Job and Employee Stocks and Flows in the Czech Republic

Kateřina Duspivová[1] | *University of Economics, Prague, Czech Republic*
Jana Kramulová[2] | *University of Economics, Prague, Czech Republic*

Abstract

The main aim of this paper is to present a comprehensive system of statistical information concerning the labour market with respect to the theoretical background as well as to the latest trends in the labour market statistics. This framework interlinks relations between demand and supply sides of the labour market as well as stocks and flows. In addition to the generally known indicators of economic activity, the authors define a new set of employment indicators derived from job creation, job destruction, hires and separations. There have never been quantified and balanced the demand and supply side stocks and flows in the Czech Republic, so the pilot results concerning the year 2010 are introduced as well. The systematic approach, based on a wider use of linked employer-employee microdata combined with other data sources, has the advantages of a higher information capability as well as of complying with the requirements of the academics.

Keywords

System of labour market indicators, worker flows, job flows, Czech Republic

JEL code

C82, J21, J63

INTRODUCTION

The research concerning fundamental relations and processes in the labour market is an important task for each country. A comprehensive system of labour market indicators enables to identify the point during the economic cycle that the economy is approaching, so the results support policy-makers in their strategic choices on the economic policy. A further reason for developing of relevant labour market indicators lies in the fact that the labour market equilibrium can be achieved through a low labour market turnover or through turbulences in the form of a high degree of staff turnover. Generally known indicators of economic (in)activity are usually focused on monitoring stocks, so they provide only a minimum information on structural changes in the labour market. Contrary to that, a comprehensive system of labour market indicators encompasses a range of aspects including labour market trends, demographic situation, etc. and can ensure (and in many countries it actually does) consistent and comparable data on stocks and flows in the labour market. Due to this fact, the systematic approach is generally recommended and represents current trend in an international context.

A crucial role in the quantification of labour market stocks and flows plays undoubtedly the work of Davis and Haltiwanger (1989, 1990, 1992, 1999) and Davis et al. (1996, 2006), who were followed by number of international research teams (Abowd et al., 1996; Albaek and Sørensen, 1998; Bruil et al.,

[1] University of Economics, Prague, Nám. W. Churchilla 4, 130 67 Prague 3, Czech Republic. Author is also working at TREXIMA, spol. s r.o., tř. T. Bati 299, 764 21 Zlín-Louky, Czech Republic. Corresponding author: e-mail: duspivova@trexima.cz.

[2] University of Economics, Prague, Nám. W. Churchilla 4, 130 67 Prague 3, Czech Republic. Author is also working at the Czech Statistical Office, Na Padesátém 81, 100 82 Prague 10, Czech Republic.

2010; Centeno et al., 2009; Page, 2010). Nowadays, their approach represents mainstream in the research of labour market indicators, however, there has not been paid enough attention to link these indicators with the currently used ones so far. As a result, there exist two independent sets of indicators and it may appear, at first sight, that there is not a causal link between both systems (i.e. between currently used indicators of stocks and indicators of flows developed under the research projects).

Therefore, the main aim of this paper is to introduce the system of labour market indicators that eliminates imperfections of the above mentioned approach. The system will be designed in such a way to connect stocks and flows in the labour market and to ensure adequate links between supply and demand sides of the labour market. Moreover, the system will be based on fundamental findings of the economic theory concerning the labour market functioning in order to be utilizable also for a verification of theoretical labour market models without further limitations. However, when switching from an economic to statistical labour market perspective, it will be necessary to deal with so called adequation problem, i.e. it will be necessary to match economic terms with precisely defined statistical indicators (see Fischer and Sixta, 2009). Subsequently, the higher information value will be illustrated with a particular example of the Czech labour market.

The structure of the paper is as follows: section 1 introduces a theoretical framework of the labour market that will provide a basis for the system of labour market indicators proposed in section 2. Section 3 presents data sources and methods used. The main empirical results concerning the Czech labour market in 2010 are presented in section 4. The last section concludes the paper.

1 THEORETICAL MODEL

There is a great deal of theoretical work on the labour market, however, the use of principal findings and conclusions drawn from the economic theory is usually limited because of fundamental differencies between economic schools of thought – be it assumptions, conclusions or recommendations.[3] As for the labour market statistics, it is essential to focus on various states of the labour market that relate to labour market transitions as well as to the reallocation of jobs and workers. As far as the systematic approach to the labour market statistics is concerned, it is important to identify basic relations and transitions on the labour market. Doing so, one can encounter the above mentioned problem of the inconsistency of individual economic schools, but fortunately, all of the economic schools respect the law of supply and demand, and differ in fact in the explanation of the scope and nature of stimuli and motivations of individual agents on the labour market. Therefore, the labour market functioning can be described as follows.

In the labour market, as in other markets, there are production factors whose utilization adjusts to the economic cycle. As a factor of production, labour represents human resources involved in the production process and is the subject to the law of supply and demand. On the demand side of the labour market, there create employers new jobs or destruct redundant jobs. On the supply side of the labour market, there offer workers their labour and are ready to accept the job at least at individuals' reservation wage rate (def. by Lippman and McCall, 1976), i.e. the lowest wage rate demanded by an individual worker. When the employer offers less than the reservation wage, the worker leaves the job or does not even apply for a particular job (Burdett and Mortensen, 1998).

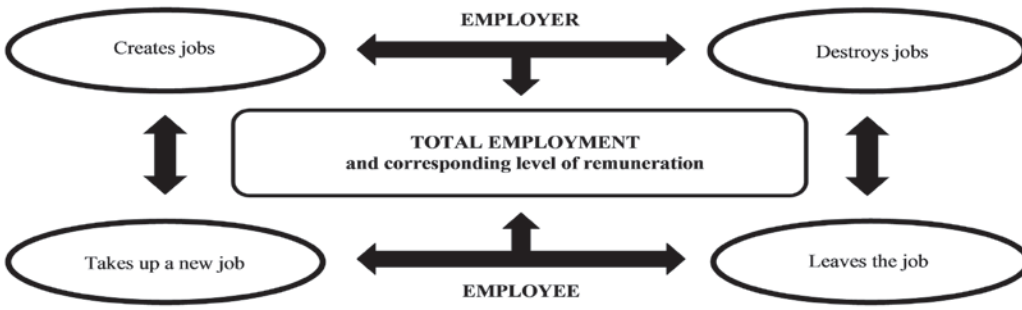
Just as each worker sets his or her lowest acceptable wage, employers usually set – with respect to the worker's contribution to the employer's revenue – their level of remuneration that they are willing to pay for a particular job. Thesedays almost nobody doubts, that employers can voluntarily keep a higher wage level compared to an equilibrium wage rate. As for the standard neoclassical model, its assumptions have already been overcome (see e.g. Cahuc and Zylberberg, 2004; Isard, 1977; Kaufman, 1999; Brown,

[3] The theoretical research on the labour market is summarized e.g. by Blau et al. (2006), Boeri and van Ours (2008), Borjas (2010), Cahuc and Zylberberg (2004), Ehrenberg and Smith (2009), Manning (2003) or Saint-Paul (2000).

1985; Rutherford, 2001), and employers can keep wage rates at higher levels for rational reasons. In fact, employers can – thanks to higher wage rates – control the worker turnover (Lane et al., 1996a; Stiglitz, 1974; Schlicht, 1978), the probability of hiring less qualified employees (Malcomson, 1981; Weiss, 1980; Burdett and Mortensen, 1998; Manning, 1993) as well as staff morale (Calvo and Wellisz, 1979; Rebitzer and Taylor, 1995; Mankiw, 1998; Shapiro and Stiglitz, 1984).

As mentioned above, employers and employees meet on the labour market and respond to different impulses. Responses of individuals vary, but in total, they lead to the particular level of employment and remuneration. Figure 1 shows a theoretical framework of the labour market that is neutral with respect to all economic schools of thought. This framework interlinks relations between employers and employees and clearly shows not only the above mentioned relations between employees and employers, but also labour market transitions as well as job and worker reallocation (namely job creation, job destruction, hires and separations).

Figure 1 Basic relations and job and worker reallocation in the labour market

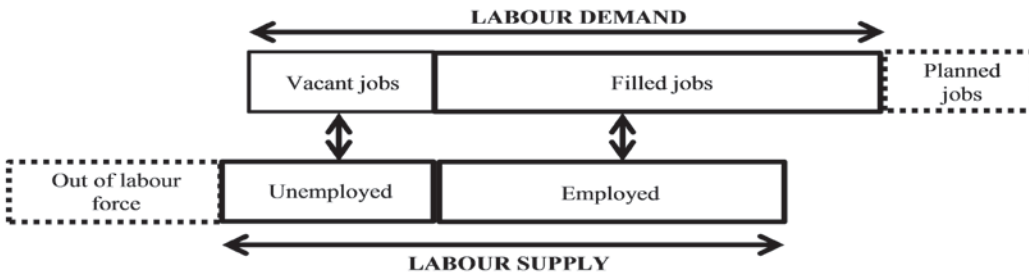


Source: Own construction

As an alternative, the above mentioned theoretical framework can be described in terms of categories of labour supply and demand. Figure 2 clearly depicts the relationship between supply and demand in the labour market. As shown in Figure 2, filled jobs on the demand side reflect the situation of employed persons on the supply side and represent successfully matched jobs and workers. However, essential information on the labour market is contained in the relation between unemployed persons and vacancies. The number of job seekers usually exceeds the number of unfilled jobs, so the so-called Beveridge relation is regarded as an important indicator of the labour market dynamics (see e.g. Blanchard and Diamond, 1989). As for the efficiency of the labour market in terms of matching jobs and workers, many empirical studies have confirmed the simultaneous coexistence of unemployment and vacancies, i.e. the reallocation on the supply and demand sides generates delays in matching of both jobs and workers. The (mis)match between jobs and workers can be formalized using a matching function, that plays a key role in the search and matching theory (see Diamond, 1982; Blanchard and Diamond, 1989, 1990; Mortensen, 1994; Burdett and Mortensen, 1998; Pissarides, 1985, 2000; Postel Vinay and Robin, 2002; Kiyotaki and Lagos, 2007).

For the sake of completeness, it should be pointed out that the vast literature devoted to this subject has used the diagram in Figure 3 (see e.g. Blanchard and Diamond, 1990; Burda and Wyplosz, 1994; Broersma et al., 2000; Davis et al., 1996, and others). In this diagram, there are shown transitions between individual categories of economic activity (namely employed and unemployed persons) and persons out of the labour market. For the purposes of this article, persons out of the labour market refer

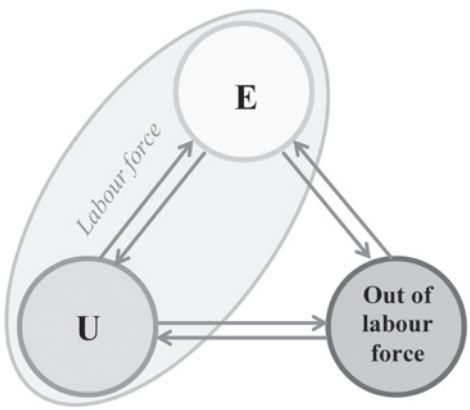
Figure 2 Relations between labour demand and supply



Source: Own construction based on Bruil et al. (2010) and Burda and Wyplosz (1994)

to economic inactive population as well as to all persons leaving the national labour market due to migration or death. It is obvious that Figure 3 displays only the transitions on the supply side of the labour market and omits several important aspects of the labour market covered by Figures 1 and 2. To be more specific, Figure 3 totally ignores the demand side of the labour market or the relationship between job and worker flows. Using such a labour market diagrams stems most likely from the fact that the literature on worker flows (i.e. on the labour supply) has developed separately from the literature on job flows (i.e. on the labour demand). In addition, most models have assumed job and worker flows to be equal (Burgess et al., 2000). Fortunatelly, empirical research on the relationship between the demand and supply sides of the labour market has brought the required turnaround because it has explained some of the labour market specifics as far as labour market functioning is concerned (e.g. Lane et al., 1996b, confirmed that also expanding economic subjects destroy jobs and contracting employers create jobs). This appears to be the reason why the synthesis of approaches has taken on greater significance and the number of comprehensive studies has continually increased (Burda and Wyplosz, 1994; Hamermesh et al., 1994; Lane et al., 1996a, 1996b; Davis et al., 1996, 2006; Burgess et al., 2000, etc.) instead of studying only the supply side (Pissarides, 1985, 2000; Blanchard and Diamond, 1989, 1990) or demand side (Dunne et al., 1989; Davis and Haltiwanger, 1990, 1992).

Figure 3 Basic relations and transitions on the supply side of the labour market



Note: *E* stands for employment, *U* unemployment.
Source: Own construction based on Blanchard and Diamond (1990), Burda and Wyplosz (1994) and Broersma et al. (2000)

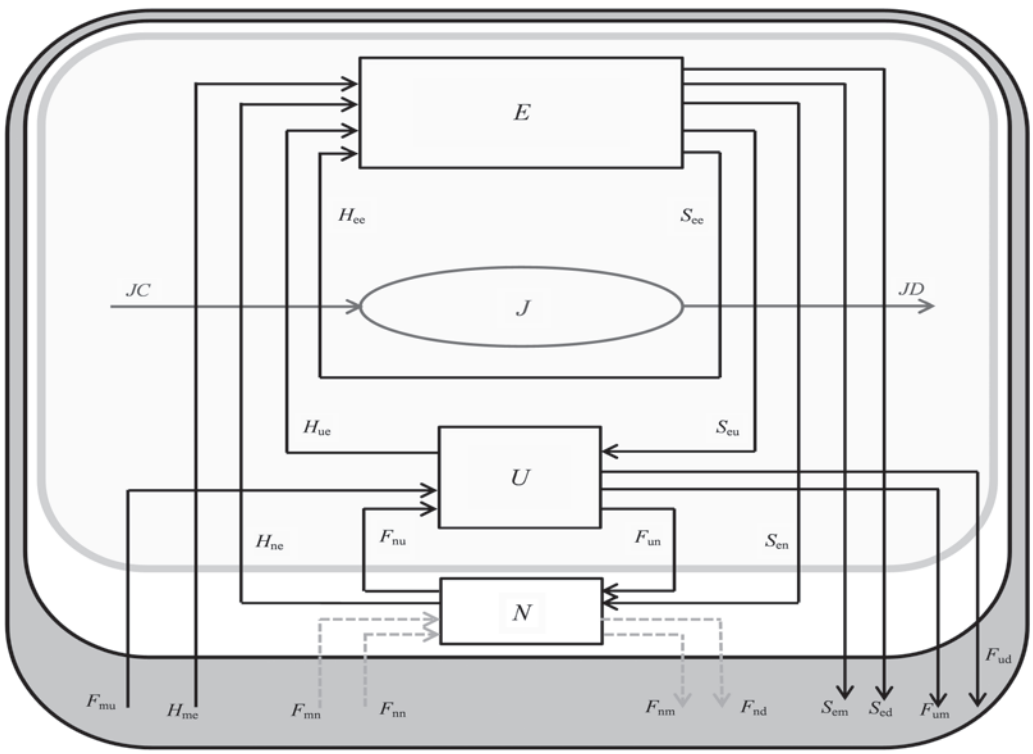
2 SYSTEM OF LABOUR MARKET INDICATORS

The system of statistical information concerning the labour market in the Czech Republic, presented in this article, complies with both the theoretical background and latest trends in the labour market statistics. The most likely advantage of the new system is the fact that all the key aspects of the labour market are surveyed and evaluated together. In addition, the system interlinks relations among employees and employers. Figure 4 shows all stocks and flows included into the comprehensive national system of labour market at the macro level. This scheme is based on the national accounting system proposed by Bruil et al. (2010), but it was

not effective to take over their system as a whole because they abstained from some events and flows (migration, deaths) for reasons of simplicity. The system proposed in this article extends their model and handles stocks and flows in the labour market in the wider context. Figure 4 shows mutual interactions between the supply and demand sides of the labour market (represented by the pale grey area), but also relations of individual players in the labour market to persons who are staying out of the labour market. In this article, we distinguish between different states of being out of (un)employment. In the national context, the stock of persons out of the labour market includes economically inactive population (such as students, pensioners, etc.) represented by the white area in Figure 4. In the dark grey area, there are allocated transitions that are not captured by the white area. To be more specific, the dark grey area covers transitions on account of migration (emigration, immigration) and the natural increase of population (live births, deaths). As stated by Pořízková (2008), migration plays a crucial role also in the Czech labour market, so it cannot be omitted from the system.

The system of labour market information includes four stocks. On the supply side of the labour market, there are three stocks classified, namely Employed (*E*), Unemployed (*U*) and economically inactive persons (*N*). On the demand side, there is the number of Jobs (*J*) classified.

Figure 4 System of labour market indicators in the Czech Republic



Source: Own construction

Above mentioned stocks are very closely related to flows that can be detected only in the labour market (i.e. transitions between employment and unemployment) or they refer to economically inactive

persons or migrants. Figure 4 depicts transitions of employed persons that are denoted as *H* and *S* (where *H* refers to newly hired employees and *S* to separating employees), as well as transitions of unemployed and economically inactive persons denoted as *F*. Subscripts denote one by one initial and final labour market status, where

H_{xe} represents transitions from categories *X* (*x* = e, m, n, u) to category *E* (i.e. to the employment),

S_{ex} transitions from *E* (i.e. from the employment) to *X* (*x* = d, e, m, n, u),

F_{xy} transitions from *X* (*x* = m, n, u) to *Y* (*y* = m, n, u).

Initial and final categories of the labour market status are used in accordance with indicators mentioned above, or they imply events concerning other than current population of a given country, i.e. *M* is used for migration and *D* for deaths.

As for employment, we identified following labour market transitions:

H_{me} – immigrants who found a job and became employed,

H_{ue} – unemployed persons who found a job,

H_{ne} – persons out of the labour force who entered the employment,

H_{ee} – employed persons who switched the job,

S_{em} – employed persons who emigrated,

S_{eu} – employed persons who were laid off,

S_{en} – employed persons who left the labour force,

S_{ed} – employed persons who died and

S_{ee} – employed persons who left the job but moved to another job (without delay).

In Figure 4, there are depicted flows that influence labour market via unemployment. Namely, these flows are as follows:

F_{nu} – persons currently out of the labour force who entered the labour market and became unemployed,

F_{mu} – immigrants who became unemployed,

F_{un} – unemployed job searchers who left the labour force,

F_{um} – unemployed persons who emigrated, and

F_{ud} – unemployed persons who died during the given period.

For the sake of completeness, there are depicted flows in Figure 4 that are not directly linked to the labour market. These flows are as follows:

F_{mn} – immigrants who are out of the labour force,

F_{nn} – newly born,

F_{nm} – persons who were out of the labour force and emigrated, and

F_{nd} – persons who were out of the labour force and died during the given period.

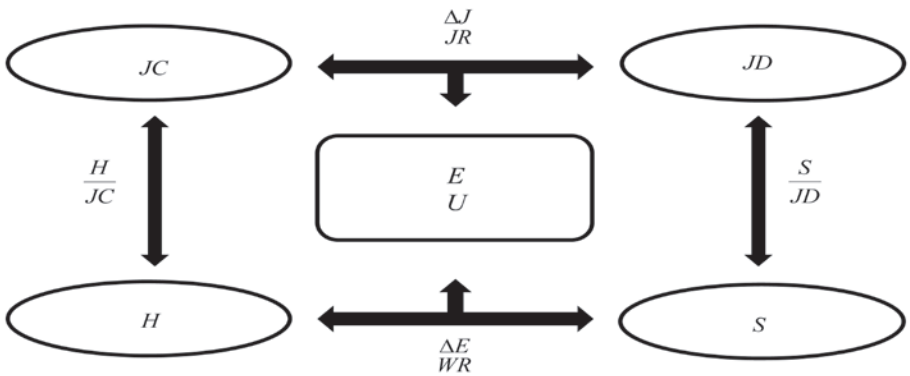
In addition to the labour status transitions, Figure 4 also depicts job-to-job flows (i.e. flows within the category of employed persons). As Bruil et al. (2010) point out, in adressing labour market flexibility, the focus should be on all movements of workers into and out of jobs. Thus, omitting job-to-job flows understates the true magnitude of worker reallocation (Hyatt and McEntarfer, 2012) and the measure would not count all labour market transitions. Neglecting job-to-job flows leads also to the biased conclucions concerning the labour market elasticity because there would not be any information on worker flows with no job creation and destruction (i.e. on workers who have left their jobs and moved to another jobs, and at the same time, the old jobs have remained and been filled by other workers).

As for the demand side of the labour market, there were two basic flows identified, namely creation (*JC*) and destruction of jobs (*JD*).

Furthermore, Figure 4 also shows situations when supply and demand sides of the labour market meet. These situations are depicted in those points where job flows intersects worker flows. To be more specific, Figure 4 depicts the inflow into employment from unemployment followed by job creation (point of intersection of lines *JC* and H_{ue}), destruction of jobs after the workers' deaths (*JD* and S_{ed}), etc.

Relations between labour market indicators are shown in Figure 5. In fact, this diagram is a statistical mirror to the theoretical framework of the labour market shown in Figure 1. Figure 5 depicts the above mentioned indicators (*JC*, *JD*, *H*, *S*, *E*, *U*) as well as other, derived indicators. On the demand side of the labour market, there are two indicators described, namely the net change of jobs (Δ*J*, see below) and job reallocation (*JR*, see below). On the supply side of the labour market, there are two following indicators depicted – the net employment change Δ*E*, see below) and worker reallocation (*WR*, see below). Relations between supply and demand sides are measured using a ratio of the number of hires to job creation, or a ratio of the number of separations to job destruction. Using these ratios, it is possible to measure the labour market flexibility, i.e. to conclude, whether the Czech labour market is flexible or rather rigid in terms of fluctuation. In the case of the above mentioned ratios with an estimated value higher than 1, the staff turnover is several times higher than would be required by the demand side of the labour market. In other words, these values indicate the lack of the stability of workers that has significant negative consequences for staff loyalty, commitment and performance.

Figure 5 Stocks and flows on the demand and supply sides of the labour market and the links between them



Source: Own construction

Stock indicators, namely the number of employed, unemployed and economically inactive persons, are currently very well covered by the labour market statistics. These indicators are commonly known and quantified on the basis of internationally accepted recommendations, so we decided not to pay more attention to them.[4] Similarly, we will not further discuss the relation of vacancies and unemployed persons, because this issue has already been deeply analysed by Galuščák and Münich (2007). Instead, we will focus on indicators that are not commonly used in the Czech Republic. It should be noted that many of these indicators have not even been defined in the Czech Republic.[5]

[4] Description of methodology, indicators as well as links to corresponding international recommendations or European regulation for LFS is accessible in CZSO (2014b). On business statistics, which is a source for information on the average gross wage in the Czech Republic and average registered number of employees, focus Eurostat (2010) and CZSO (2014a). With labour costs, as an integral part of business statistics, deals Eurostat (2011). Methodology of ISPV describes MPSV (2013). Methodology of national accounts is described in CZSO (2012). Issues connected with registered unemployment follows up CZSO (2014b), evidence of vacancies then MPSV (2012).

[5] The basic indicators (*H*, *S*, *JC*, *JD*, Δ*E*, *JR*, *WR*) have already been used for other purposes by Duspivová (2011) and Duspivová and Spáčil (2011). These indicators are an integral part of the system of labour market indicators, and therefore will be defined also in this article.

More formally, labour market indicators are as follows:

Consider an economic subject *s* holding a job *j* with an employee *e* in the subset of economic subjects *o* (industry, region, etc.) in the time period *t*. The *number of employees* (*E*) of the subject *s* in the time period *t* is defined as follows (1)

$$E_{so}^{(t)} = \sum_{i=1}^{n} e_{so}^{(t)}, \tag{1}$$

the *net employment change* in the economic subject *s* is defined as (2)

$$\Delta E_{so}^{(t)} = E_{so}^{(t)} - E_{so}^{(t-1)}. \tag{2}$$

Total number of jobs (*J*) in the economic subject *s* is defined as (3)

$$J_{so}^{(t)} = \sum_{i=1}^{n} j_{so}^{(t)}, \tag{3}$$

and the *net change of jobs* (ΔJ) in the economic subject *s* is defined as (4)

$$\Delta J_{so}^{(t)} = J_{so}^{(t)} - J_{so}^{(t-1)}. \tag{4}$$

Basic indicators of job and employee flows are defined as follows:

hires (*H*) in all of the economic subjects in the subset *o* according to Davis et al. (1996) as

$$H_{so}^{(t)} = \sum_{i=1}^{n} e_{so_i}^{(t)}, \text{ where } (e_{so_i} \in s^{(t)}) \wedge (e_{so_i} \notin s^{(t-1)}), \tag{5}$$

separations (*S*) from all of the economic subjects in the subset *o* according to Davis et al. (1996) as

$$S_{so}^{(t)} = \sum_{i=1}^{n} e_{so_i}^{(t)}, \text{ where } (e_{so_i} \in s^{(t-1)}) \wedge (e_{so_i} \notin s^{(t)}), \tag{6}$$

job creation (*JC*) in the subset of economic subjects as (7)

$$JC_{so}^{(t)} = \sum_{k=1}^{m} j_{so_k}^{(t)}, \text{ where } (j_{so_k} \in s^{(t)}) \wedge (j_{so_k} \notin s^{(t-1)}), \tag{7}$$

job destruction (*JD*) in the subset as (8)

$$JD_{so}^{(t)} = \sum_{k=1}^{m} j_{so_k}^{(t)}, \text{ where } (j_{so_k} \in s^{(t-1)}) \wedge (j_{so_k} \notin s^{(t)}). \tag{8}$$

As for hires, there can be applied the identity based on Figure 4 (9)

$$H^{(t)} = H_{\text{ee}}^{(t)} + H_{\text{ue}}^{(t)} + H_{\text{ne}}^{(t)} + H_{\text{me}}^{(t)} \tag{9}$$

as well as for separations (10)

$$S^{(t)} = S_{\text{ee}}^{(t)} + S_{\text{eu}}^{(t)} + S_{\text{en}}^{(t)} + S_{\text{em}}^{(t)} + S_{\text{ed}}^{(t)}. \tag{10}$$

Total number of jobs can be calculated using the following formula (11)

$$J = J_M + J_V, \tag{11}$$

where J_M identifies filled jobs and J_V vacant jobs.

In addition to the basic indicators defined above, there can be other comprehensive indicators derived, namely *total employment change* (ΔE_{sot}) is defined as (12)

$$\Delta E_{so}^{(t)} = JC_{so}^{(t)} - JD_{so}^{(t)} = H_{so}^{(t)} - S_{so}^{(t)}, \tag{12}$$

worker reallocation (*WR*) according to Davis et al. (1996) as (13)

$$WR_{so}^{(t)} = H_{so}^{(t)} + S_{so}^{(t)} \tag{13}$$

and *job reallocation* (*JR*) defined by Davis et al. (1996) as (14)

$$JR_{so}^{(t)} = JC_{so}^{(t)} + JD_{so}^{(t)}. \tag{14}$$

Relationship between individual indicators can be expressed using ratios mentioned in relation to Figure 5, i.e.

$$R^{+} = \frac{H}{JC} \tag{15}$$

$$R^{-} = \frac{S}{JD}. \tag{16}$$

Furthermore, it is possible to quantify indicators that assess labour market dynamics from a different perspective. For example, *excess job reallocation* (*EJR*) defined according to Davis et al. (1996) as (17)

$$EJR_{so}^{(t)} = JR_{so}^{(t)} - \left|\Delta E_{so}^{(t)}\right| = JC_{so}^{(t)} + JD_{so}^{(t)} - \left|JC_{so}^{(t)} - JD_{so}^{(t)}\right| \tag{17}$$

provides a measure of the job reallocation beyond the minimum change in employment. In other words, this indicator says about job changes that are not necessary to accomodate the net employment change and, put simply, occurred unnecessarily. As another example may serve an indicator defined according to Bassanini and Marianna (2009) in the form of *excess worker reallocation* (*EWR*) (18)

$$EWR_{so}^{(t)} = WR_{so}^{(t)} - \left|\Delta E_{so}^{(t)}\right| = H_{so}^{(t)} + S_{so}^{(t)} - \left|H_{so}^{(t)} - S_{so}^{(t)}\right|, \tag{18}$$

that measures worker flows, that occurred beyond the minimum necessary to achieve the net employment change.

Then we can define an indicator of worker flows in excess of job flows, that is usually called *churning* (*CH*). This indicator provides a measure of worker flows not related to job flows, and can therefore approximate the worker flows in stable jobs. Churning can be defined in accordance with Burgess et al. (2000) as

$$CH_{so}^{(t)} = WR_{so}^{(t)} - JR_{so}^{(t)}, \tag{19}$$

or according to OECD (2009) as

$$CH_{so}^{(t)} = EWR_{so}^{(t)} - EJR_{so}^{(t)}, \tag{20}$$

where the following identity holds according to Haltiwanger et al. (2012)

$$H_{so}^{(t)} - JC_{so}^{(t)} = S_{so}^{(t)} - JD_{so}^{(t)}. \tag{21}$$

According to Tornquist et al. (1985), to convert time-t measures to rates, we divide the corresponding figure by the average of employment at t and $t-1$, i.e.

$$\overline{E}_{so}^{(t)} = \frac{E_{so}^{(t)} + E_{so}^{(t-1)}}{2}, \tag{22}$$

hence individual rates are as follows (using lower case letters for the rates):

$$jc_{so}^{(t)} = \frac{JC_{so}^{(t)}}{\overline{E}_{so}^{(t)}}, \tag{23}$$

$$jd_{so}^{(t)} = \frac{JD_{so}^{(t)}}{\overline{E}_{so}^{(t)}}, \tag{24}$$

etc.

3 DATA AND METHODOLOGY

The system of labour market indicators, proposed in the previous chapter, will be more data demanding in comparison to the generally known basic set of labour market indicators. In order to be able to make meaningful conclusions on the labour market dynamics, the indicators of the supply side should be consistent with indicators of the demand side (Davis et al., 1996). Consistent measurement of individual processes in the labour market requires ideally an integrated data source that links the both populations of workers and employers (Burgess et al., 2000). As for the Czech Republic, development of such an integrated data source, that will incorporate data about persons as well as economic entitities, is limited because of the complicated legal situation from the perspectives of data treatment and their potential linkage. This is the reason, why individual indicators depicted in Figure 4 will be estimated using the combination of the following data and data sources:

- the labour force survey (LFS) (in particular CZSO, 2010, 2011d, 2011e);
- transition probabilities according to CZSO (2011b);
- stocks and flows of population (CZSO, 2011a, 2011c, 2014c);
- job and worker flows in the wage sphere (Duspivová and Spáčil, 2011);
- vacancies according to the Ministry of Labour and Social Affairs (MPSV) statistics;
- statistics of job applicants from EU and the European Economic Area managed by the MPSV;
- foreigners employment statistics managed by the MPSV and
- data on valid trade licences granted to foreigners by the Ministry of Industry and Trade of the Czech Republic (MPO).

Because of lack of relevant microdata, we will exploit the internal consistency of data on stocks and flows at the macro level. Doing so, we will use the most suitable available data for each indicator.

All the figures presented in the next part are the annual measures and the reference year is 2010. This period was chosen intentionally because for another period, there is no information available on labour market transitions based on the LFS and grossed up to the universe (CZSO, 2011b).

The measurement unit of indicators of the supply side of the labour market is a physical person (i.e. each person is alloted to one stock only). In order to be able to compare supply and demand sides of the labour market, it is necessary to precisely define a job. Usually, a job is defined as an agreement between an employee and an employer (Burda and Wyplosz, 1994; Davis et al., 1996; Pissarides, 2000; methodology of national accounts SNA 2008 according to UN, 2009). Using such a definition of the job would provide the biased information on the Czech labour market because the LFS category

of employed persons contains apart employees (i.e. those persons who are directly linked to the jobs in terms of the above mentioned definition) also self-employed persons and employers. In accordance with Bruil et al. (2010), the definition of the job will be broadened to job vacancies as well. Job vacancies are an important part of the labour demand, because of the information on vacancies we can, among others, evaluate achieving of the labour market equilibrium. So, the total number of jobs at the macro level will be defined as the sum of:

- jobs created by employers (see the usual concept of the job),
- jobs created by self-employed and employers for themselves (on the basis of a notional, fictitious agreement) and
- job vacancies.

The following is the description of our construction methods.

3.1 Labour supply

Stocks

Stocks on the supply side of the labour market at the beginning and end of the period were set as follows:

- $E^{1.1.2010}$, $U^{1.1.2010}$, $N^{1.1.2010}$ were set according to the LFS results in the 1st quarter of 2010 (CZSO, 2010). As for the population aged 15 and older (population 15+), the difference between the number of population on 1 January 2010 according to the demographic statistics (CZSO, 2011a) and the LFS amounts to 0.01% of persons. We consider this difference as negligible for the above mentioned purposes;
- $E^{31.12.2010}$, $U^{31.12.2010}$, $N^{31.12.2010}$ were set according to the LFS results in the 4th quarter of 2010 (CZSO, 2011e). As for the population 15+, the difference between the number of population on 31st December 2010 according to the demographic statistics (CZSO, 2011a) and the LFS amounts to 0.05% of persons. In this case, we also consider this difference as negligible.

Flows according to the labour market status

Worker flows according to the labour market status were derived from both transition probabilities published by CZSO (2011b) and an assumption that flows between the 3rd quarter of 2009 and 3rd quarter of 2010 are comparable to those between the 4th quarter of 2009 and 4th quarter of 2010. In fact, we assumed that transition probabilities in the 4th quarter of 2009 equaled to probabilities in the 4th quarter of 2010. Transition probabilities in 2010 were obtained by multiplying of all transition matrices in individual quarters (see Table 1). The flows between individual labour market statuses were estimated as follows:

- H_{ue}^{2010} was estimated as the transition probability Unemployed → Employed multiplied by $U^{1.1.2010}$;
- H_{ne}^{2010} as transition probability Economically inactive → Employed multiplied by $N^{1.1.2010}$;
- S_{eu}^{2010} as transition probability Employed → Unemployed multiplied by $E^{1.1.2010}$;
- S_{en}^{2010} as transition probability Employed → Economically inactive multiplied by $E^{1.1.2010}$;
- F_{nu}^{2010} as transition probability Economically inactive → Unemployed multiplied by $N^{1.1.2010}$;
- F_{un}^{2010} as transition probability Unemployed → Economically inactive multiplied by $U^{1.1.2010}$.

Table 1 Transition probabilities by the labour market status between the 3rd quarter 2009 and the 3rd quarter 2010

Q3 2009/ Q3 2010	Employed	Unemployed	Ec. Inactive
Employed	0.925	0.025	0.050
Unemployed	0.478	0.342	0.180
Ec. inactive	0.056	0.022	0.922

Source: Own calculation based on CZSO (2011b)

Migration

Flows connected with migration were estimated using data on cross-border migration according to age and sex (CZSO, 2011c) with an assumption that distribution of emigrants and immigrants according to the labour market status is identical with those of the Czech population. Individual flows were estimated as follows:

- S_{em}^{2010} was estimated as a number of emigrants multiplied by the specific employment rate according to age and sex in 2010;
- H_{me}^{2010} as a number of immigrants multiplied by the specific employment rate according to age and sex in 2010;
- F_{um}^{2010} as a number of emigrants multiplied by the share of unemployed persons according to age and sex in 2010. To check the robustness in terms of accuracy of our accounting system and to prevent underestimation on the basis of the demographic statistics, we compare this estimate with the number of job applicants moving abroad, that were registered by the MPSV;
- F_{mu}^{2010} as a number of immigrants multiplied by the share of unemployed persons according to age and sex in 2010. In this case, we compared our estimate based on the demographic statistics with the number of newly immigrated job applicants registered by the MPSV during all quarters of 2010;
- F_{nm}^{2010} as a number of emigrants multiplied by the share of economically inactive persons according to age and sex in 2010;
- F_{mn}^{2010} as a number of immigrants multiplied by the share of economically inactive persons according to age and sex in 2010.

Specific rates and shares according to age and sex were computed on the basis of the LFS results (CZSO, 2011d).

Demographic change

The numbers of employed, unemployed and economically inactive persons, who died during the period, were estimated according to the data concerning both the natural increase of population (CZSO, 2014c) and the LFS. We had to make an assumption that the distribution of dead persons according to the labour market status is identical with those of the Czech population. S_{ed}^{2010} was estimated as a sum of the number of dead persons in 2010 according to sex and age groups multiplied by the specific employment rate according to age and sex in 2010. The latter one was based on the LFS results (CZSO, 2011d). F_{ud}^{2010} was estimated as a sum of the number of dead persons in 2010 according to sex and age groups multiplied by the share of unemployed persons in the Czech population in corresponding sex and age groups. F_{nd}^{2010} was estimated as a sum of the number of dead persons in 2010 according to sex and age groups multiplied by the share of economically inactive persons in the Czech population in corresponding sex and age groups.

F_{nn}^{2010} was estimated as the number of live births in 2010 (see CZSO, 2011c).

Job-to-job flows

Stocks and flows of employees were estimated using the percentage share of employees in the category of employed persons. This share was 82% in 2010 (CZSO, 2011d).

Besides the flows quantified in the wage sphere (Duspivová and Spáčil, 2011), it was necessary to estimate the flows of employees who changed their jobs and remained employed.

The estimate of H_{ee}^{2010} proceeds from the total number of hires H^{2010}. H^{2010} was estimated as a sum of hires in the wage sphere and the minimum number of hires in the salary sphere. As for the latter, it equals to the number of jobs created in the salary sphere in 2010. Then, the individual flows concerning hires (based on the above mentioned percentage share of 82%) were subtracted from the total number of hires, i.e.

$$H_{ee}^{2010} = H^{2010} - H_{me}^{2010} - H_{ne}^{2010} - H_{ue}^{2010}. \quad (30)$$

The estimate of S_{ee}^{2010} proceeds from the total number of separations S^{2010}. S^{2010} was estimated as a sum of separations in the wage sphere and the minimum number of separations in the salary sphere. As for the latter, it equals to the number of jobs destroyed in the salary sphere in 2010. Then, the individual flows concerning separations (based on the above mentioned percentage share of 82%) were subtracted from the total number of separations, i.e.

$$S_{ee}^{2010} = S^{2010} - S_{eu}^{2010} - S_{en}^{2010} - S_{em}^{2010} - S_{ed}^{2010}. \quad (31)$$

Furthermore, the following identity was used

$$H_{ee}^{2010} = S_{ee}^{2010}, \quad (32)$$

because an employee, who left one economic entity (and therefore is covered by S_{ee}^{2010}), passed into another economic entity (and therefore is covered by H_{ee}^{2010}). The system was therefore necessary to balance in such a way to keep the identity (32). This identity was achieved by increasing S_{ee}^{2010} by 136 thousand persons. This balancing adjustment was carried out by separations because of the lower quality of the primary data source available for the salary sphere.

The above mentioned job-to-job flows of employees were further increased by the sum of persons changing their economic status from an employee to self-employed, and vice versa. The number of these transitions was estimated as the number of persons in individual category at the beginning of the period (CZSO, 2010) multiplied by the corresponding transition probability according to Table 2. The transition probabilities in Table 2 were calculated using the same methodology as well as assumptions as in the case of probabilities in Table 1. So, the job-to-job flows were increased by the number of employees who switched to self-employed persons (25 thousand persons) and by the number of self-employed persons who became employees (21 thousand persons) in 2010. Since both flows relate to the transitions within the category of employed persons, they were added to hires and separations in the same amount, and therefore no other balancing adjustments were needed.

Table 2 Transition probabilities by the economic status between the 3rd quarter 2009 and 3rd quarter 2010

Q3 2009/ Q3 2010	Employee	Self-employed	Without work
Employee	0.906	0.006	0.088
Self-employed	0.025	0.923	0.052
Without work	0.094	0.013	0.893

Source: Own calculation based on CZSO (2011b)

Balancing

Finally, there were worker and job flows balanced with respect to the stock information concerning the labour market in the Czech Republic. As for our accounting framework, three stock-flow equations were used, namely:

$$E^{31.12.2010} = \quad (33)$$
$$= E^{1.1.2010} + H_{me}^{2010} + H_{ne}^{2010} + H_{ue}^{2010} + H_{ee}^{2010} - S_{ee}^{2010} - S_{eu}^{2010} - S_{en}^{2010} - S_{em}^{2010} - S_{ed}^{2010},$$

$$U^{31.12.2010} = U^{1.1.2010} + S_{eu}^{2010} + F_{nu}^{2010} + F_{mu}^{2010} - H_{ue}^{2010} - F_{un}^{2010} - F_{um}^{2010} - F_{ud}^{2010}, \quad (34)$$

$$N^{31.12.2010} = N^{1.1.2010} + S_{en}^{2010} + F_{un}^{2010} + F_{mn}^{2010} + F_{nn}^{2010} - H_{ne}^{2010} - F_{nu}^{2010} - F_{nm}^{2010} - F_{nd}^{2010}. \quad (35)$$

During the balancing, we used additional data on the total number of the Czech population on 1st January 2010 and 31st December 2010. In an ideal case, the change in a stock should equal inflows minus outflows. As for the Czech population, this simple accounting rule does not hold because of the problems concerning recording of the cross-border migration in the demographic statistics.[6] Balancing adjustments of the stocks of employed, unemployed and economically inactive persons were carried out because the initial stocks were based on the LFS results (i.e. they referred to individual quarters, not to specific dates, e.g. to 1st January 2010 or 31st December 2010). Balancing adjustments are provided in Table 3.

Table 3 Balancing adjustments of the labour market indicators in the Czech Republic in 2010

Indicator	Result [thousand persons]	of which **balancing adjustment** [thousand persons]
$U^{1.1.2010}$	431	8
$U^{31.12.2010}$	355	–8
$N^{1.1.2010}$	5 228	–27
$N^{31.12.2010}$	5 286	31
H_{me}^{2010}	72	57

Source: Own calculation

3.2 Labour demand

Job stocks

$J^{1.1.2010}$ was estimated as the sum of employees, employees with a second job, employers, own-account workers, family workers and members of producers' cooperatives (all in physical numbers of persons) according to the LFS (CZSO, 2010) and vacancies in the 1st quarter of 2010. $J^{31.12.2010}$ was estimated as a sum of employed persons and employees with a second job according to the LFS (CZSO, 2011e) and vacancies in the 4th quarter of 2010. Job stocks were further adjusted using data on job flows (see below) to hold the equation

$$J^{31.12.2010} = J^{1.1.2010} + JC^{2010} - JD^{2010}. \quad (36)$$

Balancing adjustments were carried out to initial job stocks (+18 thousand jobs) as well as final job stocks (+17 thousand jobs).

Job flows

Estimates of JC^{2010} a JD^{2010} came out from an assumption that in the salary sphere, there is the lower level of flows compared to the wage sphere. Nowadays, no survey is available in any country similar to the Czech Republic that would focus on differences in the level of job and worker flows in the wage and salary spheres. Generally, the salary sphere is considered to be more stable part of an economy and is characterized by both the lower level of job flows and the higher stability of employees. That

[6] The demographic statistics defines external migration as a change of a permanent stay of the person from the Czech Republic to abroad or from abroad to the Czech Republic (CZSO, 2001). Therefore, migration is not recorded if any change in permanent stay does not occur.

is confirmed e.g. by Pisani-Ferry (2003) who stated that the public sector participated in job creation in the French economy by only 15% during the period 1996–2001. We suppose, with regard to Pisani-Ferry (2003), that the wage sphere participated in job reallocation by 90% and salary sphere by 10%. Taking into consideration, that employment in the salary sphere was in 2010 more or less stable,[7] the job reallocation in the salary sphere is divided into created and destroyed jobs in the ratio of 1:1 (see Table 4).

Table 4 Estimates of job flows in the Czech Republic in 2010

Indicator	Result [thousand jobs]	share on reallocation [%]
JC_{WS}^{2010}	394	–
JD_{WS}^{2010}	184	–
JR_{WS}^{2010}	578	90
JR_{SS}^{2010}	64	10
JC_{SS}^{2010}	32	–
JD_{SS}^{2010}	32	–

Note: WS means the wage sphere, SS the salary sphere.
Source: Own calculation

In accordance with the definition of the job, there were estimated job flows that were connected with transitions of persons among economic statuses (above all with self-employed persons). Jobs were created in two cases – if an employee became self-employed (25 thousand jobs) or if a person out of the labour force became self-employed (56 thousand jobs). Jobs were destroyed in cases when a self-employed became an employee (21 thousand jobs) or left the labour market (43 thousand jobs). The estimates were based on the numbers of persons in individual categories according to CZSO (2010) and transition probabilities in Table 2.

Job flows were further adjusted in order to hold the equation (17). Since the difference between hires and separations amounted to 90 thousand persons, it was necessary to carry out the balancing adjustment concerning job flows in the amount of 136 thousand jobs. Due to this fact, the number of destroyed jobs was increased by 136 thousands.

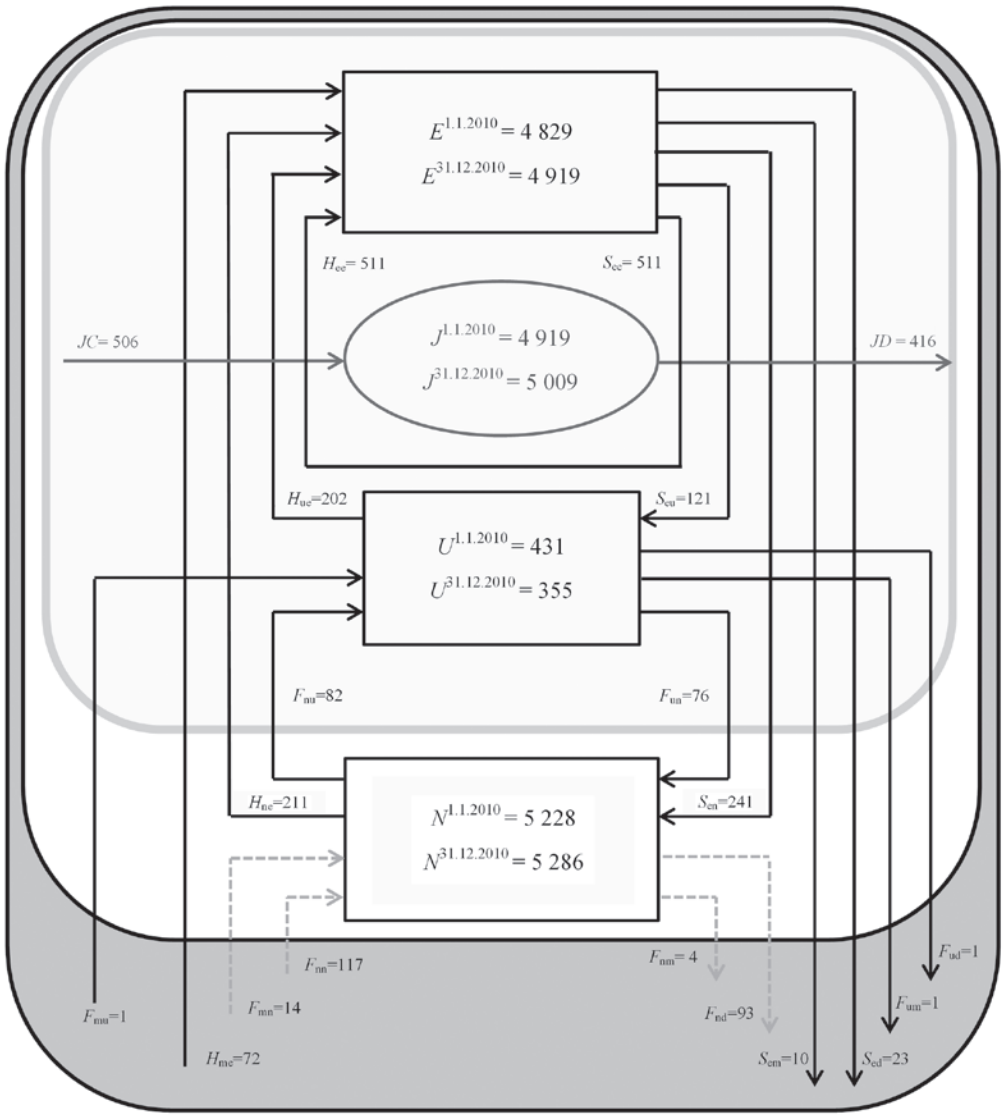
4 STOCKS AND FLOWS IN THE CZECH LABOUR MARKET

Figure 6 summarizes job and worker flows in the Czech labour market in 2010 as constructed by the system proposed in the previous chapters. Stocks and flows are balanced at the macro level and the units of measure are thousand jobs and thousand persons (i.e. each person is alloted to one stock only). Table 5 presents job and worker flows expressed as rates using denominator (22).

Figure 6 (and analogously Table 5) offers a new perspective on the Czech labour market dynamics. First, job flows involved 18.9% of jobs (jr^{2010}) and worker flows 39.0% of employed persons (wr^{2010}) in the Czech labour market in 2010. Second, the flows between labour market statuses appear to be particularly large. In 2010, 51.4% of unemployed persons found a job (i.e. the flow from unemployment to employment was related to 51.4% of unemployed persons), and otherwise put, 4.1% of employed persons represent the inflow from unemployment to employment. On the contrary, 2.5% of employed persons became unemployed and these persons accounted for 30.8% of the unemployed. From the Czech labour market perspective, there is also the migration important because 1.5% of workers immigrated in 2010.

[7] According to CZSO (2011b), the average registered number of employees in the 1st quarter of 2010 in the salary sphere amounted to 742.7 thousand persons and 747.3 thousand persons in the 4th quarter of 2010.

Figure 6 Stocks and flows in the Czech labour market in 2010 (thousand persons, thousand jobs)



Source: Own calculation

Furthermore, Table 6 shows some keynote indicators of labour market dynamics that are of crucial importance for the social policy. To be more specific, the transitions between unemployment and economic inactivity may indicate, for example, that unemployed persons opt out from searching for a job. In 2010, 19.3% of the unemployed left the labour force, and vice versa, 20.9% of economically inactive persons became unemployed. Table 6 expands the analysis and shows the most important rates calculated with the denominator (22), i.e. the average number of employed persons ($\overline{E}^{2010}$), as well as with the denominators defined as the average number of unemployed ($\overline{U}^{2010}$) and economically inactive persons ($\overline{N}^{2010}$) in t and $t-1$.

Table 5 Job and worker flows rates in the Czech Republic in 2010

Indicator	[%]	Indicator	[%]	Indicator	[%]
h_{ue}^{2010}	4.1	s_{em}^{2010}	0.2	wr^{2010}	39.0
s_{eu}^{2010}	2.5	s_{ed}^{2010}	0.5	jr^{2010}	18.9
h_{ne}^{2010}	4.3	h^{2010}	20.4	ewr^{2010}	37.2
s_{en}^{2010}	4.9	s^{2010}	18.6	ejr^{2010}	17.1
h_{ee}^{2010}	10.5	jc^{2010}	10.4	ch^{2010}	20.1
s_{ee}^{2010}	10.5	jd^{2010}	8.5	R^{+}	2.0
h_{me}^{2010}	1.5	Δe^{2010}	1.8	R^{-}	2.2

Note: Differences in sums are caused by rounding.
Source: Own calculation

Table 6 Comparison of job and worker flow rates in the Czech Republic in 2010 according to different denominators

Rate [%]	Denominator		
	$\overline{E}^{2010}$	$\overline{U}^{2010}$	$\overline{N}^{2010}$
h_{ue}^{2010}	4.1	51.4	–
s_{eu}^{2010}	2.5	30.8	–
h_{ne}^{2010}	4.3	–	4.0
s_{en}^{2010}	4.9	–	4.6
f_{un}^{2010}	–	19.3	1.4
f_{nu}^{2010}	–	20.9	1.6
h_{me}^{2010}	1.5	–	–
s_{em}^{2010}	0.2	–	–

Source: Own calculation

Figure 6 shows also the flows within the category of employed persons (i.e. the job-to-job flows) that experienced 10.5% of workers. In 2010, the job-to-job flows accounted for 465 thousand workers who left their job and found another. A detailed analysis revealed that 21 thousand self-employed persons became employed and vice versa, 25 thousand employed persons became self-employed.

Due to the natural increase of population (live births, deaths) the number of employed persons decreased by 0.5%.

In Figure 6, we provide stocks and flows concerning jobs as well. As for stocks, the number of jobs exceeds the number of employed persons because a person may work in several jobs. In 2010, there were 10.4% of jobs created and 8.5% of jobs destroyed, so the net change in the number of jobs equals 1.8% (see Table 5). In fact, job flows may be even higher because any flows within firms have not been taken into account in this study. According to Hamermesh et al. (1994), accounting for simultaneous creation and destruction of jobs may increase economywide job flows by up to 15%. The same applies for worker flows as well.

Table 5 demonstrates several interesting facts about job and worker flows and their relations. The ratios defined in (15) and (16) indicate that the number of hires was two times higher than the number of jobs created in 2010, and the number of separations was more than two times higher than the number of jobs destroyed, respectively. The worker flows were much larger – by a factor of 2 – than the job flows. The pattern of excess turnover can be further detailed using both excess job reallocation (ejr^{2010}) and excess worker reallocation (ewr^{2010}). The evidence in Table 5 shows that worker flows exceeded the job flows in 2010, i.e. there was a vast amount of labour reallocation in the Czech labour market. About 17.1% of the jobs changes took place but these changes were not needed by firms to reach the desired employment

level. As for worker flows, 37.2% of workers moved beyond required adjustment in the employment level. This is a clear evidence of significant levels of churning (ch^{2010}) in the Czech labour market in 2010, because 20.1% of the worker flows arose from permanent jobs. Otherwise put, 20.1 % of worker flows were not associated neither with creation nor destruction of jobs. This result is consistent with the measures of job-to-job flows (i.e. flows within the category of employed persons), namely h_{ee}^{2010} and s_{ee}^{2010}. The sum of both measures of job-to-job flows (10.5 and 10.5% respectively) corresponds with the level of churning.

CONCLUSION

The main aim of this paper was to present a new system of statistical indicators concerning the labour market in the Czech Republic with respect to the theoretical background as well as to latest trends in the labour market statistics.

First, a theoretical framework of the labour market was introduced. This framework interlinks relations between employees and employers, characterizes the processes associated with demand and supply sides of the labour market, and what is more, it is neutral with respect to all the economic schools of thought.

Then, there was the new system of statistical information concerning the labour market proposed. The most likely advantage of the new system is the fact that the system interlinks relations between employees and employers and all the key aspects of the labour market are evaluated together. The system proposed in this article extends current models and handles stocks and flows in the labour market in the wider context. Moreover, it provides new evidence on labour turnover caused by the natural increase of population as well as by migration. In addition to the generally known indicators of economic activity, we proposed new indicators of job creation, job destruction, hires, separations, job reallocation and worker reallocation. Furthermore, we defined aggregate indicators that allow us to assess labour market dynamics from a different perspective, namely excess worker reallocation, excess job reallocation and churning.

There have never been quantified the indicators concerning job and employee stocks and flows using integrated data source in the Czech Republic, so the pilot results were introduced in this paper. The worker and job flows were balanced with respect to the stock information concerning the labour market, so the measures of job and worker flows shed better light on employment dynamics. Conclusions that can be drawn from the proposed system have an essential importance also for the economic policy – actually, in 2010 the changes in the labour market were associated with 18.9% of jobs and 39.0% of workers in the Czech Republic.

The system brings a new insight to the dynamics of the labour market compared to the generally known basic set of labour market indicators. It is obvious that implementing the new system, we could prove some hypotheses that were impossible to prove before. The systematic approach, based on a wider use of linked employer-employee microdata combined with new indicators, has the advantages of a higher information capability as well as of complying with the requirements of the academics. Provided that sufficient data are available, it is possible to construct a consistent set of all relevant indicators at the macro level in a full time series.

References

ABOWD, J. M., CORBEL, P., KRAMARZ, F. *The Entry and Exit of Workers and the Growth of Employment: An Analysis of French Establishment.* Working Paper No. 5551, Cambridge, MA: NBER, 1996.

ALBAEK, K., SØRENSEN, B. E. Worker Flows and Job Flows in Danish Manufacturing, 1980–91. *The Economic Journal*, 1998, Vol. 108, No. 451, pp. 1750–1771.

BASSANINI, A., MARIANNA, P. *Looking inside the perpetual-motion machine: Job and worker flows in OECD countries.* Discussion Paper No. 4452, Bonn: IZA, 2009.

BLANCHARD, O. J., DIAMOND, P. The Beveridge Curve. *Brookings Papers on Economic Activity*, Microeconomics, 1989, Vol. 20, No. 1, pp. 1–60.
BLANCHARD, O. J., DIAMOND, P. The Cyclical Behavior of the Gross Flows of U.S. Workers. *Brookings Papers on Economic Activity*, Microeconomics, 1990, Vol. 21, No. 2, pp. 85–155.
BLAU, F. D., FERBER, M. A., WINKLER, A. E. *The Economics of Women, Men, and Work.* 5th ed. Upper Saddle River, NJ (US): Pearson Prentice Hall, 2006.
BOERI, T., VAN OURS, J. *The Economics of Imperfect Labor Markets.* Princeton (New Jersey): Princeton University Press, 2008.
BORJAS, G. J. *Labor Economics.* 5th ed. Boston, MA (US): McGraw-Hill/Irwin, 2010.
BROERSMA, L., DEN BUTTER, F. A. G., KOCK, U. A national accounting system for worker flows. *Economics Letters*, 2000, Vol. 67, No. 3, pp. 331–336.
BROWN, C. An Institutional Model of Wives' Work Decisions. *Industrial Relations: A Journal of Economy and Society*, 1985, Vol. 24, No. 2, pp. 184–204.
BRUIL, A., DEN BUTTER, F. A. G., KEE, P. *The definition of a job and the flow approach to the labour market; a sensitivity analysis for the Netherlands.* Discussion paper No. 10011, The Hague/Heerlen: Statistics Netherlands, 2010.
BURDA, M., WYPLOSZ, C. Gross Worker and Job Flows in Europe. *European Economic Review*, 1994, Vol. 38, No. 6, pp. 1287–1315.
BURDETT, K., MORTENSEN, D. T. Wage Differentials, Employer Size, and Unemployment. *International Economic Review*, 1998, Vol. 39, No. 2, pp. 257–273.
BURGESS, S., LANE, J., STEVENS, D. Job Flows, Worker Flows, and Churning. *Journal of Labor Economics*, 2000, Vol. 18, No. 3, pp. 473–502.
CAHUC, P., ZYLBERBERG, A. *Labor Economics.* Cambridge, MA (US): The MIT Press, 2004.
CALVO, G., WELLISZ, S. Hierarchy, Ability and Income Distribution. *Journal of Political Economy*, 1979, Vol. 87, No. 5, pp. 991–1010.
CENTENO, M., MACHADO, M., NOVO, A. A. *Excess Turnover and Employment Growth: Firm and Match Heterogeneity.* Discussion Paper No. 4586, Bonn: IZA, 2009.
CZSO. 2001. *Příručka demografické statistiky pro potřebu oblastních statistických orgánů.* Prague: Czech Statistical Office, 2001.
CZSO. 2010. *Zaměstnanost a nezaměstnanost v ČR podle výsledků výběrového šetření pracovních sil 1. čtvrtletí 2010* [online]. Prague: Czech Statistical Office, 2010. [cit. 26.1.2015]. <https://www.czso.cz/csu/czso/zamestnanost-a-nezamestnanost-v-cr-podle-vysledku-vyberoveho-setreni-pracovnich-sil-1-ctvrtleti-2010-8mcv8v5kli>.
CZSO. 2011a. *Demografická ročenka ČR – 2010* [online]. Prague: Czech Statistical Office, 2011. [cit. 26.1.2015]. <https://www.czso.cz/csu/czso/demograficka-rocenka-cr-2010-wg5imclir9>.
CZSO. 2011b. *Přechody na trhu práce mezi 3. čtvrtletím roku 2009 a 3. čtvrtletím roku 2010 (longitudinální studie)* [online]. Prague: Czech Statistical Office, 2011. [cit. 13.5.2014]. <https://www.czso.cz/csu/czso/cri/vyvoj-ekonomicke-aktivity-obyvatelstva-4-ctvrtleti-lq49boi580>.
CZSO. 2011c. *Stav a pohyb obyvatelstva v ČR v roce 2010 (předběžné výsledky)* [online]. Prague: Czech Statistical Office, 15.3.2011 [cit. 26.1.2015]. <http://www.czso.cz/csu/2014edicniplan.nsf/p/130062-14>.
CZSO. 2011d. *Zaměstnanost a nezaměstnanost v ČR podle výsledků výběrového šetření pracovních sil 2010* [online]. Prague: Czech Statistical Office, 2011. [cit. 26.1.2015]. <https://www.czso.cz/csu/czso/zamestnanost-a-nezamestnanost-v-cr-podle-vysledku-vyberoveho-setreni-pracovnich-sil-rocni-prumery-2010-908icdp8f5>.
CZSO. 2011e. *Zaměstnanost a nezaměstnanost v ČR podle výsledků výběrového šetření pracovních sil 4. čtvrtletí 2010* [online]. Prague: Czech Statistical Office, 2011. [cit. 26.1.2015]. <https://www.czso.cz/csu/czso/zamestnanost-a-nezamestnanost-v-cr-podle-vysledku-vyberoveho-setreni-pracovnich-sil-4-ctvrtleti-2010-1yx818alvj>.
CZSO. *Gross National Income Inventory 2002 Czech Republic. Version 2.2. Annex: Main revision 2011* [online]. Prague: Czech Statistical Office, 2012. [cit. 26.1.2014]. <http://apl.czso.cz/nufile/CZ_GNI_Rev%202.2.pdf>.
CZSO. 2014a. *Průměrná mzda a evidenční počet zaměstnanců – Metodika* [online]. Prague: Czech Statistical Office, 2014. [cit. 2.1.2015]. <https://www.czso.cz/csu/czso/1-pmz_m>.
CZSO. 2014b. *Zaměstnanost a nezaměstnanost podle výsledků VŠPS – Metodika* [online]. Prague: Czech Statistical Office, 2014. [cit. 27.1.2015]. <https://www.czso.cz/csu/czso/zam_vsps>.
CZSO. 2014c. *Zemřelí podle seznamu příčin smrti, pohlaví a věku v ČR, krajích a okresech 2004 až 2013* [online]. Prague: Czech Statistical Office, 2014. [cit. 29.1.2015]. <https://www.czso.cz/csu/czso/130065-14-r_2014-01>.
DAVIS, S. J., FABERMAN, J. F., HALTIWANGER, J. The Flow Approach to Labor Markets: New Data Sources and Micro–Macro Links. *Journal of Economic Perspectives*, 2006, Vol. 20, No. 3, pp. 3–26.
DAVIS, S. J., HALTIWANGER, J. *Gross Job Creation, Gross Job Destruction, and Employment Reallocation.* Working Paper No. E-89-33, Stanford: Stanford University, The Hoover Institution, 1989.
DAVIS, S. J., HALTIWANGER, J. Gross Job Creation and Destruction: Microeconomic Evidence and Macroeconomic Implications. *NBER Macroeconomics Annual*, 1990, V, pp. 123–168.
DAVIS, S. J., HALTIWANGER, J. C. Gross Job Creation, Gross Job Destruction, and Employment Reallocation. *The Quarterly Journal of Economics*, 1992, Vol. 107, No. 3, pp. 819–863.

DAVIS, S. J., HALTIWANGER, J. C. Gross job flows. In: ASHENFELTER, O., CARD, D. eds. *Handbook of Labor Economics.* New York: Elsevier Science North-Holland, 1999, Volume 3, Part 2, Chapter 41, pp. 2711–2805.

DAVIS, S. J., HALTIWANGER, J. C., SCHUH, S. *Job Creation and Destruction.* Cambridge, MA: The MIT Press, 1996.

DIAMOND, P. Aggregate Demand Management in Search Equilibrium. *Journal of Political Economy*, 1982, Vol. 90, No. 5, pp. 881–894.

DUNNE, T., ROBERTS, M. J., SAMUELSON, L. Plant Turnover and Gross Employment Flows in the U.S. Manufacturing Sector. *Journal of Labor Economics*, 1989, Vol. 7, No. 1, pp. 48–71.

DUSPIVOVÁ, K. Role zahraničního vlastnictví z hlediska tvorby pracovních míst a fluktuace zaměstnanců. *Politická ekonomie*, 2011, Vol. 59, No. 6, pp. 759–774.

DUSPIVOVÁ, K., SPÁČIL, P. The Czech Labour Market and the Current Economic Crisis: What Can the Linked Employer-Employee Data Tell Us? *Statistika*, 2011, Vol. 91, No. 4, pp. 22–34.

EHRENBERG, R. G., SMITH, R. S. *Modern Labor Economics*. Theory and Public Policy. 10th ed. Boston, MA (US): Pearson Education, Inc., 2009.

EUROSTAT. *National Quality Report Czech Republic 2007* [online]. Luxembourg: Eurostat, 2010. [cit. 29.1.2014]. <http://ec.europa.eu/eurostat/ramon/nat_methods/SBS/NQR/NQR-CZ2007.pdf>.

EUROSTAT. *Labour Cost Survey (LCS) 2008 – Synthesis of Quality Reports Council Regulation (EC) No 530/1999 and Commission Regulation (EC) No 698/2006.* Luxembourg: Eurostat, 2011.

FISCHER, J., SIXTA, J. K propočtu souhrnné produktivity faktorů. *Politická ekonomie*, 2009, Vol. 57, No. 4, pp. 544–554.

GALUŠČÁK, K., MÜNICH, D. Structural and Cyclical Unemployment: What Can Be Derived from the Matching Function? *Czech Journal of Economics and Finance*, 2007, Vol. 57, No. 3-4, pp. 102–125.

HALTIWANGER, J., HYATT, H., MCENTARFER, E., SOUSA, L. *Job Creation, Worker Churning, and Wages at Young Businesses* [online]. Business Dynamics Statistics Briefing: Seventh in a series of reports using data from the November 2012 U.S. Census Bureau's Business Dynamics Statistics. Kansas City, Missouri: Ewing Marion Kauffman Foundation, 2012. <http://www.census.gov/ces/pdf/BDS_StatBrief7_Creation_Churning_Wages.pdf>.

HAMERMESH, D. S., HASSINK, W. H. J., VAN OURS, J. C. *New Facts About Factor-Demand Dynamics: Employment, Jobs, and Workers.* Working Paper No. 4625, Cambridge, MA: NBER, 1994.

HYATT, H., McENTARFER, E. *Job-to-Job Flows and the Business Cycle.* CES Working Paper No. 12–04, Center for Economic Studies, U.S. Census Bureau, 2012.

ISARD, P. How Far Can We Push the "Law of One Price"? *American Economic Review,* 1977, Vol. 67, No. 5, pp. 942–948.

KAUFMAN, B. E. Expanding the Behavioral Foundations of Labor Economics. *Industrial and Labor Relations Review*, 1999, Vol. 52, No. 3, pp. 361–392.

KIYOTAKI, N., LAGOS, R. A Model of Job and Worker Flows. *Journal of Political Economy*, 2007, Vol. 115, No. 5, pp. 770–819.

LANE, J. I., ISAAC, A. G., STEVENS, D. W. 1996a. Firm heterogeneity and worker turnover. *Review of Industrial Organization*, 1996, Vol. 11, No. 3, pp. 275–291.

LANE, J. I., STEVENS, D., BURGESS, S. 1996b. Worker and Job Flows. *Economics Letters*, 1996, Vol. 51, No. 1, pp. 109–113.

LIPPMAN, S. A., McCALL, J. J. The economics of job search: a survey. *Economic Inquiry*, 1976, Vol. 14, pp. 15–189.

MALCOMSON, J. M. Unemployment and the Efficiency Wage Hypothesis. *The Economic Journal*, 1981, Vol. 91, No. 364, pp. 848–866.

MANKIW, N. G. *Principles of Economics.* Fort Worth, TX (US): Dryden Press, 1998.

MANNING, A. Wage bargaining and the Phillips curve: The identification and specification of aggregate wage equations. *Economic Journal*, 1993, Vol. 103, No. 416, pp. 98–118.

MANNING, A. *Monopsony in Motion: Imperfect Competition in Labor Markets.* Princeton, NJ (US): Princeton University Press, 2003.

MORTENSEN, D. T. The Cyclical Behavior of Job and Worker Flows. *Journal of Economic Dynamics and Control*, 1994, Vol. 18, No. 6, pp. 1121–42.

MPSV. *MPSV: Nový systém poskytne efektivnější údaje o počtech volných pracovních míst* [online]. Prague: Ministry of Labour and Social Affairs, 2012. [cit. 27.1.2015]. <http://www.mpsv.cz/cs/12012>.

MPSV. *Zpráva o kvalitě šetření ISPV za rok 2011* [online]. Prague: Ministry of Labour and Social Affairs, 2013. [cit. 27.1.2014]. <http://www.ispv.cz/getattachment/4c5b67e9-b56a-48c0-8a62-b6a19b202259/ISPV_QR_2011-pdf.aspx?disposition=attachment>.

OECD. *OECD Employment Outlook 2009: Tackling the Jobs Crisis.* Paris: Organization for Economic Cooperation and Development, 2009.

PAGE, M. *Annual measures of job creation and destruction in New Zealand.* Wellington: Statistics New Zealand, 2010.

PISANI-FERRY, J. *The Surprising French Employment Performance: What Lessons?* CESifo Working Paper No. 1078, Munich: CESifo Group, 2003.

PISSARIDES, C. A. Short-Run Equilibrium Dynamics of Unemployment, Vacancies, and Real Wages. *The American Economic Review*, 1985, Vol. 75, No. 4, pp. 676–690.

PISSARIDES, C. A. *Equilibrium Unemployment Theory.* 2nd ed. Cambridge, MA (US): MIT Press, 2000.

POŘÍZKOVÁ, H. *Analýza zahraniční zaměstnanosti v České republice; postavení cizinců na trhu práce a podmínky jejich ekonomické integrace.* Prague: VÚPSV, v.v.i., 2008.
POSTEL-VINAY, F., ROBIN, J. Equilibrium Wage Dispersion with Worker and Employer Heterogeneity. *Econometrica*, 2002, Vol. 70, No. 6, pp. 2295–2350.
REBITZER, J., TAYLOR, L. The Consequences of Minimum Wage Laws: Some New Theoretical Ideas. *Journal of Public Economics*, 1995, Vol. 56, No. 2, pp. 245–255.
RUTHERFORD, M. Institutional Economics: Then and now. *The Journal of Economic Perspectives*, 2001, Vol. 15, No. 3, pp. 173–194.
SAINT-PAUL, G. *The Political Economy of Labor Market Institutions.* Oxford, NY (US): Oxford University Press, 2000.
SHAPIRO, C., STIGLITZ, J. E. Equilibrium Unemployment as a Worker Discipline Device. *The American Economic Review*, 1984, Vol. 74, No. 3, pp. 433–444.
SCHLICHT, E. Labour Turnover, Wage Structure, and Natural Unemployment. *Journal of Institutional and Theoretical Economics (Zeitschrift für die gesamte Staatswissenschaft)*, 1978, Vol. 134, No. 2, pp. 337–346.
STIGLITZ, J. E. Alternative Theories of Wage Determination and Unemployment in LDC's: The Labor Turnover Model. *The Quarterly Journal of Economics,* 1974, Vol. 88, No. 2, pp. 194–227.
TORNQUIST, L., VARTIA, P., VARTIA, Y. How Should Relative Change Be Measured? *The American Statistician*, 1985, Vol. 39, No. 1, pp. 43–46.
UN. *System of National Accounts 2008*. New York: United Nations Publication, 2009.
WEISS, A. Job Queues and Layoffs in Labor Markets with Flexible Wages. *Journal of Political Economy*, 1980, Vol. 88, No. 3, pp. 526–538.