ECONSTOR
Make Your Publications Visible.

A Service of

ZBW Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Huber, Peter

Conference Paper

Quantity Adjustments in Candidate Countries Regional Labour Markets

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

Provided in Cooperation with:
European Regional Science Association (ERSA)

Suggested Citation: Huber, Peter (2003) : Quantity Adjustments in Candidate Countries Regional Labour Markets, 43rd Congress of the European Regional Science Association: "Peripheries, Centres, and Spatial Development in the New Europe", 27th - 30th August 2003, Jyväskylä, Finland, European Regional Science Association (ERSA), Louvain-la-Neuve

This Version is available at:
https://hdl.handle.net/10419/116057

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

Quantity Adjustments in Candidate Countries Regional Labour Markets

Vera Gacs and Peter Huber *
Austrian Institute for Economic Research (WIFO)
Arsenal, Objekt 20
1030 Wien
Austria
e-mail: huber@wifo.ac.at

Abstract

This paper analysis the adjustment of regional labour markets of candidate countries to asymmetric shocks. It finds, that idiosyncratic region specific developments of unemployment rates are of a smaller importance in first round candidate countries. We also find that candidate countries are typical European labour markets in the sense that a substantial part of the adjustment to changes in employment is carried by participation decisions and migration plays a small role only in regional adjustment. The differences between candidate countries and member states is that the former have experienced larger region specific shocks to labour demand, and that these shocks lead to a higher long run change in employment. Typologies based on sectoral specialisation indicate that urban regions have experienced a substantially more favourable and industrial and peripheral regions less favourable labour market developments throughout transition. Furthermore, we find evidence that high regional unemployment can in part be explained by the low capability of high unemployment regions to absorb region specific shocks.

Key Words: Regional Labour Market Adjustment, Transition, EU - Accession

JEL – Classification: E24, R11, P25

* This research was supported by the European Commission 5th framework program ACCESSLAB. We thank Laszlo Halpern and the participants of the ACCESSLAB workshop in Budapest for helpful comments. Mistakes remain in the responsibility of the author.

Introduction

In the years from 1990 to 1998 employment population ratios in the Central and Eastern European accession candidate countries declined by between 6 and 20 percentage points, participation rates fell by over 5 percentage points and unemployment rates increased from zero to close to double digit levels in many countries. These rapid changes, however, mask the substantial variation in regional labour market developments. Regional labour market disparities in candidate countries increased throughout the 1990's (see Pertrakos 1995, Boeri and Scarpetta, 1996) and reached levels comparable to those of western Europe by the end of the decade (see chapter 1 of this report).

In this paper we are interested in whether the substantial heterogeneity in regional labour market conditions in the candidate countries is associated with differences in the capability of regions to absorb region specific shocks. This is not only interesting from the point of view of explaining historic experiences, but is also highly relevant in the context of enlargement of the European Union (EU). The capability of candidate countries to adjust to regional shocks is an important determinant for a number of important policy decisions to be taken in the phase of integration following accession. It will influence the optimal point in time for the candidate countries to join EMU, and determines the particular policy needs of candidate countries with respect to the reforms of structural funds.

This paper thus extends the literature on regional labour market dynamics in candidate countries (see for instance the last chapter of this study) by moving the level of analysis from a univariate setting to the application of a multi-variate model that has become the "work horse" model of the regional evolution literature (see Blanchard and Katz, 1992 and Decressin and Fatas, 1995) and by focusing on potential differences in labour market adjustment between region types. We find first, that idiosyncratic region specific developments in unemployment are of a smaller importance in first round candidate countries, while concerning other labour market indicators few differences to the EU can be found. In second round candidate countries, by contrast region specific developments in participation rates are more important than in member states. Second, that in contrast to EU member states, candidate countries have experienced larger region specific shocks to labour demand, and that these shocks tend to be more persistent than in member states. Third, our results indicate that

regional differences in the adjustment of labour markets pertain mainly to the persistence of the employment rate shock and the role of unemployment rate. Unemployment rate adjustment is particularly important in low unemployment regions and border regions, thus regions that have performed better than average in terms of unemployment. This suggests that in part high regional unemployment can be explained by the low capability of high unemployment region to absorb region specific shocks.

The paper is structured as follows. The next section describes the theoretical model underlying our analysis, and section three discusses data issues. In section three we focus on the issue of region specific developments and in section five on the nature of regional shocks in candidate countries. Section six clears some of the econometric problems that have to be dealt with before estimation while sections six, seven and eight present results concerning labour market adjustment in candidate countries with respect to univariate processes, the multivariate model and the regional differentiation, respectively. Section nine concludes.

A model of Labour Market Adjustment

To analyse regional labour market dynamics of the candidate countries we use the "workhorse" model in the "regional evolutions" literature due to Blanchard and Katz, 1992. The starting point of this model is that region specific labour demand is given by:

(1) $$l_{it} = -\alpha_1 w_{it} + z_{it}$$

with l_{it} employment in region i at time t, w_{it} the wage rate in the region and z_{it} a shift parameter for labour demand. In this model all variables are in log deviations from national developments. The motivation for including this shift parameter is to allow for the possibility of capital mobility. As in Blanchard and Katz (1992) we assume that the location decision of a firm is driven by the aim to locate in regions with the lowest costs i.e.

(2) $$\Delta z_{it} = \rho_{0i} + \rho_1 w_{it} + \zeta^D{}_{it} \, .$$

with $\rho_1<0$. Regional labour supply is driven by migration decisions and the participation decision of the residents. Thus the labour supply (n_{it}) in region i at time t satisfies the identity $n_{it} = pop_{it} + p_{it}$ with pop_{it} the population and p_{it} the participation rate in region i at time t . We assume that the participation rate is influenced by unemployment rates and wage levels (see also Hojvat-Gallin, 1999). Thus:

(3) $$p_{it} = \lambda_{0i} + \lambda_1 u_{it} + \lambda_2 w_{it} + \zeta_{it}^S$$

where λ_{0i} is a region specific constant to capture long run differences in participation rates between regions as may arise from differences in demographics (i.e. higher share of female or young population) as well as differences in the internal characteristics of region and u_{it} is the unemployment rate in region i (measured as the ratio between unemployment and employment in the region).

Changes in working age population of a region, relative to national changes, by contrast can be due either to differences in demographic developments or to migration. We assume that demographic trends can be described by a region fixed effect (γ_{0i}) while net migration is determined by differences in expected lifetime income in the region relative to the rest of the country. Thus changes in population can be modelled by:

(4) $$\Delta pop_{it} = \gamma_{0i} + \gamma_1 u_{it} + \gamma_2 w_{it} + \zeta_{it}^M$$

This equation follows from standard migration theory (see e.g. Harris and Todaro, 1970) which postulates that economic migrants should move from low wage, high unemployment regions to high wage and low unemployment regions.

Finally, to close the model we use the standard approximation of the unemployment rate $u_{it} \approx n_{it} - l_{it}$ and assume that wages are set according to:

(5) $$w_{it} = \chi_{i0} - \chi_1 u_{it-1}$$

As pointed out by Bean (1995) this formulation of the wage equation is compatible to a number of theoretical approaches to wage setting such as trade union or efficiency wage theory.

In this model there are two mechanisms by which regional disparities arising from region specific shocks can be evened out among regions. First capital mobility (equation (2) and job creation (equation (1) in the region may work to countervail a negative shock. This mode of adjustment, relies on wage flexibility and the reaction of firms to such wages. Only if in the face of an adverse region specific shock to labour demand wages fall

sufficiently to make job creation in the region attractive to firms, will this mechanism work. Second, migration may be an alternative mode of adjustment.[1]

The adjustment processes triggered by these two modes of adjustment will differ. If migration is the predominant mode of adjustment then jobs lost or won in regions will be highly persistent. If by contrast capital mobility or region endogenous job creation after a reduction in wages is the primary adjustment mode then jobs lost in a region should in the long run re-emerge and employment losses should be little persistent (see: Fatas, 2000).

Data

The regional data for this study were taken from regional statistical yearbooks. They encompass the period from 1992 to 1998 for the regions of five accession candidate countries (Bulgaria, Czech Republic, Hungary, Poland and Romania).[2] Similar data has been used in a number of studies on labour markets in accession candidate countries (see: Boeri and Scarpetta 1996 and Traistaru, Nijkamp and Resmini, 2002). From these countries we form two subgroups: those which have completed negotiations (i.e. the Czech Republic, Hungary and Poland) and those that are still negotiating with the EU (Romania and Bulgaria). We refer to these two groups as first and second round countries, respectively.

As a „benchmark“ we use data on the regions of five EU member states. These are the Netherlands, Germany, Spain, Portugal and Italy for the period from 1989 to 1995. This choice was guided by data availability and a concern to include highly developed EU countries as well as poorer member states, whose labour markets are considered less flexible. EU data were taken exclusively from the Eurostat Regio database.

The regions of these countries differ in terms of size, wealth and labour market outcomes (see table 1). In general the candidate countries' regions are substantially smaller than member states' both in terms of population and area. This may have implications on the findings of this paper with respect to migration. Since migration is highly distance dependent, migration across regional borders is more likely in smaller regions. One may thus

[1] In the absence of either of these adjustment mechanisms a permanent reduction in labour demand in the region will increase unemployment rates and/ or reduce participation rates in the long run.

[2] A detailed data description is provided in the appendix.

expect to find higher migration in candidate countries. Furthermore, to the extent that regionally asymmetric shocks reflect sectoral shocks in specialised regions one should also find higher shock asymmetry in smaller regions.

Table 1: Summary Statistics of Regional Data in Candidate and EU Countries

	Population		Area	Unemployment Rate		Participation Rate		Employment growth	
	1992	1998		1992	1998	1992	1998	1993	1998
Czech Republic	135.7 (133.6)	133.7 (135.8)	1,051 (578)	2.9 (1.4)	7.5 (3.0)	32.9 (6.4)	34.8 (5-0)	-18.7 (6.5)	-3.2 (4.0)
Poland	783.0 (604.0)	789.1 (590.5)	6,381 (3630)	13.6 (4.4)	10.4 (4.1)	45.9 (3.7)	45.5 (4.6)	-5.9 (5.5)	-0.1 (2.6)
Hungary[b]	516.9 (393.2)	506.8 (367.3)	4,651 (1790)	8.2 (3.2)	9.1 (3.8)	32.6 (4.3)	25.7 (6.65)	-9.8 (2.4)	-2.0 (2.2)
Bulgaria	303.0 (215.5)	293.9 (217.6)	3961 (1496)	14.7 (4.1)	13.8 (4.5)	43.8 (2.4)	43.0 (2.3)	-1.7 (2.1)	-0.2 (1.0)
Romania	555.8 (330.8)	548.8 (325.7)	5814 (1495)	3.0 (1.3)	9.0 (2.9)	47.2 (2.8)	42.7 (2.7)	-3.8 (3.0)	-2.7 (2.7)
	1989	1995		1989	1995	1989	1995	1989	1995
Germany[a]	5978.7 (5251.4)	6192.3 (5129.2)	8,925 (5,661)	6.7 (2.3)	7.6 (1.9)	43.8 (5.8)	41.7 (6.5)	3.1 (0.1)	-1.2 (0.1)
Italy	2837.9 (2276.8)	2865.0 (2245.1)	15,066 (7,226)	10.0 (6.27)	11.9 (6.8)	30.7 (3.2)	30.0 (3.5)	0.9 (1.9)	-0.7 (1.7)
Netherlands	1260.6 (964.5)	1288.3 (939.2)	2,824 (1,139)	8.5 (1.5)	7.0 (1.0)	32.8 (4.0)	33.1 (4.2)	3.0 (1.6)	2.0 (0.5)
Portugal[c]	1408.6 (1444.3)	1883.7 (1339.1)	13.123 (10,249)	4.8 (3.1)	7.3 (2.1)	29.3 (4.2)	31.6 (4.1)	2.4 (9.5)	-8.9 (5.1)
Spain	2169.8 (2014.8)	2178.3 (1992.2)	28,044 (29,521)	17.4 (6.0)	23.1 (5.4)	27.8 (3.5)	25.1 (3.8)	-4.8 (1.7)	2.9 (2.5)

Note: Table reports unweighted averages (standard deviations) of variables. Values in brackets are standard deviations Population is measured in thousand inhabitants, area in square kilometres all other variables in percent. a) German data for employment and wage growth, as well as participation rates ends in 1994 this is reported in the column headed 1995. b) Hungarian data for 1998 was excluded from the analysis due to changes in methodology thus 1997 values are reported in the table. c) Portugal excluding overseas territories (i.e. Acores and Madeira).(see also the data description in the appendix)

The primary concern of this paper, however, is with regional developments. The large regional disparities which emerged during transition have been repeatedly stressed (see: Boeri and Scarpetta, 1996 and Petrakos, 1995) and a number of authors have established lines along which they develop: Large cities have exhibited the lowest unemployment rates and highest wages throughout transition; border regions to the west have developed better than non-border regions and mono-industrial regions faced considerable labour market problems (see: Gorzelak, 1996, Smith 1998). To assess how different region types react to asymmetric shocks candidate countries we employ a taxonomy of the candidate countries regions' developed by Scarpetta and Huber (1995) which has been widely in regional labour market analysis in candidate countries (see: Burda and Profit, 1996, Boeri and Scarpetta, 1996, Boeri and Terrel, 2002). This taxonomy divides the regional units of the countries analysed into

industrial, agricultural and diverse regions. In a further step, regions of each type were divided into perspective and other regions. From this further step we use only the subdivision of diverse regions into urban regions and other diverse regions.

Table 2: Regional Indicators relative to National Average by region Types

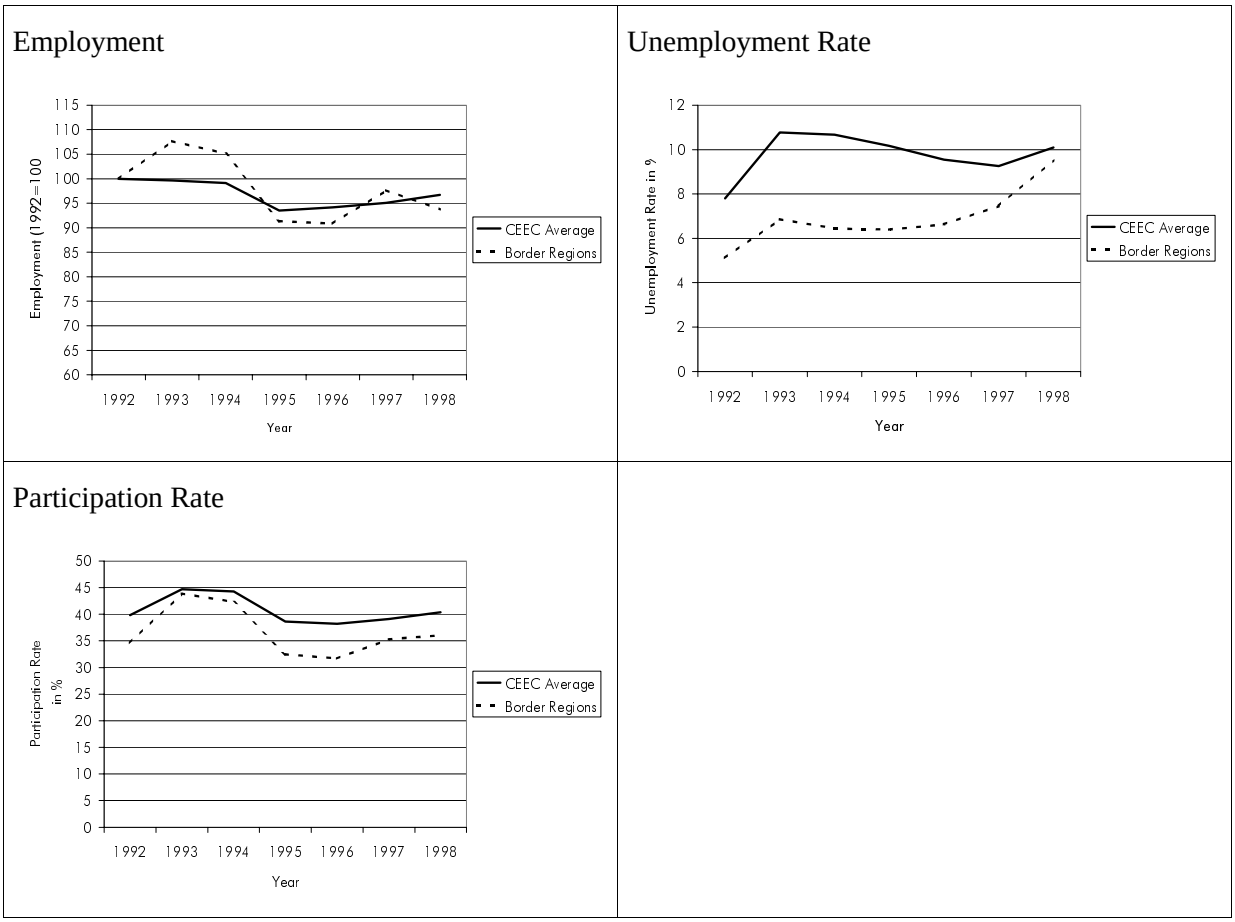
	Participation Rates		Unemployment Rates		Number of Regions
	1992	1998	1992	1998	
Agricultural	0.90	0.95	0.93	1.03	71
Regions	(0.16)	(0.14)	(0.27)	(0.39)	
Industrial	0.97	0.98	0.99	1.11	61
Regions	(0.14)	(0.12)	(0.39)	(0.38)	
Urban Regions	1.10	1.04	0.67	0.73	26
	(0.30)	(0.19)	(0.31)	(0.33)	
Other Regions	0.96	0.96	1.20	1.18	56
	(0.10)	(0.09)	(0.30)	(0.29)	

Note: Table reports unweighted averages (standard deviations) of variables normalised by national averages. Values in brackets are standard deviations Hungarian data for 1998 is included in the calculations

In all our results for regions types we exclude all EU regions and focus only on the regions of the candidate countries. Thus table 2 reports average participation rates and unemployment rates relative to the national average in 1992 and 1998 in the respective regions of the candidate countries. A value larger than one indicates that the average region of this type has shown a value higher than the national average, while a value smaller than one indicates a lower value than the national average in candidate countries. Urban regions have shown substantially smaller unemployment rates and slightly higher participation rates and nominal wages throughout transition, while the other diverse regions have been characterised by substantially higher unemployment rates and both slightly lower participation rates and wages. Industrial regions by contrast had substantially higher unemployment rates in 1998, only - a fact that reflects industrial restructuring in many of the regions. Agricultural regions have performed according to the national average.

A further category of regions we use are EU border regions. These are (Czech, Polish and Hungarian) regions directly bordering Germany or Austria. These regions were characterised by substantially lower unemployment rates, higher employment growth and lower participation rates in the early phases in transition, but have since converged to the overall levels of candidate countries (see Figure 1) concerning all indicators but participation rates. This markedly better development of border regions in early transition has been attributed to the better economic situation as well as the importance of cross border commuting and a higher activity rate in the hidden economy (see Lacko, 2000, Svejnar, 1999)).

Figure 1: Evolution of employment, unemployment rates and labour force participation in EU border regions and the CEE average, 1992-1998



Common and Region Specific Developments

These features suggest that there has been a considerable differentiation of labour market conditions in the candidate countries during the last decade. This raises the issue whether these differences have been mainly due to idiosyncratic shocks to regions or rather to different reactions of individual regions to national shocks. To disentangle these two influences a number of authors (e.g. Vinals and Jimeno, 1996, Delaigle and Lohest, 1999) have suggested running bivariate vector autoregressions of national and regional indicators. We follow this

approach using annual data from the regions in our sample. We thus estimate vector auto-regressions of the form:[3]

(6) $$Y_{At} = \beta_0 + \beta_1 Y_{At-1} + \xi_t^A$$

(7) $$Y_{it} = \delta_0 + \delta_1 Y_{it-1} + \delta_2 Y_{At} + \delta_3 Y_{At-1} + \xi_{it}$$

with Y_{it} the indicator in region i at time t and Y_{at} the same indicator for the national level, and calculate the share of the national shock in the three-year ahead prediction error.[4]

The results suggest that the importance of national developments of unemployment is somewhat larger in the first round candidate than in EU member states. Around 70% of the three year ahead forecast error of the system in equations 6 and 7, results from innovations in national unemployment development, only 30% of the forecast for region specific innovations. In the EU member states 40% of the forecast error in unemployment rates are due to national factors 60% are due to regional influences. The importance of national developments in participation rates as well as employment growth in first candidate, by contrast, are comparable to member states. In second round candidate countries region specific developments are slight more important concerning participation rates and unemployment rates, while differences to both the EU and first round candidate countries concerning other indicators are small.

Similarly, differences among region types are small and arise primarily with respect to unemployment and participation rates. In urban regions the unemployment rate development was characterised by substantial idiosyncratic developments, while in other diverse regions national factors seem to have played a more important role. In agricultural regions participation rate developments have shown above average idiosyncraticity while industrial regions follow national developments more closely. Finally, in agricultural regions employment growth has followed national developments slightly more closely than in other regions. In border regions national developments in participation rates are less important than in non-border regions. This may be attributed to the higher impact of emigration and cross-border commuting in these regions.

[3] These are estimated by single equation estimation using the GMM estimator proposed by Arellano – Bond (1991) see below

[4] Three year ahead forecast errors were used to mimic „medium term" adjustment, results are robust to using two or four year ahead forecast errors.

Table 3: Share of three year ahead forecast error of national shocks in regional series

	Participation rate	Unemployment rate	employment growth	wage growth
Member States[c)]	0.427	0.395	0.544	0.472
Candidate Countries[a)]	0.456	0.601	0.531	0.490
First Round[a)]	0.494	0.681	0.509	0.487
Second Round	0.314	0.467	0.511	0.498
Border Regions	0.371	0.583	0.539	0.487
Non-Border Regions	0.528	0.629	0.482	0.548
Agricultural Regions [a)]	0.436	0.444	0.562	0.517
Industrial Regions [a)]	0.611	0.511	0.444	0.544
Urban Regions [a)]	0.500	0.433	0.477	0.557
Other Diverse regions [a)]	0.486	0.568	0.497	0.563
High Unemployment Regions [a)]	0.377	0.313	0.391	0.539
Low Unemployment Regions [a)]	0.551	0.498	0.545	0.533

Notes: high unemployment rate regions = regions with unemployment rates in excess of 10% in 1998; Low unemployment rate regions = regions with unemployment rates lower than 7% in 1998. Regional typology for candidate countries according to Scarpetta and Huber a) Hungarian data from 1992 to 1997 b) Wages, employment growth and participation rate for Germany 1989 – 1994 Excluding overseas territories (Acores and Madeira)

The important difference, in region specific developments lies in the important role of region specific shocks in high unemployment regions relative to the smaller role in low unemployment regions. Regional idiosyncratic developments in unemployment and participation rates as well as employment growth have been more important in high unemployment regions of the candidate countries. This suggests that high unemployment rates (and low participation rates) in the high unemployment regions are due to region specific problems to a larger degree than in low unemployment rate regions.

Demand or Supply Shocks

A second issue arising from the model presented in equations (1) to (5) is whether shocks to labour demand or labour supply have been more important in explaining regional labour market development in candidate countries. This too can be addressed at the hands of descriptive statistics. In particular if average unemployment rates and employment growth rates are positively correlated, this implies that employment growth is primarily driven by labour supply shocks. If by contrast employment growth is driven by labour demand shocks the two

variables will be negatively correlated. We thus estimate a regression of the unemployment rate on employment growth for the time period 1992-1998. The results (see table 4) suggest a significant positive and correlation between annual employment change and average unemployment. The R^2 of this regression, however, is small and the relationship seems to be unstable over time. When looking at shorter time periods (1992-1994 and 1995-1998), a negative relationship between average unemployment and employment growth in the first time period and a positive relationship between the two variables in the second time period can be observed. That is while between 1992 and 1994 reductions in employment growth were associated with simultaneous increases in the unemployment rate. The regression results indicate a „labour supply-driven" change in employment for the period 1995-1998.

Table 4: Relationship between average unemployment and average annual employment growth (in logs) in the Candidate Countries

	1992-1998	1992-1994	1995-1998
Constant	0.103***	0.095***	0.126***
	(0.002)	(0.002)	(0.001)
Ln (Employment Growth)	0.189***	-0.601***	0.807***
	(0.06)	(0.034)	(0.032)
Number of Observations			
Adjusted R^2	0.006	0.318	0.4163

Values in brackets indicate standard errors. ***, ** and * correspond to significance at the 1%, 5% and 10%, respectively.

Econometric Issues

Direct estimation of the Model in equations (1) to (5) is made difficult by the fact that the migration equation (4) and the participation rate equation (3) are difficult to identify separately unless one makes strong assumptions about the relative speed with which migration and participation react to changes in wages and unemployment. Since these assumptions in turn would prejudice findings concerning the speed with which migration adjusts Blanchard and Katz (1992) suggest running trivariate vector autoregressions of the form:

(8) $$\Delta l_t = \varphi_{0i} + \varphi_1(L)\Delta l_{t-1} + \varphi_2(L)er_{t-1} + \varphi_3(L)pr_{t-1} + \xi_t^D$$

(9) $$er_t = \phi_{0i} + \phi_1(L)\Delta l_t + \phi_2(L)er_{t-1} + \phi_3(L)pr_t + \xi_t^D$$

(10) $$pr_t = \theta_{0i} + \theta_1(L)\Delta l_t + \theta_2(L)er_{t-1} + \theta_3(L)pr_{t-1} + \xi_t^D$$

with l_t, er_t and pr_t the log of employment, the employment rate (i.e. the negative unemployment rate) and pr_t the participation rate relative to the national at time t. The identifying assumption made in this analysis is that contemporaneous shocks to labour demand affect neither the employment nor the participation rate immediately and that the employment rate does not affect participation contemporaneously. While these assumptions may seem strong, by estimating this model migration can be implicitly calculated from the identity $l_t = er_t + pr_t + pop_t$ (see Fatas, 2000).

There are a number of issues that have to be dealt with in the estimation of the system represented in equations (8) to (10). First, the fact that the system consists of a dynamic panel specification renders the standard least squares dummy variable (LSDV) estimator biased, due to the fact that the error terms are correlated with the right hand side variables (see e.g. Baltagi, 1995). For this reason we estimate the system by single equation estimation using the GMM estimator proposed by Arellano and Bond, (1991).[5] Since the model in (8) to (10) is triangular, given that the error terms (shocks) in (8) to (10) are not autocorrelated and that the variables included in VAR in equations (8) to (10) are not integrated this will lead to consistent estimates of the system (see e.g. Greene, 2000)

Second, the model in (8) to (10) is formulated in region specific variables. In the literature two methods have been proposed to define this region specific variable. Decressin and Fatas (1995) run regressions of the form

(11) $Y_{it} = \gamma + \gamma_1 Y_{at} + \eta_{it}$

for each and every region and interpret the residuals of this regression as region specific development, while Blanchard and Katz (1992) use differences between regional and national indicators. In part the choice between these methods depends on how closely regional developments follow national trends. For this reason we ran regressions of the regional indicator on the national indicator as in Decressin and Fatas (1992). We find that in

[5]) In simulation studies (see Kiviet, 1995 and Judson and Owen, 1996) this estimator outperforms the LSDV estimator for data sets of our size. To check for robustness, however, the model in (8) to (10) was also estimated using the LSDV estimator and including two lags (rather than one). None of this changes the qualitative results, reported below. Furthermore, results are robust to using two-step rather than one-step estimates. Gacs (2003) uses differences to candidate countries rather than residuals for a subset of countries considered in this study. Her results are comparable to ours (see Appendix).

these regressions the average γ_1 is close to one in average and R^2 values are high for all countries considered (see table 5). Thus differences between the approaches of Decressin and Fatas (1995) and Blanchard and Katz (1992) should be small, since regional indicators follow national dynamics closely.

Table 5: Results of Specification Tests

	Regression Results*						P-Value of Unit Root test**		
	Employment Rate		Participation Rate		Employment Growth		Employment Rate	Participation Rate	Employment Growth
	γ_1	R^2	γ_1	R^2	γ_1	R^2			
Member States	0.95	0.76	1.16	0.52	1.01	0.97	0.00	0.00	0.00
Candidate Countries	0.99	0.80	0.93	0.62	0.98	0.99	0.00	0.00	0.00
First Round	0.97	0.87	0.91	0.65	0.98	0.98	0.00	0.00	0.00
Second Round	1.01	0.66	0.96	0.57	0.99	1.00	0.00	0.00	0.00
Border regions	0.96	0.70	0.90	0.60	0.88	0.70	0.15	0.00	0.00
Non-border regions	0.93	0.80	0.96	0.65	0.79	0.83	0.00	0.00	0.00
Agricultural Regions	0.89	0.75	0.87	0.59	0.99	1.00	0.00	0.00	0.00
Industrial regions	1.05	0.85	0.99	0.67	0.99	1.00	0.00	0.00	0.00
Urban Regions	0.90	0.81	0.82	0.56	1.01	1.00	0.00	0.00	0.00
Other Diverse	1.10	0.83	0.99	0.66	0.98	0.98	0.00	0.00	0.00
High Unemployment	1.12	0.74	0.89	0.49	0.97	0.99	0.00	0.00	0.00
Low Unemployment	0.77	0.86	1.00	0.80	1.02	1.00	0.00	0.00	0.00

* Columns labelled γ_1 report the average coefficient of a regression of the regional indicator on the national indicator and columns labelled R^2 the average R^2 value of this regressions ** Columns report the P-value of the Im, Persaran and Shin (1997) test for Unit roots of the series of residuals in equation (11)

A further influence on the choice is whether the resulting series are stationary. Fatas (2000) shows that implicitly these procedures represent a detrending method, and the choice of method may have implications for findings. He finds that operating with differences between regional and national indicators yields results intermediate to using the raw indicators and the method used by Decressin and Fatas (1995). We thus conducted Im, Persaran and Shin (1997) panel unit root tests on the residuals of equation (11). Starting from a specification as:

(12) $$\Delta y_{it} = \alpha_i + \rho_i y_{it-1} + \xi_{it}$$

With y_i the residual of (11). This test tests the null hypothesis that $\rho_i = 0$ for all i against the alternative that a subset of the series in the panel are not integrated i.e. $\rho_i < 0$ for all i=1..N_1 , and $\rho_i = 0$ for all i=N_1+1, ..., N (see Banerjee, 1999, Maddala and Wu, 1999 for comparisons of panel unit root tests). Results reported in table 5 suggest that for the transformed series the null (of a unit root) can be rejected for all series at the national level

and almost all series regionally. Thus for the remainder of the paper we follow the approach of Decressin and Fatas (1995).

Third, the lag length of the lag polynomials of (8) to (10) has to be determined. To decide on this we performed a number of specification tests using lag lengths from one to three for all lag polynomials. In general models using lags of length one performed best in terms of parameter significance of included lags, tests for autocorrelations of the residuals and when conducting tests of instrument exogeneity for the Arellano Bond estimates. Thus below we report results for models using a lag of one.

Univariate Processes

Before estimating the model presented in equations (8) to (10) we also estimated univariate processes of the form:

$$(13) \qquad \bar{\eta}_{it} = \alpha_i + \delta_1 \bar{\eta}_{it-1} + \xi_{it}$$

where $\bar{\eta}_{it}$ is the estimated residual of equation (11) for each of the indicators entered in our regression, α_i is a region specific fixed effect, while δ_1 is a measure of the persistence of the indicator.

In accordance with the literature on EU member states (see Fatas, 2000, Decressin and Fatas, 1995) we find low persistence of employment growth rates in the EU, but high levels of persistence for both unemployment and participation rates (see: table 6). For first round candidate countries by contrast, we find comparable persistence in employment growth rates but significantly lower persistence of unemployment and participation rates. In the second round candidate countries unemployment rates are as persistent as in the EU but wages are slightly less persistent. Differences among region types seem to be small, however. Except for unemployment being less persistent in urban regions and more persistent in industrial regions there are no significant differences between region types. High unemployment regions have a slightly higher persistence in unemployment and participation rates and in non – border regions persistence in unemployment rates is also higher than in non-border regions.

Table 6: Persistence of regional Development

	participation rate		unemployment rate		employment growth	
First Round 1992-1998	0.231** (0.023)	T=7 [a] N=143	0.168 (0.070)	T=7 N=143	-0.149** (0.024)	T=6 [a] N=155
Second Round 1992-1998	0.084** (0.039)	T=7 N=69	0.420** (0.071)	T=7 N=69	-0.053 (0.063)	T=6 [a] N=74
EU 1992-1998	0.693*** (0.132)	T=5 N=68	0.390*** (0.107)	T=5 [a] N=68	-0.392** (0.155)	T=4 N=68
Border Regions	0.229*** (0.066)	N=25	0.286** (0.126)	N=25	-0.269*** (0.080)	N=25
Non- Border Regions	0.213*** (0.032)	N=185	0.486*** (0.032)	N=185	-0.159*** (0.032)	N=185
Agricultural Regions	0.172*** (0.022)	N=71	0.407*** (0.075)	N=71	-0.191*** (0.041)	N=71 T=
Industrial Regions	0.210*** (0.024)	N=61	0.650*** (0.155)	N=61	-0.162*** (0.024)	N=61
Urban Regions	0.235** (0.082)	N=26	0.276*** (0.092)	N=26	-0.210*** (0.054)	N=26
Other Diverse Regions	0.119** (0.047)	N=50	0.456*** (0.140)	N=50	-0.170** (0.081)	N=50
high unemployment	0.220** (0.028)	N=96	0.491*** (0.079)	N=96	-0.172*** (0.042)	N=107
low unemployment	0.195** (0.017)	N=55	0.430*** (0.054)	N=55	-0.130*** (0.032)	N=60

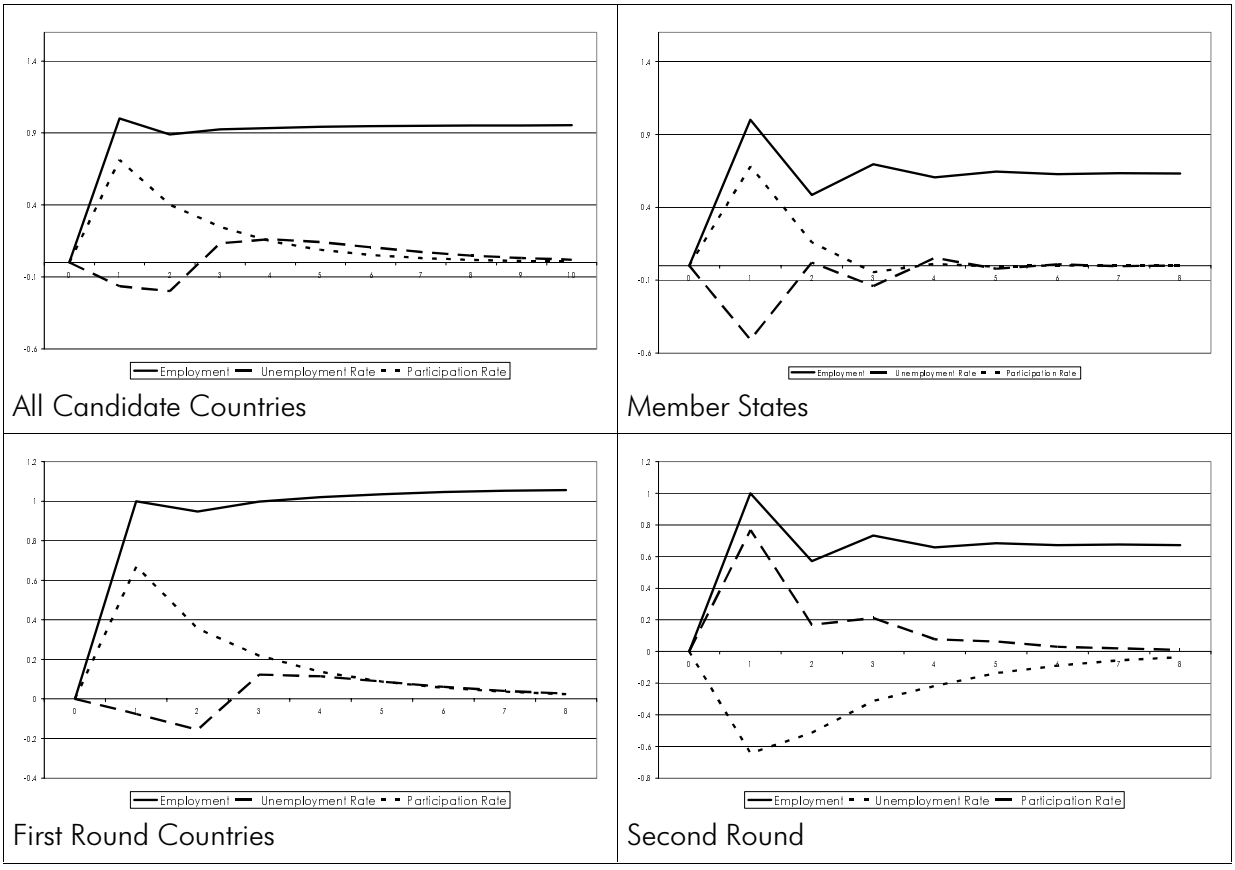
Note: Results report the coefficient of regression (2), values in brackets are standard errors of the estimate, a) indicates that the null of second order auto-correlation as suggested by Arellano – Bond cannot be rejected at the 5% level *** (**) (*)coefficients are significantly different from zero at the 1% (***), 5% (**) and 10% (*) level. Candidate countries: results for participation and unemployment rates excluding Slovenia and Estonia, results for wage growth excluding Bulgaria. EU: German wages and employment growth and participation rate 1989 – 1994, excluding Portuguese overseas territories (Acores and Madeira).. T= maximum number of time periods, N= number of cross sectional units.

Multivariate Results

Figure 2 displays the estimated impulse response functions of the model considered in equations (8) to (10). This figure shows the reaction of relative employment, relative unemployment rates and relative participation rates in a „typical“ CEE region to a unit relative labour demand shock. An increase relative in employment in period t=1 has a large and persistent impact. While in the first year after the shock (t=2) 89 percent of the initial increase is present, by the third year (t=4) this amounts to 94 percent. In member states unemployment is slightly less persistent. After three years 69.3% of the original shock persists. This finding is not surprising when considering the substantial employment decline in Central and Eastern European regions in the years of transition. The increase in relative employment is primarily accommodated by relative participation rates, while relative

unemployment rate dynamics play a smaller role in the reaction. Adjustment via labour force participation and employment rate peak after one year and then steadily decline to their long run level in all country groups. In candidate countries this return takes 4 years and in member states the process ends after 3 years. Differences between first and second round candidate countries are particularly pronounced with respect to the persistence of the employment change, which is more persistent in first round countries, and the reaction of unemployment rates, which are more persistent in second round candidate countries.

Figure 2: Impulse Response of relative employment, relative employment rate and relative participation rate to a shock of one standard deviation in relative employment



The calculations are based on single equation robust Arellano-Bond estimations of log relative employment, log relative participation rate (participation rate defined as labour force to total regional population) and log relative employment rate where relative refers to relative to the CEEC average

These differences, however, should be interpreted in the light of results in the literature. In table 7 we thus report the share of the first year shock accommodated by changes in the unemployment rate, participation rate and

migration within one year, reported in estimates in the literature. This table suggests that the results for EU member states are comparable to those of other studies of the European Union. The only counterintuitive result is that a negative demand shock on the region leads to a slight immigration rather than emigration in member states. This is, however, not uncommon in the literature. In particular Fatas (2000) reports similar dynamics for Germany (one of the countries in our study) and the UK. Thus we conclude that even though our observation period is relatively short, we are capable to capture the major features of labour market adjustment in the EU.

Results for second round candidate countries by contrast are somewhat implausible. As shown in Table 7 we find that a unit shock to labour demand leads to an immigration of half of the original shock. Thus the unemployment rate increases by 76% of the original shock and participation accommodates for another 54%. One explanation for these strange results could be the substantial differences in national reporting systems of registered unemployed in some of the second round candidate countries.[6]

With respect to the first round candidate countries our results indicate that adjustment is well within the realms of the parameters usually found in the European Union. In particular, unemployment rate reactions accommodate 10% of the initial shock. A figure that is comparable Sweden, the Netherlands, Germany and the U.K. and migration accounts for 21% of the shock which seems relatively large, but is plausible in the context of the smaller region size in candidate countries and comparable to Spain, Sweden and Belgium. With respect to the non-European OECD member states listed in table seven, however, candidate countries appear to be typical European countries. As in most of the EU participation rate adjustments carry the largest part of the adjustments and in contrast to the US and Australia unemployment rate and migration are of relatively minor importance.

Thus although the candidate countries appear to be comparable to many member states the difference between the two regions seems to lie a in the size of past shocks and the persistence of employment gains. The standard deviation of the residual of equation (8) which can be interpreted as the size of the regions specific labour demand shock is substantially higher in candidate countries (both first and second round) than in member states.

---

[6]) Since in Romania persons with land ownership in excess of one hectare are not considered unemployed and restitution has given many persons such ownership this may distort results. A further reason could be that there are only few cross sectional units in the second round candidate countries, which may impinge on the quality of estimates.

Also changes in employment are substantially more persistent in the candidate countries. The adjustment to the shock in employment ends at a level of around 90% the original in the candidate countries but at 69% in the member states (see Table 8).

Table 7: Comparison of Shares of Shock Accommodated by Alternative Variables in the Literature

	Employment Rate	Participation Rate	Net Migration
Europe (1975 – 1987, 51 Regions)	22	75	4
Spain* (1976 – 1994, 17 regions)	36	23	41
Sweden (1966 – 1993, 24 regions)	8	26	66
Finland (1976 – 2000, 11 regions)	27	65	8
Netherlands* (1993 – 1999, 18 regions)**	14	74	12
Belgium (1970 – 1995, 3 Regions)[a)]	-4 to 22	3 to 33	45 to 99
Germany (8 regions, 27 years)	12	93	-5
Italy (11 regions, 27 years)	37	62	1
UK (11 regions, 27 years)	12	91	-3
US (1978 – 1990, 51 States)	34	26	40
Australia (1978 – 1997, 7 States)	20	40	40
This Paper			
Member States	35	68	-3
Candidate Countries overall (200 regions)	16	71	12
First Round (1992 – 1998, 141 regions)	10	69	21
Second Round (1992 – 1998, 69 regions)	54	76	-41

Sources: Decressin and Fatas (1995) for Europe, Jimeno and Bentolila (1998) for Spain, Fredrickson (1998) for Sweden, Pekkala and Kangashartju (2002) for Finland, Boersma and van Dijk (2002) for the Netherlands, Deglaigle and Lohest (1999) for Belgium, Blachard and Katz (1992) for US and Debelle and Vickery (1998) for Australia Fatas (2000) for Germany, Italy, UK (approximate figures estimated from graphs)* Quarterly Data, ** First quarter a) separate for each of three regions

Table 8: Dynamic Behaviour of Employment by Country Groups

	Size of Shock	% of shock remaining after One year t=2	% of shock remaining after three years t=4
Member States	0.021	68.5	69.5
Candidate Countries	0.055	89.5	93.4
First Round	0.056	94.7	102.0
Second Round	0.046	57.0	65.9

Regional Differences

We also estimated model (8) to (10) for the region types in the Scarpetta and Huber (1995) taxonomy, non border regions as well as for high and low unemployment rate regions (see Table 10 and Figures in the Appendix). In a number of cases these results are highly unreliable due to the low number of regions. This is the case for urban and diverse regions in the case of the Scarpetta and Huber taxonomy and for border regions. In all these cases the number of cross-sectional observations is smaller or equal to fifty. Thus we focus on results of non-border regions only and merge urban and other diverse regions into one category.[7]

.Table 9: Dynamic Behaviour of Employment and first year Adjustment by Region types

				Share of shock accommodated in the first year by...		
	Size of Shock	% of shock remaining after One year t=2	% of shock remaining after three years t=4	Employment Rate	Participation Rate	Net Migration
Non Border Regions	0.056	90	94	19	72	9
Agricultural Regions	0.057	62	64	46	71	-19
Industrial Regions	0.052	78	79	28	74	-2
Diverse Regions	0.053	100	100	7	68	25
Low unemployment regions	0.049	68	69	24	74	2
High unemployment regions	0.062	81	79	45	75	-20

In general results indicate that differences among region types are driven by the persistence of the employment shock and the relative importance unemployment rates and migration in the adjustment. While in border regions persistence in relative employment and the share of the shock accommodated in the first year by the unemployment rate and migration resemble that of candidate countries overall, there is some heterogeneity when considering region types according to the Scarpetta and Huber Taxonomy. In particular agricultural regions are characterized by low persistence of employment shocks and a high reaction of unemployment rates, while in diverse regions the opposite is the case. In these regions employment shocks are highly persistent and migration plays an important role in adjustment.[8]

[7] Impulse responses for region types are displayed in the Appendix

[8] This accords with the results of Gacs (2003), who finds relatively similar adjustments in using a slightly different typology and for border regions and non border regions

Finally, high unemployment regions differ from low unemployment regions by the fact that high unemployment regions have been subjected to larger asymmetric shocks, a higher persistence of employment changes (which were mostly employment declines in these regions), and a higher importance of adjustment through unemployment rates.

Conclusions

This paper analysis the adjustment of regional labour markets of candidate countries to asymmetric shocks. We find that idiosyncratic region specific developments in unemployment are of a smaller importance in first round candidate countries, while concerning other labour market indicators few differences can be found to the EU. In second round candidate countries region specific developments in participation rates are more important than in member states. Furthermore, in contrast to EU member states, candidate countries have experienced larger region specific shocks to labour demand, and that these shocks tend to be more persistent than in member states. Otherwise member states regions are typical European regions in many respects. In particular as in the EU and in contrast to non-European OECD member states adjustments in the participation rate play a large role and adjustments in migration a small role.

We also find that regional typologies based on sectoral specialisation indicate that urban regions have experienced a substantially more favourable and industrial and peripheral regions a less favourable labour market development throughout transition. Some of these differences as well as the differences between high and low unemployment rate regions may be attributable to differences in the adjustment of regions to shocks in labour demand. In particular high unemployment rate regions were characterised by larger (mostly negative) shocks to labour demand, a higher persistence of these shocks, and larger adjustment through unemployment rates rather than migration. This suggests that in particular in these high unemployment regions policy aimed at enhancing the mobility of labour could be particularly helpful in reducing unemployment.

Literature

Arellano, Manuel and Stephen Bond (1991) Some Tests of Specification for Panel data: Monte Carlo Evidence and an Application to Employment Equations, Review of Economic Studies, p 277 – 297

Baltagi, Badi H. (1995) The Econometric Analysis of Panel Data, John Wiley & Sons, Cichester

Banerjee, Anindya (1999) Panel unit Roots and Cointergration an Overview, Oxford Bulletin of Economics and Statistics, pp. 603 -606

Blanchard, Olivier and Lawrence F. Katz (1992) Regional evolutions, Brookings Papers on Economic Activity, 1, pp. 1-75.

Boeri, Tito and Stefano Scarpetta (1996) Regional mismatch and the transition to a market economy, Labour Economics, 3, pp. 233 - 254

Boeri, Tito and Katherine Terrel (2002) Institutional Determinants of Labour Reallocation in Transition, Journal of Economic Perspectives, pp 51 – 76.

Boersma, Lourens and Jouke van Dijk (2002) Regional Labour Market Dynamics in the Netherlands, Papers in Regional Science, Vol 81, pp 343 - 364

Burda, Michael C. and Profit Stefan (1996) Matching Across Space: Evidence on Mobility in the Czech Republic, Labour Economics, 3, pp. 233 - 254.

Debelle, Guy and James Vickery (1998) Labour Market Adjustment: Evidence on Interstate Labour Mobility, Research Discussion paper 9801, Reserve of Australia, Economic Research Department.

Decressin, J and A. Fatas (1995) Regional Labour Market Dynamics in Europe, European Economic Review, pp 1627 – 55.

Delaigle, Sophie and Olivier Lohest (1999) Regional Labour Market Dynamics: Evaluation and Application to Belgium, Universite catholoque de Louvain,

Fatas, Antonio (2000) Intranational Labour Migration Business Cycles and Growth, in Gregory D. Hess and Eric van Wincoop Intranational Macroeconomics, Cambridge, Cambridge University Press

Fredrikson, Peter (1998) The Dynamics of Regional Labour Markets and Active Labour Market Policy: Swedish Evidence, manuscript, University of Upsala

Gacs, Vera (2003) Regional Labour Market Dybnamics – An Application to Central and Eastern Europe, manuscript, WIFO

Gorzelak Gregor. (1996) The regional Dimension of Transformation in Central Europe, Regional Studies Association, London

Greene, William H. (2000) Econometric Analysis , Prentice Hall, Upper Saddle river, New Jersey.

Harris, J.R. and M.P. Todaro (1970), "Migration, Unemployment and Development: A Two Sector Analysis," *American Economic Review* 60 (1), 120-142.

Hojvat Galin, Joshua (1999) Net Migration and state Labour Market Dynamics, Federal Reserve, manuscript

Im K. S., M.H. Persaran and Y. Shin (1997) Testing for Unit Roots in Heterogeneous Panels, mimeo, Department of Applied Economics, University of cambridge

Jimeno, J.F. and S. Bentolila (1998): Regional unemployment persistence Spain, 1976-94, *Labour Economics* 5, 25-51

Judson, Ruth A. and Owen, Ann L., Estimating Dynamic panel data Models: A Practical Guide for Macroeconomists, Economics Letters 65, 1:9-15, October 1999

Kertresi, Gabor and Janos Köllö (2001) The patterns of non-employment in Hungary's least developed regions, Budapest Working Papers on the Labour Market, BWP 2001/1, Budapest University of Economics

Kiviet, Jan F (1995) On bias, inconsistency and efficiency of various estimators in dynamic panel data models, Journal of Econometrics, pp 53 – 78.

Lackó Mária (2000): Egy rázós szektor: a rejtett gazdaság és hatásai a poszt-szocialista országokban háztartási áramfelhasználásra épülô becslések alapján, (A shocking sector: The hidden economy and its effects in post-socialist countries based on estimations of household electricity usage) "Analysis of the Role of Hidden Economy in Hungary" Paper Series, The Estimation of Development of Importance and Measurement of Hidden Economy between 1992-2000.The Institute of Economics of HAS and the TÁRKI RT Social Research Centre, http://econ.core.hu/hirek/tarki/TARKItan1.pdf

Maddala, G.S. and Shaowen, Wu (1999) A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test, Oxford Bulletin of Economics and Statistics, pp. 607 -630

Pekkala, Sari and Ari Kangasharju (2002) Regional Labour Markets in Finland: Adjustment to total versus region specific shocks, Papers in Regional Science, Vol 81, pp 329 - 342

Petrakos, George (1995) Patterns of Regional Inequality in Transition Economies, Manuscript, Department of Planning and Regional Development University of Thesaly, Greece

Scarpetta, Stefano and Peter Huber (1995) Regional Economic Structures and Unemployment in Central and Eastern Europe: An Attempt to Identify Common Patterns in Stefano Scarpetta and Andreas Wörgötter Eds. The Regional Dimension of Unemployment in transition Economies, OECD, Paris.

Svejnar, Jan (1999) Labour Market in the Transitional Central and East European Economies, in Ashenfelter, Orley and David Card, Handbook of Labour economics, Volume 3, Elsevier Science. pp. 2810 – 2857

Smith Adrian (1998) Restructuring the Regional Economy – Industrial and Regional Development in Slovakia, Studies of Communism in Transition, Edward Elgar, Cheltenham, UK

Traistaru, Iulia, Peter Nijkamp and Lucia Resmini (2002) The Emerging Economic Geography in EU Accession Countries, Ashgate Publishing Ltd, Aldershot

Vinals, Jose and Juan F. Jimeno (1996) Monetary Union and European Unemployment, CEPR Discussion Paper No. 1485

Appendix 1: Data Description & Sources

Data Definitions

Data for the Czech Republic, Hungary and Poland were taken from national sources (regional and national statistical yearbooks). Data for Bulgaria and Romania was taken from the Regspec database (see: Traistaru and Iara, 2002 for a description). Despite their substantial use in regional labour market analysis of candidate countries data are not always comparable, due to differences in national statistical systems. The following indicators were used:

Unemployment Rates: Registered unemployment rates are measured at the end of the year (31.12.) for the Czech Republic, Poland, Hungary and Slovakia. In Bulgaria, Romania they are annual averages.

Population: Refers to the average population for all countries

Participation Rates: Are measured in % of total population and were calculated appropriately from employment figures and unemployment rates in all countries.

Dealing with data Problems

Furthermore in some cases changes in reporting system and regional aggregation needed to be overcome: In the Czech Republic in 1996 the district of Jesenik was formed from the territories of Sumperk and Bruntal. Thus for

Czech data the districts of Sumperk, Jesenik and Bruntal were excluded to provide a comparable level of regional disaggregation for the complete period from 1992 to 1998.

In Hungary up to 1997, regional employment statistics were collected at the enterprise level, after this establishment level statistics are provided. Due to these changes 1998 data were omitted.

Data Sources

Czech Republic - Cesky Statisticke Urad (CSU): Okresy Ceske Republiky (Okresy of the Czech Republic), years 1992 - 1998

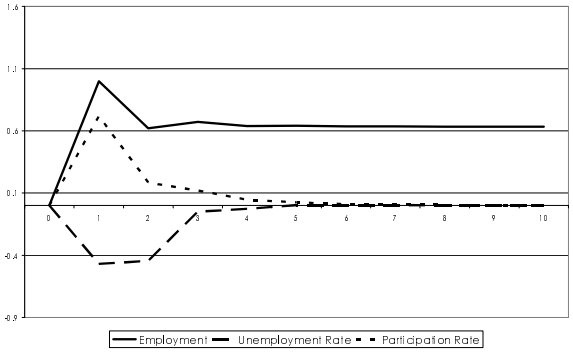
Poland - Glowny Urzad Statystyczny (Polish Statistical Office) Rocznik Statystyczny Wojewodztw, various issues, 1992 - 1999

Hungary - Központi Statisztikai Hivatal, Területi Statiisztikai Evkönyv – Regional Statistical Yearbook, various years, 1992-1998

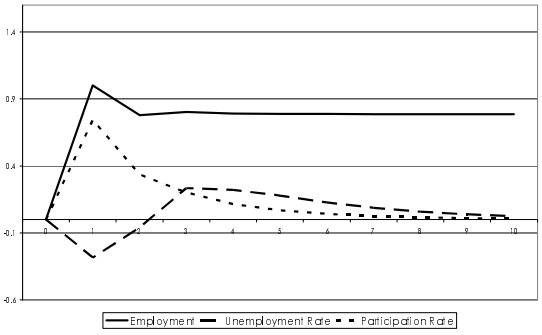
Bulgaria, Romania – Respec database (REGSTAT) see Iara and Traisturu (2002) for descriptions

APPENDIX 2: IMPULSE REPONSE FUNCTIONS BY REGION TYPES

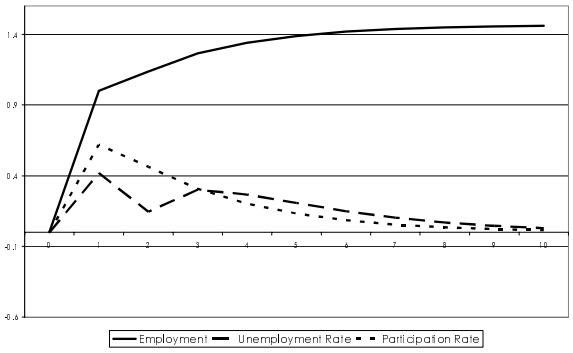
Agricultural Regions



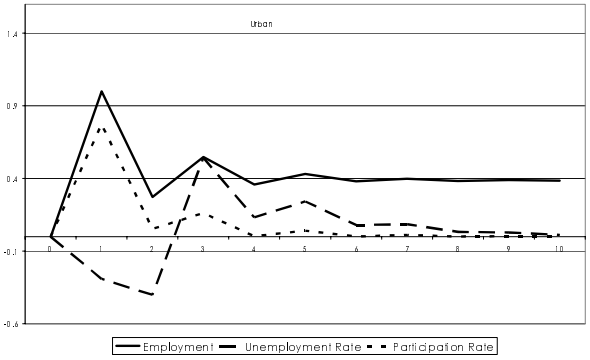
Heavily Industrialised Regions

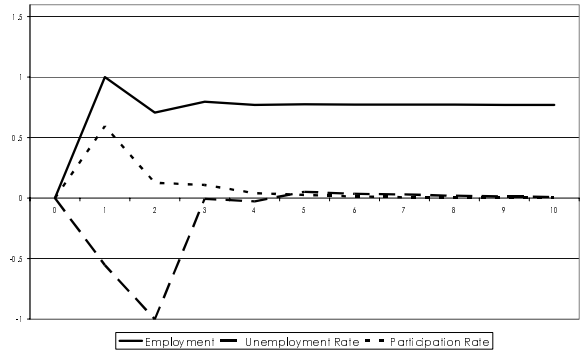


Diversified Regions

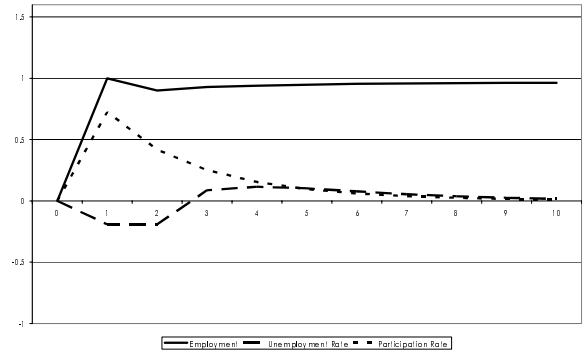


Urban Regions

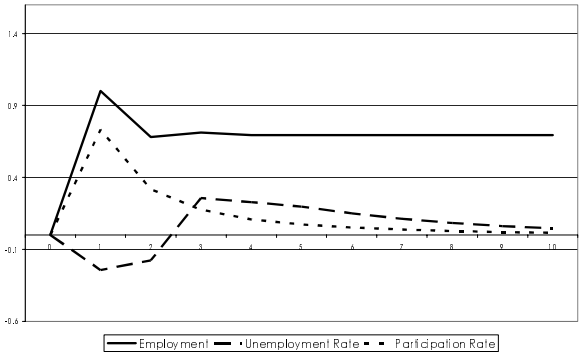




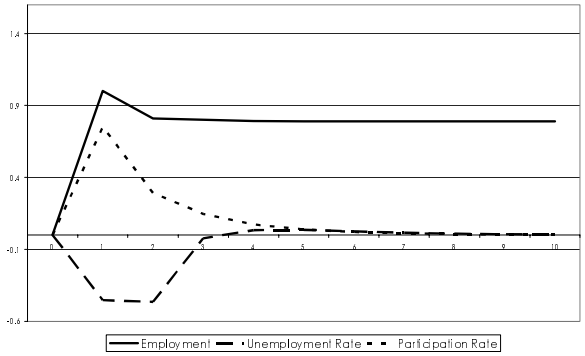
Border Regions



Non Border Regions



Low Unemployment Rate



High Unemployment Rate

Appendix 3: Robustness of Results

This Appendix presents results concerning the robustness of estimates. First, Table A3.1 and A3.2 compare our results to LSDV estimates and to estimates where the regions specific innovation is defined as the difference to the candidate countries average (in Gacs, 2003). Figure A3.1 reports overall Impulse responses using two lags rather than one and in the last section (Figures A3.2 to A3.4) impulse responses using Gacs' (2003) and LSDV estimation results are displayed.

Table A3.1: Comparison of Shares of Shock Accommodated by Methods

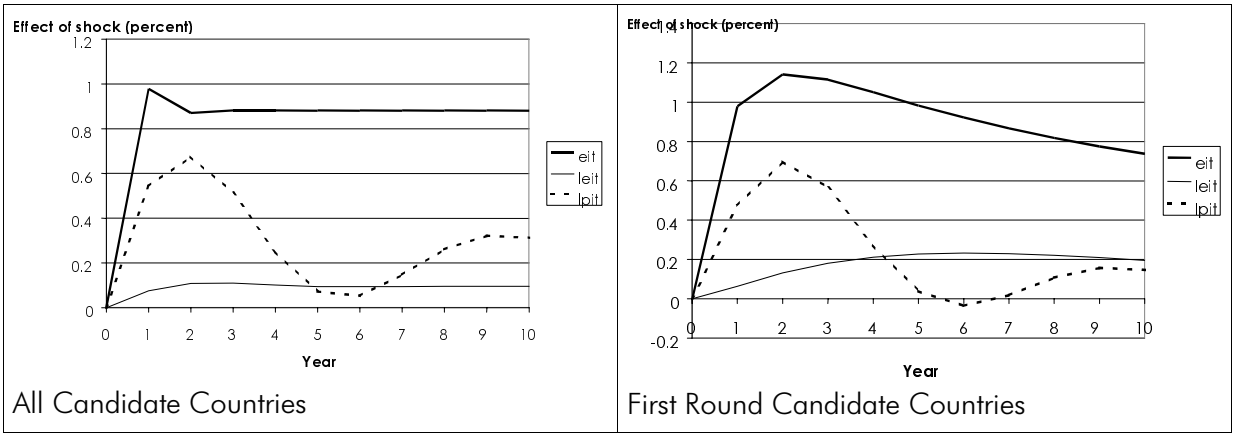
	Employment Rate	Participation Rate	Net Migration	Employment Rate	Participation Rate	Net Migration
	LSDV Estimation			Relative to CC average (Gacs 2003)		
Overall	54	60	-14	10	68	22
First Round	19	75	6	2	90	1
Second Round	90	62	-53			
MS	34	68	-2			
Aggr	46	64	-10	29	62	7
Ind	72	63	-35	11	55	33
Urban	18	63	55	4*	68	30
Other	7	31	76			
High un	12	58	30			
Low un	73	68	-31			
non border				15	62	23

Table A3.1: Comparison of Size and Persistence of Shocks by Methods

	Size of Shock	% of shock remaining after One year t=2	% of shock remaining after three years t=4	Size of Shock	% of shock remaining after One year t=2	% of shock remaining after three years t=4
	LSDV Estimation			Relative to CC average (Gacs 2003)		
Overall	0.019	0.6	0.6	0.15	0.5	0.5
First Round	0.018	0.6	0.6	0.18	0.8	0.6
Second Round	0.023	0.5	0.3			
MS	0.013	0,6	0.6			
Aggr	0.014	0.6	0.6	0.11	0.7	0.5
Ind	0.018	0.5	0.6	0.09	0.6	0.4
Urban	0.017	0.6	0.6	0.19	0.5	0.5
Other	0.022	0.7	0.7			
High un	0.016	0.6	0.6			
Low un	0.015	0.0	-0.1			
non border				0.15	0.5	0.5

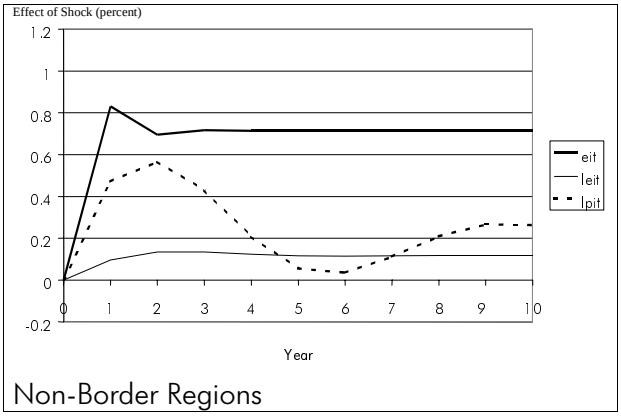
Figure A3.1 Impulse responses for Candidate Countries with lag length two

Figure A3.2: Impulse Response of relative employment, relative employment rate and relative participation rate to a shock of one standard deviation in relative employment



The calculations are based on single equation robust Arellano-Bond estimations of log relative employment, log relative participation rate (participation rate defined as labour force to total regional population) and log relative employment rate where relative refers to relative to the CEEC average

Figure A3.3: Non-border regions: Impulse Response of relative employment (in first differences), relative employment rate and participation rate to a positive unit labour demand shock



The calculations are based on single equation robust Arellano-Bond estimations of log relative employment growth, log relative participation rate (participation rate defined as labour force to total regional population) and log relative employment rate where relative refers to relative to the CEEC average

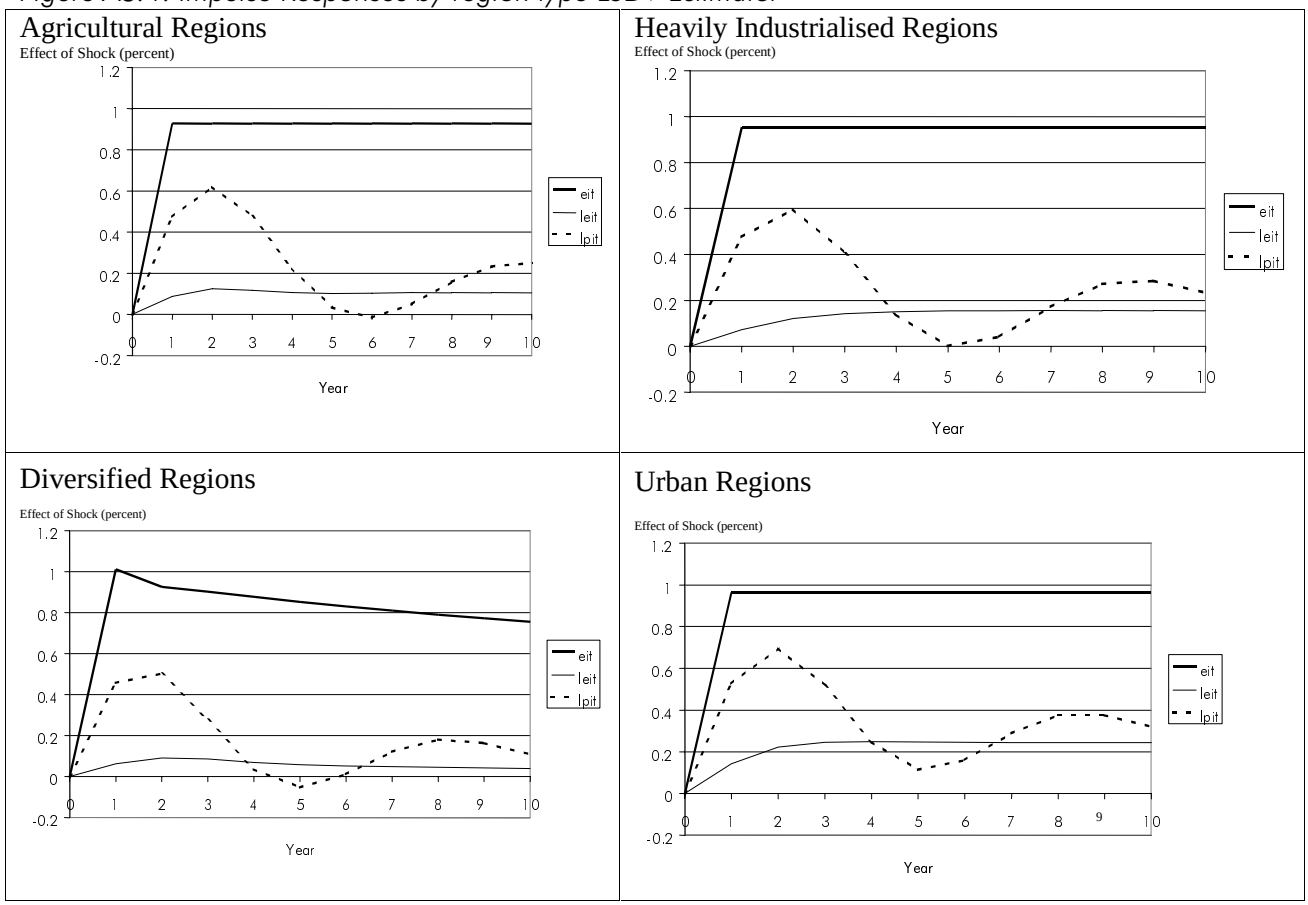



Figure A3.4: Impulse Responses by region type LSDV Estimator