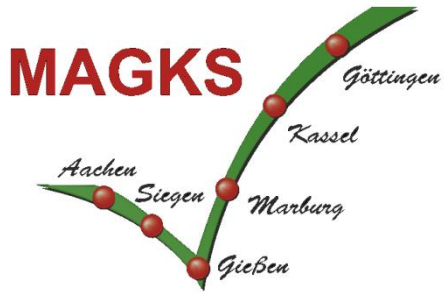

Joint Discussion Paper Series in Economics

by the Universities of

Aachen · Gießen · Göttingen
Kassel · Marburg · Siegen

ISSN 1867-3678

No. 39-2012

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The effect of market access on the labor market: Evidence from German reunification*

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August 14, 2012

Abstract

The New Economic Geography predicts a positive effect of market access on wages, as represented by the wage equation. Several studies provide empirical evidence in favor of the wage equation. However, a key problem is the endogeneity of market access: it is challenging to identify the causal effects of market access on wages, since market access itself depends on wages. Whereas most approaches rely on instrumental variables and strong assumptions on exogeneity, the present analysis relies on German reunification as an exogenous variation of market access in order to identify the effects. Since the market access shock due to reunification was accompanied by a labor supply shock due to migrants and commuters from eastern Germany, the effects on wages, employment and unemployment are analyzed. The results provide evidence in favor of a labor demand shock due to the increase in market access and a labor supply shock due to migrants and commuters from eastern Germany.

JEL Classification: F15, R12, R23

Keywords: New Economic Geography, wage equation, market access, natural experiment, differences-in-differences

*I would like to thank Bodo Aretz, Prof. Dr. Blien, Prof. Dr. Bräuninger, Prof. Dr. Bröcker, Ronny Freier, Ph.D., Prof. Dr. Hayo, Prof. Dr. Kessing, Florian Neumeier, Prof. Dr. Michaelis, Prof. Dr. Niebuhr, Prof. Dr. Otto, Dr. Steinhardt, Dr. Stiller, Dr. Wedemeier, Prof. Dr. Winker, Prof. Dr. Ziegler and the participants of the SMYE, the GfR Winterseminar, and the seminars at the HWWI, MAGKS and the University of Kiel for their valuable comments on earlier drafts of this paper. The usual disclaimer applies.

1 Introduction

The disparities in regional economies are an important concern of national and European economic policy. The New Economic Geography (NEG) provides a theoretical explanation of how such disparities emerge and why they persist. A key prediction from NEG theory is that because of the love of variety, transport costs and increasing returns to scale, firms locate close to large markets. This implies that factor prices are higher in regions where firms have access to larger markets. Hence, a key result of the NEG is the "wage equation", which states that wages positively depend on market access.

The empirical side of the NEG is, however, less developed than its theoretical counterpart. Redding (2010) presents a recent review of the empirical NEG literature and especially points to the problems of identification and potential alternative explanations. A key problem of estimating the wage equation is that market access is endogenous in it. It is thus challenging to identify the causal effects of market access on wages and to separate the effects of market access from other determinants of regional development (Redding 2010).

The present analysis therefore relies on a natural experiment to identify the effects of market access. German reunification presents an exogenous increase in market access that varies across regions. These differences across regions are used to estimate the effect of the increase in market access on wages, employment and unemployment in a differences-in-differences (DID) framework. The analysis is not restricted to wages but also includes employment and unemployment since the market access shock due to reunification was accompanied by a labor supply shock triggered by migrants and commuters from eastern Germany, which potentially alleviates the effects of the market access shock on wages. The estimates are based on data for 1.3 million individuals whose employment histories are observed over the period from 1975 to 2004, derived from the IABS data of the Institute for Employment Research (IAB).

The remainder of the paper is organized as follows. Section 2 presents the theoretical background. Section 3 provides a brief overview of the related empirical literature, highlighting the identification problems of previous studies. Section 4 presents the empirical approach and discusses its suitability in the case of German reunification. Then, the data are introduced in Section 5. The results are discussed in Section 6 and the conclusions are drawn in Section 7.

2 Theoretical Background

The idea that market access matters for the location of economic activity goes back to Harris (1954). Harris's measure of market potential MP (or market access) of a region r is the sum of

all accessible markets M divided by their distance d to that region,

$$MP_r = \sum_s M_s / d_{rs}. \tag{1}$$

He measures the sizes of accessible markets in terms of sales. However, he does not provide a theoretical foundation for his measure of market access or for how it influences the location of economic activity. This "fairly crude measure of market access" might lead to an overestimation of the role played by market access for the wages of surrounding regions (Hering and Poncet; 2010, p. 145). Nevertheless, Harris's idea of market access is now a key feature of most NEG models, which provide a sound theoretical foundation of market access and how it affects the location of economic activity.

The most prominent representation of the NEG is the seminal core-periphery model of Fujita et al. (1999). This model is based on monopolistic competition, the love of variety, transport costs and increasing returns to scale in a world of two regions and two sectors (manufacturing and agriculture). Combining these elements leads to the well-known wage equation (Fujita et al.; 1999, p. 64),

$$w_r = \left[\sum_s Y_s T_{rs}^{1-\theta} P_s^{\theta-1} \right]^{1/\theta}, \tag{2}$$

where w_r is the wage in region r, Y is income, T_{rs} are the transport costs between region r and s, P is the manufacturing price index and θ is the elasticity of substitution between varieties of manufactured goods. Hence, the wage in a region depends on the income in all other locations, whereas the influence of the neighbor's income declines with its distance. However, since income is defined as the sum of labor income (i.e. wages), endogeneity results. Two key approaches exist to estimate the wage equation, one from Hanson (2005) and one from Redding and Venables (2004).

In the original model of Fujita et al. (1999), there are two regions that each contain a manufacturing and an agricultural sector. Nevertheless, the model only allows for the full agglomeration of manufacturing activity in one region, or perfect symmetry in both regions. Helpman (1998) dropped the agricultural market and extended the model to cover a housing market. The resulting model produces less extreme outcomes and partial agglomeration might result. Hanson (2005, p. 6) uses the model of Helpman to derive his wage equation,

$$\ln(w_r) = \beta + \theta^{-1} \ln \left(\sum_s Y_s^{\frac{\theta(\mu-1)+1}{\mu}} H_s^{\frac{(\theta-1)(1-\mu)}{\mu}} w_s^{\frac{\theta-1}{\mu}} T_{rs}^{\theta-1} \right), \tag{3}$$

where β is a function of fixed parameters, H is the stock of housing and μ is the share of

expenditures for traded goods. Hanson replaces the transport costs by a function $T_{rs} = e^{-\tau d_{rs}}$, where τ are iceberg transport costs for a unit distance and d_{rs} is the distance between regions r and s. Then, wages depend on market access, whereas market access in a region is defined as the sum of income in all regions,[1] lowered by the distance to the respective regions. Mion (2004) also presents a linearization of Hanson's wage equation.

By contrast, Redding and Venables (2004) use a new trade theory model as the basis for their wage equation. In their equation, wages depend on market and supplier access. They derive market and supplier access from bilateral trade data based on a gravity equation. The approaches of Hanson (2005) and Redding and Venables (2004) thus both include a calculation of market access in order to estimate its influence on prices. This market potential is a function of income Y, which itself depends on wages w. This is where the endogeneity enters the models. Hanson (2005) and Redding and Venables (2004) use instruments in order to cope with this endogeneity.

In both specifications, the wage equation reflects labor demand by firms. An increase in market access implies that firms can serve a larger market, so that more firms enter the market, leading to an increase in labor demand. Then, the overall effect of an increase in market access depends on how labor supply is modeled.

The approach of Redding and Venables (2004) is based on the assumption of labor immobility. Further, the approaches of Redding and Venables (2004) and Hanson (2005) are both based on the assumption of fixed (i.e. inelastic) labor supply. These assumptions are not valid in the case of German reunification because with the opening of the border, significant numbers of people from eastern Germany entered the western German labor market as migrants or commuters. Dietz et al. (1992) show that in some regions the share of migrants and commuters as a proportion of regional employment was as much as 20 % by the end of 1991. Hence, labor supply significantly increased in western Germany in the aftermath of German reunification.

Therefore, it is important to consider the effects of elastic labor supply. When labor supply is elastic, the positive effect of market access on wages is alleviated by increasing labor supply. In an imperfect labor market, where there exists a negative relationship between unemployment and wages,[2] the effect of an increase in market access should lead to increasing wages and employment, but decreasing unemployment because the increase in wages raises labor supply.

Contrarily, the positive labor supply shock (due to migrants and commuters) should lead to decreasing wages, but increasing employment and unemployment. A detailed discussion of the

[1] More precisely it is defined as the sum of expenditures for the goods that can be shipped.

[2] This relationship is frequently confirmed by the wage curve literature. See, for example, Blanchflower and Oswald (1994, 2005).

labor supply shock is presented by Büttner and Rincke (2007) who discuss a specific model for the case of German reunification that consists of three regions: eastern Germany, the border regions to eastern Germany in the west and the hinterland. Since wages are lower in eastern Germany, the drastic reduction of mobility costs due to reunification leads to an increase in labor supply in the border regions at the expense of eastern Germany. Assuming a negative slope for the labor demand function, this increase in labor supply leads to increasing employment and decreasing wages in the border region. Further, assuming a negative relationship between unemployment and wages, as discussed by the wage curve literature, the decline in wages should be accompanied by an increase in unemployment.

3 Related Literature

In the empirical NEG literature, two key structural approaches to estimate the wage equation have been proposed by Hanson (2005) and Redding and Venables (2004). Hanson (2005) relies on Helpman's (1998) modification of the seminal core-periphery model of Fujita et al. (1999). Hanson does not estimate all equations of the model but rather captures its main features in an augmented market potential function. In this equation, nominal wages in a region depend on income, housing prices, wages and transportation costs in all other regions. It is clear that endogeneity arises, since wages appear on both sides of the equation. To cope with this problem Hanson uses spatially aggregated data on the right-hand side of the equation.

Redding and Venables (2004) derive a wage equation from a new trade theory model that has been extended to cover transport frictions and intermediate production goods. Their analysis proceeds in several steps. First, they estimate bilateral transport costs and market and supply capacities based on a gravity equation. They use these estimates to calculate the market access of exporters and the supplier access of importers. Based on these calculations, they estimate a wage equation where the wage depends on market and supplier access. Additionally, they regress the relative manufacturing price index on the estimate of supplier access. However, endogeneity remains an issue in the wage equation. Redding and Venables therefore use time-lagged estimates of market and supplier access in the wage equation to check the robustness of their results.

Many authors who structurally estimate a wage equation follow the approaches of Hanson (2005)[3] or Redding and Venables (2004)[4] and apply their analyses to other countries and contexts, or vary the original approaches. These structural approaches use instruments in order to

[3]Examples are Ahlfeldt and Feddersen (2009), Brakman et al. (2002, 2004, 2006), de Bruyne (2002), Garcia Pires (2006), Brakman et al. (2000), Kosfeld and Eckey (2010), Mion (2004), Niebuhr (2006), Ottaviano and Pinelli (2006), Overman et al. (2003) and Roos (2001).

[4]Examples are Breinlich (2006), Ma (2006), Mayer (2008) and Lin (2005).

identify the effects of market access on wages. Hence, these approaches face the problem that the validity of the results ultimately relies on the assumption that the instruments are strictly exogenous. Redding (2010, p. 301) accordingly concludes that "these instruments require demanding identification assumption, which are unlikely to be satisfied in practice".

A rather new approach is to use micro data in order to reduce the endogeneity problem. Mion and Naticchioni (2005) use linked employer-employee data to distinguish between the influence of market potential and urbanization on individual wages. Hering and Poncet (2010) in turn estimate a wage equation based on micro data for China, whereas Fingelton and Longhi (2011) do so for the United Kingdom. Although the problem of endogeneity is reduced by using micro data, it is not fully resolved.[5] Therefore, Hering and Poncet (2010), for example, rely on instruments in their micro-approach, too, in order to cope with endogeneity.

Another approach to cope with endogeneity is to use exogenous variations of market access to identify causal effects. The division of Germany after the Second World War and its reunification present variations of market access that are unlikely to depend on economic considerations and thus are exogenous. Redding and Sturm (2008) and Bosker et al. (2007) use this variation to test the effect of market access on city sizes. However, owing to a lack of data they are unable to discuss the effects on wages. Others have analyzed the bombing of Japan (Davis and Weinstein; 2002, 2008) or Vietnam (Miguel and Roland; 2011) to discuss NEG arguments. However, they do not test the effects of market access on wages either.

Bröcker and Meier (2010) have already used the reunification of Germany as an exogenous variation of market access to estimate its influence on productivity and employment. They derive an indicator of market access from a theoretical model and use it in their empirical analysis. They find a positive effect of market access in both cases. By contrast, Büttner and Rincke (2007) argue that the reunification of Germany presents a labor supply shock for the direct border regions in western Germany. They apply a DID approach to empirically show the negative effect of the labor supply shock on wages in border regions. Further, they show the positive effects of the labor supply shock on employment and unemployment. The present analysis also applies a DID approach based on German reunification as a natural experiment, but the effects of market access on wages, employment and unemployment are estimated and the interrelation of the labor supply shock with the market access (labor demand) shock is discussed.

Other related articles include the surveys of integration effects in border regions presented by Niebuhr and Stiller (2004, 2006), a survey of results for the labor market effects of trade by Pflüger et al. (2010)[6] and articles by Moritz (2009a,b, 2011) and Moritz and Gröger (2007), who

[5]The problem is reduced since the individual wage has only a minor influence on the aggregate wage level. However, wages in a region are usually correlated, meaning that the problem remains.

[6]De Pinto and Michaelis (2011), for example, consider the effects of heterogeneous workers in this strand of

present results for the labor market effects of European integration in the Bavarian/Czech border region.

For the case of the European integration in the Bavarian/Czech border regions, Moritz (2009a) reports mixed effects on the labor market. There is no structural break in the employment share of border regions in Bavaria, nor in the structural change. Moritz (2009a,b), however, finds that wages of low-skilled male employees increased in border regions due to the integration. Nevertheless, the wage gap between low-skilled and skilled employees increased in the border regions from 1995 to 2001. Moritz and Gröger (2007) also investigate the effects of this integration process on Bavarian border regions and focus on the skill structure. They do not find clear effects on the skill structure. There is weak evidence for wage increases of low-skilled employees, but no effects on skilled and high-skilled employees. Moritz (2011) further investigates the effects of Czech commuters after the fall of the Iron Curtain on the labor market in Bavarian border regions. He does not find far-reaching negative effects of these commuters on the Bavarian labor market. It seems that the integration process between Czech and Bavarian border regions had at most little effects on the Bavarian regional labor markets.

Brülhart et al. (2012) analyze the effects of the integration process between Austria and central and eastern Europe on local labor markets in Austria. They find a rapid positive response of wages and a slower but more pronounced positive response of employment to the integration shock in border municipalities. This implies that the shock was mainly absorbed by quantity (employment) adjustments and only to a lesser extend by price (wage) adjustments. Their results thus confirm that it is important to draw a more encompassing picture of the market under shock, rather than focusing on a single outcome variable only, when discussing the effects of market access shocks.

4 Empirical Approach

The basic idea of the present analysis is to treat German reunification as a natural experiment to test the effects of market access on wages, employment and unemployment, based on the arguments of Redding and Sturm (2008). In this setting, German reunification presents the treatment and border regions are regarded as the treatment group. German reunification is suited as a natural experiment since it came as a surprise to most observers and it led to a large trade shock.[7] In the course of reunification, the regions in western Germany gained new trading

literature in their theoretical model.

[7]In particular, Nitsch (2004) shows that the relation of west-to-east German exports is higher than exports from western Germany to foreign countries by a factor of 2.2 and that most of the increase in west-to-east German exports occurred between 1989 and 1992. Hence, the effect was strong and occurred rapidly after reunification.

partners in eastern Germany. This increase in market access was more pronounced for regions close to the former inner-German border since their trading costs to eastern German regions were lower compared with those for remote regions due to the smaller distance. More precisely, the decline in trading costs to eastern Germany induced by reunification was more pronounced for border regions than it was for non-border regions due to the smaller distance to the border. There is no clear argument why the selection process of the regions into the treatment group should be influenced by the variables investigated herein (wages, employment and unemployment), since selection into the treatment group is solely based on the geographical location of the regions. Hence, the treatment can be assumed to be exogenous.[8]

Based on the theoretical background, a positive labor demand shock of reunification on border regions is expected. Assuming inelastic labor supply, this should lead to higher wages. However, as labor supply is unlikely to be inelastic, the effect on wages should be alleviated by increasing employment and decreasing unemployment. The empirical approach used here to test these hypotheses is the DID framework. In this framework, the effect of a treatment on a treatment group is identified by comparing the relative development of the variable of interest in the treatment group in course of the treatment compared with a control group in the same period. This can be carried out in a fixed effects panel estimation using the specification

$$y_{rt} = \alpha_r + \beta_1 gru_t + \beta_2 (gru_t \times border_r) + \epsilon_{rt}, \tag{4}$$

where y_{rt} denotes the variable of interest and α_r represents the regional fixed effects that are used to control for preexisting time-constant differences between the regions. The overall effect of time before and after the treatment (here: German reunification) is captured by a time dummy gru_t, which is zero prior to the treatment and one during/after the treatment. The effect of the treatment on the treatment group is represented by the interaction of this time dummy with a dummy for the treatment group $border_r$, which are the border regions in this case. The key identifying assumption of this approach is that the treatment and control groups would have followed the same trend if the treatment had not occurred. In order to identify the treatment effect the researcher has to assume that the coefficient β_2 would be zero in the absence of the treatment. This assumption is of course invalid if the trend in the outcome variable y_{rt} was already different before the treatment. When there are preexisting differences in trends, and the researcher does not control for this, the coefficient β_2 captures both these preexisting differences in trends as well as the treatment effect.

[8]German reunification is frequently applied as a natural experiment to test various hypotheses. In the case of the labor market or trade effects, see, for example, Redding and Sturm (2008), Bröcker and Meier (2010) and Büttner and Rincke (2007).

Based on the above, the present approach argues that reunification increases market access for the border regions so that a positive labor demand shock from reunification on these regions is expected. This increase of market access is the result of the decline in transport costs, caused by reunification. By comparing the labor market variables in the border regions with those in the control regions, the effects of the increase in market access on wages, employment and unemployment are identified. No indicator is available for the labor force so that the effects of the increase in market access on the distribution of the labor force cannot be discussed. However, the effects on employment and unemployment implicitly contain information on the effect on the distribution of the labor force.

Büttner and Rincke (2007) argue that reunification presents a positive labor supply shock, because significant numbers of migrants and commuters from eastern Germany entered the western German labor market immediately after the opening of the border. This is explicitly illustrated by the figures presented by Dietz et al. (1992) on the regional shares of migrants and commuters from eastern Germany in western German regional employment. In some regions, these shares are as high as 20 % by the end of 1991.

A problem with the present approach, therefore, is that reunification actually presents two shocks, namely a positive labor demand shock and a positive labor supply shock, which makes it difficult to disentangle the two. However, these two shocks have different implications for the development of wages, employment and unemployment. A positive labor demand shock should lead to higher wages, higher employment and lower unemployment, whereas a positive labor supply shock should lead to lower wages, higher employment and higher unemployment. Accordingly, the aggregate developments of wages and unemployment will show which of the labor market shocks dominates. However, when employment is positively affected by reunification, it is unclear whether this is because of the labor demand or the labor supply shock. The figures by Dietz et al. (1992) provide the possibility to partially control for the labor supply shock at the regional level, but the measure is imperfect since the figures are only available for the end of 1991. Furthermore, the share of migrants and commuters reflects the labor supply shock, the location decisions of these migrants and commuters and the composition effect of the migrants and commuters on the employees in the region.[9]

Bertrand et al. (2004) argue that standard panel DID approaches too often reject the null hypothesis of no treatment effect. They show that when there is serial correlation, the standard approach implies a wrong estimation of standard errors, leading to an over-rejection of the null hypothesis. They propose three procedures to correct these standard errors: block bootstrap, an

[9]The migrants and commuters from eastern Germany were especially medium and highly qualified employees (Dietz et al.; 1992), which affected the composition of the employees in the destination regions.

arbitrary variance-covariance matrix or collapsing the data into pre- and post-treatment periods. The first two methods provide reasonable results when N is large. The third method is also applicable for small N, although the power of this test is small. Here, the second method is used throughout in order to correct the standard errors, as N is large enough.[10] More precisely, an arbitrary variance-covariance matrix is estimated where the errors are clustered at the state level (see Bertrand et al.; 2004).

5 Data

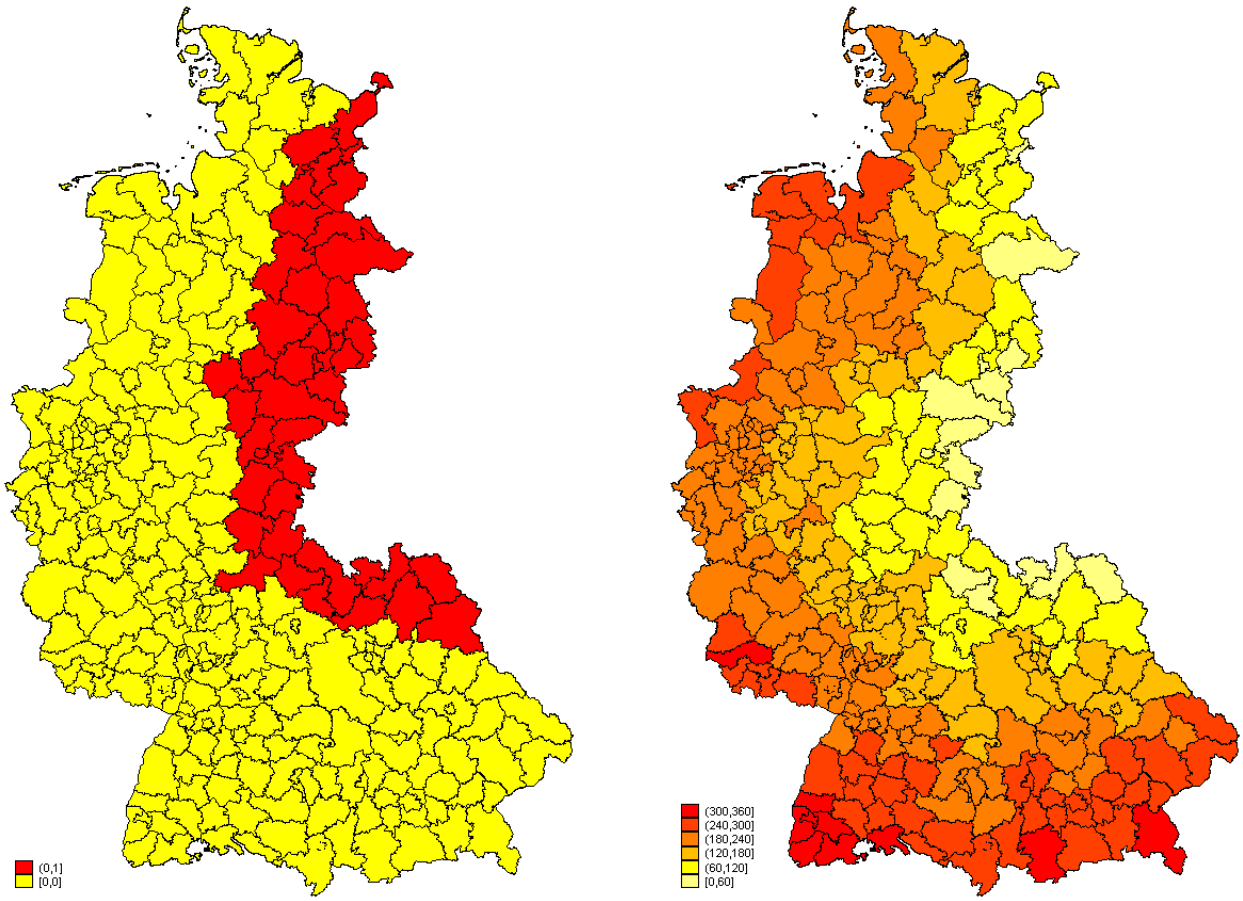
This analysis relies on the IAB Employment Sample (IABS), which contains the employment histories of 1.3 million individuals in Germany between 1975 and 2004 at the NUTS 3 level. These data are provided by the IAB for scientific purposes as a Scientific Use File. The long period of the data provides the opportunity to use the reunification of Germany as an exogenous variation of market access in order to estimate its effect on labor market indicators over a long period.

An advantage of IABS data is its high reliability, because it is based on official data that are used for the calculation of social security contributions. However, a disadvantage of the data is that wages are reported only below the contribution limit for the social insurance system. The procedure proposed by the IAB is used to impute wages above the limit (Gartner; 2005). In order to improve the quality of the qualification variable the procedure proposed by Fitzenberger et al. (2006) is applied.

The data are organized in employment spells, indicating the start and end date of each employment or unemployment phase. These spells are reorganized into a panel data set by looking at the employment status of each individual on 30th June each year. This is in accordance with the procedure of the federal employment agency for official statistics on regional employment. IABS data are then used to derive the regional wage level w_{rt} and the regional number of employees l_{rt}, where r indicates the region and t indicates the year. Both w_{rt} and l_{rt} are measured in logs. The regional unemployment rate u_{rt} is derived from an official publication of the German employment agency (Bundesagentur für Arbeit; 2005).

Different definitions to differentiate between the treatment and control groups are used. The main definition is based on neighborhood. In the neighborhood setting, regions are defined as being close to the border when they are first- or second-order neighbors to the border. This is illustrated in Figure 1(a). To locate these individuals, the NUTS 3 regions of their work-places were identified. IABS data provide the NUTS 3 region of the work-place for each job match.

[10] Bertrand et al. (2004) consider an N of 50 as large in their simulations, whereas here N is 266.



(a) Neighborhood

(b) Travel Time in Minutes by Car

Source: Büro für Raumforschung, Raumplanung und Geoinformation (2009), authors own illustration.

Figure 1: Definition of the Treatment Group

However, some small regions have been merged with their neighbors into larger regions. The number of regions in the data set is 266.

Further, the distance of each region to eastern Germany is quantified by the travel times between the regions. Travel time is measured by the car travel time in minutes from each centroid of a region to the closest centroid of any eastern German region, derived from a travel time matrix.[11] A centroid reflects the most important administrative center of a region. Figure 1(b) shows the distribution of these travel times.

Another feature that has to be taken into account is the special subsidies to the regions at the border to eastern Germany and eastern Europe called *Zonenrandförderung*. These regions

[11] Büro für Raumforschung, Raumplanung und Geoinformation (2009).

are identified using official publications. New subsidies were granted to firms in these regions until the end of 1991. These features are captured by a dummy for regions subject to the *Zonenrandförderung* (zrg_r) and a time dummy for years before 1992 ($subsidy_t$), the period during which these subsidies were granted. Additionally, the regional share of migrants and commuters in total employment from eastern Germany serves as a control for the labor supply shock after reunification. These data are derived from Dietz et al. (1992) who report this share for the end of 1991. They are thus used for all years from 1990 but set to zero for years before 1990 in order to control for the increase in labor supply after reunification.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Full Sample					
w_{rt} (a)	4522	4.996	0.192	4.531	5.691
w_{rt} (b)	4522	4.739	0.185	4.291	5.212
l_{rt} (a)	4522	6.517	0.638	5.043	9.054
l_{rt} (c)	4522	7.090	0.622	5.666	9.627
u_{rt}	4522	0.087	0.033	0.023	0.273
zrg_r	4522	0.162	0.368	0.000	1.000
$migr_{rt}$	4522	0.031	0.034	0.000	0.200
Treatment Group ($border_r = 1$)					
w_{rt} (a)	714	4.957	0.176	4.551	5.549
w_{rt} (b)	714	4.705	0.182	4.297	5.200
l_{rt} (a)	714	6.464	0.681	5.198	9.054
l_{rt} (c)	714	7.060	0.658	5.969	9.627
u_{rt}	714	0.101	0.028	0.036	0.194
zrg_r	714	0.786	0.411	0.000	1.000
$migr_{rt}$	714	0.064	0.060	0.000	0.200
Control Group ($border_r = 0$)					
w_{rt} (a)	3808	5.003	0.194	4.531	5.691
w_{rt} (b)	3808	4.745	0.186	4.291	5.212
l_{rt} (a)	3808	6.527	0.629	5.043	8.867
l_{rt} (c)	3808	7.095	0.615	5.666	9.486
u_{rt}	3808	0.085	0.033	0.023	0.273
zrg_r	3808	0.045	0.207	0.000	1.000
$migr_{rt}$	3808	0.025	0.021	0.000	0.080
Time Period	1984-2000				
(a) - based on male full time employees					
(b) - based on all low/medium qualified employees					
(c) - based on all employees					

Table 1: Descriptive Statistics

Table 1 contains the descriptive statistics of the data for the full sample, as well as individually for the treatment and control groups. Treatment regions are defined as those regions that are first- or second-order neighbors of eastern Germany ($border_r = 1$); the remaining regions are defined as members of the control group ($border_r = 0$). Table 1 refers to the period 1984 to 2000. The descriptive statistics, which are based on the regional aggregates, show some key features of the data. For example, the log wage is lower in the treatment compared with the control group. Further, the share of migrants and commuters from eastern Germany in total regional employment is larger in treatment regions. An important feature is contained in the

dummy variable for regions subject to the *Zonenrandförderung*: Treatment and control groups both contain regions subject to as well as not subject to the *Zonenrandförderung*. This is because not all second-order neighbors of eastern Germany received those subsidies and because those subsidies were granted to regions at the border to eastern Europe, which covers more regions than just the border regions to eastern Germany.

A prerequisite of the analysis is that the sectoral structure must not diverge too much between the border and non-border regions. In particular, the share of the tradeables sector should be sufficiently large so that the increase of market access, due to reunification, can have an effect on the labor markets in the border regions. Table 11 in the appendix highlights that the sectoral structure is very similar between border and non-border regions. Thus the sectoral structure does not constrain the analysis.

6 Results

This section presents the results of the estimations. The first subsection refers to the effects on wages, the second to unemployment and the third to employment. Based on the insights into the developments of the individual labor market indicators, a picture of the shocks that occurred on the labor market is drawn in the last subsection, including an analysis of the robustness.

6.1 Wages

A DID approach is applied to show the overall effect of reunification on wages in the border regions. Average regional wages are based on the information on full-time male employees only. The hypothesis, derived from the wage equation, is that reunification led to an increase in market potential, resulting in an increase in wages. However, reunification also lead to an increase in labor supply due to migrants and commuters from eastern Germany, especially in the border regions, which should lead to a decrease in average wages in border regions (see Büttner and Rincke; 2007). The first DID specification is

$$\begin{aligned} w_{rt} = \alpha_r + \beta_1 gru_t + \beta_2 (gru_t \times border_r) \\ + \beta_3 subsidy_t + \beta_4 (zrg_r \times subsidy_t) + \beta_5 migr_{rt} + \epsilon_{rt}, \end{aligned} \tag{5}$$

where w_{rt} represents average log wages in region r and at year t. gru_t is a time dummy for reunification, which is one for the period of reunification, starting in 1990, and zero for the pre-

Variable		Model	
		w5a	w5b
gru_t	coef.	0.1630***	0.1683***
	s.e.	(0.0033)	(0.0013)
$(gru_t \times border_r)$	coef.	-0.0292***	-0.0225***
	s.e.	(0.0055)	(0.0037)
$(zrg_r \times subsidy_t)$	coef.	0.0125***	0.0106***
	s.e.	(0.0040)	(0.0038)
$subsidy_t$	coef.	-0.2229***	-0.2226***
	s.e.	(0.0019)	(0.0019)
$migr_{rt}$	coef.	0.1316*	
	s.e.	(0.0759)	
constant	coef.	5.0166***	5.0166***
	s.e.	(0.0009)	(0.0009)
NT		5586	5586
time		1984-2004	1984-2004
indiv. eff.		yes	yes
time eff.		no	no
rob. s.e. (1)		yes	yes
(1) according to Bertrand et al. (2004)			
sign. lev.: *0.1, **0.05, ***0.01			

Table 2: Specification 5 for Wages

reunification period until 1989. The variable $border_r$ is one for regions that are defined as border regions and zero for the remaining regions. Border regions are the treatment group and these are usually defined as first- and second-order neighbors, although below the robustness of the results is shown by changing this definition. The interaction effect $(gru_t \times border_r)$ captures the effect of reunification on border regions, that is, the treatment effect. A time dummy $subsidy_t$ controls for the subsidies of the *Zonenrandförderung*, which is one for the period of these subsidies (and zero otherwise). This is interacted with a dummy zrg_r, which is one for the regions of the *Zonenrandförderung* and zero for the remaining regions. $migr_{rt}$ reflects the share of migrants and commuters from eastern Germany in total regional employment. This controls for the overall effect of the labor supply shock on wages. The model is a fixed effects panel model (within transformation), while α_r contains the individual effects and ϵ_{rt} is the error term.

The results are presented in Table 2.[12] It seems that the overall effect of reunification on wages in border regions was negative, even when controlling for the labor supply shock. This is in contrast to the hypothesis of a positive market access shock. The effect of the labor supply shock, represented by $migr_{rt}$, seems to be positive. However, this variable represents the effect of migration and commuting on wages, the location choices of migrants and commuters and the effect of migration on the skill composition of employees.

Büttner and Rincke (2007) instead use interactions between yearly time dummies and the border region dummy to illustrate the variation in the effect of the labor supply shock on wages

[12] All models are labeled using three elements. The first element refers to the endogenous variable, the second to the equation (specification) number from the text and the last is an alphabetic index of the models.

Variable		Model			
		w6a	w6b	w6c	w6d
$(d_{1985} \times border_r)$	coef.			-0.0019	-0.0019
	s.e.			(0.0025)	(0.0025)
$(d_{1986} \times border_r)$	coef.			-0.0058*	-0.0058*
	s.e.			(0.0032)	(0.0032)
$(d_{1987} \times border_r)$	coef.	-0.0033	-0.0033	-0.0091***	-0.0091***
	s.e.	(0.0022)	(0.0022)	(0.0035)	(0.0035)
$(d_{1988} \times border_r)$	coef.	0.0003	0.0003	-0.0055	-0.0055
	s.e.	(0.0027)	(0.0027)	(0.0041)	(0.0041)
$(d_{1989} \times border_r)$	coef.	-0.0063*	-0.0063*	-0.0121**	-0.0121**
	s.e.	(0.0033)	(0.0033)	(0.0049)	(0.0049)
$(d_{1990} \times border_r)$	coef.	-0.0208***	-0.0127***	-0.0266***	-0.0185***
	s.e.	(0.0043)	(0.0029)	(0.0060)	(0.0046)
$(d_{1991} \times border_r)$	coef.	-0.0243***	-0.0162***	-0.0301***	-0.0219***
	s.e.	(0.0046)	(0.0029)	(0.0063)	(0.0046)
$(d_{1992} \times border_r)$	coef.	-0.0224***	-0.0160***	-0.0282***	-0.0220***
	s.e.	(0.0049)	(0.0041)	(0.0065)	(0.0057)
$(d_{1993} \times border_r)$	coef.	-0.0200***	-0.0136***	-0.0257***	-0.0196***
	s.e.	(0.0049)	(0.0040)	(0.0064)	(0.0055)
$(d_{1994} \times border_r)$	coef.	-0.0216***	-0.0152***	-0.0273***	-0.0212***
	s.e.	(0.0050)	(0.0039)	(0.0060)	(0.0049)
$(d_{1995} \times border_r)$	coef.	-0.0267***	-0.0203***	-0.0324***	-0.0263***
	s.e.	(0.0054)	(0.0043)	(0.0066)	(0.0054)
$(d_{1996} \times border_r)$	coef.	-0.0323***	-0.0259***	-0.0380***	-0.0319***
	s.e.	(0.0053)	(0.0042)	(0.0064)	(0.0053)
$(d_{1997} \times border_r)$	coef.	-0.0319***	-0.0255***	-0.0376***	-0.0315***
	s.e.	(0.0058)	(0.0050)	(0.0069)	(0.0060)
$(d_{1998} \times border_r)$	coef.	-0.0330***	-0.0266***	-0.0388***	-0.0326***
	s.e.	(0.0055)	(0.0047)	(0.0069)	(0.0061)
$(d_{1999} \times border_r)$	coef.	-0.0416***	-0.0353***	-0.0474***	-0.0412***
	s.e.	(0.0077)	(0.0071)	(0.0090)	(0.0084)
$(d_{2000} \times border_r)$	coef.	-0.0444***	-0.0381***	-0.0502***	-0.0441***
	s.e.	(0.0071)	(0.0065)	(0.0086)	(0.0080)
$(zrg_r \times subsidy_t)$	coef.	0.0032	0.0008	0.0032	0.0005
	s.e.	(0.0035)	(0.0033)	(0.0041)	(0.0038)
$migr_{rt}$	coef.	0.1351**		0.1348**	
	s.e.	(0.0592)		(0.0670)	
constant	coef.	4.7801***	4.7805***	4.7125***	4.7129***
	s.e.	(0.0014)	(0.0014)	(0.0018)	(0.0018)
NT		3990	3990	4522	4522
time		1986-2000	1986-2000	1984-2000	1984-2000
indiv. eff.		yes	yes	yes	yes
time eff.		yes	yes	yes	yes
rob. s.e. (1)		yes	yes	yes	yes
(1) according to Bertrand et al. (2004)					
sign. lev.: *0.1, **0.05, ***0.01					

Table 3: Specification 6 for Wages

over time. Their approach is shown in Table 3. The specification of this model is

$$w_{rt} = \alpha_r + \sum_{t=2}^{T} \phi_{1,t} d_t + \sum_{t=2}^{T} \phi_{2,t}(d_t \times border_r) + \phi_3(zrg_r \times subsidy_t) + \phi_4 migr_{rt} + \nu_{rt}, \tag{6}$$

where d_t is a set of dummy variables for each year (with the first year as the base year) and $(d_t \times border_r)$ is the respective interaction effect for each year dummy with the border region dummy. The remaining variables are as before and the model is estimated as fixed effects where α_r contains the individual effects and ν_{rt} is the error term. In contrast to Büttner and Rincke (2007) first- and second-order neighbors are used as border regions because this analysis focuses on the effect of market access, which potentially works at larger distances. Variations of this definition are presented later to show the robustness of the results. The results of Büttner and Rincke (2007) are confirmed when applying their estimation approach. Starting from 1990, the interactions between the year dummies and border dummy are negative and significant. This points to a negative effect of reunification on wages in border regions and stands in contrast to the hypothesis of a positive effect of market access on wages. However, the results are not robust: when changing the time period to the years 1984 to 2000, the interaction effects become negative and significant before reunification. This highlights that the negative interaction effects are not due to reunification. Instead, there is a general negative trend in these interactions because the trend of wages in border regions tended to be worse than that in the remaining regions before reunification. Hence, one cannot conclude from the negative interaction effects that reunification had a negative effect on wages. The common trend hypothesis is violated and thus simply comparing the average levels of wages in the treatment and control regions before and after reunification, as is carried out in the models from Tables 2 and 3, is misleading. To support this argument, wages in the control and treatment regions before reunification (time period from 1984 to 1989) are regressed on a time trend $trend_t$,[13] which is interacted with the border dummy $(trend_t \times border_r)$ in a fixed effects panel model. Table 4 presents the results.

$$w_{rt} = \alpha_r + \gamma_1 trend_t + \gamma_2(trend_t \times border_r) + \varepsilon_{rt}. \tag{7}$$

The results from Table 4 highlight that the common trend hypothesis is indeed violated. Wage trends in border regions were already worse than those in the remaining regions before reunification, as the coefficient for the interaction effect γ_2 is negative and significant. One

[13] The time trend $trend_t$ is one for the year 1984, two for the year 1985 and so on.

Variable		Model		
		w7	w8a	w8b
$trend_t$	coef.	0.0334***	0.0334***	0.0334***
	s.e.	(0.0002)	(0.0003)	(0.0003)
$(trend_t \times border_r)$	coef.	-0.0021***	-0.0021**	-0.0021**
	s.e.	(0.0005)	(0.0009)	(0.0009)
gru_t	coef.		0.1067***	0.1116***
	s.e.		(0.0038)	(0.0028)
$(gru_t \times border_r)$	coef.		-0.0081	-0.0001
	s.e.		(0.0069)	(0.0054)
$(gru_t \times trend_t)$	coef.		-0.0105***	-0.0105***
	s.e.		(0.0004)	(0.0004)
$(gru_t \times border_r \times trend_t)$	coef.		-0.0003	-0.0005
	s.e.		(0.0009)	(0.0009)
$migr_{rt}$	coef.		0.1275*	
	s.e.		(0.0665)	
$(zrg_r \times subsidy_t)$	coef.		0.0007	-0.0013
	s.e.		(0.0034)	(0.0032)
$subsidy_t$	coef.		-0.0529***	-0.0525***
	s.e.		(0.0014)	(0.0014)
constant	coef.	4.6801***	4.7329***	4.7329***
	s.e.	(0.0007)	(0.0025)	(0.0025)
NT		1596	4522	4522
time		1984-1989	1984-2000	1984-2000
indiv. eff.		yes	yes	yes
time eff.		no	no	no
rob. s.e. (1)		no	yes	yes
(1) according to Bertrand et al. (2004)				
sign. lev.: *0.1, **0.05, ***0.01				

Table 4: Specifications 7 and 8 for Wages

therefore cannot conclude from the previous models that reunification had a negative effect on wage levels: this negative effect might just simply reflect the preexisting negative trends in wages. The following DID approach is used to take these differences in trends into account,

$$\begin{aligned} w_{rt} = \alpha_r &+ \theta_1 trend_t + \theta_2(trend_t \times border_r) + \theta_3 gru_t + \theta_4(gru_t \times border_r) \\ &+ \theta_5(gru_t \times trend_t) + \theta_6(gru_t \times border_r \times trend_t) \\ &+ \theta_7 subsidy_t + \theta_8(zrg_r \times subsidy_t) + \theta_9 migr_{rt} + \eta_{rt}. \end{aligned} \tag{8}$$

The model is estimated as fixed effects. $gru_t \times trend_t$ represents the interaction of the reunification dummy with the trend, i.e. the change in the time trend due to reunification. $gru_t \times border_r \times trend_t$ represents the interaction of border regions with reunification and the time trend and captures the difference in the change in the time trend due to reunification in border compared with non-border regions. The remaining variables are as above. The results are presented in Table 4.

In this setting, neither θ_4 nor θ_6 are significantly different from zero. When controlling for

preexisting differences in trends, the effect of reunification on wages vanishes. Note that the effect of migrants and commuters on wages (θ_9) is positive and significant, although only at the 10 % level. However, this coefficient reflects the labor supply shock, the location decisions of migrants and commuters and the composition effect of employees' qualifications. The results are robust against the exclusion of the migration variable. Therefore, there is no significant aggregate effect of reunification on the wages of full-time male employees.

In a next step, the above regressions are repeated based on wage data for all low and medium qualified employees.[14] As in Büttner and Rincke (2007), high qualified are excluded, since for a significant proportion of them wages are censored at the social security system contribution limit. The results do not change qualitatively, except for specification 8. Here, there is a significant negative effect of reunification on wages and a much stronger positive and significant effect of migration on wages. However, the former effect vanishes when restricting the coefficient for migration to zero ($\theta_9 \equiv 0$). This confirms that the aggregate effect of reunification, including the labor supply shock as well as the labor demand shock (due to the increase in market access), is zero.

6.2 Unemployment

As the aggregate effect of the labor demand shock (due to the increase in market access) and the labor supply shock (due to migrants and commuters from eastern Germany) on regional wages after reunification is zero, the analysis proceeds with the effects on unemployment. As a first approach, specification 5 is estimated, although wages w_{rt} are replaced by the unemployment rate u_{rt} as the endogenous variable. In the basic specification where migration $migr_{rt}$ is included, there seems to be a positive and significant effect of reunification on the unemployment rate. However, this effect becomes insignificant when standard errors, as suggested by Bertrand et al. (2004), are used. Nevertheless, the positive effect of migration on the unemployment rate remains. It seems that there was indeed a positive labor supply shock (see Table 5).

Specification 6 is applied to the unemployment rate u_{rt} to illustrate the time variation of this effect. These results seem to confirm the results from model u5a: starting in 1990, the interactions between the year dummies and border dummy are positive and many of them are significantly so, when excluding migration from the specification ($\phi_4 \equiv 0$). In the model where ϕ_4 is not restricted to zero, the effect of the labor supply shock on the unemployment rate is fully captured by the migration variable $migr_{rt}$ and no more reflected in the year border interactions, as these interactions become insignificant. However, by adjusting the time period, the results

[14] The results are in the appendix.

Variable		Model	
		u5a	u5b
gru_t	coef.	-0.0371***	-0.0371***
	s.e.	(0.0012)	(0.0020)
$(gru_t \times border_r)$	coef.	0.0044**	0.0044
	s.e.	(0.0019)	(0.0045)
$(zrg_r \times subsidy_t)$	coef.	0.0082***	0.0082**
	s.e.	(0.0015)	(0.0040)
$subsidy_t$	coef.	-0.0254***	-0.0254***
	s.e.	(0.0008)	(0.0008)
$migr_{rt}$	coef.	0.1012***	0.1012**
	s.e.	(0.0218)	(0.0433)
constant	coef.	0.1188***	0.1188***
	s.e.	(0.0008)	(0.0007)
NT		5586	5586
time		1984-2004	1984-2004
indiv. eff.		yes	yes
time eff.		no	no
rob. s.e. (1)		no	yes
(1) according to Bertrand et al. (2004)			
sign. lev.: *0.1, **0.05, ***0.01			

Table 5: Specification 5 for Unemployment

for the year border interaction coefficients again change substantially. It still seems that the unemployment rate increased in border regions due to reunification when ϕ_4 is restricted to zero, although this is hard to distinguish from a potentially different time trend in the border regions compared with the remaining regions (see Table 6).

Therefore, specification 7 is estimated for the unemployment rate as the endogenous variable to test for diverging trends before reunification. The results show that the time trend in the unemployment rate was different in border regions before reunification (see Table 7). To control for these differences in trends between border and non-border regions, specification 8 is estimated for the unemployment rate as the endogenous variable. The results confirm that the labor supply shock due to migration had a positive effect on the unemployment rate. However, interestingly, now there is a negative effect of reunification on the unemployment rate in border regions. This shows that the increase in market access due to reunification and the respective labor demand shock significantly reduced the unemployment rate in border regions, when controlling for the labor supply shock. However, this effect is not permanent, as reunification simultaneously led to an increase in the general trend of the unemployment rate in border regions compared with non-border regions (see Table 7).

6.3 Employment

So far, the results point to a simultaneous positive labor supply and positive labor demand shock, the former due to migration and commuting from eastern Germany and the latter due to the

Variable		Model			
		u6a	u6b	u6c	u6d
$(d_{1985} \times border_r)$	coef.			-0.0021*	-0.0021*
	s.e.			(0.0012)	(0.0012)
$(d_{1986} \times border_r)$	coef.			-0.0071***	-0.0071***
	s.e.			(0.0018)	(0.0018)
$(d_{1987} \times border_r)$	coef.	-0.0009	-0.0009	-0.0079***	-0.0079***
	s.e.	(0.0008)	(0.0008)	(0.0022)	(0.0022)
$(d_{1988} \times border_r)$	coef.	0.0005	0.0005	-0.0066***	-0.0066***
	s.e.	(0.0014)	(0.0014)	(0.0024)	(0.0024)
$(d_{1989} \times border_r)$	coef.	0.0018	0.0018	-0.0053**	-0.0053**
	s.e.	(0.0017)	(0.0017)	(0.0027)	(0.0027)
$(d_{1990} \times border_r)$	coef.	-0.0030	0.0062***	-0.0070*	-0.0009
	s.e.	(0.0035)	(0.0022)	(0.0042)	(0.0028)
$(d_{1991} \times border_r)$	coef.	-0.0049	0.0043*	-0.0089**	-0.0028
	s.e.	(0.0036)	(0.0025)	(0.0042)	(0.0028)
$(d_{1992} \times border_r)$	coef.	-0.0004	0.0068	-0.0016	0.0030
	s.e.	(0.0051)	(0.0049)	(0.0059)	(0.0056)
$(d_{1993} \times border_r)$	coef.	-0.0002	0.0070	-0.0014	0.0032
	s.e.	(0.0054)	(0.0052)	(0.0061)	(0.0058)
$(d_{1994} \times border_r)$	coef.	0.0005	0.0077	-0.0007	0.0039
	s.e.	(0.0058)	(0.0056)	(0.0065)	(0.0062)
$(d_{1995} \times border_r)$	coef.	0.0018	0.0090	0.0006	0.0052
	s.e.	(0.0058)	(0.0056)	(0.0066)	(0.0062)
$(d_{1996} \times border_r)$	coef.	0.0050	0.0122**	0.0038	0.0084
	s.e.	(0.0058)	(0.0056)	(0.0066)	(0.0063)
$(d_{1997} \times border_r)$	coef.	0.0073	0.0145**	0.0061	0.0108*
	s.e.	(0.0057)	(0.0056)	(0.0065)	(0.0063)
$(d_{1998} \times border_r)$	coef.	0.0088	0.0160***	0.0076	0.0122**
	s.e.	(0.0056)	(0.0055)	(0.0064)	(0.0062)
$(d_{1999} \times border_r)$	coef.	0.0088	0.0159***	0.0075	0.0122**
	s.e.	(0.0055)	(0.0053)	(0.0063)	(0.0061)
$(d_{2000} \times border_r)$	coef.	0.0100*	0.0172***	0.0088	0.0134**
	s.e.	(0.0054)	(0.0053)	(0.0063)	(0.0060)
$(zrg_r \times subsidy_t)$	coef.	0.0093**	0.0066	0.0131**	0.0110**
	s.e.	(0.0044)	(0.0046)	(0.0055)	(0.0056)
$migr_{rt}$	coef.	0.1519***		0.1018**	
	s.e.	(0.0409)		(0.0448)	
constant	coef.	0.0926***	0.0930***	0.1027***	0.1030***
	s.e.	(0.0013)	(0.0013)	(0.0014)	(0.0014)
NT		3990	3990	4522	4522
time		1986-2000	1986-2000	1984-2000	1984-2000
indiv. eff.		yes	yes	yes	yes
time eff.		yes	yes	yes	yes
rob. s.e. (1)		yes	yes	yes	yes
(1) according to Bertrand et al. (2004)					
sign. lev.: *0.1, **0.05, ***0.01					

Table 6: Specification 6 for Unemployment

Variable		Model	
		u7	u8a
$trend_t$	coef.	-0.0043***	-0.0043***
	s.e.	(0.0002)	(0.0003)
$(trend_t \times border_r)$	coef.	-0.0012***	-0.0012**
	s.e.	(0.0004)	(0.0005)
gru_t	coef.		-0.0688***
	s.e.		(0.0024)
$(gru_t \times border_r)$	coef.		-0.0186***
	s.e.		(0.0047)
$(gru_t \times trend_t)$	coef.		0.0067***
	s.e.		(0.0003)
$(gru_t \times border_r \times trend_t)$	coef.		0.0029***
	s.e.		(0.0006)
$migr_{rt}$	coef.		0.0991**
	s.e.		(0.0443)
$(zrg_r \times subsidy_t)$	coef.		0.0122***
	s.e.		(0.0044)
$subsidy_t$	coef.		-0.0122***
	s.e.		(0.0010)
constant	coef.	0.1106***	0.1209***
	s.e.	(0.0006)	(0.0015)
NT		1596	4522
time		1984-1989	1984-2000
indiv. eff.		yes	yes
time eff.		no	no
rob. s.e. (1)		no	yes
(1) according to Bertrand et al. (2004)			
sign. lev.: *0.1, **0.05, ***0.01			

Table 7: Specifications 7 and 8 for Unemployment

increase in market access. In order to get a full picture of the labor market the analysis proceeds with the effects on employment.

Again, specification 5 is first estimated for (log) total employment l_{rt} as the endogenous variable. Repeating the forthcoming models based on data for full-time male employees qualitatively does not lead to different results.[15] The results for all employees show a positive significant effect of migration on employment, indicating that the immigrating and in-commuting labor force from eastern Germany found new employment in border regions. Contrarily, the effect of reunification on employment in border regions (β_2) is negative and significant. The latter is contra-intuitive to the interpretation of reunification as a simultaneous positive labor supply and positive labor demand shock. However, no significant effect of reunification remains when excluding migration ($\beta_5 \equiv 0$), which indicates that the aggregate effect of the labor supply and demand shock is zero (see Table 8).

In order to improve the picture of the effects of reunification, specification 6 is estimated for employment as the endogenous variable (see Table 9). When controlling for migration, there seems to be a negative effect of reunification on employment in border regions in 1990 and

[15]These additional results are in the appendix.

Variable		Model	
		l5a	l5b
gru_t	coef.	0.0541***	0.0874***
	s.e.	(0.0101)	(0.0033)
$(gru_t \times border_r)$	coef.	-0.0468***	-0.0042
	s.e.	(0.0178)	(0.0131)
$(zrg_r \times subsidy_t)$	coef.	-0.0009	-0.0127
	s.e.	(0.0134)	(0.0132)
$subsidy_t$	coef.	0.0024	0.0044
	s.e.	(0.0049)	(0.0049)
$migr_{rt}$	coef.	0.8309***	
	s.e.	(0.2353)	
constant	coef.	7.0352***	7.0352***
	s.e.	(0.0018)	(0.0017)
NT		5586	5586
time		1984-2004	1984-2004
indiv. eff.		yes	yes
time eff.		no	no
rob. s.e. (1)		yes	yes
(1) according to Bertrand et al. (2004)			
sign. lev.: *0.1, **0.05, ***0.01			

Table 8: Specification 5 for Employment

1991, although this effect vanishes when ϕ_4 is restricted to zero, so that the interaction effects capture both the labor supply and the labor demand shock. When $\phi_4 \equiv 0$, there is weak evidence for a positive overall effect of reunification on employment in border regions for 1991. However, some of the border year interactions were already significant before reunification, thus indicating a potential violation of the common trend hypothesis. Still, specification 6 is more robust against changes in the time period in the case of employment than in the cases of wages and unemployment, as the general conclusions do not change when varying the time period. Nevertheless, the results do not confirm the negative interaction effects when changing the time period and restricting $\phi_4 \equiv 0$. Therefore, the analysis proceeds by estimating specification 8 for employment as the endogenous variable to check the robustness of the results.

When controlling for differences in trends (see Table 10), there are positive and significant effects of migration and commuting on employment. Contrarily, the general trend in employment in border regions relative to non-border regions (θ_6) decreased in the aftermath of reunification. When excluding migration from this specification ($\theta_9 \equiv 0$), the effect of migration is captured by the interaction of the reunification time dummy with the border region dummy (θ_4), which becomes significant. This highlights that reunification led to a positive labor demand shock (due to the increase in market access), which was absorbed by a simultaneous labor supply shock (due to migration and commuting from eastern Germany). However, the positive effect on employment was only temporary since the employment trend in border regions decreased relative to non-border regions in the post-reunification period.

Variable		Model			
		l6a	l6b	l6c	l6d
$(d_{1985} \times border_r)$	coef.			0.0047	0.0047
	s.e.			(0.0059)	(0.0059)
$(d_{1986} \times border_r)$	coef.			0.0092*	0.0092*
	s.e.			(0.0055)	(0.0055)
$(d_{1987} \times border_r)$	coef.	0.0000	0.0000	0.0091	0.0091
	s.e.	(0.0035)	(0.0035)	(0.0068)	(0.0068)
$(d_{1988} \times border_r)$	coef.	-0.0081*	-0.0081*	0.0011	0.0011
	s.e.	(0.0046)	(0.0046)	(0.0075)	(0.0075)
$(d_{1989} \times border_r)$	coef.	-0.0033	-0.0033	0.0059	0.0059
	s.e.	(0.0054)	(0.0054)	(0.0089)	(0.0089)
$(d_{1990} \times border_r)$	coef.	-0.0400***	0.0017	-0.0346**	0.0109
	s.e.	(0.0130)	(0.0063)	(0.0157)	(0.0093)
$(d_{1991} \times border_r)$	coef.	-0.0267*	0.0150*	-0.0213	0.0242**
	s.e.	(0.0136)	(0.0079)	(0.0160)	(0.0101)
$(d_{1992} \times border_r)$	coef.	-0.0252	0.0074	-0.0198	0.0146
	s.e.	(0.0171)	(0.0141)	(0.0187)	(0.0155)
$(d_{1993} \times border_r)$	coef.	-0.0238	0.0089	-0.0183	0.0160
	s.e.	(0.0182)	(0.0153)	(0.0196)	(0.0164)
$(d_{1994} \times border_r)$	coef.	-0.0264	0.0062	-0.0210	0.0134
	s.e.	(0.0202)	(0.0175)	(0.0221)	(0.0192)
$(d_{1995} \times border_r)$	coef.	-0.0224	0.0103	-0.0169	0.0174
	s.e.	(0.0200)	(0.0177)	(0.0217)	(0.0192)
$(d_{1996} \times border_r)$	coef.	-0.0305	0.0021	-0.0251	0.0093
	s.e.	(0.0207)	(0.0182)	(0.0226)	(0.0199)
$(d_{1997} \times border_r)$	coef.	-0.0348	-0.0022	-0.0294	0.0050
	s.e.	(0.0217)	(0.0193)	(0.0237)	(0.0211)
$(d_{1998} \times border_r)$	coef.	-0.0401*	-0.0075	-0.0347	-0.0004
	s.e.	(0.0210)	(0.0191)	(0.0232)	(0.0210)
$(d_{1999} \times border_r)$	coef.	-0.0662***	-0.0336	-0.0608**	-0.0265
	s.e.	(0.0250)	(0.0233)	(0.0265)	(0.0247)
$(d_{2000} \times border_r)$	coef.	-0.0569**	-0.0243	-0.0515**	-0.0172
	s.e.	(0.0223)	(0.0205)	(0.0247)	(0.0227)
$(zrg_r \times subsidy_t)$	coef.	-0.0071	-0.0194	-0.0070	-0.0221
	s.e.	(0.0156)	(0.0151)	(0.0170)	(0.0163)
$migr_{rt}$	coef.	0.6911***		0.7538***	
	s.e.	(0.1920)		(0.2100)	
constant	coef.	7.0419***	7.0439***	7.0128***	7.0153***
	s.e.	(0.0046)	(0.0047)	(0.0048)	(0.0050)
NT		3990	3990	4522	4522
time		1986-2000	1986-2000	1984-2000	1984-2000
indiv. eff.		yes	yes	yes	yes
time eff.		yes	yes	yes	yes
rob. s.e. (1)		yes	yes	yes	yes
(1) according to Bertrand et al. (2004)					
sign. lev.: *0.1, **0.05, ***0.01					

Table 9: Specification 6 for Employment

Variable		Model	
		l8a	l8b
$trend_t$	coef.	0.0125***	0.0125***
	s.e.	(0.0007)	(0.0007)
$(trend_t \times border_r)$	coef.	0.0005	0.0005
	s.e.	(0.0016)	(0.0016)
gru_t	coef.	0.1064***	0.1346***
	s.e.	(0.0098)	(0.0049)
$(gru_t \times border_r)$	coef.	0.0026	0.0485***
	s.e.	(0.0168)	(0.0105)
$(gru_t \times trend_t)$	coef.	-0.0135***	-0.0134***
	s.e.	(0.0008)	(0.0008)
$(gru_t \times border_r \times trend_t)$	coef.	-0.0038**	-0.0045**
	s.e.	(0.0018)	(0.0018)
$migr_{rt}$	coef.	0.7346***	
	s.e.	(0.2095)	
$(zrg_r \times subsidy_t)$	coef.	-0.0136	-0.0254*
	s.e.	(0.0136)	(0.0133)
$subsidy_t$	coef.	0.0013	0.0032
	s.e.	(0.0030)	(0.0030)
constant	coef.	6.9944***	6.9944***
	s.e.	(0.0046)	(0.0046)
NT		4522	4522
time		1984-2000	1984-2000
indiv. eff.		yes	yes
time eff.		no	no
rob. s.e. (1)		yes	yes
(1) according to Bertrand et al. (2004)			
sign. lev.: *0.1, **0.05, ***0.01			

Table 10: Specification 8 for Employment

6.4 Robustness and Discussion

The results presented above point to a simultaneous positive labor supply shock and positive labor demand shock due to reunification. In order to check the robustness of these results, a placebo test is performed and the definition of the treatment group is varied for specification 8 for wages, unemployment rate and employment as the endogenous variable. The results tables are in the appendix. In the placebo setting, treatment status is randomly assigned to the regions. Thus, the interaction of the treatment group with the reunification dummy (θ_4), and the interaction of the treatment group with the reunification dummy and the time trend (θ_6), should not significantly diverge from zero. Indeed, they do not significantly diverge from zero, which confirms that the results are not spurious.

Further, the definition of treatment (=border region) status is varied by using only first-order neighbors or only regions within a distance of two hours travel time to eastern Germany as border regions. The key results qualitatively do not differ from the above results, pointing to the robustness of the findings. Hence, the results are robust and indicate that there was no effect of reunification on wages, except for the effect of migrants and commuters from eastern Germany. However, the latter effect is hard to interpret since it covers the labor supply shock, the location decisions of the migrants and commuters and the composition effect on employees. Further, there was a temporary reduction in unemployment due to reunification, although this effect vanishes over time. Finally, migration and commuting from eastern Germany led to an increase in employment in border regions. The migration variable fully captures the positive effect of reunification on employment, although the general trend of employment in border regions relative to non-border regions declined after reunification.

Additionally, the time period is varied to the years until 1995 for specification 8 for wages, unemployment and employment to check the robustness of the results. This is done, because starting 1995, trade agreements with central and eastern European countries were made so that there was an additional market access shock which, however, was weaker than the reunification shock. The shock was weaker because the distance of the border regions of the present sample to the central and eastern European countries is larger than to eastern Germany and because the political and economic integration process was much stronger between the two German states than the integration process between western Germany and central and eastern Europe. The results are presented in Table 15 in the appendix. They do not change qualitatively for wages and unemployment and hence are robust. However, the employment effects of reunification on border regions are insignificant in the shorter time period which indicates that the employment adjustment process took place much slower than the adjustment processes of wages and unemployment; a similar result has been presented by Brülhart et al. (2012) for the case of Austria.

Therefore, the results are in favor of a simultaneous positive labor demand and labor supply shock. A labor demand shock leads to increasing wages, decreasing unemployment and increasing employment. Contrarily, a labor supply shock leads to decreasing wages, increasing unemployment and increasing employment. The results show that on aggregate wages did not change, whereas employment increased and unemployment decreased in the short run. Hence, the increase in labor demand was absorbed by the increase in labor supply due to the immigration and in-commuting from eastern Germany, so that no effect on wages remained. However, the positive effects on employment and negative effects on unemployment are only temporary. This points to only a temporary labor demand shock. The labor demand shock, induced by an increase in market access, might be temporary, as in the aftermath of reunification the former socialist eastern German economy collapsed, leading to emigration and a decline in income. This emigration and decline in income potentially (partly) reduced the former increase in market access in border regions.

The results presented above confirm the positive labor supply shock found by Büttner and Rincke (2007), although controls for the relevant violations of the common trend hypothesis are included. In contrast to them, the results presented here also show evidence in favor of a positive labor demand shock, as induced by the increase in market access, although this effect seems to be temporary.

In their survey of integration effects in border regions, Niebuhr and Stiller (2004) conclude that no clear evidence exists on whether border regions benefit or lose out from the integration. The results presented above suggest that this might be caused by the fact that opening borders results in more than one shock. In the case of German reunification, the effects of the increase in market access on wages are alleviated by labor supply adjustments and the labor supply shock. This shows that interpreting the results of an integration process as a single shock on a single variable might be misleading. Historical events such as German reunification remain attractive as natural experiments, but the multitude of shocks should be taken into consideration to identify the effects of interest.

7 Conclusions

The wage equation, a core element of the NEG, predicts a positive effect of market access on wages. However, market access itself depends on wages, meaning that endogeneity is a key issue in empirical applications to the wage equation. Whereas most studies rely on instruments to cope with this endogeneity, the present analysis relies on German reunification as an exogenous variation of market access. Owing to the opening of the border, former border regions gained new

trading partners in eastern Germany, leading to an increase in market access. This is reflected in a labor demand shock. However, this labor demand shock was accompanied by a labor supply shock since significant numbers of eastern Germans entered the western German labor market as migrants or commuters.

This analysis estimates the effects of these shocks on wages, unemployment and employment in the aftermath of reunification in order to draw a picture of the reaction of the labor market to these shocks. The results show that there was no aggregate effect on wages, whereas unemployment temporarily decreased and employment temporarily increased in border regions relative to non-border regions. This is in line with the interpretation of reunification as a simultaneous positive labor demand and labor supply shock. The expansion of labor demand in border regions, because of their enlarged market access led to upward pressure on wages and employment, but downward pressure on unemployment. Contrariwise, the labor supply shock put downward pressure on wages, but upward pressure on employment and unemployment in border regions. In the case of German reunification, the aggregate effect on wages was zero, whereas employment temporarily expanded and unemployment temporarily declined. The results of the employment regressions further suggest that the expansion of labor demand was absorbed by the increase in labor supply, which explains why the aggregate effect on wages was zero.

Additionally, this analysis provides an example why the aggregate effects of integration processes on border regions are often ambitious, as for example found by Niebuhr and Stiller (2004): integration processes can imply multiple shocks, meaning that the effects on a single outcome variable might be hard to identify. By drawing a more encompassing picture of the market under shocks, researchers might disentangle shocks from one another.

A Descriptive Statistics

Sector	$border_r$		Total
	0	1	
Agriculture, energy, mining	2.85	2.35	2.76
Raw material production	8.05	6.34	7.77
Steel/light metal production, machine building	10.75	11.07	10.81
Construction of vehicles and equipment	10.06	7.29	9.6
Consumer goods industry	7.18	7.99	7.32
Food, drink and tobbaco industry	3.13	3.21	3.15
Main construction trade	4.5	4.43	4.49
Finishing trade	2.78	2.87	2.8
Wholesale trade	5.69	5.84	5.72
Retail trade	7.92	8.29	7.98
Transport and communication	4.71	5.91	4.91
Business related services	9.19	9.63	9.26
Household related services	4.32	4.61	4.37
Health and education	8.19	9.32	8.37
Associations, organizations	4.08	4.16	4.09
Administrative units, social insurance	6.59	6.69	6.6
Total	100	100	100

Table 11: Employment Shares of Sectors

B Robustness Tests

		Model		
Variable		u8b	w8c	l8c
$trend_t$	coef.	-0.0046***	0.0331***	0.0128***
	s.e.	(0.0004)	(0.0005)	(0.0009)
$(trend_t \times border_r)$	coef.	0.0002	-0.0000	-0.0004
	s.e.	(0.0005)	(0.0006)	(0.0012)
gru_t	coef.	-0.0726***	0.1175***	0.1454***
	s.e.	(0.0034)	(0.0044)	(0.0067)
$(gru_t \times border_r)$	coef.	0.0003	-0.0075	-0.0062
	s.e.	(0.0037)	(0.0048)	(0.0089)
$(gru_t \times trend_t)$	coef.	0.0072***	-0.0110***	-0.0144***
	s.e.	(0.0004)	(0.0005)	(0.0010)
$(gru_t \times border_r \times trend_t)$	coef.	-0.0001	0.0009	0.0006
	s.e.	(0.0005)	(0.0007)	(0.0013)
$migr_{rt}$	coef.	0.1137***	-0.0428	
	s.e.	(0.0346)	(0.0511)	
$(zrg_r \times subsidy_t)$	coef.	0.0070*	0.0137***	-0.0188
	s.e.	(0.0038)	(0.0038)	(0.0116)
$subsidy_t$	coef.	-0.0114***	-0.0550***	0.0021
	s.e.	(0.0009)	(0.0014)	(0.0029)
constant	coef.	0.1209***	4.7329***	6.9944***
	s.e.	(0.0015)	(0.0026)	(0.0046)
NT		4522	4522	4522
time		1984-2000	1984-2000	1984-2000
indiv. eff.		yes	yes	yes
time eff.		no	no	no
rob. s.e. (1)		yes	yes	yes
(1) according to Bertrand et al. (2004)				
sign. lev.: *0.1, **0.05, ***0.01				

Table 12: Placebo Tests

Variable		Model		
		u8c	w8d	l8d
$trend_t$	coef.	-0.0044***	0.0331***	0.0126***
	s.e.	(0.0003)	(0.0003)	(0.0006)
$(trend_t \times border_r)$	coef.	-0.0015**	-0.0013	-0.0002
	s.e.	(0.0007)	(0.0014)	(0.0021)
gru_t	coef.	-0.0679***	0.1062***	0.1392***
	s.e.	(0.0029)	(0.0047)	(0.0047)
$(gru_t \times border_r)$	coef.	-0.0154*	-0.0103	0.0481***
	s.e.	(0.0082)	(0.0128)	(0.0113)
$(gru_t \times trend_t)$	coef.	0.0069***	-0.0105***	-0.0139***
	s.e.	(0.0003)	(0.0004)	(0.0007)
$(gru_t \times border_r \times trend_t)$	coef.	0.0036***	-0.0007	-0.0033
	s.e.	(0.0007)	(0.0011)	(0.0024)
$migr_{rt}$	coef.	0.0390	0.1263	
	s.e.	(0.0573)	(0.0992)	
$(zrg_r \times subsidy_t)$	coef.	0.0100**	0.0104***	-0.0196
	s.e.	(0.0040)	(0.0040)	(0.0129)
$subsidy_t$	coef.	-0.0119***	-0.0545***	0.0022
	s.e.	(0.0009)	(0.0015)	(0.0029)
constant	coef.	0.1209***	4.7329***	6.9944***
	s.e.	(0.0015)	(0.0025)	(0.0046)
NT		4522	4522	4522
time		1984-2000	1984-2000	1984-2000
indiv. eff.		yes	yes	yes
time eff.		no	no	no
rob. s.e. (1)		yes	yes	yes
(1) according to Bertrand et al. (2004)				
sign. lev.: *0.1, **0.05, ***0.01				

Table 13: Only 1st Order Neighbors

Variable		Model		
		u8d	w8e	l8e
$trend_t$	coef.	-0.0044***	0.0331***	0.0122***
	s.e.	(0.0003)	(0.0003)	(0.0007)
$(trend_t \times border_r)$	coef.	-0.0008*	-0.0004	0.0019
	s.e.	(0.0005)	(0.0009)	(0.0015)
gru_t	coef.	-0.0689***	0.1135***	0.1352***
	s.e.	(0.0024)	(0.0037)	(0.0051)
$(gru_t \times border_r)$	coef.	-0.0102**	-0.0014	0.0368***
	s.e.	(0.0044)	(0.0062)	(0.0099)
$(gru_t \times trend_t)$	coef.	0.0067***	-0.0106***	-0.0135***
	s.e.	(0.0003)	(0.0004)	(0.0008)
$(gru_t \times border_r \times trend_t)$	coef.	0.0021***	0.0003	-0.0033**
	s.e.	(0.0006)	(0.0009)	(0.0016)
$migr_{rt}$	coef.	0.0814**	-0.0333	
	s.e.	(0.0390)	(0.0632)	
$(zrg_r \times subsidy_t)$	coef.	0.0115***	0.0132***	-0.0142
	s.e.	(0.0041)	(0.0046)	(0.0124)
$subsidy_t$	coef.	-0.0121***	-0.0549***	0.0014
	s.e.	(0.0010)	(0.0015)	(0.0029)
constant	coef.	0.1209***	4.7329***	6.9944***
	s.e.	(0.0015)	(0.0026)	(0.0046)
NT		4522	4522	4522
time		1984-2000	1984-2000	1984-2000
indiv. eff.		yes	yes	yes
time eff.		no	no	no
rob. s.e. (1)		yes	yes	yes
(1) according to Bertrand et al. (2004)				
sign. lev.: *0.1, **0.05, ***0.01				

Table 14: Border Regions Based on Travel Time

Variable		Model		
		u8e	w8f	l8f
$trend_t$	coef.	-0.0043***	0.0334***	0.0125***
	s.e.	(0.0003)	(0.0003)	(0.0007)
$(trend_t \times border_r)$	coef.	-0.0012**	-0.0021**	0.0005
	s.e.	(0.0005)	(0.0009)	(0.0016)
gru_t	coef.	-0.0995***	0.0538***	0.2071***
	s.e.	(0.0024)	(0.0035)	(0.0075)
$(gru_t \times border_r)$	coef.	-0.0160**	-0.0121	0.0062
	s.e.	(0.0073)	(0.0097)	(0.0187)
$(gru_t \times trend_t)$	coef.	0.0109***	-0.0027***	-0.0230***
	s.e.	(0.0003)	(0.0005)	(0.0011)
$(gru_t \times border_r \times trend_t)$	coef.	0.0026**	0.0009	0.0005
	s.e.	(0.0010)	(0.0014)	(0.0028)
$migr_{rt}$	coef.	0.0858**		
	s.e.	(0.0414)		
$(zrg_r \times subsidy_t)$	coef.	0.0108**	-0.0012	-0.0165
	s.e.	(0.0042)	(0.0026)	(0.0102)
$subsidy_t$	coef.	0.0030***	-0.0327***	-0.0310***
	s.e.	(0.0010)	(0.0013)	(0.0025)
constant	coef.	0.1059***	4.7130***	7.0270***
	s.e.	(0.0015)	(0.0019)	(0.0040)
NT		3192	3192	3192
time		1984-1995	1984-1995	1984-1995
indiv. eff.		yes	yes	yes
time eff.		no	no	no
rob. s.e. (1)		yes	yes	yes
(1) according to Bertrand et al. (2004)				
sign. lev.: *0.1, **0.05, ***0.001				

Table 15: Shorter Time Period

C Wage Regressions for Medium and Low Qualified

		Model	
Variable		w5a (2)	w5b (2)
gru_t	coef.	0.1613***	0.1731***
	s.e.	(0.0034)	(0.0013)
$(gru_t \times border_r)$	coef.	-0.0272***	-0.0121***
	s.e.	(0.0053)	(0.0035)
$(zrg_r \times subsidy_t)$	coef.	0.0047	0.0005
	s.e.	(0.0035)	(0.0033)
$subsidy_t$	coef.	-0.2001***	-0.1994***
	s.e.	(0.0013)	(0.0013)
$migr_{rt}$	coef.	0.2956***	
	s.e.	(0.0784)	
constant	coef.	4.7368***	4.7368***
	s.e.	(0.0009)	(0.0009)
NT		5586	5586
time		1984-2004	1984-2004
indiv. eff.		yes	yes
time eff.		no	no
rob. s.e. (1)		yes	yes
(1) according to Bertrand et al. (2004)			
(2) based on low/medium qualified employees			
sign. lev.: *0.1, **0.05, ***0.01			

Table 16: Specification 5 for Wages (Low/Medium Qualified)

		Model			
Variable		w6a (2)	w6b (2)	w6c (2)	w6d (2)
$(d_{1985} \times border_r)$	coef.			-0.0029	-0.0029
	s.e.			(0.0024)	(0.0024)
$(d_{1986} \times border_r)$	coef.			-0.0030	-0.0030
	s.e.			(0.0029)	(0.0029)
$(d_{1987} \times border_r)$	coef.	-0.0022	-0.0022	-0.0052*	-0.0052*
	s.e.	(0.0016)	(0.0016)	(0.0030)	(0.0030)
$(d_{1988} \times border_r)$	coef.	0.0015	0.0015	-0.0015	-0.0015
	s.e.	(0.0027)	(0.0027)	(0.0032)	(0.0032)
$(d_{1989} \times border_r)$	coef.	-0.0056*	-0.0056*	-0.0085**	-0.0085**
	s.e.	(0.0033)	(0.0033)	(0.0039)	(0.0039)
$(d_{1990} \times border_r)$	coef.	-0.0207***	-0.0058*	-0.0250***	-0.0087**
	s.e.	(0.0048)	(0.0032)	(0.0051)	(0.0039)
$(d_{1991} \times border_r)$	coef.	-0.0232***	-0.0082**	-0.0275***	-0.0112**
	s.e.	(0.0051)	(0.0037)	(0.0055)	(0.0044)
$(d_{1992} \times border_r)$	coef.	-0.0220***	-0.0103**	-0.0252***	-0.0129***
	s.e.	(0.0049)	(0.0041)	(0.0055)	(0.0049)
$(d_{1993} \times border_r)$	coef.	-0.0222***	-0.0105**	-0.0254***	-0.0131***
	s.e.	(0.0053)	(0.0044)	(0.0055)	(0.0049)
$(d_{1994} \times border_r)$	coef.	-0.0259***	-0.0142***	-0.0291***	-0.0168***
	s.e.	(0.0063)	(0.0052)	(0.0060)	(0.0050)
$(d_{1995} \times border_r)$	coef.	-0.0244***	-0.0127**	-0.0276***	-0.0153***
	s.e.	(0.0064)	(0.0053)	(0.0061)	(0.0051)
$(d_{1996} \times border_r)$	coef.	-0.0236***	-0.0119**	-0.0268***	-0.0145***
	s.e.	(0.0061)	(0.0054)	(0.0058)	(0.0053)
$(d_{1997} \times border_r)$	coef.	-0.0245***	-0.0128**	-0.0277***	-0.0154***
	s.e.	(0.0063)	(0.0055)	(0.0061)	(0.0055)
$(d_{1998} \times border_r)$	coef.	-0.0236***	-0.0120**	-0.0269***	-0.0146***
	s.e.	(0.0060)	(0.0053)	(0.0060)	(0.0054)
$(d_{1999} \times border_r)$	coef.	-0.0329***	-0.0212***	-0.0361***	-0.0238***
	s.e.	(0.0075)	(0.0066)	(0.0072)	(0.0064)
$(d_{2000} \times border_r)$	coef.	-0.0282***	-0.0165***	-0.0314***	-0.0191***
	s.e.	(0.0063)	(0.0056)	(0.0065)	(0.0060)
$(zrg_r \times subsidy_t)$	coef.	0.0008	-0.0036	0.0024	-0.0031
	s.e.	(0.0039)	(0.0035)	(0.0041)	(0.0037)
$migr_{rt}$	coef.	0.2470***		0.2704***	
	s.e.	(0.0653)		(0.0722)	
constant	coef.	4.5209***	4.5216***	4.4551***	4.4560***
	s.e.	(0.0014)	(0.0014)	(0.0016)	(0.0016)
NT		3990	3990	4522	4522
time		1986-2000	1986-2000	1984-2000	1984-2000
indiv. eff.		yes	yes	yes	yes
time eff.		yes	yes	yes	yes
rob. s.e. (1)		yes	yes	yes	yes
(1) according to Bertrand et al. (2004)					
(2) based on low/medium qualified employees					
sign. lev.: *0.1, **0.05, ***0.01					

Table 17: Specification 6 for Wages (Low/Medium Qualified)

		Model		
Variable		w7 (2)	w8a (2)	w8b (2)
$trend_t$	coef.	0.0328***	0.0328***	0.0328***
	s.e.	(0.0002)	(0.0003)	(0.0003)
$(trend_t \times border_r)$	coef.	-0.0012**	-0.0012	-0.0012
	s.e.	(0.0005)	(0.0008)	(0.0008)
gru_t	coef.		0.1475***	0.1578***
	s.e.		(0.0036)	(0.0023)
$(gru_t \times border_r)$	coef.		-0.0204***	-0.0037
	s.e.		(0.0066)	(0.0057)
$(gru_t \times trend_t)$	coef.		-0.0156***	-0.0156***
	s.e.		(0.0003)	(0.0003)
$(gru_t \times border_r \times trend_t)$	coef.		0.0004	0.0002
	s.e.		(0.0009)	(0.0009)
$migr_{rt}$	coef.		0.2682***	
	s.e.		(0.0715)	
$(zrg_r \times subsidy_t)$	coef.		0.0016	-0.0027
	s.e.		(0.0035)	(0.0032)
$subsidy_t$	coef.		-0.0768***	-0.0761***
	s.e.		(0.0011)	(0.0011)
constant	coef.	4.4233***	4.4998***	4.4998***
	s.e.	(0.0007)	(0.0021)	(0.0021)
NT		1596	4522	4522
time		1984-1989	1984-2000	1984-2000
indiv. eff.		yes	yes	yes
time eff.		no	no	no
rob. s.e. (1)		no	yes	yes
(1) according to Bertrand et al. (2004)				
(2) based on low/medium qualified employees				
sign. lev.: *0.1, **0.05, ***0.01				

Table 18: Specifications 7 and 8 for Wages (Low/Medium Qualified)

D Employment Regressions for Male Full Time Employees

		Model	
Variable		l5a (2)	l5b (2)
gru_t	coef.	0.0356***	0.0833***
	s.e.	(0.0126)	(0.0041)
$(gru_t \times border_r)$	coef.	-0.0654***	-0.0042
	s.e.	(0.0222)	(0.0168)
$(zrg_r \times subsidy_t)$	coef.	-0.0039	-0.0209
	s.e.	(0.0164)	(0.0162)
$subsidy_t$	coef.	0.0462***	0.0490***
	s.e.	(0.0059)	(0.0060)
$migr_{rt}$	coef.	1.1924***	
	s.e.	(0.2930)	
constant	coef.	6.4348***	6.4348***
	s.e.	(0.0023)	(0.0021)
NT		5586	5586
time		1984-2004	1984-2004
indiv. eff.		yes	yes
time eff.		no	no
rob. s.e. (1)		yes	yes
(1) according to Bertrand et al. (2004)			
(2) based on male full time employees			
sign. lev.: *0.1, **0.05, ***0.01			

Table 19: Specification 5 for Employment (Male Full Time Employees)

		Model			
Variable		l6a (2)	l6b (2)	l6c (2)	l6d (2)
$(d_{1985} \times border_r)$	coef.			0.0045	0.0045
	s.e.			(0.0074)	(0.0074)
$(d_{1986} \times border_r)$	coef.			0.0086	0.0086
	s.e.			(0.0075)	(0.0075)
$(d_{1987} \times border_r)$	coef.	0.0003	0.0003	0.0089	0.0089
	s.e.	(0.0045)	(0.0045)	(0.0076)	(0.0076)
$(d_{1988} \times border_r)$	coef.	-0.0054	-0.0054	0.0032	0.0032
	s.e.	(0.0055)	(0.0055)	(0.0088)	(0.0088)
$(d_{1989} \times border_r)$	coef.	-0.0023	-0.0023	0.0063	0.0063
	s.e.	(0.0071)	(0.0071)	(0.0110)	(0.0110)
$(d_{1990} \times border_r)$	coef.	-0.0492***	0.0095	-0.0460**	0.0181
	s.e.	(0.0160)	(0.0093)	(0.0184)	(0.0119)
$(d_{1991} \times border_r)$	coef.	-0.0391**	0.0197*	-0.0359*	0.0282**
	s.e.	(0.0172)	(0.0115)	(0.0187)	(0.0125)
$(d_{1992} \times border_r)$	coef.	-0.0382*	0.0077	-0.0332	0.0152
	s.e.	(0.0219)	(0.0184)	(0.0236)	(0.0200)
$(d_{1993} \times border_r)$	coef.	-0.0405*	0.0054	-0.0354	0.0129
	s.e.	(0.0229)	(0.0195)	(0.0243)	(0.0207)
$(d_{1994} \times border_r)$	coef.	-0.0386	0.0073	-0.0336	0.0148
	s.e.	(0.0240)	(0.0207)	(0.0264)	(0.0230)
$(d_{1995} \times border_r)$	coef.	-0.0336	0.0123	-0.0286	0.0198
	s.e.	(0.0250)	(0.0222)	(0.0275)	(0.0246)
$(d_{1996} \times border_r)$	coef.	-0.0381	0.0079	-0.0330	0.0153
	s.e.	(0.0248)	(0.0222)	(0.0271)	(0.0244)
$(d_{1997} \times border_r)$	coef.	-0.0510*	-0.0051	-0.0460	0.0024
	s.e.	(0.0270)	(0.0244)	(0.0293)	(0.0266)
$(d_{1998} \times border_r)$	coef.	-0.0568**	-0.0109	-0.0517*	-0.0034
	s.e.	(0.0263)	(0.0242)	(0.0285)	(0.0263)
$(d_{1999} \times border_r)$	coef.	-0.0598**	-0.0139	-0.0547*	-0.0064
	s.e.	(0.0272)	(0.0253)	(0.0299)	(0.0280)
$(d_{2000} \times border_r)$	coef.	-0.0748***	-0.0289	-0.0698**	-0.0214
	s.e.	(0.0278)	(0.0260)	(0.0306)	(0.0287)
$(zrg_r \times subsidy_t)$	coef.	-0.0110	-0.0283	-0.0085	-0.0298
	s.e.	(0.0184)	(0.0178)	(0.0207)	(0.0198)
$migr_{rt}$	coef.	0.9728***		1.0610***	
	s.e.	(0.2370)		(0.2585)	
constant	coef.	6.4789***	6.4817***	6.4595***	6.4629***
	s.e.	(0.0057)	(0.0059)	(0.0060)	(0.0061)
NT		3990	3990	4522	4522
time		1986-2000	1986-2000	1984-2000	1984-2000
indiv. eff.		yes	yes	yes	yes
time eff.		yes	yes	yes	yes
rob. s.e. (1)		yes	yes	yes	yes
(1) according to Bertrand et al. (2004)					
(2) based on male full time employees					
sign. lev.: *0.1, **0.05, ***0.01					

Table 20: Specification 6 for Employment (Male Full Time Employees)

		Model	
Variable		l8a (2)	l8b (2)
$trend_t$	coef.	0.0102***	0.0102***
	s.e.	(0.0008)	(0.0008)
$(trend_t \times border_r)$	coef.	0.0008	0.0008
	s.e.	(0.0019)	(0.0019)
gru_t	coef.	0.1291***	0.1690***
	s.e.	(0.0120)	(0.0058)
$(gru_t \times border_r)$	coef.	-0.0137	0.0514***
	s.e.	(0.0208)	(0.0138)
$(gru_t \times trend_t)$	coef.	-0.0176***	-0.0174***
	s.e.	(0.0009)	(0.0009)
$(gru_t \times border_r \times trend_t)$	coef.	-0.0036*	-0.0046**
	s.e.	(0.0020)	(0.0020)
$migr_{rt}$	coef.	1.0436***	
	s.e.	(0.2586)	
$(zrg_r \times subsidy_t)$	coef.	-0.0144	-0.0312*
	s.e.	(0.0168)	(0.0163)
$subsidy_t$	coef.	-0.0085**	-0.0058
	s.e.	(0.0036)	(0.0036)
constant	coef.	6.4550***	6.4550***
	s.e.	(0.0056)	(0.0056)
NT		4522	4522
time		1984-2000	1984-2000
indiv. eff.		yes	yes
time eff.		no	no
rob. s.e. (1)		yes	yes
(1) according to Bertrand et al. (2004)			
(2) based on male full time employees			
sign. lev.: *0.1, **0.05, ***0.01			

Table 21: Specification 8 for Employment (Male Full Time Employees)

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