

# The hire and separation of workers and employment growth: An analysis of heterogeneous firms and workers\*

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## Abstract

This paper provides evidence on job and worker flows at the employer level in a context of heterogeneous market conditions and within institutional constraints with direct impact on these flows. We show that both firm and worker characteristics are important in shaping the flows. We use two large datasets covering all private sector jobs in Portugal that allow us to contrast the annual and quarterly flows. There exists an intense reallocation process, most employers simultaneously hire and separate from workers at both frequencies. Hires and separations move symmetrically when firms expand or contract. There is a large heterogeneity in flows and excess turnover, over both firm and worker dimensions. Large firms have lower turnover, but high excess rotation levels. Turnover is concentrated among young, less-educated, and low-paid workers.

*Keywords:* Job flows; Worker flows; Excess turnover; Polarization; Contractual forms.

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# 1 Introduction

Labor markets of developed economies are characterized by the existence of a continuous process of job destruction and job creation, which is naturally associated with a process of workers' reallocation. In each firm, this process is characterized by the simultaneous hire and separation of workers; to fill a job vacancy firms often resort to the hire and separation of more than one worker. This matching process is carried out jointly by workers and firms, and due to a lack of detail in the data, is often modelled without taking into account the heterogeneity in both firms and workers behavior.

Workers rotation rates in the Portuguese labor market largely exceed the rates of job creation and destruction. On average, in expanding firms (those that create jobs), the creation of 100 jobs in a year involve the hire of 180 workers and the separation from 80 workers. That is, it resulted in the excessive turnover of 80 workers. Similarly, in contracting firms (those that reduce their level of employment), the reduction of 100 jobs involved the separation from 160 workers and the hire of 60 new workers. These numbers do not differ from the ones observed for other European economies with comparable labor legislation (see, for example Abowd, Corbel and Kramarz (1999)). When compared to the rates of worker turnover in countries with less rigidity in labor market regulation, for example, the United States, the figures for Portugal are smaller (Davis, Faberman, Haltiwanger and Rucker 2008).

We use two databases covering all private sector jobs in the period from 2001 to 2006. We will be particularly interested in the differences in the intensity of hire and separation of workers in firms expanding and contracting. The differences in turnover due to sectoral and firm characteristics will also be examined, as well as the role of the age of workers, their wages, the type of contract, and their qualifications.

Following the work of Davis, Haltiwanger and Schuh (1996) the interest in calculating job and worker flows increased substantially. The literature has also evolved to include micro and macroeconomic perspectives, examples of which are the work of Shimer (2007), Hall (2005) and Petrongolo and Pissarides (2008).

This article contributes to the description of the behavior of firms that face the decisions to hire and separate from workers. The theoretical basis for the existence of a continuous flow of hires and separations in the same firm can be found in the seminal work of Jovanovic (1979), Gibbons and Katz (1991) or Topel and Ward (1992). The existence of shocks (uncertainty) on

the allocation of labor is the main explanation to the simultaneous occurrence of job creation and destruction. Additionally, it is recognized that the labor market works with imperfect information, whether it is because of asymmetries in information, as in Gibbons and Katz (1991), or because of differences in match productivity, as in Jovanovic (1979) and Topel and Ward (1992). These factors are behind the simultaneous existence of hires and separations of workers, as firms and workers search for a better match.

The results reported in this paper contribute to the characterization of employment adjustment intensity in a context of heterogeneous market conditions and within institutional constraints to labor adjustments that influence the relative cost of the different contractual forms available (namely, the co-existence of fixed-term and permanent contracts).

These limitations profoundly change the relative price adjustments of employment, for example, between different types of contracts, and thus firms' behavior may have a significant impact on economic welfare. Blanchard and Landier (2002) argue that the potential benefits of increased flexibility generated by fixed term contracts may not exceed the potential costs of its coexistence with more rigid permanent contracts. We identify some traits in the functioning of the Portuguese labor market that closely match those in other European countries, raising the same questions about its efficiency.

The data used in this article have significant advantages over other sources of information commonly used for the calculation of these labor market indicators. We use the monthly administrative records of the Portuguese Social Security, covering *all* private sector salaried workers. We complement the results with annual data from *Quadros de Pessoal*, also an administrative matched employee-employer dataset. Besides a wider coverage, the advantage of the Social Security data remains the availability of intra-annual information and at the same time allowing for a longitudinal treatment of both firms and workers.

Each quarter, 24 percent of firms are net creators of jobs and 26 percent reduce their level of employment<sup>1</sup>. The remaining 50 percent do not make adjustments in the size of their workforce in each quarter, but promote, as a rule, adjustments in the composition of their workforce, that is, hire and separate themselves from workers. The net change of employment in the Portuguese economy is associated with a process of creation and destruction of jobs that involves 125 thousand firms employing 2.1 million workers.

Our results point towards a strong heterogeneity in the pattern of workers rotation. In larger

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<sup>1</sup>Not counting firms with a single worker who decide not to change its level of employment

firms there is a higher incidence of excessive workers rotation (90 percent of new contracts do not result in net increases in the level of employment for expanding firms with over 250 employees, while for smaller firms the same figure drops to 30 percent). The services sector is also subject to a greater worker turnover, which exceeds job flows to an extent much higher than in the manufacturing sector. As indicators of the segmentation observed in the Portuguese labor market, workers rotation is much higher among young people, workers with fixed term contracts and among low-skilled and low-wages workers. Note that these are the groups in which we observed the largest gains in employment.

This paper focuses on aspects of employment mobility, not considering the important issues related with workers' earnings and non-employment spells that are associated to these changes in employment. Thus, two natural complements to this analysis will be the consideration of the pattern of wages associated with the phenomenon of entry and exit of workers and with the pattern of firm's production and productivity; and the pattern of non-employment duration of workers who separate from firms. These issues are part of an agenda for research that is important to pursue.

## **2 Data**

In the analysis of the process of job creation and destruction and workers reallocation in the Portuguese economy we use two alternative statistical sources. This is particularly useful, not only because it allows a cross validation of the results between the two datasets, but mainly because the two datasets complement each other in a number of important aspects. The statistical sources are the Quadro de Pessoal (QP), collected by the Ministry of Employment and the administrative dataset of Social Security records (BDRSS).

### **2.1 Quadros de Pessoal (QP)**

The QP is a dataset created from the administrative information collected on an annual basis (reported to the month of October each year) by the MTSS covering all Portuguese firms with at least one worker (although firms with less than 5 workers have lower response rates). QP does not cover government workers, entities that employ non-permanent rural workers and domestic workers. The QP is a source of information of great importance in the microeconomic analysis of employment in Portugal and has been extensively used (see Centeno, Machado and Novo

(2008), for a more detailed description of the dataset).

The analysis with QP is conducted for the period 2002 to 2005, to overlap with the period available for the BDRSS. In 2005, the data cover about 340 thousand enterprises with a total of nearly 3 million employees.

It is worth mentioning that the longitudinal file of workers often presents a number of records that does not match with the number of workers declared by firms as employees, so that the flow of workers identified in the workers' file do not match the pattern of employment identified in the firms' file and could be overstated. To limit this difference, the flows of workers from QP presented in this article relate only to firms that in which the number of workers with valid individual records is at least 90 percent of the number of workers that the firm reported as its level of employment. The resulting sample covers, on average, 1.5 million workers each year.

## **2.2 Database of Social Security records (BDRSS)**

Social Security data have been increasingly used in country studies for labor market analysis. These studies include issues related with mobility and the wage determination process (see, for example, the studies on job creation and destruction cited throughout the text). The nature of the information, self-declared earnings subject to mandatory contributions to the Portuguese social security system, makes the BDRSS a unique source of information on labor market developments.

The BDRSS covers the period from March 2001 to March 2006. The dataset includes all pairs employer-employee for which there is at least one month of wages declared to the Social Security. For each of these pairs, the dataset has the information on the first and last month in which there are wage payments and the number of months in which, during that period, a payment is reported.

The dataset has about 14 million jobs, and for about 75 percent of these jobs there were no interruptions in wage payments recorded. The remaining cases could correspond to periods of continuous work under the same contractual relationship or to successive work periods for the same employer, in which case we split them as different employment spells.

### 3 Terminology

The concepts of job creation, job destruction and worker turnover (hires and separations) follow Davis et al. (1996). We define each of these concepts as follows:

#### *Employment flows*

Job creation – Job creation at time  $t$  is equal to the change in employment for firms that expand or begin their activity between  $t - 1$  and  $t$ ;

Job destruction – Job destruction at time  $t$  is equal to the change in employment for firms that contract or exit the market between  $t - 1$  and  $t$ ;

#### *Workers flows*

Hires – The hire of workers at time  $t$  is equal to the number of workers in a firm at time  $t$  that were not employed in that firm at  $t - 1$ ;

Separations – The separation of workers at time  $t$  is equal to the number of workers in a firm at time  $t - 1$  that are not employed in that firm at  $t$ ;

Based on job or workers flows, we can define:

Net job creation – The net job creation at time  $t$  is equal to the difference between the level of employment at  $t-1$  and  $t$ ;

Excessive turnover (or churning) – The excessive turnover of workers at time  $t$  is equal to the difference between total hires and separations, and net job creation.

Note that the net creation of jobs is equal to the difference between job creation and destruction, or alternatively, between the hires and separations of workers. The flow of workers is much higher than the flow of jobs. The process of workers hire and separation occurs simultaneously in most firms, whether they are expanding or contracting their employment level. This process of replacing workers to occupy the same job is a typical behavior of firms, and occurs either because the employee was laid-off or because he left the job voluntarily. This activity takes place far beyond the needs that the firm has to adjust its level of employment and, hence, it is known in the literature as excessive turnover of workers or churning.

To convert these measures of employment change to rates, we divided them by the average employment in  $t - 1$  and  $t$ . Davis et al. (1996) discuss the advantages of this measure over traditional rates of growth. For example, for firms that did not exist at time  $t - 1$  the growth rates are not computable, while with the definition used in this article the corresponding value is 2 (and in the case of firms leaving the market the corresponding rate of destruction takes the

value -2).

In this article, we emphasize the relationship between the flows of jobs and workers. To this end, we present hire and separation rates by type of growth of employment at the firm level. From period to period (quarterly or annually), we identify firms with positive employment growth, with negative employment growth and with no change in employment. For each of these groups of firms we calculate hire and separation rates and the net change of employment using as reference the average level of employment in each of these groups (as opposed to total employment in the economy).

## 4 Job and workers flows

The relationship between the flows of jobs and workers is not easy to describe, since there are many competing reasons for the existence of workers' rotation. Indeed, several studies show that the behavior of labor demand by firms is rather complex (see, for example, Hamermesh, Hassink and van Ours (1996)). Firms that reduce their level of employment also hire new workers and firms undergoing expansion also lay-off workers.

Clearly, the magnitude of job flows will always be lower than that of worker flows. The process of workers reallocation beyond what would be necessary to increase or decrease the level of employment, i.e. the one that occurs in excess of job flows, is related to the re-evaluation of the match quality. This reassessment may be made either by the employer, resulting in the simultaneous existence of lay-offs and hires, or by the worker, resulting in the occurrence of voluntary exits and the subsequent replacement of the worker.

This process of mobility must be understood as an investment decision, by comparing the costs of changing labor market partner with the benefits of future earnings (Jovanovic (1979)). The existence of worker flows in excess of job flows should be understood as an essential aspect of the functioning of the labor market, allowing individuals to improve their careers, as referred by Slichter, and that has been identified in many empirical studies (for example, Topel and Ward (1992)).

Table 1 shows the rates of job creation and destruction, as well as the rates of hires and separations of workers. We compute both annual and quarterly rates, using Social Security data. The annual information captures only the hires of workers in the reference year that were still working in the firm at the end of that year. Also, the rate of separation captures only the

exit of workers who joined the firm before the end of the previous year. Thus, annual data ignores all transitions involving one entry and one exit in the same year.

The average rates of annual job creation and destruction are close to 12 percent. These figures are very close to the ones obtained from Quadros de Pessôal in Centeno et al. (2008). On average, over the period, in firms that expand their employment level or that enter the market, are created almost 13 new jobs for every 100 jobs in the economy and in firms that contract their employment level or that leave the market are destroyed 12 jobs for every 100 existing jobs.

[TABLE 1 HERE (see page 24)]

The process of creation and destruction of jobs is, however, characterized by much larger flows of entry and exit of workers. This process occurs simultaneously in most firms, whether they are expanding or contracting their employment level. In aggregate terms, the workers flows double that of job flows (25 per cent, on average). This is clear evidence in favor of the existence of significant levels of churning; worker flows exceed the minimum rotation needed by firms to promote the observed adjustment in their employment level.

The level of job and worker flows differs substantially according to the frequency with which these flows are observed, high-frequency quarterly data capture flows that are left unidentified in annual observation. On average in each quarter, Portuguese firms create 5 new jobs for every 100 existing jobs (and the same number is destroyed). This process of expansion and contraction of employment in firms is achieved through the hire of 9 new employees and an equal number of separations, also for every 100 existing jobs.

The level of excess turnover is lower in the quarterly data than in the annual data. This result is expected given that part of the phenomena of rotation are associated with the end of fixed-term contracts, the end of specific tasks, and that, in general, the trial period lasts more than three months.

The phenomenon of excess rotation is easier to see if the information presented is less aggregated. Table 2 separates firms according to their type of employment growth in two successive periods. We have a group composed of firms with net job creation, another group of firms with net job destruction, and finally a group of firms with stable employment. For each group, we study worker hires and separations.

[TABLE 2 HERE (see page 24)]



Firms that have positive annual employment growth hire two new workers and separate from a worker for each job created in net terms. In these firms, the excess turnover corresponds to 75 percent of the rate of job creation, i.e., to generate 100 new jobs these firms hire 175 workers. In firms contracting their level of employment, there is also a high turnover of workers, but still less than the one observed in expanding firms; to destroy 100 jobs these firms separate themselves from 160 workers<sup>2</sup>.

One interesting result is obtained for firms that have stable employment. These firms have hiring and separation rates lower than those of the other two groups, yet they separate and hire, on average, 10 percent of their workforce each year.

The intensity of hires and separations in firms with net job creation is very different from that which occurs in firms with net job destruction. Firms in expansion destroy a much smaller fraction of their workforce than firms in contraction. Similarly, firms in contraction of employment hire a percentage of new workers rather smaller than those that are in expansion. Thus, despite the rigidity of regular employment legislation Portuguese firms are able to adjust their workforce level using both dimensions of the adjustment process: hiring when they wish to expand and separating when they are downsizing. This behavior differs somewhat from the result obtained for France by Abowd et al. (1999). However, this discrepancy is mainly explained by the fact that their French sample covers only firms with more than 50 workers, and the size of the firm is a key variable for the level of excess turnover as we will illustrate in the next section.

This analysis can be further detailed if we relate the individual behavior of each firm in terms of the flow of workers and net employment growth. Figure 1 shows the sectional relationship between the hiring and separation rates and the net employment growth for each year and firm in the Social Security data. The hiring and separation rates are measured in the vertical axis as a percentage of total employment. The rate of employment growth is measured in the horizontal axis (also as a percentage of total employment). The lines in bold starting from the origin (zero net creation of employment) show the minimum level of recruitment (for firms in expansion) and separations (for firms in contraction) needed to change the level of employment in a particular percentage. Figure 1 uses all annual observations for continuing firms, between 2001 and 2006, and estimates the average hiring and separation rates for small intervals of the distribution of the rate of employment growth. These rates are weighted by firm size, using

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<sup>2</sup>The excess turnover for firms with net job creation is the ratio between the rate of separation and the rate of expansion; for firms with net job destruction, it is calculated as the ratio between the hiring rate and the rate of contraction.

total employment. Figure 1 allows also to examine the relationship between worker and job flows.

The main results drawn from the chart can be summarized as follows: the hiring and separation rates are non linear functions of the employment growth rate, having an inflection point around the null employment growth; the hiring rate grows at about the same pace (and in a linear fashion) as the employment growth rate in firms in expansion, as does the separation rate in firms in contraction; the expanding firms have higher rates of worker separation than the observed hiring rate in firms reducing employment; finally, Figure 1 shows that firms with zero employment growth have smaller excess workers rotation.

[FIGURE 1 HERE (see page 22)]

## 5 Workers hirings and separations: sector and firm size

### 5.1 Sector: Manufacturing and services

Over recent decades the services sector has been gaining importance in the Portuguese economy. The specificities of manufacturing and services result, naturally, in differentiated human resources policies; in the services sector, capital is less specific to each firm, resulting in greater mobility. Table 3 shows a higher turnover of workers in services. Hiring and separation rates are larger in services than in manufacturing, both for expanding and contracting firms. In quarterly terms, in this sector, firms in expansion hired workers representing 18.4 percent of their average employment; for firms in the manufacturing sector, that figure was 16.1 percent. Similarly, but with a greater gap between sectors, firms that reduce their level of employment in services cease relations with 16.6 percent of its workers during a quarter, while in manufacturing only 12.4 percent of the workers ended the employment relationship. Notice that the hiring rate in firms in expansion is higher than those of separation for firms in contraction (18.4 vs. 16.6 for services, and 16.1 vs. 12.4 for the industry).

[TABLE 3 HERE (see page 25)]

The highest turnover of workers in services results, also, in larger excess worker turnover; in quarterly terms, to increase employment by 11.9 percent, 55 percent of the hiring become "redundant". In manufacturing, for a similar percentage increase in employment, the excess turnover drops to 36 percent.

It is worth noticing that contracting firms in services have a rate of excess turnover of 50 percent, decreasing to 30 percent for the manufacturing sector. This reflects the fact that these firms have a low hiring rate (2.8 percent), therefore, almost all separations result in reductions in the level of employment (little worker excess turnover). In services, the hiring rate of firms in contraction is almost twice, 5.4 percent. This behavior may be related to the practice of labor hoarding more common in manufacturing, but is also associated with the smaller incidence of non-permanent employment in the manufacturing sector.

## 5.2 Firm size

One key determinant of the hiring and separation rates in the economy is the size of firms, as measured by the (average) number of workers. In light of the models of industrial organization (see, for example, Cabral and Mata (2003)), we expect a distinct behavior by firm size.

The quarterly results by average size of firms over the period under review (2001 to 2006) reported in Table 4 highlights three key facts: first, in general, for firms in expansion, the hiring rates fall monotonically with firm size (from 36.8 percent for firms with less than 5 employees to values around 13 percent for firms with more than 50 workers), whereas the separation rates increase, from 2.7 in firms with less than 5 workers, to 8.6 percent in firms with more than 500 employees; secondly, for firms in contraction, the separation rates fall with size, from 45.6 percent for the smaller firms to 9 percent for the larger firms. On the contrary, the hiring rates increase from 2.6 percent to 5.1 percent, respectively, for small and large firms; finally, regardless of the firm size, the hiring rates of firms in expansion are always clearly above the hiring rates of firms in contraction.

[TABLE 4 HERE (see page 26)]

In terms of excess turnover, Figure 2 illustrates that larger firms are the ones that experiment workers the most. Even though they do not exhibit high rates of expansion or contraction (they are closer to a desired level of employment), these firms are those that foster greater worker turnover. For example, for firms with 250 to 499 workers, for every job created almost two workers (1.9) are hired, i.e., 90 percent of the hirings do not result in employment gains. If we consider firms with 10 to 49 employees, the same indicators are substantially lower, 1.3 and 30 percent, respectively.

[FIGURE 2 HERE (see page 23)]

For France, Abowd et al. (1999) note that separation rates between firms in expansion and contraction do not differ much. However, this is conditional on the size of firms in their dataset. If we consider only firms with at least 50 workers, as in their sample, the separation rates of firms in contraction are only slightly higher than the separation rates of firms in expansion. For Veneto, in Italy, Tattara and Valentini (2005) also report a greater excess turnover in larger firms.

## **6 The role of match characteristics: the type of contract and wages**

### **6.1 The role of contract types in worker flows**

We have seen that hiring and separation decisions account in similar ways to the variability of employment in Portuguese firms. We now show how this can be accomplished by means of fixed-term contracts usage, in a labor market that shares a high rigidity in regular employment protection, with a large scope to fixed-term contracting.

In Portugal, workers may be hired on open-ended contracts or on fixed-term contracts. Fixed-term contracts were introduced in the revolutionary period to introduce flexibility into labor market contracting in a period of severe economic difficulties. Under the current legislation fixed-term contracts can be signed for most tasks in a firm, generally up to three years, but in some cases they can last up to six years. Contrary to some other countries, in which the probationary period is rather short, as is the case of France, in Portugal this period can last up to six months for regular workers, which reduces the role of fixed-term contracts for selection and testing. At the termination of the contract, the worker receives a severance payment equal to XXXX.

The incidence of fixed-term contracts is clearly influenced by the rigidity in the regulation of open-ended contracts. Blanchard and Landier (2002) argue that partial reforms of the labor market, such as the introduction of fixed-term contracts, concurrently with open-ended contracts, may have a negative impact on the functioning of the market. More recently, Kahn (2007*a*) and Kahn (2007*b*) show evidence of the impact of legislation protecting employment on the pattern of temporary employment incidence. These results point to an increase in non-employment in some demographic groups and, additionally, to a greater negative impact on the groups of less skilled workers, youth, women, and immigrants, as they have a higher incidence of

fixed-term contracts. The literature associates the existence of various types of contracts to the different roles played by these contracts in adjusting the level and composition of employment, or to the uncertainty that usually surrounds the process of job creation.

Table 5 shows the hires and separation rates for the set of firms that remain in Quadros de Pessoal in two consecutive years (the same restriction as in the previous analysis). This analysis is performed on the annual data of QP since the information about the type of contract is not available in the Social Security data.

Fixed-term contracts are by far the most important type of entry into firms. The share of fixed-term contracts in hiring is larger for contracting firms. As a result, the worker turnover is much higher for workers with fixed-term contracts. The difference is larger in terms of hires than separations (hires rates about 4 times higher in expanding firms and separation rates about 3 times higher in contracting firms). This difference reflects, somehow, the negative net job creation of open-ended contracts, in contrast with the increasing share of fixed-term contracts. This evidence is in line with strong recomposition of salaried employment by type of contract observed in Portugal over the last decade.

[TABLE 5 HERE (see page 27)]

In Table 5 is also clear the level of excess turnover observed in the Portuguese economy, and most importantly, its differentiation by type of contract. In expanding firms excess turnover is 57 percent, for fixed-term contracts, whereas it is 90 per cent for open-ended contracts. The opposite occurs in contracting firms. The excess turnover of workers on fixed-term contracts is 130 percent, whereas the one for workers on permanent contracts is only 30 percent. These are striking differences and reveal the importance of fixed-term contracts to firms employment level adjustment in Portugal. Expanding firms replace almost all exits of open-ended contracts and only half of those under fixed-term contracts. On the contrary, contracting firms strongly reduce their level of open-ended contracts and increase significantly the share of fixed-term contracts.

## **6.2 Worker rotation over the wage distribution**

Another dimension in which firms adjust their labor force is the wage scale. As we mentioned earlier, we will not proceed in this paper with a detailed analysis of how the pattern of job mobility is coupled with wage mobility in the Portuguese economy. However, it is interesting to examine the incidence of worker turnover by wage quintiles. The theoretical results suggest

greater turnover in lower wage levels (Jovanovic (1979)). With the survival of high quality matches, the separation rate should decrease over the distribution of wages. Also regarding hirings, the existence of internal labor markets, where workers are initially hired for a relatively low level and then progress internally (Lazear and Oyer (2004)), would also result in a falling hiring rate over the distribution of wages.

These patterns are observed in the sample of QP used in this article (Table 9). Hiring and separation rates fall monotonically over the wage distribution. Hiring rates are 36 percent for the 1st wage quintile and 15.7 for the 5th quintile, for expanding firms. The separation rates for contracting firms also decrease within the same range. This behavior is confirmed in Table 6.

[TABLE 6 HERE (see page 27)]

The pattern of excess worker turnover shows a high replacement of workers in upper quintiles for expanding firms (larger than 75 percent) and only a modest excess turnover at the bottom quintile (35 percent). Growing firms are usually willing to replace exiting high wage workers. On the contrary, contracting firms have a low excess turnover rate of upper quintile workers (quite similar to the one observed for workers in the bottom quintiles). Thus, when contracting firms get rid of high-wage workers (not replacing them) as much as they do of low paying individuals.

## **7 Workers characteristics: education, skills and age**

The number of hires and separations reported so far is high but it hides a great deal of heterogeneity across groups of individuals, such as low-skilled workers, young people and those with lower levels of education. This heterogeneity unveils a strong process of polarization, where a growing number of individuals only have access to jobs of short duration, with a very high risk of separation and subsequent non-employment spells without access to the unemployment system.

Employment growth in an economy is also characterized by a recomposition in terms of the characteristics of jobs that are created and destroyed. The closer an economy moves to the technological frontier the highest should be its levels of qualifications and schooling. The Portuguese economy has witnessed an increase in the average level of education, which should be reflected in the hiring and separation rates.

## 7.1 Education level and turnover

The figures by level of education (Table 7) point towards a net employment gain for the more educated. In expanding firms, the separation rates fall with the level of education, while the hiring rate is relatively stable over the distribution of education. In contracting firms, the same pattern occurs for the separation rate, but the hiring rate increases with the level of education. These patterns entail negative job creation rates for workers with less than second level of basic education and positive for other employees.

The rates of excess worker rotation by education level are completely different for expanding and contracting firms. The firm group of firms has a quite high separation rate of low educated workers, that is matched with a much higher hiring rate (excess turnover close or above 80 percent). The same figures for contracting firms are about 5 times smaller. These firms strongly separate from low educated workers, that they do not replace by similar workers (an excess turnover rate of around 25 percent). When moving to the upper end of the education distribution, we observe contracting firms replacing virtually all workers they separate from with higher education, whereas expanding firms have a much smaller rate of excess turnover, about 60 percent.

[TABLE 7 HERE (see page 28)]

## 7.2 The role of worker skills

Table 8 shows the annual hiring and separation rates by skill level. The net job creation rates are positive for the lower skill levels and negative in the higher levels. The less skilled are subject to greater turnover than the other workers; hiring and separation rates are much larger for the first group in both expanding and contracting firms.

[TABLE 8 HERE (see page 29)]

As in most of other analysis carried out, adjustment of employment level is done in expanding firms mainly through hiring, whereas contracting firms rely mainly in an increase in separations and a reduction in hirings. The ratio of hiring to separation rates is roughly constant across skill levels in expanding firms (excess turnover hovers around 70 percent). It is much more variable for contracting firms. We can interpret the high hiring and separation rates of low skilled individuals as a sign of the importance of matching in the Portuguese labor market.

### 7.3 Worker's age

The characteristics and productive capacity of workers do change throughout the working life. It is, therefore, natural to observe differences in behavior of different age groups in the labor market, not only among the workers themselves, but also among firms.

Table 9 considers workers flows by age group: young (up to 35 years) and older (above 35 years). For each of these groups we calculate the hiring and separation rates, having as reference the employment of each age group by type of employment growth. The results confirm the existence of a higher turnover among the younger.

[TABLE 9 HERE (see page 30)]

In quarterly terms, for every 100 young employees, firms in expansion hired on average 23 workers and end the employment relationship, on average, with 7.6 young employees. The rates for older workers are much smaller, the hiring rate stays at 13.3 percent, and the separation rate at 4.1 percent.

Qualitatively, firms that reduce their workforce from a quarter to another have a similar behavior to those that expand: they adjust especially young employment (separation rates of 19.2 and 11.8 percent, respectively, for the young and older workers).

This behavior reflects itself also in the excess turnover rates; 40 and 30 percent for older people, respectively, in firms in expansion and contraction and 50 percent for young people in both groups of firms.

This pattern of differentiation among younger and older workers is observed in other economies. For one of the most industrialized regions of Italy, the Veneto, Tattara and Valentini (2005) reported a drastic reduction in worker flows among individuals over 35 years working in manufacturing.

## 8 Cyclical behavior and volatility of flows

The results presented in this article are broadly in line with those obtained in studies for other countries. In Portugal there is strong worker turnover and this turnover is much higher than the job turnover. Additionally, there are signs of strong heterogeneity in the flow of workers, as in other developed countries, notably France and the United States.

Notice, however, that the comparison of hiring and separation rates across countries is



constrained by several factors. Indeed, these levels depend on how the information is collected (administrative data vs specific business surveys), the level of coverage of data (census vs a limited sample of firms).

Thus, it is with some caution that we compare, in Figure 3, the rates obtained for the Portuguese labor market with those reported in Davis et al. (2008) for the U.S.

[FIGURE 3 HERE (see page 23)]

Worker flows in the U.S. are higher than those observed in Portugal. Indeed, on average, and for the period considered, the flows in Portugal are 60 percent lower than those in the U.S. (see Table 10). Centeno, Machado and Novo (2007) present an identical comparison for job flows; the relationship between these flows in the two countries is close to 1.4. Excess worker turnover in the U.S. is clearly higher to that observed in Portugal. Indeed, the results for the U.S. of Burgess, Lane and Stevens (2000), Burgess, Lane and Stevens (2001), and Davis, Faberman and Haltiwanger (2006) indicate a higher separation rate in expanding firms than the one in Portugal. The same is true for contracting firms.

[TABLE 10 HERE (see page 31)]

An interesting fact in the comparison of the two labor markets is the existence of greater volatility in the rates of separation in Portugal, which is 26 percent higher than the volatility of the hiring rate, while in the U.S. is 15 percent higher. This is an important fact for the study of the cyclical behavior of these variables and their relationship with other aggregates of the labor market, such as the unemployment rate. An important aspect of this analysis is that the separation rate includes job-to-job transitions. These transitions are markedly pro-cyclical, so the behavior of the separation rate can become acyclic or pro-cyclical, unlike the exit rate to unemployment, which has a counter-cyclical behavior (see Shimer (2007) and Fallick and Fleischman (2001)).

In another study, with data for manufacturing in Denmark, Albæk and Sorensen (1998) obtain annual hiring and separation rates close to 28 percent. These rates are very close to the ones obtained for Portugal. Another interesting fact in this study is the aggregate relationship between the hiring rates and job creation, and between the separation rates and job destruction. In Denmark, from 1980 to 1990 this ratio was, on average, slightly above 2. Thus, as in the comparison with the U.S., the biggest difference between the Portuguese and Danish labor

markets in worker turnover relates to the number of workers hired for each job created in net terms (and similarly for job destruction).

## 9 Conclusion

This article uses the Social Security census records of salaried workers between 2000 and 2006 to identify the processes associated with the worker and job flows. The results are complemented by those obtained with Quadros de Pessoal, which includes a slightly smaller number of records and only in annual terms. As a whole more than 14 million labor relations are used, representing about 5 million workers and 600 thousand firms.

A set of important conclusions emerges from this study. The annual job creation in firms operating two consecutive years is characterized by the hiring of two workers and the separation of one worker for each job created in a given year. In quarterly terms, the figures are lower at around two thirds of the annual values. In turn, in annual terms, the job destruction in existing firms is characterized by the hiring of 2 workers and the separation of 4 workers for every 2 jobs destroyed (and therefore half the value for the hirings), maintaining the relationship of two thirds for the quarterly data. Worker turnover is higher in small firms and among workers younger and less skilled. New hirings each year are mostly made in the form of fixed-term contracts. The services sector has worker flows higher than the manufacturing sector. Jobs with lower wages, traditionally those of lesser quality, represent a huge quantity of job flows in the economy and concentrate the net creation of jobs in recent years.

These indicators are shared by the labor markets of many developed economies. In France, Denmark and Italy there is evidence of the existence of large worker and job flows. The level of these flows is still lower than that seen in the United States. In particular, the relationship between workers and job flows is lower in Portugal than in the United States. This is an important indicator of the difficulties experienced by the Portuguese labor market and shared by other European markets (see, for example, Abowd et al. (1999)). In European markets the adjustment of employment is mainly done through the adjustment of new entries, whereas in the U.S. this process is associated with a higher number of exits.

The available results indicate that firms have a marked idiosyncratic behavior (which is visible, for example, in the sectoral results). The human resources policies of these firms seem to be permanently attached to a minimum level of worker turnover. The reasons for this

behavior, even in a context where the ability to adjust the level of employment is determined by the rigidity of legislation, may be very different. For example, some organizations may need a constant influx of new workers (new human capital, new knowledge, new creativity), while other firms, due to the specific activity or human resources policies, may opt for a strategy of low wage/high turnover. In any of the contexts, the restrictions imposed by the legislation become particularly harmful to their productive efficiency, as we observe a large share of employment adjustments occurring through fixed-term contracts.

The evolution of the labor market in countries with high employment protection has been characterized by an increased use of more flexible contractual forms. In a situation where firms need the degrees of flexibility indicated by the existence of high levels of excess turnover, the burden of flexibility suffered by specific labor market groups, more exposed to this turnover, may have consequences for the overall welfare and generate polarization phenomena similar to those that have been observed in some advanced economies.

In this article we concentrated on aspects of job mobility, ignoring other quality aspects of the match, measured, for example, through the impact of turnover on wages and the distribution of job tenure. The role wages assumes, however, a very important dimension in the labor market adjustment that needs to be analyzed in future research.

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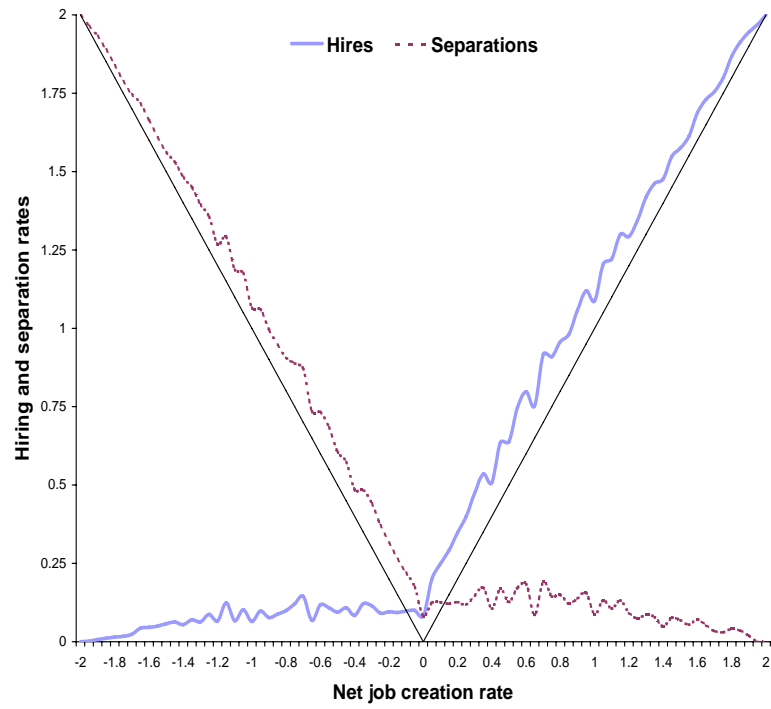


Figure 1: Firm level workers flows and net job creation rate, annual data, 2001-2006

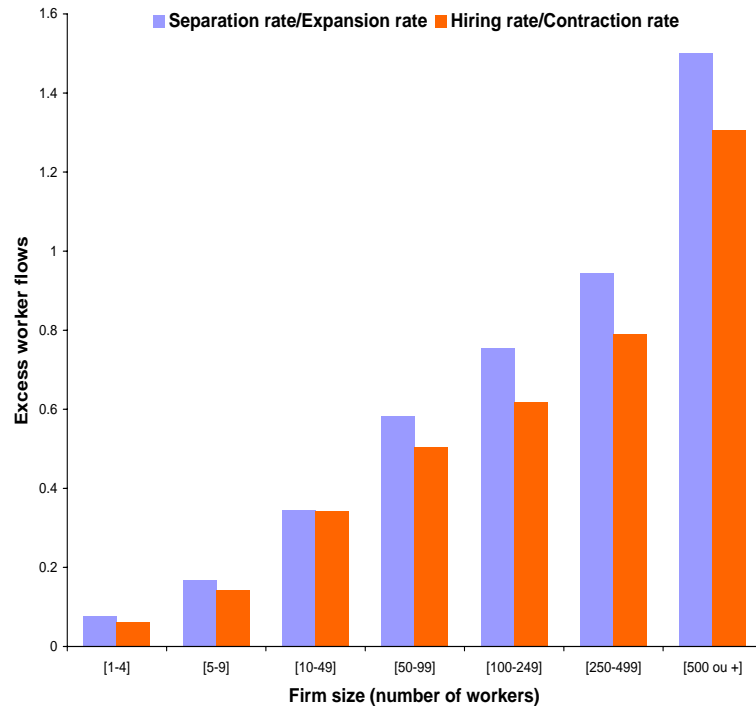


Figure 2: Excess rotation by firm size, 2001-2006

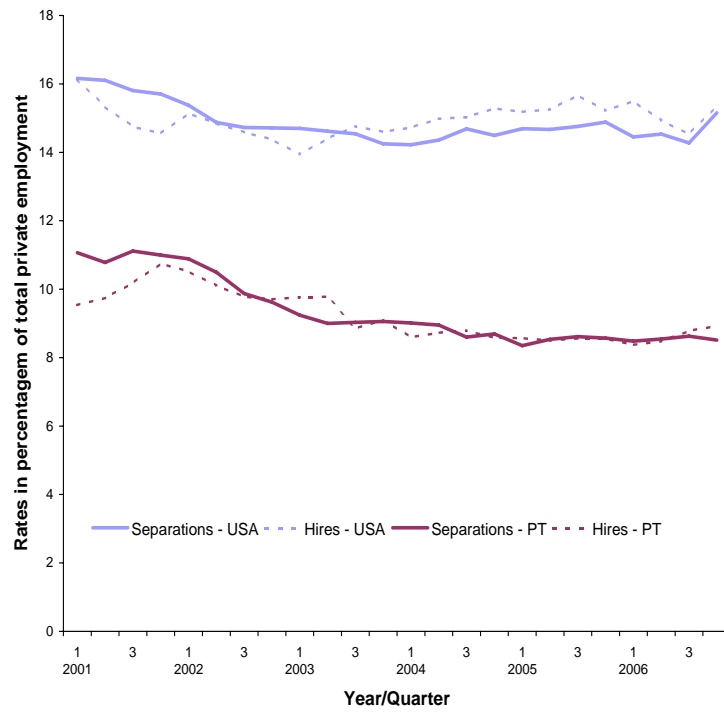


Figure 3: Hiring and separation rates - Portugal and the U.S.

Table 1: Average annual and quarterly job creation and destruction rates and workers hiring and separation rates, 2001-2006

Year	Job		Workers		Net job creation (5)
	Creation rate (1)	Destruction rate (2)	Hiring rate (3)	Separation rate (4)	
<b>Annual average</b>	13.5	11.8	26.1	24.4	1.6
<b>Quarterly average</b>	5.2	5.1	9.4	9.2	0.1

Sources: BDRSSS (2000-2007). Authors' computations.

Table 2: Average worker flows: Hiring and separation rates by type of employment growth, 2001-2006

Employment growth category	Expansion rate (1)	Hiring rate (2)	Separation rate (3)	Contraction rate (4)
<b>Average annual rate (2001-2006)</b>				
Firms with net job creation	21.1	37.0	15.9	
Firms with net job destruction		11.6	30.7	19.1
Firms with stable employment		10.5	10.5	
<b>Average quarterly rate (2001:03-2006:12)</b>				
Firms with net job creation	12.1	17.8	5.7	
Firms with net job destruction		4.2	14.8	10.6
Firms with stable employment		2.3	2.3	

Sources: BDRSSS (2000-2007). Authors' computations.

Notes: (1) The expansion rate is the job creation rate of existing firms that expanded their employment between period  $t - 1$  and  $t$ ; (2) and (3) see text; (4) The contraction rate is the job destruction rate of firms that reduced their employment from period  $t - 1$  to  $t$  without exiting the market.



Table 3: Average worker flows: Hiring and separation rates by sector of activity and type of employment growth, 2001-2006

Employment growth category	Expansion rate (1)	Hiring rate (2)	Separation rate (3)	Contraction rate (4)
<b>Manufacturing</b>				
<b>Average annual rate (2001-2006)</b>				
Firms with net job creation	20.4	32.4	12.0	
Firms with net job destruction		8.2	26.4	18.1
Firms with stable employment		10.2	10.2	
<b>Average quarterly rate (2001:03-2006:12)</b>				
Firms with net job creation	11.9	16.1	4.3	
Firms with net job destruction		2.8	12.4	9.7
Firms with stable employment		2.2	2.2	
<b>Services</b>				
<b>Average annual rate (2001-2006)</b>				
Firms with net job creation	21.3	39.3	17.9	
Firms with net job destruction		14.8	34.9	20.1
Firms with stable employment		10.8	10.8	
<b>Average quarterly rate (2001:03-2006:12)</b>				
Firms with net job creation	11.9	18.4	6.4	
Firms with net job destruction		5.4	16.6	11.2
Firms with stable employment		2.4	2.4	

Sources: BDRSSS (2000-2007). Authors' computations.

Notes: (1) The expansion rate is the job creation rate of existing firms that expanded their employment between period  $t - 1$  and  $t$ ; (2) and (3) see text; (4) The contraction rate is the job destruction rate of firms that reduced their employment from period  $t - 1$  to  $t$  without exiting the market.

Table 4: Average worker flows: Quarterly hiring and separation rates by firm (average) dimension and type of employment growth, 2001-2006

Employment growth category	Expansion rate (1)	Hiring rate (2)	Separation rate (3)	Contraction rate (4)
<b>[Firm average work force dimension (2001-2006)]</b>				
<b>[1-4]</b>				
Firms with net job creation	34.1	36.8	2.7	
Firms with net job destruction		2.6	45.6	43.0
Firms with stable employment		1.9	1.9	
<b>[5-9]</b>				
Firms with net job creation	24.0	28.0	4.0	
Firms with net job destruction		3.3	26.3	23.0
Firms with stable employment		2.4	2.4	
<b>[10-49]</b>				
Firms with net job creation	13.9	18.6	4.8	
Firms with net job destruction		4.3	17.0	12.7
Firms with stable employment		2.8	2.8	
<b>[50-99]</b>				
Firms with net job creation	8.5	13.5	5.0	
Firms with net job destruction		3.8	11.4	7.5
Firms with stable employment		3.0	3.0	
<b>[100-249]</b>				
Firms with net job creation	6.8	12.0	5.2	
Firms with net job destruction		3.6	9.3	5.8
Firms with stable employment		2.9	2.9	
<b>[250-499]</b>				
Firms with net job creation	7.0	13.5	6.6	
Firms with net job destruction		4.5	10.2	5.7
Firms with stable employment		3.2	3.2	
<b>[500 ou +]</b>				
Firms with net job creation	5.7	14.3	8.6	
Firms with net job destruction		5.1	9.0	3.9
Firms with stable employment		3.6	3.6	

Sources: BDRSSS (2000-2007). Authors' computations.

Notes: (1) The expansion rate is the job creation rate of existing firms that expanded their employment between period  $t - 1$  and  $t$ ; (2) and (3) see text; (4) The contraction rate is the job destruction rate of firms that reduced their employment from period  $t - 1$  to  $t$  without exiting the market.

Table 5: Average hiring and separation rates of workers by type of contract and type of employment growth, 2001-2006

		Open-ended	Fixed-term
Firms with net job creation	Hiring	15.2	54.1
	Separation	7.1	19.7
Firms with net job destruction	Hiring	4.2	33.2
	Separation	19.1	57.6
Firms with stable employment	Hiring	4.7	27.0
	Separation	5.8	19.3
Weight in 2005		80.7%	19.3%

Sources: Workers longitudinal file from Quadros de Pessoal, 2003 to 2005; Firms longitudinal file from Quadros de Pessoal, 2003 to 2005.

Notes: The rates are computed as a percentage of the employment level in year  $t$ ; It considers only firms that remain in activity for 2 consecutive years.

Table 6: Average hiring and separation rates of workers by wage quintile and type of employment growth, 2003-2005

		Wage quintiles				
		1st	2nd	3rd	4th	5th
Firms with net job creation	Hiring	36.3	28.4	22.2	19.8	15.7
	Separation	10.1	10.6	9.8	8.3	6.7
Firms with net job destruction	Hiring	11.2	9.9	8.4	7.6	5.2
	Separation	36.7	28.5	21.6	18.0	15.0
Firms with stable employment	Hiring	8.9	7.9	6.5	6.0	5.7
	Separation	7.8	7.1	6.4	5.9	6.4

Sources: Workers longitudinal file from Quadros de Pessoal, 2003 to 2005; Firms longitudinal file from Quadros de Pessoal, 2003 to 2005.

Notes: The rates are computed as a percentage of the employment level in year  $t$ ; it considers only firms that remained in activity for 2 consecutive years; (2) Wage quintiles refer only to full-time workers with full remuneration.

Table 7: Average hiring and separation rates of workers by education level and type of employment growth, 2003-2005

		< Primary school	Primary school	6th grade	9th grade	High school	Higher education	Total
Firms with net job creation	Hiring	24.5	20.1	24.1	29.7	25.4	26.1	25.0
	Separation	14.3	9.3	9.7	11.4	10.2	9.5	10.2
Firms with net job destruction	Hiring	7.6	5.9	7.6	10.8	9.2	11.5	8.5
	Separation	36.2	26.2	25.4	27.4	21.8	21.6	25.3
Firms with stable employment	Hiring	7.5	4.8	6.5	8.5	7.0	8.2	6.7
	Separation	10.0	6.1	6.8	7.4	6.2	6.9	6.7
Weight in 2005		1.6%	26.1%	22.9%	20.3%	18.6%	10.6%	

Sources: Workers longitudinal file from Quadros de Pessoal, 2003 to 2005; Firms longitudinal file from Quadros de Pessoal, 2003 to 2005.

Notes: The rates are computed as a percentage of the employment level in year  $t$ ; It considers only firms that remain in activity for 2 consecutive years.

Table 8: Average hiring and separation rates of workers by skill level and type of employment growth, 2003-2005

		Senior Management	Middle Management	Supervisors, skilled workers	Senior professionals	Professionals	Junior professionals	Unskilled workers	Apprentices	Total
Firms with net job creation	Hiring	17.2	18.9	14.0	20.1	22.7	22.1	37.6	53.4	25.0
	Separation	6.7	7.4	6.8	7.2	9.4	9.2	17.2	16.5	10.2
Firms with net job destruction	Hiring	5.6	6.7	4.3	6.5	7.6	6.7	16.1	27.3	8.5
	Separation	21.8	17.2	16.1	18.1	24.9	21.9	39.3	63.4	25.3
Firms with stable employment	Hiring	2.5	4.3	4.1	6.0	6.6	7.9	11.6	16.9	6.7
	Separation	3.1	3.9	5.0	6.1	6.9	8.1	10.9	13.7	6.7
Weight in 2005		10.6%	5.2%	4.4%	7.2%	41.4%	16.2%	11.2%	3.8%	

Sources: Workers longitudinal file from Quadros de Pessoal, 2003 to 2005; Firms longitudinal file from Quadros de Pessoal, 2003 to 2005.

Notes: The rates are computed as a percentage of the employment level in year  $t$ ; it considers only firms that remained in activity for 2 consecutive years.

Table 9: Average hiring and separation rates of workers by age and type of employment growth, 2001-2006

Employment growth category	Expansion rate (1)	Hiring rate (2)	Separation rate (3)	Contraction rate (4)
<b>Workers aged 34 years or less</b>				
<b>Average annual rate (2001-2006)</b>				
Firms with net job creation	28.4	48.9	20.5	
Firms with net job destruction		19.1	39.4	20.3
Firms with stable employment	1.7	16.3	14.6	
<b>Average quarterly rate (2001:03-2006:12)</b>				
Firms with net job creation	15.4	23.0	7.6	
Firms with net job destruction		6.6	19.2	12.6
Firms with stable employment	0.2	3.5	3.2	
<b>Workers aged 35 years or more</b>				
<b>Average annual rate (2001-2006)</b>				
Firms with net job creation	15.3	27.4	12.1	
Firms with net job destruction		7.2	25.7	18.5
Firms with stable employment		7.0	8.0	1.0
<b>Average quarterly rate (2001:03-2006:12)</b>				
Firms with net job creation	9.2	13.3	4.1	
Firms with net job destruction		2.6	11.8	9.3
Firms with stable employment		1.6	1.7	0.2

Sources: BDRSSS (2000-2007). Authors' computations.

Notes: (1) The expansion rate is the job creation rate of existing firms that expanded their employment between period  $t - 1$  and  $t$ ; (2) and (3) see text; (4) The contraction rate is the job destruction rate of firms that reduced their employment from period  $t - 1$  to  $t$  without exiting the market.

Table 10: Average hiring and separation rates - Portugal (BDRSS) and the United States (JOLTS), 2001-2006

		Average	Standard deviation
Hiring rate	Portugal	9.22	0.72
	U.S.A.	14.96	0.48
Separation rate	Portugal	9.36	0.98
	U.S.A.	14.86	0.56
Relative volatility (Hirings/Separations) <sup>(1)</sup>	Portugal		0.74
	U.S.A.		0.85

Source: The data for the U.S.A. are estimates using JOLTS taken from Davis et al. (2008). The correction proposed approximates JOLTS's firm demography (which does not cover new firms, nor exiting firms) to the firm demography reported in other data sources for the American market.

Notes: (1) Volatility is measured by the standard deviation of the data series.