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The German-Czech Border Region after the Fall of the Iron Curtain: Effects on the Labour Market

An Empirical Study Using the IAB Employment Sample (IABS)

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Contents

Abstract

Using the IAB Employment Sample (IABS) covering 1980-2001 we investigate what impact the fall of the Iron Curtain has had on the skill structure of employment and wages in the western German districts neighbouring the Czech Republic. The introduction of free trade in this region, which has one of the world's largest spatial wage differentials, can be seen as a natural experiment.

We presume that changes in skill and wage structures are particularly apparent in the regions situated immediately on the open border.

Distinguishing three skill categories we obtain unexpected results. Though we observe a general shift from low-skilled jobs towards skilled jobs and a convergence trend of border regions towards the national average, we do not find a special effect for the period after the opening of the border, neither concerning the skill structure nor the wage differentials.

Keywords: border regions, international trade, employment, wage inequality

JEL classification: R23, J31, F16

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1 Introduction

The fall of the Iron Curtain fundamentally changed the economic relationships between Western and Eastern European countries. Particularly the regions situated on the border with the new EU member countries are affected by reduced restrictions in trade and an increased international division of labour.

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 liberalised trade and reduced restrictions on foreign investment in Mexico led to cross-border linkages along the US-Mexico border (Hanson 1996)[1], a gradual integration process is leading to the outsourcing of economic activities from the Bavarian to the Czech borderland. As a result of outsourcing we expect structural shifts in labour demand, especially in the border regions, 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. Studies by Niebuhr (2004, 2005) provide results about higher integration benefits for border regions caused by declining trade impediments. Blien et al. (2003) and Büttner/Rincke (2004) show significant labour market effects along the former German-German border, whereas Barjak/Heimpold (2000) and Stiller (2004) do not find specific effects in German-Polish border regions. Riedel/Untiedt (2001) deliver investigations on several economic factors with respect to German regions bordering on new EU member states.

[1] After trade liberalisation during the 1980s trade increased above average in cities along the US-Mexico border. In Mexico production shifted significantly from the center to the so called maquiladoras in the border region, export assembly plants, which were established by U.S. multinational firms.

Surprisingly few studies use individual-level data to estimate spatial effects in regions situated along the former Iron Curtain.

In this paper we investigate the shifts in skill group shares and wage differentials in eastern Bavaria, the part of western Germany bordering the Czech Republic. Above all we are interested in the development of wages in the border region compared with the average level in the Federal Republic. Which skill group benefits from the opening of the border: low-skilled, medium-skilled or high-skilled workers?

The paper is organised as follows: section 2 provides a theoretical background of increasing wage inequalities and shifts in skill structures. Data and basic definitions are described in section 3. Section 4 contains descriptive evidence on the shift in the shares of skill groups in the Bavarian border region compared with the development at national level. Sections 5 and 6 introduce econometric models to test the theoretical predictions empirically and present the results. Section 7 concludes.

2 Theoretical Background

Increasing wage inequality between skill groups is the consequence of a growing demand for skilled workers. During the 1980s and 1990s wage inequality expanded dramatically in the United States and Great Britain. In other European countries, due to wage rigidities, the wage structure remained comparatively stable, whereas unemployment rates for unskilled workers grew disproportionately (Fitzenberger 1999).

The question as to the cause of the demand shift towards more highly qualified workers is a controversial topic.

One possible explanation is biased technical progress, which reduces the demand for unskilled workers. New technologies and production methods require more skilled workers (Bound/Johnson 1992; Lawrence/Slaughter 1993; Berman/Bound/Griliches 1994).

A different view emphasises the effects of globalisation. An increase in international trade and competition leads to changes in the shares of production between countries, with the result that countries which are abundant in skilled labour would specialise in the production of skill-intensive products (Wood 1994; Borjas/Ramey 1995; Leamer 1996).

Traditional trade theory predicts an increasing demand for skilled workers in industrial countries which are abundant in capital and skilled labour. According to Heckscher/Ohlin and Stolper/Samuelson low-skilled workers in Germany are likely to be the losers of the European integration process, i.e. wage inequalities and the relative unemployment of low-skilled workers are likely to increase, whereas in the EU accession countries a contrasting effect is likely to favour low-skilled workers and lead to decreasing wage inequalities.

Since there is empirical evidence of growing wage gaps also in developing and transition countries, e.g. Mexico (Feenstra/Hanson 1996; Feenstra/ Hanson 1997, emphasising effects particularly in border regions; Airola/ Juhn 2005) and Poland (Skuratowicz 2005), new trade theories try to explain these developments. In the model developed by Feenstra and Hanson (1996) a single manufactured good is produced from a continuum of intermediate inputs using skilled workers, unskilled workers and capital. The south produces and exports inputs up to a critical ratio of skilled and unskilled labour. The north produces the rest of the inputs, including such activities as R&D and marketing. Production activities that are shifted from the north to the south are unskilled-intensive from the perspective of the north, but are considered skilled in the south. Thus in both countries the demand for skilled labour increases and the wage of low-skilled workers is expected to fall.

Proximity to the border also reduces transaction and mobility impediments, i.e. outsourcing should be far easier in this case, we therefore expect a noticeable shift in the skill and wage structures in the Bavarian-Czech border region after the fall of the Iron Curtain.

3 Data and Basic Definitions

For the period from 1980 to 2001 we use micro data from the Employment Sample (IABS), which is provided by the Institute for Employment Research (IAB) and covers a two percent random sample of all employees covered by social security.

We eliminate apprentices, marginal part-time and part-time workers from the data.

The reference values at federal level are related only to West Germany (without Berlin), since the inclusion of data of eastern Germany (which are available from 1992 onwards) would lead to biased results.

This reduces our dataset to around 400,000 observations per year from 265 regions[2], some of which consist of aggregated districts.

We distinguish three skill groups:

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 Oberfranken (Upper Franconia), Oberpfalz (Upper Palatinate) and Niederbayern (Lower Bavaria) including the university towns of Regensburg and Passau and the towns with polytechnics (Fachhochschulen) Hof, Weiden, Amberg and Deggendorf (15 districts and 7 autonomous municipal authorities, see appendix, figure A1).[3]

Taking into account the differences between urban and rural areas we 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) (see appendix, table A1).

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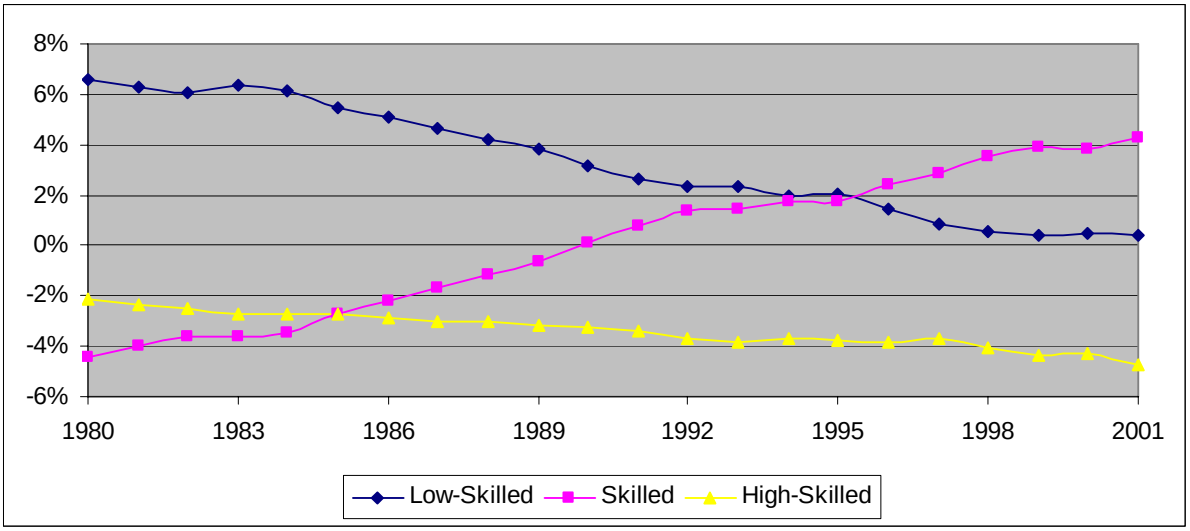
[2] i.e. districts or autonomous municipal authorities.

[3] In contrast to the border region in ASAV, § 6 para. 1 our analysis covers the city and the district of Regensburg.

4 Skill Structure in Eastern Bavaria: Some Descriptive Evidence

To evaluate the shifts in the skill structure in eastern Bavaria we 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 1.

Figure 1: Deviation of Skill Group Shares in the Eastern Bavarian Border Region from the Averages in Western Germany (as %, 1980-2001)

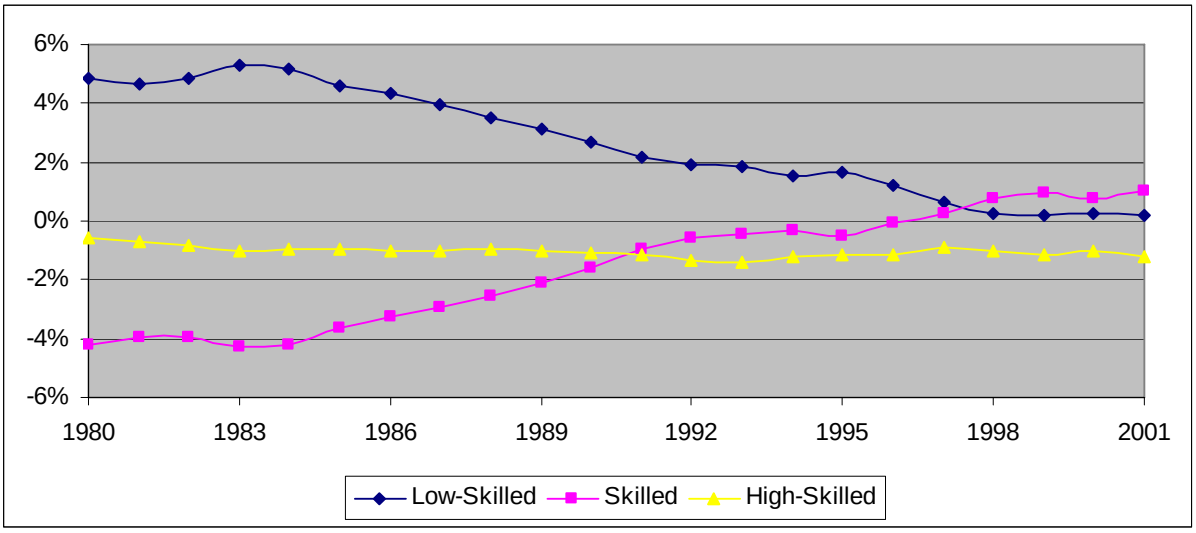


The share of low-skilled workers, which stood at 6.58% above the national average in 1980, was virtually equal to the national level in 2001 (0.39% above the national average). In contrast to this development we observe a sharp rise in the share of skilled employees in eastern Bavaria, which, starting from a subproportional 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).[4]

[4] Though the relative growth rate of the high-skilled share is higher in the border region, due to the low base level the absolute difference between eastern Bavaria and the rest of western Germany increases; for an overview of absolute differences see appendix, figures A2a-c.

Taking into account the rural structure of eastern Bavaria and comparing the region only with district types 5-9 at national level the results are similar (see figure 2).

Figure 2: Deviation of Skill Group Shares in the Eastern Bavarian Border Region from the Averages in the District Types 5-9 in Western Germany (as %, 1980-2001)



The share of low-skilled workers in eastern Bavaria from 1980 to 2001 was approximately equivalent to 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 1 the deficit of high-skilled workers in eastern Bavaria compared 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.

5 Econometric Analysis of Qualification Trends

To investigate the changes in the skill structure we use the following econometric approach:

For the 265 regions we calculate the shares of the skill groups for each year so that we obtain a “balanced panel” from 1980 to 2001.

Then we estimate the following equations using standard OLS method.[5]

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

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

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

$LOWSK_{rt}$ ($SKILLED_{rt}$, $HIGHSK_{rt}$) denotes the share of low-skilled (skilled, high-skilled) workers in region r in year t (as %). Our equation includes (0.1)-dummy variables for the Federal State of Bavaria (BAYERN)[6], the district types (DRTYP2: district types 5-6; DRTYP3: district types 3-4 & 7-9) and the eastern Bavarian border region (BORREG). Using TREND und TRENDOPENB we control for 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 identifies the changes in the wages in eastern Bavaria after the opening of the border. According to our hypothesis we expect negative values for low-skilled employees and positive values for skilled and high-skilled persons, 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, better skilled workers in the border region should benefit by the opening of the border.

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5 i.e. we have 5830 observations in each of the three estimations (265 regions times 21 years).

6 In Bavaria the proportion of school leavers with upper secondary education is significantly smaller than the proportions in other federal states.

Tables A2-A4 in the appendix contain the results of the estimates. The adjusted R^2 ranges between 0.32 for skilled persons and 0.44 for low-skilled ones. The signs of the coefficients for the dummy variables correspond with our theoretical expectations, positive values in the estimation with low-skilled workers, negative signs in the cases of more highly skilled workers.[7] As expected the share of low-skilled employees is higher in Bavaria, in rural regions and in the border region. 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 we observe differentiated results. What is more striking and even in contrast to our predictions is the significantly positive sign of the coefficient for TRENDOPENB for low-skilled workers and the significantly negative values for skilled and high-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 our analysis, TRENDOPENB_BORREG, lies close to 0 and is statistically insignificant in all cases. Therefore we are not able to identify an effect of the opening of the border on the skill structure in eastern Bavaria. Though we observe an upward movement in the skill structure in general, we find no evidence of the theoretically predicted increase in skilled labour in the region under review, which is in line with our descriptive results.

6 Econometric Analysis of Wage Differentials

To estimate border region effects on wages for employees in eastern Bavaria, we use a Tobit model taking into account the censored (top-coded)

[7] With the exception of DRTYP3 in the regression for skilled workers and BORREG in the regression for high-skilled workers.

income thresholds of the data, which vary yearly.[8] We estimate separately for each skill group for each year the wage equation:

$$\ln WAGE_i = \alpha + \beta DFEM_i + \gamma_1 EXPER_i + + \gamma_2 EXPER_i^2 + \gamma_3 EXPER\_F_i + \gamma_4 EXPER^2\_F_i + \sum_{j=1}^{J=4} \delta_j DKT_{ji} + \sum_{k=1}^{K=15} \lambda_k DWZWG_{ki} + \tau BORREG_i + \varepsilon_i$$

$WAGE_i$ denotes the individual i's daily wage. In addition to the conventional variables of the Mincerian wage equation we use dummies for the district types and the branches of economic activity.[9] In order to avoid estimations for a reference group of job entrants we include only individuals with at least five years of work experience. For a detailed definition of the variables see appendix, tables A5a-b.

The coefficient of BORREG τ estimates the wage effect (as a %) for the skill group in the border region compared with the national level.

According to our hypothesis we expect decreasing values of τ for low-skilled workers and increasing values for skilled and high-skilled workers for the years after 1989.

We obtain the following results for τ (see appendix, table A6) for low-skilled workers (Figure 3), skilled workers (Figure 4) and high-skilled workers (Figure 5) supplemented by 95% confidence bounds (upper and lower limit). We regress the estimated values of τ on TREND and TRENDOPENB, so that we obtain a broken trend line and can distinguish the development before and after the opening of the border.

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8 The upper earnings ceiling is relevant for social security contributions in Germany.

9 Since the district types 1-4 do not appear in the border region we exclude observations of these districts from the estimation.

Figure 3: Wage of Low-Skilled Workers in the Border Region compared with Low-Skilled Workers in Western Germany (1980-2001)

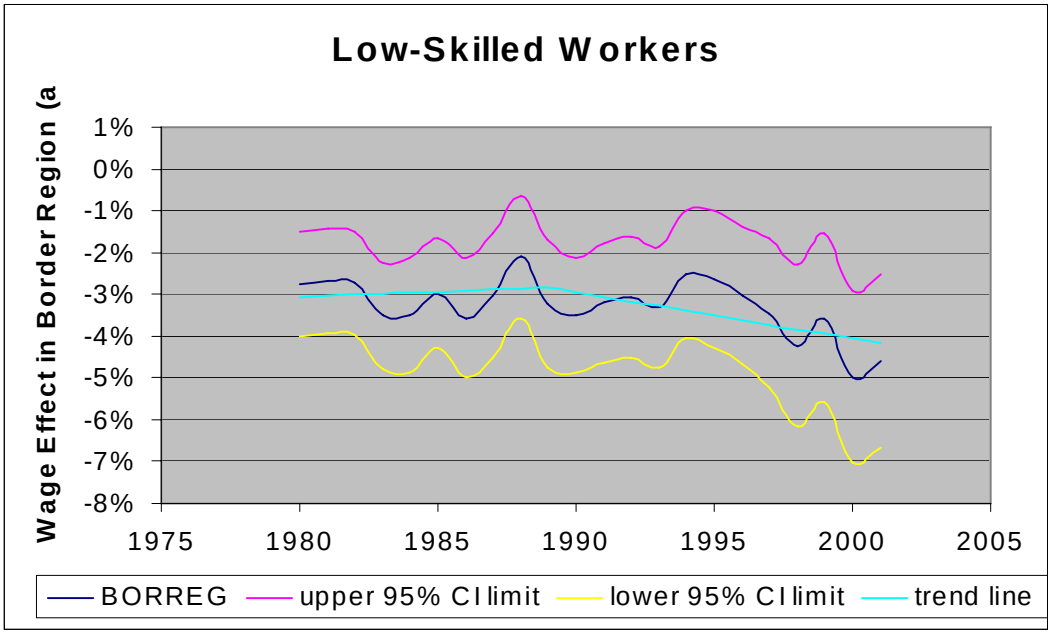


Figure 3 shows that on average low-skilled workers in eastern Bavaria initially earned approximately 3% less than their counterparts in the rest of western Germany. From 1994 onwards the wage gap grew to 5% in 2000. Though we observe that the wages in the border region were significantly below the wages at national level, the trend line does not indicate a significant widening of the wage differential after the opening of the border. Therefore 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 4 and 5.

The wage differential of skilled workers rose 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 (see figure 4). The coefficient for BORREG declined noticeably in 1992 and 1993, but in general no consistent open-border effect is identifiable.

Figure 4: Wage of Skilled Workers in the Border Region compared with Skilled Workers in Western Germany (1980-2001)

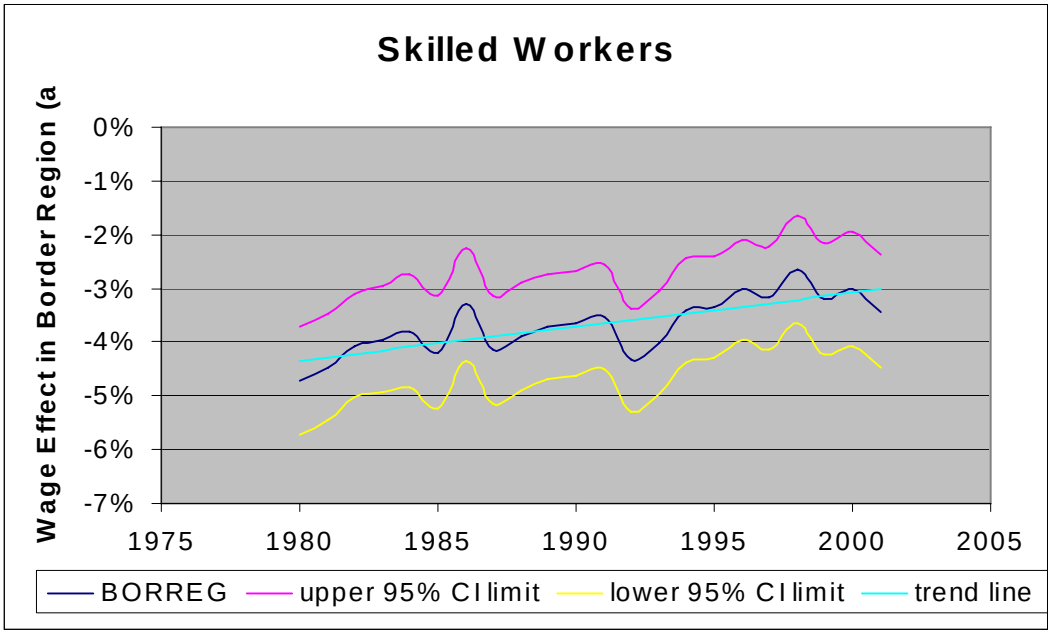
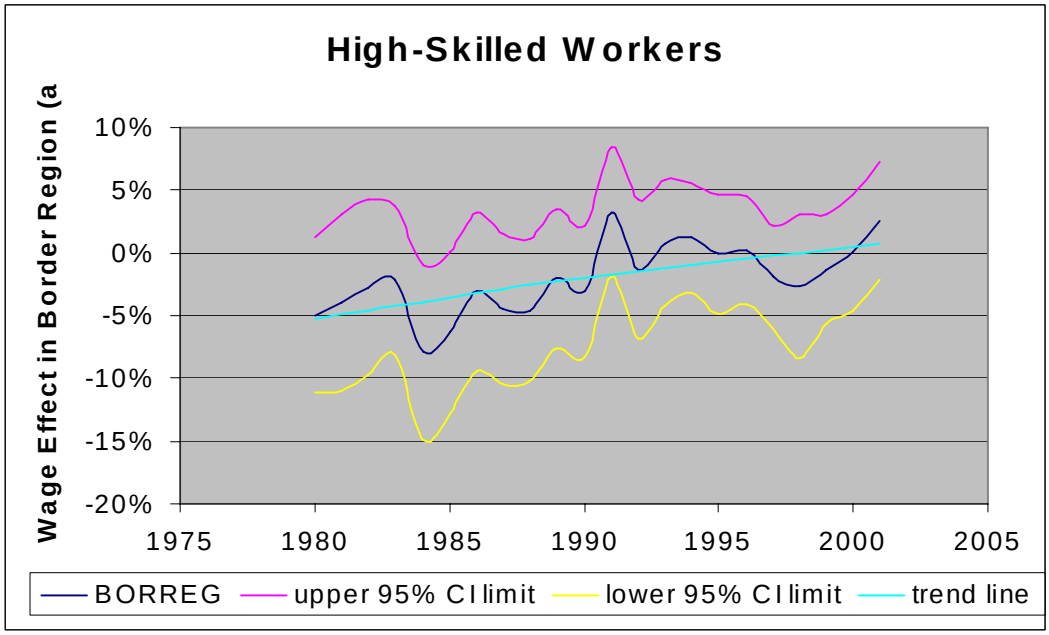


Figure 5: Wage of High-Skilled Workers in the Border Region compared with High-Skilled Workers in Western Germany (1980-2001)



Regarding high-skilled employees in eastern Bavaria we observe similar results but on a larger scale (figure 5).[10] Whereas the wage differential of persons employed in the border region was permanently negative during

[10] Due to there being far fewer persons with higher education in the dataset, the results vary to a greater extent than in estimations with low-skilled or skilled employees.

the 1980s, positive values have appeared sporadically since 1991. As in the estimation for skilled employees we can not observe an effect caused by the opening of the border.

7 Conclusion

To sum up the main results, we do not find clear evidence of disproportionate shifts in the skill and wage structure in eastern Bavaria caused by the opening of the border to the Czech Republic.

The trend towards more skilled labour led to substantial shifts in the employment structure in the Bavarian border region, too.

In the period under review, from 1980 to 2001, the share of low-skilled workers, which was considerably larger in eastern Bavaria at the beginning, adjusted to the average value of the districts comparable with the observed region. 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 remains just below the aggregate level.

Our regression results correspond to the descriptive figures. There is no evidence of a special skill-upgrading process after the opening of the border.

Regarding wage differentials between eastern Bavaria and the rest of western Germany there are no indications that a disproportionate number of skilled workers would profit from free trade with the Czech Republic. Despite a catching-up trend, i.e. a decrease in the wage gap, we can not identify any positive effects for skilled and high-skilled workers as a result of integration. The wage differential of low-skilled employees in eastern Bavaria seems to have grown in the late 1990s, but our results are not significant.

This suggests that the opening of the border did not have a profound impact on the districts situated immediately on the border. Though the accession of the Czech Republic to the EU might cause labour market effects in eastern Bavaria, particularly regarding the free movement of labour, there is so far no reason for political scaremongering.

References

Airola, J., and Ch. Juhn (2005): Wage Inequality in Post-Reform Mexico. IZA Discussion Paper 1525.

Anwerbestoppausnahmeverordnung ASAV (regulation on the granting of employment permits to foreigners) (1997): http://bundesrecht.juris.de/asav/ (accessed July 3, 2006).

Barjak, F., and G. Heimpold (2000): Development Problems and Policies at the German Border with Poland - Regional Aspects of Trade and Investment. In: Borders, Regions and People. European Research in Regional Science, Vol. 10, eds. M. van der Velde and H. van Houtum, 13-31. London: Pion.

Berman, E., J. Bound, and Z. Griliches (1994): Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufacturers. In: Quarterly Journal of Economics 109(2): 367-98.

Blien, U., E. Maierhofer, D. Vollkommer, K. Wolf, L. Blume, A. Eickelpasch, and K. Geppert (2003): Die Entwicklung der Ostdeutschen Regionen. Vol. 267 of *Beiträge zur Arbeitsmarkt- und Berufsforschung*. Nuremberg.

Borjas, G., and V. Ramey (1995): Foreign Competition, Market Power and Wage Inequality. In: Quarterly Journal of Economics 110(4): 1075-1110.

Bound, J., and G. Johnson (1992): Changes in the Structure of Wages in the 1980s: An Evaluation of Alternative Explanations. In: American Economic Review 82(3): 371-92.

Büttner, T., and J. Rincke (2004): Labour Market Effects of Economic Integration – the Impact of Re-Unification in German Border Regions. CESifo Working Paper 1179.

Fitzenberger, B. (1999): International Trade and the Skill Structure of Wages and Employment in West Germany. In: Jahrbücher für Nationalökonomie und Statistik 219(1/2): 67-89.

Feenstra, R., and G. Hanson (1997): Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladoras. In: Journal of International Economics 42(3/4): 371-393.

Feenstra, R., and G. Hanson (1996): Foreign Direct Investment, Outsourcing and Relative Wages. In: Political Economy of Trade Policy: Essays in Honour of Jagdish Bhagwati, eds. R. Feenstra, G. Grossman, and D. Irwin, 89-127. Cambridge: MIT Press.

Hanson, G. (1996): U.S.-Mexico Integration and Regional Economies: Evidence from Border-City Pairs, National Bureau of Economic Research, Working Paper 5425.

Lawrence, R.Z., and M.J. Slaughter (1993): International Trade and American Wages in the 1980s: Giant Sucking Sound or Small Hiccup? In: Brookings Papers on Economic Activity. Microeconomics, 1993(2), 161-226.

Leamer, E. (1996): In Search of Stolper-Samuelson Effects on U.S. Wages, National Bureau of Economic Research, Working Paper 5427.

Niebuhr, A. (2005): The Impact of EU Enlargement on European Border Regions. HWWA Discussion Paper 330.

Niebuhr, A. (2004): Spatial Effects of European Integration: Do Border Regions Benefit Above Average. HWWA Discussion Paper 307.

Riedel, J., and G. Untiedt (2001): EU-Osterweiterung und Deutsche Grenzregionen - Strukturpolitik und Raumplanung in den Regionen an der Mitteleuropäischen EU-Außengrenze zur Vorbereitung auf die EU-Osterweiterung. Expertise. Subproject. 2 vols. Dresden.

Skuratowicz, A. (2005): Growing Wage Inequalities in Poland: Could Foreign Investment be Part of the Explanation? Vol. 2 of *ECFIN Country Focus*. Issue 5. European Commission, Brussels.

Stiller, S. (2004): Integration in the German-Polish Border Region - Status Quo and Potential. In: Argumenta Oeconomica 15(1): 31-56.

Wood, A. (1994): North-South Trade, Employment and Inequality. Oxford University Press.

Appendix

Figure A1: Eastern Bavarian Border Region

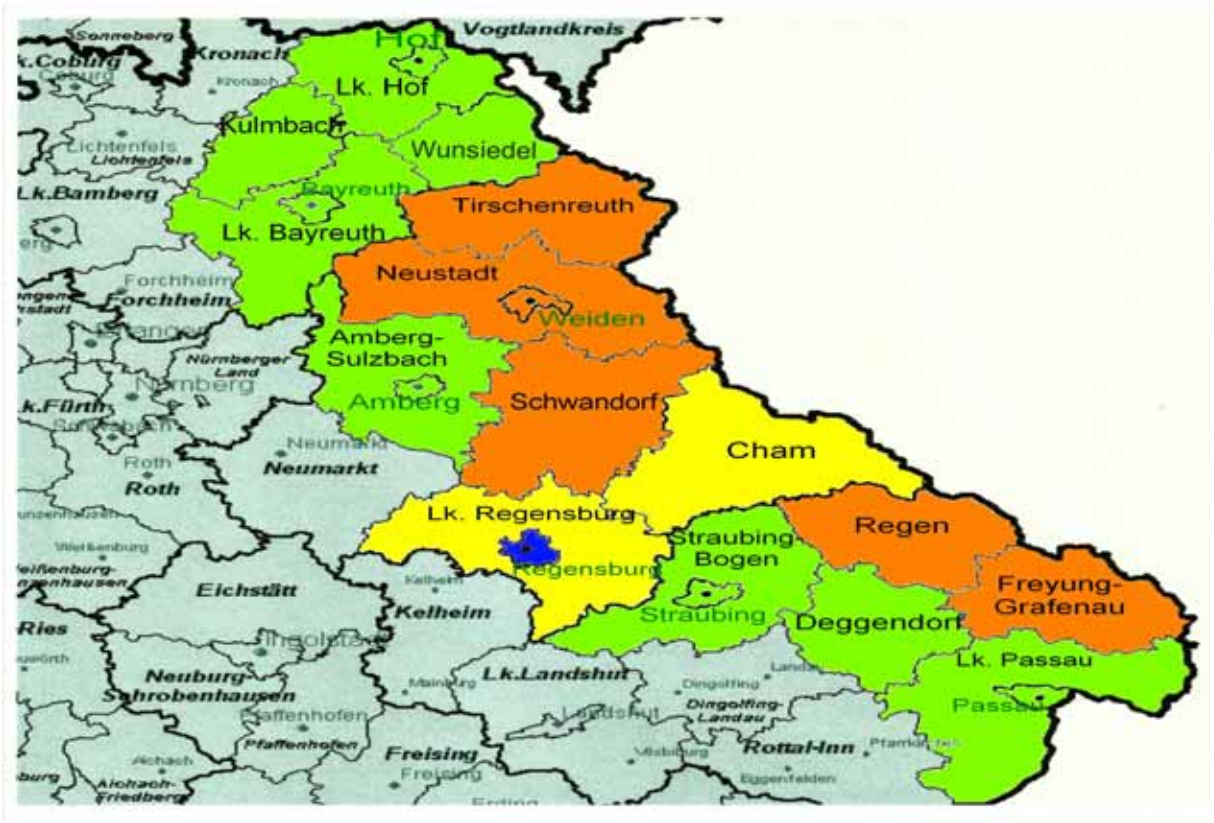


Figure A2a-c: Shares of Skill Groups in Eastern Bavaria and Western Germany

Figure A2a: Low-Skilled (as %, 1980-2001)

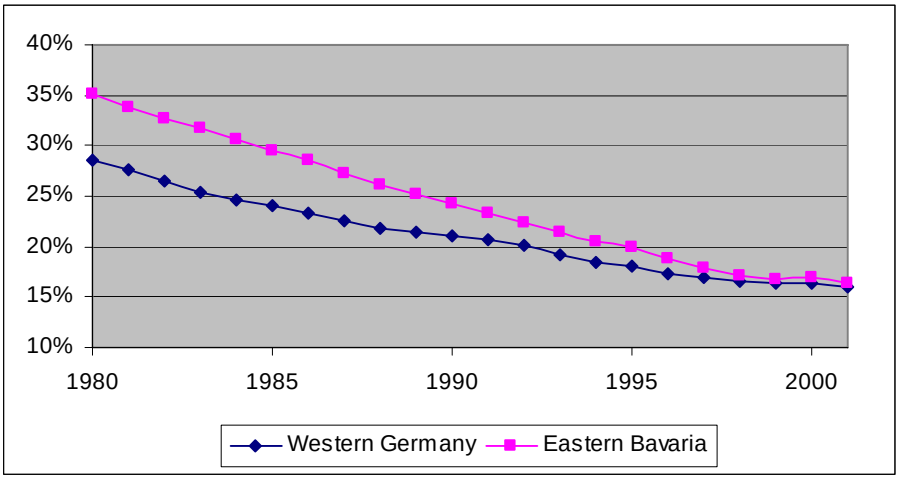


Figure A2b: Skilled (as %, 1980-2001)

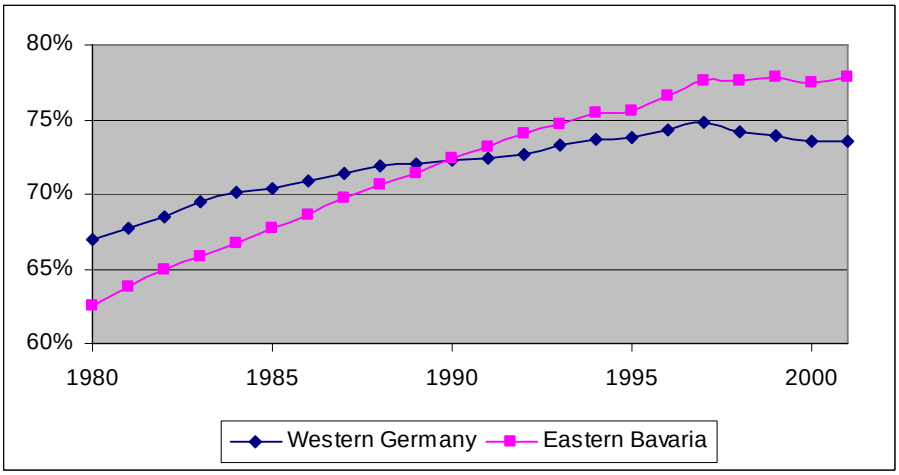
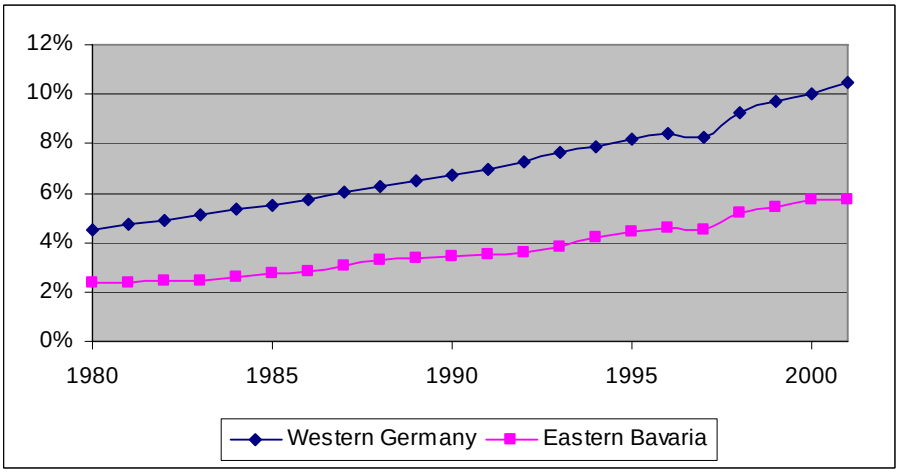


Figure A2c: High-Skilled (as %, 1980-2001)[11]



[11] The low value for 1996 for high-skilled employees can be traced back to a lack of registration of doctors in this year.

Table A1: Regional Classification Scheme Based on BBR Classification

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

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

Table A2: Estimation Results for the Share of Low-Skilled Workers

Variable	Coef.	Std.Err.
BAYERN	**0.0251**	0.0035
DRTYP2	**0.0110**	0.0037
DRTYP3	0.0055	0.0034
BORREG	**0.0401**	0.0099
TREND	**-0.0081**	0.0003
TREND_BORREG	-0.0016	0.0013
TREND_BAYERN	**-0.0007**	0.0002
TREND_DRTYP2	*-0.0006*	0.0003
TREND_DRTYP3	*-0.0005*	0.0002
TRENDOPENB	**0.0040**	0.0004
TRENDOPENB_BORREG	-0.0008	0.0019
Constant	**0.2941**	0.0026
test statistics		
Number of observations	5830	
R-squared	0.4425	
Root MSE	0.0471	

Notes: Regression with robust standard errors; all coefficients significant at the 1 percent level are printed in bold, all coefficients significant at the 5 percent level are in italics.

Source: Own calculations based on IABS.

Table A3: Estimation Results for the Share of Skilled Workers

Variable	Coef.	Std.Err.
BAYERN	**-0.0234**	0.0032
DRTYP2	-0.0037	0.0034
DRTYP3	**0.0124**	0.0032
BORREG	**-0.0415**	0.0090
TREND	**0.0057**	0.0003
TREND_BORREG	0.0019	0.0012
TREND_BAYERN	0.0001	0.0002
TREND_DRTYP2	**0.0013**	0.0002
TREND_DRTYP3	**0.0021**	0.0002
TRENDOPENB	**-0.0047**	0.0004
TRENDOPENB_BORREG	0.0006	0.0016
Constant	**0.6685**	0.0023
test statistics		
Number of observations	5830	
R-squared	0.3229	
Root MSE	0.0450	

Notes: Regression with robust standard errors; all coefficients significant at the 1 percent level are printed in bold.

Source: Own calculations based on IABS.

Table A4: Estimation Results for the Share of High-Skilled Workers

Variable	Coef.	Std.Err.
BAYERN	-0.0017	0.0022
DRTYP2	**-0.0073**	0.0016
DRTYP3	**-0.0180**	0.0017
BORREG	0.0014	0.0023
TREND	**0.0025**	0.0002
TREND_BORREG	-0.0003	0.0003
TREND_BAYERN	**0.0006**	0.0002
TREND_DRTYP2	**-0.0007**	0.0002
TREND_DRTYP3	**-0.0015**	0.0002
TRENDOPENB	**0.0007**	0.0002
TRENDOPENB_BORREG	0.0002	0.0005
Constant	**0.0374**	0.0012
test statistics		
Number of observations	5830	
R-squared	0.3681	
Root MSE	0.0278	

Notes: Regression with robust standard errors; all coefficients significant at the 1 percent level are printed in bold.

Source: Own calculations based on IABS.

Table A5a: Variables of the Wage Equation

ln WAGE	Logarithm of individual wage
DFEM	Dummy for sex (female=1)
EXPER (≥5)	Job experience
$EXPER^2$	Job experience ^{2}/100
EXPER_F	Job experience, female
$EXPER^2$_F	Job experience ^{2}/100, female
DKT*	Dummies for district types 5-8
DWZWG*	Dummies for branches of economic activity 2-16
BORREG	Dummy for border region
_cons	Constant

Table A5b: Values of EXPER

The workers' potential on-the-job experience (EXPER) is measured in years as age minus average duration of education minus six. We 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 respectively for skilled workers, 16 years for high-skilled workers holding a degree from a polytechnic- and 18 years for high-skilled university graduates.

Qualification	**EXPER**	**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

Table A6: Results for the Coefficient of BORREG in the Wage Equation Estimates 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

Notes: All coefficients significant at the 1 percent level are printed in bold.

Source: Own calculations based on IABS.

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