Aleksandra Rogut

The efficiency of regional labour market mechanisms in absorbing regional shocks in Poland in the context of accession to Euro Area

1. Introduction

The expected accession of Poland to the European Monetary Union will be concerned with the loss of the autonomous monetary and exchange rate policy. A very important question in this context is whether the other adjustment mechanisms are efficient enough in responding to asymmetric shocks. Of particular interest is the labour market flexibility.

A lot of attention has been put on the potential costs and benefits of expected Polish accession to euro zone at the national level. However the hitherto analysis omitted the problem of their possible uneven distribution at the regional level. The question whether some of the regions will gain more or lose more then the others and whether the differences in the level of economic development between Polish regions will increase is often pointed out in the social debates. Special fears concern the agricultural eastern regions of Poland.

In the literature it is often underlined that the big differences between regions are not optimal from the national point of view as they may accelerate inflation and decrease the economic growth rate (see among others Bande, Karanassou, 2007 or Estevao, 2002). The wide dispersion in unemployment rates may serve as an early brake on economic recovery as inflation picks up first in low unemployment areas. Moreover the existence at the same time the low and high unemployment areas in the same country suggest poor labour market efficiency and imperfect resource utilization. In the light of expected euro accession the permanent differences in regional labour market development in Poland may have some implications for the macroeconomic performance of Polish economy. Taking into account for instance the Lisbon Strategy employment goal, the permanent poor performance in some regions limits the degree to which it can be successful.

The optimum currency area theory considers that the adoption of a common currency brings about both advantages and disadvantages. From the regional point of view the advantages are said to be positively related to the degree of specialization and the degree of openness of the

integrated regions. Disadvantages are not only related to the probability of suffering asymmetric shocks but are also a negative function of the existence, and relevance, of adjustment mechanisms (see Dohse et al, 2000 or Castro, 2000).

The problem of the possible uneven regional distribution of both costs and benefits has been widely studied in euro zone countries before adopting the common currency. The authors underlined that the potential uneven distribution of costs and benefits of EMU across regions may contribute to exacerbate spatial inequalities in the country and increase the differences in the level of economic development between regions. They stressed that the decrease of transaction costs and exchange rate risk would influence more the regions with higher share of export and import in the total production and that the scale of benefits would be greater the more open is the region (see also Castro, 2001).

Benefits can be unevenly distributed also because of different degree of specialization and different degree of openness between regions. Decressin and Fatas (1995) underlined that if there is more specialization in the production of goods and services at the regional rather than the national level, the national labor market dynamics will be, from an economic point of view, a fairly arbitrary aggregation of many heterogeneous regional dynamics. Analyzing regional dynamics is then likely to provide more relevant results (see Decressin i Fatas, 1995 or Choy et al., 2002).

Moreover, with the adoption of the European Single Act and the Maastricht Treaty, European countries move closer to full economic integration, and consequently region-specific shocks are becoming more prominent. There are a variety of reasons for this: as transaction costs continue to fall, regional specialization in production increases; concurrently macroeconomic policies converge further, increasingly shifting attention of policymakers from harmonizing national evolutions to addressing regional imbalances (Bande, Karanasoou, 2007, Overman, Puga, 2002 or Decressin, Fatas, 1995). In that context, a careful analysis of the sizes and repercussions of region-specific shocks should provide interesting insights for the further development and coordination of regional policies within an integrated Europe (see Decressin, Fatas, 1995).

As the potential costs are concerned, it is underlined in the literature that region-specific shocks may trigger different adjustment mechanisms compared to national shocks (see

Decressin, Fatas, 1995). In particular, more interregional migration in response to region-specific shocks might be expected than international migration in response to national shocks. Furthermore, regional differences in labour supply characteristics could mean that regions may differ in their response to labour market shocks (see also Choy et al., 2002 or Broersma, van Dijk, 2005).

The issue of how regional labour markets adjust to shocks is also of international significance. Several studies have previously applied the methodology used in this study to other countries or international regions. The primary adjustment channels have been found to differ internationally. For example, previous studies have found that worker migration plays a substantial role in the local labour market adjustment process in the US. However, labour mobility plays a much smaller role in the adjustment of many European labour markets to region-specific shocks. Instead, labour force participation changes bear most of the adjustment.

Finally, if prices and wages are not fully flexible to compensate for the loss of exchange rate as well as in case of low degree of labour market flexibility, asymmetric shocks could lead to deep regional recessions and increase in unemployment which could be socially and politically unacceptable (see Bande, Karanassou, 2007 and Fatas, 1997). This problem also often appears during the debates with the social partners in Poland.

The aim of the paper is to analyze the efficiency of regional labour market adjustment mechanisms in responding to asymmetric shocks in Poland in the context of expected accession of Poland to the euro zone. In particular in the paper we attempt to:

- explore whether regional labor market disturbances in Poland are distributed less or more symmetrically than across the regions in Europe and answer the question how much of the movement in regional employment is common to all regions and how much is region specific;
- examine the speed and duration of adjustment processes and compare with those in other European regions. In particular we are intrested if the adjustment processes on Polish labour market are efficient and how long it takes for the regional labour markets to return after the shock.

The answer to the question if the level of flexibility is evenly distributed over Polish regions, or if there is a difference in adjustment speed, and hence flexibility, between Polish regions would help us to indicate whether the potential costs concerned with the imperfect labour market adjustment mechanisms would be evenly distributed between regions or whether there are some regions were the adjustment processes are not efficient enough and the costs in case of asymmetric shock in these regions would be higher.

Number of papers concerning the efficiency of regional European labour markets in the light of optimal currency areas can be found in the literature. Unfortunately we have not found any research concerned with the possible uneven regional distribution of benefits and costs in case of Poland.

The paper is organized as follows. In the next section we discuss the data. Section 3 presents some characteristics of regional labour market in Poland. Section 4 reviews the literature on regional labour market adjustment. Section 5 describes the theoretical model. Section 6 outlines the model specification and the empirical results. In Section 7 we summarize the key findings from our results and discuss how our results compare with those from the studies of the euro zone countries. This section also discuss the potential areas for future research.

2. Data

All the regional data on employment growth rates, the unemployment rate, the labour force participation rate and the working age population we use in the paper were obtained from the Polish Labour Force Survey (LFS). As a measure o worker's renumeration we use average gross monthly wages in a given region reported quarterly by Central Statistical Office in Poland. The data from LFS are available on quarterly basis from 1995 for 16 Polish regions. Data concerning wages by region are available since 1999 .

Acoording to Labour Force Suvey the employed are defined as persons aged 15 and more, who in the period of a reference week (see Polish Labour Force Survey, www.stat.gov.pl):

- performed any gainful non-agricultural work, i.e. were hired, worked on own (or rented) farm or conducted own non-agricultural economic activity, assisted (without a wage or salary) in maintaining a family-owned farm or conducting a non-agricultural family-owned business,

- did not perform work (e.g., due to illness, vacation, break in company activity, bad weather, strike), but formally had a job as hired employees or
- were self-employed.

Employed persons - in line with international standards - also include students, with whom employers or physical persons concluded a contract for apprenticeship or teaching a particular job, if they receive wages or salary. The term "any work" shall be understood as work performed for at least 1 hour.

Unemployment rate is a percentage share of the number of unemployed population in the number of economically active population (i.e. employed and unemployed persons). Unemployed according to LFS are persons aged 15-74 who simultaneously fulfill three conditions:

- during the reference week were not employed
- were actively seeking work, i.e. they undertook specific actions during 4 weeks (including the reference week as the last one) to find work;
- were ready (capable) to take up employment during two weeks after the reference week.

Persons who weren't seeking work, because they had an arranged employment and waited for its beginning for time not longer than 3 months - and additionally in LFS were ready to take it up, were also counted as unemployed.

Participation (activity) rate is the share of economically active persons in the working age population (aged 15 and more according to LFS).

As the administrative unit is concerned we decided to focus on the NUTS-2 regional division, however we are aware of significant heterogeneity within the regions. The choice is mainly of practical reason. In 1999 the new administrative division of Poland was introduced (16 instead of 49 NUTS-2 regions). Most of the statistical data on the NUTS-2 level has been reestimated by the Central Statistical Office. In case of smaller administrative units (subregions) the data are available since 1999 (or in case of poviats – the data starts in 2001).

3. Regional labour market performance in Poland in 1995-2007

In this part of the paper we examine the extent to which the labour market fortunes of different regions have varied between each other and in comparison with the national picture. As we mentioned before the labour market indicators that the study focused on are the employment growth rate, the unemployment rate, the labour force participation rate and wages.

Looking at the regional diversity of employment growth rates (see figure 1 in appendix) we can conclude that different factors and shocks influencing employment were not uniformly spread across regions. The graphs show that there have been differences in regional employment growth over time, which indicates both that the common (national) shocks were not symmetrically distributed over region and that regions were also affected by idiosyncratic shocks . These phenomena, ie, shocks that only affect one region or the component of a shock that while affecting other regions is disproportionately felt in the region are of interest in this study.

Figure 2 in appendix shows the average annual employment growth rate for the Polish regions over the periods 1995 to 1998 and 2004 to 2007 (both are the economic boom periods). The obtained regression line has a slope of 0,36 and an R^2 of 0,07. Those regions that were growing relatively fast (compared to the national average growth rate) in the first period continued to do so in the next one. We can therefore conclude that there is some persistence in regional employment growth. We can compare the regional employment growth rate persistence in Poland with the results obtained by other authors. For some of the euro zone regions examined by Decressin and Fatas (1995), the slope of the regression line was found to be 0,55 (R^2 of 0,16; see Decressin i Fatas, 1995). At first glance therefore it seems to be less persistence of employment growth in Poland than is found to be in the case of euro zone countries.

Looking at the regional distribution of unemployment rates in Polish regions it can be seen that the shape of most of the regional unemployment rate plots does rather closely follow the national picture, however we can see considerable differences in the level of unemployment rates between regions (see figure 3 in the appendix). Figure 4 confirms that there appears to be some persistance in regional unemployment rate in 1995 and 13 years later, as shown by a

slope coefficient of 0,27. Regions that begin with a higher then the average unemployment rate after the initial transition period tend to end up with higher unemployment rates in 2007.

During the analyzed period western and northern regions were in general characterized by higher than the average unemployment rates. They are on one hand the consequence of the existence of centrally planned economy for decades, on the other, the result of changes which took place during the process of transformation to the fully market economy (see also Zatrudnienie w Polsce 2005). The main reason of high unemployment rates in northern and western part of Poland was the liquidation the state-owned agricultural farms in 1991 (in zachodniopomorskie, pomorskie, lubuskie, kujawsko-pomorskie and warminsko-mazurskie regions). As the share of employment in public agriculture in those regions was more than 20% of total employment, the shutdown of the farms caused rapid growth of unemployment. The majority of workers were those with low level of education (and with rather weak chances to find another job) and they remained unemployed for a long period of time (see Góra i Sztanderska, 1998 or Rogut, 2007).

On the other hand the regions in the eastern and south-eastern part of Poland are characterized by relatively low observed unemployment rates, which are mainly due to high share of employment in agricultural sector and high hidden unemployment (see among others Góra, 2005).

Looking at the regional participation rates we can see significant differences between regions (see figure 5 in appendix 1). On average relatively higher participation rates are noted in agricultural regions of Poland (lubelskie, podkarpackie, podlaskie and mazowieckie) and relatively lower ones in the western (dolnoslaskie, slaskie, opolskie, zachodniopomorskie) and northern part of the country (pomorskie, warminsko-mazurskie). While analyzing the participation rate persistence on regional labour markets in Poland (see figure 6 in appendix) we can see that the regression yields a positive slope coefficient of 0,41 with the R^2 at the level of 0,3.It would therefore appear that participation rates in Poland are also persistent over time.

We can observe the significant regional differences also in case of wages. The highest wages are traditionally observed in capital region (mazowieckie, see figure 7 in appendix). Higher then the average wages are also in regions with big cities and high share of financial sector or

mining industry (dolnoslaskie and slaskie regions) and in pomorskie region with shipping industry. While explaining the regional differences in wages, it is worth to note, that the existing regional differences in wages in Polish economy are to some extend the result of the existence of the centrally planned system for several decades. Deformations in the sectoral diversity of wages within the previous system resulted to a large extent from the primacy of industry production over services. Wages in the strategic industries (for instance in coal-mining) were above average in order to stimulate the development of selected branches or industries (see Welfe, 1997).

Figure 8a in appendix 1 confirms what was seen from figure 7 - there is a persistence in rankings of wage levels across regions. Regional wage levels are either persistently higher or persistently lower than the national wage. It is, however, difficult to see from figure 8a whether low wage regions are catching up. Figure 8b is more informative in this regard as it plots the average rate of growth of monthly wages from 1999 to 2007 against their value in 1999. It shows that low-wage regions have in general lower growth rates in wages, while high-wage regions continue to have high wage growth rates. Therefore, not only are low-wage regions not catching up, but the differences between Polish regions are growing.

4. Empirical evidence

The first attempt to study the regional labour market adjustments was undertaken by Blanchard and Katz (1992) who applied the Vector Autoregressive (VAR) approach to the investigation of labour market adjustment in the United States. This methodology has since been adopted and modified by Decressin and Fatas (1995) for the European regions.

The empirical results show that the both the speed of adjustment and adjustment channels have been found to differ internationally. Blanchard and Katz (1992) found that in the United States, migration plays a substantial role as a regional labour market adjustment mechanism to labour demand shocks. In other words laid-off workers leave depressed areas to find jobs elsewhere. Following a state-specific shock, the migration response in U.S. is strong even in the first year after the shock. A negative shock to employment leads initially to an increase in unemployment and a small decline in participation. Over time, the effect on employment increases, but the effect on unemployment and participation disappears after approximately five to seven years (Blanchard i Katz, 1992). Blanchard and Katz (1992) also conclude that

wages decrease and dampen the employment response, but by relatively little. This evidence suggests that in the US, wages play a limited role as a regional labour market adjustment mechanism in response to economic shocks.

Decressin and Fatas (1995) found that in European labour markets, labour force participation rate changes play a larger role in bringing unemployment back to trend after a region-specific shock, rather than migration. In other words, workers leave the labour force rather than migrate out of their region. Their study also illustrates that, even within a particular region, the exact nature of adjustment for a regional labour market may differ depending on whether the shock experienced is a region-specific or economywide shock. They conclude that the common shocks have permanent effects in Europe. Relative unemployment when hit by a shock to itself return to their means fairly quickly (3-4 years, see table 1 in Appendix)

After these two pioneer papers some other reaserch occured trying to investigate the adjustment mechanisms both at the European as well as overseas regional labour markets. In case of Europe the results mostly confirm the findings of Decressin and Fatas that labour mobility plays a much smaller role in the adjustment of many European labour markets to region-specific shocks (see table 1). Instead, labour force participation changes bear most of the adjustment. The duration of absorption period in the analyzed European countries varies around 3-7 years. Unfortunately as far as Poland is concerned we did not find any similar papers studying the regional adjustment processes. This paper attempts to study the regional adjustment process in Poland and compare them with the findings from the analysed euro zone countries.

5. Theoretical model

To analyze the regional adjustment on Polish regional labour markets we follow the theoretical model proposed by Blanchard and Katz (1992). The model tries to understand the regional shocks and mechanisms underlying regional slumps and booms. As regions produce different bundles of goods, they experience different shocks to labor demand and thus experience region-specific fluctuations (Blanchard i Katz, 1992). Shocks to labor demand first lead to movements in relative wages and unemployment. These in turn trigger adjustments through both labour and firm mobility, until unemployment and wages have returned to normal. By then, however, employment is permanently affected; to what extent depends on

the relative speed at which workers and firms adjust to changes in wages and unemployment (for more explanation see Blanchard i Katz, 1992).

In the literature two approaches are used to explain the processes of regional adjustments (see for example Choy et al., 2002). According to the first one regional adjustment occurs when differences between regions become less. This view implies that in the long run all regions converge to the same steady-state equilibria. An alternative viewpoint is that there may be stable long-run differences between regions meaning that regional adjustment entails restoring long-run relativities after a regional shock. Following Blanchard and Katz model assumptions, we believe that it is possible to have permanent differences across Polish regions, and thus we allow for this in our model.

Theory also suggests that regional labour markets can adjust in response to shocks through at least one of the following channels: changes in unemployment, changes in labour force participation, changes in worker remuneration and migration. The adjustment mechanisms can be explained more precisely (for an example see Choy et al., 2002).

A negative labour demand shock implies a reduction in employment in the affected region. Individuals who had a job no longer have one. Important question is how do firms and individuals respond to the shock. One possibility is that unemployment increases. Another possible adjustment is that labour force participation may drop. Some of those people who lose their jobs may decide to take early retirement or decide that the best thing for their future prospects is to undertake further training. Some who have lost their jobs and those who were already unemployed may become discouraged and no longer actively seek work.

On the other way it may be that they decide that the region no longer provides them with the opportunities they desire and consequently leave the region in search of better job opportunities. It is likely that not all the people who decide to leave were those who directly lost their own jobs as a result of the shock. Family members of those who lost their jobs may also leave. People who were unemployed prior to the shock may leave as they see the likelihood of finding employment has decreased due to the shock. Even people with jobs may leave if they fear that the region is in decline and they may be next in line for job losses.

Another possible form of adjustment is through changes to the price of labour. The decrease in labour demand may have a negative impact on wages. A decrease in wages may help mitigate the effect of the initial reduction in demand for labour by attracting new firms into the region, hence creating some new jobs to offset the initial shock, or discouraging existing firms from cutting jobs.

The discussion above suggests that when analyzing the impact of an employment shock, it will be important to capture all the adjustment channels mentioned above. Consequently, our analysis of regional labour market adjustment in Poland captures changes of employment level, the unemployment rate and the labour force participation rate .

Following Blanchard and Katz (1992) to model the regional labour market adjustment in Poland we use a Vector Autoregressive approach. The advantage of VAR models is that this technique examines the joint fluctuations of the selected set of variables over time and then forms the baseline results. We use vector autoregressive approach also to be able to compare the adjustment processes on Polish regional labour markets with results obtained with this particular methodology for the euro zone countries.

6. Empirical results

Before we examine the adjustments on regional labour market in Poland to the region-specific shocks we have to answer the question to what extent they are important for regional labour market performance in Poland. Following the literature in this area, we make a distinction between regional shocks and aggregate shocks. The national shocks are usually defined as the ones which influence all the sectors in all regions to the same extent. A regional shock is one that is felt either specifically in the one region or for which a region experiences a disproportionate impact of a shock that also affects other regions in the economy (see Choy et al., 2002). Examples of regional shocks include the closure of a large factory in the region or a downturn in an industry in which the region is relatively specialized.

To indicate how much of a typical movement in regional employment is common to all regions and how much is region-specific we follow the methodology proposed by Blanchard i Katz (1992) and estimate for each of the 16 Polish regions the parameters of following equation:

$$\Delta \log(L_{it}) = \alpha_i + \beta_i \Delta \log(L_t) + \xi_{it}$$

where L_{it} - is the employment in region i at time t, L_t - is the total employment in the country, β is a measure how responsive an employment in a given region is to changes in the national employment, in other words, β is an elasticity. If β=1 (β=0) it means that the regional movements in employment are totally symmetric (asymmetric). Regions may differ in terms of their elasticity to changes to the national value of a employment depending on a range of factors, such as how the industry composition within the region compares to the national average, or how labour force characteristics differ across regions.

The average adjusted R^2 of the employment changes equations gives us the answer to the question how much regions move together ie. how much of the regional employment movement can be explained by movements in regional employment. The average adjusted R^2 in case of Polish regions is 0,35 which indicates that the aggregate shocks can explain on average 35% of regional employment changes in Poland. We can compare our results with the results obtained by other researchers for euro zone countries. The obtained parameter of 0,35 in case of Poland is higher that in case of average for European regional labour markets for which Decressin and Fatas (1995) found the average adjusted R^2 of 0,2. However when comparing with the results for individuan European countries (France, where the adjusted R^2 was reported on the level of 0,76, Germany – 0,52, Italy – 0,41, Spain – 0,60, Netherlands – 0,49 (see Decressin i Fatas, 1995), we can conclude then the aggregate shocks in Poland explain on average less regional employment behavior than in the analyzed euro zone countries.

Looking at differences in R^2 from the employment regressions between Polish regions a fairly clear pattern emerges. Adjusted R^2 are higher for more industrial regions in western and central Poland (pomorskie, mazowieckie, malopolskie, lubuskie, dolnoslaskie, slaskie, lodzkie and opolskie), which implies that employment movements in those regions are much dominated by aggregate movements. Adjusted R^2 are lower for agricultural easternregions (lubelskie, podkarpackie, podlaskie, warminsko-mazurskie and swietokrzyskie) as well as for kujawsko-pomorskie and wielkopolskie regions.

The standard deviation of β coefficient indicates how much the regional employment movements are symmetric. The higher is the standard deviation of β the more asymmetric are

the regional employment changes. In case of Polish regions the standard deviation of β equals 0,63 which is more less the same as in case of euro zone regions studied by Decressin and Fatas, 1995 (0,72).

Of our interest is the distribution of β‘s across regions. Looking at the regional diversity of β's we can see that on the high side are opolskie, mazowieckie and swietokrzyskie which have the elasticities of 2,64; 1,46 and 1,52 respectively. On the low side is slaskie (with elasticity of 0,1), kujawsko-pomorskie (0,15), zachodniopomorskie (0,4) and lubelskie (0,5). In general we can conclude that (with some exceptions) the employment changes in more industrial regions with big agglomeration centers were more symmetric to the aggregate employment changes than it was observed in the more agricultural regions.

The above results show that region-specific shocks play an important role at the Polish local labour markets. Therefore the next research question is concerned with the speed and duration of adjustment processes of regional variables to region-specific shocks in Poland. As we stated before we examine it by estimating a VAR model. In using the VAR technique, there are some specification issues that need to be addressed.

The first specification issue is the choice of variables to be included in the VAR model. Given that our objective is to investigate regional labour market adjustments and taking into account the limited availability of data regarding wages, the set of variables selected are the employment level, unemployment rate and the participation rate.

The second issue is the choice in which form the variables should enter the model. As we are interested in investigating how regional labour markets adjust to shocks which have an impact on the relative status and attractiveness of a regional labour market compared with other regions not all shocks we should take into account. For example, if a slow-down in the global economy affects all regions evenly, then the relative attractiveness of a particular region would not change and therefore we would not expect a net migration response.

As the time series data that we have for the regional labour market contain both the impacts of region-specific shocks we are interested in, as well as aggregate shocks, we are not interested in, we follow the literature to remove the latter. Therefore following the Blanchard and Katz

(1992) we construct the region-specific variables as the relative to their aggregate Polish counterparts:

$$l_{it} = \log(L_{it}) - \log(L_t)$$
$$u_{it} = \log(ur_{it}) - \log(ur_t)$$
$$p_{it} = \log(pr_{it}) - \log(pr_t)$$

where:

L_{it} - is the employment in region i at time t,

L_t - is the total employment in the country at time t,

ur_{it} - is the unemployment rate in region i at time t,

ur_t - is the average unemployment rate in the country at time t,

pr_{it} - is the particiaption rate in region i at time t,

pr_t - is the average particiaption rate in the country at time t.

The third specification issue is how the variables should enter the VAR model. In particular the question is whether should they enter in levels or difference form. To answer this question we need to test whether the underlying stochastic process generating the series is stationary, as all variables entering the VAR should be stationary. We conduct a number of unit root tests prior to deciding how to enter our chosen variables in to the VAR model. The results obtained are provided in appendix. Taking into account the results of the unit root tests we decided to model employment in first difference, while the employment rate and participation rate have entered the model in levels.

Following the procedure described above we estimated the 3 variable VAR model using data for each region separately. The analyzed period is 1995Q1-2007Q4. For each region we estimated the parameters of the following VAR model:

$$\mathbf{y}_{(3)t} = \boldsymbol{\mu}_{(3)} + \sum_{s=1}^{S} \mathbf{y}_{(3)t-s} \boldsymbol{\Pi}_s + \boldsymbol{\xi}_{(3)t}$$

where:

$\mathbf{y}_{(3)t}$ is the vector of variables (employment growth, unemployment rate and labour force participation rate);

$\boldsymbol{\mu}_{(3)}$ is the constant terms vector;

$\boldsymbol{\Pi}_s$ is the parameter matrix;

$\boldsymbol{\xi}_{(3)t}$ is the vector of error terms;

S is the highest lag operator.

Vector Autoregressive model, besides dividing the variables on endo- and exogenous is characterized by the identical construction of all equations, it takes as a regressors only lagged values of variables used in the model and the chooses such model specification that the error term is the white noise (see Welfe, 2003). Therefore while estimating the VAR model for each region we chose the lag lenght separately for in each case basing on appropriate criteria. The values of all tests are presented in appendix. When the the criteria were not conclusive, the lag lenght were chosen basing on the normality tests (see appendix for all the test values). The low value of Jarque-Bera test in case of some regions are due to kurtosis problem which the VAR models are resistant to.

The above estimation process provides us with a separate set of results for each region. Having estimated the VAR model for each region separately and obtained estimates for all of the coefficients included in the model we were able to obtain impulse response functions (IRFs) for all the variables in the model. Following Blanchard and Katz, 1992, we associate unforeseeable movements in employment with innovations in labor demand. We trace the effects of positive demand shock on employment, unemployment rates and participation rates.

Looking at the initial response of employment to the demand shock (see figure 9a in appendix) we can see significant differences between regions. Relatively strong response can be noticed in the northern and western part of Poland (opolskie, slaskie, wielkopolskie, zachodniopomorskie). Strong reaction is observed also in lubuskie, pomorskie and mazowieckie (see figure 1). Relatively weak reaction is noted in central and eastern regions of Poland and surprisingly also dolnoslaskie region. These observations confirm the results obtained by others (see Zatrudnienie w Polsce, 2005).

Significant differences can be seen also in case of shock persistence (see figure 10a in appendix). With the exception of slaskie region the effects of the demand shock on employment in western regions disappear during five years. In slaskie region the shock on employment disappears after 8 years. In case of four region (kujawsko-pomorskie, mazowieckie, opolskie i swietokrzyskie) the effects of the shock on employment still persist after 10 years.

Looking at the response of unemployment rates to the demand shock we can see the decrease in unemployment rates in all regions in the first period. In general with two exceptions (zachodniopomorskie and lubuskie) the reaction of unemployment rates to the employment shock is higher in western and northern regions. The decrease in unemployment rates is weaker in more agricultural regions in eastern and south-eastern part of Poland (see figure 9b in appendix). The effects of the employment shock to the unemployment rates is much more persistent than in case of employment (see figure 10b). Only in four regions the effects of the shock disappear during 8 years (dolnoslaskie, malopolskie, lubuskie and lodzkie). In lubelskie, podkarpackie and pomorskie it stabilizes around 10 years after the shock. In nine regions the effects of the shock on unemployment rates still persist after 10 years.

After the positive shock on employment the participation rates in all region increase in the first year after the shock, however the strenght of the reaction differs between regions. The reaction is the strongest in the western and north-western regions and relatively weak in the central, southern and eastern part of Poland (see figure 9c in appendix). In case of malopolskie the reaction of participation rate is almost insignificant. The effects of employment shock to the participation rates is also persistent. Only in seven regions (malopolskie, dolnoslaskie, lodzkie, lubelskie, lubuskie, pomorskie and slaskie) the effects of the shock disappears during 8 years. In opolskie the participation rates needs about 10 years to come back to the equilibrium level. In eight regions the effects of the shock on participation rates still persist after 10 years.

Looking at the scale of adjustments of employment, unemployment rates and participation rates (see figure 10 in appendix, the scale on all the figures has been unified to make the reactions comparable with each other) we can see that the main adjustment channel in case of Polish regional labour markets is the unemployment rate. The reaction of participation rate is much weaker.

7. Conclusions

The expected accession of Poland to the euro zone will bring both advantages and disadvantages for Polish regions. Advantages, or benefits, are said to be positively related to the degree of specialization and degree of openness of the integrated regions. Disadvantages,

or costs, are both related to the probability of suffering asymmetric shocks and to the existence and relevance of adjustment mechanisms.

The main aim of the paper was to attempt to answer to the question whether the costs of joining to the euro zone will be evenly distributed between Polish regions. However it is impossible to get a precise quantitative idea of the net costs of EMU for any Polish region, the above analysis offers some interesting, although preliminary, conclusions.

First of all, the provided analyses indicate that the aggregate shocks in Poland explain less regional employment behavior than on average in the euro zone countries. Most of the regional employment changes in Poland are idiosyncratic. However the results differ between regions. In the industrial regions in western and northern part of Poland the employment movements are more dominated by aggregate movements. In the agricultural eastern regions the aggregate employment behavior explains little of regional employment changes.

Taking into account the symmetry of shocks affecting the regional labour market we can see that in case of Polish regions the asymmetry of the shocks were on the similar as in the euro zone regions level. Looking at the distribution of elasticity of regional employment to the national one we can see that higher than the average elasticity was notefd in industrial regions. Lower elasticity of employment changes has been noted in eastern rural regions and in the Slaskie region.

The analyses show that significant part of movements on the regional labour market in Poland is due to region-specific shocks. Therefore, concerning the expected adoption of common currency, there is a need to study the efficiency of regional labour market in responding to asymmetric shocks.

The provided analysis indicate that Polish regions differs in response to the regional shock. The differences are both in the strenght of initial response and in the persistence. Comparing the adjustment process in Poland and other European countries to a demand shock we can see that in case of employment the reaction to the demand shock is similar to the one observed in the euro zone countries. The average adjustment period is 5-7 years.

The differences occurs while analyzing the adjustment in both regional unemployment rates and regional participation rates. In general in Poland we observe more persistence in the behavior of both variables. In case of unemployment rates only in four regions the effects of the shock disappear during 8 years (dolnoslaskie, malopolskie, lubuskie and lodzkie). In nine regions the effects of the demand shock on unemployment rates still persist after 10 years. Similar reaction can be observed for regional participation rates. Only in seven regions (malopolskie, dolnoslaskie, lodzkie, lubelskie, lubuskie, pomorskie and slaskie) the effects of the demand shock on participation rates disappears during 8 years. In eight regions the effects of the shock on participation rates still persist after 10 years. The results for the euro zone countries indicate that the absorption period in case of unemployment rates and participation rates does not excced 7 years. The analyses for Poland indicate that the demand shocks have longer lasting effects on relative unemployment rates that in the analysed euro zone countries. It takes several years before shocks are completely absorbed by the regional labour markets in Poland.

The important question for the economic policy is why there are differences in responding to the shock between regions. In particular the important question is whether we can find some common features of the labour markets which are responsible for lower than the average adjustment process. This question was not a subject of the provided analysis however the literature attempts to point to some important explanations. On of the factor which seems to be particularly significant is the employment structure in the region. Employment structure can influence the labour demand elasticity in the region (labour markets with higher share of employment in services and manufacturing have higher labour market elasticity that the agricultural ones). This could be the explanation why the regions with archaic employment structure adjust slower. The second reason point in the literature are the differences in the composition of the labour force, which may also generate different regional responses to aggregate shocks (see also Choy et al., 2002).

The other important question is why on average in Poland we can observe more persistence in unemployment rates and participation rates than in other European economies. There is a consensus in Polish literature that the relatively slow adjustment processes on Polish labour market can be explained by institutional factors: high tax wegde in Poland, early retirement benefit system, relatively high replacement ratio and low effectiveness of active labour market policy (see among others: OECD, 2008 or Lewandowski, Koloch, Regulski, 2008). The high

tax wedge on low-wage workers prices some of them out of the labour market and leaves others with too few incentives to seek registered employment. And on the benefit side, a substantial share of older workers can withdraw from the labour force on favourable conditions well before statutory retirement age. Relatively high replacent ratio lowers the incentives to leave the unemployment and low effectiveness of ALMP lowers the size of effective labour force.

Although we can not indicate any definitive conclusions regarding the regional distribution of potential EMU costs and benefits and the paper shows we can see some differences both in shock symmetry as well as the in adjustment process the policy implications of these results are that the lack of monetary autonomy may not be very onerous for the Polish regions. The common monetary policy implemented by the ECB will probably have similar effects on all Polish regions. Thus, the danger of an increase in regional disparities via this channel does not seem to be very severe. We can not confirm the hypothesis that the costs of joining the euro zone for eastern regions will be higher than for other regions.

In any case, this conclusion should be taken very cautiously given that in paper we have been analyzing only the potential costs concerned with the regional labour market adjustment mechanisms. There can be both costs and benefits (both macro and microeconomic in nature) that have not been considered in this paper. In particular one should carefully look at the regional adjustment of wages as well as the interregional migration channel. Because of short time series data concerned with wages we were not able to estimate the parameters of 4 variables VAR model for each of the regions separately. However the analyses of elasticity of wages are necessary to fully answer the question about regional differences in labour market elasticity. This should be on the agenda for future research.

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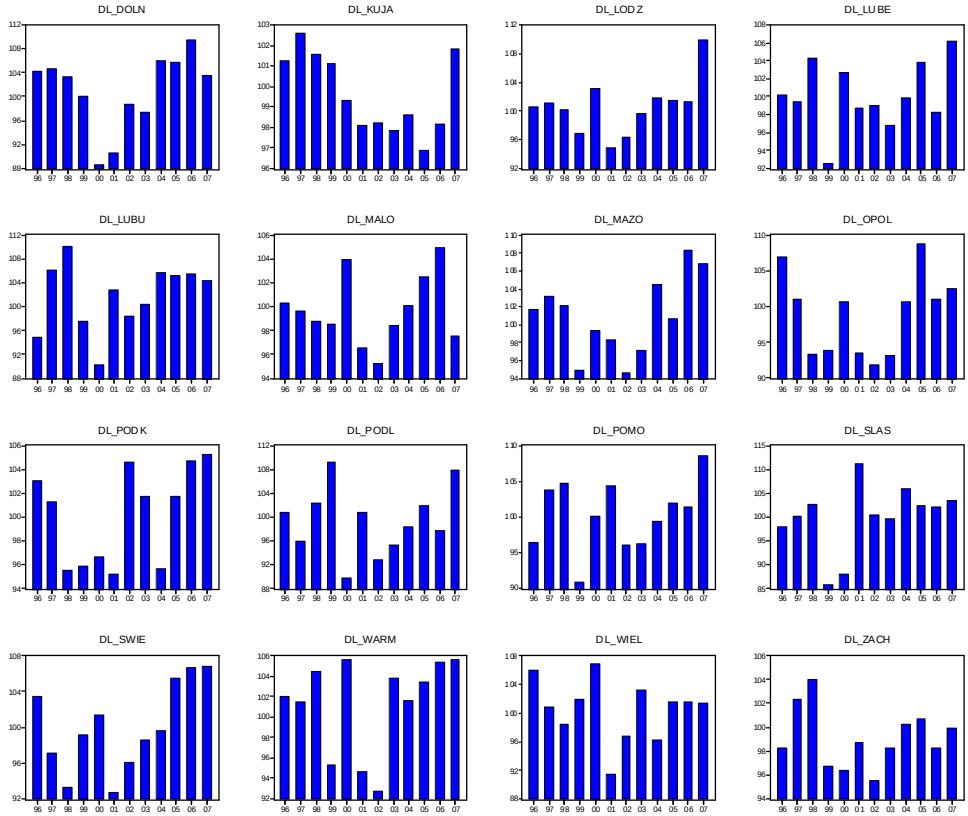
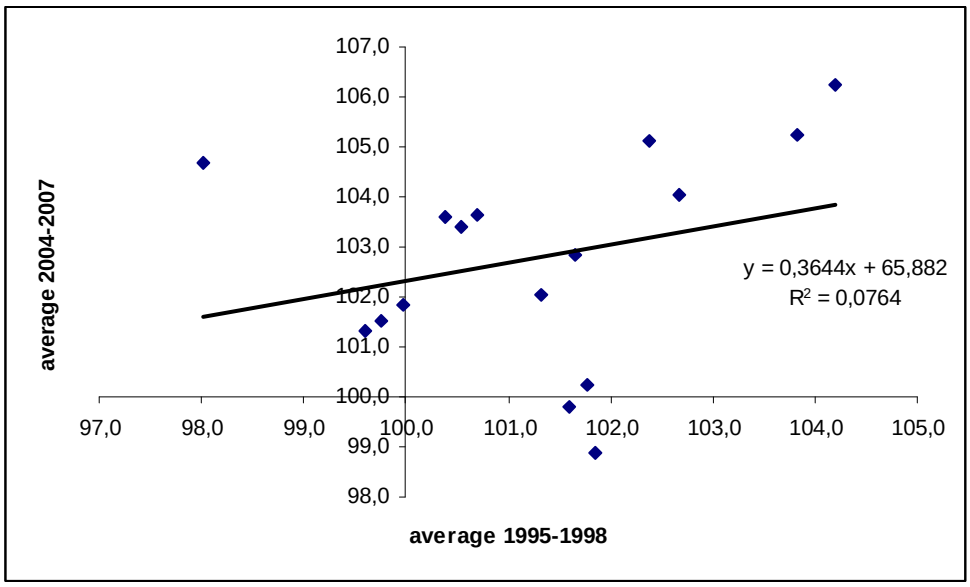
Appendix 1

Figure 1
Employment growth by region in Poland in 1996-2007 (previous year equals 100)



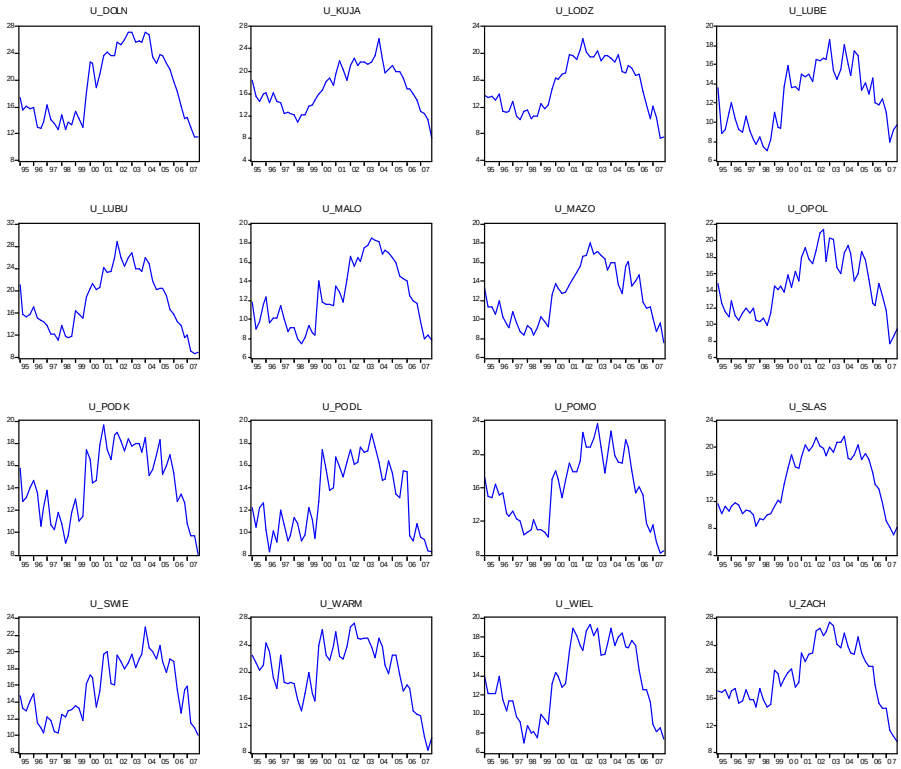
Source: Source: Polish Labour Force Survey, various editions 1995-2008, own calculations.

Figure 2
Regional employment growth persistence in Poland in 1996-2007



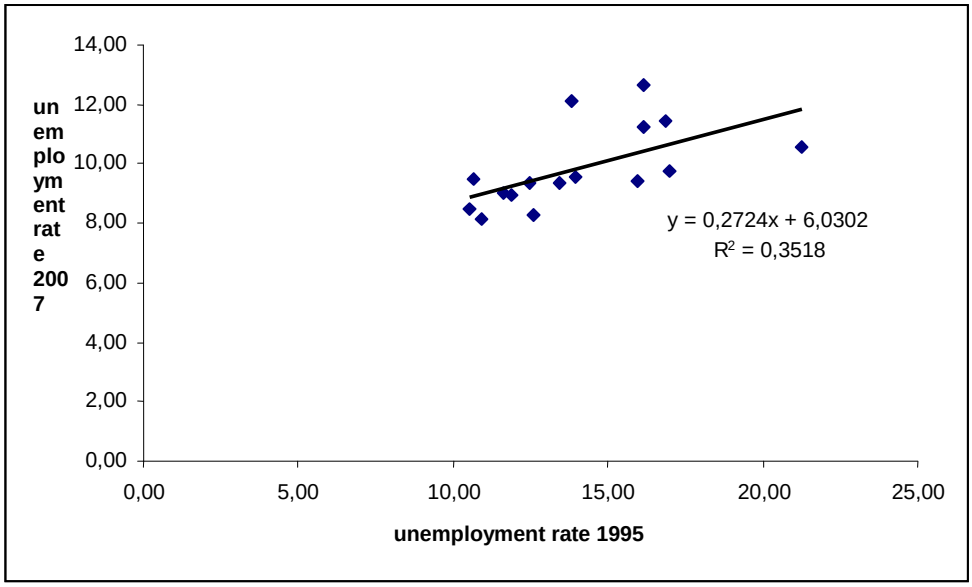
Source: Polish Labour Force Survey, various editions 1995-2008, own calculations.

Figure 3
Unemployment rates by region in Poland in 1995-2007 (in % of labour force in the region)



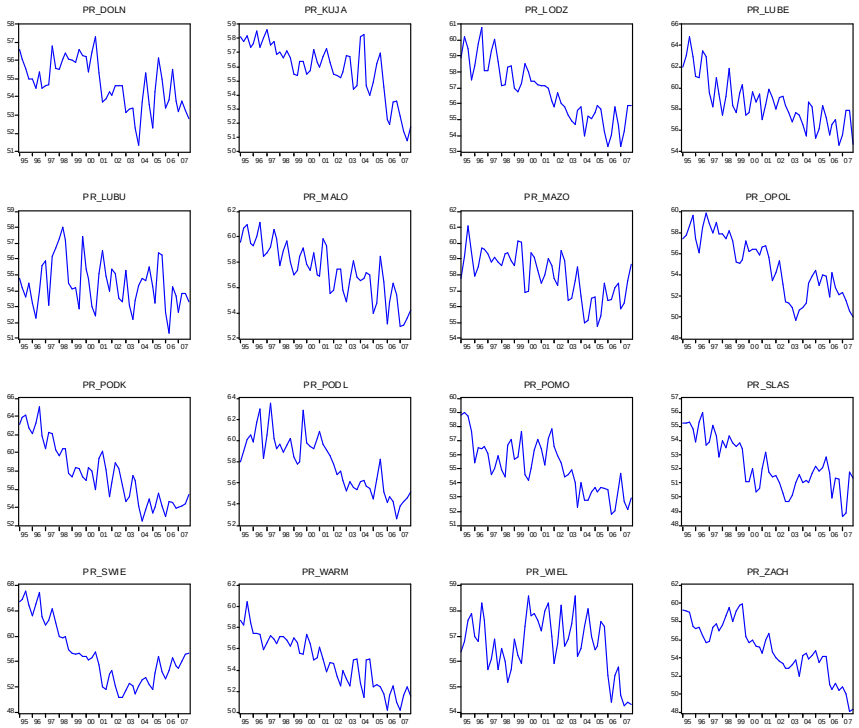
Source: Polish Labour Force Survey, various editions 1995-2008.

Figure 4
Unemployment rate persistence in Poland in 1995-2007



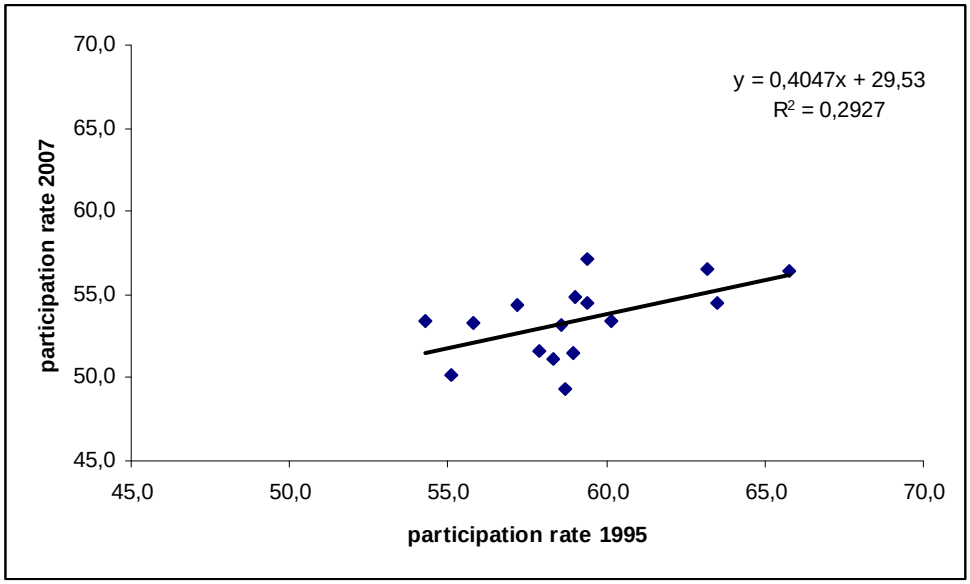
Source: Polish Labour Force Survey, various editions 1995-2008.

Figure 5
Regional labour force participation rate in Poland in 1995-2007 (in % of working age population in the region)



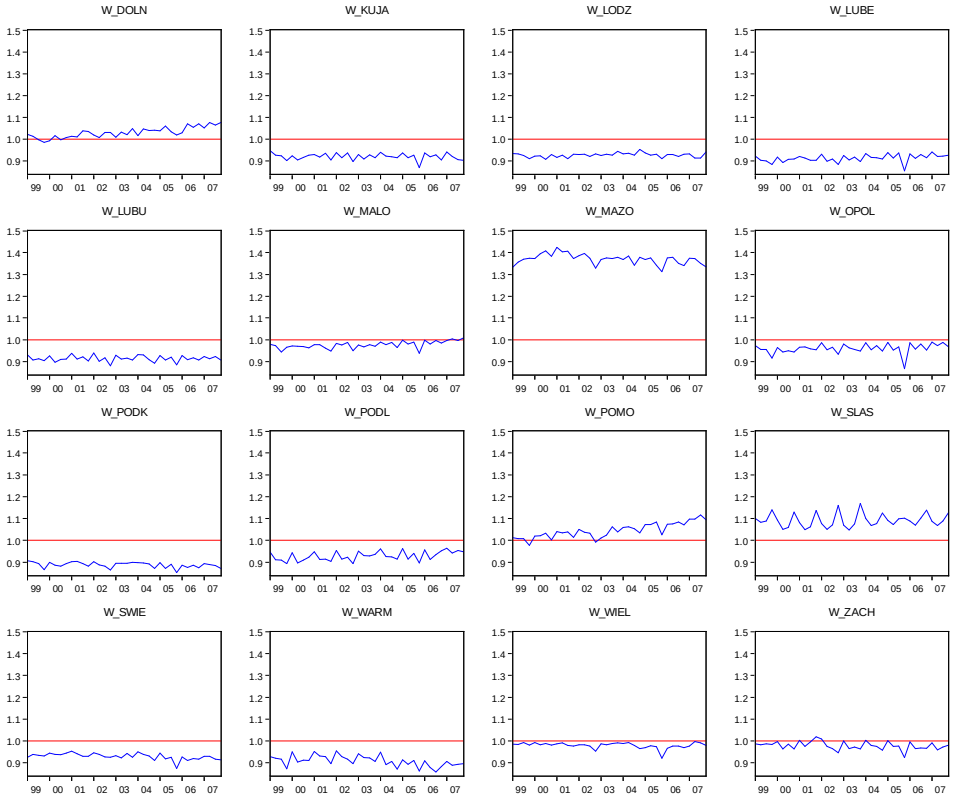
Source: Polish Labour Force Survey, various editions 1995-2008.

Figure 6
Regional participation rate persistence in Poland in 1995-2007



Source: Polish Labour Force Survey, various editions 1995-2008.

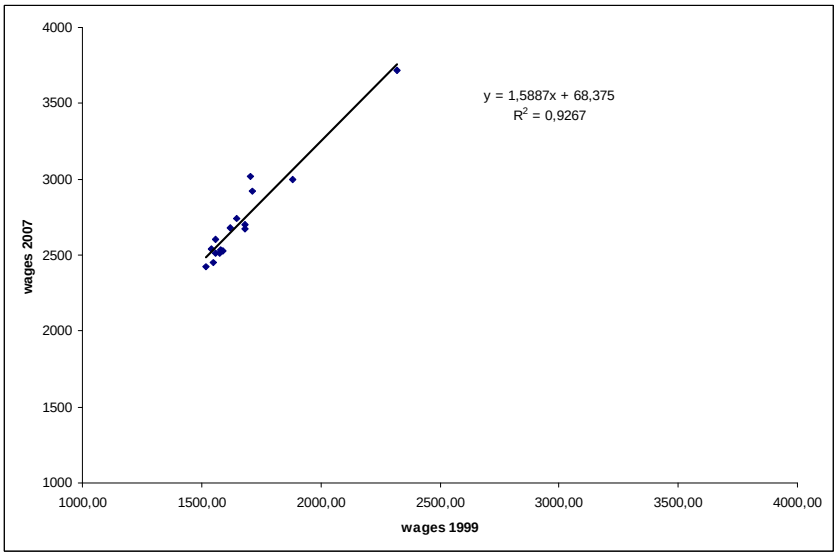
Figure 7
Relative wages by region in Poland in 1999-2007 (wages in a given region in relation to a country average)



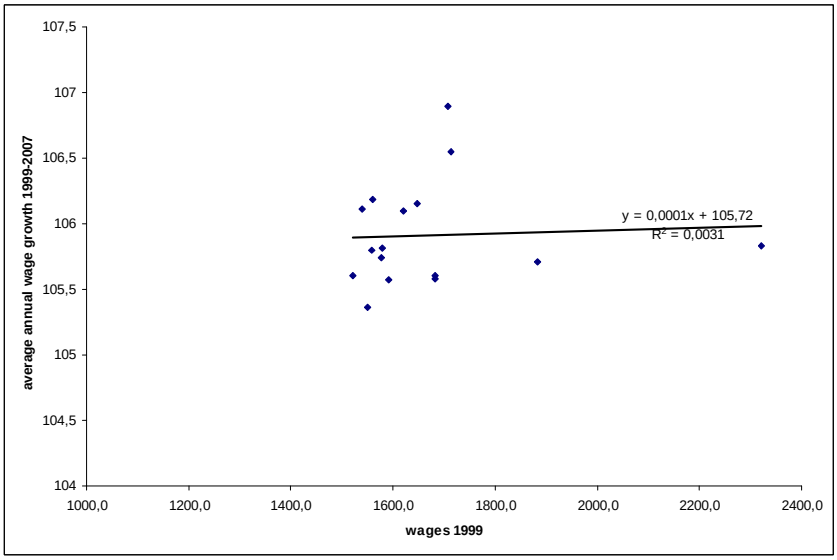
Source: Zatrudnienie i wynagrodzenia w gospodarce narodowej (Employment, wages and salaries in national economy), various editions 1999-2008, own calculations.

Figure 8
Wage persistence (a) and wage divergence (b) across Polish regions 1999-2007

a)



b)



Source: Zatrudnienie i wynagrodzenia w gospodarce narodowej (Employment, wages and salaries in national economy), various editions 1999-2008, own calculations.

Table 1
Some empirical evidence of regional adjustment

Authors	**Country**	**Number of regions**	**Analyzed period**	**Variables**	**Methodology**	**Main absorption channel**	**Absorption period**
Blanchard, Katz, 1992	U.S.	50	Annual 1952-1990	e, ur, pr, w	VAR	Migration	5-7 years
Decressin, Fatas, 1995	Europe	51	Annual 1975-1987	e, ur, pr	Pooled VAR	Participation rate	4 years for unemployment, 3 years for participation rate
Broesma, van Dijk, 2001	Netherlands	18	Quarterly 1993-1999	e, ur, pr	Pooled VAR and clusters (4 region each)	In the East, West and South – participation rate, in the North - unemployment rate	In the North: 3-5 years. In the other regions: 5-7 years.
Choy et al., 2002	New Zealand	12	Quarterly 1985-2001 (1989-2001)	e, er, pr (w)	Individual 3-VAR (4-VAR)	Migration	5-6 years
Estevao, 2003	Belgium	2 (Wallon and Franders province)	Annual	e, er, pr	Pooled VAR separately for Wallon and Franders province	Participation	About 5-7 years.

e - employment, ur - unemployment rate, pr - participation rate, w – wages

Table 2
Estimated parameters of β's

	Beta	t-Stat	Adj. R2
dolnoslaskie	1,45	4,68	0,51
kujawsko-pomorskie	0,15	0,69	0,04
lubelskie	0,55	2,47	0,09
lubuskie	0,91	2,21	0,59
lodzkie	1,04	5,16	0,47
malopolskie	0,60	2,71	0,57
mazowieckie	1,46	5,17	0,66
opolskie	2,64	3,26	0,44
podkarpackie	0,58	1,69	0,03
podlaskie	0,81	2,53	0,12
pomorskie	0,57	1,55	0,82
slaskie	0,10	0,14	0,45
swietokrzyskie	1,52	4,63	0,28
warminsko-mazurskie	1,04	3,62	0,18
wielkopolskie	0,87	1,28	0,003
zachodniopomorskie	0,40	0,75	0,31
S.D. of β's = 0,63			
Average adj. R^2 = 0,35			

Table 3
Results of the unit root test for the panel of regional variables

Levin, Lin & Chu t* Null: Unit root (assumes common unit root process)	Statistic	Prob.**	Cross-section	Obs.
Employment	0.37871	0.3525	16	805
Employment growth	25.5806	0.0000	16	793
Unemployment rate	3.28409	0.0005	16	809
Participation rate	1.74338	0.0406	16	793

Table 4
Results of the individual unit root test for each of the regional variables

Variable	Test	Statistic	Prob.**	Cross-sections	Obs
Employment	Im, Pesaran and Shin W-stat	0.41500	0.3391	16	798
	ADF - Fisher Chi-square	36.4693	0.2686	16	798
	PP - Fisher Chi-square	33.4159	0.3984	16	816
Employment growth	Im, Pesaran and Shin W-stat	20.0061	0.0000	16	784
	ADF - Fisher Chi-square	381.902	0.0000	16	784
	PP - Fisher Chi-square	580.141	0.0000	16	800
Unemployment rate	Im, Pesaran and Shin W-stat	5.32248	0.0000	16	808
	ADF - Fisher Chi-square	94.9184	0.0000	16	808
	PP - Fisher Chi-square	77.7919	0.0000	16	816
Participation rate	Im, Pesaran and Shin W-stat	3.72545	0.0001	16	799
	ADF - Fisher Chi-square	65.4586	0.0004	16	799
	PP - Fisher Chi-square	48.6744	0.0298	16	816

Null: Unit root (assumes individual unit root process).

Table 5
VAR residual serial correlation LM test

Region	Component	Jarque-Bera	Prob.	Skewness	Prob.	Kurtosis	Prob.
doln	e	26,705	0,000	0,381	0,537	26,324	0,000
	ur	24,243	0,000	0,237	0,627	24,006	0,000
	pr	23,875	0,000	0,028	0,867	23,847	0,000
kuja	e	6,571	0,037	0,203	0,652	6,368	0,012
	ur	4,873	0,088	0,014	0,905	4,859	0,028
	pr	4,836	0,089	0,034	0,854	4,802	0,028
lodz	e	7,174	0,028	0,363	0,547	6,810	0,009
	ur	6,053	0,049	0,345	0,557	5,708	0,017
	pr	7,553	0,023	0,000	0,986	7,553	0,006
lube	e	12,502	0,002	0,040	0,842	12,463	0,000
	ur	26,851	0,000	0,205	0,651	26,645	0,000
	pr	20,883	0,000	0,256	0,613	20,626	0,000
lubu	e	7,775	0,021	0,082	0,775	7,693	0,006
	ur	22,825	0,000	0,245	0,620	22,579	0,000
	pr	38,400	0,000	0,057	0,812	38,343	0,000
malo	e	6,613	0,037	0,030	0,862	6,582	0,010
	ur	7,164	0,028	0,423	0,515	6,740	0,009
	pr	9,280	0,010	0,045	0,831	9,235	0,002
mazo	e	0,046	0,977	0,022	0,883	0,025	0,875
	ur	4,747	0,093	0,043	0,836	4,704	0,030
	pr	4,748	0,093	0,031	0,860	4,717	0,030
opol	e	3,159	0,206	0,810	0,368	2,349	0,125
	ur	4,317	0,116	0,014	0,904	4,303	0,038
	pr	4,935	0,085	0,013	0,908	4,922	0,027
podk	e	16,756	0,000	0,573	0,449	16,183	0,000
	ur	1,333	0,514	0,430	0,512	0,903	0,342
	pr	21,913	0,000	21,528	0,000	0,385	0,535
podl	e	7,482	0,024	0,299	0,585	7,184	0,007
	ur	4,232	0,121	0,990	0,320	3,242	0,072
	pr	5,652	0,059	0,112	0,737	5,540	0,019
pomo	e	6,572	0,037	0,037	0,847	6,534	0,011
	ur	3,073	0,215	0,349	0,554	2,724	0,099
	pr	6,689	0,035	0,018	0,892	6,671	0,010
slas	e	2,056	0,358	0,381	0,537	1,675	0,196
	ur	2,555	0,279	0,124	0,724	2,431	0,119
	pr	5,646	0,059	0,001	0,970	5,644	0,018
swie	e	8,032	0,018	0,014	0,904	8,018	0,005
	ur	5,238	0,073	0,015	0,903	5,223	0,022
	pr	6,030	0,049	0,037	0,847	5,993	0,014
warm	e	1,572	0,456	0,192	0,661	1,379	0,240
	ur	1,368	0,505	0,125	0,724	1,243	0,265
	pr	4,964	0,084	2,193	0,139	2,771	0,096
wiel	e	6,345	0,042	0,020	0,887	6,325	0,012
	ur	4,174	0,124	0,050	0,824	4,125	0,042

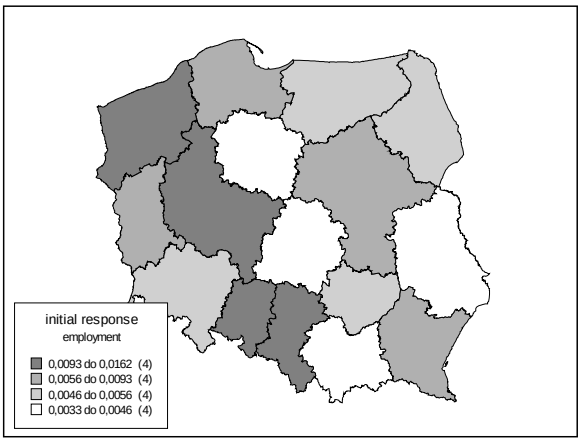
	pr	3,318	0,190	1,409	0,235	1,909	0,167
zach	e	3,578	0,167	0,006	0,937	3,572	0,059
	ur	0,307	0,858	0,255	0,613	0,051	0,821
	pr	2,422	0,298	0,556	0,456	1,866	0,172

Table 6
VAR Residual Normality Tests (Doornik-Hansen)

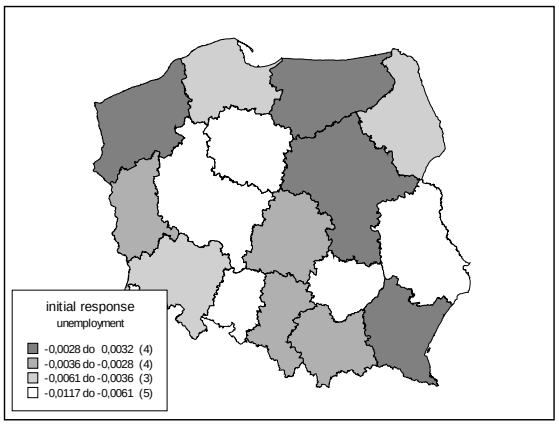
	Lags	LM-Stat	Prob		Lags	LM-Stat	Prob
doln	1	9,967	0,353	podk	1	7,317	0,604
	2	10,999	0,276		2	2,760	0,973
	3	12,011	0,213		3	3,426	0,945
	4	12,567	0,183		4	8,047	0,529
kuja	1	8,244	0,510	podl	1	16,361	0,060
	2	7,709	0,564		2	11,803	0,225
	3	7,701	0,565		3	6,728	0,665
	4	6,285	0,711		4	10,479	0,313
lodz	1	9,464	0,396	pomo	1	14,083	0,119
	2	7,627	0,572		2	11,743	0,228
	3	10,645	0,301		3	7,404	0,595
	4	9,143	0,424		4	9,699	0,375
lube	1	12,090	0,208	slas	1	17,155	0,046
	2	13,791	0,130		2	26,759	0,002
	3	14,351	0,110		3	6,444	0,695
	4	10,213	0,334		4	9,580	0,386
lubu	1	8,413	0,493	swie	1	10,443	0,316
	2	9,132	0,425		2	8,897	0,447
	3	6,981	0,639		3	4,955	0,838
	4	13,311	0,149		4	12,110	0,207
malo	1	8,276	0,507	warm	1	13,957	0,124
	2	14,147	0,117		2	16,065	0,066
	3	7,249	0,611		3	5,611	0,778
	4	14,896	0,094		4	3,674	0,932
mazo	1	7,687	0,566	wiel	1	13,999	0,122
	2	5,227	0,814		2	10,352	0,323
	3	9,277	0,412		3	24,561	0,004
	4	9,325	0,408		4	16,570	0,056
opol	1	7,887	0,546	zach	1	5,980	0,742
	2	5,653	0,774		2	2,231	0,987
	3	8,603	0,475		3	8,582	0,477
	4	14,632	0,102		4	5,557	0,783

Figure 9
Initial impulse response of employment, unemployment rates and particiaption rates on one stadard deviation shock on employment

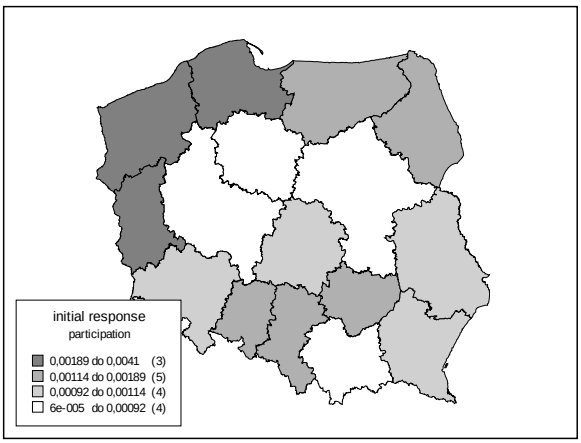
a) employment growth



b) unemployment rates



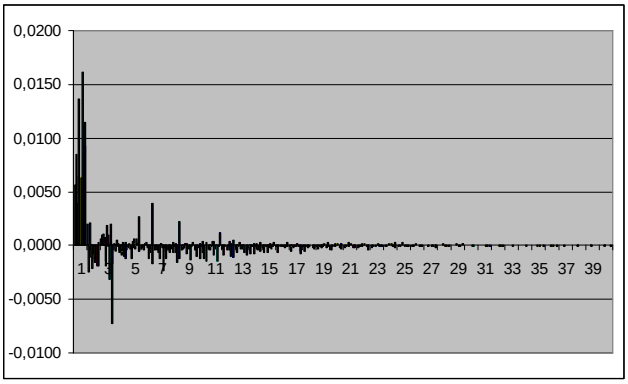
c) participation rates



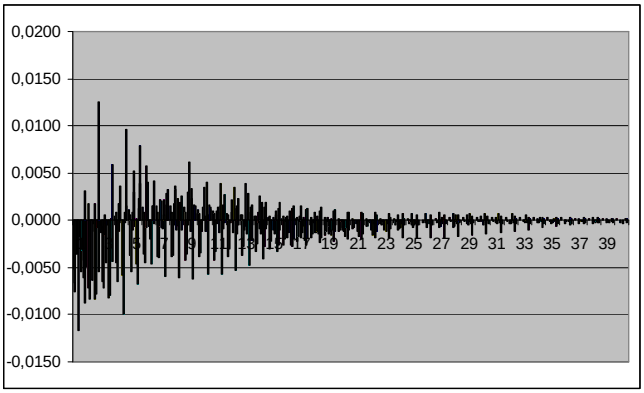
Source: own calculations.

Figure 10
Regional employment growth, unemployment rate and participation rate response to one standard deviation demand shock

a) employment growth



b) unemployment rates



c) participation rates