What drives the Unemployment Rate in Poland.

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Abstract

This paper studies flows on the labour market in Poland in 1995-2008. We show that the main driving force behind the unemployment rate is the behaviour of outflow to employment. Moreover, the flows that involve the state of inactivity constitute for a large share of total flows. They seem to be an idiosyncratic phenomenon of Polish labour market. In addition the inflow to employment is found to be procyclical, while the separation rate is acyclical.

JEL codes: J63, J64

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1 Introduction

Market economies are characterised by high level of job turnover. Unemployment occurs when a worker departs from job and spend some time to find a new one. Additional unemployment arises when people enter or re-enter the labour market from inactivity. Furthermore, some flows reflect the natural worker rotation caused by the generation overlap and firm emergence's and collapses. There exist also other factors like, for instance, changes in demographic structure. When population get older more people quit the labour market than enter into the labour force. This creates additional inactivity oriented flows.

The flow approach to modelling labour markets has recently acquired the acceptance among labour market economist and dominates recent works on labour market related issues. One has to notice an important distinction between jobs and workers flow. The job flows are caused by the employers and reflect a job creation and a job destruction processes. Worker flows concerns factors that influence workers and makes them move among labour market states. In the article we look deeply inside the latter.

From an economic point of view worker flows determinants can be clustered into two broad categories. On the one side, the demand factors caused by employers who create new jobs and destroy old ones at every moment. They reflect natural fluctuation of the economy. The worker flows of that kind account for a large fraction of the separations and the hires measured at the employer level and a large fraction of the job changes and movement into and out of the employment measured at the worker level. On the other, the supply created by currently unemployed people willing to work or by

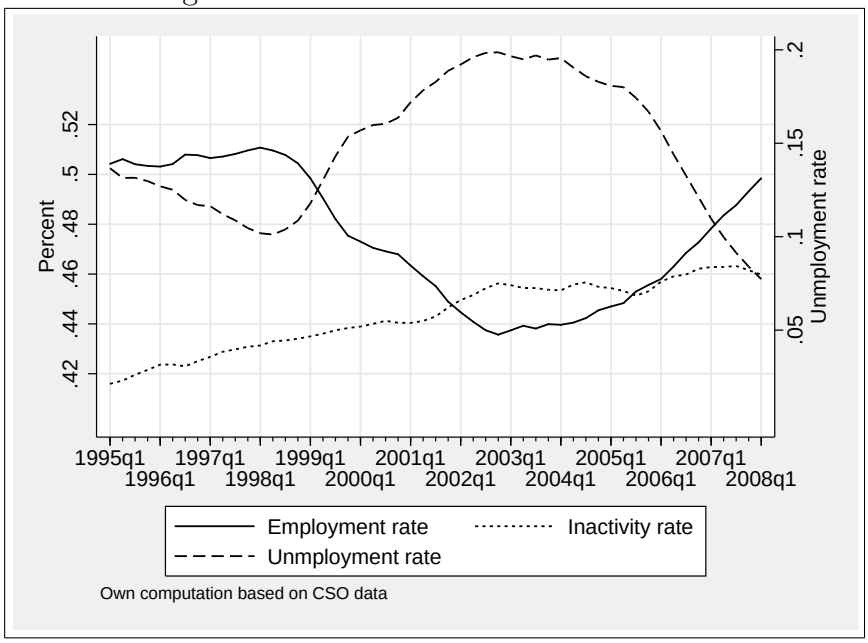
the employed willing to change their employer. The behaviour of unemployed and the non-employed people play a crucial role during expansions and recessions. Roughly speaking, job flow measures capture demand-side developments, while workers flows reflect events and developments in both categories (Davis at al. 2005).

Despite that the underlying theory is well established, not many empirical works has been issued. However, the vast majority is concerned with job flows or the U.S. labour market or both. Nevertheless, they make a substantial contribution, as information contained in the flow data is potentially more useful than the information enclosed in the stocks (Mortensen & Pissarides (1994)).

European labour markets are characterised by greater rigidity and therefore job and workers flows are limited in comparison to the US. In a recent study Petrongolo and Pissarides (2008) analysed three European labour markets and showed that the contribution of inflows and outflows to unemployment volatility is nearly equal. Our aim is to conduct analogous analysis for the biggest European transition economy that has recently joined the European Union, i.e. Poland. Time span of the analysis is from the first quarter of 1995 to the first quarter 2008. The unemployment rate oscillated between 9 % and 22 %. However, still participation ratio is low, about 54 %. For comparison, in Spain participation ratio is above 60 % and is still among the lowest in European Union Countries (Bover et al. 2000).

This study try to explain what happen to the labour market in Poland. The polish economy during fifteen year successfully transitioned from command rule to liberal market. It is well-known that such a big reform com-

Figure 1: Evolution of the labour market



pletely changes labour demand and, at the same time, labour supply is not able to adjust so quickly. We try to explain the behaviour of the employment, the unemployment and the inactivity stocks by looking though the dynamics of the Polish labour market. The main research question concerns factors that influence the actual and steady-state unemployment level. A special attention is paid to the question of what drives the unemployment rate. Our analysis uses the framework of Shimer (2005) to capture the flows between different labour market states. We use extensions proposed by the other authors (Fujita & Ramey 2007, Petrongolo & Pissarides 2008) to relate the variability of the unemployment rate to the observed flows on the labour market. In addition, we try to shed some light on the cyclicality of the unemployment rate.

The results indicate that the labour market in Poland is somewhat flex-

ible and comparable rather to the UK or the US labour market than to the ones in continental Europe. Poland has an unemployment profile similar to Spain during 1990's, and similarly to that country the strong economic expansion is assisted by a considerable fell in the unemployment rate. However, the impact of the flows into and out of unemployment is much larger. We show that the transition from unemployment to employment explains a considerable share of the variation in the unemployment rate. We study this particular flow in great detail and show that it's impact is lessened during the time of relatively stable unemployment level. At those times the impact of inactivity related flows raises. Moreover, the employment-unemployment transition rate is found to be pro-cyclical. Therefore, we conclude that the job creation process drives the unemployment rate level.

Next section present a short literature review concerning issues related to labour flow modelling and also some facts and figures in relation to Polish labour market. In section 3 we describe two-state model, discuss dataset properties and presents the result of conducted analysis. The closing paragraph relates observed movements on the labour market to the general state of the economy. In section 4 the model is extended to account for the state of inactivity and exercises from section 3 are repeated in the new environment. Section 5 summarises and concludes.

2 Literature review

The common research question considered in labour market literature is the main cause of the actual unemployment level. The reported evidence is mixed and the given answer depends on chosen methodology. Some researchers

indicate that the crucial role belongs to the inflows (see f.e. Darby et. al 1986, Elsby et al. 2007) while the others point out that the outflows are decisive (see f.e. Shimer 2005). However, this issue could not be separated from cyclical nature of the economy and therefore most of works investigate those problems together.

Blanchard and Diamond (1990) in their seminal work on flows find sharp differences between the cyclical behaviour of the various flows. In particular, the employment unemployment (hereafter EU) flow increases in a recession while the employment inactivity (hereafter EI) flow decreases, the unemployment employment (hereafter UE) flow increases in a recession, while unemployment inactivity (hereafter UI) flow decreases. If inactivity would be left aside, the increased flow between employment and unemployment should coincide with the slowdown period.

Moreover, the procyclicality of the hazard rate for exiting unemployment plays an important role in cyclical unemployment. Elsby et al. (2007) shows that also counter-cyclical inflows into unemployment are important.

On the contrary, Shimer (2005) show that the job finding probability is strongly procyclical and the separation probability nearly acyclical. He proposes two distinct explanations for these phenomenons. The first is related to the observed behaviour of the unemployed. The job finding probability is a decreasing function of the time since displacement. Therefore, the job fining rate is higher during the boom than the slowdown. The second explanation exploits skill-biased technical change and states that as the labour market changes the probability of finding jobs decreases due to lack of skills. The job seekers are discouraged form working by demand for new skills.

Darby at al. (1986) assert that the changes in the size and the distribution of the inflow into the unemployment are the most important determinant of the unemployment rate. Since the probability of leaving unemployment is primarily determined by the characteristics of those being unemployed and is little affected by the business cycle, the outflows from unemployment and hence the actual changes in the unemployment rate are primarily determined by the inflows.

In a very recent study Elsby at al. (2007) draw similar conclusions and reveal an important role of increased inflows into the unemployment. They noted that increased inflows are important in most recessions, especially the most severe ones.

On the contrary, Shimer (2005) using microeconomic data shows that an outflow from unemployment is a key determinant of the unemployment level. He provide evidence that "virtually all of the increase in unemployment and decrease in employment during the 1991 and 2001 recessions was a consequence of a reduction in the job finding probability". Nevertheless, his measures rely on two strong assumptions: workers neither enter nor exit labour force but simply transit between the employment and the unemployment and all workers are ex-ante identical, and, in particular, in any period all unemployed workers have the same job finding probability and all employed workers has the same job exit probability.

Fujita and Ramey (2007) criticised Shimer approach and point out that his analysis is problematic for at least two reasons. Firstly, cyclicality is not evaluated properly and therefore conclusions about procyclical finding probability and acyclical separation probability could be misleading. Secondly,

and more importantly for our purpose, the measured contributions to unemployment variability do not decompose unemployment variability, because the unemployment is fact a non-linear function of the hazard rates.

After applying several corrections Fujita and Ramey (2007) showed that the separation rates makes a substantial contribution to the unemployment variability and also are countercyclical. They exhibit a strong negative correlation with GDP movement and lead the business cycle by one or more quarters. Authors claim that in Shimer (2005) work cyclicality is not related to any business cycle measure, and moreover, proposed variance decomposition method is inappropriate.

The European labour markets are characterised by both greater quantity and price restrictions and therefore job and workers flow are limited (Haltiwanger and Vodopivec 2003). The actual evidence for European countries is rather limited. Albaek and Sorensen (1998) analysed job and workers flows in manufacturing sector in Denmark. They show that the find and separation rates are rather stable over time, with small cyclical fluctuation. The inflows and the outflows constitute roughly the same share of total unemployment.

Blanchard and Portugal (2001) compared US and Portugal labour market flows. They concluded that despite the unemployment rate and proportions of gross flows are very similar, unemployment duration in Portugal is three times longer, and henceforth flows in relation to working population are three times lower.

In a recent study Petrongolo and Pissarides (2008) looked at the contribution of inflows and outflows to the dynamics of unemployment in three large European Union members, i.e. the United Kingdom, France and Spain.

In the UK the separation rate account for 25 to 40 percent of unemployment variability measure based on administrative data. On the other hand, estimates based on LFS data suggest that inflow into employment contribution is about 48 %. The picture is very different for continental Europe. In France the contribution of inflow rate to unemployment volatility varies from 5 % to 45 % depending on chosen period. It is very low during period with stable unemployment level and high during the expansion period.

Labour market in Spain in the 1990's was very similar to one that we observe in Poland in the recent years. The unemployment rate was above 20 % and reached its maximum in 1994, and then it started to fall gradually. The contribution of inflows and outflows to unemployment volatility are nearly equal. However, during the strong rise in the unemployment rate level inflow accounts for just over 60% of total unemployment variability (Petrongolo & Pissarides 2008).

There are few studies concerning the labour market flows in Poland and other Central and Eastern Europe countries. Cazes and Scarpetta (1998) analysed labour market flows at early stage of transition in Poland and Bulgaria basing on official register data. Their results suggest that the short-term unemployed (less than 6 months) often leave the register for a regular or a subsidised job in the formal sector. At the same time, those leaving towards the end of the unemployment benefit entitlement are also likely to move to employment. On the other hand, over 50 % of those who left the register after one year of a continuous spell became inactive.

Góra and Walewski (2002) conducted a study concerning steady state unemployment rate in Poland in 1993-2001. What is interesting for our

purpose, this study also uses the LFS dataset. Authors showed that in the case of the Polish labour market flows between activity and inactivity are of the great importance. They claim that the unemployment level would be 5-10 % higher without exit to inactivity. They also concluded that with the assumption of stable labour force over time[1] the estimate of unemployment rate is well above the observed level.

Report prepared by Bukowski et al. (2005) draws similar conclusions. Additionally, they point out that the main factors behind low level of equilibrium unemployment in the 1990's are low inflows and relatively high outflows from unemployment. The rise in the unemployment level was sudden and sharp in 1999 and 2001/2002. The first rise can be explained by demand shock, the second was a result of supply shock (Bukowski et al. (2005)).

Myck et al. (2007) studies an influence of a change in the employment structure on wages during 1996-2003. They showed that employment fluctuations are among important determinants of the wage dynamics. Also the role of non-random selection into employment is stressed. Not surprisingly, it is more likely for younger and less experienced workers to flow between unemployment and employment.

There is no clear evidence on flow behaviour in Polish labour market. Therefore, our aim is to fill in that gap and investigate this very interesting issue.

[1] We mean by that stable working population and inactivity related flows held at zero level

3 Two State Model

3.1 Theory

The model for transition probabilities follows Shimer (2005). The model itself describes the job finding probability for unemployed workers $\mathcal{P}(F)_t$ and the separation probability $\mathcal{P}(S)_t$. To extract those measures from raw data it is necessary to make strong behavioural assumptions. We follow the original model and for that part of the analysis ignore out of the labour force status, and assume that workers just move from employment to unemployment and vice versa. This simplification is justified since, as noted by Blanchard and Diamond (1990), distinction between unemployed and not in the labour force status is fuzzy, with many workers moving between these two states.

The model is expressed in continuous time. However, the data are available only at discrete dates. For $t \in \{0, 1, 2, \ldots\}$, refer to interval $[t, t+1)$ as period t. The goal is to recover the job finding probability $\mathcal{P}(F)_t \in [0, 1]$ and the separation probability $\mathcal{P}(S)_t \in [0, 1]$ during the period t from commonly available data. It is assumed that all workers are identical and their probability of movement between labour market states is uniformly distributed on time interval t. Therefore, during period t, all unemployed workers find a job according to a Poisson process with arrival rate $f_t \equiv -log(1-\mathcal{P}(F)_t)$ and all employed workers lose their job according to a Poisson process with arrival rate $s_t \equiv -log(1-\mathcal{P}(S)_t)$. Throughout the paper we will follow terminology proposed by Shimer and refer to f_t and s_t as job finding and separation rates and to $\mathcal{P}(F)_t$ and $\mathcal{P}(S)_t$ as the corresponding probabilities.

For a fixed $t \in \{0, 1, 2, \ldots\}$ let $\tau \in [0, 1]$ be a time elapsed since the last

measurement date. Let $e_{t+\tau}$ denote the number of employed workers at time $t+\tau$, $u_{t+\tau}$ denote the number of unemployed workers at time $t+\tau$, and $u_t^s(\tau)$ denote "short term unemployment", those workers who are unemployed at time $t+\tau$ but were employed at some time period $t' \in [t, t+\tau]$. Note that $u_t^s(0) = 0$ for all t. It is convenient to define $u_{t+1}^s = u_t^s(1)$ as the total amount of short term unemployment at the end of period t.

The total unemployment outflow during t, denoted by F_t, is given by the equation (1) in Petrongolo & Pissarides (2008):

$$F_t = (1 - e^{-f_t})u_t + \int_0^1 [1 - e^{-f_t(1-\tau)}]u_t^s(\tau)d\tau \tag{1}$$

where u_t is unemployment level at start of the period, and $u_t^s(\tau)$ is the unemployment inflow between t and $t+\tau$. The first element on right hand side of (1) counts those people that were unemployed at t and are employed at $t+\tau$ and the second element captures people that inflow into unemployment and find a new job within period t.

For $t \in \{0, 1, 2, \ldots\}$ and $\tau \in [0, 1]$, unemployment and short term employment evolve according to the following differential equations:

$$\dot{u}_{t+\tau} = e_{t+\tau}s_t - u_{t+\tau}f_t \tag{2}$$

$$\dot{u}_t^s(\tau) = e_{t+\tau}s_t - u_t^s(\tau)f_t \tag{3}$$

Unemployment level increases when employed workers separate, at an instantaneous rate s_t, and decreases when unemployed workers find jobs, at an instantaneous rate f_t. Short term unemployment increases when employed workers separate and decreases when short term unemployed find jobs.

To solve above equations for job finding probability, eliminate $e_{t+\tau}s_t$ be-

tween these equations, resulting

$$\dot{u}_{t+\tau} = \dot{u}_t^s(\tau) - (u_{t+\tau} - u_t^s(\tau))f_t \tag{4}$$

for $\tau \in [0, 1)$. By construction, $u_t^s(0) = 0$, so given an initial condition for u_t, this differential equation can be solved for u_{t+1} and $u_{t+1}^s \equiv u_t^s(1)$:

$$u_{t+1} = (1 - \mathcal{P}(F)_t)u_t + u_{t+1}^s \tag{5}$$

The number of unemployed workers at time $t + 1$ is equal to the number of unemployed workers at date t who did not find a job (fraction $1 - \mathcal{P}(F)_t = e^{-f_t}$) plus short term unemployed workers u_{t+1}^s, those who are unemployed at date $t + 1$ but were employed at some point during period t. One can express the job finding probability as a function of unemployment and short term unemployment.

$$\mathcal{P}(F)_t = 1 - \frac{u_{u+1} - u_{t+1}^s}{u_t} \tag{6}$$

One can also solve the differential equation (2) forward to obtain an implicit expression for the separation probability

$$u_{t+1} = \frac{1 - e^{-f_t - s_t}}{f_t + s_t} l_t + e^{-f_t - s_t} u_t \tag{7}$$

where $l_t \equiv u_t + e_t$ is a size of the labour force during period t, which is assumed to be constant since the model does not allow for entry and exit from the labour force. Since $l_t \geq u_t$ the right hand side of the expression is non decreasing in s_t. Given the job finding probability from equation (6) and data on employment and unemployment, equation (7) uniquely defines the separation probability $\mathcal{P}(S)_t$.

To understand equation (7), note first that if unemployment is constant during period t, the unemployment rate is determined by the ratio of the

separation rate to the job finding rate $\frac{u_t}{l_t} = \frac{s_t}{s_t+f_t}$, a standard formula. More generally, it helps to compare equation (7) with discrete time model in which there is no possibility of both finding and loosing job within a period. In this case

$$u_{t+1} = \mathcal{P}(S)_t e_t + (1 - \mathcal{P}(F)_t)u_t \tag{8}$$

A fraction $\mathcal{P}(S)_t$ of employed workers lose their job and a fraction $\mathcal{P}(F)_t$ of unemployed workers find a job during period t, determining the unemployment rate at the start of period $t+1$. When the time period is sufficiently short, or equivalently $s_t + f_t$ is sufficiently small, equation (7) converges to this simple expression.

The distinction between equations (6) and (7) is quantitatively important for measuring both the level of separation probability and its cyclicality. When the job finding rate f_t is high, equation (7) captures the fact that a worker who loses her job is more likely to find new one without experiencing a measured spell of unemployment. These separations are missed in equation (6), so the latter formula yields fewer separations and, more importantly as stressed by Shimer (2005), a negative bias in the measured correlation between job finding and separation rate. Starting explicitly from a continuous time environment avoids this time aggregation bias.

3.2 Data

We use micro-level data from the Labour Force Survey. The LFS is representative individual level survey, however the population covered by the survey is observed through the households. The information is collected quarterly with a focus on the labour market activity. Each quarter the survey gathers

information of about 50.000 individuals.

LFS is designed as a rolling panel. The whole sample for each quarter consist four elementary sub samples. In a given quarter there are two sub samples surveyed in the previous quarter, one newly introduced into the survey, and one which has been not surveyed in the previous quarter and was introduced exactly a year before. We exploit this design to calculate the transition probabilities.

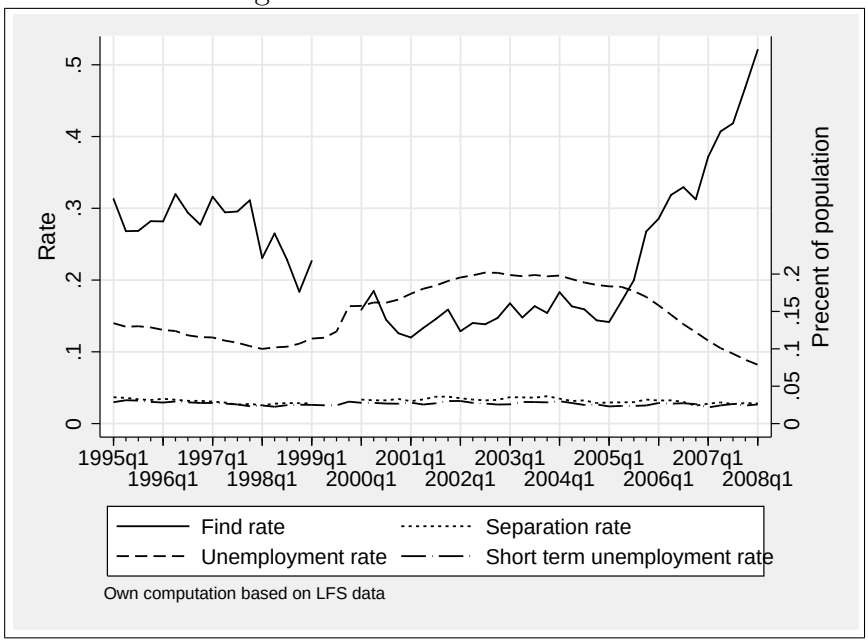
There are some methodological problems with the dataset such as redesigns of the survey. They will be discussed in the section 4.2 since they only affect the flows measured at micro level. Looking from macroeconomic perspective the major concern is the survey discontinuity that occurred during 2nd and 3rd quarter 1999. To remove this gap in the dataset we estimate using available data from neighbouring periods seasonal patterns and then replace missing data with linear predictions.

The measures of the number of employed, unemployed and inactive are directly accessible from the LFS. To capture the short time unemployment level u_t^s we use the question asked to currently unemployed about the last day of employment. We treat as short-time unemployed individuals who are unemployed at the time of the survey and declared that were employed in some point during last three months before week of the survey.

3.3 Results

Figure 2. presents the find rate (solid line) and the separation rate (dotted line). Both series are constructed according to (6) and (7) respectively. Additionally, we plot a series for the unemployment rate (dashed line) and short

Figure 2: Labour market flows



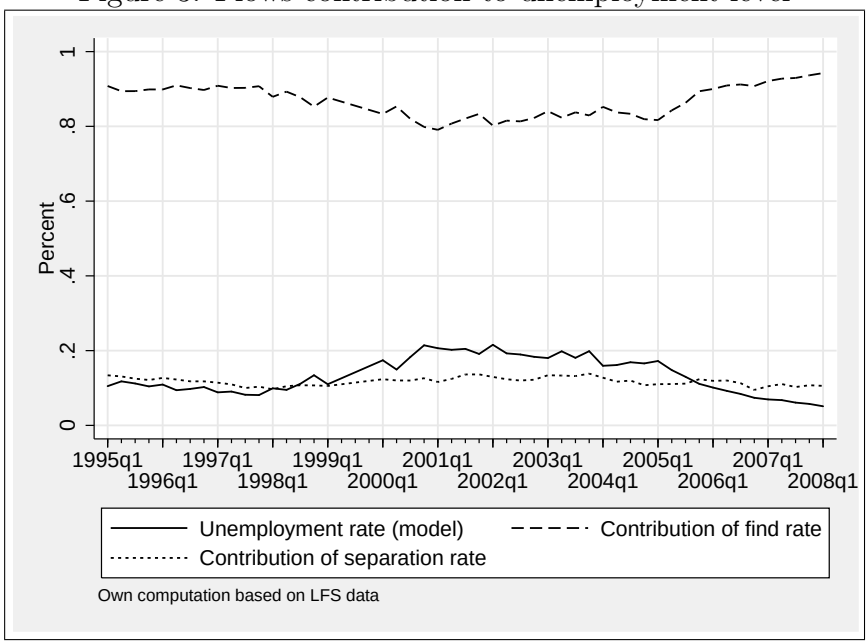
term unemployment rate (dotted and dashed line). The job finding rate is high and very volatile in comparison to the remaining series. The evident pattern is that when the find rate is relatively high and goes over 20 % then the unemployment level is starting to fall. Unfortunately, we do not have the real data from 1999 slowdown period, but it is apparent that at this time find rate was declining.

It is interesting to see that separation rate behaviour is very similar to the short term unemployment level. Basically, those measures are closely related. However, the separation rate is derived from the find rate and the stock of unemployed, while the short-term unemployment rate is computed directly from matched microdata. The difference represents those people that separate and immediately, within one quarter, find new job. They account for 0.005 % of working population only. In other words, time aggregation

bias adjustment suggested by Shimer (2005) is negligible when working on LFS data.

To examine the contribution of find and separation rates to unemployment level at first we utilise Shimer (2005) approach. Following his paper we construct two measures: $\frac{s_t}{s_t+\bar{f}_t}$ for separation rate and $\frac{\bar{s}_t}{\bar{s}_t+f_t}$ for find rate, where $\bar{s}_t$ and $\bar{f}_t$ are the sample averages of the separation and find rate, respectively. They represent hypothetical unemployment rates if there were only fluctuations in one component. As it is presented on Figure 3. the find rate explains on average 85% of the variability of unemployment rate[2], with standard deviation of 0.05. The separation rate explanatory power ranges between 9% and 18%, with 13.5% on average.

Figure 3: Flows contribution to unemployment level



Another way to capture the contribution of each component is to quan-

[2]To compute the find and the separation rates explanatory power we excluded artificially constructed data

tify the variances and the correlations between changes in constructed rates and changes in unemployment rate level. We constructed measures for the entire sample period and four subsamples. The latter are driven by market fluctuation changes and available data. The first period, up to 1999Q1, is characterised by stable level of unemployment around 13 %. During the analysis we omit the artificially reconstructed data. The next period consists information from 1999Q4-2001Q4, a time when the unemployment rate rose to 17.5 %. The following period (2002Q1-2004Q1) is characterised by high and persistent unemployment level. The unemployment passed 20 % mark at this time. The last period begins with the entrance to the European Union (2004Q2) and is characterised by declining unemployment rate. The actual figure in 2008Q1 is 9.5 %. The results are reported in Table 1. The second, third and fourth column consists variances of the unemployment rate, the find rate and the separation rate respectively. In the fifth column the correlations between the unemployment rate and the separation rate are reported. Two last columns consists contribution of the separation and the find rate. In each row values for different time span are reported. The first row represents results for whole sample.

The variance of the unemployment rate was at relatively low level at the starting quarters of the analysis. Then it sharply rose in 1999 and slowly decreased up to the first quarter 2004. Since 2nd quarter 2004 the overall volatility moves up considerably. An obvious explanation of that phenomenon can be given. Joining the European Union have opened common market to Polish producers and result with an increase in economic activity. At this time Polish economy recover from the stagnation, thus the GDP

Table 1: Contributions from separation rate to unemployment volatility

Period	var(u_t)	var(f_t)	var(s_t)	corr(u_t, s_t)	s_t	f_t
1995Q1-2008Q1	.0025627	.0018024	.0001220	0.63	0.14	0.85
1995Q1-1999Q1	.0001811	.0002252	.0001259	0.32	0.27	0.83
1999Q4-2001Q4	.0004531	.0004214	.0000555	0.28	0.10	0.85
2002Q1-2004Q1	.0002439	.0002391	.0000384	0.17	0.07	0.85
2004Q2-2008Q1	.0021347	.0019584	.0000569	0.42	0.07	0.99

Own calculations based on LFS data.

growth boosted. The variance of the find rate is much greater than the variance of the separation rate.

The striking observation is that the correlation between the separation rate and the actual unemployment level is considerably higher in the first period. This can be explained by restructurisation caused by privatisation and therefore increased inflows to unemployment (Góra, Walewski 2004). Conducted analysis shows clearly that the main determinant of the unemployment rate movements are fluctuations in the find rate. They account for over 80 % of total variance.

Another way to look at the problem of variance decomposition is to use a correction proposed Fujita and Ramey (2007). Despite this method is more accurate, it also provides a steady-state linear approximation only. The results are presented in Table 2. The overall results are very similar to the previous analysis. The explanatory power of decomposition for the full sample is 81%. The contribution of the separation rate not exceed 10 %, except for the period whit the highest unemployment level. The contribution of

Table 2: Contributions from separation rate to unemployment volatility

Period	s_t	f_t
1995Q1-2008Q1	0.074	0.889
1995Q1-1999Q1	0.031	0.918
1999Q4-2001Q4	0.078	0.851
2002Q1-2004Q1	0.163	0.851
2004Q2-2008Q1	0.059	1.054

Own calculations based on LFS data.

the find rate is about 90 %. This suggests that the labour market became more flexible. The sum of contribution is a measure of labour market volatility. Thus increased flows implies increased volatility. The more volatile the market the more flexible, i.e. time spend in unemployment at work search is shorter. Since European Union enlargement estimate of the contribution exceeds 100 %. This means that the flexibility increased further. Together with decreasing unemployment level and increased employment this lead to the conclusion that previously inactive people started to enter the market. We will exploit this phenomenon in the next section.

In general contribution values are closer to those calculated for the United States or the United Kingdom than continental Europe countries. Like in the original Shimers' paper, we showed that outflows from unemployment are the primary determinant of the unemployment level. It seems that labour market is just more flexible than the European Union average.

In order to deeply investigate the problem we decompose change of unemployment rate in a way proposed by Petrongolo and Pissarides (2008). Their decomposition uses the fact that when there are not many people that

separate and find new job within one period, one can replace the differential equation (2) with the following difference equation

$$\Delta u_t = (1 - u_t)u_{t-1}\frac{\Delta s_t}{s_{t-1}} - u_t(1 - u_{t-1})\frac{\Delta f_t}{f_{t-1}} \tag{9}$$

The first term on the right hand side of equation (9) reflects the contribution to the change in unemployment rate of the separation rate, while the second informs about the contribution of the inflows. However, one must bear in mind that while the labour market is not stable changes in labour force participation can outnumber flows into and out of unemployment.

To obtain instantaneous flow rates it is assumed that the inflows and the outflows from unemployment are uniformly distributed. Consequently, one could replace (2) with

$$F_t = (1 - e^{-f_t})u_t + \Big(1 - \frac{1 - e^{-f_t}}{f_t}\Big)S_t \tag{10}$$

where S_t is the total number of separations during period t. Similar expression could be derived for the separation rate.

The relation between continuous and discrete-time transitions rates is given by equation 4 and 5 in Petrongolo and Pissarides (2008):

$$\hat{f}_t = \frac{f_t}{f_t + s_t}\big[1 - \exp(f_t + s_t)\big] \tag{11}$$

$$\hat{s}_t = \frac{s_t}{f_t + s_t}\big[1 - \exp(f_t + s_t)\big] \tag{12}$$

where $\hat{f}_t$ is a proportion of job finders between $t - 1$ and t to the number of unemployed in period $t - 1$ and $\hat{s}_t$ is the number of separating individuals divided by the unemployment level. Both figures are recovered from raw microdata.

The major advantage of this approach is that flow into and out of inactivity are included in the analysis. Under investigations are not only flows

Table 3: Contributions from separation rate to unemployment volatility

Period	s_t	f_t
1995Q1-2008Q1	0.595	0.405
1995Q1-1999Q1	0.329	0.671
1999Q4-2001Q4	0.407	0.593
2002Q1-2004Q1	0.950	0.050
2004Q2-2008Q1	0.693	0.307

Own calculations based on LFS data.

between employment and unemployment. Since a vast number of inflows into unemployment originates from non-participation one could expect that the decomposition will differ from previous result.

Table 3 consists the results of decomposition. As it is expected in all periods the obtained estimates of contribution differ from previous ones. More emphasis is put on the role of the separation rate. Notwithstanding, these results are closely related to three-state model, that is discussed in the next section.

The contribution of the separation rate varies between a third and 2/3 of total unemployment rate volatility after controlling for inactivity flows. During the period of high unemployment (2002Q1-2004Q1) the contribution is even higher and the separation rate is responsible for almost whole unemployment rate changes. Despite that this results differ from previous, they are closely related to Petrongolo & Pissarides (2008) findings for the UK and Spain and shows that the overall shape of the separation rate curve is not able to explain observed changes in unemployment level.

We showed in that section that the variability in the unemployment rate

is nearly one to one explained by fluctuations in the find rate. The inflows to unemployment are more important during changes in the labour market structure while the outflows form unemployment dominates when the situation is stable. However, the picture changes when we explicitly control the state of inactivity. Also the literature provides similar evidence (see, for example Elsby et al. 2007). We discuss all flows in the next section.

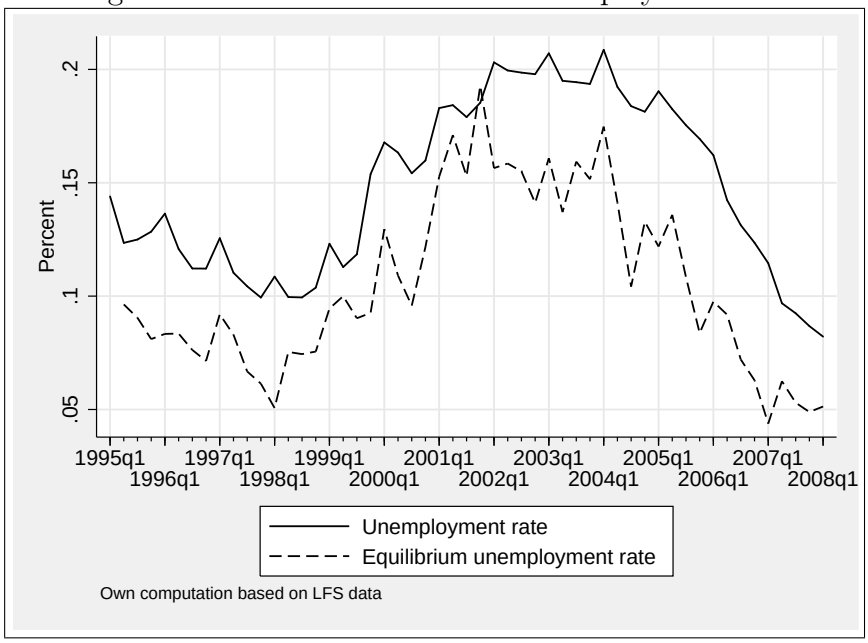
3.4 Cyclicality

A very important question is how the find and separation rates behave during the business cycle. There is no widely held consensus in the literature about the cyclical behaviour of labour market flows. We investigate this issue using recently proposed approach by Elsby et al (2007). Their approach extends Shimer's decomposition based on the hypothetical steady-state unemployment rate. Shimer's counterfactual unemployment rates are sensitive to arbitrary decision of choosing the constant value of find and separation rates.

Flow based unemployment level can be considered as a level of steady-state unemployment. On the figure 4. the actual unemployment rate derived from the number of employed and unemployed is compared with an estimate of the equilibrium unemployment. The latter corresponds with a hypothetical situation, what should be unemployment level if the find rate and separation rate would be held at the last period values.

The obtained estimates of the steady state level are in line with previous studies (Góra and Walewski (2002), Bukowski et al. 2005). The steady state level is primarily influenced by the inflow stream into the unemployment as

Figure 4: Stock and Flow based unemployment rate



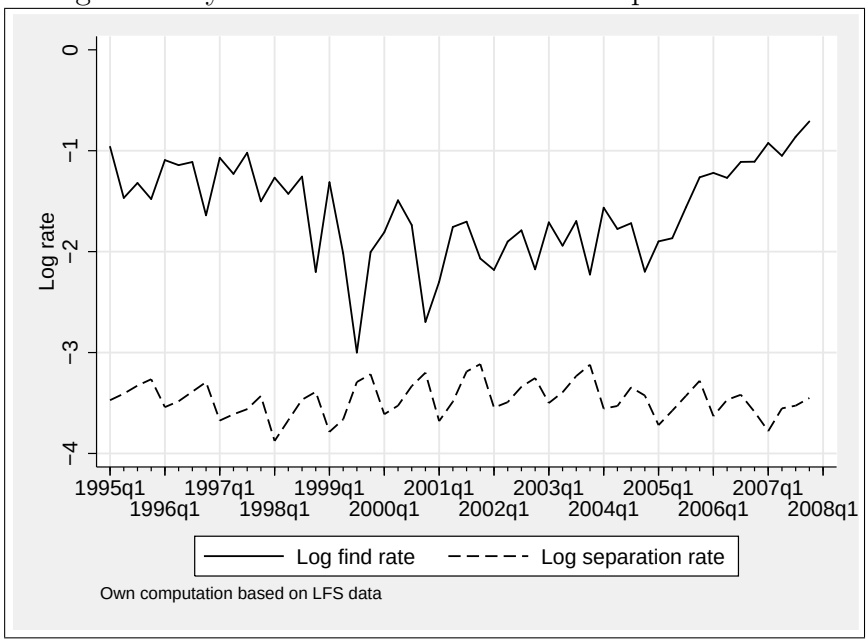
inflows outnumber outflows. On the other hand, at some quarters when the unemployment rate was about over 20% level, outflow rate exceed inflow rate.

It is interesting to observe that the steady-state movement precedes the changes in the unemployment level by one quarter. The relation between actual and steady state unemployment is not stable over time. Two underlying series seems to converge to each other.

Analysis of Elsby et al. departs from the steady-state equilibrium. The actual unemployment rate in the steady state is approximated by relation of the separation rate to the sum of find and separation rates. By taking logs and differentiating one can express log of change in unemployment rate as the sum of log change in find and separation rates.

Figure 5. presents results of decomposition conducted according to above mentioned method. The graphs represent the change in the log of inflow rate

Figure 5: Cyclical behaviour of find and separation rates



into unemployment and log of outflow rate from the unemployment for each quarter.

The picture reveals two important patterns. Firstly, the find rate is evidently lower when unemployment rate is high, and is higher at the time of relatively low unemployment. Also, the variation of inflow into unemployment is higher during the slowdown. Hence, it seems to be that the find rate is procyclical. Secondly, the separation rate beside its seasonal pattern is stable over time and has no link to business cycle of the economy.

To deeply investigate this issue we correlate the find and separation rate with the most important macroeconomic measure, i.e. GDP growth rate. The reason is quite obvious. GDP is the best indicator of the general condition of the economy. Results indicate that the find rate is pro-cyclical (correlation 0.4) and the separation rate is slightly counter-cyclical (corre-

lation -0.24). These results are very similar to the previous findings in the literature. During the expansions entrepreneurs create more jobs and as a consequence more vacancies are available to the unemployed. Hence, more people are prone to find a job. Similarly, when the economy slows down, firms stop recruitment process, hence find rate declines.

Two-state model gave us general picture of the labour market behaviour and potential explanations. The inflows from employment to unemployment exhibit little variation and are likely to be stable over the time. The separation rate itself is very closely related to the short term unemployment level. However, the picture derived from different approaches to unemployment variance decomposition is a bit blurry. From the former one can see the link is between level of unemployment and the find rate. The evidence from the approach proposed by Fujita and Ramey confirms that results. The contribution of the separation rate does not vary greatly between periods. It reaches a maximum value during the slowdown, and has a low values during the expansion.

The highest estimates of contributions to unemployment from the separation rate are obtained via approach proposed by Petrongolo and Pissarides (2008). This is in line with the expectations, as the inactivity related flows are considered. The obtained result differs from previous ones, in the sense that the largest contributions of the separation rates are observed in the period with difficult labour market situation. Surprisingly, it wil be apparent from the next section results, that this result is closer to ones obtained from three-state model.

One should notice that inflows and outflows derived by Petrongolo and

Pisarides method are completely different from those obtained by Shimer method. The primarily source of difference is a diverse treatment of inactivity related flows. The second source of existing difference may arise from not the same information explored during calculations. Shimer's method relies on stock data, while Petrongolo and Pissarides computations combines stocks and flows information. This may be an explanation of completely different results of decomposition, and may confirm major inconsistencies between micro and macro data regarding observed flows, and general information about sizes of stocks.

The information about stocks, i.e. the number of employed, unemployed and inactive people is directly obtained from the survey. However, to compute the flows, the cross-sectional files from neighbouring quarters are used. On average, only 48% of observations is used. In addition, the LFS is subject to the increasing problem of missing data (Myck et al. 2007). In addition, the sample is representative to working population on yearly, not quarterly basis. This causes serious inconsistencies between the micro flow data and the macro stock information.

4 Three State Model

4.1 Theory

In this section the model is extended to explicitly account for the state of inactivity, Let λ_t^{XY} denote the Poisson arrival rate of a shock that moves a worker from state $X \in \{E, U, I\}$ to different state $Y \in \{E, U, I\}$ such that $Y \neq X$ during period t. Let $\Lambda_t^{XY} = 1 - e^{-\lambda_t^{XY}}$ is associated full-period

transition probability. As with job finding and separation rates the original model accounts for time aggregation bias by modelling a continuous time in which data are available only at discrete dates.

It is not possible to measure the transition probabilities directly since workers may move through multiple stages within a period. Instead, gross flows are used, measuring the number of workers who were in state X at the date t and are in state Y at date $t+1$. Let $N_t^{XY}(\tau)$ denote the number of the workers who were in state $X \in \{E, U, I\}$ at date t and are in state $Y \in \{E, U, I\}$ at date $t+\tau$. Also define $n_t^{XY}(\tau) = \frac{N_t^{XY}(\tau)}{\sum_Z N_t^{XZ}(\tau)}$, the associated share of workers who were in state X at t and move to Y until $t+\tau$. Note that $N_t^{XY}(0) = n_t^{XY}(0) = 0$ for all $X \neq Y$. It is useful to think of a worker's state as including both her employment status at the last measurement date X and her current status Y, say XY. Then, for all $X \neq Y$, $n_t^{XY}(\tau)$ evolves according to a differential equation

$$\dot{n}_t^{XY}(\tau) = \sum_Z n_t^{XZ}(\tau)\lambda_t^{ZY} - n_t^{XY}(\tau)\sum_Z \lambda_t^{YZ} \tag{13}$$

The share of workers who are in state XY increases when a worker in some other state XZ moves to XY and decreases when a worker in state XY moves to XZ. All these transition rates λ depend only on a worker's current employment status, that is Y or Z and not on her start-of-period employment status X.

Given initial conditions and the restrictions that the shares at time t sum to 1, the differential equation system (13) can be solved for the six fractions $n_t^{XY}(1)$ as a functions of transition rates λ_t^{XY}. As it is shown by Shimer (2005) the resulting equations cannot be solved analytically for the λ's. Nevertheless, given data on gross flows of workers from the state X to

state Y in period t, $N_t^{XY}(1)$, it is possible to compute the shares $n_t^{XY}(1)$ and then invert these equation numerically to recover the instantaneous transition rates λ_t^{XY} and hence the transition probabilities Λ_t^{XY}.

4.2 Data

The most important issue for estimation of three-state model is quantification of gross flows. To measure the flows N_t^{XY} we follow other authors in the field. We rely on merged microdata and calculate the flow streams. As the LFS is designed as a rotating panel, this makes it feasible to observe nearly half of the sample in two consecutive quarters. We use these data to construct the flows.

However, we have to mention some problems related to the LFS methodology. Up to first quarter of 1999 the data were gathered in the middle week of a quarter. From 1999Q4 the survey method has been replaced by continuous observation. During each week reports from 1/13 of the whole sample are collected. This methodological change has a considerable influence on the size of the variance of analysed series.

When one looks at the mean values and the variances of various flows, he can easily notice that while the average values of flows remain almost unchanged, the volatility increased by 20% to 80%. As there is not rational economic explanation to that phenomenon, it has to be data driven. This fact makes analysis burdensome.

In addition, the survey was stopped in 2nd and 3rd quarter of 1999, and therefore we have to choose between two disturbances of the data. We could either exclude this period from the analysis or make effort to reconstruct

Table 4: Flow variances

Flow	95Q1-99Q1 mean	99Q4-08Q1 mean	95Q1-99Q1 std dev	99Q4-08Q1 std dev	Relative std dev
(1)	(2)	(3)	(4)	(5)	(4)/(5)
flowEE	.279	.313	.0063563	.0209223	3.2915847
flowUU	.028	.054	.0033775	.0130690	3.8694301
flowII	.205	.266	.0073161	.0135939	1.8580801
flowEU	.004	.004	.0008458	.0012475	1.4749350
flowEI	.005	.004	.0012616	.0010317	0.8177711
flowUE	.006	.006	.0016793	.0012680	0.7550765
flowUI	.004	.004	.0005793	.0010659	1.8399793
flowIE	.005	.003	.0017223	.0010199	0.5921733
flowIU	.004	.004	.0009932	.0013048	1.3137334

Own calculations based on LFS data.

those missing values. We decided to replace missing values. Firstly using observations from 1995Q1-1999Q1 we estimated seasonal patterns of each separate flow. Then we interpolate data from 1997 to 2002 and replace missing values with a seasonal interpolation.

Another important sample redesign took place in 2006. Since then the LFS covers whole population not only 15+, however the size of the survey sample remains unchanged. Therefore, our estimates for the latter period are characterised by lager variance.

Each quarter about 50.000 individuals are surveyed. We match the files from different quarters and obtain nearly 25.000 quarter-to-quarter matched

pairs in 1995Q1-1999Q1. Since 1999Q4, after redesign, the number of successfully matched pairs dropped to about 22.000. Since 2005 the number of matches oscillates between 20.000 and 22.000. The larger number of matched pairs are found in winter months. Basing on that matches we calculated weighed transition rates.

To quantify the importance of changes in six transition rates for fluctuations in the unemployment rate, it is again useful to do some steady state calculations. In the steady state, the flows in and out of employment are equal, as the flows in and out of unemployment:

$$(\lambda_t^{EU} + \lambda_t^{EI})e_t = \lambda_t^{UE}u_t + \lambda_t^{IE}i_t$$
$$(\lambda_t^{UE} + \lambda_t^{UI})u_t = \lambda_t^{EU}e_t + \lambda_t^{IU}i_t$$

where e_t, u_t, and i_t are the number of employed, unemployed and inactive individuals. After rearranging above equations is easy to obtain:

$$\begin{aligned} e_t &= k_t(\lambda_t^{UI} + \lambda_t^{IE} + \lambda_t^{IU} + \lambda_t^{UE} + \lambda_t^{IE} + \lambda_t^{UE}) \\ u_t &= k_t(\lambda_t^{EI} + \lambda_t^{IU} + \lambda_t^{IE} + \lambda_t^{EU} + \lambda_t^{IU} + \lambda_t^{EU}) \\ i_t &= k_t(\lambda_t^{EU} + \lambda_t^{UI} + \lambda_t^{UE} + \lambda_t^{EI} + \lambda_t^{UI} + \lambda_t^{EI}) \end{aligned} \tag{14}$$

where k_t is a period specific constant that $e_t + u_t + i_t$ is equal to the relevant population in period t.

4.3 Results

We begin with graphical analysis. First we look at seasonally adjusted series implied by an estimate of the steady-state equilibrium (Figure 6 & 7). The difference between implied and real flows is an effect of a convergence

Figure 6: Employment related flows

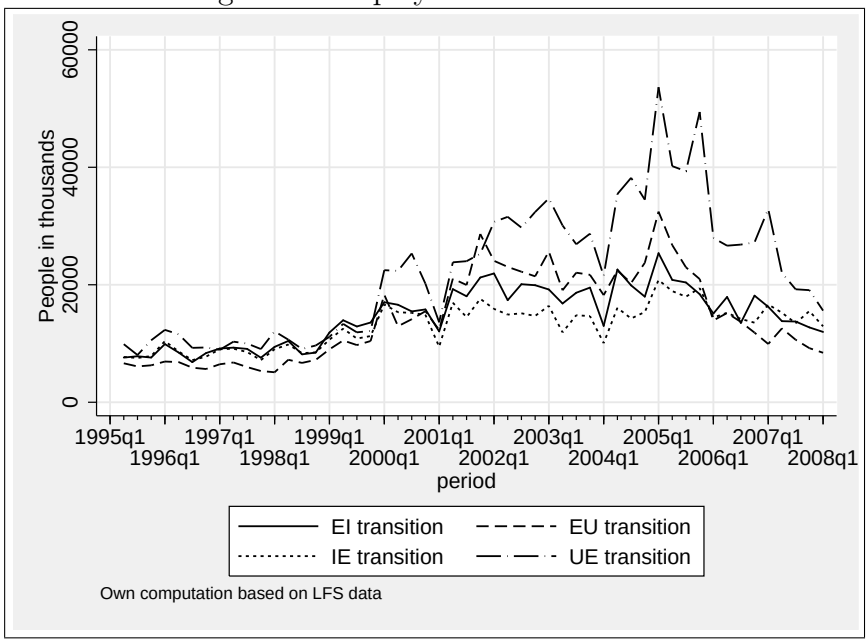
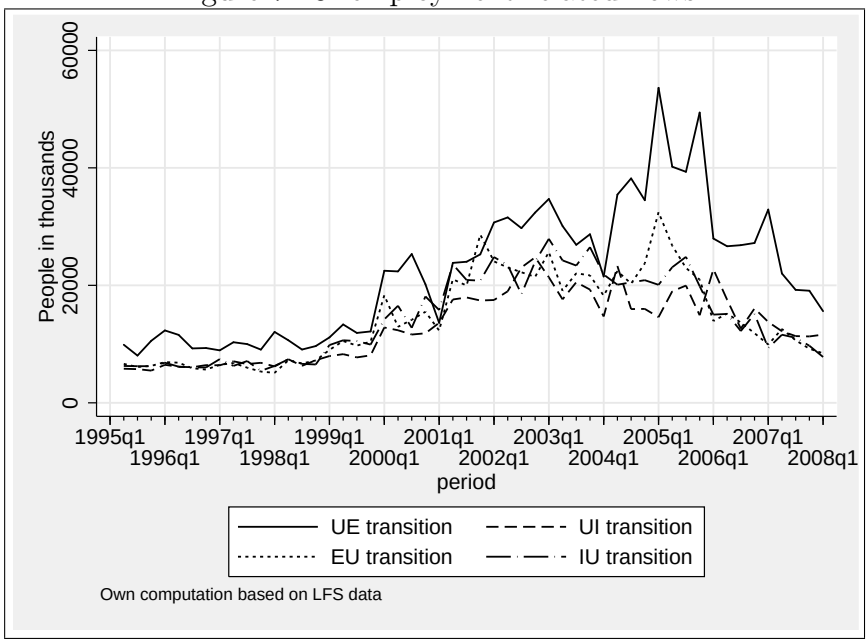


Figure 7: Unemployment related flows



to the steady state. Looking from both employment and unemployment perspective, it seems that the quantitatively most important flow towards steady

state adjustment is the one from unemployment to employment. In addition, unemployment related flows behave very similarly to one another up to 3rd quarter of 1999 and then, up to 2007, the UE transition clearly dominates the picture. During all analysed period the balance of flows between employment and inactivity is very close to zero, with the clear exception for 2001-2005 period where the balance is positive, i.e. more people exit from employment to inactivity than directly move in the opposite direction. This suggest, that at the time of high unemployment level inactive people were discouraged from labour market participation. Moreover, from the unemployment perspective picture is very similar. The series follow similar pattern to 1999, since then evidently the UE transition rate dominates. Around beginning of 2005 spike in the UE transition level is observed. It is caused by accelerated economic expansion by European Union accession. At this time firms started to create more jobs and employ more workers[3]. This situation lead to increased number of mismatches between the labour supply and labour demand at individual level and hence causes an increase in workers turnover.

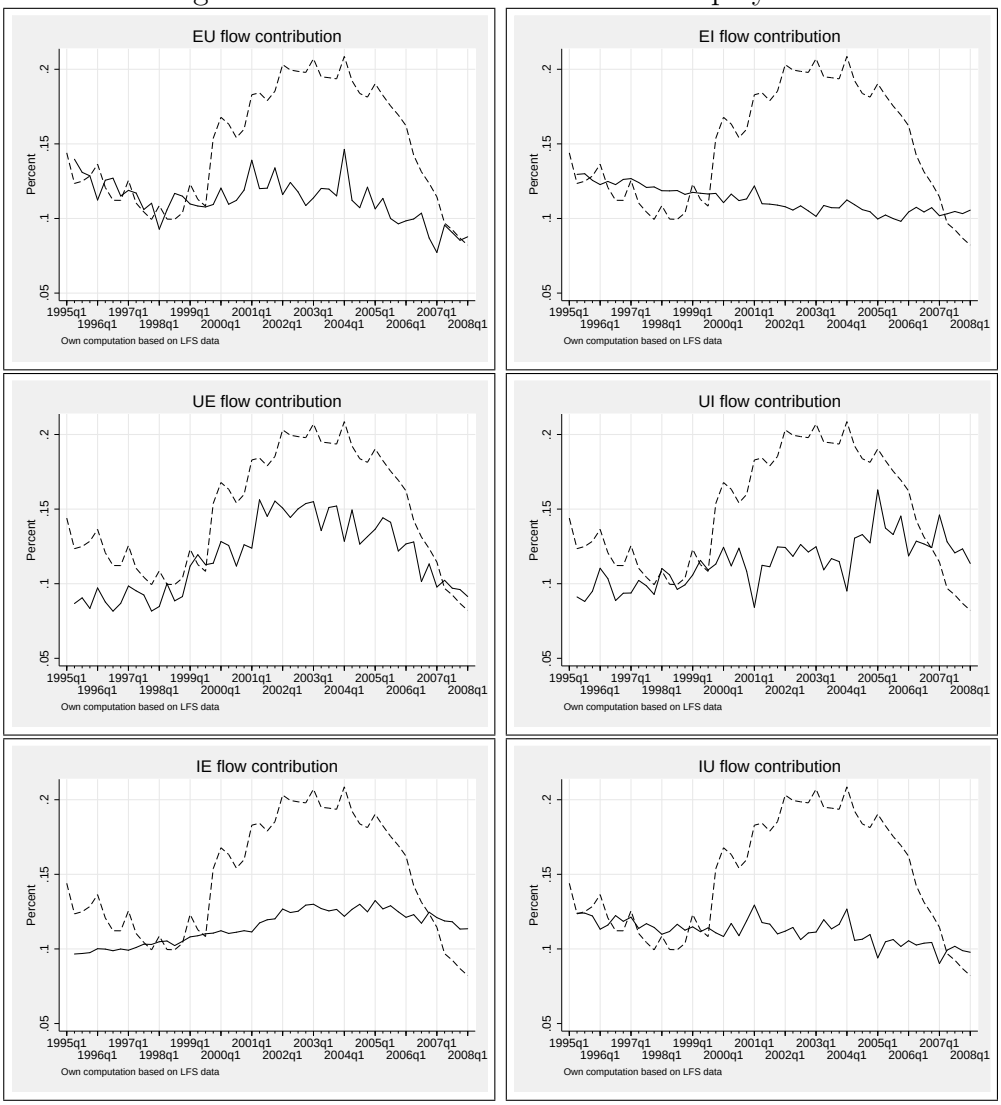
Furthermore, we use decomposition given by (14) and by holding all but one transition rate on their average value we measure the contribution of each separate component to the fluctuation in the unemployment rate[4]. Dashed line on each panel of Figure 8 presents the unemployment level derived from the number of unemployed, employed and inactive in each quarter. Solid lines show the hypothetical level of unemployment, the level that would be observed if all but the analysed flow would be held at their average val-

[3]See the spikes in all employment related transition rates in 2004/2005.

[4]We removed seasonal patterns from flow series with TRAMO/SEATS seasonal adjustment.

ues. The graphs can be interpreted as "contributions" of each flow to the unemployment rate.

Figure 8: Flow "contributions" to unemployment



From purely graphical analysis it seems that the most important source of changes in unemployment rate is UE component. Movement in unemployment-employment transition rate fairly good reproduce the behaviour of the unemployment rate. The UE transition is especially of great importance at the

time of relatively rapid changes, its role during more stable periods is limited. The potential link could also be observed on graphs representing EU and UI flows, however the overall fit of these series is evidently lower. The role of EU flow is straightforward. An increase of this particular flow increases the unemployment. The UI flow represents "withdrawal rate", i.e. an intensity at which workers resign from active participation in the labour market.

Above mentioned results suggest that the main determinant of inflows to employment is a job availability. This implies that a major role in the rise and persistence of unemployment was played by the decrease in the number of new jobs.

We also decompose the total changes in the unemployment rate using the approach of Shimer (2005). He shows, that using regression analysis one can derive the decomposition on the basis of a correlation of each transition rate λ^{XY} with the unemployment rate[5]. The numbers presented in Table 5 represent the contribution of each of six transition rates to the unemployment rate. They confirm the results of graphical analysis. During all analysed periods the most important are fluctuations in the unemployment-employment flow rate. They explain over a half of the unemployment rate variability. The all but one remaining series account for similar share. The odd series are IU and EI transition rate, which both have very low contribution to unemployment volatility.

When we analyse selected periods of stabilisation, growth of unemployment, stabilisation on higher level and decline the general picture changes. During the periods with stable unemployment the most prominent role is

[5]We simply regress seasonally adjusted transition rates on the seasonally adjusted unemployment rate

Table 5: Flow contributions

Flow	95Q1-08Q1	95Q1-99Q1	99Q4-01Q4	02Q1-04Q1	04Q2-08Q1
λ^{EU}	0.15	0.46	0.62	0.97	0.23
λ^{EI}	-0.10	0.21	-0.07	0.01	-0.01
λ^{UE}	0.56	0.15	1.07	-0.47	0.44
λ^{UI}	0.15	0.01	-0.27	-0.33	0.16
λ^{IE}	0.20	-0.15	0.22	-0.06	0.12
λ^{IU}	0.02	0.18	0.21	0.26	0.06

Own calculations based on LFS data.

played by transition form unemployment to employment. The high contribution of this transition rate up to 1999 may be linked with restructurisation of Polish economy and termination of long term employment contracts. The transition process speeds up at the beginning of the slowdown in 1999. During the period of the changes in the unemployment level unemployment-employment transition is the most important. At the time of rise of unemployment, decreased outflow to employment increased the unemployment, and at the time of economic expansion outflows outnumbers the inflows. Hence, also important is reduced EU transition. In addition, during the changes the role of inactivity related flows is increased.

Analogously to two state model, decomposition method proposed by Petrongolo and Pissarides (2008) can be extended to account for state of the inactivity. In order to perform such decomposition one should replace in equation (9) a separation rate with the sum of flow to unemployment from employment and from inactivity, and similarly replace find rate with the sum unemployment-employment and inactivity-employment moves. After the re-

Table 6: Flow contributions to unemployment

Flow	95Q1-08Q1	95Q1-99Q1	99Q4-01Q4	02Q1-04Q1	04Q2-08Q1
λ^{EU}	0.344	0.093	0.232	0.911	0.191
λ^{UE}	-0.460	-0.611	-0.679	-0.063	-0.452
λ^{UI}	-0.022	-0.154	-0.007	0.131	-0.007
λ^{IU}	0.170	0.136	0.094	0.160	0.367

Own calculations based on LFS data.

placement, one should obtain following decomposition:

$$\Delta u_t = (1-u_t)u_{t-1}\frac{\Delta s_{U,t}}{s_{U,t-1}+s_{I,t-1}} + (1-u_t)u_{t-1}\frac{\Delta s_{I,t}}{s_{U,t-1}+s_{I,t-1}}$$
$$-u_t(1-u_{t-1})\frac{\Delta f_{E,t}}{f_{E,t-1}+f_{I,t-1}} - u_t(1-u_{t-1})\frac{\Delta f_{I,t}}{f_{E,t-1}+f_{I,t-1}} \qquad (15)$$

where the first term on the right hand side of (15) represents the contribution of inflow from employment to unemployment to the change in the unemployment level. The second element "can loosely be interpreted as the contribution of inactivity transition to unemployment" (Petrongolo and Pissarides (2008)). The two remaining components are related to outflow to employment and inactivity, respectively.

The quantitative results of decomposition presented in Table 6[6]. cannot be directly compared with the previous ones due to the different treatment of direct flows between employment and inactivity. In the former analysis they are included explicitly, while in the latter they have an influence on all contributions.

[6]The sings inform about the direction of correlation between a particular flow and changes in the unemployment rate.

In all but one, the 2002Q1-2004Q1 period, the sum of the contributions is very close to one[7].

In general, outflows from unemployment are negatively related to the unemployment level, with the exception of 2002Q1-2004Q1 period. The counter intuitive relationship can be explained by difficult labour market situation. At that period hardly any find a job, the overall flows were low, and, in addition, a large cohort of young persons passed the age at which they appear in the labour statistics.

The results from table 6. confirms previous findings. Due to the different method, they can be treated as sensitivity analysis. When the whole period is considered, inflows and outflows constitute about the same share of the contribution to the unemployment rate movement. However, if the analysis is conducted in each sub-period separately the different picture arises. Firstly, it is worth noticing that the share of inactivity related flows is quite high. With an exception of 1999Q4-2001Q4 period, they contribute 30% or even more in the last period.

In the first two sub-periods the most important are outflows from unemployment to employment. They move down the steady-state unemployment level in the first period. In the second period contribution of inflows to unemployment from employment rises considerably and at the same time there are lower inactivity oriented transition rates.

In the third period quantitatively most important are inflows into unemployment. In addition, all but the UE transition seems to positively influence

[7]To calculate the sum one has to take into account the absolute values. The sum is exactly one when the working population is stable during the analysed period. At this particular time large inflow of young person into the labour marked occurred.

the equilibrium unemployment.

During the last analysed period the signs of contributions are in accord with the expectations and the economic theory. The outflows decrease the steady state unemployment while the inflows increase. The most important determinant of decrease in steady state unemployment are increased outflow to employment and decreased in flow from inactivity to unemployment.

The characteristic feature of Polish labour market are large contributions from inactivity related flows. In other European countries they are usually at the lower level. For example, in the UK and Spain their contribution not exceed 25 % in any single period while in Poland is well over 35% during 2004Q2-2008Q1, and nearly 20 % in the whole sample.

Summing up, the graphical and quantitative analysis provides closely related results. The most important determinant of unemployment are outflows to employment and at the same time the main determinant of steady-state unemployment are inactivity related flows.

4.4 Cyclicality

In analogy to the two-state model we analyse various flows among the labour market states in the context of the cyclical behaviour of the economy.

Table 7. present correlations between GDP growth rate and size of each flow separately. Only transitions to employment are positively correlated with the GDP growth. However, these correlations are very weak and not exceed one standard deviation of ΔGDP series. All remaining transition rates are negatively correlated with the growth of GDP. The counter-cyclicality of employment-unemployment transition is consistent with Blanchard and Di-

Table 7: Flows and GDP

Flow	ΔGDP
Employment - Inactivity	-0.08
Employment - Unemployment	-0.43
Inactivity - Employment	0.01
Inactivity - Unemployment	-0.31
Unemployment - Employment	0.03
Unemployment - Inactivity	-0.10

Own calculations based on LFS data.

amond (1990) model and Fujita and Ramey findings. The result is also in opposition to the Shimer's results of acyclical separation rate. Moreover, transitions from employment to inactivity seems to be acyclical in both directions. Also outflows from employment are found to be acyclical. The quantitatively most important is transition from employment to unemployment. Also the correlation of the transition from inactivity to unemployment is moderately strong.

5 Summary and conclusions

In this study we analysed the changes in the unemployment rate level in Poland. In the framework of labour flow model and with use of quarterly data on flows we showed that the main driving force behind the unemployment rate is the behaviour of outflow to employment. To quantify the impact of particular transition rates we have used extensions to the basic model proposed by Fujita & Ramey (2007) and Petrongolo & Pissarides (2008). The results from models that ignore inactivity indicate that about 85% - 90% of the changes in unemployment rate may be attributed to the job finding rate, while the separation rate is stable over time. Furthermore, the overall results indicate that flows are determined by the demand for labour.

When we consider three-state model, again quantitatively most important is flow from unemployment to employment. The movements in the UE transition rates fairly good reproduce the fluctuations in the unemployment rate. Moreover, the inactivity oriented flows constituted for a large share of total flows. They seem to be an idiosyncratic characteristic of Polish labour market.

The overall result shows that the estimated find and separation rate values are higher than in other continental Europe countries. This implies that the labour market in Poland is characterised by greater flexibility and, therefore, is more close to the UK or US labour market.

Aside from main research question, we investigated the issue of cyclical behaviour various flows. It turns out that transitions to employment are positively related to the changes in GDP and follow procyclical patterns, however, the estimated correlation values are very small. The important

result is that the impact of UE flow is lower when the unemployment level is relatively stable and rises as the labour market conditions are changing. During the expansions more people are able to find a new jobs and move into employment. On the other hand, we found that the EU transition rate is rather countercyclical. The countercyclicality of this particular rate is consistent with Blanchard and Diamond (1990) theoretical model and Fujita and Ramey (2007) evidence for U.S. economy.

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A Transition probabilities

Table 8: Transition probabilities

	EU	EI	UE	UI	IE	IU
all	1,31%	1,45%	12,23%	7,59%	1,68%	1,67%
1995	1,72%	2,12%	17,58%	10,14%	3,06%	2,35%
1996	1,47%	1,93%	17,28%	10,32%	2,60%	2,01%
1997	1,33%	1,89%	16,38%	11,55%	2,47%	1,94%
1998	1,22%	1,67%	16,54%	10,85%	2,23%	1,70%
1999	1,24%	1,62%	11,92%	7,97%	1,80%	1,71%
2000	1,37%	1,46%	10,74%	5,79%	1,74%	1,70%
2001	1,64%	1,46%	8,25%	6,91%	1,45%	2,10%
2002	1,40%	1,23%	7,74%	5,20%	1,05%	1,57%
2003	1,41%	1,19%	7,89%	5,15%	1,01%	1,83%
2004	1,51%	1,27%	9,37%	5,25%	1,09%	1,72%
2005	1,15%	0,94%	9,17%	3,45%	0,98%	1,16%
2006	1,01%	1,18%	11,63%	7,25%	1,26%	1,25%
2007	0,81%	1,07%	14,85%	7,94%	1,41%	0,99%
2008	0,87%	1,18%	16,02%	13,84%	1,72%	1,09%

Own calculations based on LFS data. The numbers represent yearly average of quarterly transition probabilities. There are two exception for that rule. For year 1995 the average is based on three values and for the year 2008 one observation is used, i.e. transition 2007Q4-2008Q1. For quarters with missing data in 1999 seasonal interpolation of neighbouring data was done.