for German employees in eastern Bavaria (as %, 1980–2001)



Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.
Notes: In the case of censoring, wages are calculated in the framework of an imputation procedure using the Tobit estimation method; regression with heteroskedasticity-robust standard errors.

Regarding skilled employees, the general catching-up process in eastern Bavaria, which the results of the regression with the scientific use file already imply, is clearly confirmed in my further estimates, but interestingly, again only for male employees (Figure 3.17c). With earnings of nearly 5.5 % less in 1980, the differential becomes continuously smaller until the mid 1990s, where it settles at a level of about 3 %. Then, similarly to the trend for low-skilled male workers, the graph

turns to a deeper wage gap of around 4 % in 1999 with a slight recovery in the following two years. For female skilled workers the picture is completely different again (Figure 3.17d). Relative wage losses for employees in the borderlands in the 1980s (from –2 % to –3 %) are succeeded by a reduction in losses in the 1990s (from –3 % to –2 %).

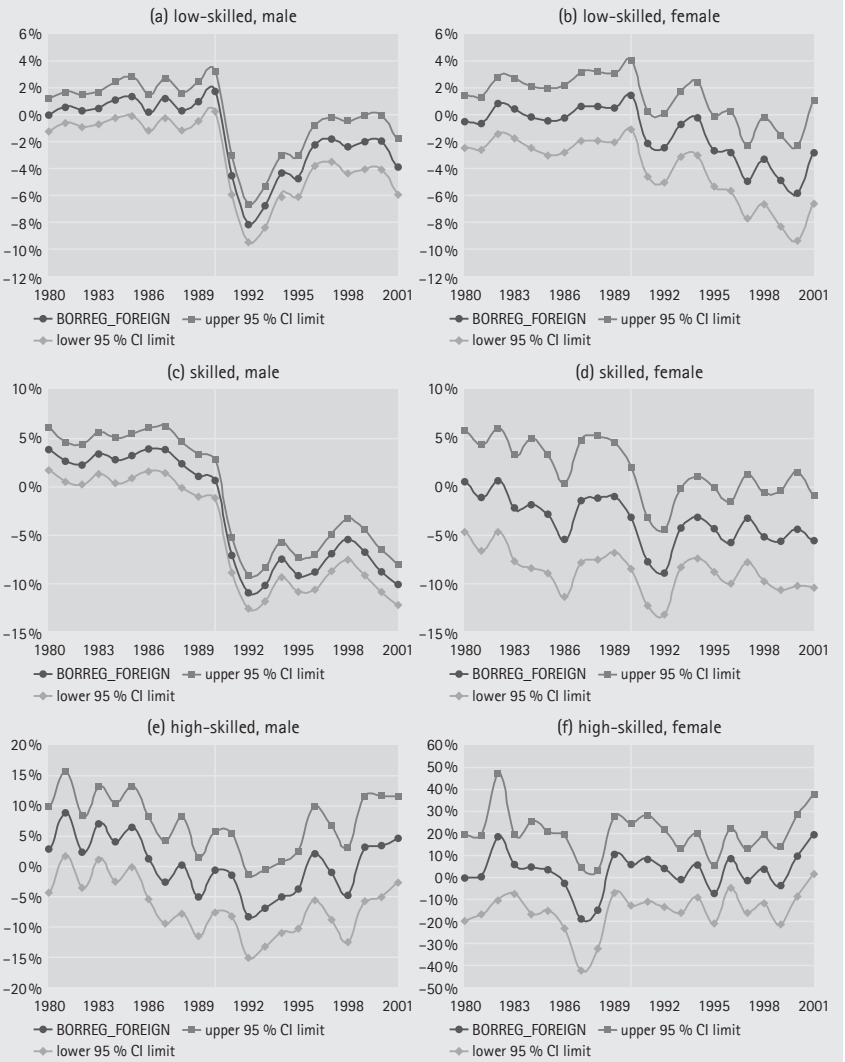
As far as high-skilled workers are concerned, the distinctively smaller number of observations still poses a problem (apparent in the figures through the huge confidential bounds). Male high-skilled workers in eastern Bavaria (Figure 3.17e) earn about 1 % below average until the mid 1980s. In the following ten years the wage differential is positive and then oscillates around the 0 % line. Female high-skilled workers in the border region obviously catch up in the 1980s from below-average to above-average values. In the 1990s the wage level stabilises around the reference value for western Germany (Figure 3.17f).

The question arising is which forces are behind the relative wage gains for male low-skilled workers. One possible explanation could lie in the strengthened position of low-skilled employees in supermarkets and hypermarkets. These stores did not exist in the early years after the fall of Communism in the Czech Republic and, like in Poland (Ullmann 2006), were largely established as recently as the second half of the 1990s. Masses of Czech consumers flocked to the nearby eastern Bavarian stores in these years in order to satisfy their demand for western-type consumer goods. Although the relative employment share in the retail industry grew to a smaller extent by an above-average rate in the border region in the early 1990s (see Figure 3.2), this did not have a resounding effect on low-skilled workers' wages in eastern Bavaria. Running the regression for low-skilled male workers without those employed in the retail and wholesale industries does not change the result essentially.

Another reason for the catching-up of low-skilled workers, which is already ruled out here by the specification of the regression model, could be the more productive Czech commuters who potentially substituted less productive German workers at the beginning of the 1990s. Since I control for foreign workers, this cannot cause the positive change in the wage differential. But, as it turns out, it pays off to take a closer look at Czech employees in the Bavarian borderlands.

First of all, I explore the outcomes for the interaction term *BORREG_FOREIGN* (Figure 3.18). As mentioned above, this variable controls for *all* foreign workers in eastern Bavaria, measuring their relative wage position compared to *all* foreign workers in the rest of western Germany. An alternative explanation is the additional wage differential for foreign employees compared to German employees in the border region.

Figure 3.18: Additional wage effect for foreign employees in eastern Bavaria (as %, 1980–2001)



Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.
Notes: In the case of censoring, wages are calculated in the framework of an imputation procedure using the Tobit estimation method; regression with heteroskedasticity-robust standard errors.

Disregarding high-skilled employees, there are evidently significant changes for the other skill groups after the opening of the border. Slightly positive additional wage differentials for foreign workers in eastern Bavaria in the 1980s turn into negative values of down to –10 % in the early years after the fall of the Iron Curtain. After these drastic changes, which are mostly apparent for low-skilled and skilled male

workers (Figures 3.18a and 3.18c), the wage differentials stabilise in the mid 1990s, or the trend even reverses, as in the case of low-skilled male workers.

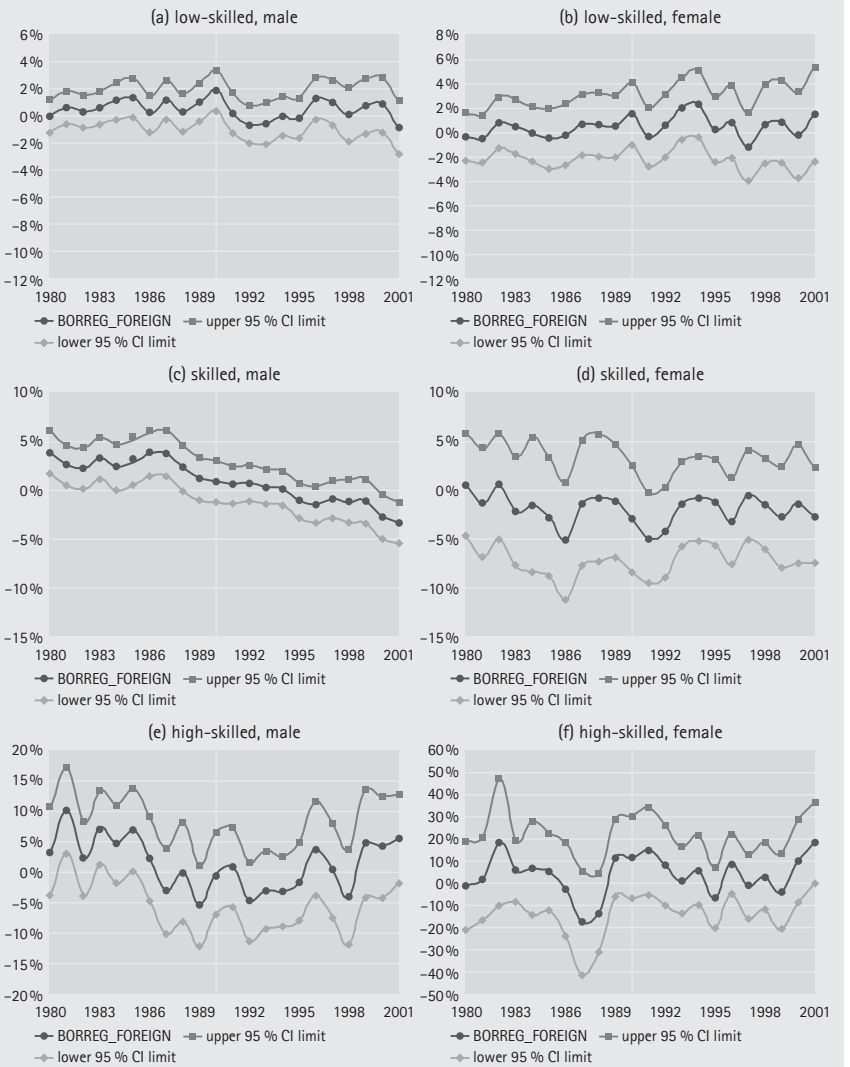
The first suggestion with regard to the reason for these relative wage losses of foreigners in eastern Bavaria is that Czech commuters, for whom it was relatively easy to become employed in the Bavarian borderlands at the beginning of the 1990s, caused the drop in relative wages. Understandably, for Czech workers it was highly appealing to work in Bavaria and earn the multiple higher wage, though it was less than the average wage of other foreigners. Moreover, Czech commuters had a particular incentive for cross-border jobs, since they could keep their homes in the Czech Republic and take advantage of the lower cost of living there.

Recalling the shares of Czech employees in the different skill groups in eastern Bavaria (Figure 3.8), the essential point so far is that the share of Czech workers in the border region is considerably high for precisely those skill groups where I noticed a fall in the relative wages for foreigners after 1990. In order to check definitively whether Czech workers caused the relative wage drop, I estimate the wage differentials excluding Czechs. The revealing results are presented in Figure 3.19. The graphs for the skill groups, in which the share of Czech workers did not exceed 1 % in the 1990s (female skilled and both sexes of high-skilled workers), do not change substantially. For the skill groups which exhibit a perceptible increase in the share of Czech employees, however, the graph changes fundamentally if Czechs are excluded from the estimation. For male low-skilled and skilled workers (Figures 3.19a and 3.19c), as well as for low-skilled female workers (Figure 3.19b) – to a smaller degree –, the drop in the relative wage for foreigners estimated above now disappears.

Summarising the sensitivity analyses, the estimates with the larger datasets shed light on differences between male and female workers. For male low-skilled and skilled workers, who represent more than 60 % of the eastern Bavarian workforce, a catching-up process can be verified until the mid 1990s. From 1995 onwards the trend reverses and workers in the border region lose out in relation to employees in the rest of western Germany. Neither the Czech consumers shopping in the supermarkets of the Bavarian borderlands nor the substitution of less productive German workers with more productive Czech commuters can account for the relative wage gains in the early 1990s. Neither can the cause of the growing wage gap in the late 1990s be explained by the available data. Interestingly, Czech workers employed in eastern Bavaria bear the responsibility for the drop in the wage differential for foreign workers in the border region.

However, the estimation methods applied up to now control neither for selection biases nor unobserved heterogeneity, which leaves enough scope for research to be done in the next subsections.

Figure 3.19: Additional wage effect for non-Czech foreign employees in eastern Bavaria (as %, 1980–2001)



Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.

Notes: In the case of censoring, wages are calculated in the framework of an imputation procedure using the Tobit estimation method; regression with heteroskedasticity-robust standard errors.

3.5.2.3 Propensity Score Matching

The disadvantage of the applied estimation method lies in the assumption of a certain functional specification in the regression equation. An evaluation of economic relationships based on a dummy variable has the drawback that only differences in levels are captured. Otherwise, additional interaction terms would have to be incor-

porated into the estimation equation, making the interpretation of the results quite difficult. Besides this, large differences in the range of variable values between observations in the border region and the interior region could pose a problem. This would be the case if employees in eastern Bavaria were a specific subgroup of all employees in western Germany, e.g. caused by a lower infrastructural endowment in the border region. If employees in eastern Bavaria differed from workers in the non-border region and if people with certain characteristics tended to live in the border or non-border region, then their relative wage would have risen or fallen, independently of whether they worked in the (non-)border region.

These obstacles can be mitigated by using a matching approach (Rubin 1974), which is particularly applied for the evaluation of labour market policies (e.g. Heckman et al. 1999). In order to evaluate the wage effect for workers in the border region I calculate the *average treatment effect on the treated* (*att*), which – relating to border region workers – is defined as the difference between the expected outcome for having a job in the borderland and having a job in the non-borderland.

$$\begin{aligned} \Delta_{att} &= (\Delta \mid BORREG = 1) \\ &= E(lnWAGE^{1} \mid BORREG = 1) - E(lnWAGE^{0} \mid BORREG = 1) \end{aligned} \tag{3.6}$$

The fundamental evaluation consists in the hypothetical outcome of $E(lnWAGE^{0} \mid BORREG = 1)$, i.e. the potential wage for border region workers in the non-borderland which is not observable. Naturally, it is only possible to observe one status, i.e. a person has a job either in the border region or in the non-border region. In my case, I can only observe the wage of an individual in one region and not the counterfactual outcome in the other region. The wage of non-border region workers in the non-borderland $E(lnWAGE^{0} \mid BORREG = 0)$ is observable. However, people in the two areas of observation could differ systematically, i.e. as it turns out, workers in the non-borderland have greater potential experience on average, which in turn raises the probability of a higher wage. Therefore, $E(lnWAGE^{0} \mid BORREG = 1)$ has to be estimated. For this purpose the group of border region employees is contrasted with a group of workers not working in the border region, which is preferably similar regarding relevant variables and is therefore called "statistical twins". Basically, all variables which have an effect on the state of working in the border region and on the wage are relevant. The potential wage for working in the non-borderland has to be equal for border region and non-border region employees $lnWAGE^{0} \perp BORREG$ or $E(lnWAGE^{0} \mid BORREG = 1) = E(lnWAGE^{0} \mid BORREG = 0)$ respectively, i.e. the *Conditional Independence Assumption* (*CIA*) is fulfilled and the non-border region employees serve as an adequate

control group (Rubin 1977). In other words, it is assumed that all influencing factors are included in the analysis and thus wage differentials can be traced back exclusively to the region.

A second necessary requirement consists in the C*ommon Support Assumption*, i.e. employees with the same *X* values have a positive probability of working either in the border region or the non-border region. Since it is not possible to condition on all relevant observed covariates *X*, Rosenbaum/Rubin (1983) suggest the use of a balancing score *b(X)*, i.e. the conditional distribution of *X* given *b(X)* is independent of belonging to the treatment group (*BORREG = 1*) or the control group (*BORREG = 0*), that is

$$X \perp BORREG \mid b(X) \tag{3.7}$$

As a further condition I assume that the wage of a person working in the border region is not affected by other people's state of working in the borderland or the non-borderland (*Stable Unit Treatment Value Assumption SUTVA*).

Admittedly, applying a matching approach is problematic, insofar as no real assignment to treatment ("working in the border region") can be identified. I assume that the opening of the border had a particular effect on workers employed in an area of up to 70 km from the Czech border, considering that it is easier in this area to outsource production activities or purchase goods and services in the Czech Republic. I am not able to manipulate the treatment "working in the border region", since only workers who are either employed in eastern Bavaria (and mostly already were so before the fall of the Iron Curtain) or hold a job in the non-border region are included. The condition that there is no unobserved influencing factor concerning the variables involved in constituting the control group is questionable. The qualitative education level, motivation or career planning could possibly determine whether or not a person is living in the borderland. Consequently, I cannot assign the treatment clearly, because "working in the border region" is dependent on several unobservable individual characteristics. Hence, it can be argued whether causal conclusions are possible and whether the quantification of a causal effect seems appropriate. Nevertheless, I am able to examine changes in wage differentials before and after the opening of the border and I regard the application of the matching approach as a complement to the abovementioned conventional regression method.

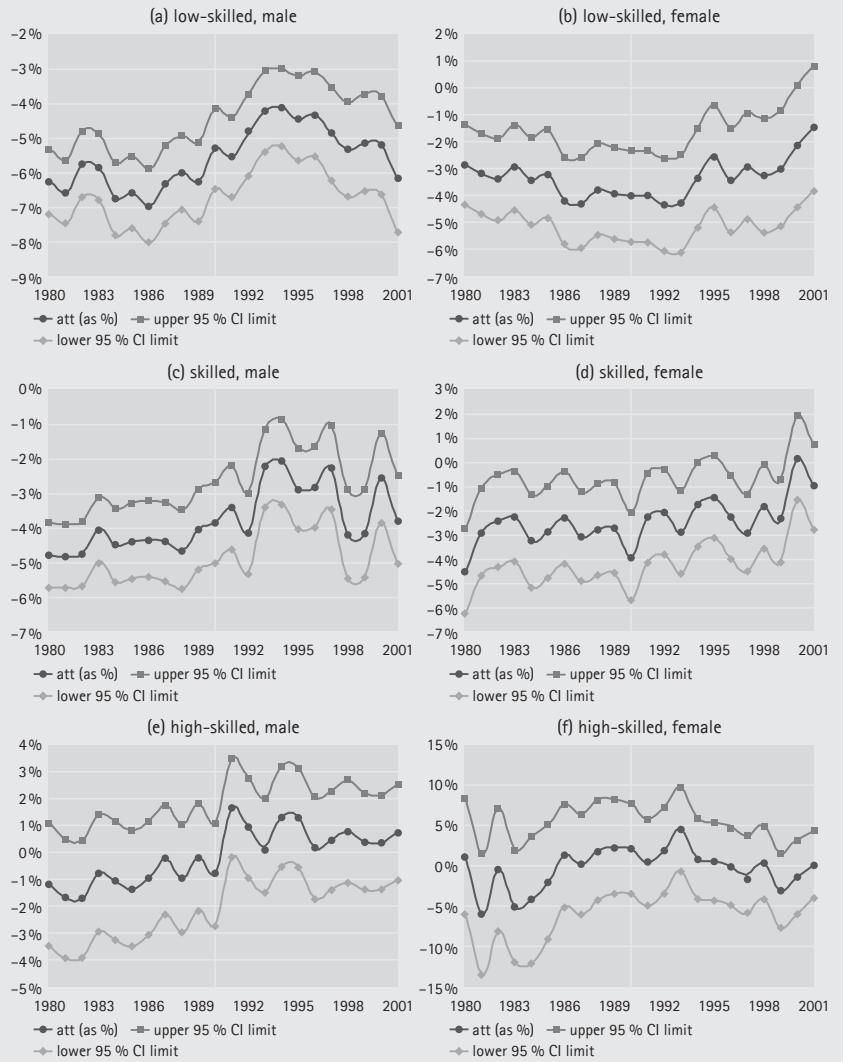
I apply "propensity score matching" as a matching method, i.e. I match people from the treatment group ("border-region workers") with people from the comparison group ("non-border-region workers"). The propensity score is one of several possible implementations of the above-mentioned balancing score, in this case the

probability of "working in the border region" given observed characteristics *X*. This probability is calculated by probit estimation with "working in the border region" as an endogenous variable. Considering the results of the previous subsection I assume that the "foreigners in the border region" group is fundamentally influenced by Czech commuters, for which I am not able to find equivalent counterparts in the non-border region. Hence, I decided to restrict the matching analysis to German employees. The control group is identified using the nearest neighbour algorithm with replacement on the basis of the variables experience, district type and sector of economic activity (primary, secondary or tertiary sector).[21] Since border region employees are highly overrepresented in the dataset due to the observations from the BeH, every worker from the border region is matched with 20 workers from the non-border region who exhibit the most similar propensity score. As the matching is successful, the means of the exogenous variables do not differ significantly between the employees in eastern Bavaria and the rest of western Germany. This is important with respect to the district types, for instance, since district type 5 is in the border region only represented by the city of Regensburg. Using imputed wages again I estimate the *average treatment effect on the treated* (*att*) for every year between 1980 and 2001. As mentioned above, this relevant parameter is defined as the difference of the average wage of the border region workers and the average wage of the matched twins.

Figure 3.20 shows the results of the *average treatment effect* (*att*) for the different skill and sex groups. The outcome for male workers in the border region corresponds to my previous findings: a narrowing of the wage gap in the first half of the 1990s for low-skilled and skilled employees in eastern Bavaria, whereas in the late 1990s the wage differentials rise again (Figures 3.20a and 3.20c). According to this matching analysis, high-skilled workers in the border region earn below-average wages before the opening of the border and enjoy a positive wage differential in the 1990s – a result that is in line with my theoretical expectations (Figure 3.20e). Regarding the analysis for female workers, the outcome deviates somewhat from the regression estimates: low-skilled employees now exhibit rising relative wages in the borderland (Figure 3.20b) in the 1990s, contradicting the continuous downward trend in the regression analysis. The outcome for the other two skill groups is however consistent with the preceding results, with growing relative wages for skilled women in eastern Bavaria (Figure 3.20d) and not very informative values for high-skilled female employees due to fewer observations (Figure 3.20f).

21 Using the classification of 28 industries instead of three sectors leads to poor matching results.

Figure 3.20: Estimation of average treatment effect on the treated (att) for German employees in eastern Bavaria (as %, 1980–2001)



Treatment: employment in the border region; caliper: 0.01
Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.
Note: In the case of censoring, wages are calculated in the framework of an imputation procedure using the Tobit estimation method.

3.5.2.4 Pooling Cross Sections Over Time

In the previous subsections I split the dataset into the years from 1980 to 2001 and estimated the wage effect in the border region or the average treatment effect separately. In order to account for the time structure of the data I now use the whole dataset across the years. Since some individuals are observed in more

than one period, the data have the structure of an unbalanced panel, which entails some advantages. Compared to a series of cross sections the explanatory variables now vary over two dimensions (individuals and time). Moreover, having a larger sample size in only one equation usually leads to more accurate estimators. More intuitively, the data should provide better information since the same individuals are repeatedly observed (Verbeek 2008).

In this subsection I apply a difference-in-differences approach. Using imputed wages, in accordance with the regression analysis applied above, I take the logarithm of the daily wage as an endogenous variable and capture the influence of "working in the border region" through a dummy variable (*BORREG*). In this case, the coefficient of this variable reflects the basic wage differential of employees in the eastern Bavarian border region in 1980. In order to reflect the wage increases over time, I include a set of time dummies in the wage equation above, so that *YEAR1981 = 1* if *t* = 1981 and so on. While the year 1980 constitutes the base period, the time dummies capture the general trend in each year which does not vary between the individuals. Furthermore, I generate interaction terms between the different years and the border region dummy (*BORREG_YEAR1981* etc.). As these interaction terms control for the difference (over time) in the difference (wage gap in the border region), the coefficients $\omega_1,...\omega_{21}$ represent the difference-in-differences estimators (Wooldridge 2002). The coefficient of an interaction term in a specific year expresses the change in the wage differential of the border region relative to the rest of the country. Analogously to Büttner/Rincke (2007), who analyse the development of labour market indicators at the inner-German border before and after reunification, I do not capture the "shock" of the opening of the border by a single interaction term, but account for the integration *process*. Similar to the previous estimation methods, I observe the values of the coefficients over time – in this case in form of interaction terms all included in one regression – and investigate whether there are major changes after the fall of the Iron Curtain. According to my hypothesis I expect a structural break in the coefficients of the interaction terms after 1989, assuming that except for the opening of the border no other "shock" occurred that would have influenced the development of wages.

Estimating separate regressions for male and female workers, the equation now takes the following form:

$$\begin{aligned} lnWAGE_{it} = {} & \alpha + \gamma_1 EXPER_{it} + \gamma_2 EXPER_{it}^2 + \sum_{j=1}^{J=3} \delta_j BBR_{jit} + \sum_{k=1}^{K=27} \lambda_k DWZWG_{kit} \\ & + \tau BORREG_{it} + \varphi FOREIGN_{it} + \eta BORREG\_FOREIGN_{it} \\ & + \upsilon_1 YEAR1981_t + ... + \upsilon_{21} YEAR2001_t \\ & + \omega_1 (BORREG\_YEAR1981_{it}) + ... + \omega_{21} (BORREG\_YEAR2001_{it}) + \varepsilon_{it} \end{aligned} \tag{3.8}$$

The coefficient τ now captures the basic wage differential in 1980. Table 3.11 shows the results for the different skill and sex groups. In Figure 3.21 the results for the interaction terms of *BORREG* with the time dummies are depicted.

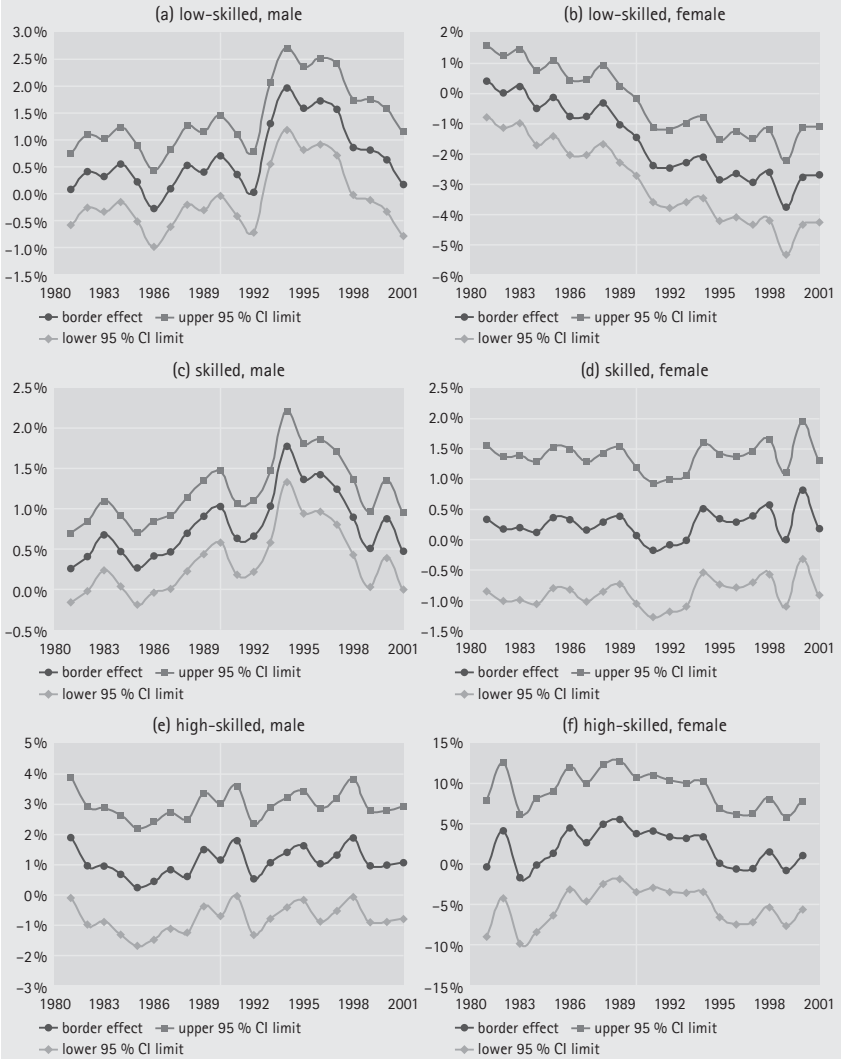
The results gained from using this estimation method largely confirm the findings from the previous sections: in all cases the base level for the wage differential in the border region has a negative sign with significant values at the one percent level for both sexes for low-skilled and skilled workers. The high wage gaps for low-skilled (–5.1 %) and skilled (–4.7 %) male employees in the reference year 1980 narrow in the early 1990s, but widen again afterwards (Figures 3.21a and 3.21c). Having lower basic wage differentials, the development for female workers in the border region is different (Figures 3.21b and 3.21d), above all for low-skilled ones, who lose continuously over time. Regarding male high-skilled employees in eastern Bavaria (Figure 3.21e), starting from a negative base level the wage differential in both the 1980s and the 1990s is marginally positive (addition of the coefficients for *BORREG* and for the interaction term of the relevant year). The confidence bounds are far larger for female high-skilled employees, with results indicating a catching-up process in the 1980s and a downward trend in the 1990s (Figure 3.21f).

Table 3.11: Basic wage differential for German employees in 1980 in difference-in-differences estimations

	BORREG (low-skilled)		BORREG (skilled)		BORREG (high-skilled)	
sex	Coef. τ	Std. Err.	Coef. τ	Std. Err.	Coef. τ	Std. Err.
male	–0.0514***	0.0025	–0.0468***	0.0016	–0.0061	0.0074
	N = 1,579,214	R^2 = 0.5036	N = 5,610,951	R^2 = 0.4661	N = 362,935	R^2 = 0.4543
female	–0.0165***	0.0043	–0.0268***	0.0044	–0.0128	0.0302
	N = 1,315,872	R^2 = 0.4068	N = 2,108,504	R^2 = 0.3690	N = 73,356	R^2 = 0.2832

Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.
Notes: In the case of censoring, wages are calculated in the framework of an imputation procedure using the Tobit estimation method; regression with heteroskedasticity-robust standard errors; */**/*** significant at the 10/5/1 percent level.

Figure 3.21: Difference-in-differences wage effect in eastern Bavaria (as %, 1981–2001)



Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.

3.5.2.5 Panel: Fixed Effects

While Propensity Score Matching mitigates *observed* heterogeneity, another problem could lie in the *unobserved* heterogeneity. Individuals not only exhibit differences in the observed variables, but have characteristics which are hardly observable. This fact poses a problem if these attributes have an effect on the outcome variable and are also correlated with an explanatory variable, i.e. the estimate of this variable will be biased due to endogeneity. In the border region scenario, for

instance, employees living there could exhibit characteristics, e.g. concerning career planning and motivation, that lead to a lower wage. Omitting this factor in the regression would yield a biased estimate for the variable *BORREG*, which then captures this effect.

In order to control for unobserved heterogeneity I apply a fixed effects approach, i.e. I mitigate the omitted variable bias by replacing the constant in the wage equation in the previous subsection with a fixed effect π_i, which captures time-invariant characteristics of the individuals.

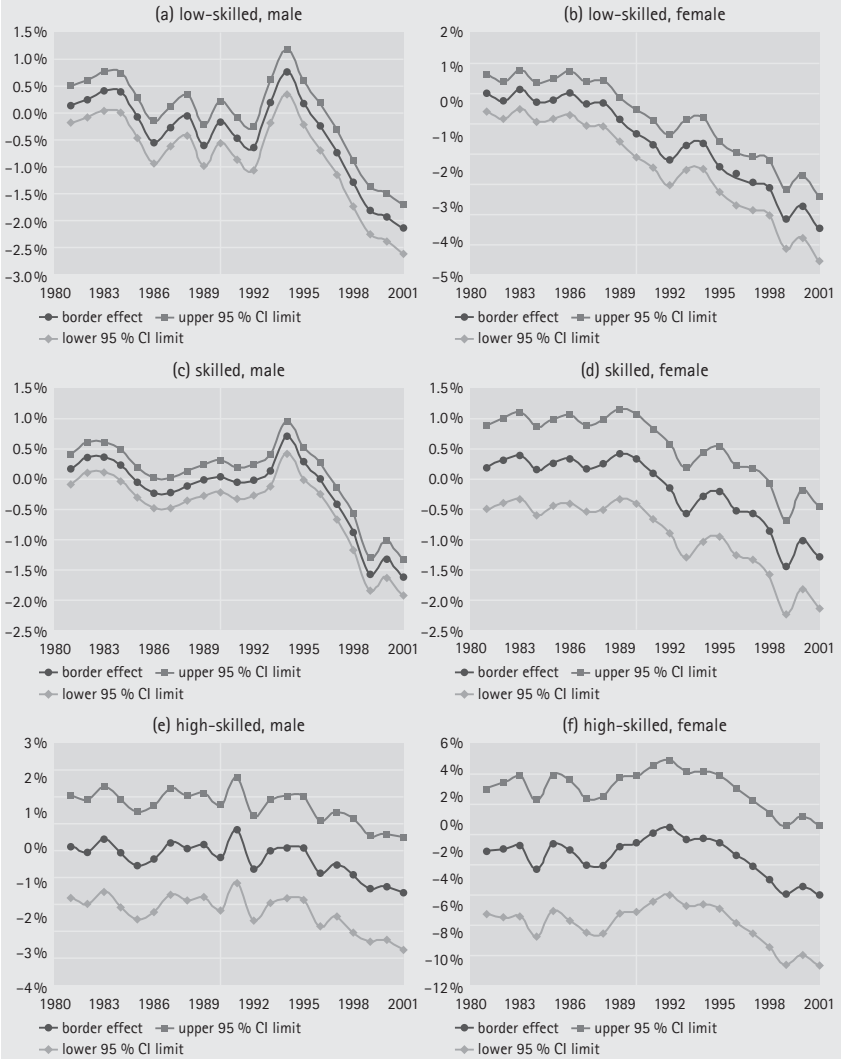
Since a Hausman test rejects in all cases the hypothesis that the differences in the estimated coefficients are not systematic with respect to a random effects model, i.e. the fixed effects model is favoured, I only present the results of this model. Table 3.12 shows the wage differentials in the reference year 1980 and Figure 3.22 the development in the following years. In this case *N* represents the number of observations in the sample, while *n* denotes the number of individuals identified in different years by the same insurance policy number. *N* divided by *n* yields the average number of observations of one person. In most cases this number is close to six, while skilled men are observed more than eight times on average and high-skilled women only an average of four times. It is important to mention that the variable *BORREG* in the fixed effects regression only estimates the effect for movers from the non-border- to the borderland against the movers in the opposite direction. Nevertheless, the results for *BORREG* and the interaction terms are quite plausible. In all cases the coefficient for *BORREG* exhibits a negative sign, in this case with significant values for all male subgroups.

Table 3.12: Basic wage differential for German employees in fixed effects estimations

	BORREG (low-skilled)		BORREG (skilled)		BORREG (high-skilled)	
sex	Coef. τ	Std. Err.	Coef. τ	Std. Err.	Coef. τ	Std. Err.
male	–0.0816***	0.0135	–0.0445***	0.0056	–0.0949***	0.0308
	N = 1,579,214 n = 256,058	R^2 = 0.7573	N = 5,610,951 n = 647,543	R^2 = 0.7586	N = 362,935 n = 60,526	R^2 = 0.5692
female	–0.0174	0.0438	–0.0205	0.0156	–0.0835	0.0767
	N = 1,315,872 n = 212,503	R^2 = 0.6312	N = 2,108,504 n = 353,526	R^2 = 0.5791	N = 73,356 n = 18,321	R^2 = 0.5197

Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.
Notes: In the case of censoring, wages are calculated in the framework of an imputation procedure using the Tobit estimation method; regression with heteroskedasticity-robust standard errors; */**/*** significant at the 10/5/1 percent level; N: number of observations, n: number of individuals; R^2 within.

Figure 3.22: Fixed effects estimations: wage effect in eastern Bavaria (as %, 1981–2001)



Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.

While the course of the graph in all cases looks similar to the gradient in my previous regressions, there is one striking difference: for all male and female subgroups the wage gap at the end of the observation period (in 2001) is larger than at the beginning (in 1980). Regardless of the trend which was already starting in the 1980s, or be it a reversal in the mid 1990s, the decline is more substantial than in my preceding results. For high-skilled employees a downward trend is also clearly observable. This means that controlling for idiosyncratic characteristics of the in-

dividuals, the relative wages in the eastern Bavarian border region are decreasing, though not significantly everywhere. It is interesting that the catching-up process for male low-skilled and skilled workers is also confirmed using this estimation method. However, the trend from the mid 1990s onwards seems generally unfavourable for eastern Bavaria.

3.5.2.6 Additional Analysis: Splitting the Border Region

In an additional variant of the estimation I subdivide the eastern Bavarian border region into two subgroups: the southern and the northern part (see appendix, Figure A 3.1). The southern part embraces the border region of Lower Bavaria (*Niederbayern*) and the southern districts of the Upper Palatinate (*Oberpfalz*), i.e. the districts and cities along the river Danube, the Bavarian forest and the districts of Cham and Schwandorf, which belong to the catchment area of Regensburg. The districts of Upper Franconia (*Oberfranken*) and the northern districts of the Upper Palatinate form the northern part of the border region. This subdivision is motivated by indications that the development in the two parts of the border region differs. Unemployment rates, for instance, are traditionally higher in the northern border region. In part, the discrepancies between the north and the south are obvious from the VALA results (see chapter 3.3.1 and Böhme/Eigenhüller 2005). Locational fixed effects are mostly negative in the northern districts, while the economic situation looks more favourable in the southern part of the region.

As in the previous subchapter I use the fixed effects estimation approach controlling for unobserved heterogeneity. The results are shown in the appendix in Tables A 3.1 and A 3.2 and Figures A 3.2 and A 3.3. There are noticeable differences between the two parts of the border region. First of all, as shown in the tables, the basic wage differentials in the year 1980 in northeastern Bavaria are positive for female low-skilled and skilled workers, but not significant. The high significance of the wage gap of male skilled and high-skilled employees disappears if only the northern part is considered. Regarding the changes in the 1980s and 1990s, which are depicted in the figures, to some extent a South-North divide becomes apparent. While the break in the catching-up process is observable for male low-skilled and skilled workers in both parts, the size of the decline is much larger in the north. There, compared to around 1–2 percentage points in the south, the employees in the skill groups mentioned relatively lose about 4 percentage points until 2001. The same descent from 1995 onwards is evident for female low-skilled workers in the northern border region. Interestingly, female skilled employees continuously lose in the south, while the wage differential is kept relatively constant in northeastern Bavaria suggesting even an overall positive wage compared to the rest of western Germany. Concerning high-skilled workers, the widening of

the wage gap seems to be more distinctive in the north, with obviously incisive relative losses for females.

All in all, these results are not surprising. As mentioned above, the northeastern border region faces structural adjustment problems to a far higher degree than the prosperous cities along the Danube. However, the results indicate that the integration effects are partly superposed by the fundamental development of the districts. While the situation in the southern part of eastern Bavaria seems quite acceptable, the position in the northeastern borderland gives reason for concern.

3.6 Conclusion

The aim of this chapter was to analyse the relative effects of the fall of the Iron Curtain on the eastern Bavarian borderland with respect to shifts in the structure of employment, skills and wages. To do this, I compared the situation on the labour market before the opening of the border in the 1980s to the years afterwards until 2001. Both theoretical strands on which I based the analyses predict integration effects which should be larger in the border region. However, concerning labour demand, the Feenstra-Hanson trade model and the Brülhart et al. NEG model come to opposing conclusions in some aspects. While both theories expect high-skilled employees to profit especially in eastern Bavaria due to comparative advantages and a higher market potential respectively, the situation of low-skilled workers is seen differently. On the one hand, according to Feenstra/Hanson, international trade and outsourcing hits the low-skilled workforce in the border region to a higher degree, leading to relative wage losses. On the other hand, according to the NEG model, the higher attractiveness of the region after the abolition of trade impediments could also benefit low-skilled employees.

The results of my analyses are the following: with respect to the structural change and specialisation in the border region, the opening of the German-Czech border did not change trends that had already been under way in the years before. The structural change in eastern Bavaria proceeds analogously to the development in the rest of the country. Caused by the continuous decline of the consumer goods industry, the economic structure in eastern Bavaria conforms to the western German pattern.

Regarding the relative employment share, the development in eastern Bavaria is positive overall: the share of the workforce in Germany which is employed in the border region increased continuously before and after the introduction of free trade with the Czech Republic and outsourcing to it. This outcome holds for only German workers observed, not only where all workers are considered.

Concerning the skill structure of employed and unemployed people, I do not find clear evidence of disproportionate shifts in the descriptive figures or in the estimates of an econometric model. The general trend towards more skilled labour also led to substantial shifts in the employment structure in the Bavarian border region. In the period under review, from 1980 to 2001, the share of low-skilled workers, which was substantially larger in eastern Bavaria in 1980, adjusted to the average value of the districts comparable with the border region observed. In accordance with this development, the share of skilled workers in the border region increased up to the average of the comparable districts. The share of high-skilled employees remained just below the aggregate level. The regression results correspond to these descriptive figures in the sense that there is no evidence of a special skill-upgrading process after the opening of the border. Having a look at the unemployment spells in the IABS does not change this picture.

A large part of my study deals with wage differentials between eastern Bavaria and the rest of western Germany. I applied several estimation methods in order to identify the effects of the open border. While using the IABS scientific use file and estimating a Tobit model yields no significant results of relative wage losses for low-skilled workers and gains for more highly skilled workers, advanced methods and a larger dataset shed more light on the changes. In the former case there are no significant indications that workers in eastern Bavaria would profit or lose from integration with the nearby Czech market. Despite a slight catching-up trend, i.e. a decrease in the wage gap, which started as early as in the 1980s, I cannot identify any positive effects for skilled and high-skilled workers as a result of integration. The wage differential of low-skilled employees seems to have grown in the late 1990s, but the results are not significant. This prima facie impression suggests that the opening of the border did not have a profound impact on the districts situated immediately on the border. Adding additional observations for the border region from the employment register makes it possible to take a closer look. Using imputed wages and separating male and female employees, I apply several estimation methods (standard OLS, propensity score matching, DID and fixed effects). The outcome is very robust, at least in some cases: male low-skilled and skilled workers in the borderland caught up until the mid 1990s and then lost ground compared to employees in the rest of western Germany. The findings for all female skill groups and also male high-skilled employees are not so clear-cut. The results of the fixed effects estimation are most striking: for all sex and skill groups the wage gap widens in the observation period. The question remains whether or not the opening of the border caused this development, and if so, why different skill and sex groups are affected in an unequal manner. After all, there is no change for the worse immediately after the opening of the border: indeed, the indications are

actually quite positive in the early 1990s. Interestingly, precisely in this period it was relatively easy for Czech commuters to obtain a work permit in Bavaria. The catching-up process above all of male low-skilled employees after the fall of the Iron Curtain is not caused by the substitution of German workers with more productive Czech workers (nor by the surge of supermarkets in the borderland). In fact, Czech employees in eastern Bavaria earned wages substantially below the average in eastern Bavaria. However, from 1995 or so onwards, the development of wages in the border region gives cause for concern.

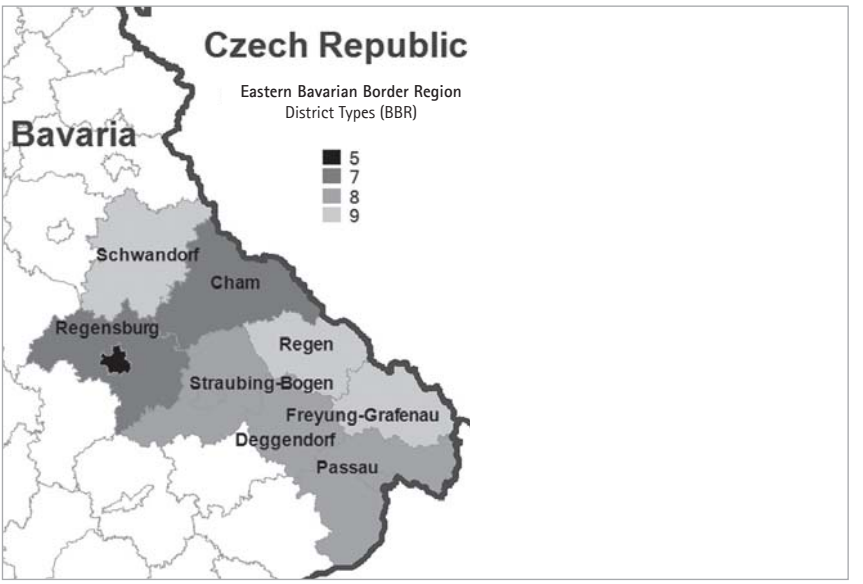
In short, there are no profound border effects of economic integration observable apart from the wage differentials. With respect to the theoretical models, the relative losses for low-skilled workers, which are detected by using the larger dataset, are in line with the Feenstra-Hanson model. International trade and outsourcing apparently took their toll in the border region. So far, there are no obvious positive effects due to a higher market potential predicted on the basis of Brülhart et al.

The results prompt the ongoing research on this topic. Since the observation period ends in 2001, the effects of the accession of the Czech Republic to the EU are not investigated in this framework. Moreover, free movement of labour is still restricted between Germany and the Czech Republic, i.e. the abolition of tariffs and the full liberalisation of labour markets in 2011 at the latest might cause deeper effects in eastern Bavaria.

Appendix to Chapter 3

Figure A 3.1: Southern and northern part of the eastern Bavarian border region

(a) Southern part of the eastern Bavarian border region



(b) Northern part of the eastern Bavarian border region

Table A 3.1: Basic wage differential for German employees in fixed effects estimations in the southeastern Bavarian border region

	BORREG (low-skilled)		BORREG (skilled)		BORREG (high-skilled)	
sex	Coef. τ	Std. Err.	Coef. τ	Std. Err.	Coef. τ	Std. Err.
male	–0.0905***	0.0173	–0.0565***	0.0060	–0.1084***	0.0392
	N = 939,867 n = 157,411	R^2 = 0.7521	N = 3,247,504 n = 388,752	R^2 = 0.7530	N = 227,656 n = 38,652	R^2 = 0.5605
female	–0.0518	0.0608	–0.0248	0.0199	–0.0654	0.0663
	N = 694,266 n = 118,528	R^2 = 0.6135	N = 1,234,669 n = 214,035	R^2 = 0.5638	N = 50,221 n = 12,562	R^2 = 0.5227

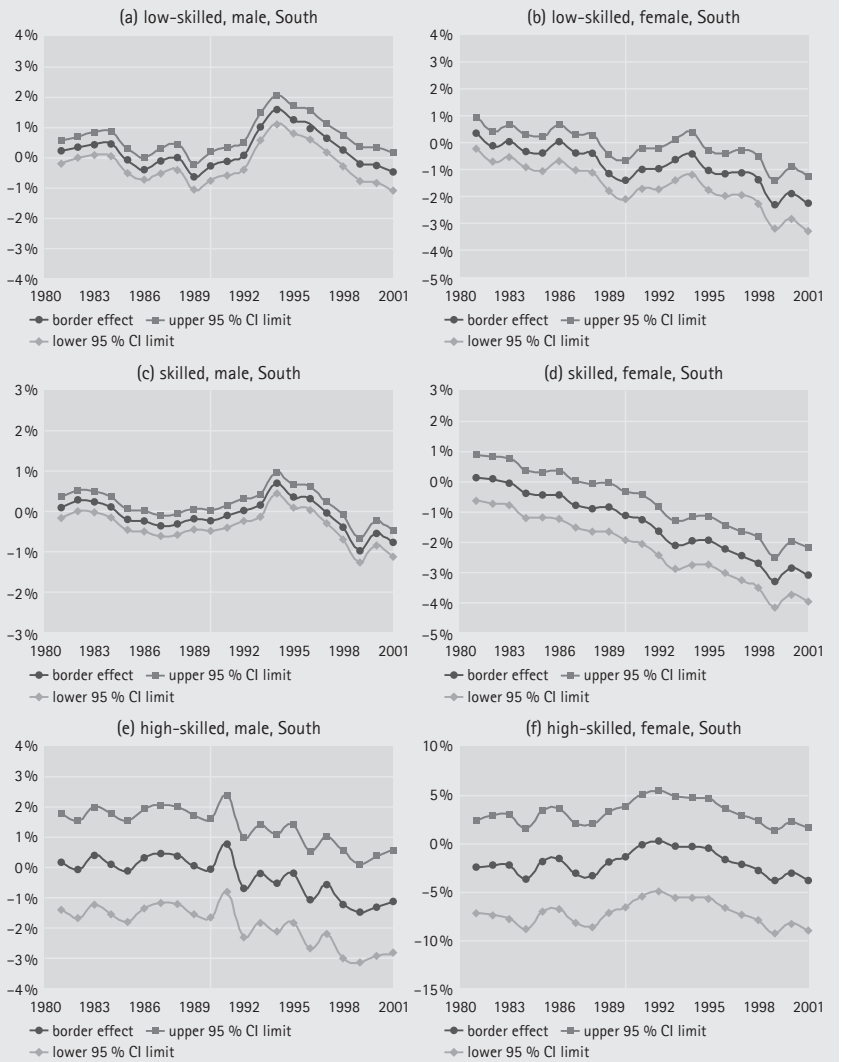
Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.
Notes: In the case of censoring, wages are calculated in the framework of an imputation procedure using the Tobit estimation method; regression with heteroskedasticity-robust standard errors; */**/*** significant at the 10/5/1 percent level; N: number of observations, n: number of individuals; R^2 within.

Table A 3.2: Basic wage differential for German employees in fixed effects estimations in the northeastern Bavarian border region

	BORREG (low-skilled)		BORREG (skilled)		BORREG (high-skilled)	
sex	Coef. τ	Std. Err.	Coef. τ	Std. Err.	Coef. τ	Std. Err.
male	–0.0697***	0.0191	–0.0156	0.0115	–0.0566	0.0417
	N = 810,398 n = 129,645	R^2 = 0.7624	N = 3,036,192 n = 350,090	R^2 = 0.7627	N = 190,724 n = 31,997	R^2 = 0.5824
female	0.0321	0.0470	0.0139	0.0229	–0.1082	0.1297
	N = 731,382 n = 114,928	R^2 = 0.6540	N = 1,154,173 n = 190,594	R^2 = 0.5953	N = 34,995 n = 9,001	R^2 = 0.5157

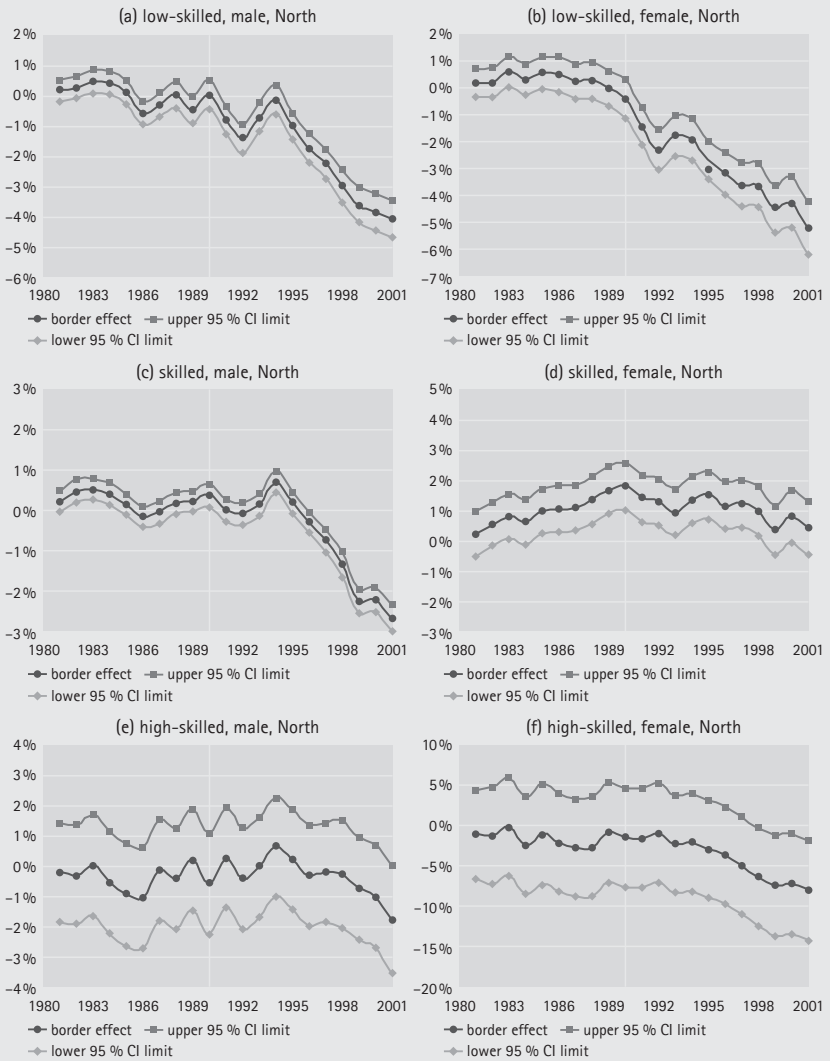
Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.
Notes: In the case of censoring, wages are calculated in the framework of an imputation procedure using the Tobit estimation method; regression with heteroskedasticity-robust standard errors; */**/*** significant at the 10/5/1 percent level; N: number of observations, n: number of individuals; R^2 within.

Figure A 3.2: Fixed effects estimations: wage effect in southeastern Bavarian border region (as %, 1981–2001)



Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.

Figure A 3.3: Fixed effects estimations: wage effect in northeastern Bavarian border region (as %, 1981–2001)



Source: Author's own calculations using the weakly anonymous version of the IABS and BeH extract.

4 Labour Market Effects in the Czech Border Region

4.1 Introduction

Of course, the fall of the Iron Curtain had an effect not only on Western European labour markets, but also on the transition countries. The employees in the Central and Eastern European Countries (CEEC) had to undergo deep changes during the first years on the way from plan to market. Not only did the formerly dependable delivery areas of the COMECON break away, but many state-owned enterprises were also not ready for competition. In the years after the opening of the border, trade impediments vanished and, just as crucial, the transition countries opened their markets for foreign capital. Apart from other motives like developing new markets, foreign direct investment (FDI) also occurs in order to relocate production activities to low-wage countries, also referred to as international outsourcing. Concerning the evaluation in the literature Egger/Egger (2002: 83) critically note that "... the theoretical analysis and empirical assessment ... of international outsourcing is rather new and at least concerning its implications for developing countries it seems to be still in its infancy."[22] Obviously, investigating integration effects in former Eastern Bloc countries is quite different from analysing Western European countries. Until the fall of the Communist regimes a real labour "market" did not exist, i.e. unemployment was basically hidden and education-related wage differentials were extremely low (Münich et al. 2005). Moreover, in contrast to the research on the German labour market, I am not able to approach spatial differences on the Czech labour market by stressing the "natural experiment" situation before and after the introduction of free trade and capital mobility due to the lack of suitable data. Datasets containing appropriate regional information only provide data from the beginning of the 1990s onwards.

However, it is exceedingly interesting to discover whether the Czech border region close to the Western European high-wage countries benefits from its geographical position during the increasing integration of markets. It is important to notice that even without transnational free labour mobility (which will probably be restricted for Czech workers until 2011), trade and international outsourcing of production activities can lead to shifts in the labour demand and wage structure regarding different skill groups. According to my hypothesis, these integration effects should be stronger in border regions. Using two data sources, I investigate whether free trade with Western European countries led to special effects on the labour market in the districts neighbouring Bavaria and Austria.

22 See also Pusterla/Resmini (2007: 839): "The Central and Eastern Europe region has been only marginally considered in the empirical literature on firm location choice."

The existing literature does not provide clear-cut results. Regarding the theoretical assessment about the impact of capital mobility on labour markets in developing and transition countries, the Feenstra-Hanson two-country model (1996a) suggests that in CEEC regions close to EU15 countries labour demand and wages should increase at an above-average rate for more highly skilled employees. Assuming that the rental on capital is lower in the industrial country, capital will move to the transition country. Consequently, the transition country specialises in an expanded range of activities, while the industrialised country specialises in a contracted range of activities. The production activities which are outsourced from the industrialised country use skilled labour less intensively than the activities which are still carried out at home. Thus, the relative demand for unskilled labour drops in the industrialised country, while the relative demand for skilled labour rises. In the transition country, the relocated activities use relatively more skilled labour than was used hitherto, leading to a growing demand for skilled labour there too. This effect is assumed to be stronger in border areas. Feenstra/Hanson (1997) find evidence that this was the case in Mexican border regions after trade liberalisation in the 1980s, when U.S. firms went offshore to the "maquiladoras". However, in recent studies the implications of the Feenstra-Hanson model are contradicted by results for the 1990s, according to which returns to human capital in the Mexican border region were actually decreasing compared to other regions (Airola/Juhn 2005; Chiquiar 2008). Interestingly, these studies refer to traditional trade theory and Stolper-Samuelson effects.

In contrast to international trade models, New Economic Geography (NEG) models try to predict the spatial consequences of international integration caused by different regional effects on the market potential within a country. The model of Brülhart et al. (2004) explicitly differentiates between an interior and a border region. Generally, the issue of reduced centripetal and centrifugal forces is addressed. If the effect of decreasing trade costs on centrifugal forces is stronger, the probability that production activities will concentrate in the border region rises (unless the border region is – in terms of, for instance, the employment share – relatively small prior to integration). Basically, NEG models do not distinguish between different skill groups. Thus, all employees in the border region should either benefit from integration or lose out, regardless of their education. However, Brülhart et al. implicitly account for comparative advantages and skill differences between countries, claiming that above all the border region will attract industries where direct import competition is unlikely to be strong. Though the model in the first instance refers to EU15 countries facing labour market effects of the EU enlargement, it can also be applied to accession countries. Some studies show results indicating that the accession of the CEEC only leads to a

small rise in welfare or the market potential of EU15 regions (Bröcker 1998; Niebuhr 2008). By contrast, for the new EU member states the simulated additional market potential is substantial (Huber et al. 2006). Thus, due to the reduction in transaction costs, CEEC border regions close to EU15 countries should become preferred location sites.

Summarising the theoretical background considerations, the ongoing integration process between Germany and the Czech Republic should lead to changes on the Czech labour market which are assumed to be more noticeable in the borderland. Based on trade and NEG models, industries which have comparative advantages in the Czech Republic should gain above-average importance in the districts near Bavaria and the Czech Republic. While an increasing relative labour demand for more highly skilled employees in the border region can be derived from the Feenstra-Hanson model, the Brülhart et al. model predicts a relative rise in the borderland especially in the labour demand for lower skilled workers, since import competition from Western European countries is relatively unimportant.

This chapter is organised as follows: Data and basic definitions are described in section 4.2. Section 4.3 contains descriptive evidence of some labour market indicators in the Czech border region compared to the development at national level. Section 4.4 analyses qualification trends using an econometric model. Section 4.5 also introduces an econometric model to test the theoretical predictions on spatial wage differentials and presents the results. Section 4.6 concludes.

4.2 Data and Basic Definitions

Concerning useful datasets for the Czech Republic with respect to my research question there are few options. The data have to embrace an adequate time period and regional information must be available. Moreover, in order to apply similar analyses to those in the Bavarian case, I need individual data containing relevant variables on individual characteristics.

Regarding the territorial structure of the Czech Republic, the following levels, corresponding to EU statistics, can be distinguished (Hanousek/Münich 2000; Turnovec 2001):

- The local level (NUTS 5 level): 6,196 independent rural and urban municipalities which are enforced by law to act in their own name in juridical relations and bear full responsibility for their activities.
- The lower intermediate level (NUTS 4 level): 77 districts (*okresy*) – on average about 130,000 inhabitants and 1,000 square kilometres in size – whose administrators are appointed by and responsible to the government in Prague, i.e. they do not play a role with respect to self-administration. Regarding their size

they can be compared to the Bavarian rural districts (*Landkreise*). However, this analogy is not valid concerning their authority to decide.

- In 1997, 14 regions (*kraje*) were formally established as the so-called upper intermediate and NUTS 3 level. They have been self-governing since the elections for regional parliaments in November 2000. However, the competences of these regions are basically restricted to school and street administration and some excise taxes.
- From January 1, 2000 eight regions were formally established for the purposes of European statistics (NUTS 2 level). The 14 NUTS 3 level regions are integrated in these eight regions, i.e. one NUTS 2 level region consists of one or two NUTS 3 level regions.

By now, several sets of statistics exist containing information about the Czech labour market, for instance in the framework of the quarterly Labour Force Survey (LFS) and the International Social Survey Program (ISSP). However, most datasets do not provide information for the early and mid 1990s and/or comprise data only at NUTS 2 level. Besides this, there are some statistics on average wages at NUTS 3 level. The only data source which meets all criteria regarding my research issue is the Czech Microcensus, from which I therefore use the data. In order to check whether the results are reasonable, I additionally apply aggregated district data on unemployment.

The data of the Czech Microcensus have been collected by the Czech Statistical Office for the years 1992, 1996 and 2002. The dataset consists of a household census and a census on individuals and focuses on household incomes. Wages are available, for instance, in the form of the annual gross and net wage for the regular occupation. Unfortunately, the gross wage is not available in 1992 and the variable "net wage" has a lot of missing data in 2002. The data provide information on demographic characteristics, e.g. age, education, marital status, economic status, occupation and place of residence at NUTS 4 level (77 districts). Regarding the occupational status, the individuals are ordered by the International Standard Classification of Occupations (ISCO). This schedule was composed by the International Labour Organization (ILO) according to a person's duties and responsibilities in order to make statistics comparable at the international level. The current version ISCO-88 distinguishes between ten major groups, from which I exclude the group of the armed forces for the purposes of my analyses. For the years 1996 and 2002 there is an additional variable with information on industries which classifies the economic activity of the individuals according to the Nomenclature of Economic Activities (NACE). From the original 17 industries (ordered from A to Q) I exclude industries P (private households with employed persons) and Q (extra-territorial organisations and bodies), since there are too few observations on these categories in the dataset. Besides

this, I combine industries A (agriculture, hunting and forestry) and B (fishing), i.e. I eventually differentiate between 14 industries. Investigating the shifts in the decade between 1992 and 2002 I restrict the analysis to full-time workers in dependent employment. In focusing on earnings from full-time jobs, only a small segment of the Czech labour market will be neglected, because most Czech males and – compared to other EU countries – an extraordinarily large proportion of females work full-time. In order to represent the total population, weights are used in all calculations. Table 4.1 shows the sample size for the different years.

Table 4.1: Sample size of the Czech Microcensus in 1992, 1996 and 2002

year	sample	N	full-time employees
1992	0.5 %	43,573	12,964 (29.8 %)
1996	1 %	64,492	19,522 (30.3 %)
2002	0.25 %	19,002	4,880 (25.7 %)

Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.
Notes: Sample: percentage of total population; N: number of observations.

As a second data source, I use quarterly unemployment data from 1992 to 2006, which are also made available by the district labour exchanges at NUTS 4 level. This dataset covers the absolute number of registered unemployed in each of the 77 districts. In addition, the figures are split up according to age, sex and education and provide information on those receiving benefits and taking part in retraining programmes.

Since the classification of the educational structure coincides in both datasets, I am able to use the same grouping for employed and unemployed people. I distinguish between the following four skill groups, which are listed in Table 4.2:

Table 4.2: Classification of Czech skill groups

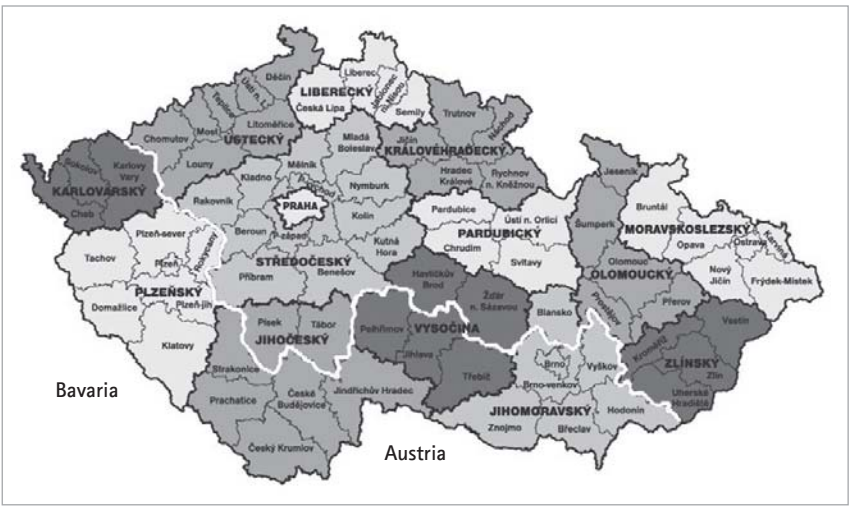
unskilled	people with at most primary education
low-skilled	people with (lower) secondary (technical) education without a certificate of upper secondary education (*without maturita*)
medium-skilled	people with professional, general or special secondary higher (technical) education with a certificate of upper secondary education (*maturita*)
high-skilled	people holding a Bachelor's, university or Ph.D. degree

In order to evaluate spatial effects of the integration of the Czech economy with Western Europe, I generate a border region dummy which equals 1 if the districts are close to Bavaria and/or Austria and 0 otherwise. Thus, the term "border region"

is used in this study as a synonym for the Czech districts close to Bavaria and/or Austria. According to my definition, the districts neighbouring eastern Germany do not fall into the "border region" category, since the conditions of economic integration there are quite different from the case of Bavaria and Austria. Likewise, in the framework of my analysis the districts near Slovakia and Poland are part of the non-border (also called interior) region, i.e. the rest of the country.

In my definition a district belongs to the border region if the next international border crossing shared with Bavaria or Austria is reachable within 60 minutes by car at most. Therefore, I calculate the required driving time by means of an Internet route planner. Table A 4.1 in the appendix contains the distances (in minutes) between the capital city of each of the 77 districts and the next international border crossing. According to these figures the Czech borderland consists of the western and southern parts of Bohemia and the southern parts of Moravia, altogether 24 out of 77 NUTS 4 districts (see also Figure 4.1). Regarding population density, the distribution in the border and non-border region is fairly balanced: the non-border region includes the capital city of Prague as well as the third, fifth and sixth largest cities in the country (Ostrava, Olomouc, Liberec), while the second, fourth and the seventh largest cities (Brno, Plzeň [Pilsen], České Budějovice [Budweis]) belong to the border region. On the other hand, both areas of observation contain relatively sparsely populated districts like the Bohemian Forest and some districts close to Poland.

Figure 4.1: Czech NUTS 3 and NUTS 4 regions



Source: Czech Statistical Office (http://www.czso.cz/lexikon/mos.nsf/index; accessed August 31, 2009).
Border region districts: České Budějovice, Český Krumlov, Jindřichův Hradec, Prachatice, Strakonice, Domažlice, Klatovy, Plzeň-město, Plzeň-jih, Plzeň-sever, Rokycany, Tachov, Cheb, Karlovy Vary, Sokolov, Jihlava, Pelhřimov, Třebíč, Brno-město, Brno-venkov, Břeclav, Hodonín, Vyškov, Znojmo.

4.3 The Labour Market in the Czech Republic: Some Descriptive Evidence

Undoubtedly, the early transition years in the Czech Republic can be denoted as a successful period from an economic point of view. Due to the privatisation process, i.e. the selling of shares of former state-owned enterprises to the common people using so-called vouchers, the country achieved promising results. After the separation of the Slovak Republic the Czech Republic was seen as a model transition country and belonged to the first group of CEEC candidates concerning EU enlargement in the early 1990s. However, problems emerged in 1997 when it came to the privatisation of large state-owned enterprises and banks. What followed was a period of disillusionment characterised by a shrinking economy and growing unemployment which lasted until 2000. Since then, the Czech economy has gathered momentum again. The European integration process has been accelerating, reaching a first highlight in the accession of the Czech Republic together with nine other candidate countries to the EU on May 1, 2004.

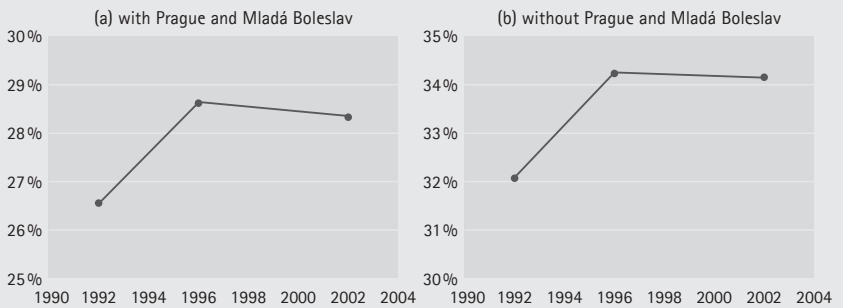
Regarding regional aspects, the Czech economy is affected by the outstanding role of the capital city of Prague. Regional disparities are strong: on the one hand there is booming Prague, the prosperous districts around the capital and some relatively well-off districts and large cities, most of them in the south and west of the country, where the industrial structure is relatively diversified and the share of the service sector is high; and on the other hand, there are the laggard districts which have been dependent on monostructural activities for decades, e.g. the coal mining regions in northern Bohemia and Moravia, where unemployment rates exceed the 20 percent level at times. Moreover, things are getting worse due to the lack of ambitions of the unemployed to move to places where they could find employment (Fidrmuc 2004). Another factor, to which my research topic refers, is the geographical position of a district. Locations close to the Western European markets are in a favourable situation compared to the areas close to Poland and the Slovak Republic, where purchasing power beyond the border is far lower. Otherwise, the districts close to Germany and Austria face a higher risk of "brain drain" due to the reduced distance, i.e. outward commuters could increase the lack of qualified personnel in these areas.

4.3.1 Relative Employment Share and Structural Change

In order to gain a prima facie impression of the Czech border region, I first calculate some basic figures contrasting the border districts with the non-border districts (Figure 4.2). The share of full-time workers who are employed in the border region

indicates the relative importance of the border districts as an economic location. In 1992, 26.5 % of all fully employed people worked in the border region (Figure 4.2a). This proportion increased to 28.6 % in 1996 and then slightly declined to 28.3 % in 2002. This means that in the early transition years the districts near Bavaria and Austria gained in attractiveness as locations for employers and employees. From 1996 to 2002 the non-border districts including Prague recaptured three tenths of a percentage point of relative employment. Since the outstanding importance of Prague and Mladá Boleslav[23] possibly distorts the outcome, I also calculate the border region share without these districts (Figure 4.2b). In this case the proportion of employees working in the border region is naturally far higher. However, the conclusion does not change. Starting from an employment share in the border region of 32.1 % in 1992, the proportion rose to 34.3 % in 1996 and fell again to 34.1 % in 2002, signifying the stabilisation of the regional employment share.

Figure 4.2: Share of full-time employees working in the Czech border region: (a) including Prague and Mladá Boleslav, (b) without Prague and Mladá Boleslav (as %)



Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.

Similar to the investigation with the German data, I also inspect the Czech Microcensus with respect to the structural change and specialisation in the border and non-border region. Of course, since I only have two points in time containing information about industries I do not observe a structural change indicator over time using this variable. However, I can alternatively analyse the changes using the differences in the distribution of occupations. First, I take a look at the relative shares of occupational and industrial sectors. Due to the predictions of the models of Feenstra/Hanson and Brülhart et al., free trade and international outsourcing should lead to spatial effects regarding the distribution of economic activities within a country. The border region particularly should attract economic activities

23 The automotive manufacturer Škoda Auto a.s. has its main production location in Mladá Boleslav, employing around 20,000 staff members.

in industries which have comparative advantages over the foreign country (Barjak/Heimpold 2000b), i.e. Germany and Austria. The two theoretical strands point in the same direction: while the Feenstra-Hanson model refers to offshore activities conducted outside the high-wage country, the NEG model suggests a relative increase in sectors where import competition from Germany and Austria is supposed to be relatively low. In any case, the predicted effects should be reflected in the descriptive figures and in indicators displaying structural change and specialisation.

Table 4.3: Employment shares of occupations in the Czech non-border and border region (as %)

	ISCO-88 major groups	non-border region			border region		
		1992	1996	2002	1992	1996	2002
1	Legislators, senior officials and managers	3.45	2.95	3.57	2.74	2.36	3.87
2	Professionals	7.13	5.87	7.77	7.04	5.22	9.76
3	Technicians and associate professionals	20.44	19.74	24.89	20.17	19.20	24.84
4	Clerks	10.47	12.78	13.74	10.51	14.32	6.94
5	Service workers, shop & market sales workers	10.20	10.44	13.35	9.95	10.21	12.98
6	Skilled agricultural and fishery workers	1.29	1.52	1.07	2.26	2.15	1.61
7	Craft and related workers	25.95	26.08	19.48	26.12	27.25	21.94
8	Plant and machine operators, assemblers	12.14	11.83	9.86	11.18	11.53	13.06
9	Elementary occupations	8.94	8.79	6.26	10.03	7.75	5.00
	Total	100	100	100	100	100	100

Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.

Concerning occupations, Table 4.3 shows the employment shares of the nine ISCO major groups in the three years of observation divided into the border region and the rest of the country. Not surprisingly, as the Czech proficiency with respect to engineering and manufacturing is well-known, technicians and craft workers (major groups 3 and 7) constitute the bulk of the workforce, followed by clerks, service workers and plant and machine operators (major groups 4, 5 and 8). As the ISCO corresponds to the International Standard Classification of Education (ISCED), it pays off to analyse the shifts in this context, too. Elementary occupations (major group 9) are defined as the lowest skill level. Major groups 4–8 are considered to be at the second level, major group 3 forms the third level and major group 2 the highest level. There is no skill reference for major group 1, since this group embraces significant skill differences.

Obviously there are no outstanding differences between the districts near Bavaria and Austria and the rest of the Czech Republic. From 1992 until 2002 major

groups 1–5 exhibit increasing employment shares in both the non-border and border region (with one exception), while the shares fell for major groups 6–9 in both objects of investigation (with one exception). This indicates a general professional skill upgrading, which, interestingly, happened not from 1992 until 1996 but from 1996 until 2002. The employment shares remained relatively stable in the early transition years, but after the recession years, the occupations which correspond to higher skill levels recorded higher values. Possibly, employment relationships were relatively stable in the upswing years, but the years from 1997 onwards brought a lot of restructuring. I will get back to this point below. Another striking figure is the severely decreasing share of clerks in the border region from 1996 until 2002. This is apparently closely related to the advancement of Prague as a financial centre. If Prague is excluded from the dataset, the share of clerks in the non-border region falls from 1996 until 2002. Besides, the share of plant and machine operators and assemblers (major group 8) rose in the border region in contrast to the rest of the country. The increase in this occupation group is potentially connected with some cross-border relations in industries which are also important at least in the Bavarian borderlands.[24]

In Table 4.4 the shares of 14 industries subject to the NACE classification are recorded for border and non-border districts. Though this variable is not available in 1992, it is nevertheless interesting to investigate the shifts between 1996 and 2002, since this period embraces the years of recession and, as the figures for occupations have shown, a lot of changes happened during this period of time. First of all – as in the case of occupations – the relative figures for the border and non-border region are very similar. As is also common in transition countries, most industries in the primary and secondary sector became less important in relation, while the shares of the service industries in the tertiary sector increased.

The sign of the change is identical in the non-border and border region in 11 of the 14 industries, which indicates that the structural change proceeded in the same direction. Only in the industries E (electricity, gas and water supply), G (wholesale and retail trade etc.) and N (health and social work) did the share in the non-border region rise, but declined in the border region. The only really outstanding change is the relative shrinking of the largest industry, which comprises all sorts of manufacturing. This industry decreased by about 8 percentage points in the non-border districts, but only marginally in the border districts. Possibly – as mentioned above – the dominant position of manufacturing in the border region is maintained due to trade relations of large manufacturing locations such as Pilsen, for instance, which is closely affiliated with the Bavarian industry.

24 Regarding the shares of clerks and plant and machine operators & assemblers the differences between the borderland and the non-border region in 2002 are statistically significant.

Table 4.4: Employment shares of industries in the Czech non-border and border region (as %)

	NACE industries	non-border region		border region	
		1996	2002	1996	2002
AB	Agriculture, hunting and forestry & fishing	4.51	3.65	6.37	5.16
C	Mining and quarrying	3.53	1.18	1.31	0.65
D	Manufacturing	35.16	27.20	32.94	32.18
E	Electricity, gas and water supply	2.32	2.55	2.63	2.34
F	Construction	8.42	7.31	9.75	7.26
G	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	10.21	11.62	9.32	8.71
H	Hotels and restaurants	2.12	3.46	2.56	2.66
I	Transport, storage and communication	7.37	8.16	7.37	8.23
J	Financial intermediation	2.34	3.21	1.68	1.69
K	Real estate, renting and business activities	2.85	3.52	2.86	4.35
L	Public administration and defence; compulsory social security	6.55	8.96	6.92	8.79
M	Education	5.72	7.14	6.32	7.74
N	Health and social work	5.28	6.73	6.70	6.61
O	Other community, social and personal service activities	3.63	5.30	3.26	3.63
	Total	100	100	100	100

Source: Author's own calculations from Czech Microcensus 1996, 2002.

Table 4.5 comprises the values for an indicator of structural change (ISC) and the Krugman specialisation index (KSI). The indicator of structural change measures the absolute deviations of the employment shares of occupations or industries in year *t+1* ($a_{i,t+1}$) from the figures in year *t* ($a_{i,t}$). Adding up all absolute deviations and dividing by 2, the ISC equals 0 if the shares in *t+1* are identical to the shares in *t* and equals 1 if the structure in *t+1* deviates maximally from the structure in *t* (formula 4.1).

$$ISC_{t,t+1} = \frac{1}{2}\sum_{i=1}^{N} \left| a_{i,t+1} - a_{i,t} \right| \qquad (4.1)$$

The values for the occupational structure are higher in the border region for both time periods, which can potentially be traced back to the smaller number of observations in this area. The ISC for the industrial structure, which can only be calculated once, however, has a higher value for the non-border region, probably caused by the high decrease in manufacturing.

The KSI is defined as the sum of the absolute deviations of the employment shares in the border region ($a_{i,t,\,border}$) from the employment shares in the rest of the country ($a_{i,t,\,non\text{-}border}$) for all occupations or industries in year *t*. Divided by 2, the index equals 0 if the employment shares in the two areas are identical and equals 1 if the structure in the border region deviates maximally from the structure in the non-border region (formula 4.2).

$$KSI_t = \frac{1}{2} \sum_{i=1}^{N} \left| a_{i,\,t,\,border} - a_{i,\,t,\,non\text{-}border} \right| \qquad (4.2)$$

Regarding both occupations and industries, the KSI exhibits increasing values, i.e. the specialisation of the border region grew over the years. Including the data from Tables 4.3 and 4.4, this development can be explained by a higher persistence of manufacturing occupations (e.g. major group 8 in Table 4.3) and industries (Table 4.4) in the border region, while the change towards the tertiary sector is stronger in the non-border region. Moreover, the results of both indices (ISC and KSI) corroborate the impression that in the uneasy years from 1996 onwards the economy underwent more profound change than in the four years before.

Table 4.5: Indicator of structural change and Krugman specialisation index for occupations and industries in the Czech Republic

		1992/1996	1996/2002
Indicator of structural change (occupations)	non-border	0.029	0.056
	border	0.115	0.160
Indicator of structural change (industries)	non-border		0.123
	border		0.061
	1992	1996	2002
KSI (occupations)	0.023	0.033	0.085
KSI (industries)		0.063	0.080

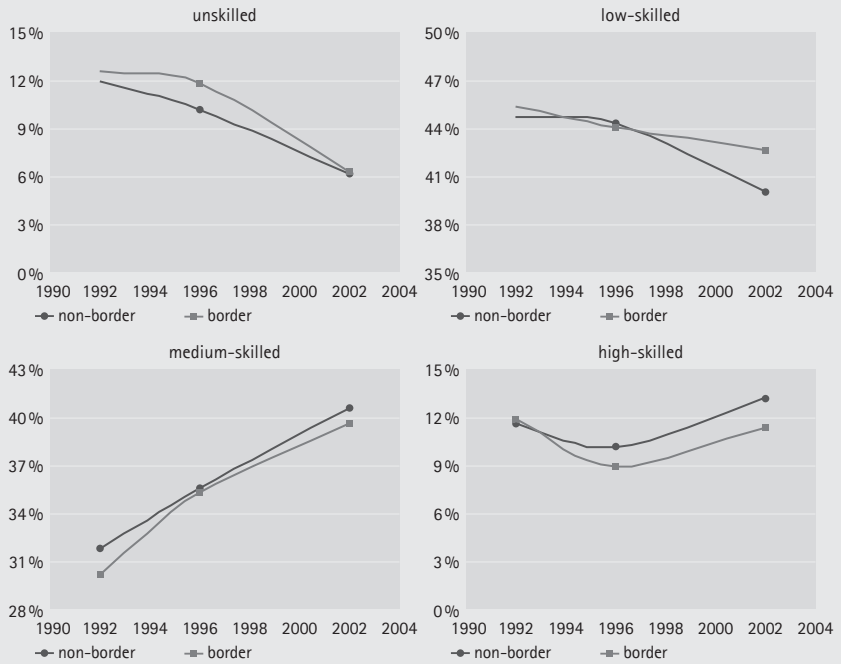
Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.

4.3.2 Skill Structure of Employed People

Regarding the distribution of skills, I investigate whether there is a different development in the skill structure between border and non-border districts. While the predictions of the two models were consistent in the previous subsection, they are not so with respect to the skill structure of the labour demand: according to Feenstra/Hanson the activities which are shifted to the foreign low-wage country should lead to a skill upgrading process, since these production steps are relatively skill-intensive there. If distance matters, border regions will be particularly affected

and the demand for more highly skilled labour is assumed to increase at an above-average rate in the districts near Bavaria and Austria. In contrast, on the basis of the NEG model unskilled and low-skilled labour especially should have comparative advantages in the borderland, as import competition from beyond the frontier is relatively low for activities requiring less human capital in relation.

Figure 4.3: Shares of skill groups of full-time workers comparing the Czech border region to the rest of the country (as %)



Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.

The descriptive figures are contained in Figure 4.3. The share of unskilled employees generally decreases from about 12 % in 1992 to about 6 % in 2002, in both the border and non-border districts. Only in 1996 are unskilled workers slightly overrepresented in the districts close to Bavaria and Austria. Regarding low-skilled workers, the share remains fairly stable from 1992 to 1996, oscillating around 45 % in both regions under review. However, in 2002 it then declines to 42.7 % in the border districts and to 40.1 % in the non-border districts. While the fraction of medium-skilled employees shifts in parallel from about 30 % in 1992 to 40 % in 2002, the proportion of high-skilled workers initially falls between 1992 and 1996, but then rises to 13.2 % in the non-border region and 11.4 % in the border region. Altogether, unskilled and low-skilled workers are slightly overrepresented in the

border districts at the end of the observation period, but there is no fundamental difference identifiable in the development of skill group shares. Disregarding the decreasing share of high-skilled workers from 1992 until 1996, the figures show evidence of a skill upgrading process in the Czech Republic which is in line with the relative changes in the ISCO major groups (see chapter 4.3.1). The share of unskilled and low-skilled workers declines over time, while the share of more highly skilled employees rises.

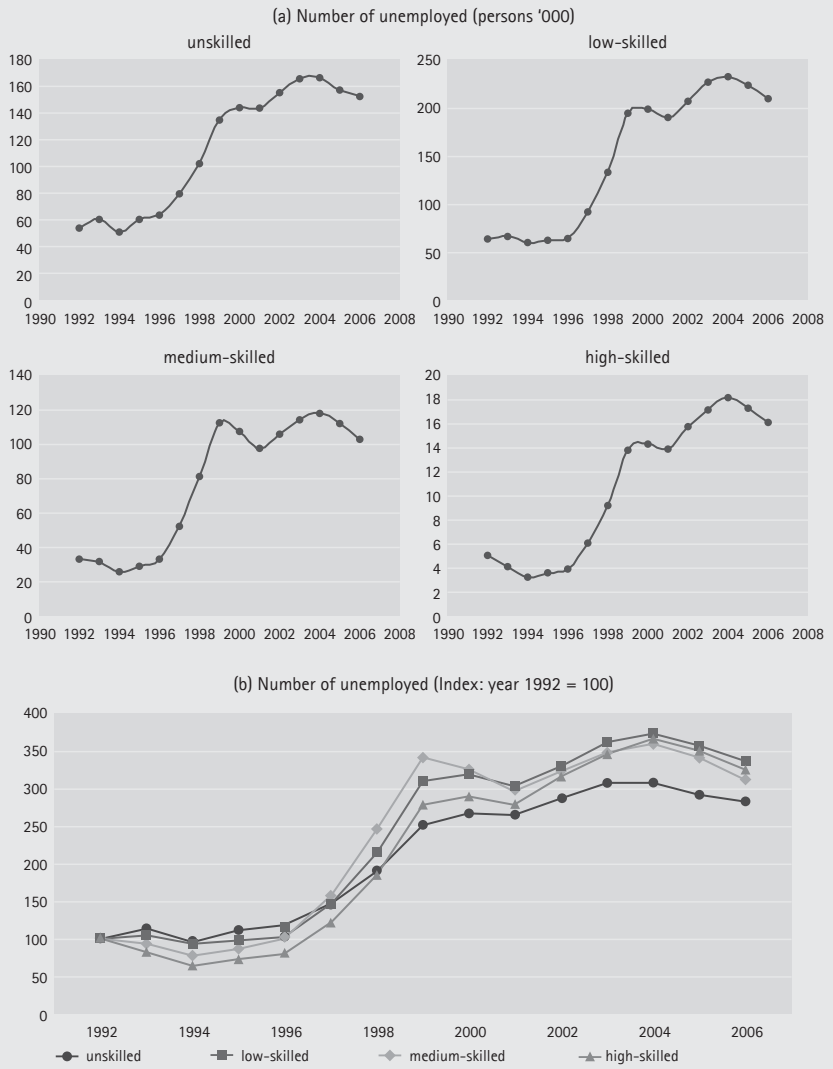
4.3.3 Skill Structure of Unemployed People

Using quarterly unemployment data provided by the district labour exchanges, I take a similar look at the shares of unemployed people in order to investigate whether the distribution of skill groups in the two areas of observation exhibits fundamental differences compared to the figures for employed workers in chapter 4.3.2. The absolute numbers show the tremendous growth in unemployment across all skill groups in the late 1990s recession years (Figure 4.4). The number of unskilled unemployed increased from less than 60,000 at the beginning of the 1990s to more than 160,000 ten years later. The number of low-skilled unemployed, which was also about 60,000 in 1992, even rose to nearly a quarter of a million in the first years of the new century. The groups of medium-skilled and high-skilled unemployed quadrupled from approximately 30,000 to nearly 120,000 and from under 5,000 to almost 20,000 respectively.

Interestingly, the development of the shares of the different skill groups in unemployment prima facie seems quite surprising (Figure 4.5). The share of unskilled people out of the total unemployment share declines – after a rise in the early 1990s – from nearly 40 % to 30 %. Equivalently, the fractions of the other three skill groups increased in the recession years. While the proportion of medium-skilled unemployed fell after 1998, the share of low-skilled and high-skilled unemployed grew moderately. Taking into account the economic transformation process in the Czech Republic, the figures are quite plausible. Before 1997, unemployment was rather an exception. The recession affected a much larger spectrum of the labour force across education groups and the growing denominator (growing faster than the number of unskilled unemployed) led to a lower share of unskilled workers. The pool of unskilled workers is limited and given that many members of this skill group were already unemployed before 1997, the proportion of unskilled unemployed could not grow so fast. In other words, unemployment became an issue of the "masses", as was common in other EU countries. After the recession years, the proportion of unskilled people increases again compared to the total number of unemployed. Comparing the border region to the non-border districts, the fraction of unskilled and low-skilled unemployed in the

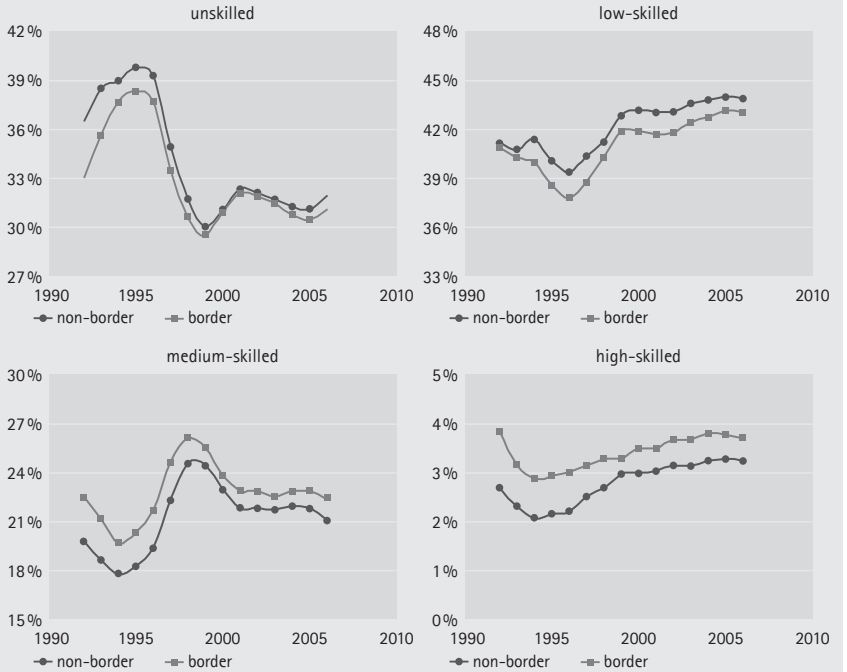
border districts remains slightly below the level for the rest of the country, while the opposite applies for the medium- and high-skilled unemployed. Bearing in mind the figures for employees (see chapter 4.3.2), the results could indicate a slightly higher labour demand for more highly skilled workers in the non-border region. This is quite clear intuitively, since Prague belongs to the non-border region and possibly absorbs qualified personnel from other parts of the country. In the econometric part of this chapter I will control for this and other factors.

Figure 4.4: Number of unemployed in the different skill groups



Source: Author's own calculations from quarterly unemployment data of Czech district labour exchanges (1/1992–2/2006).

Figure 4.5: Relative shares of skill groups of unemployed people comparing the Czech border region to the rest of the country (as %)



Source: Author's own calculations from quarterly unemployment data of Czech district labour exchanges (1/1992–2/2006).

4.3.4 Wage Differentials between Border and Non-Border Region

Differences in the labour demand are assumed to be also reflected in the development of wages. As mentioned in the previous subsections, relative labour demand and thus relative wages should rise for more highly skilled employees in the border region compared to non-border districts if the Feenstra-Hanson trade effects play a dominant role. In contrast, according to the model of Brülhart et al., unskilled and low-skilled workers are particularly supposed to benefit in the borderlands due to the higher market potential and relatively low import competition.

Regarding wage differentials between the Czech border and non-border region at the descriptive level, I use the gross wages available from the Microcensus in 1996 and 2002 and contrast the figures for the two areas. Table 4.6 shows that annual nominal gross wages substantially increased in the observation period for all three calculated deciles and region types with growth rates from about 32 to 62 percent. In general, border region workers earn less than

their peers in the non-border region. In 1996, the wage gap between non-border and border districts monotonically widens for all skill groups with the decile considered. The relative wage gap in the groups of medium- and high-skilled workers is larger (from about 3 to 11 percent), while the only decile in which border region employees are ahead is the second decile for low-skilled workers. In 2002 the wage differential widens for three skill groups in all deciles. However, concerning unskilled employees the picture is completely different. All deciles of this skill group are higher in the border region with a maximum difference of 15.1 % for D5. The differences between the years of observation are shown in Figure 4.6.

Regarding wage differentials between different skill groups, I calculate the skill premium for low-, medium- and high-skilled workers compared to unskilled employees (Table 4.7). In most cases the wage differentials are higher at the top of the distribution. With the exception of low-skilled workers in 1996 the skill premium is higher in the non-border region. Bearing in mind the previous results it is not surprising that the wage gap concerning unskilled employees decreases considerably in the border region in 2002. Figure 4.7 shows the size and development of the skill premium for low- and medium-skilled employees relative to unskilled workers in the border region (horizontal axis) and the non-border region (vertical axis). Using the same scale for both regions the 45° line represents points where the skill premia are equal in the border and non-border region. In 1996 all values are relatively close to the 45° line, so that it can be concluded that the border region differs only marginally from the non-border region. The arrows in the figure indicate the changes between 1996 and 2002. In 2002 all points are above the 45° line, representing a higher skill premium in the non-border region. All arrows point north-west, i.e. the skill premium shrinks in the districts close to Western Germany and Austria, while it increases in the districts relatively distant from the border.[25]

Summarising the results for the descriptive wage differentials, I conclude that the border districts suffered relative wage losses in three out of four skill groups. Interestingly, in the group of unskilled workers the development differs substantially. However, the informative value of these figures is restricted, since the non-border region, for example, contains Prague and Mladá Boleslav, featuring special developments which I have to control for in the econometric analysis.

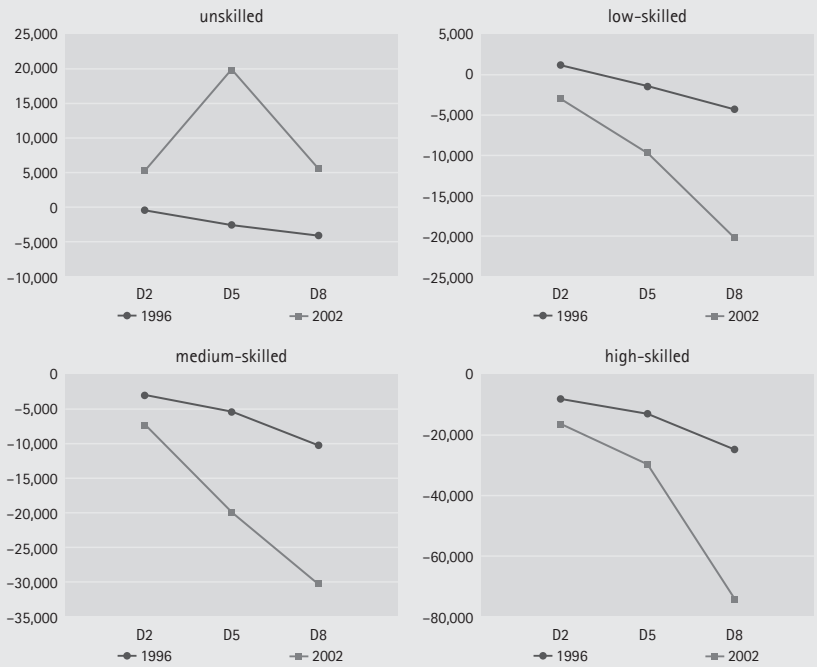
25 For reasons of clarity I do not map the wage premia of high-skilled workers, which are in line with the results for low- and medium-skilled workers and do not change the general findings.

Table 4.6: Gross wages in the Czech border and the non-border region (in Kč)

	unskilled			low-skilled		
1996	D2	D5	D8	D2	D5	D8
border	62,200	82,150	109,000	76,200	101,700	132,300
non-border	62,800	84,700	113,100	75,000	103,300	136,800
difference (as %)	–1.0	–3.1	–3.8	1.6	–1.6	–3.4
2002	D2	D5	D8	D2	D5	D8
border	96,000	132,000	166,752	106,318	138,958	180,762
non-border	90,654	112,042	161,307	109,533	148,708	200,984
difference (as %)	5.6	15.1	3.3	–3.0	–7.0	–11.2
	Change 2002/1996					
border	54.3	60.7	53.0	39.5	36.6	36.6
non-border	44.4	32.3	42.6	46.0	44.0	46.9
	medium-skilled			**high-skilled**		
1996	D2	D5	D8	D2	D5	D8
border	87,500	115,600	156,200	123,900	164,500	230,600
non-border	90,600	121,200	166,500	132,300	177,800	255,600
difference (as %)	–3.5	–4.8	–6.6	–6.8	–8.1	–10.8
2002	D2	D5	D8	D2	D5	D8
border	129,536	168,673	229,567	170,352	221,119	340,824
non-border	136,920	188,804	260,000	187,071	250,757	415,152
difference (as %)	–5.7	–11.9	–13.3	–9.8	–13.4	–21.8
	Change 2002/1996					
border	48.0	45.9	47.0	37.5	34.4	47.8
non-border	51.1	55.8	56.2	41.4	41.0	62.4

Source: Author's own calculations from Czech Microcensus 1996, 2002.

Figure 4.6: Wage differential between Czech border and non-border region (in Kč)



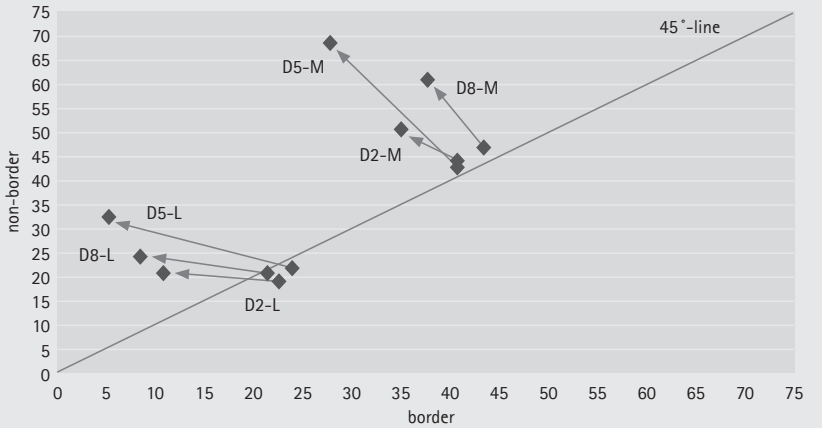
Source: Author's own calculations from Czech Microcensus 1996, 2002.

Table 4.7: Skill bonus by regional type in the Czech Republic (as %)

	low-skilled vs. unskilled				medium-skilled vs. unskilled				high-skilled vs. unskilled			
1996	D2	D5	D8	D8-D2	D2	D5	D8	D8-D2	D2	D5	D8	D8-D2
border	22.5	23.8	21.4	−1.1	40.7	40.7	43.3	2.6	99.2	100.2	111.6	12.4
non-border	19.4	22.0	21.0	1.5	44.3	43.1	47.2	2.9	110.7	109.9	126.0	15.3
Difference	3.1	1.8	0.4	−2.7	−3.6	−2.4	−3.9	−0.3	−11.5	−9.7	−14.4	−3.0
2002	D2	D5	D8	D8-D2	D2	D5	D8	D8-D2	D2	D5	D8	D8-D2
border	10.7	5.3	8.4	−2.3	34.9	27.8	37.7	2.7	77.5	67.5	104.4	26.9
non-border	20.8	32.7	24.6	3.8	51.0	68.5	61.2	10.1	106.4	123.8	157.4	51.0
Difference	−10.1	−27.5	−16.2	−6.1	−16.1	−40.7	−23.5	−7.4	−28.9	−56.3	−53.0	−24.1
Change in percentage points 2002/1996												
border	−11.8	−18.5	−13.0	−1.2	−5.7	−12.9	−5.6	0.1	−21.7	−32.7	−7.2	14.6
non-border	1.4	10.8	3.6	2.2	6.8	25.4	14.0	7.2	−4.3	13.9	31.4	35.7

Source: Author's own calculations from Czech Microcensus 1996, 2002.

Figure 4.7: Skill premium in the border and the non-border region by skill group (L: low; M: medium; relative to unskilled workers) and decile (as %, in 1996 and 2002)



Source: Author's own calculations from Czech Microcensus 1996, 2002.

4.4 Econometric Analysis of Qualification Trends

4.4.1 Employed People

In order to check more precisely whether there are significant differences in the qualification trends between the border and non-border region, I apply an econometric model. In a first step, I calculate the shares of the employees in the four skill groups for each district in 1992, 1996 and 2002.[26] The estimation model is as follows:

$$SHARE_{rt} = \alpha + \beta PORDENS_{rt} + \gamma PRAHA_r + \delta_1 YEAR1996_t + \delta_2 YEAR2002_t + \tau_1 BORREG_r + \tau_2 BORREG{*}YEAR1996_{rt} + \tau_3 BORREG{*}YEAR2002_{rt} + \varepsilon_{rt} \quad (4.3)$$

$SHARE_{rt}$ (UN_SKILL_{rt}, LOW_SKILL_{rt}, $MEDIUM\_SKILL_{rt}$, $HIGH\_SKILL_{rt}$) denotes the share of the respective skill group (unskilled, low-skilled, medium-skilled, high-skilled) in district *r* in year *t* (as a percentage). As a control variable for agglomerations I use data from the Czech Statistical Office for the variable *POPDENS* (population density of the districts in thousand inhabitants/km²) and – accounting for the special labour market situation – a dummy variable (*PRAHA*), which takes the value 1 for the

26 Since the number of Prague districts varies according to the year, I do not have an exactly balanced panel, but include five more districts in 2002.

districts of Prague and Mladá Boleslav and 0 otherwise. Moreover, I include dummy variables for the years 1996 and 2002 (with the reference year 1992) which equal 1 in the respective year and control for the changes in time (*YEAR1996, YEAR2002*). The variables I am most interested in are the border region dummy *BORREG* and the interaction terms *BORREG*YEAR1996* and *BORREG*YEAR2002*. *BORREG* equals 1 if the district lies in the border region and 0 if the district is remote from Bavaria and Austria. This variable estimates the difference in the share of the respective skill group for districts in the border region in 1992, the reference year. The interaction terms control for changes in this difference in 1996 and 2002. The results of the four regressions are shown in Table 4.8.

Table 4.8: Estimation results for the share of skill groups of Czech employees

variable	unskilled		low-skilled		medium-skilled		high-skilled	
	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.
POPDENS	−0.0233***	−3.85	−0.0737***	−6.23	0.0440***	4.33	0.0530***	5.23
PRAHA	0.0082	0.60	−0.0164	−0.63	−0.0162	−0.70	0.0243	1.06
YEAR1996	−0.0154**	−2.12	−0.0079	−0.65	0.0368***	3.57	−0.0136**	−1.99
YEAR2002	−0.0604***	−8.76	−0.0340**	−2.07	0.0798***	5.91	0.0145	1.45
BORREG	0.0055	0.42	−0.0115	−0.69	−0.0063	−0.38	0.0123	1.19
BORREG~96	0.0104	0.65	−0.0022	− 0.11	0.0074	0.36	−0.0156	−1.25
BORREG~02	−0.0040	−0.23	0.0070	0.24	0.0064	0.24	−0.0094	−0.49
Constant	0.1287***	22.39	0.4950***	57.14	0.2976***	37.65	0.0787***	15.78
Test statistics								
N	245		245		245		245	
R^2	0.3849		0.4333		0.3358		0.5444	

Dependent variable: share of relevant skill group
Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

The outcome, with values of R^2 ranging from 0.34 to 0.54, clearly shows the effect of the population density on the distribution of skills. Negative coefficient values for *POPDENS* in the case of unskilled and low-skilled workers and positive values for medium-skilled and high-skilled employees indicate that more highly skilled workers are represented at an above-average level in more densely populated areas. This is in line with the hypothesis that agglomerations attract more highly skilled people. However, the insignificant results for the variable *PRAHA* suggest that there is no special effect regarding Prague and Mladá Boleslav. With the exception of the value for high-skilled in 1996, the coefficients

for the year dummies reflect the general skill upgrading in the Czech Republic, which is already transparent in the descriptive figures. With respect to the border region, all relevant variables are insignificant. The coefficients for *BORREG*, *BORREG*YEAR1996* and *BORREG*YEAR2002* signify that there were no outstanding differences in the distribution of skill groups in 1992 (*BORREG*) and nor were there any material changes until 1996 and 2002 (interaction terms). In the end, the results confirm the descriptive statistics stating that the differences in the skill group shares between border and non-border region are only marginal over the whole period of observation.

4.4.2 Unemployed People

Concerning the unemployed, I analyse the development and the regional differences in unemployment in the same manner as in the preceding subsection, using the district labour exchange data. Since aggregated data are available for every district in every year from 1992 to 2006, I generate a trend variable *TREND* which takes the values *TREND* = 1,...15 beginning in 1992. This variable can be put together with the border region dummy, which then estimates the deviating trend in the districts close to the Western European countries (*TREND*BORREG*). The regression equations now have the following form:

$$SHARE_{rt} = \alpha + \beta\, PORDENS_{rt} + \gamma PRAHA_{r} + \delta TREND_{t} + \tau_1 BORREG_{r} + \tau_2 TREND{*}BORREG_{rt} + \varepsilon_{rt} \qquad (4.4)$$

Table 4.9 shows the results. Apart from the regression for unskilled unemployed people, the coefficient for the variable controlling the population density (*POPDENS*) takes highly significant values. The low-skilled unemployed are represented in above-average numbers in more sparsely populated districts, while in agglomerations more highly skilled unemployed are overrepresented. These figures are in line with the results in section 4.4.1 in the sense that human capital is located in densely populated places to a greater extent. Furthermore, the more highly skilled unemployed are represented in above-average numbers in Prague and Mladá Boleslav (*PRAHA*). Recalling the descriptive figures it comes as no surprise that the coefficient of the trend variable (*TREND*) takes a negative sign for the unskilled unemployed, whereas it is positive for the other three skill groups. The border region dummy (*BORREG*) estimates the deviation of the relevant share in the border region from the non-border districts in the reference year 1992. For unskilled and medium-skilled workers the coefficient of this variable is insignificant. Significant values for low-skilled (–)

and high-skilled employees (+) indicate the ceteris paribus higher representation of the high-skilled unemployed in the border region at the beginning of the observation period. However, the coefficient of the most interesting variable (*TREND*BORREG*) takes insignificant values for all skill groups. This means that there are no fundamental differences in the development of the skill structure between the border region and the rest of the country over time. Along with the descriptive statistics in sections 4.3.2 and 4.3.3 and the results in subchapter 4.4.1, the figures show evidence that the skill structure in the Czech Republic has changed analogously in the border and non-border region with respect to employed and unemployed people.

Table 4.9: Estimation results for the share of skill groups of Czech unemployed people

variable	unskilled		low-skilled		medium-skilled		high-skilled	
	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.
POPDENS	0.0032	0.65	−0.0391***	−13.81	0.0140***	3.60	0.0219***	13.77
PRAHA	−0.0367***	−3.94	−0.0202***	−4.10	0.0353***	6.02	0.0216***	8.77
TREND	−0.0062***	−8.80	0.0038***	9.98	0.0019***	4.76	0.0006***	5.98
BORREG	0.0108	0.81	−0.0208***	−2.60	0.0049	0.69	0.0051***	3.05
TR~BORREG	0.0001	0.05	0.0007	0.89	−0.0006	−0.89	−0.0002	−0.85
Constant	0.3794***	54.89	0.4020***	107.12	0.2021***	51.07	0.0165***	18.61
Test statistics								
N	1,140		1,140		1,140		1,140	
R^2	0.1016		0.2322		0.0654		0.4805	

Dependent variable: share of relevant skill group
Source: Author's own calculations from quarterly unemployment data of Czech district labour exchanges (1/1992–2/2006).
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

4.5 Econometric Analysis of Wage Differentials

4.5.1 Standard OLS Regressions without Pooling Cross Sections

Along the lines of my investigation of the German data, I start with OLS regressions, focusing on wage differentials between the borderland and the rest of the country. Since the dataset is relatively small, I merge the four original skill groups into two. Thus, I distinguish between lower (unskilled and low-skilled) and more highly (medium-skilled and high-skilled) skilled workers. This grouping is feasible since the shares of the skill groups between the two areas of observation differ only

marginally (see section 4.3.2). In order to evaluate the changes in the wage differentials I estimate the following Mincerian wage equation (Mincer 1974) separately for the years 1992, 1996 and 2002:

$$\begin{aligned} lnWAGE_i = {} & \alpha + \beta DFEM_i + \gamma_1 EXPER_i + \gamma_2 EXPER_i^2 + \gamma_3 EXPER\_F_i \\ & + \gamma_4 EXPER^2\_F_i + \sum_{j=1}^{J=3} \delta_j MARSTAT_{ji} + \sum_{m=1}^{M=8} \varphi_m OCCUP_{mi} \\ & + \eta\, PORDENS_i + \varphi\, PRAHA_i + \tau BORREG_i + \varepsilon_i \end{aligned} \tag{4.5}$$

$WAGE_i$ denotes the individual *i*'s annual gross wage in the regular occupation in the relevant year. Unfortunately, data concerning gross wage are not available for 1992. On the other hand, the variable for the net wages includes a lot of missing values in 2002 (almost two-thirds of the 4,880 observations with regard to full-time employment). Since net and gross wages are almost perfectly correlated in 1996 and 2002 (correlation coefficient > 0.99), I decided to use the net wage in 1992 as a proxy for the gross wage.[27] In addition to the conventional variables of the Mincerian wage equation (*DFEM*, *EXPER*, $EXPER^2$, interaction terms), I use dummies for marital status (*MARSTAT*) and occupational status (*OCCUP*). In this estimation I do not control for industries since this information was not available for 1992. As in the estimations of qualification trends, I control for the population density of the districts (*POPDENS*) and the special labour market situation in Prague and Mladá Boleslav (*PRAHA*). For a detailed definition of the variables see Tables 4.10 and 4.11.

The results of the coefficients for the control variables correspond to the theoretical expectations (Table 4.12). Female workers ceteris paribus earn about 20 % less than male employees in the lower skilled group and 25 % less in the more highly skilled group. These values hardly change over time. One additional year of potential experience yields a significant wage increase, but the significant negative coefficient for $EXPER^2$ signifies that the benefit of experience declines over time. For female workers these effects are less distinctive.

27 One possible explanation for the high value of the correlation coefficient is the fact that in socio-scientific surveys "people tend to respond by estimating net rather than gross earnings, even if they are asked for the latter" (Večerník 2006: 8). Nevertheless, I will do some sensitivity analyses (see below) in order to check whether the results are robust.

Table 4.10: Variables of the wage equation (Czech Republic)

ln WAGE	logarithm of individual wage
DFEM	dummy for sex (female = 1)
EXPER	potential job experience
$EXPER^2$	potential job $experience^2/100$
EXPER_F	potential job experience, female
$EXPER^2$_F	potential job $experience^2/100$, female
MARSTAT*	3 dummies for the marital status (married, divorced, widowed)
OCCUP*	8 dummies for occupations
BRANCH*	13 dummies for industries (only in 1996 and 2002)
POPDENS	population density in thousand inhabitants/km^2
PRAHA	dummy for Prague and Mladá Boleslav
BORREG	dummy for border region
Constant	constant

Table 4.11: Values of EXPER (Czech Republic)

Qualification	Potential experience	Skill group
primary education not complete	EXPER = AGE – 6 – 6	unskilled
primary education	EXPER = AGE – 6 – 9	unskilled
occupational qualification with lower secondary education	EXPER = AGE – 6 – 11	low-skilled
occupational qualification with (lower) secondary education (without *maturita*)	EXPER = AGE – 6 – 12	low-skilled
occupational qualification with upper secondary education (with *maturita*)	EXPER = AGE – 6 – 13	medium-skilled
higher technical education	EXPER = AGE – 6 – 15	medium-skilled
university degree	EXPER = AGE – 6 – 19	high-skilled
PhD degree	EXPER = AGE – 6 – 21	high-skilled

Notes: The workers' potential on-the-job experience (EXPER) is measured in years as age minus average duration of education minus six. I impose six years as the average duration of education for unskilled workers without primary education, nine years for unskilled workers with primary education, 11, 12 and 13 years for workers with secondary education depending on the respective level of secondary occupation and 15, 19 and 21 years for workers with higher technical education or university graduates.

Table 4.12: Estimation results for the wage effect of lower and more highly skilled workers without pooling cross sections

variable	lower skilled (unskilled & low-skilled)			more highly skilled (medium- & high-skilled)		
	1992	1996	2002	1992	1996	2002
DFEM	−0.2277*** (0.0242)	−0.2172*** (0.0211)	−0.2125*** (0.0516)	−0.2840*** (0.0300)	−0.2713*** (0.0256)	−0.2587*** (0.0481)
EXPER	0.0313*** (0.0019)	0.0177*** (0.0015)	0.0155*** (0.0036)	0.0296*** (0.0026)	0.0200*** (0.0023)	0.0190*** (0.0047)
EXPER²	−0.0741*** (0.0042)	−0.0402*** (0.0032)	−0.0334*** (0.0081)	−0.0733*** (0.0064)	−0.0480*** (0.0055)	−0.0471*** (0.0114)
EXPER_F	−0.0266*** (0.0025)	−0.0143*** (0.0021)	−0.0146*** (0.0054)	−0.0175*** (0.0036)	−0.0062** (0.0029)	−0.0070 (0.0058)
EXPER²_F	0.0651*** (0.0060)	0.0334*** (0.0049)	0.0354*** (0.0126)	0.0555*** (0.0095)	0.0189** (0.0074)	0.0175 (0.0148)
MARSTAT1 (married)	0.1754*** (0.0140)	0.1136*** (0.0106)	0.0298 (0.0222)	0.1612*** (0.0173)	0.0806*** (0.0141)	−0.0160 (0.0258)
MARSTAT2 (divorced)	0.1900*** (0.0189)	0.0977*** (0.0148)	0.0148 (0.0285)	0.1630*** (0.0245)	0.0504*** (0.0194)	−0.0186 (0.0311)
MARSTAT3 (widowed)	0.1877*** (0.0287)	0.1166*** (0.0260)	−0.0203 (0.0492)	0.1141*** (0.0372)	0.1475*** (0.0313)	−0.0104 (0.0760)
OCCUP*	yes	yes	yes	yes	yes	yes
PRAHA	0.0520*** (0.0175)	0.0708*** (0.0151)	0.1083*** (0.0361)	0.0733*** (0.0186)	0.0850*** (0.0157)	0.1910*** (0.0349)
POPDENS	0.0379*** (0.0081)	0.0576*** (0.0071)	0.0408** (0.0174)	0.0352*** (0.0080)	0.0503*** (0.0069)	0.0238 (0.0155)
BORREG	−0.0072 (0.0082)	−0.0087 (0.0065)	0.0009 (0.0157)	−0.0160 (0.0104)	−0.0152* (0.0085)	−0.0360* (0.0186)
Constant	10.6998*** (0.0769)	11.7313*** (0.0428)	12.1240*** (0.1103)	1.0280*** (0.0310)	12.1292*** (0.0279)	12.5134*** (0.0494)
Test statistics						
N	7,479	10,967	2,190	5,485	8,555	2,689
R^2	0.4010	0.3390	0.3301	0.3726	0.3598	0.3138

Dependent variable: ln Wage

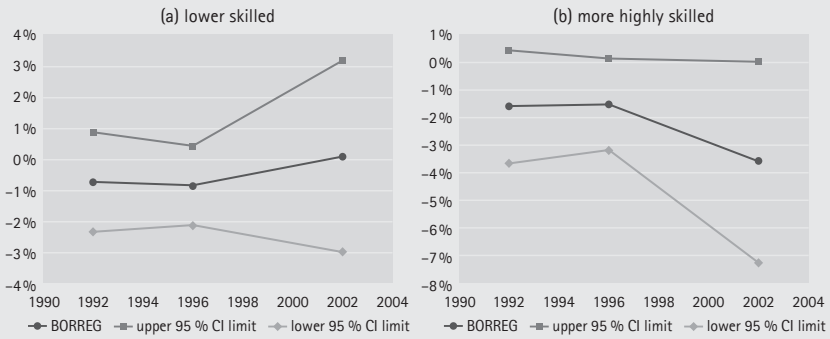
Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.

Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

There are wage premia for married, divorced and widowed employees in 1992 and 1996, which, interestingly, disappear for both skill groups in 2002. Maybe the first generation of young single employees, educated after the fall of Communism

compensated for the wage premia of non-singles with their higher productivity.[28] Significant outcomes for almost all occupation dummies indicate the differences between the various professions. The wage differential for workers in Prague and Mladá Boleslav increases over time, from 5.2 % to 10.8 % in the lower skilled group and from 7.3 % to 19.1 % in the more highly skilled group. With the exception of one case, the population density has a significant positive effect on the wage. The variable which I am most interested in is the border region dummy. In 1992 and 1996 the coefficient indicates negative, but – in three out of four cases – insignificant wage differentials for border region workers (Table 4.12 and Figure 4.8). In 2002 the wage gap seems to disappear for unskilled and low-skilled workers and to widen for medium- and high-skilled employees in the districts near Bavaria and Austria. However, since there are far fewer observations in 2002, the confidence interval is very large for this year, so that it is not possible to derive deeper conclusions from this estimation. Therefore, in a next step I apply a difference-in-differences approach in order to obtain more exact results.

Figure 4.8: Wage effect for (a) lower and (b) more highly skilled workers in the Czech border region (as %)



Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.

4.5.2 Pooling Cross Sections Over Time

In contrast to the former estimations I now pool all observations for each of the original four skill groups over time, i.e. I have an independently pooled cross-section for unskilled, low-skilled, medium-skilled and high-skilled employees. Estimating only one equation in each case leads to a larger sample size which, in turn brings more precise estimators and test statistics with more power. Keeping the control

28 Using net wages as an endogenous variable does not change this result (despite the large amount of missing values in 2002).

variables of the previous regressions, I include year dummies for the years 1996 and 2002 (*YEAR1996*, *YEAR2002*) with the reference year 1992. Furthermore, I include interaction terms of the year dummies with the border region dummy. The variables *BORREG*YEAR1996* and *BORREG*YEAR2002* measure the change of the wage differential in the border region from 1992 to 1996 and 2002 respectively. As these interaction terms control for the difference (over time) in the difference (wage gap in the border region), the coefficients ω_1 and ω_2 represent the difference-in-differences estimators (Wooldridge 2002). The equation now has the following form:

$$\begin{aligned} lnWAGE_i = {} & \alpha + \beta DFEM_i + \gamma_1 EXPER_i + \gamma_2 EXPER_i^2 + \gamma_3 EXPER\_F_i \\ & + \gamma_4 EXPER^2\_F_i + \sum_{j=1}^{J=3} \delta_j MARSTAT_{ji} + \sum_{m=1}^{M=8} \varphi_m OCCUP_{mi} + \eta\, PORDENS_i \\ & + \varphi\, PRAHA_i + \tau BORREG_i + \upsilon_1 YEAR1996_t + \upsilon_2 YEAR2002_t \\ & + \omega_1 (BORREG*YEAR1996_{it}) + \omega_2 (BORREG*YEAR2002_{it}) + \varepsilon_i \end{aligned} \tag{4.6}$$

The results are shown in Table 4.13. In this case the coefficient values of the control variables also correspond to the theoretical expectations. The gender wage gap is most distinctive for unskilled workers, i.e. female unskilled employees earned ceteris paribus 36.9 % less than their male counterparts. Compared to unskilled females the differential is only half as large for low-skilled female workers, but then increases with the skill level. The coefficient values for the variables concerning experience indicate that depending on the skill group, one additional year of potential experience yields a wage increase, which mitigates over time and is smaller for female workers. With the exception of low-skilled workers, the wage bonus in Prague and Mladá Boleslav oscillates around 10 %. The population density, which controls for agglomeration effects, has a positive effect on wages, but which is only significant in the case of low- and medium-skilled workers. The coefficient for *BORREG* shows a negative, but insignificant wage differential for employees from all skill groups in the districts near Bavaria and Austria in 1992. This wage gap did not change considerably until 1996, as shown by the outcome for *BORREG*YEAR1996*. However, the values for *BORREG*YEAR2002* indicate that things changed between 1996 and 2002. By adding the basic wage effect for the border region and the effect until 2002, which is captured by the interaction term, it turns out that unskilled workers in the border districts in 2002 earned about 12 % more than employees in districts remote from Bavaria and Austria. In all other skill groups the wage differential for border region employees deteriorated over time. Although – apart from the unskilled group – only the value for medium-skilled workers is significant at the 5 percent level, it is striking that the wage differential deepens with the skill level. While the total wage effect in the low-skilled group amounts 1.9 % in 2002, i.e. workers in the border region earned 1.9 % less, the effect for medium- and high-

skilled workers adds up to 5.1 % and 6.1 % respectively. This means that regarding skill levels, a clear structure with respect to wage differentials emerged by 2002: the higher the skill level, the more disadvantageous was a job in the border region.

Table 4.13: Estimation results for the wage effect in difference-in-differences estimations

variable	unskilled		low-skilled		medium-skilled		high-skilled	
	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.
DFEM	−0.3688***	−6.58	−0.1975***	−10.37	−0.2446***	−9.55	−0.2768***	−5.97
EXPER	0.0109***	2.65	0.0257***	18.70	0.0238***	10.19	0.0210***	5.67
EXPER^2	−0.0255***	−3.10	−0.0592***	−19.32	−0.0543***	−10.21	−0.0525***	−5.39
EXPER_F	−0.0004	−0.08	−0.0236***	−11.42	−0.0125***	−4.42	−0.0071	−1.24
EXPER^2_F	0.0047	0.47	0.0588***	11.58	0.0356***	5.08	0.0330**	2.14
mar. status	yes		yes		yes		yes	
occ. status	yes		yes		yes		yes	
PRAHA	0.0993***	3.84	0.0650***	4.45	0.1116***	7.34	0.1013***	3.28
POPDENS	0.0114	0.91	0.0531***	7.99	0.0342***	5.15	0.0164	1.29
YEAR1996	0.8460***	68.23	0.8615***	136.79	0.9197***	114.51	1.0083***	59.88
YEAR2002	1.1759***	49.43	1.2279***	122.35	1.3457***	113.86	1.4054***	61.15
BORREG	−0.0190	−1.17	−0.0007	−0.08	−0.0075	−0.65	−0.0165	−0.80
BORREG~96	0.0009	0.04	−0.0053	−0.45	−0.0077	−0.54	−0.0053	−0.19
BORREG~02	0.1382***	3.07	−0.0187	−0.99	−0.0435**	−1.97	−0.0445	−1.04
Constant	11.0608***	71.53	10.7842***	245.63	11.0350***	375.89	11.1996***	282.95
Test statistics								
N	4,000		16,636		12,855		3,874	
R^2	0.7697		0.7705		0.7606		0.7326	

Dependent variable: ln Wage
Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

Some sensitivity analyses do not change this finding. Restricting the difference-in-differences approach to only two years of observation (1992 & 1996, 1992 & 2002, 1996 & 2002) yields very similar results. In the most interesting version, excluding the observations of 1992, it is possible to include dummy variables for the 14 industries in the estimation. It could be important to control explicitly for industries such as manufacturing, for instance, which is notably represented above-average in the border region in 2002. However, the wage differentials for the different skill groups do not deviate substantially from the outcomes above (Table 4.14, see Ta-

ble A 4.2 in the appendix for control variables): a remarkable relative wage gain of 13.2 % for unskilled workers in the borderlands, while all other skill groups exhibit relative wage losses from 1996 until 2002, downgrading with the skill level. According to this version, the relative wage of medium-skilled workers in the border region decreased by more than five percentage points (significant at the 1 percent level) and the wage of high-skilled workers by more than six percentage points (significant at the 10 percent level).

Table 4.14: Wage effect in the border region controlling for industries

variable	unskilled		low-skilled		medium-skilled		high-skilled	
	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.
BORREG(1996)	–0.0029	–0.20	0.0106	1.45	0.0036	0.40	0.0112	0.50
BORREG~2002	0.1317***	2.98	–0.0209	–1.21	–0.0512***	–2.65	–0.0646*	–1.67
Test statistics								
N	2,402		10,755		8,826		2,418	
R^2	0.4570		0.4930		0.5022		0.4642	

Dependent variable: ln Wage
Control variables: see Table A 4.2 in the appendix
Source: Author's own calculations from Czech Microcensus 1996, 2002.
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

In an alternative specification I do not split the dataset according to skill groups but again according to years. In contrast to the former estimations I now run regressions including all skill groups in one year. Thus, I generate dummy variables for low-skilled, medium-skilled and high-skilled employees (*L_SKILL*, *M_SKILL*, *H_SKILL*) with unskilled workers as the reference group. Furthermore, all skill group dummies interact with the border region dummy (*LSKILL*BORREG*, *MSKILL*BORREG*, *HSKILL*BORREG*). Consequently, I now analyse not only the deviations of the wage differential in the borderlands, but also the development of the wage differentials between the different skill groups. The results for the variables with respect to the skill level and the region are summarised in Table 4.15 (see Table A 4.3 in the appendix for control variables). The values for the coefficient of *BORREG* show that in 2002 unskilled workers in the border region earned significantly more (11.2 %) than unskilled workers in the non-border region. The wage differentials between the skill groups increased above all in the early transition years from 1992 until 1996

and remained almost stable afterwards.[29] Regarding the interaction terms between the skill and border region dummies, the outcome only yields significant results in 2002. Based on the wage differential for the reference group (the unskilled workers), all other skill groups are in an inferior position in the border region, which is consistent with my previous results.

Table 4.15: Regression results for qualificational wage differentials

variable	1992		1996		2002	
	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.
BORREG	–0.0181	–1.11	–0.0170	–1.18	0.1121***	2.61
L_SKILL	0.0418***	3.69	0.0612***	6.32	0.0904***	3.66
M_SKILL	0.1635***	11.62	0.2169***	18.82	0.2299***	8.37
H_SKILL	0.3364***	16.32	0.4360***	24.79	0.4381***	12.09
LSKILL*BORREG	0.0164	0.88	0.0126	0.79	–0.1218***	–2.66
MSKILL*BORREG	–0.0028	–0.14	–0.0030	–0.18	–0.1481***	–3.17
HSKILL*BORREG	–0.0155	–0.63	–0.0053	–0.21	–0.1491**	–2.58
Test statistics						
N	12,964		19,522		4,879	
R^2	0.4454		0.4486		0.4343	

Dependent variable: ln Wage
Control variables: see Table A 4.3 in the appendix
Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

4.6 Conclusion

In this chapter I analysed the development of several labour market indicators in the Czech Republic after the fall of the Iron Curtain, comparing the districts close to Bavaria and/or Austria with the rest of the country. Hypotheses can be derived from two theoretical strands: the Feenstra-Hanson trade model dealing with the skill intensity of outsourced production activities and the Brülhart et al. NEG model referring to the market potential and import competition.

In the early transition years (from 1992 until 1996) the relative employment share of the border region increased and then stabilised by 2002. Contrary to my hypotheses I do not find clear evidence of disproportionate shifts in the economic

29 These results correspond to the findings of Večerník (2006: 7): "In the 1996–2002 period, the effect of education stagnated ..."

structure in the Czech districts bordering on Bavaria and Austria compared to the non-border districts. With respect to both industries and occupations the shifts proceeded more or less in a similar way with some exceptions, e.g. clerks and the manufacturing sector. Calculating an indicator of structural change and a specialisation index yields higher values in the period from 1996 until 2002. This is not surprising, not only because of the longer time span, but also due to the troubling recession years.

In the period under review a skill-upgrading process took place all over the country. Distinguishing between four skill groups, the skill structure of employed and unemployed people changed analogously in both areas of observation, i.e. the trend towards more skilled labour led to noticeable shifts in the Czech border region as well as in the remaining districts. The descriptive statistics are confirmed by the results of econometric estimations in each case (employed and unemployed).

Regarding wage differentials between workers employed in the border region and workers in the rest of the country, I first took a look at the descriptive figures and then ran several regressions, obtaining robust results: in 1992 border region employees generally earned slightly less than their peers in the non-border districts (about 1–2 %). While there was not so much variation until 1996, the picture changed between 1996 and 2002. The workers with the lowest skill degree exhibit a positive wage differential of around 12 % in the border region compared to their counterparts in the non-border region. For all other skill groups in the border region the spatial wage gap is negative and, in absolute value, increases with the skill level. These results clearly contradict the predictions of the Feenstra-Hanson model, according to which the skill upgrading should be especially noticeable in the border region. However, the findings meet with the expectations of the NEG model by Brülhart et al., according to which above all industries and employees are in a favourable position in the border districts where import competition from Germany and Austria is low, i.e. less human-capital-intensive activities benefit.

Of course, these results only indicate the effects of economic integration in an ongoing process, which is far from being completed. The effects of the Czech Republic's accession to the EU still have to be analysed, not to mention the impact of free movement of labour, which will bring new opportunities to the Czech workforce in 2011 at the latest. Since the Czech Republic is surrounded by old and new EU member states, the country is predestined for further research on integration effects.

Appendix to Chapter 4

Table A 4.1: Distance from district capital to next Bavarian or Austrian international border crossing (in minutes by car)

District	min	border crossing	District	min	border crossing
Praha	120	*Waidhaus*	Liberec	194	*Waidhaus*
Benešov	114	*Grametten*	Semily	195	*Waidhaus*
Beroun	90	*Waidhaus*	Hradec Králové	191	*Grametten*
Kladno	119	*Waidhaus*	Jičín	184	*Waidhaus*
Kolín	147	*Grametten*	Náchod	227	*Grametten*
Kutná Hora	131	*Grametten*	Rychnov nad Kněžnou	189	*Drasenhofen*
Mělník	156	*Waidhaus*	Trutnov	232	*Grametten*
Mladá Boleslav	155	*Waidhaus*	Chrudim	148	*Grametten*
Nymburk	153	*Waidhaus*	Pardubice	167	*Grametten*
Praha-východ	120	*Waidhaus*	Svitavy	116	*Drasenhofen*
Praha-západ	120	*Waidhaus*	Ústí nad Orlicí	155	*Drasenhofen*
Příbram	105	*Phillipsreut*	Havlíčkův Brod	94	*Grametten*
Rakovník	119	*Waidhaus*	Jihlava	86	*Kleinhaugsdorf*
České Budějovice	41	*Wullowitz*	Pelhřimov	61	*Grametten*
Český Krumlov	33	*Wullowitz*	Třebíč	68	*Kleinhaugsdorf*
Jindřichův Hradec	24	*Grametten*	Žďár nad Sázavou	103	*Drasenhofen*
Písek	88	*Wullowitz*	Blansko	84	*Drasenhofen*
Prachatice	42	*Phillipsreut*	Brno-město	49	*Drasenhofen*
Strakonice	56	*Phillipsreut*	Brno-venkov	49	*Drasenhofen*
Tábor	76	*Grametten*	Břeclav	27	*Drasenhofen*
Domažlice	19	*Furth i. W.*	Hodonín	50	*Drasenhofen*
Klatovy	47	*Furth i. W.*	Vyškov	65	*Drasenhofen*
Plzeň-město	52	*Waidhaus*	Znojmo	15	*Kleinhaugsdorf*
Plzeň-jih	52	*Waidhaus*	Jeseník	205	*Drasenhofen*
Plzeň-sever	52	*Waidhaus*	Olomouc	100	*Drasenhofen*
Rokycany	66	*Waidhaus*	Prostějov	81	*Drasenhofen*
Tachov	26	*Waidhaus*	Přerov	107	*Drasenhofen*
Cheb	13	*Schirnding*	Šumperk	149	*Drasenhofen*
Karlovy Vary	54	*Schirnding*	Kroměříž	87	*Drasenhofen*
Sokolov	35	*Schirnding*	Uherské Hradiště	110	*Drasenhofen*
Děčín	199	*Schirnding*	Vsetín	160	*Drasenhofen*
Chomutov	104	*Schirnding*	Zlín	126	*Drasenhofen*
Litoměřice	164	*Waidhaus*	Bruntál	162	*Drasenhofen*
Louny	134	*Schirnding*	Frýdek-Místek	165	*Drasenhofen*
Most	126	*Schirnding*	Karviná	203	*Drasenhofen*
Teplice	152	*Schirnding*	Nový Jičín	141	*Drasenhofen*
Ústí nad Labem	168	*Schirnding*	Opava	169	*Drasenhofen*
Česká Lípa	202	*Waidhaus*	Ostrava-město	168	*Drasenhofen*
Jablonec nad Nisou	185	*Waidhaus*			

Source: Author's own calculations from Internet Route Planner ViaMichelin.

Notes: District: 77 Czech NUTS 4 level districts; min: distance in minutes by car; border crossing: next Bavarian or Austrian international border crossing.

Table A 4.2: DID estimation controlling for industries – full set of variables

variable	unskilled		low-skilled		medium-skilled		high-skilled	
	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.
DFEM	–0.3488***	–4.71	–0.1969***	–7.88	–0.2230***	–7.49	–0.2547***	–4.26
EXPER	0.0032	0.59	0.0182***	10.40	0.0194***	6.54	0.0140***	2.83
EXPER²	–0.0082	–0.75	–0.0399***	–10.06	–0.0427***	–6.31	–0.0299**	–2.37
EXPER_F	0.0049	0.76	–0.0173***	–6.37	–0.0072**	–2.15	0.0012	0.17
EXPER²_F	–0.0078	–0.58	0.0426***	6.45	0.0198**	2.39	0.0121	0.64
marital status	yes		yes		yes		yes	
occup. status	yes		yes		yes		yes	
industry	yes		yes		yes		yes	
PRAHA	0.1657***	4.25	0.0938***	4.81	0.1340***	7.42	0.1318***	3.22
POPDENS	–0.0059	–0.33	0.0517***	5.70	0.0303***	3.83	–0.0100	–0.58
YEAR2002	0.3465***	15.12	0.3760***	41.03	0.4263***	41.37	0.3964***	19.33
BORREG(1996)	–0.0029	–0.20	0.0106	1.45	0.0036	0.40	0.0112	0.50
BORREG~2002	0.1317***	2.98	–0.0209	–1.21	–0.0512***	–2.65	–0.0646*	–1.67
Constant	11.7796***	66.37	11.5968***	212.51	11.8398***	312.56	12.0014***	147.46
Test statistics								
N	2,402		10,755		8,826		2,418	
R^2	0.4570		0.4930		0.5022		0.4642	

Dependent variable: ln Wage
Source: Author's own calculations from Czech Microcensus 1996, 2002.
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

Table A 4.3: Qualificational wage differentials – full set of variables

variable	1992		1996		2002	
	coef.	t-Stat.	coef.	t-Stat.	coef.	t-Stat.
DFEM	−0.2464***	−13.09	−0.2341***	−14.79	−0.2372***	−6.67
EXPER	0.0316***	20.73	0.0190***	15.18	0.0152***	5.14
EXPER²	−0.0737***	−21.25	−0.0416***	−14.86	−0.0336***	−5.00
EXPER_F	−0.0212***	−10.45	−0.0096***	−5.71	−0.0090**	−2.27
EXPER²_F	0.0566***	11.23	0.0244***	6.07	0.0225**	2.36
marital status	yes		yes		yes	
occup. status	yes		yes		yes	
PRAHA	0.0647***	5.09	0.0757***	7.10	0.1418***	5.77
POPDENS	0.0309***	5.48	0.0466***	9.55	0.0311***	2.72
BORREG	−0.0181	−1.11	−0.0170	−1.18	0.1121***	2.61
L_SKILL	0.0418***	3.69	0.0612***	6.32	0.0904***	3.66
M_SKILL	0.1635***	11.62	0.2169***	18.82	0.2299***	8.37
H_SKILL	0.3364***	16.32	0.4360***	24.79	0.4381***	12.09
LSKILL_BORREG	0.0164	0.88	0.0126	0.79	−0.1218***	−2.66
MSKILL_BORREG	−0.0028	−0.14	−0.0030	−0.18	−0.1481***	−3.17
HSKILL_BORREG	−0.0155	−0.63	−0.0053	−0.21	−0.1491**	−2.58
Constant	10.7361***	367.25	11.7864***	501.83	12.1707***	247.27
Test statistics						
N	12,964		19,522		4,879	
R^2	0.4454		0.4486		0.4343	

Dependent variable: ln Wage
Source: Author's own calculations from Czech Microcensus 1992, 1996, 2002.
Notes: Regression with heteroskedasticity-robust standard errors;
*/**/*** significant at the 10/5/1 percent level.

5 Summary and Outlook

The aim of this thesis was to investigate the impact of open borders on the labour market in the Bavarian and Czech border regions after the fall of the Iron Curtain. This issue is of great interest to labour market and regional economists, as the area of observation is characterised by one of the world's highest wage differentials. Effects of drastic economic changes should be more obvious there than in regions far away from the frontier. From a theoretical standpoint, both trade theory and New Economic Geography provide indications that areas close to new markets are affected by the abolition of trade impediments to a greater extent. Due to short geographical distances, i.e. lower transportation and transaction costs, trade and the international outsourcing of production activities are supposed to be more intensive in border regions. Based on the Feenstra-Hanson trade model and the Brülhart et al. NEG model, I derived hypotheses with regard to integration effects. Both models partly point in the same direction by emphasising the impacts of comparative advantages and a higher market potential on the labour market. However, with respect to the shifts in the labour demand for different skill groups, the models are inconsistent with one another. The Feenstra-Hanson model predicts a skill upgrading process on both sides of the border, which should be especially noticeable in the border region. In contrast, Brülhart et al. refer to the influence of import competition, which should favour more highly skilled employees in eastern Bavaria and unskilled and low-skilled workers in the Czech border region.

In both countries I oppose the border districts to the non-border districts, which serve as the reference group. The eastern German districts are excluded from the analysis due to the enormous disparities compared to the western German labour market and also the availability of data. In the Czech case, in contrast, all districts in the country are included in the analysis. In both Germany and the Czech Republic I calculate indices of structural change, specialisation and the relative employment share of the border region. Furthermore, I examine the changes in the skill structure of employees and unemployed people at the descriptive level and apply econometric methods in order to control for differences in the districts and the people observed. Since individual data are available on both sides of the border, I estimate wage differentials in the borderlands using several econometric methods.

The analysis of the economic structure in eastern Bavaria yields the result that there is no structural break in the development before and after the opening of the border. While the relative employment share of eastern Bavaria continuously increases, the structural changes are in principle in line with the trends in the rest of the country. One result worth mentioning is the catching-up process

in eastern Bavaria with respect to the skill structure. Between 1980 and 2001 the share of low-skilled workers, which was above-average in the border region at the beginning of the observation period, conforms to the nationwide level. The share of the formerly under-represented skilled workers approximates it analogously. Concerning the unemployed, the dataset used, the IAB employment sample (IABS), provides far fewer observations. On this basis no fundamental deviations in the skill composition of unemployment in eastern Bavaria from the nationwide structure are identifiable. The implication of the descriptive figures, that the fall of the Iron Curtain had no special effects on the skill structure in eastern Bavaria, is confirmed by econometric regressions in both cases (employed and unemployed people).

The results of the estimations of wage differentials are more striking. At the beginning of the observation period employees from all skill groups earn less on average in eastern Bavaria than in the rest of western Germany. After the opening of the border some significant changes appear: male low-skilled workers gain in the border region compared to their non-border counterparts in the period shortly after the fall of the Iron Curtain. This outcome is quite noticeable, since the number of Czech commuters in Bavaria reached its peak in the early 1990s. In an additional analysis it is ascertained that the Czech employees earned ceteris paribus significantly less than other foreigners in the border region. After 1995, however, a downtrend for the eastern Bavarian workforce sets in with respect to the wage development. Until the end of the observation period in 2001 the wage gap for low-skilled and skilled employees widens in the borderland. This conclusion is confirmed by the application of several estimation methods. Another remarkable finding is that the wage differentials of males and females differ quite substantially.

Concerning the analysis on the Czech side of the frontier, there is one big difference: data are only available for the period *after* the fall of the Iron Curtain. Hence, it is not possible to explore a structural break on the way from plan to market. Nevertheless, it is possible to investigate the changes during the still ongoing transition period.

The main data source for my research purpose, the Czech Microcensus, only provides data for three periods (1992, 1996, 2002). Naturally, the explanatory power of structural change and specialisation indices is reduced, though the impact of the recession years in the late 1990s is observable. Regarding the skill structure of employees and unemployed people, the differences between border and non-border region are small. Skill upgrading led to a decrease in the share of less qualified workers, while the troubling years, characterised by a shrinking GDP, also caused unemployment in more highly qualified classes of the population.

With respect to spatial wage differentials I find evidence that the employees holding the lowest skill degree saw a relative gain in the border region in the years between 1996 and 2002. For the three other skill groups the wage gap compared to the workers in the non-borderland deteriorated: the higher the skill group, the higher the wage differential. This outcome corresponds to the predictions of the Brülhart et al. NEG model which are that in the border region mainly those employees will benefit who are least affected by import competition. Though the skill-upgrading hypothesis derived from the Feenstra-Hanson model is quite plausible in the nationwide perspective, it has to be rejected in the case of regional differentiation, since more highly skilled employees are the losers in the border region compared to the rest of the country.

The results for the Czech wage structure are in line with my findings on the German side of the border. Lower skilled workers in eastern Bavaria have been suffering relative wage losses since the mid 1990s, whereas Czech unskilled workers in the districts near Bavaria and Austria were making relative profits in the same period of time. This outcome indicates that it took some years after the fall of the Iron Curtain until trade and the outsourcing of production activities had a measurable impact on the wage structures.

Regrettably, the data basis with respect to high-skilled employees is poor on both sides of the border. Though some conclusions can also be drawn for this skill group, the results have to be interpreted cautiously due to the lower number of observations. However, for future research this problem will be reduced, since the share of high-skilled persons generally increases.

With respect to the confrontation of the implications of, on the one hand, the Feenstra-Hanson trade model and, on the other hand, the Brülhart et al. NEG model there is no confirmation of the theories for most aspects of the analysis. Against the background of one of the world's highest wage differentials in the reviewed area, this is a rather surprising outcome. The – in both models – predicted above-average structural change and specialisation process in border regions is neither observable on the German side nor in the Czech Republic. In this case, the findings indicate that the lower distance in regions close to the foreign country seems not to play a dominant role with regard to international outsourcing and import competition. The same conclusion can be drawn concerning the development of skill group shares in both countries, as long-lasting trends apparently continue during the years of economic integration. The only deviant result is found for wage differentials in both countries between the borderlands and the non-border districts. In this respect, as mentioned above, my empirical findings do not go with the forecasts of the Feenstra-Hanson model. The predictions of the Brülhart et al. model obviously possesses more explanatory power, as unskilled

employees in the Czech border region are the relative winners in the course of increasing trade relations with Germany.

What implications do the results provide for regional policy? First, it can be said that the fears raised by the population and politicians in eastern Bavaria about the region falling behind were exaggerated. The main conclusion of the results is that the Bavarian border region did quite well after the opening of the border. The increasing shares of relative employment and skilled employees indicate that human capital – a vital growth factor – plays a growing role in eastern Bavaria. However, the negative wage differential becoming larger for low-skilled and skilled workers in the second half of the observation period is cause for concern with regard to the future attractiveness of the borderland. Assuming that the prospects for activities using low-skilled labour relatively intensively are rather poor, regional policy could underpin the lasting creation of highly skilled jobs in the region. Examples of possible starting points are the strengthening of the regional universities, the durable promotion of centres for founders and technology and the provision of risk capital. Since both the Bavarian and the western and southern Bohemian border region hold a strong position in the manufacturing and engineering industries, cross-border co-operations in these fields pose promising opportunities. The completion of the A6 motorway has improved the traffic and transport opportunities considerably. The extension of international railway connections would certainly make an additional contribution to the economic development of eastern Bavaria. Regarding the Czech Republic it seems obvious that the capital city of Prague absorbs a sizeable fraction of the available human capital. Apart from this agglomeration pull the results for wage differentials suggest that the Czech border region is running the risk of becoming less attractive for qualified workers. In order to counteract the potential outflow of skilled workers it might be important to support the attraction of locations like Brno, Pilsen and Budweis, which could then also bring forward less densely populated areas.

Of course, due to the current state of data availability this thesis only marginally addresses the consequences of the EU enlargement. Since the accession of the Czech Republic to the EU in May 2004 is one large part of an ongoing integration process, its effects should however act in the same direction as those described above. In general, the interactions between the German and the Czech labour markets leave scope for further research. Now surrounded only by EU member states, the Czech Republic holds a favourable position. Germany (and Austria) is obliged to lift the restrictions on the free movement of labour from the Eastern European countries by 2011 at the latest. This, certainly, will affect the economies of the countries which have a common border with CEE countries. However, in contrast to the widely negative assessment of the popular press, it

is not so obvious which countries will profit and which will suffer from labour mobility. The shortage of skilled labour ("brain drain"), for instance, is becoming an increasing problem in the Czech Republic which could worsen by the easier access on the western European labour markets. On the other hand, it is hardly predictable to what extent the incentive of higher incomes in a neighbouring country will influence the Czechs, who have so far been rather immobile. In any case, there is no lack of research issues.

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List of Abbreviations

a.s.	akciová společnost (joint stock company)
BeH	Beschäftigten-Historik (employment register)
CEPR	Centre for Economic Policy Research
CEEC	Central and Eastern European Countries
CERGE-EI	Center for Economic Research and Graduate Education – Economics Institute
CES	Constant Elasticity of Substitution
CESifo	Center for Economic Studies – Institut für Wirtschaftsforschung
COMECON	Council of Mutual Economic Assistance
ČSÚ	Český Statistický Úřad (Czech Statistical Office)
DID	difference-in-differences
ed(s).	edition/editor(s)
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
Hrsg.	Herausgeber (editors)
HWWA	Hamburgisches Welt-Wirtschafts-Archiv (Hamburg Institute of International Economics)
IAB	Institut für Arbeitsmarkt- und Berufsforschung (Institute for Employment Research)
IABS	IAB-Beschäftigtenstichprobe (IAB employment sample)
IES	Institute of Economic Studies, Prague
ILO	International Labour Organization
ISC	Indicator of Structural Change
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISSP	International Social Survey Programme
IW	Institut der deutschen Wirtschaft
IZA	Institut zur Zukunft der Arbeit (Institute for the Study of Labor)
Jg.	Jahrgang (year)
Kč	Korun českých (Czech crowns)
KSI	Krugman Specialisation Index
LFS	Labour Force Survey
NACE	Nomenclature of Economic Activities
NBER	National Bureau of Economic Research
NEG	New Economic Geography

NUTS	Nomenclature des Unités Territoriales Statistiques (Nomenclature of Territorial Units for Statistics)
OLS	Ordinary Least Squares
para.	paragraph
U.S.	United States (of America)
VALA	Vergleichende Analyse von Länderarbeitsmärkten (Comparative Analysis of Labour Markets in German Federal States)
vol.	volume
ZEW	Zentrum für Europäische Wirtschaftsforschung (Centre for European Economic Research)

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Kurzfassung

Die Staaten Europas stehen im Zuge der Globalisierung vor neuen Herausforderungen, die insbesondere auf dem Arbeitsmarkt spürbar sind. Während die Arbeitnehmer in Westeuropa dem zunehmenden Druck von Niedriglohnländern in Osteuropa und Asien ausgesetzt sind, müssen auch die Arbeitskräfte in diesen Ländern die dramatischen ökonomischen Veränderungen meistern. Die vorliegende Arbeit beschäftigt sich mit der Entwicklung des Arbeitsmarktes entlang der bayerisch-tschechischen Grenze. Dort treffen die über Jahrzehnte sich in einer Marktwirtschaft entwickelnde Region Ostbayern einerseits und die Grenzgebiete des Transformationslandes Tschechien andererseits aufeinander. Vor dem Hintergrund der Integration der mittelosteuropäischen Märkte in die Europäische Union stellt sich die Frage, inwieweit der Arbeitsmarkt in den Grenzregionen zwischen alten und neuen EU-Mitgliedsstaaten signifikante Unterschiede im Vergleich mit der Entwicklung auf aggregierter staatlicher Ebene aufweist. Gerade in den Gebieten unmittelbar an der Grenze sollten die Auswirkungen des Falls des Eisernen Vorhangs besonders deutlich auftreten. In dieser Arbeit untersuche ich die Effekte der Grenzöffnung im Jahr 1989 und des darauf folgenden Integrationsprozesses bis zum Beginn des neuen Jahrhunderts in Bezug auf Strukturwandel, Qualifizierungstrends und Lohnentwicklung. In beiden Ländern erfolgt ein Vergleich der grenznahen Kreise mit den grenzfernen Regionen, die jeweils als Referenzgruppe dienen.

Nach der Herleitung der Hypothesen aus dem Handelsmodell von Feenstra-Hanson und dem New Economic Geography-Modell von Brülhart et al. beschäftigt sich der erste Schwerpunkt der Arbeit mit der Entwicklung des Arbeitsmarktes auf der deutschen Seite. In der empirischen Untersuchung werden die Daten der IAB-Regionalstichprobe (IABS) und der Beschäftigten-Historik (BeH) analysiert. Ein spezieller Grenzöffnungseffekt ist dabei weder bei der Wirtschaftsstruktur noch bei der Qualifikationsstruktur in der Grenzregion festzustellen, was durch ökonometrische Schätzungen untermauert wird. Die Ergebnisse der Lohnregressionen fallen deutlicher ins Auge. In den Jahren nach der Grenzöffnung kommt es zu signifikanten Veränderungen: In der Gruppe der Geringqualifizierten verbuchen Arbeitnehmer in Ostbayern zunächst relative Gewinne im Vergleich zu Arbeitnehmern im übrigen westdeutschen Bundesgebiet. Ab Mitte der 1990er-Jahre setzt jedoch in Bezug auf die Lohnentwicklung ein relativer Abwärtstrend für diesen Teil der abhängig Erwerbstätigen in der Grenzregion ein. Bis zum Ende der Beobachtungsperiode vergrößert sich der Lohnabstand zwischen geringqualifizierten Arbeitnehmern in grenzfernen und grenznahen Regionen. In einem zweiten Schwerpunkt werden auf der Basis von Daten des tschechischen Mikrozensus und vierteljährlich aggregierten Daten zur Arbeitslosigkeit auf Kreisebene die Auswirkungen des Falls des

Eisernen Vorhangs auf regionale Unterschiede bezüglich der Wirtschafts-, Qualifikations- und Lohnstruktur in der Tschechischen Republik analysiert. Die Ergebnisse zeigen, dass es keine Hinweise auf überproportionale Veränderungen in der Wirtschafts- und Qualifikationsstruktur in den an Bayern und Österreich angrenzenden tschechischen Kreisen im Vergleich zu den nicht im Grenzgebiet liegenden Bezirken gibt. Wenn man die Lohnunterschiede zwischen Arbeitnehmern in der Grenzregion und Arbeitnehmern im Rest des Landes betrachtet, zeigt sich, dass in der zweiten Hälfte des Beobachtungszeitraums die Beschäftigten in der Grenzregion mit der niedrigsten Qualifikationsstufe einen positiven Lohnunterschied im Vergleich zu entsprechenden Beschäftigten im Binnenland aufweisen. Diese Erkenntnis steht im Einklang mit den Ergebnissen auf der deutschen Seite.

Summary

In the course of globalisation European countries are facing new challenges, which is particularly evident on the labour market. While employees in Western European countries are exposed to growing pressure from low-wage transition and developing countries primarily situated in Eastern Europe and Asia, the workers in these upcoming economies are also having to cope with the rapid changes. Against this background, the central question of my study is which consequences the fall of the Iron Curtain in 1989 and the ongoing integration process until the early 2000s has had on the economic structure as well as on qualification trends and wage differentials in eastern Bavaria and the Czech border region. In principle, border regions play a special role in an integration process, since effects of transnational competition should be stronger in the absence of the deterrence of costs incurred in order to overcome distance. Drawing upon the trade model by Feenstra/Hanson and the New Economic Geography model by Brülhart et al., I derive hypotheses with regard to integration effects. In both countries I oppose the border districts to the non-border districts, which serve as the reference group.

The empirical examination in Germany is based on data from the IAB employment sample (IABS) and the employment register (BeH). The analysis of the economic structure in eastern Bavaria yields the result that there is no structural break in the development before and after the opening of the border. Likewise, the Iron Curtain had no special effects on the skill structure in eastern Bavaria, which is confirmed by econometric regressions for both employed and unemployed people. The results of the estimations of wage differentials are more striking. After the opening of the border some significant changes appear: low-skilled workers gain in the border region compared to their non-border counterparts in the period shortly after the fall of the Iron Curtain. From the mid 1990s onwards, however, a relative downtrend for this part of the eastern Bavarian workforce sets in with respect to the wage development. Until the end of the observation period the wage gap widens between low-skilled employees in the non-border- and the borderland.

Regarding the development in the Czech Republic, I exploit data from the Czech Microcensus and quarterly unemployment data of the Czech district labour exchanges. As in Germany, there are no indications for spatial effects of the opening of the border on the economic structure and the skill structure of employees and unemployed people. With respect to wage differentials I find evidence that the employees holding the lowest skill degree saw a relative gain in the border region in the second half of the observation period, which is in line with my findings on the German side of the border.

Due to globalisation, European countries are facing new challenges for their labour markets: Employees in Western Europe are exposed to strong pressures from low-wage countries, which for their part have had to cope with rapid economic changes. What consequences did the Fall of the Iron Curtain in 1989 and the subsequent integration process up to the early 2000s have on the labour market in the border regions between old and new EU member states? Michael Moritz addresses this question for the border region between Bavaria and the Czech Republic. He analyses whether the short distance between eastern Bavaria and the Czech border region had an impact on the development of economic structures, qualification trends, and wage differentials in both regions, and to what extent differences can be observed in comparison to the development in regions more distant from the border.

W. Bertelsmann Verlag

ISBN 978-3-7639-4013-4

Institut für Arbeitsmarkt- und Berufsforschung der Bundesagentur für Arbeit
Weddigenstraße 20-22 ▪ 90478 Nürnberg ▪ www.iab.de