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Matching and Labour Market Efficiency across Space and through EU accession: Evidence from Latvia, Estonia and Slovenia

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Matching and labour market efficiency across space and through EU accession: evidence from Latvia, Estonia and Slovenia *

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Abstract

During the transition to market economy and the accession to the EU Central and Eastern European countries have witnessed remarkable changes in the structure and functioning of national economies. The aim of this paper is to analyze the dynamics of aggregate and regional labour markets through the last decade in several new EU member states (Latvia, Estonia and Slovenia).

The estimation of aggregate matching functions on monthly panel (1999-2006) data allows performing the diagnostics of labour market efficiency in terms of worker-firm matching. We exploit regional and country differences, the dynamics and changes over time (we compare pre to post EU enlargement periods) and measure the importance of spatial spill over effects in matching. The potential misspecification of the matching function is addressed by allowing for stock-flow specification and for spatial interactions between regions in terms of worker and job flows.

The results reveal that in transition - EU accession context the hiring process is labour demand driven and displays the existence of stock-flow patterns and spatial spillovers. In Latvia due to job shortage and limited labour demand, hires mainly occur between the stock of unemployed and the inflow of new vacancies, while in Slovenia the inflow of new unemployed also plays an important role in match creation. The aggregate efficiency of the labour market in terms of worker-firm matching increases over time in Latvia and seems to decrease in Estonia and Slovenia. The role of labour demand in creating new hires stands crucial in three countries, but the results also feature the development of a new trend: after the accession to the EU the role of labour demand in the matching process becomes weaker, but the role of labour supply is increasing. The efficiency of matching varies across districts and regions and can partially be explained by the population density in the area or by its geographical location (its proximity to the national borders). Spatial spill over effects in matching are confirmed to be statistically significant: unemployed do not limit their search to the region of residence and search in neighboring areas. The asymmetry of spill over effects is weak in Latvia, while in Slovenia the magnitude of the effects depends on economic context in neighboring regions or also on local population density.

Keywords: stock-flow matching, spatially augmented matching function, transition countries, new EU member states. **JEL Classification :** C13, J61, J64, E24.

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1 Introduction

During the phases of economic transformation - the transition from centrally planned to market economy and the accession to the European Union - all countries of Central and Eastern Europe, as well as the Baltic states, have witnessed remarkable changes in the structure and functioning of national economies[1].

First, the recession in the beginning of the 90's and parallel restructuring seriously limited the employment capacity of productive sectors, created high inflows into unemployment and inactivity and, in addition, induced an important mismatch (skill, geographical) between labour supply and labour demand.

Further, CEEB transition countries reached a substantial progress in reforms, stabilized their economies and and displayed rapid economic growth. While aggregate unemployment declined to reasonable levels, the development of regional markets followed heterogenous paths, leading to strong disparities in terms of economic development, working and living conditions and access to employment.

Finally, the accession to the EU in 2004 and 2007 have contributed to sustain the economic growth and to improve social conditions. At the same time it also facilitated labour mobility within the EU. Very high migratory flow of workers from new to old EU member states, along persisting skill and qualification mismatch in the labour markets of these former, raise a full set of new concerns related to a forthcoming shortage of adequate labour in the region.

The aim of this paper is to analyze the dynamics of aggregate and regional labour markets through the last decade in several new EU member states. The analysis is performed using the matching function approach, which since the 80's has become one of predominant stands in macroeconomics and labor economics. The matching function, which formally relates available job seekers to vacant jobs in the labour market and produces new hires as output, allows to account for the presence of frictions in the labour market. Frictions typically arise from the existence in the labour market of some inadequacy (in terms of information, geographical location, or qualifications) between buyers (employers) and sellers (job seekers). In transition countries, where the structure of the economy and the skills required to match with labour demand have significantly changed through last 15 years, frictions are indeed important. The relevance of the matching function approach for labour market analysis and policy evaluation in Central and Eastern European countries has been supported by numerous studies employing this methodology in transition context: Burda [1993], Boeri and Burda [1996], Profit [1997], Burda and Profit [1996], Munich et al. [1999], Galuscak and Munich [2005] for Czech and Slovak Republics, Puhani [1999] for Poland, Dmitrijeva and Hazans [2007] for Latvia.

[1]We alternate the expressions - transition countries, accession countries or new EU member states - when refereing to Central and Eastern European countries (including the Baltic states), which have undergone the process of economic transition in the 90's and have recently joint the European Union.

The existing empirical literature, however, seldom goes beyond the basic matching function specification, despite the fact that the expanding literature has recently proposed a number of extensions, allowing for a large variety of externalities, market imperfections and particular forms of the matching process[2]. A likely reason why these wealth of theoretical tools have been under-utilized in the transition context is that data of relevant quality have not been available to scholars. Thus, the simple matching function, traditionally used for studies on transition economies, assumes the random matching between the stocks of unemployed and vacant jobs. Meanwhile this standard matching function may be misspecified: some recent developments by Coles and Smith [1998], Gregg and Petrongolo [2005] and Coles and Petrongolo [2003] reveal the importance of flow variables (inflows of new unemployed and jobs) in determining outflows from unemployment. They show on U.K. data that the matching is realized between stocks and flows, due to the existence of non-random patterns in the matching process. The evidence from transition countries usually features very high vacancy turnover rates and significant correlations between hires and new vacancies, hence giving rise to the question on the true nature of the matching process. Can it be described by the standard stock-stock matching function (used in the previous studies on transitional labour markets), or should a more detailed specification be called for? To answer this question and to avoid the misspecification while performing the analysis of the aggregate efficiency of the labour market, we will employ both stock-stock and stock-flow specifications of the matching function.

Another misspecification of the matching process may come from the assumption that regional labour markets, which in recent literature ar often considered as heterogenous, are isolated. Meanwhile the evidence from European labour markets (see Burda and Profit [1996], Burgess and Profit [2001], Ahtonen [2005]) shows that the interactions between regions in terms of worker and job flows may be important. We address this issue by allowing for spatial spillover effects in the process of worker-firm matching.

We estimate the matching functions using the data from Latvian and Slovenian regions, as well as aggregated Estonian data. The estimation results allow performing the diagnostics of labour market efficiency in terms of worker-firm matching, exploiting regional and country differences, the dynamics and changes over time (we compare pre to post EU enlargement periods), measuring the importance of spatial spillovers in matching and also examining the sensibility of aggregate matching performance to the changes in labor supply and labor demand.

The reminder of the paper is organized as follows. Section 2 presents the standard matching function, gives more intuition on different types of matching (stock-flow matching) and describes how spatial interactions between regions can be integrated in the analysis of labour market efficiency (spatially augmented matching function). Section 3 describes data and variables used in the analysis. Section 4 discusses the estimation procedure, section 5 displays the results. Section 6 concludes and provides policy suggestions.

[2]See Petrongolo and Pissarides [2001] for a detailed survey.

2 The matching function

2.1 Standard matching function

In a labour market with search frictions (originating from information imperfections, underdevelopment of insurance markets, low labour mobility, high individual heterogeneity, high qualification mismatch and other similar factors), both unemployed and firms are involved in a costly and time consuming process of searching and finding the appropriate match. This complex process can be summarized by a well-behaved *matching function*, which acts like a production function for new hires and relates the outflows from unemployment to employment (matches) $M_{i,t}$ in locality i (region, district, municipality)[3] at period t (week, month, quarter, year) to the numbers of unemployed job seekers $U_{i,t}$ and available job vacancies $V_{i,t}$ in the same location[4] and time.

When employing the simplest version of the matching function *(i)* one treats the pool of unemployed and vacancies as homogenous, *(ii)* assumes that the beginning of month *stocks* of unemployed and vacancies determine the outflows to employment, *(iii)* considers regional markets as separated and *(iv)* supposes that firms and unemployed meet at random. Denoting $A_{i,t}$ a scale parameter, that captures different mismatch possibilities, the simple matching function can be formalized as follows:

$$M_{i,t} = A_{i,t} m(U_{i,t}, V_{i,t}), \quad \text{where } m_U > 0, m_V > 0 \tag{1}$$

We specify the matching function by a Cobb-Douglas form[5].

$$M_{i,t} = A_{i,t} \left(U_{i,t}\right)^{\alpha_U} \left(V_{i,t}\right)^{\alpha_V} \tag{2}$$

After a logarithmic transformation of both sides, one obtains the regression equation, where the mismatch parameter can be transformed in order to capture the efficiency of matching over time (by including time fixed effects λ_t) [6] and across regions (by including region fixed effects μ_i), to include the effects of k various macroeconomic factors and to allow for random variations in hiring:

$$\ln A_{i,t} = \alpha_0 + \mu_i + \lambda_t + \alpha_{Z^1} Z^1_{i,t} + ... + \alpha_{Z^k} Z^k_{i,t} + \varepsilon_{i,t}.$$

The resulting regression equation is the following:

$$\ln M_{i,t} = \alpha_0 + \alpha_U \ln U_{i,t} + \alpha_V \ln V_{i,t} + \alpha_{Z^1} Z^1_{i,t} + ... + \alpha_{Z^k} Z^k_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \tag{3}$$

[3] We alternate these notions further in the text when designing a geographically distinct areas within a country. Such word manipulation should not introduce any source of confusion since in this paper we only use one level of regional disaggregation for each country.

[4] We introduce the presence of spatial inter-regional effects in section 2.3.

[5] Despite the absence of convincing micro-foundations for such functional form, it is widely used by empirical research and has become "standard" specification in the estimation of the matching function (see Petrongolo and Pissarides [2001]).

[6] The details of how the time periods are controlled can be found in section 4, where the specifications of estimated models are developed. Generally we include seasonal (quarterly) dummies and annual trend.

It can be rewritten in a more compact way as:

$$\ln M_{i,t} = \alpha_0 + X_{i,t}\alpha_X + Z_{i,t}\alpha_Z + \mu_i + \lambda_t + \varepsilon_{i,t} \tag{4}$$

Hence the vector $X_{i,t}$ contains main explanatory variables of the matching function $X_{i,t} = [\ \ln U_{i,t} \quad \ln V_{i,t}]$ and $\alpha_X = [\ \alpha_U \quad \alpha_V]'$ contains the corresponding coefficients to estimate. Similarly, the k-dimensional vector $Z_{i,t}$ contains the variables used to define the macroeconomic context $Z_{i,t} = [\ Z^1_{i,t} \quad ... \quad Z^k_{i,t}]$ and $\alpha_Z = [\ \alpha_{Z^1} \quad ... \quad \alpha_{Z^1}]'$ contains the corresponding coefficients.

The parameters α_U and α_V can be interpreted as elasticities of matches (outflows from unemployment to employment) with respect to the size of unemployment and vacancy pools. Thus one percent increase in the number of unemployed, available for matching in the beginning of the period would increase the number of matches (new hires) realized during this period by α_U percent. Using the definition of the elasticity, $\alpha_U = (\partial M/M)/(\partial U/U)$, it is possible - by multiplying the elasticity by (M/U) - to define the marginal effect $(\partial M/\partial U)$, that indicates the number of additional matches produced if the stock of unemployed increases by one unity. The interpretation is symmetrical with regard to the elasticity α_V.

The estimated elasticities can also give a measure of the extent of externalities existing in the matching process. In fact, α_U measures the positive externality from searching workers to firms and α_V - the positive externality caused by firms on job seekers. By contrast, $(\alpha_U - 1)$ measures the negative externality (congestion) caused by the unemployed on other unemployed persons and $(\alpha_V - 1)$ the congestion caused by searching firms on other firms. Higher elasticities imply thus less congestion and more positive externalities (see Petrongolo and Pissarides [2001])[7].

The empirical analysis of the matching function is quite similar to the one of the production function and thus, wherever $(\alpha_U + \alpha_V)$ exceeds, is less than, or equals unity implies, respectively, increasing, decreasing or constant returns to scale. When the returns to scale are constant, a proportional increase in inputs (unemployed and vacancy number) augments the output (new hires) in the same proportion. But when the returns to scale are decreasing, for example, output grows slower than input.

The diagnostics of the return to scale in the matching function is one of the central questions in the empirical analysis of worker-firm matching. On one hand, the homogeneity (constancy of the returns to scale) ensures the existence of a unique equilibrium in a model of equilibrium unemployment with endogenous search effort (see Petrongolo and Pissarides [2001]), while increasing returns to scale make room for multiple equilibria. On the other hand, the magnitude

[7] To see this point consider the average probability for the unemployed to find a job during a reference time period (transition probability or hazard rate). This probability is given by $h_U = M/U$. Similarly the average probability of a vacancy to be filled in a reference period is $h_V = M/V$. Using the Cobb-Douglas form of the matching function it comes that $h_U = AU^{(\alpha_U - 1)}V^{\alpha_V}$ and $h_V = AU^{\alpha_U}V^{(\alpha_V - 1)}$. Therefore, wherever enlarging the pool of unemployed will rise the average job-finding probability is defined by the sigh of $\partial h_U/\partial U$ and thus depends on $(\alpha_U - 1)$. The effect of enlarged unemployment pool on average vacancy transition rate $\partial h_V/\partial U$ depends on α_U.

of the returns to scale allows to draw conclusions on the aggregate efficiency of the matching process.

The empirically estimated matching functions often display constant or slightly decreasing returns to scale in developed countries. For example Burda and Wyplosz [1994] report decreasing returns to scale for France, Germany, Spain and U.K., while Pissarides [1986] and Layard et al. [1991] find constant returns for U.K. The results are more diverse for transition countries and new EU member states. Instable and rapidly changing macroeconomic context has certainly made its contribution - the results vary across countries, but also across time: Burda [1993] finds decreasing returns to scale in Czech Republic and Slovakia in time period from 1990 to 1992, while Munich et al. [1999] show that for the period from 1979 to 1984 the returns to scale in matching are rather increasing in this region.

2.2 Particular forms of the matching process: stock-flow matching

While the standard matching function, described above, is extensively used for labour market diagnostics in various contexts, Coles and Smith [1998], followed by Gregg and Petrongolo [2005] and Coles and Petrongolo [2003], suggest that a traditionally employed simple matching function, which treats matching process as random and determines the outflow from unemployment by beginning of period stocks of unemployed and vacancies, may be misspecified. Observing a very high vacancy turnover rate in European labour markets (new vacancies are filled rapidly, within a reference period, and do not appear in end - period stocks), the authors state and show on U.K. data that not only stocks but also inflows of new vacancies and unemployed during the reference period intensively participate in the matching process. Coles and Smith [1998], when estimating a log-linear matching function, find that only the *inflow of new vacancies*, but not the *stock of vacancies*, increases the job-finding rates for long-term unemployed. Gregg and Petrongolo [2005] by estimating quasi-structural outflow equations for unemployed and vacancies and allowing for higher exit rates of flows also provide an empirical support to stock-flow matching.

Along with empirical evidence Coles and Smith [1998] also develop a theoretical model which explains why trade in the labour market may result in matching between stocks and flows. Basic intuition underlying this theoretical model is provided below, while a more detailed exposition can be found in the original article by Coles and Smith [1998] and in a matching function survey by Petrongolo and Pissarides [2001].

The key idea behind stock-flow matching relies on non-random patterns in unemployed search. To understand why such patterns in search behavior will result in stock-flow matching one should consider the unemployed who enters the unemployment pool. It is assumed that upon his arrival at the marketplace the job seeker does not contact employers at random (in contrast with traditional setting), but scans the bulk of advertisements (journals, newspapers, TV,

employment agencies and etc.) before deciding where to apply. There are no frictions due to information imperfections, so unemployed can locate at no cost all appropriate jobs and apply to them. Moreover, Coles and Smith [1998] make a clear distinction between contact and stages in the hiring process. They assume that the heterogeneity between jobs and unemployed implies a positive probability that unemployed will not fit the requests of the employer. Thus there are two possible outcomes for the unemployed that has contacted several employers: (a) he may match with one of them or (b) he may remain unmatched. Let us consider the implications of these outcomes:

(a) if the job seeker have been accepted by the employer, he will be hired and thus outflow to employment. At the aggregate level, this job seeker is accounted in unemployed *flow* (as we have assumed that he has just entered the unemployment pool), while the job he has obtained has been accounted in *vacancy stocks* (as he has consulted only available job proposals, *i.e.* already existing at the market, at the moment of his arrival). Thus if the match is realized, it is a match between the *vacancy in stock* and the *job seeker in flow*.

(b) if the unemployed remains unmatched it means that his match (the job he will fit and that would suit him) does not exist in the market (recall that if job seeker has not been matched this is because he did not fit to *any* of selected employers, while applications have been sent to *all* jobs that have been considered as appropriate). Thus it is reasonable to suppose that the job seeker will wait for the inflow of new job proposals and try to locate his "match" among them, ignoring the old vacancies. In this case when the new vacancies will appear on the market, at the beginning of the next period, the unemployed will be accounted in *stocks* of unemployed and if he would find the appropriate job during this period, the match will be realized between *unemployed in stock* and *vacancy in flow*.

Thus, when old vacancies would match with new unemployed or new vacancies would match with old unemployed, at the aggregate level, we will observe stock-flow rather than stock-stock matching.

If the economic agents adopt a selective search strategy the matching process is no longer random. Gregg and Petrongolo [2005] and Coles and Petrongolo [2003] state that a correctly specified matching function should include both beginning of month stocks of unemployed and vacancies and their inflows during the month.

The stock-flow specification of the matching function has recently been employed by Dmitrijeva and Hazans [2007] on Latvian data and by Galuscak and Munich [2005] on the data from Czech Republic. These studies show that in the context of a transition economy the misspecification from omitting flow variables in the matching function can be important and suggest a stock-flow matching function to be the only relevant specification for describing a hiring process in these economies. However a stock flow pattern in the matching may not result here from the differentiation between old *versus* new vacancies by the unemployed, but from the dominant

role of labour demand. In transition economies labour demand is often low and the number of job vacancies is smaller than the number of unemployed: the vacancies are thus filled very rapidly. For example in Latvia, the size of the vacancy stock in the beginning of the month is systematically smaller than the size of vacancy inflow during the month (see tables 6, 7). This suggests that most of vacancies are filled within one month and thus do not appear in next month's stock. Therefore the outflows from unemployment mainly result from the matches realized between inflowing vacancies and previous period's unmatched unemployed (unemployed stock).

With regard to the estimation of the stock-flow version of the matching function, it is suitable to retain a basic specification originally proposed by Coles and Smith [1998]. We use, as previously, a Cobb-Douglas form:

$$M_{i,t} = A_{i,t} \left(U^S_{i,t}\right)^{\alpha_{SU}} \left(U^F_{i,t}\right)^{\alpha_{FU}} (V^S_{i,t})^{\alpha_{SV}} (V^F_{i,t})^{\alpha_{FV}}$$

Technically, we simply augment the traditional specification with variables describing inflows of new unemployed and new opened job vacancies and estimate the following log-linear relationship:

$$\begin{array}{c} \ln M_{i,t} = \alpha_0 + \alpha_{SU} \ln U^S_{i,t} + \alpha_{SV} \ln V^S_{i,t} + \alpha_{FU} \ln U^F_{i,t} + \alpha_{FV} \ln V^F_{i,t} + \\ + \alpha_{Z^1} Z^1_{i,t} + ... + \alpha_{Z^k} Z^k_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \end{array} \tag{5}$$

where α_{SU} and α_{SV} are elasticities with respect to the size of the stocks U^S and V^S, while α_{FU} and α_{FV} measure the elasticities of outflows with respect to flow variables U^F and V^F. The function exposes constant returns to scale if $(\alpha_{SU} + \alpha_{SV} + \alpha_{FU} + \alpha_{FV})$ equals unity.

The equation 5 can still be written as previously in a following compact form:

$$\ln M_{i,t} = \alpha_0 + X_{i,t}\alpha_X + Z_{i,t}\alpha_Z + \mu_i + \lambda_t + \varepsilon_{i,t} \tag{6}$$

The vector $X_{i,t}$ still englobe the main explanatory variables or the matching function, but their number has now doubled (we include not only stocks but also inflows of unemployed and vacancies): $X_{i,t} = [\ \ln U^S_{i,t} \quad \ln U^F_{i,t} \quad \ln V^S_{i,t} \quad \ln V^F_{i,t}]$. The dimension of the vector α_X has also increased - it now contains four parameters to estimate $\alpha = [\ \alpha_{SU} \quad \alpha_{SV} \quad \alpha_{FU} \quad \alpha_{FV}]'$. With this exception , all other components are equivalent to those in equation 4.

Equations 3 and 5, corresponding to stock-stock and stock-flow versions of the equation 6 - the empirical matching function - will be estimated on administrative data from several new EU member states (Latvia, Estonia, Slovenia) and for several time periods. The estimation results will allow performing the diagnostics of the labour market functioning and monitoring its efficiency in terms of firm-unemployed matching across different time periods and regions. We will address the particularities in the matching process in former transition countries and discuss the stability of this process through EU accession. We will also assess the sensibility of outflows from unemployment to the changes in labour supply and labour demand. The results are displayed in section 5.

2.3 Spatially augmented matching function: regional spillovers

As previously discussed, an aggregate economy can rarely be considered as a single market or a collection of homogenous micro-markets. When the process of job matching is not homogenous across space, a common practice in empirical literature is to consider the aggregate labour market as a collection of spatially distinct and heterogenous labour markets that can suffer from many frictions. A panel or cross section of regions, municipalities, statistical or administrative units is therefore often used in order to estimate the aggregate matching function [8].

Moreover, it is possible that the heterogenous micro-markets do not develop separately but interact with each other. Economic conditions affecting one region may affect the neighboring regions as well. Unemployed, that are searching for work are not likely to restrict their search to one labour office district; they extend their search to other districts as well. As both commuting and migration are possible outcomes of the job search process of workers, spatial externalities are involved in the matching process. Including a spatial dimension in the econometric analysis of matching function is therefore a necessary step in the assessment of the process of worker-firm matching.

While job search across spatially distinct labour markets is brought in by a job search models of migration (Hughes and McCormick [1994]), the individual decision to stay or leave the home region is, however, completely ignored in the standard matching or flow approach to labour market analysis (see Petrongolo and Pissarides [2001]). Burda and Profit [1996] have pioneered in addressing this issue by developing a model of non-sequential search over space and providing the empirical evidence of the relevance of spatial interaction in job search for the Czech economy. Burgess and Profit [2001] provide the evidence for existence of spatial externalities in job matching across travel-to-work areas in the United Kingdom, while Petrongolo and Wasmer [1999] found weak cross-regional spillovers for Britain and France. Recently, Lopez-Tamayo et al. [2000] established the evidence for the relevance of the spatial dimension in matching workers to vacant jobs for Spanish regions, while Fahr and Sunde [2006a] and Fahr and Sunde [2006b] investigated spatial interactions in the matching process for West German planning regions in the time period from 1980 to 1997.

When a standard matching model is extended in order to allow for spatial spillovers, it can be referred to as a *spatially augmented matching function*. The key assumption is that regional job matching does not only depend on local stocks (and inflows in a stock-flow setting) of unemployed workers and job openings. Unemployed workers from neighboring or other spatially distinct labour markets will compete with local job searchers for vacant posts. Naturally, also local job seekers can apply for job vacancies in neighboring areas. The spatially augmented matching function can be written:

$$\ln M_{i,t} = \alpha_0 + X_{i,t}\alpha_X + X^*_{i,t}\alpha^*_X + Z_{i,t}\alpha_Z + \mu_i + \lambda_t + \varepsilon_{i,t} \tag{7}$$

[8] See section 4 for more details.

As previously, the vector $X_{i,t}$ collects the main explanatory variables or the matching function (stocks and flows of unemployed and vacancies), while the vector $X^*_{i,t}$ consists of *foreign* versions of those variables and measures the spatial spillovers. Thus if

$$X_{i,t} = [\ \ln U^S_{i,t} \quad \ln U^F_{i,t} \quad \ln V^S_{i,t} \quad \ln V^F_{i,t}]$$

then

$$X^*_{i,t} = [\ \ln U^{*S}_{i,t} \quad \ln U^{*F}_{i,t} \quad \ln V^{*S}_{i,t} \quad \ln V^{*F}_{i,t}]\ .$$

External variables in $X^*_{i,t}$ are defined here as weighted averages of the corresponding variable $X_{i,t}$ observed over neighboring regions. Thus W being the spatial weights matrix, $X^*_{i,t} = W \otimes X_{i,t}$ or equivalently:

$$U^{*S}_{i,t} = \sum_{j=1}^{N} w_{i,j} U^S_{j,t} \text{ and } U^{*F}_{i,t} = \sum_{j=1}^{N} w_{i,j} U^F_{j,t}$$
$$V^{*S}_{i,t} = \sum_{j=1}^{N} w_{i,j} V^S_{j,t} \text{ and } V^{*F}_{i,t} = \sum_{j=1}^{N} w_{i,j} V^F_{j,t}$$

We use a simple specification for weights $w_{i,j} = J_i^{-1}$ if regions i and j are neighboring and 0 otherwise. For each region i, J_i is the number of contentent regions (we chose to attribute the same weight to all neighbor). Two regions are considered neighboring if they share a common border or if one of them is surrounded by the other, as it may be the case when the administrative data distinguishes the cities and their surrounding areas. Furthermore, we do not consider a region to be neighbor to itself.

2.3.1 The magnitude of spatial spillovers

The magnitude of the effects of external variables may differ across regions. The asymmetry in spatial spillovers may be related to the differences between local and foreign unemployment rates. In fact, the job seekers tend to widen their search radius and search more intensively in neighboring areas if local unemployment is high comparing to the surrounding areas. Following Burgess and Profit [2001], the asymmetry in spatial spillovers can be accounted for by using the unemployment rate ratio index (URR), which is constructed as the ratio of local unemployment rate in the region (as denominator) and a weighted average of the unemployment rates in neighboring regions (as numerator). For a given region i, a high value of URR indicates that the region i is surrounded by municipalities where the unemployment is much higher than local, while a low value of URR witnesses the opposite : the region i is surrounded by a low unemployment area. The regions are then sorted according to URR and two dummy variables are created: HR (high unemployment rate around) takes the value of 1 for the regions in the top of the distribution (usually 10-15 %, we take 4 regions in Latvia and 2 regions in Slovenia) and LR (low unemployment rate around) picks out the regions from the bottom of the distribution (4 Latvian and 2 Slovenian regions). When the basic spillover variables are multiplied by these dummies and included into the model; we get:

$$\ln M_{i,t} = \alpha_0 + X_{i,t}\alpha_X + X^*_{i,t}\alpha^*_X + X^{*HR}_{i,t}\alpha^{*HR}_X + X^{*LR}_{i,t}\alpha^{*LR}_X + Z_{i,t}\alpha_Z + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (8)$$

Basic spillover is now decomposed in spillovers from high relative unemployment areas ($X_{i,t}^{*HR}$), low relative unemployment areas ($X_{i,t}^{*LR}$) and spillovers from the areas with similar unemployment context ($X_{i,t}^{*}$).

The magnitude of spillovers can also be related to the population density in the region itself. In order to analyze such an asymmetry the basic spillover can be separated into the spillovers to dense regions and spillovers to the rest of the regions. In this order a dummy variable POP is constructed: it takes value one if the population density in the region i is higher than the average in the country and 0 otherwise. The spillover variables are multiplied by this indicator and included into the model. The estimated matching function takes then the following form:

$$\ln M_{i,t} = \alpha_0 + X_{i,t}\alpha_X + X_{i,t}^{*}\alpha_X^{*} + X_{i,t}^{*POP}\alpha_X^{*POP} + Z_{i,t}\alpha_Z + \mu_i + \lambda_t + \varepsilon_{i,t} \tag{9}$$

The equations 7 - 9 can be rewritten in a more compact way as:

$$\ln M_{i,t} = \alpha_0 + X_{i,t}\alpha_X + X_{i,t}^{*}\alpha_X^{*} + X_{i,t}^{*ASYM}\alpha_X^{*ASYM} + Z_{i,t}\alpha_Z + \mu_i + \lambda_t + \varepsilon_{i,t} \tag{10}$$

where vector $X_{i,t}^{*}$ includes the basic spillover for the variables contained in the vector of main explanatory variables $X_{i,t}$ and the vector $X_{i,t}^{*ASYM}$ collects the variables expressing possible asymmetry of spillovers: $X_{i,t}^{*ASYM}$ may be empty if the magnitude of the effects is supposed invariant, $X_{i,t}^{*ASYM} = [\ X_{i,t}^{*HR} \quad X_{i,t}^{*LR}\ ]$ if the effects are supposed to vary with the unemployment context in neighboring areas, or $X_{i,t}^{*ASYM} = [X_{i,t}^{*POP}]$ if these rather depend on the local population density.

The equation 10 in different specifications (those are given in section 4) is estimated on administrative data from two new EU member states (Latvia, Slovenia). The results are displayed and discussed in section 5.

3 Data and Variables

Data used in this paper originates from databases of State Employment Services of three new EU member countries (State Employment Agency of Latvia (SEAL), Employment Service of Slovenia (ESS) and Estonian Labour Market Board (ELMB)[9]), Central Statistical Bureau of Latvia and EUROSTAT. Latvian data covers 33 Latvian administrative regions[10] from January 1999 to July 2006 on monthly basis. Slovenian data covers 12 regions corresponding to regional location of ESS offices[11] for a period from January 2000 to December 2006 on a monthly basis.

[9]We would like to thank Grieta Tentere and Ilze Berzina from SEA, Viljem Spruk from ESS and Aimi Kalvist from ELMB for cooperation in provision of necessary data.

[10]NUTS 4 level division

[11]In Slovenia regional division of ESS offices does not correspond exactly to the geographical separation in statistical regions. However, it corresponds roughly to NUTS 3 level division.

Estonian data is geographically aggregated (it is only available for the whole country) and covers on a monthly basis a period from January 2003 to December 2006[12].

The following variables are used in the analysis:
(i) the **stock of unemployed** U^S which is given as the number of registered unemployed at the beginning of the month; *(ii)* the **flow of unemployed** U^F which refers to the number of individuals entering the registered unemployment pool during the current month (new unemployed); *(iii)* V^S the **vacancy stocks** at the beginning of the month; *(iv)* the **vacancy flows** V^F given as the number of new job offers that have been registered by National Public Employment Service (SEAL,ELMB, ESS) during the month; *(v)* **outflows** or matches M measured by the number of registered unemployed exiting to employment during a month; *(vi)* an **additional labour demand indicator** Z which describes regional[13] macroeconomic and labour market context. It corresponds to the monthly growth in secondary employment - number of individuals having not only principal but also secondary job[14]. *(vi)* **other regional indicators** including data on population density in regions, local unemployment rates and spatial properties of the observation units.

More detailed description of variables, data coverage and sources is given in table 8 in the appendix. The descriptive statistics on regional panel data and also on aggregate data is summarized in tables 7 and 6. The maps indicating the geographical location of Latvian and Slovenian regions are displayed by figures 4 and 5 in appendix. Let us now clarify some points concerning definitions and patterns of certain variables as well as relations between them.

3.1 Main components of the matching function: unemployed, vacancies and outflows to jobs

Unemployment data covers only registered job seekers (there is no information on non-registered job seekers available on monthly basis). This may be thought as a serious limitation of our analysis since empirical evidence from transition economies (see Boeri [2001], Boeri and Terrell [2002], Hazans [2005]) reports high level of job-to-job transitions and points out that employment pool in such countries is in large part sourced by the flows of non-registered job-seekers and those out-of labour force.

This limitation, however, is unlikely to bias our results for several reasons. First, our dependent variable (outflows from unemployment to employment) only concerns outflows from the pool of registered unemployed. Second, in Latvia and Estonia, vacancy data cover job announcements

[12]Time coverage for the data on secondary employment is shorter: until June 2006 for Latvia and October 2006 for Estonia and Slovenia.

[13]Or national, when regional data are not available.

[14]It is reasonable to suppose that macroeconomic context is more favorable, labour demand is higher and access to employment to easier in the localities where high proportion of population is employed at secondary job.

placed through Public Employment Service (SEAL in Latvia and ELMB in Estonia) and thus in the first place available to registered unemployed. For Slovenia the situation is slightly different: here all the employers are enforced by law to register all free jobs at the Employment Service of Slovenia. Therefore data cover all job vacancies in Slovenia[15].

Another issue related is the adequacy between unemployed and vacancy data concerns the qualification structure of the matching pools. For example in Latvia, the share of registered unemployed with manual occupation is above 80 percent. On the other hand, vacancies posted through State Employment Agency usually refer to low-qualification jobs: 83 percent of reported vacancies concern manual jobs in Latvia (see Dmitrijeva and Hazans [2007]). From this perspective, the matching function estimated in this study refers to a segment of the labour market which to large extent excludes high skilled blue collar occupations.

Concerning the outflows from unemployment or matches, here (and in what follows) we mean by outflow the reported outflows to jobs from the pool of registered unemployed[16]. Data reveal that outflow rates - ratio of the number of registered unemployed finding jobs during a month to the beginning of month number of registered unemployed - were comparable across three analyzed countries: on average 3 percent in Latvia, 5 percent in Slovenia and 6 percent in Estonia. The figure 1 displays mean transition rates for each of the 33 regions of Latvia, for 12 regions of Slovenia and for Estonia (as a whole country).

In Latvia the highest rate of outflows from unemployment to employment is observed in the capital city Riga, in Saldus and Valkas districts, with 5 to 6 percent of registered unemployed finding a job every month. As above mentioned, Estonia witnesses a 6 percent outflow rate while in Slovenia, Kranj, Ptuj, Nova Gorika , Koper and Velenje regional offices of ESS top the distribution of transitions from unemployment to jobs with 5 to 6 percent rates[17]. The regions with the weakest performance in terms of outflows to jobs are Ludzas Rezeknes and Daugavpils - three Latvian districts where outflow rates do not exceed 2 percent for the period from 1:1999 to 07:2006. By contrast in Slovenia, even in the worst performing areas (Maribor, Triborvje, Celje regional offices of ESS) the mean outflow rate still exceeds 4 percent.

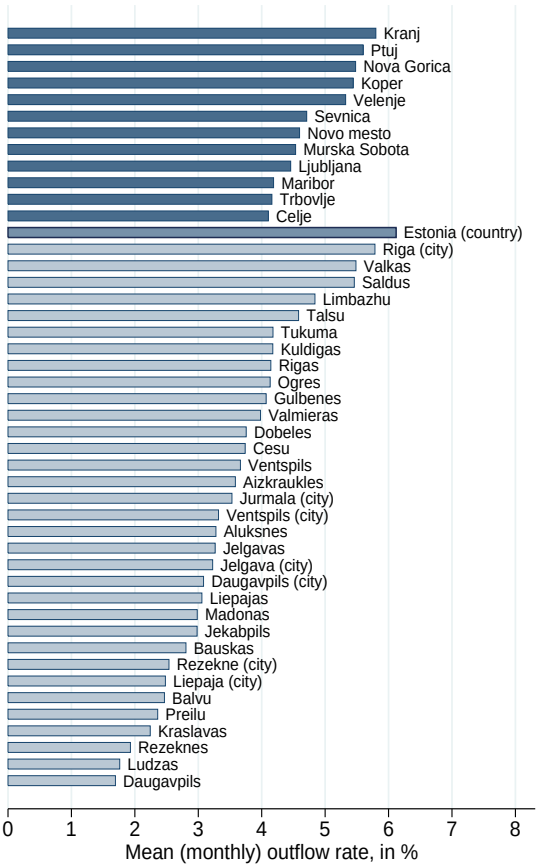
Figure 2 shows the aggregate dynamics of matches, unemployed and vacancy stocks and flows

[15]However, ESS has several publication procedure types to distinguish across job vacancy types. For example only job vacancies for which employer desires a public announcement are available to general public. Employers can also indicate whether the cooperation with ESS is wanted in order to fill the vacancy (the share is such vacancies is about 1/3 of all job vacancies).

[16]It is possible that some outflows to jobs may not be reported to the Public Employment Service by the ex-unemployed. While we do not have a reliable estimate of the scope of the problem (under-reporting) in Estonia and Slovenia, in Latvia the problem has been fixed in 2003 by using information from tax authorities. There is evidence that less than 25% of outflows to jobs in Latvia were not reported. Plausibly, the rate of under-reporting was of the similar order in other countries and did not vary significantly across districts and time periods, and hence we believe this problem does not cause bias in our results.

[17]The distribution is certainly smoother across Slovenian regions, comparing to Latvia. It should, however, be noted that the degree of spatial disaggregation of Latvian data is higher (NUTS 4 for Latvia, and NUTS 3 for Slovenia).

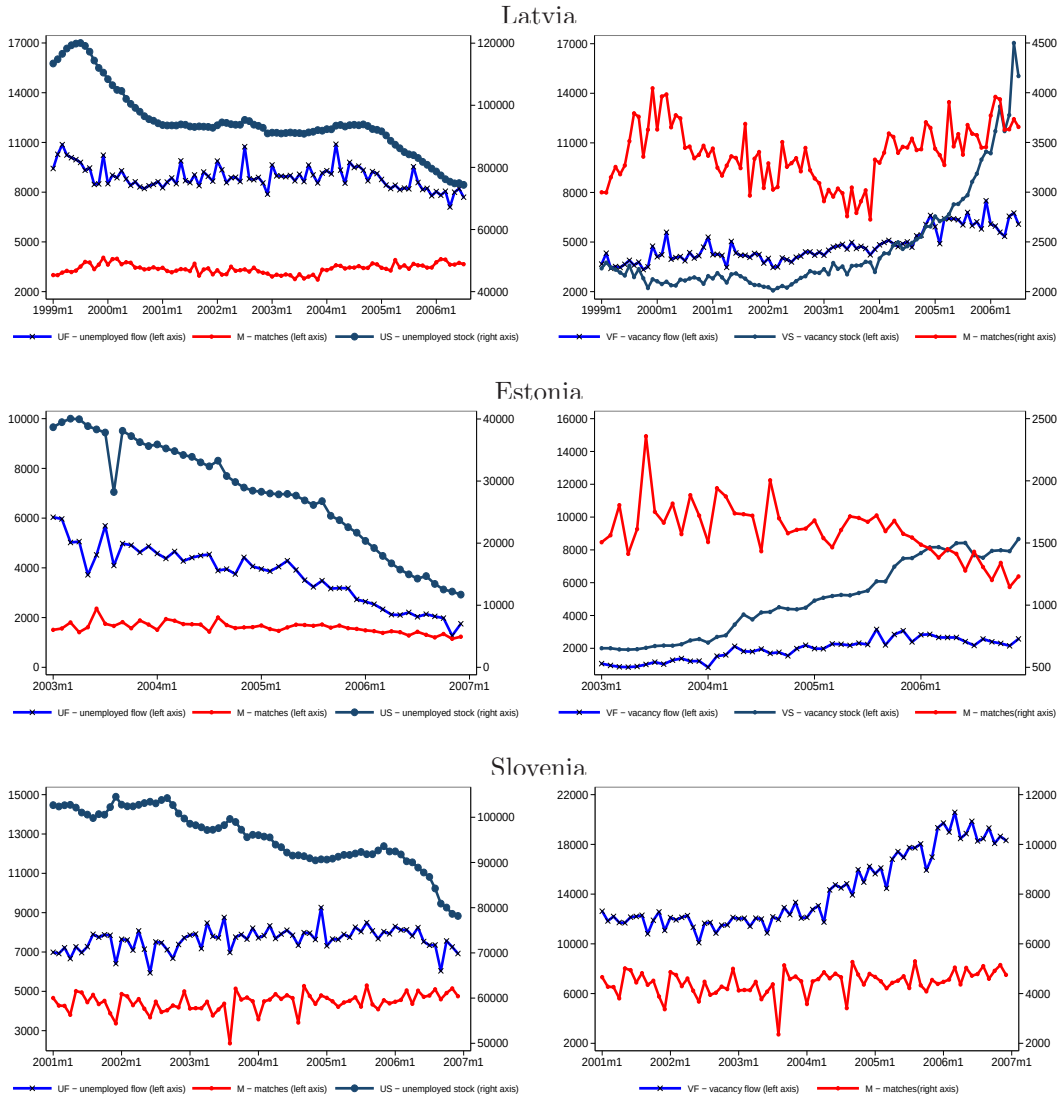
Figure 1: Mean outflow rate in Latvia (by region), Slovenia (by region) and Estonia



Source: Author's calculations based on data series from State Employment Agency of Latvia, Estonian Labour Market Board and Employment Service of Slovenia. Reported rates are averages of transition rates over available time period (see table 8).

in Latvia, Estonia and Slovenia. Outflows from unemployment (matches, new hires) seem to be quite sensitive to the movements in vacancy inflows in Latvia and to the movements in the inflow of new unemployed in Slovenia.

Figure 2: The dynamics of unemployment, vacancies and outflows to employment



Source: State Employment Agency of Latvia, Estonian Labour Market Board and Employment Service of Slovenia. Data seasonally adjusted (X11).

More intuition on the role of flow variables can be derived from table 4[18], which shows the

[18]The correlations, displayed in Table 1 are calculated on the variables transformed in order to remove heterogeneity in regional labour market size and to account for seasonal and trend effects in variables. For Latvia and Slovenia the transformations are performed as follows. For each variable $X_{i,t}$ the corresponding transformed variable $\Delta\overline{\widetilde{X}}_{i,j}$ is constructed as follows: $\widetilde{X}_{i,t} = X_{i,t}/U^S_{i,t}$ is variable divided by region specific beginning of month stock of unemployed; $\overline{\widetilde{X}}_{i,j}$ is annual mean of $\widetilde{X}_{i,t}$ for every year j within each region i; $\overline{\overline{\widetilde{X}}}_i$ is the average

turnover rates and correlations between different variables.

In Latvia and Estonia, the correlation between matches and vacancy inflow is higher than the one with vacancy stock. The correlation between the outflow to employment and the inflow of new unemployed is high in Latvia, but low and statistically insignificant in Estonia. In Slovenia, by contrast, both monthly inflow of unemployed and inflow of new vacancies are correlated to the outflow from unemployment to jobs.

The observed unemployed turnover rate (ratio of the inflow to the stock) is 0.09 in Latvia, 0.13 in Estonia and 0.08 in Slovenia. Monthly inflows into unemployment in Latvia, Estonia and Slovenia are actually important, but small relative to extremely high stock of unemployed[19]. In contrast, vacancy turnover rates are much higher: aggregate vacancy turnover rate is 0.44 in Estonia and 1.29 in Latvia (while the rate calculated on Latvian regional units exceeds 5)[20]. This suggests that vacancies are filled very rapidly in Latvia and Estonia, and especially in some of Latvian regions. The above statement, reinforced by reported correlations between outflows to jobs and other variables, confirms the importance of inflow variables (new vacancies, new unemployed) in the process of demand-supply matching in the labour market, approving its relevance for our analysis.

4 Estimation procedure

4.1 Estimated models

Let us first recall the relationships that we estimate in this study. In order to monitor the main patterns and efficiency of the labour market in terms of worker-firm matching in three new EU member states, we estimate the matching function given by equation 6. The developments on the stock-flow matching and the evidence supplied by descriptive statistics raise the question of the relevance of the standard matching function in the case of transition-accession economies. We address this issue by estimating the equation 6 in both stock-stock and stock-flow settings. As mentioned above the difference lies in the specification of the main explanatory variables when estimating the matching function (either only unemployed and vacancy stocks on RHS or both stocks and inflows of unemployed and vacancies on RHS).

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of annual means $\overline{\widetilde{X}}_{i,j}$ within each region i; and $\Delta\overline{\widetilde{X}}_{i,j} = \overline{\widetilde{X}}_{i,j} - \overline{\overline{\widetilde{X}}}_i$ is the deviation of region specific annual averages from the $\overline{\overline{\widetilde{X}}}_i$. For Estonia only national aggregated data is available. Therefore the correlations are calculated on the variables purified for for seasonal and trend effects.

[19] This is due to high frequency of inflow data. Annual inflow into unemployment is indeed higher: in year 2004, for example, both the stock of registered unemployed and yearly inflow were of the same scale in three countries : about 6-7 percent of the population aged 15 to 64 years in Latvia, from 4 to 6 percent in Estonia and 7 percent in Slovenia.

[20] It is not possible to calculate the vacancy turnover rate for Slovenia since the data on vacancy stocks is not produced by ESS, it only produces data on vacancy inflow.

Table 1: **Correlations and turnover rates**

	Latvia	**Estonia**	**Slovenia**
	Correlations of number of matches (M) with :		
Inflow of unemployed (U^F)	0.46***	0.19	0.59***
Inflow of vacancies (V^F)	0.59***	0.89***	0.82***
Stock of vacancies (V^S)	0.47***	0.76**	-
			Mean values of:
Vacancy monthly turnover rate (V^F/V^S)	5.69 (1.29)	(0.44)	-
Unemployed monthly turnover rate (U^F/U^S)	0.09 (0.09)	(0.13)	0.08 (0.08)
Monthly hiring rate (M/U^S)	0.03 (0.04)	(0.06)	0.05 (0.05)

Source: Calculations based on data from Latvian State Employment Agency, Estonian Labour Market Board and Employment Service of Slovenia. Notes: (1) Correlations are calculated on the variables transformed in order to remove heterogeneity in regional labour market size as well as for seasonal and trend effects in variables (see footnote below). (2) Calculations are made on monthly data for the time periods covered with data (see table 8). (3) Reported turnover rates are time averages of monthly rates (the length of available time period for each country is specified in table 8). (4) Reported turnover rates are averages of regional rates, while the rates calculated from aggregated data are reported in parentheses. (5) ***, **, * - correlations significantly different from zero at 1,5,10 percent level respectively.

Estimated model 1: Standard matching function

$$\ln M_{i,t} = \alpha_0 + X_{i,t}\alpha_X + Z_{i,t}\alpha_Z + \mu_i + \lambda_t + \varepsilon_{i,t}$$

for stock-stock $X_{i,t} = [\ \ln U_{i,t} \quad \ln V_{i,t}\ ]$ and for stock-flow $X_{i,t} = [\ \ln U^S_{i,t} \quad \ln U^F_{i,t} \quad \ln V^S_{i,t} \quad \ln V^F_{i,t}\ ]$

Finally, we allow for interactions between the regions and estimate a spatially augmented matching function, corresponding to the equation 10 in section 2.3.

Estimated model 2: Spatially augmented stock-flow matching function

$$\ln M_{i,t} = \alpha_0 + X_{i,t}\alpha_X + X^*_{i,t}\alpha^*_X + X^{*ASYM}_{i,t}\alpha^{*ASYM}_X + Z_{i,t}\alpha_Z + \mu_i + \lambda_t + \varepsilon_{i,t}$$

for context based asymmetry $X^{*ASYM}_{i,t} = [\ X^{*HR}_{i,t} \quad X^{*LR}_{i,t}\ ]$, for density based $X^{*ASYM}_{i,t} = [X^{*POP}_{i,t}]$

4.2 Estimation procedure and related issues

When estimating the matching function from the data, several issues are to be controlled for in order to avoid possible bias, which may be related to data contents and structure (aggregation bias), to (mis)specification of estimated models or to built-in endogeneity in the matching function.

Since Pissarides [1986], early studies on empirical matching functions were realized on aggregate time series data (Layard et al. [1991] on British data, Blanchard and Diamond [1989] on US data, Burda and Wyplosz [1994] on French, German, Spanish and U.K. data). This is due to the fact that equilibrium unemployment theory (delivering the matching function as its central

element) aims at describing the macroeconomic behavior of unemployment. In addition, it is easier to collect the aggregate (national) data on hirings, unemployment and vacancies. However, such spatial aggregation is only possible under the assumption that search frictions are homogeneous across the observation units (regions, municipalities, TTWA [21], for instance.) and therefore may impose strong and presumably counter-factual assumptions on the form of the matching function. Coles and Smith [1996] cross-sectional analysis on England and Wales has revealed the importance of demographic factors in estimating the matching function and cautioned researchers for the existence of regional heterogeneity, which was entirely neglected by the studies on the aggregate time series data. The necessity to control for spatial heterogeneities (both observable and unobservable) across observation units and to correct possible aggregation bias, along with the substantial difficulty with making inferences from the aggregate time series, has led many authors to shift their focus from aggregate to geographically disaggregate data (panels or cross sections). Anderson and Burgess [2000] estimate the matching function for four US states and 20 industries; Burgess and Profit [2001] for 303 TTWA in U.K.; Burda and Profit [1996] and Boeri and Burda [1996] for 76 districts of Czech Republic. The main parameters estimated in the matching function are the elasticities of new hires with respect to unemployment and vacancy pools. Those being affected by potential bias, the results from estimations conducted on aggregate time series and the ones proceeded on panel data may diverge with respect to the returns to scale in the estimated matching function.

While using cross section time series data (CSTS) for the estimation of the matching function considerably reduces the possibility for spatial aggregation bias, it also enriches the study with analysis opportunities: allows exploring spatial and time variations in the matching. Nonetheless, using cross sectional time series data also requires an appropriate estimation technique. CSTS typically exhibit non-spherical error structure, which does not conform to OLS assumptions: there are high chances for the residuals to be group-wise heteroscedastic, contemporaneously and serially correlated. Two methods can be used to bring necessary corrections: Parks-Kmenta method and Beck-Katz PCSE method. Parks-Kmenta method performs the estimation by Generalised Least Squares (GLS) and consists in applying two sequential transformations on the estimated model. The first transformation removes the serial correlation, while second corrects simultaneously for contemporaneous correlation and heteroscedasticity (see Beck and Katz [1995]). Parks-Kmenta method has been revised by Beck and Katz [1995, 1996]. They confirm that GLS have optimal properties for CSTS data, but remark that GLS can only be used when the variance-covariance matrix of errors is known. Otherwise it should be estimated from the sample implying the use of Feasible Generalised Least squares (FGLS) instead of GLS. Beck and Katz [1995, 1996] claim that although FGLS uses the estimate of the error process (thus giving consistent and efficient coefficient estimates), the FGLS formula for standard errors assumes variance-covariance matrix of the errors to be known (and not estimated). As a result the application of FGLS leads to downwards biased standard errors.

[21] TTW stands for Travel To Work Areas.

Beck and Katz [1995, 1996] propose a less complex method, retaining OLS parameter estimates (consistent but inefficient) and replace OLS standard errors by panel-corrected standard errors (PCSE). In this study the estimations based on both Parks-Kmenta and Beck-Katz methods are reported.

Another source of bias in the estimated coefficients of the matching function may be related to temporal aggregation problem which arises when discrete time data are used to describe continuous time processes. Indeed, the matching function describes the process that takes place continuously in spatially distinct locations (regions, municipalities, TTWA), while discrete data for observation units are used to estimate the matching function. Therefore flow variables (outflows from unemployment to employment, vacancy outflow from posted to filled) are estimated as functions of stock conditioning variables (stock of unemployed, vacancies), which changes during the reference time period. In addition, the dependent variable itself is mismeasured, since, for example, the outflow from unemployment englobe the outflows from the stock of unemployed and the outflow from the inflow into unemployment. For the time period, even as short as as quarter this can lead to the outflow greater than the initial stock. One of the possible solutions includes inflow variables on the RHS of the estimated matching function (as a fraction of inflow added to the stock variables or as a part of a stock-flow matching mechanism). Another solution to the temporal aggregation problem is purely mechanical and consists in using as high disaggregate data as possible (high frequency data). Benett et al. [1994] show that the size of the temporal aggregation bias in the estimated matching elasticity is a linear function of the measurement interval and the bias is not important when the frequency of the data is monthly or higher. Taking into account the above issues, the data used for this study is the highest available highly disaggregated in both spatial and time dimensions (monthly time series from regional units are used), and we use the estimation techniques appropriate for such data structure.

Turning to other estimation issues, a common, but rarely highlighted in the related literature, problem in empirical estimation of the matching function concerns possible built-in endogeneity of explanatory variables. In fact, current and past outflows to employment (matches) predetermine the stocks of unemployed and vacancies in the beginning of the next period. In this case the assumption of the strict exogeneity of regressors (conditional on the unobserved effect), does not hold. Meanwhile, matches partially determine both current period's errors and next period's stocks of unemployed and vacancies. Therefore errors are correlated only with future (but not current and past) values of regressors, which imply that a weaker assumption on sequential exogeneity of explanatory variables (conditional on unobserved effect) is still verified. Following Wooldridge [2002], when the times series process is appropriately stable and weakly dependent, it is possible to show that the inconsistency of using fixed effects is of order $1/T$ under sequential exogeneity assumption. Thus, when T is large (which is our case), the bias in fixed effect estimator is likely very small. Moreover, it can also be shown under the same conditions, that for $T > 2$, fixed effect estimator can have less bias than a first difference estimator,

as $N \to \infty$ (see Wooldridge [2002], p.302). We therefore prefer fixed effects over first difference methods, in the estimation of the matching function. Meanwhile, it seems that the size of the endogeneity problem is minimal in application to our case. The descriptive statistics exercise on sample data shows that the stock of unemployed $U^S_{i,t+1}$ has weaker correlation with current matches $M_{i,t}$ than with its' other components (current inflows, outflows other that matches) and the contribution of $M_{i,t}$ to $U_{i,t+1}$ relative to other contributing variables is also weak.

The last point concerns the specification of the model. When important explanatory variables or interactions are omitted in the specification the results are naturally biased. To correctly specify the matching process, we estimate both stock-stock and stock-flow matching models. We control for heterogeneity in observation units by including in all estimated models regional fixed effects, annual time trend and seasonal (quarterly) dummy variables. Region fixed effects capture unobserved region-specific factors, remove average region effect and focus the model on within region variation over time. Time trend and seasonal dummies capture the effect of macroeconomic factors, remove seasonality, and purify the between (inter-regional) component of variation from time specific effects. In order to incorporate the macroeconomic and labour market context, we use the additional indicator for labour demand, expressed as the growth in secondary employment.

Eventually we allow for interactions between spatially separated units by adding spatial spillovers in matching.

Let us now turn to the detailed description of estimated specifications.

Stock-stock and stock-flow matching functions:

- **Specification [I]**: We first estimate the specification, which includes main explanatory variables (stocks and flows of unemployed and vacancies), region dummies (for Latvia 33 regions, reference region - Riga city; for Latvia pooled with Estonia -34 regions, omitted region - Riga city; for Slovenia 12 regions, omitted region is Celje(Savinjska)), time dummies (quarters, omitted first quarter) and time trend (year).

- **Specification [II]**: baseline specification [I] augmented by the use of the additional labour demand indicator. This indicator is expressed as the growth in secondary employment. For Latvia and Latvia pooled with Estonia, the indicator varies across regions and time (giving the changes in local labour demand), while for Slovenia data is aggregate and the indicator varies only across time.

- **Specification [III]**: is only estimated for Latvia. To make sure the results are not affected by influential observations related to capital city Riga - where unemployed stock values are a lot higher than elsewhere - we run a previous specification ([II]), but exclude Riga city from the sample (in this case Riga district is used as a reference).

- **Specification [VI]**: is only estimated for Latvia. We use the time dimension of the data in order to learn whether the changes in employment legislation have affected matching efficiency in Latvia. In 1999-2003 several major changes, which could have influenced labour supply (or search effort of unemployed) and labour demand, have occurred. These regard the level of unemployment benefit and the amount of legal minimum wage. The average level of unemployment benefit has dropped by 15 percent in August 2000 (when benefit amount calculation rules became harsher) and has raised by 15 percentage oints in February 2003 (when the ceiling on benefit amount was removed). The specification [VI] shows the effect of changes in the unemployment benefit amount. It adds to the baseline specification [II] two step dummy variables: one for the period after August 1st, 2000 and another for the period after February 1st 2003.

- **Specification [V]**: is only estimated for Latvia. Shows the effect of changes in the minimum wage amount in Latvia. This amount was raised by 20 percent in July 2001 and by 17 percent in January 2003, by 14 percent in January 2004, by 13 percent in January 2006. We add to specification [II] step dummy variables for the above changes: first for the period after July 1st 2001, second for the period after January 1st 2003, third for the period after January 1st 2004 and then the fourth for the period after January 1st 2006.

For Latvia the specifications [I] - [V] are estimated both by GLS and PCSE, for both stock-stock and stock-flow models and for three time periods: overall time period 1:1999 to 07:2006, time period prior the EU accession 1:1999 to 04:2004, time period after the EU enlargement 05:2004 - 07:2006. This gives the total of 60 regressions, the results of which are reported in tables 9 -14 (see appendix).

For Latvia pooled with Estonia, we estimate the specifications [I] and [II] by GLS and PCSE for both stock-stock and stock-flow models and for three time periods (overall time period 1:2003 to 07:2006, time period prior the EU accession 1:2003 to 04:2004, time period after the EU enlargement 05:2004 - 07:2006). This gives the total of 24 regressions, the results being reported in tables 15 -16.

For Slovenia, we estimate the specifications [I] and [II] by GLS and PCSE for a semi stock-flow models [22] and for three time periods (overall time period 1:2000 to 12:2006, time period prior the EU accession 1:2000 to 04:2004, time period after the EU enlargement 05:2004 - 12:2006). This gives the total of 12 regressions, the results being reported in table 17.

The main results are compared in a synthetic result tables 2, 3 and 4.

Spatially augmented matching functions:

[22] The model estimated for Slovenia, due to data availability problems, lies in between the stock-stock and stock-flow models: it includes unemployed stocks and flows and only vacancy flows. Therefore it will be referred to as a *semi stock-flow model*.

- **Specification [VI]**: The specification, without spillover effects but showing the differences in matching efficiency in the areas bordering with other countries. For Latvia 4 regions groups are distinguished, those on the border with Estonia (4 regions), with Russia (3 regions), with Byelorussia (3 regions), with Lithuania (8 regions). The grouping will be maintained in all other spatial specifications. For Slovenia 3 groups of regions are distinguished: those bordering with Italy (3 regions), with Croatia (7 regions) and with Austria (4 regions). The bordering with Hungary is not considered as it only concerns 1 region. The grouping is not maintained in other specifications: almost all regions of Slovenia are bordering with some country, thus grouping is not being informative. Apart from grouping the regions according to their location, this specification is idem to specification [II] above.
- **Specification [VII]**: The specification including spillover effects from neighboring regions.
- **Specification [VIII]**: The specification including spillover effects from neighboring regions, and decomposing the overall spillover in the spillover from high unemployment ratio areas, from low unemployment ratio areas and from the areas with similar unemployment context.
- **Specification [IX]**: The specification including spillover effects from neighboring regions, and decomposing the overall spillover in spillover to high density and normal density areas.

For Latvia the specifications [VI] - [IX] are estimated by both GLS and PCSE, for a stock-flow models, for three time periods (total, prior the EU accession and after the EU enlargement). This gives the total of 24 regressions, the results being reported in tables 18 -20.

For Slovenia, we estimate the specifications [VI] - [IX] by GLS and PCSE for a semi stock-flow model and for three time periods (total, before and after the EU accession). This gives the total of 24 regressions, the results being reported in tables 21 -21.

The main results are compared in a synthetic result table 5[23].

5 Estimation results

We can now turn to the discussion of the estimation results. As above mentioned, we estimate the matching function in three settings representing stock-stock matching function, stock-flow matching function and a spatially augmented stock-flow matching functions.

While all estimation results can be found in annex tables, we provide a summary of regression results in tables 2, 3 and 4 below [24].

[23] As previously we report here the results of estimation of the preferred specification (VIII).

[24] To synthesize, we display here only the results of estimations for a preferred specification (specification [II]).

Table 2: **Estimation results: stock-stock matching function.**

Period : Dep.var: ln Matches (outflows from registered unemployment to employment)	Latvia Total GLS [II]	Latvia Before EU GLS [II]	Latvia After EU GLS [II]	Latvia pooled with Estonia Total GLS [II]	Latvia pooled with Estonia Before EU GLS [II]	Latvia pooled with Estonia After EU GLS [II]
ln unemployed (stock)	**0.737*** **	**0.948*** **	**1.026*** **	**0.686*** **	**0.878*** **	**0.927*** **
	[0.066]	[0.078]	[0.189]	[0.090]	[0.186]	[0.154]
ln vacancies (stock)	**0.029*** **	**0.003**	**0.025** **	**0.014**	**0.017**	**0.023***
	[0.007]	[0.009]	[0.012]	[0.010]	[0.016]	[0.012]
Indicator for local labour demand	**0.797*** **	**0.886*** **	**-0.014**	**0.723*** **	**1.129*** **	**0.108**
	[0.069]	[0.071]	[0.326]	[0.152]	[0.162]	[0.306]
Time trend (annual)	**0.032*** **	**0.012** **	**0.169*** **	**0.112*** **	**0.145*** **	**0.162*** **
	[0.004]	[0.005]	[0.028]	[0.011]	[0.023]	[0.026]
Constant	**-64.871*** **	**-27.481** **	**-342.773*** **	**-224.9**	**-292.9**	**-327.8**
	[8.604]	[11.122]	[56.924]	[21.744]	[46.226]	[53.468]
Regional dummies (test)	1504***	1192***	1294***	1504***	1111***	1374***
Quarterly dummies (test)	102***	84***	64***	97***	66***	67***
Returns to scale	0.77	0.95	1.05	0.70	0.90	0.95
Constant returns to scale, test	11.96***	0.39	0.07	11***	0.32	0.11
Observations	2738	1954	784	1304	493	811
Regions	33	33	33	34	34	34

Generally, the absence of region and time specific effects is always rejected. All reported tests indicate the presence of serial correlation and groupwise heteroscedasticity in disturbances, both in traditional stock-stock and stock-flow matching functions for all countries, while the autocorrelation in Slovenian data seems to be much weaker that in the data concerning the Baltic states.

Table 3: **Estimation results: stock-flow matching function.**

Period : Dep.var: ln Matches (outflows from registered unemployment to employment)	Latvia Total GLS [II]	Latvia Before EU GLS [II]	Latvia After EU GLS [II]	Latvia pooled with Estonia Total GLS [II]	Latvia pooled with Estonia Before EU GLS [II]	Latvia pooled with Estonia After EU GLS [II]
ln unemployed (stock)	**0.681*** **	**0.947*** **	**0.926*** **	**0.587*** **	**0.802*** **	**0.821*** **
	[0.062]	[0.074]	[0.180]	[0.089]	[0.177]	[0.142]
ln unemployed (flow)	**0.047***	**0.037**	**0.049**	**0.142*** **	**0.223*** **	**0.04**
	[0.029]	[0.033]	[0.054]	[0.040]	[0.055]	[0.050]
ln vacancies (stock)	**0.030*** **	**0.002**	**0.037*** **	**0.021** **	**0.01**	**0.035*** **
	[0.007]	[0.008]	[0.012]	[0.010]	[0.015]	[0.012]
ln vacancies (flow)	**0.203*** **	**0.206*** **	**0.198*** **	**0.195*** **	**0.236*** **	**0.206*** **
	[0.011]	[0.013]	[0.020]	[0.016]	[0.026]	[0.020]
Indicator for local labour demand	**0.749*** **	**0.825*** **	**-0.152**	**0.598*** **	**0.869*** **	**0**
	[0.066]	[0.067]	[0.298]	[0.147]	[0.156]	[0.279]
Time trend (annual)	**0.017*** **	**0.009***	**0.130*** **	**0.087*** **	**0.093*** **	**0.118*** **
	[0.004]	[0.005]	[0.027]	[0.011]	[0.023]	[0.025]
Constant	**-36**	**-22.2**	**-264.3**	**-176**	**-190**	**-240**
	[8.098]	[10.414]	[55.648]	[21.779]	[44.882]	[50.911]
Regional dummies (test)	762***	745***	632***	713***	509***	694***
Quarterly dummies (test)	75***	75***	43***	68***	51***	42***
Returns to scale	0.96	1.19	1.21	0.95	1.27	1.10
Constant returns to scale, test	0.33	5.92**	1.1	0.32	2.1	0.42
Observations	2737	1953	784	1304	493	811
Regions	32	32	32	34	34	34

Considering the main components of the matching function, the estimation results show that in Latvia and Estonia the outflows from unemployment are driven by matches between the stock of unemployed and the inflow of new vacancies. These variables have positive and statistically significant impact on the number of matches, while the estimated effect of the vacancy stock is statistically insignificant in most specifications and the effect of the inflow of unemployed is relatively weak. Also in Slovenia the matching process is better described by a stock- flow

Table 4: **Estimation results: semi stock-flow matching function.**

	Slovenia		
Period :	Total	Before EU	After EU
Dep.var: ln Matches	GLS	GLS	GLS
(outflows from registered	[II]	[II]	[II]
unemployment to employment)			
ln unemployed (stock) :	**0.581*** **	**0.661*** **	**0.929*** **
	[0.095]	[0.152]	[0.217]
ln unemployed (flow):	**0.234*** **	**0.237*** **	**0.238*** **
	[0.031]	[0.043]	[0.044]
ln vacancies (flow):	**0.595*** **	**0.688*** **	**0.399*** **
	[0.037]	[0.060]	[0.061]
Indicator for	**0.278** **	**0.131**	**1.230*** **
labour demand	[0.111]	[0.129]	[0.244]
Time trend (annual)	**-0.033*** **	**-0.037*** **	**0.021**
	[0.005]	[0.008]	[0.017]
Constant	**61.08*** **	**67.28*** **	**-49.76**
	[10.804]	[17.141]	[34.974]
Regional dummies (test)	246***	148***	78***
Quarterly dummies (test)	154***	109***	50***
Returns to scale	1.41	1.59	1.57
Constant returns to scale, test	15***	13***	6**
Observations	972	612	360
Regions	12	12	12

matching function, rather than by a traditional stock-stock one. The stock of unemployed and the inflow of vacancies very intensively participate in match creation, but, in contrast with the Baltic states, also the inflow of unemployed plays an important role in explaining the outflows from unemployment.

The efficiency of the matching process

The aggregate efficiency of the matching process can be analyzed by considering the returns to scale of the estimated matching function.

Generally, constant returns to scale can not be rejected when examining the non-augmented matching functions on Latvian data and the pooled data from Latvia and Estonia. However, the returns to scale are higher when employing a stock -flow version of the matching function. By contrast, in Slovenia, the returns to scale in the matching function are rather increasing.

The degree of homogeneity of the matching function (expressing returns to scale) is slightly increasing over time in Latvia: comparing to the earlier period of time, returns to scale are higher after Latvia's accession to the EU. When the matching function is estimated on pooled Latvian-Estonian data or on Slovenian data the returns to scale are decreasing over time.

Regarding the effect of the changes in employment legislation, which have been evaluated for Latvia, the results suggest a negative relationship between the generosity of labour market institutions and the performance of the economy in terms of matching. Higher unemployment benefits reduce search intensity (effort) of the unemployed, while higher minimum wage reduce the pool of available jobs. The effect on the number of outflows from unemployment is therefore negative.

Labour supply and labour demand

The role of labour supply (demand) in creation of new matches in the labour market can be

analyzed by considering the elasticity of outflows from unemployment to employment with respect to unemployed (vacancy) stocks and inflows. We will use the results of the estimation for the stock-flow matching function for Latvia (table 3, columns 2 and 3) and semi stock-flow matching function for Slovenia (table 4, columns 2 and 3).

Consider first the results for Latvia in the period before EU enlargement (estimation period from 1:1999 to 04:2004). Generally the elasticity of outflows with respect to the size of unemployed pool (stock) varies around 0.95 across various specifications (table 13). The estimation results of a preferred specification (II) (table 3, 3rd column) show that one percent increase in unemployed stock, raises the outflow from unemployment by 0.947 percent. In the period from 1:1999 to 4:2004 the average number of unemployed in Latvia (see table 6) was 98.8 thousand people: one percent increase in unemployed stock is equivalent to adding 988 extra persons to the number of unemployed. Similarly, the number of outflows from unemployment was 3303 on average and a 0.947 percent increase is equivalent to 31 extra matches per month. One new match can thus be created in the labour market if the number of unemployed increases by 988/31=32 persons (on average by 1 in each of Latvian regions).

The elasticity of outflows with respect to the inflow of unemployed is relatively weak (around 0.05) and often statistically insignificant, suggesting that Latvian unemployed are rarely re-employed within the first month after their registration with SEAL.

We now consider the role of job vacancies in creation of new matches in Latvia. The elasticity of outflows with respect to the stock of vacancies varies around 0.03 (table 13) and is equal to 0.002 in the above considered specification (table 3, 2nd column). Increasing the vacancy stock by 1 percent, 30 additional vacancies (see table 6), will result in a 0.002 percent increase in monthly outflow from unemployment, equivalent to 0.07 new matches. Weak elasticity of vacancy stock is closely related to a very high vacancy rotation in Latvian labour market: the majority of inflowing vacancies are filled within a month and remaining vacancies are in most part unsuitable for matching (due to their low quality or narrow specialization).

On the contrary, the elasticity of hiring with respect to new (inflowing) vacancies is always statistically significant and varies around 0.2. Using the above specification (table 3, 3rd column), it can be concluded that if the number of new job vacancies increases by 42 (1 percent), the number of new matches will increase by 7 (0.206 percent). Thus for creating one new match the number of new job offers should be increased by 6: outflows are quite sensitive to the changes in the number of new job offers (inflows)[25].

Summing up the characteristics of the matching process in the period before EU enlargement in Latvia: 6 additional new vacancies (inflowing) are equivalent, in terms of match creation, to

[25]It might be thought that the results contrast the statistics on very high vacancy turnover rates in Latvia. Some precisions should be brought in this respect: our results only refer to the matches between new vacancies and registered unemployed, while total vacancy outflows (appearing in turnover data) are likely to be sourced by the matches with employed, unregistered job seekers or with those from out-of-labour force.

32 additional unemployed in stock. One new vacancy is thus equivalent to 5 unemployed. We can conclude that generally, in that period the role of labour demand in creating new matches has been much more important than the role of labour supply.

The dynamics of the role of labour supply and labour demand in the matching process can be analyzed by comparing the estimation results for two time periods: before and after the May 1st 2004. While even after the EU enlargement labour demand still dominates labour supply in Latvian labour market, the results feature the development of a new trend: after Latvia's accession to the EU the role of labour demand in the matching process becomes weaker, but the role of labour supply increases (partially due to high migratory outflows of Latvian workers to other EU member states, see Rutkaste [2006]).

After the 1st May 2004 the effect of new vacancies on match creation decreases (staying though statistically significant), while the vacancy stock variable, that previously did not have any explanatory power, becomes statistically significant. The elasticity of the outflow with respect to the inflow of new unemployed increases suggesting that the matching process is becoming more and more sensitive to the changes in labour supply.

Replicating the previous calculations it can be shown that in the period from 5:2004 to 7:2006 one new (inflowing) vacancy was worth three unemployed (in terms of match creation).

The indicator for local labour demand has in general a positive and significant effect on the outflows from unemployment, but in the period after Latvia's accession to the EU this factor looses its statistical significance. This suggests that more job vacancies are now placed through SEAL and the role of registered vacancies in determining the outflow to employment from the pool of registered unemployed also becomes more important.

When Estonia is included into the estimation sample the results stay qualitatively the same: main components of the matching function are stock of unemployed and inflow of new vacancies. In both periods before and after EU enlargement the labour demand dominates labour supply, but the role of labour demand weakens over time (one vacancy is worth seven unemployed when considering the time period before 1st May 2004, while after this date, one vacancy is equivalent to three unemployed).

Let us now discuss the pattern and dynamics in worker-firm matching in Slovenia. As mentioned above, the data on vacancy stocks is not produced by the Employment Service of Slovenia. The other three components of the matching function -the stock of unemployed, the inflow of unemployed and the inflow of new vacancies - intensively participate in determining the outflow from unemployment to jobs.

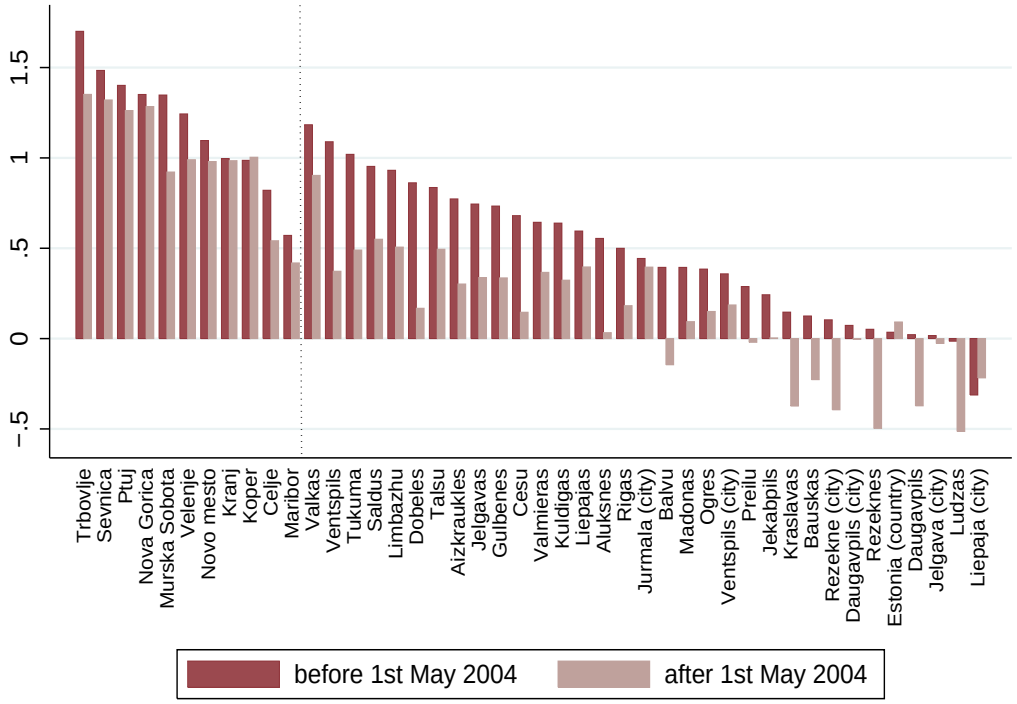
In the period before the EU enlargement the role of labour demand has been important. One additional match could be created in Slovenia by increasing the stock of unemployed by 34 persons, by adding 7 new individuals into the inflow of unemployed or by posting only 4 new vacancies. Thus in terms of match creation one vacancy can be compared to 9 unemployed

in stock or to (almost) 2 inflowing unemployed. The trend towards shifting the dominance in match creation from demand to supply side is even more pronounced in Slovenia than it is in the Baltic States. After 1st may 2004, the number of additional unemployed (stock) necessary for increasing hires by one is 21, while the number of required additional vacancies is now 9. One vacancy has as much importance in match creation as 2 unemployed.

Regional heterogeneity in matching

The efficiency of matching significantly vary across space. Figure 3 displays the efficiency of matching in various Latvian (including Estonia in the panel) and Slovenian regions. The comparison is based on regression coefficients derived when estimating the stock-flow matching function (in preferred specification [II]) on a panel of Latvian regions and Estonia (in this case the comparison is made with Riga city) and separately on a panel of Slovenian regions (in this case the reference region is Ljubljana). Generally speaking the lowest matching efficiency

Figure 3: Regional efficiency of matching in Latvia, Estonia and Slovena



Source: Author's calculations based on data series from State Employment Agency of Latvia, Estonian Labour Market Board and Employment Service of Slovenia. Time periods is available time period covered with data (see table 8).

has been observed in Liepaja, Jelgava, Rezeknes and Daugavpils cities, Ludzas, Daugavpils and Rezeknes regions. Most of these regions are located in depressed eastern part of Latvia and display the lowest levels of development and economic activity. The highest efficiency

characterized Valkas, Saldus, Limbazhu regions. The results confirm that, while in general the performance in these regions is better than the one in the capital city Riga, the efficiency gap (in favor of three regions) seems to decrease with time. In Estonia, the matching efficiency is not different from the one in the capital city of Latvia (Riga). In Slovenia, the regional distribution in terms of matching efficiency does not vary significantly over time. The central region of Ljubljana is not performing better than on average. The regions with the weakest performance in terms of matching are Celje and Maribor and those with the best performance are Tribovolje and Sevnica. Whereas Maribor and Celje areas display the highest unemployment rates in the country (13 to 14 percent in January 2006), the unemployment indicators in Trivolje and Sevnica areas are also above national's average (12 percent in these areas *versus* 10,5 national average in January 2006). At the same time, Celje and Maribor areas are situated at Koper-Ljubljana-Maribor development axis and contain the above average developed municipalities in terms population, economic activity, social conditions, while Trivolje and Sevnica mostly contain below average developed municipalities. In terms of specialization, Trivolje is industrial region, but Sevnica has agricultural orientation. It is therefore difficult to attribute higher matching efficiency in Trivolje and Sevnica to any of the above factors.

Regional differences in matching may be explained by several other factors: heterogeneity in unemployed skills and their adequacy to labour demand, differences in unemployment involvement in various active labour market policy programs, varying efficiency of such programmes, or, also, differences in skills and efficiency of staff in different SEAL regional units (which are in charge of job placements and unemployed assignment to ALMP programmes).

Numerous studies have also tried to relate the regional performance in terms of matching to population density in the region. Coles and Smith [1996] state that in the areas with dense pool of unemployed and firms, traders would be in a close proximity and thus enjoy communication with less effort and at lower costs. Therefore matching process would be faster and unemployed/vacancy transition rates consequently higher in the regions with dense population of workers and firms. Kano and Ohta [2005], by contrast, find the empirical evidence for matching efficiency to be decreasing with population density. They argue that in dense areas, the heterogeneity of both firms (in terms of hiring standards and wage structures) and unemployed (in terms of skills and reservation wages) is high and matches are therefore more difficult to arise.

Investigating the role of population density in the matching process from our sample, it turns that in Latvia regional distribution of matching efficiency is not related to population density in the regions, while in Slovenia matching efficiency seems to be lower in dense areas.

The economic activity and the efficiency of the labour market can also be related to the geographical position of the region. For example the regions bordering with other countries may perform better than central regions, because of their involvement in intensive cross-border cooperation (trade, transit or other exchange activities between countries). At the same time, those

regions, can also perform worse that the average, because of their remoteness from big cities, insufficient infrastructure, etc. We have examined this issue by introducing in the estimated specification of the matching function the dummy variables grouping the Latvian and Slovenian districts according to their geographical position *vis-a-vis* to other countries. The results show that both in Latvia and Slovenia, closeness to the border negatively affects the efficiency of matching, whereas this effect seems to become weaker in Slovenia after the accession to the EU (at least at Italian and Austrian borders).

Spatial effects

We now turn to the discussion of the estimation results of spatially augmented matching function. Due to the structure of available data, the spatial effects can only be estimated for Latvia and Slovenia.

Table 5: **Estimation results: Spatially augmented matching function.**

	Latvia			Slovenia		
Period :	Total	Before EU	After EU	Total	Before EU	After EU
Dep.var: ln Matches (outflows from registered unemployment to employment)	GLS [VIII]	GLS [VIII]	GLS [VIII]	GLS [VIII]	GLS [VIII]	GLS [VIII]
ln unemployed (stock) :	**0.749*** **	**0.932*** **	**0.862*** **	**0.718*** **	**0.812*** **	**1.107*** **
	0.07	0.085	0.212	0.1	0.147	0.245
ln unemployed (flow):	**0.022**	**0.013**	**0.027**	**0.028**	**0.025**	**0.067**
	0.032	0.036	0.06	0.051	0.067	0.071
ln vacancies (stock):	**0.022*** **	**0.004**	**0.032*** **			
	0.007	0.008	0.012			
ln vacancies (flow):	**0.184*** **	**0.186*** **	**0.198*** **	**0.372*** **	**0.438*** **	**0.271*** **
	0.011	0.013	0.02	0.048	0.062	0.073
Indicator for local labour demand	**0.762*** **	**0.802*** **	**-0.133**	**0.288*** **	**0.013**	**1.257*** **
	0.065	0.066	0.29	0.11	0.125	0.24
Time trend (annual)	**0.003**	**-0.001**	**0.076** **	**-0.032*** **	**-0.017***	**0.002**
	0.004	0.005	0.032	0.007	0.01	0.019
Constant	**-6.8**	**-1.0**	**-154*** **	**53.4*** **	**21.1**	**-14.7**
	8.811	11.486	66.256	14.926	21.667	39.529
	Neighbouring region variables					
	Overall spillover effect					
ln (W x unemployed (stock)	(-)			(+)	(+)	
ln (W x unemployed (flow)	(+)	(+)		(+)	(+)	(+)
ln (W x vacancies (stock)	(+)					
ln (W x vacancies (flow)	(+)	(+)	(+)	(+)	(+)	(+)
	Spillovers from high unemployment ratio areas					
ln (W x unemployed (stock)		(+)				
ln (W x unemployed (flow)	(-)				(-)	
ln (W x vacancies (stock)		(+)				
ln (W x vacancies (flow)			(-)			
	Spillovers from low unemployment ratio areas					
ln (W x unemployed (stock)			(+)		(-)	
ln (W x unemployed (flow)	(-)					
ln (W x vacancies (stock)	(-)					
ln (W x vacancies (flow)					(+)	
	Effects from high population density areas					
POP x ln (W x unemployed (stock)			(-)		(-)	
POP x ln (W x unemployed (flow)		(+)		(-)	(-)	(-)
POP * ln (W x vacancies (stock)						
POP * ln (W x vacancies (flow)	(-)	(-)	(-)			
Regional dummies (test)	385***	389***	331***	218***	170***	55***
Quarterly dummies (test)	79***	76***	23***	136***	77***	53***
Returns to Scale	0.67	1.02	2.00	1.76	1.64	1.95
Constant returns to scale, test	0.81	0	1.81	1.85	0.69	0.57
Observations	2679	1898	781	972	612	360
Regions	33	33	33	12	12	12

When spatial interactions are allowed for in the estimated matching function, the matching process can be specified as unemployed stock-vacancy flow matching for both countries. For Latvia the specification remains robust to the introduction of new spatial variables. For Slove-

nia, by contrast, there is a qualitative change in the results: the inflow of new unemployed, which previously has intensively contributed to determining the flow of new hires, has now lost its explanatory power due to the inclusion of spatial effects.

Spatial spillovers exist and are statistically significant in both countries. In Latvia the inflow of new vacancies in the neighboring areas positively affects local outflows to employment, while the increase in foreign unemployment decreases local outflows to jobs (mostly in the time period before Latvia's accession to EU), suggesting that unemployed search indeed and actively in the neighboring areas. This finding is in line with the results brought by Ahtonen [2005] for Finland and witnesses the effect of congestion caused by job seekers from neighboring areas. The foreign stock of vacancies and inflow into unemployment have positive influence on the matches, but this effect is not robust to specification choice and is mostly present in the time period before Latvia's accession to the EU.

In Slovenia, the foreign variable, that always increases local outflows to jobs is the inflow into the pool of unemployed workers. Together with the positive influence of foreign stock of unemployed (not always, but in most cases, statistically significant) this suggests the existence of positive externalities relied to increased number of traders at the "market place", which can presumably reduce the search costs for unemployed and employers. The posting of job offers in neighboring areas also positively influences local exits from unemployment, but especially in the pre-EU period when the role of labour demand was more important.

Regarding the asymmetry of spatial effects, in Slovenia the positive influence of new vacancies in surrounding regions is even stronger if these neighboring areas also display an unemployment rate much lower than the domestic one . However this asymmetry is only observed in the time period before the EU enlargement. The same applies to the asymmetry found in the effect of the inflow of unemployed from the areas with high unemployment rate and in the effect of the stock of unemployed from low unemployed regions: these are only statistically significant in the period before May 2004.

In Latvia, the asymmetry of spillovers seems to be weak. Meanwhile, spillovers from foreign unemployed inflow seems to be lower whenever the unemployment situation in the neighboring area is different from the domestic one (disregarding the sense).

As to the effects of population density, when the region itself is dense the foreign inflow of vacancies lowers local matches in Latvia, while in Slovenia this effect is observed for unemployed inflow.

6 Conclusions

We investigate the process of worker-firm matching in three new EU member states (Latvia, Slovenia and Estonia) by estimating the aggregate matching function.

We first assess the correct specification of the matching process. Recent developments in related literature by Coles and Smith (1998), Gregg and Petrongolo (2002) and Coles and Petrongolo (2003) suggest that traditionally estimated matching functions, which determine the outflows from unemployment by beginning of period stocks of unemployed and vacancies, may be misspecified. They show that not only stocks but also flows of unemployed and vacancies intensively participate in the matching process. Following this intuition, which is enforced by the descriptive statistics on our data and recent empirical findings of Dmitrijeva and Hazans [2007], we estimate both stock-stock and stock-flow matching functions.

When estimating the matching function in its traditional stock-stock setting either on Latvian or on combined Latvian and Estonian data, we find that the stock of vacancies has no explanatory power. The elasticity of outflows from unemployment with respect to the number of vacant jobs in stock is low, in contrast with the results for many West European countries, but similarly to other Central and Eastern European transition countries (see Munich et al. [1999]). The estimation including both stocks and flows as explanatory variables confirms our intuition for the presence of stock-flow patterns in the matching process: the key determinants of outflows to employment are the stock of unemployed and the inflow of new vacancies.

The theory underlying the stock-flow matching, derived from Coles and Smith (1998), suggests that such patterns result from the non-random nature of the matching process. One of the main assumptions concerns the presence of systematic elements in the behavior of unemployed: they only consider new job proposals (ignoring the old) when searching for jobs. Although our estimations confirm that matching in Latvia and Estonia is realized between the stocks of unemployed and the flows of new vacancies, it is difficult to derive the straightforward conclusion on the non-randomness of matching process. Another look on vacancy data highlights that in Latvia the majority of vacancies are new vacancies. Most of these are filled rapidly (within one month) and the remaining stock is therefore insignificant, which implies a high vacancy turnover rate. We believe, therefore, that stock-flow patterns in matching in Latvian and Estonian labour market do not result from differentiation between old versus new vacancies by the unemployed, but from dominant role of labour demand. Generally speaking the above findings suggest a stock-flow setting to be the only relevant for describing a matching process in a high unemployment - low labour demand environment, typical for the transition countries.

Also in Slovenia the matching process is better described by a stock-flow matching function, than by a traditional stock-stock function. Similarly to Baltic States, stock of unemployed and the inflow of vacancies participate very intensively in match creation in Slovenia. Meanwhile, the inflow of unemployed, which does not play an important role in matching process in Latvia, significantly contributes to explaining the outflows from unemployment in Slovenia.

Thus, while the patterns of the matching process are different between the Baltic states and Slovenia, in both cases a stock-flow matching function is the most appropriate for describing this process.

Comparing the aggregate efficiency of the matching process, Slovenian labour market seems to be less subject to frictions, comparing to the Baltic States. This is supported by the fact that the returns to scale in the matching function are constant in Latvia and Estonia and increasing in Slovenia. Regarding the temporal dynamics, the efficiency of the labour market in terms of worker-firm matching is increasing over time in Latvia but seems to decrease in Estonia and Slovenia.

The improvement in the efficiency of matching over time in Latvia can be partially explained by increasing efficiency of active labour market policy programs. It can also point to the reduction of macroeconomic mismatch and imbalances (better adequacy to labour demand of education and skills of Latvian population, higher labour mobility, ect.) or / and on the development of other factors, that speed up the matching process.

In Latvia, Estonia and Slovenia the role of labour demand in creating new hires is very important. However, the results also feature the development of a new trend: after the EU accession the role of labour demand in the matching process becomes weaker, but the role of labour supply substantially increases. This trend is the most pronounced in Slovenia.

Cross-region comparisons reveal that matching efficiency has been heterogenous across space. In Latvia matching is least efficient in depressed eastern part of Latvia (Rezeknes and Daugavpils cities, Ludzas, Daugavpils and Rezeknes regions) and in Liepaja and Jelgava cities, while the highest efficiency characterized Valkas, Saldus, Limbazhu regions. In Estonia, the matching efficiency is not different from the one in the capital city of Latvia (Riga). In Slovenia the regions with the weakest performance in terms of matching are Celje and Maribor and those with the best performance are Tribovolje and Trevnica.

In Latvia regional distribution of matching efficiency can not be attributed to the population density in the regions, but in Slovenia matching efficiency seems to be lower in the areas, where the population density is high.

Following Burda and Profit [1996], Burgess and Profit [2001], Ahtonen [2005] we also allow for spatial interactions in the matching process. We estimate spatially augmented matching function on Latvian and Slovenian data and show that spatial spillovers exist and are statistically significant in both countries. In Latvia the inflow of new vacancies in the neighboring areas positively affects local outflows to employment, while the increase in foreign unemployment decreases local outflows to jobs (mostly in the time period before Latvia's accession to EU), suggesting that unemployed widen their search to the neighboring areas. In Slovenia local outflows to jobs increase with the inflows into unemployment in neighboring regions.

Since the magnitude of spatial spillover effects can vary across regions, we investigate whether it is affected by the unemployment rate difference between local and neighboring regions. We also analyze wherever the spillovers to the regions with high population density are different from the ones to other regions.

While in Latvia the asymmetry of spillovers is weak, in Slovenia the extent of spillovers seem to vary depending on economic context in neighboring regions. The effects, however, are statistically significant only in the period before EU enlargement.

Population density also matters for the magnitude of a spillover for some variables: foreign inflow of vacancies lowers local hires in dense regions of Latvia, while in Slovenia local matches are negatively affected by the inflow of new unemployed in neighboring regions, if local population density is higher than national average.

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7 Appendixes

Table 6: **Descriptive statistics, aggregated data**

Variable	**Mean**	**S.d.**	**Min**	**Max**	**Obs.**	**Mean**	
	Latvia 1:1999 - 07:2006					**(a)**	**(b)**
Matches	3377	527	2520	4832	91	3303	3554
Stock of unemployed	94733	10951	73333	121760	91	98801	85092
Inflow of unemployed	8901	953	6699	11679	91	9095	8442
Stock of vacant jobs	4596	3166	1721	16378	91	2985	8417
Inflow of vacant jobs	4725	1139	2575	7829	91	4216	5931
Secondary job	51416	10544	36324	72089	90	45551	65852
	Estonia 1:2003 - 12:2006					**(a)**	**(b)**
Matches	1601	398	674	2435	48	1756	1523
Stock of unemployed	27902	9205	11989	43606	48	37518	23094
Inflow of unemployed	3730	1289	1352	7348	48	4926	3133
Stock of vacant jobs	4968	2389	1707	9210	48	2249	6327
Inflow of vacant jobs	1928	788	623	3804	48	1197	2293
Secondary job	21572	2841	16700	29200	46	23275	20663
	Slovenia 1:2000 - 12:2006					**(a)**	**(b)**
Matches	4537	899	2172	7279	84	4521	4562
Stock of unemployed	97045	7548	78303	116243	84	101788	89339
Inflow of unemployed	7522	1876	4353	11770	84	7353	7796
Inflow of vacant jobs	14076	3116	9098	22699	84	12139	17223
Secondary job	24009	6939	12700	37300	82	19702	31473

Notes: Variables are aggregated for all regions, frequency - monthly. Means (a) and (b) refer to mean values of the variables for two time periods: (a) - before April 2004, (b) - after this date.

Table 7: **Descriptive statistics on panel data (regions)**

Variable	Mean	Variation	S.d.	Min	Max	Obs.	
	Latvia: time period 01:1999 - 07:2006						
Matches (Outflows	102	overall	170	5	1478	Nit	3003
from unemployment		between	169	20	1027	Ni	33
to employment)		within	37	-200	553	Nt	91
Stock of unemployed	2871	overall	3029	419	26369	Nit	3003
		between	3000	551	18089	Ni	33
		within	670	-908	11151	Nt	91
Inflow of unemployed	270	overall	405	30	3567	Nit	3003
		between	404	54	2447	Ni	33
		within	75	-415	1390	Nt	91
Stock of vacant jobs	139	overall	681	0	11566	Nit	3003
		between	562	2	3258	Ni	33
		within	398	-1961	8448	Nt	91
Inflow of vacant jobs	143	overall	440	0	4767	Nit	3003
		between	427	16	2507	Ni	33
		within	131	-973	2403	Nt	91
Secondary job	2751	overall	8842	191	72089	Nit	2970
		between	8778	274	51416	Ni	33
		within	1857	-12341	23424	Nt	90
	Slovenia: time period 01:2000 - 12:2006						
Matches (Outflows	378	overall	236	45	1216	Nit	1008
from unemployment		between	221	163	866	Ni	12
to employment)		within	104	-76	870	Nt	84
Stock of unemployed	8087	overall	5235	2507	24121	Nit	1008
		between	5375	2991	19406	Ni	12
		within	947	3846	12802	Nt	84
Inflow of unemployed	627	overall	413	123	2365	Nit	1008
		between	381	261	1515	Ni	12
		within	193	24	1477	Nt	84
Inflow of vacant jobs	1173	overall	1181	138	7431	Nit	1008
		between	1166	288	4633	Ni	12
		within	383	-806	3971	Nt	84
Secondary job	24009	overall	6900	12700	37300	Nit	984
		between				Ni	1
		within				Nt	82

Notes: (1)N_{it} - total observation number; N_i - number of regions; N_t - number of time periods (months). (2) Between variation is constructed by calculating the means over time for every region ($\overline{x_i}$); Within variation represents the deviation of individual observations from region's average ($x_{it} - \overline{x_i} + \overline{\overline{x}}$) and can naturally be negative.

Table 8: **Data description and sources**

Variable	**Country**	**Nr. of months**	**Nr. of regions**	**Description**	**Source**
Matches	Latvia	91 (01:1999-07:2006)	33 (regional units of SEAL)	Outflows from registered	SEAL
	Estonia	48 (01:2003-12:2006)	1 (aggregate data)	unemployment to employment.	ELMB
	Slovenia	84 (01:2000-12:2006)	12 (regional units of ESS)		ESS
Stock of unemployed	Latvia	91 (01:1999-07:2006)	33 (regional units of SEAL)	End-month stock of registered	SEAL
	Estonia	48 (01:2003-12:2006)	1 (aggregate data)	unemployed.	ELMB
	Slovenia	84 (01:2000-12:2006)	12 (regional units of ESS)		ESS
Inflow of unemployed	Latvia	91 (01:1999-07:2006)	33 (regional units of SEAL)	Monthly inflow into registered	SEAL
	Estonia	48 (01:2003-12:2006)	1 (aggregate data)	unemployed.	ELMB
	Slovenia	84 (01:2000-12:2006)	12 (regional units of ESS)		ESS
Stock of vacant jobs	Latvia	91 (01:1999-07:2006)	33 (regional units of SEAL)	End-month stock of vacant jobs,	SEAL
	Estonia	48 (01:2003-12:2006)	1 (aggregate data)	posted through SEAL/ELMB	ELMB
	Slovenia	Not available (ESS does not perform accounting of vacancy stocks)			ESS
Inflow of vacant jobs	Latvia	91 (01:1999-07:2006)	33 (regional units of SEAL)	Monthly inflow of new vacancies,	SEAL
	Estonia	48 (01:2003-12:2006)	1 (aggregate data)	posted through SEAL/ELMB.	ELMB
	Slovenia	84 (01:2000-12:2006)	12 (regional units of ESS)	Total monthly inflow of new vacancies	ESS
				(registration with ESS is obligatory).	
Secondary job	Latvia	90 (01:1999-06:2006)	33 (regional units of SEAL)	Average number of employed	SCBL
	Estonia	46 (01:2003-10:2006)	1 (aggregate data)	at secondary job.	EUROSTAT
	Slovenia	82 (01:2000-10:2006)	1 (aggregate data)		EUROSTAT
Unemployment rates	Latvia	1 (12:2005)	33 (regional units of SEAL)	Regional unemployment rate	SEAL
	Slovenia	12 (01:2006-12:2006)	12 (regional units of ESS)		ESS
Population density	Latvia	1 (12:2005)	33 (regional units of SEAL)	Regional unemployment rate	CSBL
	Slovenia	1 (annual for 2005)	12 (statistical regions)		SORS

Notes: (1) SEAL: State Employment Agency of Latvia; ELMB: Estonian Labour Market Board; ESS: Employment Service of Slovenia; CSBL: Central Statistical Bureau of Latvia; SORS: Statistical Office of the Republic of Slovenia. (2) Secondary job data: Original monthly data is only available for Latvia for the period 1999 2003, in all other cases quarterly data is interpolated to monthly.

Table 9: **Latvia - Estimation results: stock-stock matching function (time period 01:1999 - 07:2006)**

Dep. variable: ln Matches (outflows from registered unemployment to employment)	GLS [I]	GLS [II]	GLS [III]	GLS [IV]	GLS [V]	PCSE [I]	PCSE [II]	PCSE [III]	PCSE [IV]	PCSE [V]
ln unemployed (stock)	**0.727*** **	**0.737*** **	**0.759*** **	**0.747*** **	**0.769*** **	**0.746*** **	**0.759*** **	**0.764*** **	**0.775*** **	**0.805*** **
	[0.068]	[0.066]	[0.068]	[0.066]	[0.065]	[0.115]	[0.107]	[0.106]	[0.101]	[0.098]
ln vacancies (stock)	**0.025*** **	**0.029*** **	**0.030*** **	**0.027*** **	**0.015** **	**0.022** **	**0.026*** **	**0.026*** **	**0.024** **	**0.012**
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.010]	[0.010]	[0.010]	[0.010]	[0.009]
Indicator for local labour demand		**0.797*** **	**0.799*** **	**0.792*** **	**0.810*** **		**0.770*** **	**0.771*** **	**0.763*** **	**0.783*** **
		[0.069]	[0.070]	[0.069]	[0.069]		[0.134]	[0.134]	[0.134]	[0.132]
Time trend (annual)	**0.033*** **	**0.032*** **	**0.033*** **	**0.036*** **	**0.028*** **	**0.032*** **	**0.032*** **	**0.032*** **	**0.036*** **	**0.029*** **
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.011]	[0.010]	[0.010]	[0.010]	[0.010]
Constant	**-65.64*** **	**-64.87*** **	**-66.93*** **	**-71.91*** **	**-57.65*** **	**-65.22*** **	**-65.01*** **	**-66.15*** **	**-72.98*** **	**-59.23*** **
	[8.979]	[8.604]	[8.695]	[8.929]	[9.126]	[22.492]	[19.596]	[19.534]	[19.889]	[21.238]
UBA 1 (after 01/08/2000)				**0.039***					**0.044**	
				[0.022]					[0.061]	
UBA 2 (after 01/02/2003)				**-0.081*** **					**-0.086**	
				[0.021]					[0.059]	
MWA1 (after 01/07/2001)					**-0.02**					**-0.022**
					[0.021]					[0.058]
MWA2 (after 01/01/2003)					**-0.103*** **					**-0.109***
					[0.022]					[0.060]
MWA3 (after 01/01/2004)					**-0.014**					**-0.033**
					[0.023]					[0.063]
MWA4 (after01/01/2006)					**0.163*** **					**0.174** **
					[0.030]					[0.083]
Regional dummies (test)	1372***	1504***	998***	1635***	1743***	2333***	2805***	1375***	3008***	3282***
Quarterly dummies (test)	79***	102***	110***	112***	117***	11**	16***	17***	18***	20***
Returns to Scale	0.75	0.77	0.79	0.77	0.78	0.77	0.78	0.79	0.80	0.82
Constant returns to scale, test	13***	11.96***	9.31***	11.41***	10.65***	4**	4.03**	3.82*	3.89*	3.45*
Observations	2769	2738	2648	2738	2738	2769	2738	2648	2738	2738
Regions	33	33	32	33	33	33	33	32	33	33
Coefficient of determination R2						0.87	0.87	0.87	0.87	0.88
Heteroscedasticity, test	898.6***	892***	643***	886***	820***					
Autocorrelation, test	20.9***	20.10***	19.59***	19.52***	18.98***					

Table 10: **Latvia - Estimation results: stock-stock matching function (time period 01:1999 - 04:2004)**

Dep. variable: ln Matches (outflows from registered unemployment to employment)	GLS [I]	GLS [II]	GLS [III]	GLS [IV]	GLS [V]	PCSE [I]	PCSE [II]	PCSE [III]	PCSE [IV]	PCSE [V]
ln unemployed (stock)	**0.936*** **	**0.948*** **	**0.983*** **	**1.003*** **	**0.901*** **	**0.980*** **	**0.991*** **	**1.005*** **	**1.050*** **	**0.949*** **
	[0.083]	[0.078]	[0.080]	[0.081]	[0.079]	[0.145]	[0.126]	[0.125]	[0.121]	[0.121]
ln vacancies (stock)	**0.003**	**0.003**	**0.004**	**0.004**	**0.002**	**-0.004**	**-0.003**	**-0.003**	**-0.003**	**-0.005**
	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.010]	[0.010]	[0.010]	[0.010]	[0.010]
Indicator for local labour demand		**0.886*** **	**0.889*** **	**0.872*** **	**0.894*** **		**0.841*** **	**0.842*** **	**0.827*** **	**0.843*** **
		[0.071]	[0.071]	[0.071]	[0.070]		[0.131]	[0.130]	[0.130]	[0.129]
Time trend (annual)	**0.014** **	**0.012** **	**0.012** **	**0.021*** **	**0.01**	**0.014**	**0.012**	**0.012**	**0.021**	**0.009**
	[0.006]	[0.005]	[0.005]	[0.006]	[0.007]	[0.016]	[0.012]	[0.012]	[0.013]	[0.016]
Constant	**-30.59** **	**-27.48** **	**-28.13** **	**-44.19*** **	**-22.69**	**-31.02**	**-27.28**	**-27.61**	**-45.253** *	**-19.93**
	[12.200]	[11.122]	[11.156]	[12.478]	[14.523]	[31.833]	[24.663]	[24.485]	[27.101]	[32.721]
UBA 1 (after 01/08/2000)				**0.047** **					**0.059**	
				[0.020]					[0.051]	
UBA 2 (after 01/02/2003)				**-0.036** *					**-0.037**	
				[0.021]					[0.055]	
MWA1 (after 01/07/2001)					**0.004**					**0.007**
					[0.020]					[0.052]
MWA2 (after 01/01/2003)					**-0.051** **					**-0.043**
					[0.024]					[0.063]
MWA3 (after 01/01/2004)					**0.074** **					**0.084**
					[0.035]					[0.089]
Regional dummies (test)	1027***	1192***	786***	1251***	1261***	2459***	2878***	1331***	3067***	3034***
Quarterly dummies (test)	58***	84***	92***	91***	91***	9**	16***	17***	18***	18***
Returns to Scale	0.94	0.95	0.99	1.01	0.90	0.98	0.99	1.00	1.05	0.94
Constant returns to scale, test	0.53	0.39	0.03	0.01	1.50	0.03	0.01	0.00	0.15	0.21
Observations	1954	1954	1890	1954	1954	1954	1954	1890	1954	1954
Regions	33	33	32	33	33	33	33	32	33	33
Coefficient of determination R2						0.89	0.90	0.90	0.90	0.90
Heteroscedasticity, test	468.1***	551***	534***	542***	571***					
Autocorrelation, test	14.7***	13.57***	13.02***	13.39***	13.25***					

Table 11: **Latvia - Estimation results: stock-stock matching function (time period 05:2004 - 07:2006)**

Dep. variable: ln Matches (outflows from registered unemployment to employment)	GLS [I]	GLS [II]	GLS [III]	GLS [V]	PCSE [I]	PCSE [II]	PCSE [III]	PCSE [V]
ln unemployed (stock)	**0.965*** **	**1.026*** **	**1.082*** **	**1.157*** **	**1.086*** **	**1.130*** **	**1.151*** **	**1.198*** **
	[0.188]	[0.189]	[0.194]	[0.195]	[0.311]	[0.316]	[0.317]	[0.321]
ln vacancies (stock)	**0.020***	**0.025** **	**0.023***	**0.023***	**0.018**	**0.021**	**0.02**	**0.019**
	[0.012]	[0.012]	[0.012]	[0.012]	[0.015]	[0.015]	[0.015]	[0.015]
Indicator for local labour demand		**-0.014**	**-0.02**	**-0.055**		**0.253**	**0.256**	**0.209**
		[0.326]	[0.328]	[0.325]		[0.469]	[0.470]	[0.461]
Time trend (annual)	**0.137*** **	**0.169*** **	**0.186*** **	**0.137*** **	**0.169*** **	**0.197*** **	**0.204*** **	**0.165** **
	[0.026]	[0.028]	[0.029]	[0.030]	[0.059]	[0.063]	[0.064]	[0.078]
Constant	**-276.92*** **	**-342.77*** **	**-376.44*** **	**-278.92*** **	**-341.59*** **	**-399.76*** **	**-413.49*** **	**-335.67** **
	[54.509]	[56.924]	[59.359]	[61.062]	[120.446]	[128.056]	[129.060]	[157.550]
MWA4 (after01/01/2006)				**0.107*** **				**0.093**
				[0.040]				[0.125]
Regional dummies (test)	1344***	1294***	952***	1352***	485169***	22081***	1206***	1502***
Quarterly dummies (test)	60***	64***	70***	68***	9**	10**	11***	11**
Returns to Scale	0.99	1.05	1.10	1.18	1.10	1.15	1.17	1.22
Consant returns to scale, test	0.01	0.07	0.29	0.83	0.11	0.23	0.29	0.46
Observations	815	784	758	784	815	784	758	784
Regions	33	33	32	33	33	33	32	33
Coefficient of determination R2					0.93	0.94	0.93	0.94
Heteroscedasticity, test	347.7***	338***	258***	397***				
Autocorrelation, test	8.7***	7.86***	7.67***	8.06***				

Table 12: **Latvia - Estimation results: stock-flow matching function (time period 01:1999 - 07:2006)**

Dep. variable: ln Matches (outflows from registered unemployment to employment)	GLS [I]	GLS [II]	GLS [III]	GLS [IV]	GLS [V]	PCSE [I]	PCSE [II]	PCSE [III]	PCSE [IV]	PCSE [V]
ln unemployed (stock)	**0.658*** **	**0.681*** **	**0.699*** **	**0.673*** **	**0.713*** **	**0.713*** **	**0.730*** **	**0.735*** **	**0.730*** **	**0.767*** **
	[0.063]	[0.062]	[0.064]	[0.062]	[0.061]	[0.102]	[0.096]	[0.096]	[0.092]	[0.089]
ln unemployed (flow)	**0.049***	**0.047***	**0.034**	**0.048***	**0.062** **	**0.003**	**0.004**	**0.001**	**0.004**	**0.02**
	[0.029]	[0.029]	[0.029]	[0.029]	[0.029]	[0.046]	[0.043]	[0.043]	[0.043]	[0.042]
ln vacancies (stock)	**0.027*** **	**0.030*** **	**0.030*** **	**0.026*** **	**0.017** **	**0.022** **	**0.025*** **	**0.026*** **	**0.022** **	**0.012**
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.009]	[0.009]	[0.009]	[0.009]	[0.008]
ln vacancies (flow)	**0.209*** **	**0.203*** **	**0.202*** **	**0.203*** **	**0.199*** **	**0.190*** **	**0.188*** **	**0.188*** **	**0.189*** **	**0.184*** **
	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]	[0.016]	[0.015]	[0.015]	[0.015]	[0.014]
Indicator for local labour demand		**0.749*** **	**0.748*** **	**0.748*** **	**0.762*** **		**0.737*** **	**0.737*** **	**0.734*** **	**0.750*** **
		[0.066]	[0.066]	[0.066]	[0.065]		[0.118]	[0.118]	[0.117]	[0.116]
Time trend (annual)	**0.016*** **	**0.017*** **	**0.018*** **	**0.019*** **	**0.015*** **	**0.021** **	**0.021** **	**0.021** **	**0.023*** **	**0.019** **
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.010]	[0.008]	[0.008]	[0.008]	[0.009]
Constant	**-34.74*** **	**-36.01*** **	**-38.021*** **	**-39.74*** **	**-32.40*** **	**-43.83** **	**-44.34*** **	**-45.31*** **	**-49.00*** **	**-40.88** **
	[8.372]	[8.098]	[8.179]	[8.460]	[8.649]	[19.714]	[17.031]	[16.995]	[17.294]	[18.445]
UBA 1 (after 01/08/2000)				**0.017**					**0.017**	
				[0.021]					[0.053]	
UBA 2 (after 01/02/2003)				**-0.083*** **					**-0.097***	
				[0.020]					[0.051]	
MWA1 (after 01/07/2001)					**0.004**					**-0.007**
					[0.020]					[0.050]
MWA2 (after 01/01/2003)					**-0.096*** **					**-0.108** **
					[0.021]					[0.052]
MWA3 (after 01/01/2004)					**-0.017**					**-0.028**
					[0.022]					[0.054]
MWA4 (after01/01/2006)					**0.139*** **					**0.148** **
					[0.028]					[0.072]
Regional dummies (test)	714***	762***	654***	789***	831***	1220***	1268***	901***	1340***	1441***
Quarterly dummies (test)	52***	75***	80***	78***	84***	8**	14***	15***	15***	17***
Returns to Scale	0.94	0.96	0.96	0.95	0.99	0.93	0.95	0.95	0.94	0.98
Constant returns to scale, test	0.68	0.33	0.26	0.55	0.02	0.4	0.25	0.25	0.31	0.03
Observations	2768	2737	2647	2737	2737	2768	2737	2647	2737	2737
Regions	33	32	33	33	33	33	32	33	33	33
Coefficient of determination R2						0.87	0.87	0.87	0.88	0.88
Heteroscedasticity, test	980.7***	1011***	709***	974***	973***					
Autocorrelation, test	20.6***	20.09***	19.54***	19.47***	18.97***					

Table 13: **Latvia - Estimation results: stock-flow matching function (time period 01:1999 - 04:2004)**

Dep. variable: ln Matches (outflows from registered unemployment to employment)	GLS [I]	GLS [II]	GLS [III]	GLS [IV]	GLS [V]	PCSE [I]	PCSE [II]	PCSE [III]	PCSE [IV]	PCSE [V]
ln unemployed (stock)	**0.931*** **	**0.947*** **	**0.985*** **	**0.979*** **	**0.938*** **	**0.971*** **	**0.988*** **	**1.001*** **	**1.025*** **	**0.971*** **
	[0.078]	[0.074]	[0.075]	[0.075]	[0.074]	[0.129]	[0.114]	[0.113]	[0.109]	[0.110]
ln unemployed (flow)	**0.038**	**0.037**	**0.024**	**0.04**	**0.041**	**-0.005**	**-0.001**	**-0.005**	**0.001**	**-0.001**
	[0.034]	[0.033]	[0.033]	[0.033]	[0.033]	[0.052]	[0.046]	[0.046]	[0.046]	[0.046]
ln vacancies (stock)	**0.002**	**0.002**	**0.003**	**0.003**	**0.001**	**-0.007**	**-0.006**	**-0.006**	**-0.006**	**-0.007**
	[0.009]	[0.008]	[0.008]	[0.008]	[0.008]	[0.010]	[0.009]	[0.009]	[0.009]	[0.009]
ln vacancies (flow)	**0.216*** **	**0.206*** **	**0.202*** **	**0.207*** **	**0.207*** **	**0.187*** **	**0.182*** **	**0.180*** **	**0.183*** **	**0.182*** **
	[0.013]	[0.013]	[0.013]	[0.013]	[0.013]	[0.019]	[0.017]	[0.017]	[0.017]	[0.017]
Indicator for local labour demand		**0.825*** **	**0.825*** **	**0.818*** **	**0.834*** **		**0.801*** **	**0.801*** **	**0.791*** **	**0.803*** **
		[0.067]	[0.067]	[0.067]	[0.066]		[0.115]	[0.115]	[0.114]	[0.114]
Time trend (annual)	**0.010***	**0.009***	**0.009***	**0.018*** **	**0.016** **	**0.011**	**0.01**	**0.01**	**0.019***	**0.014**
	[0.005]	[0.005]	[0.005]	[0.006]	[0.007]	[0.014]	[0.010]	[0.010]	[0.011]	[0.014]
Constant	**-23.337** **	**-22.159** **	**-23.081** **	**-40.247*** **	**-36.175*** **	**-25.943**	**-23.773**	**-23.959**	**-43.558***	**-31.183**
	[11.266]	[10.414]	[10.452]	[11.527]	[13.638]	[27.856]	[21.299]	[21.181]	[23.109]	[28.339]
UBA 1 (after 01/08/2000)				**0.027**					**0.034**	
				[0.018]					[0.043]	
UBA 2 (after 01/02/2003)				**-0.062*** **					**-0.067**	
				[0.019]					[0.047]	
MWA1 (after 01/07/2001)					**0.018**					**0.013**
					[0.018]					[0.044]
MWA2 (after 01/01/2003)					**-0.078*** **					**-0.071**
					[0.023]					[0.055]
MWA3 (after 01/01/2004)					**0.005**					**0.035**
					[0.033]					[0.077]
Regional dummies (test)	668***	745***	628***	770***	759***	1281***	1468***	1012***	1528***	1546***
Quarterly dummies (test)	50***	75***	81***	80***	66***	9**	17***	18***	19***	16***
Returns to Scale	1.19	1.19	1.21	1.23	1.19	1.15	1.16	1.17	1.20	1.15
Constant returns to scale, test	5**	5.92**	7.05**	7.96	5.4**	1.02	1.69	1.89	2.86*	1.48
Observations	1953	1953	1889	1953	1953	1953	1953	1889	1953	1953
Regions	33	32	33	33	33	33	32	33	33	33
Coefficient of determination R2						0.90	0.91	0.91	0.91	0.91
Heteroscedasticity, test	652.4***	779***	755***	793***	815***					
Autocorrelation, test	14.9***	14.24***	13.7***	13.96***	13.88***					

Table 14: **Latvia - Estimation results: stock-flow matching function (time period 05:2004 - 07:2006)**

Dep. variable: ln Matches (outflows from registered unemployment to employment)	GLS [I]	GLS [II]	GLS [III]	GLS [V]	PCSE [I]	PCSE [II]	PCSE [III]	PCSE [V]
ln unemployed (stock)	**0.867*** **	**0.926*** **	**0.972*** **	**1.037*** **	**1.014*** **	**1.053*** **	**1.070*** **	**1.112*** **
	[0.177]	[0.180]	[0.183]	[0.187]	[0.277]	[0.281]	[0.281]	[0.288]
ln unemployed (flow)	**0.062**	**0.049**	**0.044**	**0.046**	**0.021**	**0.008**	**0.005**	**0.004**
	[0.052]	[0.054]	[0.055]	[0.054]	[0.090]	[0.092]	[0.092]	[0.091]
ln vacancies (stock)	**0.033*** **	**0.037*** **	**0.036*** **	**0.034*** **	**0.032** **	**0.036*** **	**0.035** **	**0.034** **
	[0.011]	[0.012]	[0.012]	[0.012]	[0.013]	[0.014]	[0.014]	[0.014]
ln vacancies (flow)	**0.205*** **	**0.198*** **	**0.201*** **	**0.197*** **	**0.194*** **	**0.192*** **	**0.193*** **	**0.192*** **
	[0.019]	[0.020]	[0.020]	[0.020]	[0.026]	[0.027]	[0.027]	[0.027]
Indicator for local labour demand		**-0.152**	**-0.169**	**-0.188**		**0.175**	**0.173**	**0.135**
		[0.298]	[0.300]	[0.296]		[0.411]	[0.411]	[0.403]
Time trend (annual)	**0.102*** **	**0.130*** **	**0.141*** **	**0.100*** **	**0.127** **	**0.151*** **	**0.156*** **	**0.121***
	[0.026]	[0.027]	[0.028]	[0.029]	[0.051]	[0.054]	[0.054]	[0.066]
Constant	**-209.287*** **	**-264.281*** **	**-287.838*** **	**-206.659*** **	**-260.087** **	**-308.200*** **	**-318.329*** **	**-248.947***
	[53.243]	[55.648]	[57.351]	[59.298]	[103.708]	[109.544]	[109.979]	[133.363]
MWA4 (after01/01/2006)				**0.095** **				**0.085**
				[0.037]				[0.108]
Regional dummies (test)	642***	632***	570***	638***	13214***	39894***	5482***	6876***
Quarterly dummies (test)	42***	43***	48***	46***	7.7*	9**	9**	9**
Returns to Scale	1.17	1.21	1.25	1.31	1.26	1.29	1.30	1.34
Constant returns to scale, test	0.73	1.1	1.55	2.33	0.79	0.92	1.01	1.22
Observations	815	784	758	784	815	784	758	784
Regions	33	32	33	33	33	32	33	33
Coefficient of determination R2					0.94	0.94	0.94	0.94
Heteroscedasticity, test	380.8***	423***	407***	475***				
Autocorrelation, test	8.1***	7.44***	7.18***	7.5***				

Table 15: **Latvia and Estonia - Estimation results: stock-stock matching function**

Dep.var: ln Matches (outflows from registered unemployment to emp.)	Time period 01:2003 - 07:2006 GLS [I]	GLS [II]	PCSE [I]	PCSE [II]	Time period 01:2003 -04:2004 GLS [I]	GLS [II]	PCSE [I]	PCSE [II]	Time period 05:2004 - 07:2006 GLS [I]	GLS [II]	PCSE [I]	PCSE [II]
ln unemployed (stock)	**0.658*** **	**0.686*** **	**0.665*** **	**0.691*** **	**0.848*** **	**0.878*** **	**0.957**	**0.985*** **	**0.853*** **	**0.927*** **	**0.979*** **	**1.046*** **
	[0.091]	[0.090]	[0.180]	[0.171]	[0.211]	[0.186]	[0.000]	[0.289]	[0.154]	[0.154]	[0.252]	[0.256]
ln vacancies (stock)	**0.007**	**0.014**	**0.001**	**0.006**	**0.008**	**0.017**	**-0.009**	**-0.003**	**0.018**	**0.023***	**0.015**	**0.018**
	[0.010]	[0.010]	[0.013]	[0.013]	[0.017]	[0.016]	[0.000]	[0.019]	[0.012]	[0.012]	[0.015]	[0.015]
Indicator for local labour demand		**0.723*** **		**0.737*** **		**1.129*** **		**0.876*** **		**0.108**		**0.335**
		[0.152]		[0.266]		[0.162]		[0.281]		[0.306]		[0.424]
Time trend (annual)	**0.104*** **	**0.112*** **	**0.114*** **	**0.121*** **	**0.140*** **	**0.145*** **	**0.128**	**0.139***	**0.130*** **	**0.162*** **	**0.162*** **	**0.192*** **
	[0.011]	[0.011]	[0.029]	[0.028]	[0.026]	[0.023]	[0.000]	[0.076]	[0.025]	[0.026]	[0.058]	[0.062]
Constant	**-208.9**	**-224.9**	**-228.1**	**-243.4**	**-282.2**	**-292.9**	**-258.6**	**-280.5**	**-261.7**	**-327.8**	**-327.1**	**-387.6**
	[21.744]	[21.744]	[59.512]	[57.846]	[51.429]	[46.226]	[0.000]	[152.829]	[51.072]	[53.468]	[117.937]	[126.408]
Regional dummies (test)	1508***	1504***	6199***	6123***	1004***	1111***		9720***	1417***	1374***	47379***	29653***
Quarterly dummies (test)	83***	97***	10**	14***	41***	66***		8**	62***	67***	9**	10**
Returns to scale	0.66	0.70	0.67	0.70	0.86	0.90	0.95	0.98	0.87	0.95	0.99	1.06
CRS, test	13***	11***	3.5*	3.2*	0.46	0.32		0	0.69	0.11	0	0.06
Observations	1335	1304	1335	1304	493	493	493	493	842	811	842	811
Regions	34	34	34	34	34	34	34	34	34	34	34	34
Coef. of det. R2			0.94	0.94			0.96	0.97			0.96	0.96
Heteroscedasticity, test	649.0***	608.5***			685.1***	1130.1***			337.7***	314.4***		
Autocorrelation, test	10.0***	9.4***			2.2**	1.6*			8.7***	7.8***		

Table 16: **Latvia and Estonia - Estimation results: stock-flow matching function**

Dep.var: ln Matches (outflows from registered unemployment to emp.)	Time period 01:2003 - 07:2006				Time period 01:2003 -04:2004				Time period 05:2004 - 07:2006			
	GLS [I]	GLS [II]	PCSE [I]	PCSE [II]	GLS [I]	GLS [II]	PCSE [I]	PCSE [II]	GLS [I]	GLS [II]	PCSE [I]	PCSE [II]
ln unemployed (stock)	**0.552*** **	**0.587*** **	**0.618*** **	**0.640*** **	**0.786*** **	**0.802*** **	**0.852*** **	**0.884*** **	**0.755*** **	**0.821*** **	**0.915*** **	**0.976*** **
	[0.090]	[0.089]	[0.167]	[0.161]	[0.194]	[0.177]	[0.260]	[0.254]	[0.140]	[0.142]	[0.227]	[0.229]
ln unemployed (flow)	**0.153*** **	**0.142*** **	**0.122***	**0.115***	**0.253*** **	**0.223*** **	**0.260*** **	**0.245*** **	**0.048**	**0.036**	**0.008**	**-0.001**
	[0.040]	[0.040]	[0.067]	[0.065]	[0.057]	[0.055]	[0.089]	[0.083]	[0.049]	[0.050]	[0.086]	[0.087]
ln vacancies (stock)	**0.016***	**0.021*** **	**0.01**	**0.015**	**0.004**	**0.011**	**-0.007**	**-0.003**	**0.031*** **	**0.035*** **	**0.030*** **	**0.034*** **
	[0.009]	[0.010]	[0.011]	[0.012]	[0.016]	[0.015]	[0.018]	[0.018]	[0.011]	[0.012]	[0.013]	[0.014]
ln vacancies (flow)	**0.203*** **	**0.195*** **	**0.194*** **	**0.190*** **	**0.255*** **	**0.236*** **	**0.225*** **	**0.213*** **	**0.213*** **	**0.206*** **	**0.199*** **	**0.197*** **
	[0.016]	[0.016]	[0.023]	[0.023]	[0.026]	[0.026]	[0.039]	[0.037]	[0.019]	[0.020]	[0.026]	[0.027]
Indicator for local labour demand		**0.598*** **		**0.600*** **		**0.869*** **		**0.640*** **		**0.004**		**0.268**
		[0.147]		[0.239]		[0.156]		[0.246]		[0.279]		[0.374]
Time trend (annual)	**0.080*** **	**0.087*** **	**0.093*** **	**0.099*** **	**0.085*** **	**0.093*** **	**0.082**	**0.089**	**0.091*** **	**0.118*** **	**0.118*** **	**0.143*** **
	[0.011]	[0.011]	[0.026]	[0.025]	[0.024]	[0.023]	[0.074]	[0.063]	[0.024]	[0.025]	[0.050]	[0.053]
Constant	**-162.6**	**-176**	**-187.3**	**-200.2**	**-174.8**	**-190.2**	**-168.6**	**-184.3**	**-186.1**	**-240.1**	**-239.7**	**-291**
	[21.596]	[21.779]	[52.852]	[51.606]	[48.169]	[44.882]	[147.377]	[126.489]	[48.434]	[50.911]	[101.583]	[107.810]
Regional dummies (test)	711***	713***	3347***	2803***	472***	509***	8473***	18725***	705***	694***	17576***	5444***
Quarterly dummies (test)	62***	68***	9**	12***	35***	51***	4.66	7.8*	41***	42***	7.2*	8**
Returns to scale	0.92	0.95	0.94	0.96	1.30	1.27	1.33	1.34	1.05	1.10	1.15	1.21
CRS, test	0.6	0.32	0.11	0.06	2.1	2.1	1.4	1.54	0.1	0.42	0.44	0.8
Observations	1335	1304	1335	1304	493	493	493	493	842	811	842	811
Regions	34	34	34	34	34	34	34	34	34	34	34	34
Coef. of det. R2			0.92	0.93			0.97	0.97			0.96	0.96
Heteroscedasticity, test	543.0***	504.0***			1172.4***	1977.5***			367.2***	367.6***		
Autocorrelation, test	9.8***	9.5***			2.5***	2.2**			8.0***	7.4***		

Table 17: **Slovenia - Estimation results: semi stock-flow matching function**

	Time period 01:2000 - 12:2006				Time period 01:2000 -04:2004				Time period 05:2004 - 12:2006			
Dep.var: ln Matches (outflows from registered unemployment to emp.)	GLS [I]	GLS [II]	PCSE [I]	PCSE [II]	GLS [I]	GLS [II]	PCSE [I]	PCSE [II]	GLS [I]	GLS [II]	PCSE [I]	PCSE [II]
ln unemployed (stock)	**0.559*** **	**0.581*** **	**0.570*** **	**0.597*** **	**0.683*** **	**0.661*** **	**0.720*** **	**0.701*** **	**0.662*** **	**0.929*** **	**0.688** **	**0.902*** **
	[0.094]	[0.095]	[0.110]	[0.105]	[0.152]	[0.152]	[0.182]	[0.183]	[0.195]	[0.217]	[0.348]	[0.350]
ln unemployed (flow)	**0.200*** **	**0.234*** **	**0.193*** **	**0.227*** **	**0.231*** **	**0.237*** **	**0.231*** **	**0.236*** **	**0.184*** **	**0.238*** **	**0.171***	**0.227*** **
	[0.031]	[0.031]	[0.063]	[0.064]	[0.043]	[0.043]	[0.082]	[0.082]	[0.043]	[0.044]	[0.095]	[0.095]
ln vacancies (flow)	**0.593*** **	**0.595*** **	**0.582*** **	**0.584*** **	**0.698*** **	**0.688*** **	**0.685*** **	**0.677*** **	**0.372*** **	**0.399*** **	**0.352*** **	**0.363*** **
	[0.037]	[0.037]	[0.068]	[0.068]	[0.059]	[0.060]	[0.089]	[0.088]	[0.061]	[0.061]	[0.103]	[0.104]
Indicator for labour demand		**0.278** **		**0.264**		**0.131**		**0.113**		**1.230*** **		**1.185***
		[0.111]		[0.282]		[0.129]		[0.305]		[0.244]		[0.691]
Time trend (annual)	**-0.029*** **	**-0.033*** **	**-0.029** **	**-0.032*** **	**-0.035*** **	**-0.037*** **	**-0.038** **	**-0.040** **	**0.019**	**0.021**	**0.023**	**0.027**
	[0.005]	[0.005]	[0.011]	[0.011]	[0.008]	[0.008]	[0.018]	[0.019]	[0.017]	[0.017]	[0.042]	[0.042]
Constant	**53.85*** **	**61.08*** **	**53.021** **	**60.061*** **	**62.76*** **	**67.28*** **	**69.16***	**72.74***	**-41.82**	**-49.76**	**-50.8**	**-59.99**
	[10.957]	[10.804]	[22.684]	[22.353]	[16.845]	[17.141]	[36.995]	[37.499]	[35.246]	[34.974]	[84.717]	[85.668]
Regional dummies (test)	236***	246***	179***	182***	154***	148***	118***	119***	70***	78***	122***	115***
Quarterly dummies (test)	142***	154***	26***	29***	108***	109***	23***	24***	34***	50***	4.82	7.1*
Returns to scale	1.35	1.41	1.34	1.41	1.61	1.59	1.64	1.61	1.22	1.57	1.21	1.49
CRS, test	11***	15***	6**	10***	15***	13***	11***	10***	1.11	6**	0.29	1.53
Observations	996	972	996	972	612	612	612	612	384	360	384	360
Regions												
Coef. of det. R2			0.91	0.91			0.91	0.91			0.96	0.97
Heteroscedasticity, test	92.1***	96.6***			50.8***	55.1***			37.8***	80.5***		
Autocorrelation, test	0.60	0.20			1.3*	1.5*			2.1**	2.1**		

Table 18: **Latvia - Estimation results: Spatially augmented stock-flow matching function (time period 01:1999 - 07:2006).**

Dep. Variable: ln Matches (outflows from registered unemployment to employment)	GLS [VI]	GLS [VII]	GLS [VIII]	GLS [IX]	PCSE [VI]	PCSE [VII]	PCSE [VIII]	PCSE [IX]
ln unemployed (stock)	**0.681*** **	**0.721*** **	**0.749*** **	**0.721*** **	**0.730*** **	**0.750*** **	**0.753*** **	**0.770*** **
	0.062	0.068	0.07	0.07	0.096	0.083	0.083	0.086
ln unemployed (flow)	**0.047***	**0.03**	**0.022**	**0.03**	**0.004**	**-0.011**	**-0.02**	**-0.008**
	0.029	0.032	0.032	0.032	0.043	0.037	0.037	0.037
ln vacancies (stock)	**0.030*** **	**0.023*** **	**0.022*** **	**0.023*** **	**0.025*** **	**0.018** **	**0.017** **	**0.017** **
	0.007	0.007	0.007	0.007	0.009	0.008	0.008	0.008
ln vacancies (flow)	**0.203*** **	**0.186*** **	**0.184*** **	**0.183*** **	**0.188*** **	**0.172*** **	**0.171*** **	**0.166*** **
	0.011	0.011	0.011	0.011	0.015	0.013	0.013	0.013
Indicator for local labour demand	**0.749*** **	**0.749*** **	**0.762*** **	**0.736*** **	**0.737*** **	**0.740*** **	**0.750*** **	**0.729*** **
	0.066	0.065	0.065	0.065	0.118	0.112	0.112	0.11
Time trend (annual)	**0.017*** **	**0.002**	**0.003**	**0**	**0.021** **	**0.005**	**0.006**	**0.004**
	0.004	0.004	0.004	0.004	0.008	0.009	0.009	0.009
Constant	**-36.0*** **	**-4.2**	**-6.8**	**-0.4**	**-44.3*** **	**-11.7**	**-12.4**	**-6.7**
	8.098	8.825	8.811	8.864	17.031	18.087	17.924	17.576
Indicators for common border with:								
Estonia	**0.279**	**-0.1**	**-0.017**	**-1.236**	**-0.438*** **	**0.089**	**0.145**	**-1.434**
	0.201	0.161	0.164	1.258	0.131	0.293	0.294	1.528
Russia	**-0.644*** **	**-0.256*** **	**0.794**	**-0.395*** **	**-0.01**	**-0.563*** **	**-0.542*** **	**-0.566*** **
	0.07	0.075	1.904	0.091	0.25	0.069	0.07	0.071
Byelorussia	**0.16**	**-0.161**	**-0.784**	**-1.549**	**-0.611*** **	**-0.003**	**-0.403** **	**-1.586**
	0.17	0.132	1.891	1.27	0.07	0.197	0.197	1.6
Lithuania	**-0.085**	**-0.545*** **	**0.127**	**-0.448*** **	**-0.199**	**-0.831*** **	**-0.553** **	**-2.151**
	0.178	0.112	1.912	0.069	0.256	0.096	0.239	1.569
Neighbouring region variables								
Overall spillover effect								
ln (W x unemployed (stock))		**-0.274*** **	**-0.301*** **	**-0.271*** **		**-0.276***	**-0.265***	**-0.286***
		0.095	**0.104**	**0.105**		**0.141**	**0.143**	**0.161**
ln (W x unemployed (flow))		**0.075***	**0.139*** **	**0.058**		**0.082**	**0.144***	**0.079**
		0.043	**0.049**	**0.053**		**0.067**	**0.076**	**0.079**
ln (W x vacancies (stock))		**0.033*** **	**0.042*** **	**0.015**		**0.032** **	**0.041** **	**0.011**
		0.009	**0.011**	**0.013**		**0.014**	**0.017**	**0.019**
ln (W x vacancies (flow))		**0.118*** **	**0.118*** **	**0.200*** **		**0.122*** **	**0.125*** **	**0.213*** **
		0.014	**0.016**	**0.021**		**0.019**	**0.021**	**0.029**
Additional spillovers from high unemployment ratio areas								
ln (W x unemployed (stock))			**0.151**				**0.16**	
			0.242				**0.25**	
ln (W x unemployed (flow))			**-0.203** **				**-0.233** **	
			0.099				**0.106**	
ln (W x vacancies (stock))			**0.014**				**0.013**	
			0.021				**0.023**	
ln (W x vacancies (flow))			**-0.026**				**-0.014**	
			0.033				**0.035**	
Additional spillovers from low unemployment ratio areas								
ln (W x unemployed (stock))			**-0.001**				**-0.338**	
			0.228				**0.248**	
ln (W x unemployed (flow))			**-0.181***				**-0.163**	
			0.107				**0.117**	
ln (W x vacancies (stock))			**-0.096*** **				**-0.106*** **	
			0.026				**0.029**	
ln (W x vacancies (flow))			**0.037**				**0.011**	
			0.044				**0.049**	
Effects from high population density areas								
POP x ln (W x unemployed (stock))				**-0.101**				**-0.11**
				0.147				**0.185**
POP x ln (W x unemployed (flow))				**0.026**				**0.039***
				0.018				**0.021**
POP x ln (W x vacancies (stock))				**0.017**				**-0.018**
				0.072				**0.088**
POP x ln (W x vacancies (flow))				**-0.136*** **				**-0.151*** **
				0.026				**0.032**
Regional dummies (test)	536***	392***	385***	371***	910***	732***	574***	596***
Quarterly dummies (test)	75***	74***	79***	72***	14***	16***	16***	16***
Returns to Scale	0.96	0.91	0.67	0.76	0.95	0.89	0.30	0.72
Constant returns to scale, test	0.33	0.85	0.81	2.8*	0.25	0.41	2.6	2.31
Observations	2737	2679	2679	2679	2737	2679	2679	2679
Coefficient of determination R2					0.87	0.88	0.88	0.89
Heteroscedasticity, test	1010.6***	992.6***	953.2***	967.3***				
Autocorrelation, test	20.1***	18.3***	18.2***	18.6***				

Table 19: **Latvia - Estimation results: Spatially augmented stock-flow matching function (time period 01:1999 - 04:2004).**

Dep. Variable: ln Matches (outflows from registered unemployment to employment)	GLS [VI]	GLS [VII]	GLS [VIII]	GLS [IX]	PCSE [VI]	PCSE [VII]	PCSE [VIII]	PCSE [IX]
ln unemployed (stock)	**0.947*** **	**0.973*** **	**0.932*** **	**0.976*** **	**0.988*** **	**0.968*** **	**0.899*** **	**0.961*** **
	0.074	0.083	0.085	0.085	0.114	0.105	0.105	0.107
ln unemployed (flow)	**0.037**	**0.017**	**0.013**	**0.016**	**-0.001**	**-0.018**	**-0.027**	**-0.016**
	0.033	0.035	0.036	0.035	0.046	0.042	0.042	0.042
ln vacancies (stock)	**0.002**	**0.003**	**0.004**	**0.003**	**-0.006**	**-0.006**	**-0.006**	**-0.007**
	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009
ln vacancies (flow)	**0.206*** **	**0.188*** **	**0.186*** **	**0.185*** **	**0.182*** **	**0.164*** **	**0.162*** **	**0.160*** **
	0.013	0.013	0.013	0.013	0.017	0.016	0.016	0.016
Indicator for local labour demand	**0.825*** **	**0.795*** **	**0.802*** **	**0.789*** **	**0.801*** **	**0.775*** **	**0.789*** **	**0.768*** **
	0.067	0.066	0.066	0.066	0.115	0.11	0.109	0.108
Time trend (annual)	**0.009***	**0.003**	**-0.001**	**0.003**	**0.01**	**0.006**	**0.002**	**0.005**
	0.005	0.005	0.005	0.005	0.01	0.011	0.011	0.011
Constant	**-22.2****	**-10.3**	**-1.0**	**-9.6**	**-23.8**	**-16.8**	**-8.8**	**-15.8**
	10.414	11.383	11.486	11.521	21.299	22.694	22.655	22.455
Indicators for common border with:								
Estonia	**0.312***	**0.303**	**-3.976**	**0.886**	**0.573**	**-0.019**	**0.382**	**1.864**
	0.187	0.186	2.425	1.452	0.359	0.139	0.358	1.77
Russia	**0.375***	**-0.082**	**4.111***	**0.249**	**-0.475*** **	**0.078**	**6.468****	**-0.353*** **
	0.212	0.089	2.414	1.446	0.071	0.309	2.617	0.128
Byelorussia	**-0.537*** **	**-0.486*** **	**-4.330***	**0.303**	**0.122**	**-0.486*** **	**-6.998*** **	**1.418**
	0.071	0.091	2.43	1.465	0.256	0.142	2.629	1.848
Lithuania	**0.18**	**0.13**	**3.899**	**0.402**	**-0.637*** **	**-0.112**	**-0.237**	**-0.499*** **
	0.204	0.206	2.406	1.444	0.095	0.299	0.296	0.113
Neighboring region variables								
Overall spillover effect								
ln (W x unemployed (stock))		**-0.187***	**-0.186**	**-0.206***		**-0.086**	**-0.028**	**-0.137**
		0.11	**0.121**	**0.122**		**0.162**	**0.172**	**0.182**
ln (W x unemployed (flow))		**0.075**	**0.116****	**0.058**		**0.086**	**0.13**	**0.068**
		0.05	**0.057**	**0.061**		**0.074**	**0.085**	**0.087**
ln (W x vacancies (stock))		**-0.011**	**-0.018**	**-0.034***		**-0.013**	**-0.019**	**-0.036**
		0.012	**0.015**	**0.017**		**0.015**	**0.019**	**0.022**
ln (W x vacancies (flow))		**0.114*** **	**0.116*** **	**0.154*** **		**0.118*** **	**0.120*** **	**0.169*** **
		0.016	**0.019**	**0.024**		**0.022**	**0.025**	**0.032**
Additional spillovers from high unemployment ratio areas								
ln (W x unemployed (stock))			**0.513***				**0.5**	
			0.296				**0.318**	
ln (W x unemployed (flow))			**-0.118**				**-0.172**	
			0.118				**0.131**	
ln (W x vacancies (stock))			**0.061****				**0.061****	
			0.027				**0.029**	
ln (W x vacancies (flow))			**-0.009**				**0.003**	
			0.043				**0.045**	
Additional spillovers from low unemployment ratio areas								
ln (W x unemployed (stock))			**-0.465**				**-0.792****	
			0.307				**0.332**	
ln (W x unemployed (flow))			**-0.105**				**-0.085**	
			0.124				**0.138**	
ln (W x vacancies (stock))			**-0.051**				**-0.062**	
			0.038				**0.042**	
ln (W x vacancies (flow))			**0.035**				**0.009**	
			0.053				**0.059**	
Effects from high population density areas								
POP x ln (W x unemployed (stock))				**0.026** **0.172**				**0.173** **0.212**
POP x ln (W x unemployed (flow))				**0.042*** **0.023**				**0.049*** **0.027**
POP x ln (W x vacancies (stock))				**0.044** **0.083**				**0.054** **0.1**
POP x ln (W x vacancies (flow))				**-0.069**** **0.031**				**-0.086**** **0.037**
Regional dummies (test)	599***	401***	389***	349***	987***	775***	581***	487***
Quarterly dummies (test)	75***	79***	76***	78***	17***	21***	21***	22***
Returns to Scale	1.19	1.17	1.02	1.19	1.16	1.21	0.69	1.35
Constant returns to scale, test	6**	2.6	0	1.36	1.69	1.13	0.33	2.58
Observations	1953	1898	1898	1898	1953	1898	1898	1898
Coefficient of determination R2					0.91	0.92	0.90	0.91
Heteroscedasticity, test	779.5***	765.7***	735.0***	727.9***				
Autocorrelation, test	14.2***	13.5***	13.4***	13.7***				

Table 20: **Latvia - Estimation results: Spatially augmented stock-flow matching function (time period 04:2004 - 07:2006).**

Dep. Variable: ln Matches (outflows from registered unemployment to employment)	GLS [VI]	GLS [VII]	GLS [VIII]	GLS [IX]	PCSE [VI]	PCSE [VII]	PCSE [VIII]	PCSE [IX]
ln unemployed (stock)	**0.926*** **	**0.838*** **	**0.862*** **	**0.846*** **	**1.053*** **	**1.027*** **	**1.034*** **	**1.023*** **
	0.18	0.208	0.212	0.211	0.281	0.258	0.259	0.26
ln unemployed (flow)	**0.049**	**0.014**	**0.027**	**0.048**	**0.008**	**-0.035**	**-0.027**	**0.002**
	0.054	0.06	0.06	0.06	0.092	0.07	0.07	0.069
ln vacancies (stock)	**0.037*** **	**0.032*** **	**0.032*** **	**0.036*** **	**0.036*** **	**0.029** **	**0.028** **	**0.036*** **
	0.012	0.012	0.012	0.012	0.014	0.013	0.013	0.013
ln vacancies (flow)	**0.198*** **	**0.192*** **	**0.198*** **	**0.199*** **	**0.192*** **	**0.189*** **	**0.190*** **	**0.190*** **
	0.02	0.02	0.02	0.019	0.027	0.025	0.026	0.025
Indicator for local labour demand	**-0.152**	**-0.179**	**-0.133**	**-0.107**	**0.175**	**0.158**	**0.199**	**0.067**
	0.298	0.289	0.29	0.285	0.411	0.401	0.401	0.379
Time trend (annual)	**0.130*** **	**0.079** **	**0.076** **	**0.052**	**0.151*** **	**0.096**	**0.094**	**0.086**
	0.027	0.032	0.032	0.033	0.054	0.064	0.063	0.061
Constant	**-264.3*** **	**-160.3** **	**-154.3** **	**-102.1**	**-308.2*** **	**-195.8**	**-190.4**	**-168.3**
	55.648	66.866	66.256	67.677	109.544	131.227	129.554	124.072
Indicators for common border with:								
Estonia	**1.182** **	**-0.487** **	**7.751***	**-6.037** **	**0.193**	**0.489**	**0.433**	**-8.063** **
	0.538	0.199	4.303	2.983	0.326	0.728	0.745	3.479
Russia	**0.679**	**0.532**	**-7.696***	**-5.770** **	**0.315**	**-0.206**	**-0.162**	**-0.189**
	0.548	0.547	4.374	2.902	0.598	0.206	0.209	0.271
Byelorussia	**-1.034*** **	**-0.962*** **	**7.397***	**-1.043*** **	**-0.621*** **	**-0.087**	**-0.052**	**-0.701**
	0.195	0.226	4.348	0.261	0.108	0.408	0.417	0.479
Lithuania	**0.86**	**0.541**	**-7.694***	**-5.812** **	**0.548**	**-0.13**	**-0.107**	**-8.262** **
	0.583	0.582	4.37	2.931	0.688	0.31	0.31	3.322
Neighbouring region variables								
Overall spillover effect								
ln (W x unemployed (stock))		**-0.159**	**-0.377**	**-0.106**		**-0.32**	**-0.477**	**-0.135**
		0.29	**0.301**	**0.318**		**0.386**	**0.399**	**0.423**
ln (W x unemployed (flow))		**0.049**	**0.076**	**-0.036**		**0.083**	**0.128**	**0.022**
		0.081	**0.094**	**0.098**		**0.142**	**0.156**	**0.16**
ln (W x vacancies (stock))		**0.035***	**0.028**	**0.024**		**0.031**	**0.028**	**0.014**
		0.019	**0.024**	**0.026**		**0.026**	**0.032**	**0.038**
ln (W x vacancies (flow))		**0.097*** **	**0.114*** **	**0.273*** **		**0.096*** **	**0.106*** **	**0.295*** **
		0.024	**0.029**	**0.038**		**0.032**	**0.036**	**0.058**
Additional spillovers from high unemployment ratio areas								
ln (W x unemployed (stock))			**0.102**				**0.048**	
			0.367				**0.369**	
ln (W x unemployed (flow))			**0.08**				**-0.013**	
			0.167				**0.176**	
ln (W x vacancies (stock))			**0.024**				**0.018**	
			0.038				**0.042**	
ln (W x vacancies (flow))			**-0.117** **				**-0.084**	
			0.05				**0.054**	
Additional spillovers from low unemployment ratio areas								
ln (W x unemployed (stock))			**1.051** **				**0.723**	
			0.5				**0.552**	
ln (W x unemployed (flow))			**-0.203**				**-0.329**	
			0.191				**0.202**	
ln (W x vacancies (stock))			**0.005**				**-0.01**	
			0.053				**0.061**	
ln (W x vacancies (flow))			**0.098**				**0.073**	
			0.074				**0.082**	
Effects from high population density areas								
POP x ln (W x unemployed (stock))				**-0.745** **				**-0.935** **
				0.342				**0.376**
POP x ln (W x unemployed (flow))				**0.032**				**0.042**
				0.036				**0.041**
POP x ln (W x vacancies (stock))				**0.119**				**0.017**
				0.136				**0.164**
POP x ln (W x vacancies (flow))				**-0.262*** **				**-0.294*** **
				0.046				**0.061**
Regional dummies (test)	404***	386***	331***	384***	8393***	4408***	4301***	8755***
Quarterly dummies (test)	43***	22***	23***	20***	9**	5.1	5.3	5.38
Returns to Scale	1.21	1.10	2.00	0.43	1.29	1.10	1.44	0.28
Constant returns to scale, test	1.1	0.11	1.81	2.31	0.92	0.04	0.25	2.04
Observations	784	781	781	781	784	781	781	781
Coefficient of determination R2					0.94	0.95	0.94	0.93
Heteroscedasticity, test	422.9***	373.1***	523.7***	198.0***				
Autocorrelation, test	7.4***	6.3***	6.0***	5.9***				

Table 21: **Slovenia - Estimation results: Spatially augmented semi-stock-flow matching function (time period 01:2000 - 12:2006).**

Dep. Variable: ln Matches (outflows from registered unemployment to employment)	GLS [VI]	GLS [VII]	GLS [VIII]	GLS [IX]	PCSE [VI]	PCSE [VII]	PCSE [VIII]	PCSE [IX]
ln unemployed (stock)	**0.581*** **	**0.675*** **	**0.718*** **	**0.700*** **	**0.597*** **	**0.695*** **	**0.741*** **	**0.718*** **
	0.095	0.091	0.1	0.094	0.105	0.092	0.099	0.095
ln unemployed (flow)	**0.234*** **	**0.023**	**0.028**	**0.015**	**0.227*** **	**0.002**	**0.008**	**-0.005**
	0.031	0.05	0.051	0.051	0.064	0.045	0.046	0.045
ln vacancies (flow)	**0.595*** **	**0.375*** **	**0.372*** **	**0.373*** **	**0.584*** **	**0.350*** **	**0.347*** **	**0.349*** **
	0.037	0.048	0.048	0.048	0.068	0.045	0.045	0.045
Indicator for local	**0.278** **	**0.292*** **	**0.288*** **	**0.291*** **	**0.264**	**0.298**	**0.295**	**0.296**
labour demand	0.111	0.109	0.11	0.109	0.282	0.269	0.269	0.268
Time trend (annual)	**-0.033*** **	**-0.033*** **	**-0.032*** **	**-0.033*** **	**-0.032*** **	**-0.034** **	**-0.033** **	**-0.034** **
	0.005	0.007	0.007	0.007	0.011	0.013	0.014	0.013
Constant	**61.752*** **	**56.170*** **	**53.411*** **	**56.825*** **	**60.723*** **	**57.108** **	**54.318***	**58.627** **
	10.769	14.481	14.926	14.501	22.365	27.685	28.673	27.865
Indicators for common border with:								
Italy	**-0.398*** **				**-0.385*** **			
	0.044				0.072			
Croatia	**-0.139*** **				**-0.138*** **			
	0.041				0.046			
Austria	**-0.092**				**-0.092**			
	0.065				0.075			
Neighbouring region variables								
Overall spillover effect								
ln (W x unemployed (stock))		**0.393** **	**0.433** **	**0.540*** **		**0.410***	**0.459***	**0.523** **
		0.158	**0.187**	**0.186**		**0.225**	**0.271**	**0.24**
ln (W x unemployed (flow))		**0.279*** **	**0.291*** **	**0.378*** **		**0.314*** **	**0.334*** **	**0.407*** **
		0.059	**0.062**	**0.07**		**0.082**	**0.085**	**0.096**
ln (W x vacancies (flow))		**0.366*** **	**0.362*** **	**0.379*** **		**0.401*** **	**0.393*** **	**0.399*** **
		0.059	**0.063**	**0.069**		**0.097**	**0.101**	**0.112**
Additional spillovers from high unemployment ratio areas								
ln (W x unemployed (stock))			**-0.402**				**-0.433**	
			0.397				**0.273**	
ln (W x unemployed (flow))			**-0.062**				**-0.092***	
			0.081				**0.056**	
ln (W x vacancies (flow))			**0.016**				**0.024**	
			0.103				**0.072**	
Additional spillovers from low unemployment ratio areas								
ln (W x unemployed (stock))			**0.011**				**-0.01**	
			0.279				**0.234**	
ln (W x unemployed (flow))			**-0.047**				**-0.056**	
			0.084				**0.067**	
ln (W x vacancies (flow))			**0.043**				**0.043**	
			0.111				**0.095**	
Effects from high population density areas								
POP x				**-0.344**				**-0.313**
ln (W x unemployed (stock)				**0.235**				**0.192**
POP x				**-0.161*** **				**-0.167*** **
ln (W x unemployed (flow)				**0.059**				**0.049**
POP x				**-0.035**				**-0.007**
ln (W x vacancies (flow)				**0.074**				**0.067**
Regional dummies (test)	177***	249***	218***	247***	146***	247***	162***	213***
Quarterly dummies (test)	154***	138***	136***	140***	29***	27***	26***	27***
Returns to Scale	1.41	2.11	1.76	1.85	1.41	2.17	1.76	1.90
Constant returns to scale, test	15***	34***	1.85	13***	10***	13***	2.69	7***
Observations	972	972	972	972	972	972	972	972
Coefficient of determination R2					0.91	0.89	0.89	0.87
Heteroscedasticity, test	96.6***	32.3***	30.4***	36.0***				
Autocorrelation, test	0.20	0.80	0.80	0.90				

Table 22: **Slovenia - Estimation results: Spatially augmented semi-stock-flow matching function (time period 01:2000 - 04:2004).**

	V							
Dep. Variable: ln Matches (outflows from registered unemployment to employment)	GLS [VI]	GLS [VII]	GLS [VIII]	GLS [IX]	PCSE [VI]	PCSE [VII]	PCSE [VIII]	PCSE [IX]
ln unemployed (stock)	**0.661*** **	**0.770*** **	**0.812*** **	**0.861*** **	**0.701*** **	**0.819*** **	**0.863*** **	**0.887*** **
	0.152	0.142	0.147	0.147	0.183	0.146	0.145	0.149
ln unemployed (flow)	**0.237*** **	**-0.002**	**0.025**	**-0.017**	**0.236*** **	**-0.017**	**0.009**	**-0.031**
	0.043	0.066	0.067	0.066	0.082	0.063	0.065	0.063
ln vacancies (flow)	**0.688*** **	**0.472*** **	**0.438*** **	**0.467*** **	**0.677*** **	**0.449*** **	**0.420*** **	**0.445*** **
	0.06	0.062	0.062	0.062	0.088	0.062	0.063	0.062
Indicator for local	**0.131**	**0.007**	**0.013**	**-0.003**	**0.113**	**0.005**	**0.007**	**-0.007**
labour demand	0.129	0.127	0.125	0.126	0.305	0.285	0.28	0.284
Time trend (annual)	**-0.037*** **	**-0.017***	**-0.017***	**-0.014**	**-0.040** **	**-0.018**	**-0.018**	**-0.016**
	0.008	0.01	0.01	0.01	0.019	0.019	0.019	0.019
Constant	**68.162*** **	**19.191**	**21.105**	**17.063**	**73.653** **	**21.252**	**23.893**	**21.15**
	17.068	21.409	21.667	21.55	37.46	39.463	39.462	39.625
Indicators for common border with:								
Italy	**-0.533*** **				**-0.523*** **			
	0.066				0.094			
Croatia	**-0.181*** **				**-0.188*** **			
	0.055				0.062			
Austria	**-0.172***				**-0.190***			
	0.097				0.114			
Neighbouring region variables								
Overall spillover effect								
ln (W x unemployed (stock))		**0.486***	**0.789*** **	**0.958*** **		**0.493**	**0.836** **	**0.908** **
		0.253	**0.279**	**0.305**		**0.364**	**0.396**	**0.411**
ln (W x unemployed (flow))		**0.247*** **	**0.288*** **	**0.394*** **		**0.289*** **	**0.340*** **	**0.428*** **
		0.082	**0.085**	**0.097**		**0.107**	**0.109**	**0.127**
ln (W x vacancies (flow))		**0.595*** **	**0.486*** **	**0.456*** **		**0.608*** **	**0.487*** **	**0.452** **
		0.095	**0.107**	**0.131**		**0.154**	**0.166**	**0.195**
Additional spillovers from high unemployment ratio areas								
ln (W x unemployed (stock))			**-0.957**				**-1.086*** **	
			0.618				**0.411**	
ln (W x unemployed (flow))			**-0.183***				**-0.194*** **	
			0.107				**0.071**	
ln (W x vacancies (flow))			**0.312**				**0.270***	
			0.22				**0.155**	
Additional spillovers from low unemployment ratio areas								
ln (W x unemployed (stock))			**-0.758***				**-0.866** **	
			0.427				**0.359**	
ln (W x unemployed (flow))			**-0.157**				**-0.179** **	
			0.102				**0.089**	
ln (W x vacancies (flow))			**0.544*** **				**0.514*** **	
			0.202				**0.19**	
Effects from high population density areas								
POP x				**-0.950** **				**-0.922*** **
ln (W x unemployed (stock))				**0.384**				**0.342**
POP x				**-0.220*** **				**-0.233*** **
ln (W x unemployed (flow))				**0.077**				**0.07**
POP x				**0.215**				**0.276***
ln (W x vacancies (flow))				**0.154**				**0.143**
Regional dummies (test)	115***	172***	170***	170***	117***	147***	126***	136***
Quarterly dummies (test)	109***	75***	77***	75***	24***	17***	18***	18***
Returns to Scale	1.59	2.57	1.64	2.16	1.61	2.64	1.41	2.21
Constant returns to scale, test	13***	30***	0.69	12***	10***	12***	0.41	6**
Observations	612	612	612	612	612	612	612	612
Coefficient of determination R2					0.91	0.92	0.92	0.90
Heteroscedasticity, test	55.1***	16.1	13.9	17.8		.		
Autocorrelation, test	1.5*	2.7***	3.0***	2.8***				

Table 23: **Slovenia - Estimation results: Spatially augmented semi-stock-flow matching function (time period 04:2004 - 12:2006).**

Dep. Variable: ln Matches (outflows from registered unemployment to employment)	GLS [VI]	GLS [VII]	GLS [VIII]	GLS [IX]	PCSE [VI]	PCSE [VII]	PCSE [VIII]	PCSE [IX]
ln unemployed (stock)	**0.929*** **	**1.110*** **	**1.107*** **	**1.088*** **	**0.902*** **	**1.026*** **	**0.992*** **	**0.992*** **
	0.217	0.233	0.245	0.235	0.35	0.217	0.234	0.216
ln unemployed (flow)	**0.238*** **	**0.062**	**0.067**	**0.044**	**0.227** **	**0.032**	**0.036**	**0.019**
	0.044	0.068	0.071	0.069	0.095	0.061	0.064	0.062
ln vacancies (flow)	**0.399*** **	**0.277*** **	**0.271*** **	**0.288*** **	**0.363*** **	**0.247*** **	**0.234*** **	**0.257*** **
	0.061	0.071	0.073	0.072	0.104	0.065	0.067	0.065
Indicator for local	**1.230*** **	**1.260*** **	**1.257*** **	**1.260*** **	**1.185***	**1.252***	**1.258***	**1.254***
labour demand	0.244	0.239	0.24	0.238	0.691	0.663	0.667	0.661
Time trend (annual)	**0.021**	**0.002**	**0.002**	**0.003**	**0.027**	**0.003**	**0.003**	**0.004**
	0.017	0.019	0.019	0.019	0.042	0.048	0.048	0.048
Constant	**-48.953**	**-8.148**	**-14.668**	**-9.477**	**-59.276**	**-10.962**	**-18.586**	**-11.505**
	34.902	38.541	39.529	38.403	85.594	97.479	98.783	97.366
Indicators for common border with:								
Italy	**-0.142** **				**-0.108**			
	0.065				0.103			
Croatia	**-0.205** **				**-0.181**			
	0.086				0.134			
Austria	**-0.224**				**-0.188**			
	0.139				0.224			
Neighbouring region variables								
Overall spillover effect								
ln (W x unemployed (stock))		**-0.503**	**-0.551**	**-0.615**		**-0.419**	**-0.558**	**-0.398**
		0.334	**0.356**	**0.484**		**0.651**	**0.648**	**0.739**
ln (W x unemployed (flow))		**0.189** **	**0.175** **	**0.306*** **		**0.248** **	**0.233***	**0.338** **
		0.082	**0.087**	**0.104**		**0.123**	**0.125**	**0.144**
ln (W x vacancies (flow))		**0.247** **	**0.233** **	**0.243***		**0.255**	**0.245**	**0.248**
		0.101	**0.108**	**0.13**		**0.185**	**0.19**	**0.209**
Additional spillovers from high unemployment ratio areas								
ln (W x unemployed (stock))			**-0.181**				**0.026**	
			0.796				**0.558**	
ln (W x unemployed (flow))			**-0.01**				**-0.029**	
			0.11				**0.076**	
ln (W x vacancies (flow))			**0.035**				**0.044**	
			0.168				**0.114**	
Additional spillovers from low unemployment ratio areas								
ln (W x unemployed (stock))			**0.585**				**0.909**	
			0.846				**0.58**	
ln (W x unemployed (flow))			**0.113**				**0.097**	
			0.133				**0.09**	
ln (W x vacancies (flow))			**0.101**				**0.098**	
			0.192				**0.136**	
Effects from high population density areas								
POP x				**0.134**				**-0.076**
ln (W x unemployed (stock))				**0.538**				**0.377**
POP x				**-0.152***				**-0.141** **
ln (W x unemployed (flow))				**0.086**				**0.065**
POP x				**-0.025**				**-0.02**
ln (W x vacancies (flow))				**0.124**				**0.089**
Regional dummies (test)	47***	75***	55***	75***	49***	123***	59***	110***
Quarterly dummies (test)	50***	52***	53***	55***	7.1*	8**	8**	8**
Returns to Scale	1.57	1.38	1.95	1.31	1.49	1.39	2.33	1.22
Constant returns to scale, test	6**	1.31	0.57	0.58	1.53	0.23	1.25	0.08
Observations	360	360	360	360	360	360	360	360
Coefficient of determination R2					0.97	0.96	0.96	0.96
Heteroscedasticity, test	80.5***	55.5***	53.2***	60.0***				
Autocorrelation, test	2.1**	2.0**	2.1**	2.0**				

Explanatory notes for tables 9 -23:

(1) GLS: Model estimated by Generalized Least Squares method. PCSE: Model estimated by Panel Corrected Standard Errors method.
(2) [I] - [V]: specifications (see section 4 for details); All models include regional and time (quarterly) dummies and time (annual) trend. Local labor demand indicator: growth in local (within region) secondary employment for Latvia and Estonia, growth in aggregate (national) secondary employment for Slovenia.
(3) UBA 1 - UBA 2 are time dummies for changes in unemployment benefit amount (UBA): UB1 1=1 starting from 1/08/2000 when UBA dropped from 50 to 43 Ls, UBA 2=1 starting from 01/02/2003 when UBA raised from 43 to 50Ls.
(4) MWA 1 - MWA 4 are time dummies for changes in minimum wage amount: MWA 1=1 starting from 1/07/2001, when minimum wage raised from 50 to 60 Ls, MWA 2=1 starting from 01/01/2003 when MWA raised from 60 to 70 Ls, MWA 3=1 starting from 01/01/2004 when MWA raised from 70 to 80 Ls, MWA 4=1 starting from 01/01/2006 when MWA raised from 80 to 90 Ls.
(5) Constant returns to scale (CRS), test: test for constant returns to scale in estimated matching function. Ho: $\alpha_{SU} + \alpha_{FU} + \alpha_{SV} + \alpha_{FV} = 1$ in stock-flow specification. Ho: $\alpha_{SU} + \alpha_{SV} = 1$ in stock-stock specification. Ho: $\alpha_{SU} + \alpha_{FU} + \alpha_{FV} = 1$ in semi stock-flow specification (Slovenia).
(6) [VI] - [IX] - specifications for a spatially augmented matching function (see section 4 for details); For Latvia, includes the indicators of common border with one of the following countries: Estonia, Russia, Byelorussia, Lithuania. For Slovenia, includes the indicators of common border with one of the following countries: Croatia, Italy, Austria. All models include regional and time (quarterly) dummies and time (annual) trend. Local labor demand indicator: growth in local (within region) secondary employment for Latvia and Estonia, growth in aggregate (national) secondary employment for Slovenia. The indicators for common border are included to all specifications for Latvia and to specification [VI] only for Slovenia.
(7) Constant returns to scale, test: test for constant returns to scale in estimated matching function. For spatially augmented matching function the returns to scale are measured as a sum of estimated elasticities of all main variables (local and foreign).
(8) Heteroscedasticity, test: modified Wald test for group wise heteroscedasticity (Greene 2000, pp.598).
(9) Autocorrelation, test - Baltagi test for autocorrelation.
(10) Standard errors in parentheses, for PCSE models standard errors corrected for heteroscedasticity,cross sectional correlation and panel specific AR1 are reported.
(11) ***, **, * - estimates significantly different from zero at 1,5,10 percent level respectively.

Figure 4: Latvian regions by unemployment rate in 2002

Figure 5: Slovenian regions, by ESS offices

Source: State Employment Agency of Latvia and Employment Service of Slovenia.