MACROECONOMIC SHOCKS AND FIRMS' LABOR ADJUSTMENT*

TOR ERIKSSON

Department of Economics and Business, Aarhus University,
Fuglesangs Allé 4, DK-8210 Aarhus V, Denmark;
e-mail: tor@asb.dk

This article discusses some recent research which aims at producing evidence on how firms adjust their employment in response to output shocks using micro-level data and with a particular focus on the relationship between worker and job flows. The evidence presented is mainly based on Danish data, but a brief discussion of cross-country differences and similarities in firm-level labor adjustment is also provided. For Denmark, remarkable long-term stability in firms' labor adjustment technologies is observed and the cross-country comparisons reveal striking similarities between countries with very diverse labor market institutions. (JEL: E24, J23, J63)

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1. Introduction and background

Recent macroeconomic problems, with their roots in the financial crisis followed by the Great Depression, have also had, albeit with some time-lag, significant impacts on the academic research of labor markets. Until recently, most of the scientific labor economics research published in the best journals in the previous two decades was mainly concerned with questions related to efficiency, dealt with inequality and less commonly examined outcome variables like education, family formation, health and even crime. In recent years we have witnessed a revival of "macro labor", a renewed interest in the drivers and development of aggregate labor market outcomes like employment and unemployment in particular.

While most of the earlier research interest was primarily targeted on the behavior of agents on the supply side of the market, the current economic crisis has also meant a shift of focus to considerations also of demand side factors. In order to deal with the current employment problems, there is in particular a need to know more about the employers' behavior to better understand what is driving the job and worker flows that give rise to the large changes in employment and unemployment. On these issues there is no shortage of theoretical analysis – a standard vehicle of analysis is the Mortensen-Pissarides model (1994), which is the point of departure for a large part of this literature. Although there is a wealth of theoretical studies, the amount of empirical studies and evidence remains scarce.

The recent economic crisis has, moreover, revealed a large heterogeneity in labor market outcomes across countries, despite the global nature of the economic shock with which they were hit. A much discussed example is Germany, which experienced a deeper fall in GDP than for instance the U.S., but with little employment loss. Why Germany has had a better employment performance than most other advanced industrialized countries is, despite several explanations put forward and analyzed, not well understood.[1] But, it is not the case that Germany is a single large outlier; as is clear from e.g. OECD (2011), there are large differences in employment and unemployment changes across countries, which have led analysts and commentators to return to a question that was discussed quite intensively in the eighties and the nineties: the role of differences in labor market institutions in understanding the international patterns in labor market outcomes.

Following the influential book by Layard, Nickell and Jackman (1991) a large literature has built up aiming at explaining differences in unemployment rates across countries by differences in labor market institutions like unemployment compensation, wage bargaining systems, employment protection legislation and labor market policies. The discussion on large differences in unemployment between European countries has focused on differences in job security legislation and other restrictions on employers' ability to adjust their labor demand in response to changes in product demand or wage costs. According to the conventional wisdom, more flexibility, that is, fewer restrictions on firms' labor adjustment help to avoid high unemployment; see e.g. Bertola and Rogerson (1997) and Boeri (1999).

Next, I will discuss some recent (and ongoing) research aiming at producing more evidence on how firms adjust their employment in response to output shocks using micro-level data and in particular focus on the relationship between gross worker flows and job flows. I will mainly present evidence based on Danish data. The motivation for this is simply that this is what I have been working on myself but also that the Danish flexicurity system has attracted considerable attention in recent discussions of labor markets and labor market policies. However, towards the end of the paper I will briefly discuss some cross-country differences and similarities uncovered in recent research on firm-level labor adjustment.

[1] *See e.g. Hijzen and Martin (2013) for a discussion and cross-country analysis.*

2. Firms' labor adjustment: the Danish case

In the following I will discuss some recent research on how firms adjust their employment in response to output shocks using micro-level data. More precisely, I will discuss work which focuses on gross worker flows (hires and separations)[2] and how these are related to job flows. The distribution of shocks is captured by the employment changes[3] at the firm/establishment level, and the analysis is concerned with aggregate time variation in the distribution of shocks as well as in hires and separations.

As will be seen, this type of analysis presupposes access to quite detailed data of longitudinal character on both firms and their employees, that is, linked employer-employee data, that for a long time have been available in the Nordic (and a few other) countries.[4] The discussion will mainly be based on results from Denmark, for which they are available from a longer time period. Results from a number of other countries will, however, be discussed too. The focus on Denmark is motivated by the fact that the Danish labor market development from the mid-nineties have been thought of as something of a success story. The combination of highly flexible labor market policies and income security (the so called "flexicurity")[5], which is one of its central features, is often considered as the key to the resilience of the Danish labor market.

During the two recent decades and up to the Great Recession, the development of real GDP in Denmark traced that of the Euro Area and the United States quite closely. But as from 2008, growth fell at a markedly steeper pace in Denmark than in the other regions. The Danish unemployment rate, which since 1994 had consistently stayed below the OECD average, also jumped to considerably higher levels in 2008–2010. Despite the strong increase, unemployment remains low as seen from an international perspective and stays below the OECD average. The bulk of the decrease in the employment to population ratio has been due to the increase in unemployment and to a much lesser extent a result of a decline in labor force participation. Historically, changes in the labor input in Denmark have been due to changes in the number of employees and not (as in many other countries also) in the number of hours worked, and this continues to be the case during the Great Recession.

The "flex"-component in the flexicurity indicates that worker mobility is relatively high in the Danish labor market. As a matter of fact, worker mobility rates in Denmark are highest in the OECD, followed by U.S. and Finland (OECD, 2009). (Mobility rates are lowest in Greece and Italy.) Figure 1 shows the aggregate hires and separations rates for Danish private sector establishments during the period 1981–2001. From the figure we can see that the average hires and separations rates have been hovering around a few percentage points over thirty per cent. Part of the mobility is between establishments within enterprises, and computing the hires and separation rates for firms results in somewhat (about twenty per cent) lower turnover rates.[6] Worth of note is also that there is no visible trend in the hires and separations rates over time.[7] However, in years 2008-9, hires and separations rates dropped significantly to historically low levels. While both rates were still above their historical average values in 2008, one year later they are below and

[2] *The traditional literature, which considers net employment changes, is well summarized in Hammermesh's (1996) book.*

[3] *The framework is quite flexible and hence instead of looking at employment changes at the firm/plant level, one can for instance consider changes in output or productivity.*

[4] *However, as shown by the examples from Germany and the U.S., combinations of survey and register data can also be exploited to carry out this kind of analysis.*

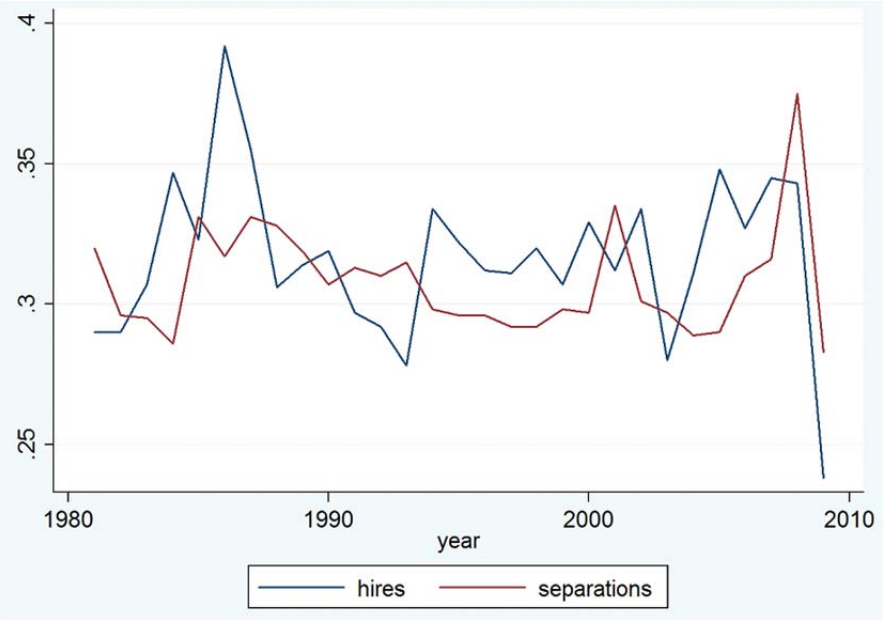
[5] *High flexibility, which implies low labor adjustment costs for employers, is due to weak employment protection of blue collar workers and modest protection of white collar employees' job security, short notification periods in connection with lay-offs, and the uncommon use of severance pay systems. The key components of the high income security are the generous benefit levels, which are associated with high replacement ratios for workers at the lower end of the compressed wage distribution, and the fact that social benefits are portable, that is, not tied to the employer. Thus adjustment costs for employees in connection with change of employer are also comparatively low.*

[6] *As mobility is lower in the public sector, which makes up about forty per cent of total employment, the overall hires and separations rates are lower and exhibit less cyclical variation than those in the private sector.*

[7] *This is different from other countries like for instance the U.S., for which a downward drift in worker and job flows has been documented for the recent decades (Davis, Faberman and Haltiwanger, 2006).*

especially the hires rate has never before during the three decades period under study reached such low levels.

Figure 1. Hires and separations rates in the Danish private sector, 1981–2009

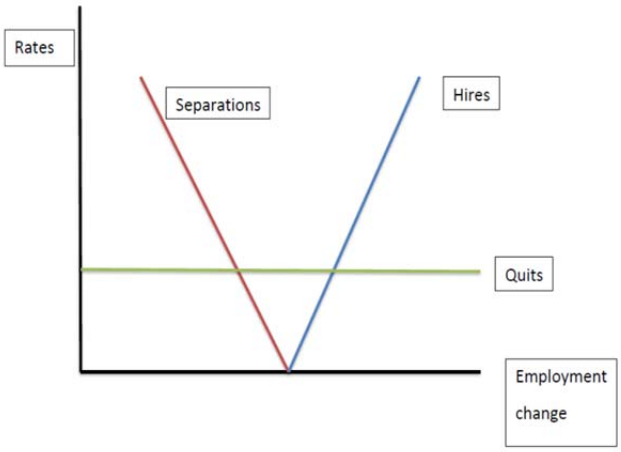


Thus, one interesting question I will touch on is how the flexicurity performs during the Great Recession. One possibility, which has been pointed out by e.g. Andersen and Svarer (2007), is that the flexicurity system worked less well when the shocks were large and global like the oil price shocks in the seventies and eighties, when the Danish economy was certainly not the example for others to follow. Or, put in another way, are there indications of re-emergence of hysteresis effects that plagued the Danish labor market in previous severe recessions? In addition, I will also briefly look into the question as to what extent cross-country differences in employment and unemployment during the Great Recession are related to cross-country differences in firms' employment adjustment technologies and distribution of shocks.

3. Model and method

The point of departure in the analysis is the canonical search-matching model of Mortensen and Pissarides (1994). In the basic version of the model, the authors make the simplifying assumption that every separation (hire) reflects a job that disappears from (is created by) a firm. This is the so called iron link property of the model implying an extremely tight link between worker and job flows. In a cross-section of firms, the iron link implies that the distribution of employment growth, which is measured on the horizontal axis of Figure 2, fully determines aggregate hires and separations. Thus, an increase in the number of jobs created (destroyed) is reflected in the figure by the shift of the two linear relationships (hires, separations) to the right (left). In the base model, quits are assumed to be exogenous. If this assumption is relaxed, and quits are for instance varying pro-cyclically, this implies that there is a need for replacement hires. Thus, if the quit rate is lower in an economic downturn, there will be less replacement hires and consequently, for a given employment growth rate fewer hires (and more lay-offs) are needed. In other words, the cross-sectional hires and separations relations will shift to the right.

Figure 2. The Mortensen-Pissarides Iron Link-Model

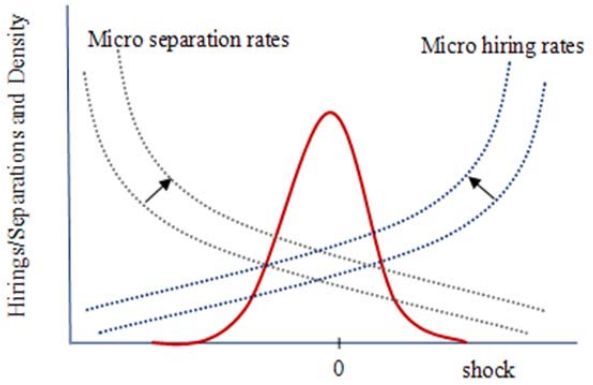


Moreover, when there are many hires in an establishment, like in an economic boom, the employer-(new) employee match quality is likely to be lower and hence, followed by an increase in (both employee- and employer-initiated) separations. All in all, removing the iron link and introducing more realism into the Mortensen-Pissarides model means, firstly, that one has to distinguish between worker and job flows, and secondly, the relation between the worker and job flows in a cross-section of firms is likely to be nonlinear. Furthermore, this relation may shift with business cycle conditions.

The first empirical applications of the Mortensen-Pissarides model are found in Burgess, Lane and Stevens (2000)[8] and Abowd, Corbel and Kramarz (1999). These analyses have been extended both empirically and theoretically in Davis, Faberman and Haltiwanger (2006).

Following Davis et al. (2006, 2012), Figure 3 gives a more elaborate version of the cross-sectional relationship between job and worker flows. As can be seen from the figure, both hiring and separation rates are assumed to take on positive values also when the firms are in the job destruction and creation domains, respectively. As a consequence, the employment adjustment technology becomes nonlinear. The macroeconomic shocks are captured by the shifts in the distribution of firms' employment growth rates; a shift to the right (left) picking up a positive (negative) output shock. The nonlinearity is important because it contributes to the understanding of differences between mild and severe recessions. During the former, a small leftward shift in the cross-sectional distribution of firm growth rates is associated with a large drop in hires and modest increase in lay-offs (separations). Severe recessions are characterized by a large shift to the left of the distribution and results in a large increase in lay-offs. This framework of analysis is quite flexible as it allows for changes over time or differences (between industries, say) in the adjustment technology (here in the form of shifts).

Figure 3. Worker and job flows in a cross-section



The studies in the papers by Davis et al. (2006, 2012) were based on the US JOLTS, which is a monthly survey of establishment level job openings and labor turnover and has been carried out since December 2000. The analysis can, however, be straightforwardly applied to other forms of data too, and linked employer-employee data in particular.

Basically, the empirical studies have the following set-up in common. Three variables are constructed. The first is the employment growth of the firm (or plant)[9]. The distribution of the growth rates[10] is divided into growth bins. Second, measures for hires

[8] *See also Burgess, Lane and Stevens (2001).*

[9] *Instead of employment growth, one can also use output (or sales) growth. Note, however, that the relation between output growth and worker flows is less tight.*

[10] *The growth rates vary from −100 (firm exit) to +100 per cent (firm entry). Naturally, most observations are closer to zero than the end of the distribution. Hence, it is important to define the growth bins quite narrowly.*

and separations rates are constructed. In the study of Denmark, I follow Davis and Haltiwanger (1999), and define hires for each establishment as the number of persons who are employed in the establishment (at the end of November) in year *t*, but who were not there in *t*−1. Correspondingly, the separations[11] are computed as the number of persons who are not employed in the establishment in year *t*, but were in *t*−1. Both hires and separations are divided by the average number of employees in the establishment in years t and t-1.

4. Worker and job flow relation estimates

Equipped with these variables one can estimate the hires and separations relationships in Figure 3 either non-parametrically (regressing the hires and separations rates on dummies for the employment growth rate bins (and when using panel data firm fixed effects) or parametrically by estimating linear relations between hires and separation rates and growth bin dummies allowing for a kink at zero growth rate.

The study by Davis et al. (2006) found a "hockey stick"-like relationship between hires rates and employment growth at the establishment level. Thus, in the positive growth domain hires increase linearly with employment growth. There is a pronounced kink around zero growth and the relation is relatively flat in the negative employment growth domain. In other words, also declining firms are hiring new employees. The relation for separations rates are by and large mirroring that for hires. The quarterly churning rate, that is, the worker flow rates at zero growth rates, is about ten per cent.

Next, I will briefly discuss some of the results obtained from an analysis carried out on Danish data (see Eriksson (2012) for a fuller discussion). The source of the estimation sample is the longitudinal employer-employee database (the so called IDA), which is kept by Statistics Denmark and contains detailed labor market information for all employees in all establishments in Denmark since 1980. For the study discussed here the sample was restricted to private sector establishments with minimum ten employees. As the construction of some of the key variables makes use of data from two adjacent years, the period analyzed is 1982 to 2009.

The cross-sectional relationship between net employment growth and the hires and separations rates were constructed for each pair of years during the period. Figures 4a, 4b and 4c show by way of example how these relationships look like at the end of the period, in years 2007–2009. Beginning with the hiring relations, we can clearly see a hockey-stick shaped relation with a pronounced kink located in the vicinity of zero growth. Hiring rates are positive also for negative establishment growth rates. This is likely reflecting replacement hires for those employees who are abandoning the ship, i.e., are leaving their contracting employer. Consistently with this, it can be seen that when establishments are declining, separations rise proportionately faster than the decrease in jobs. When establishments are creating jobs, hires increase more than one-for-one, in all likelihood because the need to hire more employees to replace the larger share of poor matches when establishments are growing fast. Poor matches and higher turnover rates among the most recently hired are also reflected in the fact that separations are positive for the entire positive establishment growth domain.

[11] *The U.S. studies are able to distinguish between two didfferent forms of separations, quits and lay-offs, respectively.*

Figure 4a. Hires and separations rates by employment growth bins, 2007

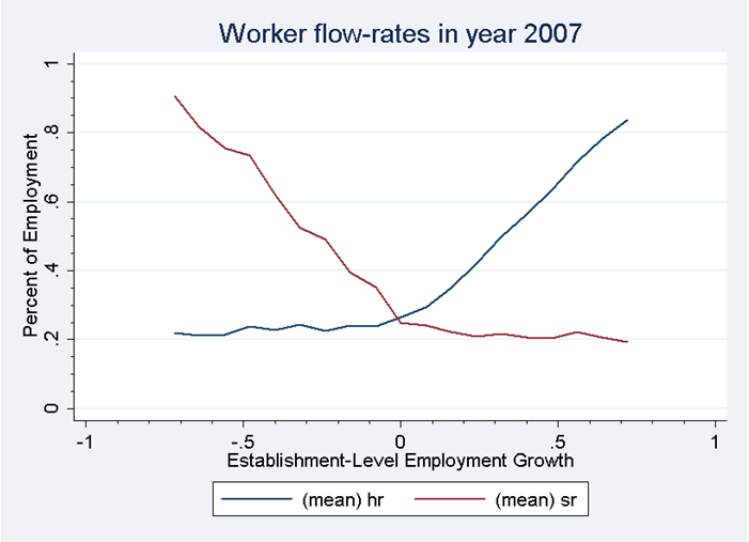


Figure 4b. Hires and separations rates by employment growth bins, 2008

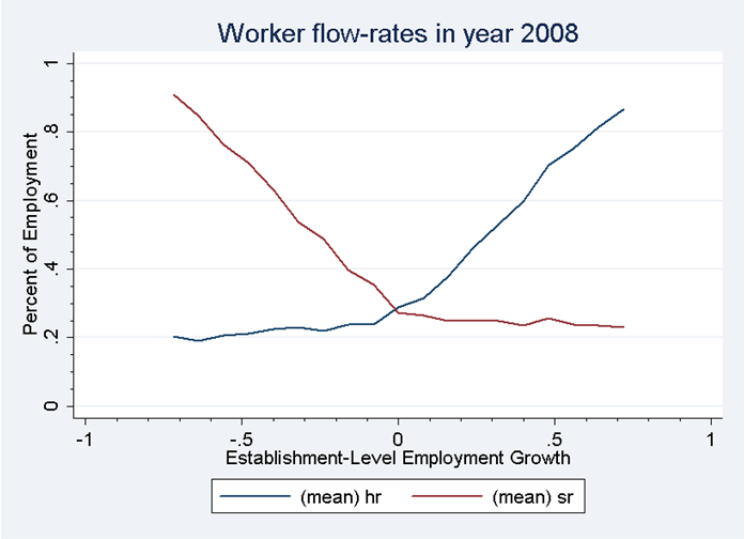
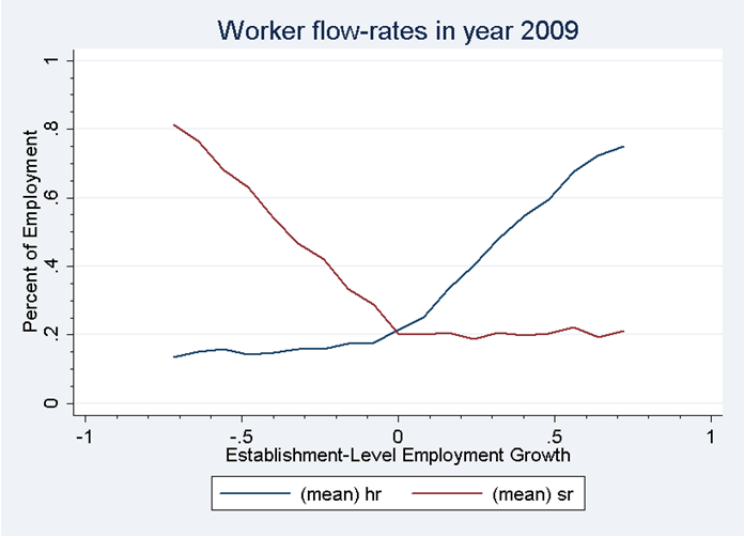


Figure 4c. Hires and separations rates by employment growth bins, 2009



From Figures 4a–4c we may also observe a marked downward shift in both relations during the Great Recession, and especially in 2009. Notably, a comparison of changes in these relations over the entire period, and also more formal statistical testing (see Eriksson, 2012), reveals that shifts similar to the ones in 2009 are the exception rather than the rule. As a matter of fact, the relationship between worker flow rates and job flows at the establishment level is quite stable.[12] It is found in the regression analyses for the whole period under study that hires and separations relations shift due to variations in aggregate employment growth, but the magnitudes of these shifts are small. Evidence for changes over time is not found either; the hires and separations relations during the post-1994 period, characterized by a considerably more active labor market policy and significant reductions in the duration of unemployment benefit entitlement, do not differ much from those in the pre-1994 period. All in all, changes in firms' adjustment technology with respect to their labor input stand out as small.

The main differences across years can be observed for the churning rate, that is, the worker or job turnover at constant employment. Consistent with the notion that fluctuations in the churning rate are primarily driven by pro-cyclical variation in quit rates, we find that churning rates are higher in expansion years and lower as the economy is entering a recession. For zero growth or small changes in establishment employment, the hires and separations rates are on average found in the 22–23 per cent range. Fluctuations around this average are typically small, the main exception are the years prior to the Great Recession, when churning rates were about 25–27 per cent, and then in 2009 dropped to about 20 per cent, the lowest level observed during the three decades examined.

Given the high transferability of many social benefits in connection with change of employer and hence low costs of mobility it appears reasonable to assume that the churning rate, to the extent that it is mainly driven by quits,[13] would be relatively high in Denmark. However, available churning rates estimates, which vary widely, would place Denmark somewhere in the middle close to the U.S. and Germany (see Davis et al. (2012) and Bellman, Gerner and Upward. (2011), respectively) but considerably below France and Japan (see Abowd et al. (1999) and Hijzen, Kambayashi, Teuyama and Genda (2011), respectively). Although the available estimates of the churning rates might have been affected by differences in data and how variables are measured, it is still worth noting that their relative magnitudes do not mirror the country rankings of the flexibility of labor markets. Churning rates should to a high extent reflect quit rates and the latter are expected to be higher in countries where labor adjustment (hiring and firing) costs are low. The French and Japanese labor markets are, however, normally considered as characterized by relatively high labor adjustment costs, while these are lower in the U.S. and Denmark.

Making comparisons across periods is difficult because the establishments may change their position in the employment distribution and also because the distribution itself can shift in response to macroeconomic shocks. In order to shed some light on this I computed kernel density estimates of the establishment growth rate distributions for pairs of adjacent years. For most pairs there are hardly any shifts in the distribution. In fact, during the whole period covering three decades, there are only three occasions when there are notable shifts. Two of these are downturn periods (1985–1986 and 2007–2009) and one is a business cycle upturn (1993–1994); see Figures 5a–c. As can be seen, especially the leftward shift in the distribution in 2009 is large and dramatic. Overall, however, it seems as if it takes sufficiently large shocks to give rise to significant shifts in the establishment growth distribution.

[12] *Furthermore, the relationships tuner out to be fairly similar across industries, establishment size classes, and skill level of employees, despite relatively large differences in hires and separations rates.*

[13] *Simultaneous hiring and dismissal of employees within establishments can also be the result of upgrading of workforce skills.*

Figure 5a. Establishment growth rate distributions, 1985–1986

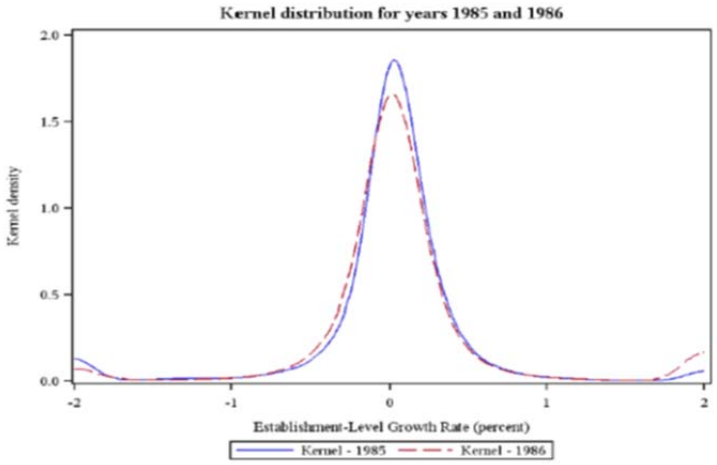


Figure 5b. Establishment growth rate distributions, 1993–1994

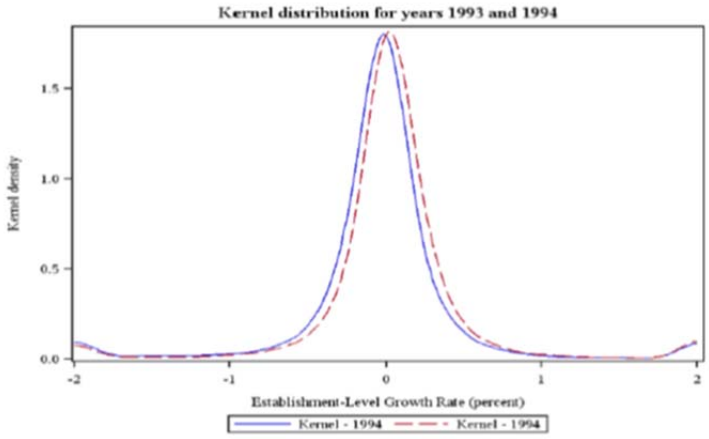
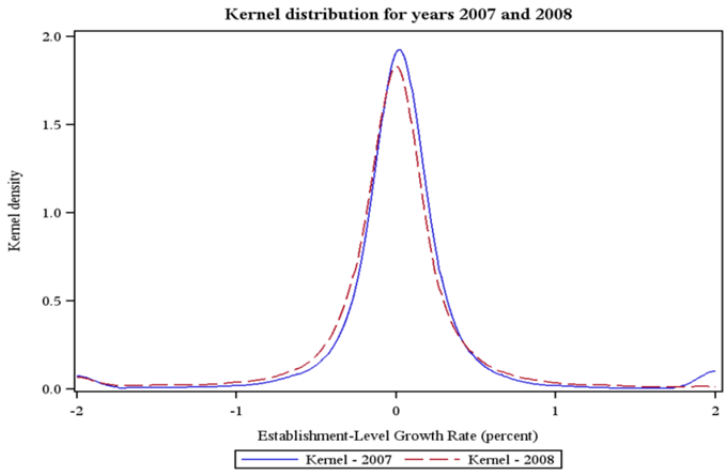


Figure 5c. Establishment growth rate distributions, 2007–2008



How do the results for Danish private sector establishments compare to those obtained for other countries? It should be emphasized that subsequent papers estimating similar relation-

ships as Davis et al. (2006) have had to use very different types of data sets, and that they in particular differ from the JOLTS used in the U.S. studies. Not only do the data sources (registers, surveys) differ considerably, also the time frame varies (quarterly, annual), and the construction of flow variables (net or gross hires/separations per time period) differs, too. Nevertheless, the relationships estimated from quite diverse countries like Germany (Bellman, Gerner and Upward, 2011), New Zealand (Fabling and Maré, 2011), Japan (Hijzen, Kambayashi, Teruyama and Genda, 2011) and Denmark (Eriksson, 2012) have been found to be broadly linear within the positive/negative domains and to exhibit sharp kinks in the vicinity of zero employment growth. Notably, with the exception for the early paper by Abowd et al. (1999) which estimated corresponding relationships for France,[14] they do not differ significantly from those documented in Davis et al. (2006,2012).[15] In fact, the similarities in the estimated establishment/firm labor adjustment technologies are striking and appear contradictory to the common wisdom according to which employers' labor adjustment is strongly affected by labor market institutions like job security legislation, unemployment compensation and labor market policies.

5. Concluding remarks

During the previous decades labor economists have made several contributions which have significantly enhanced our understanding of the supply side of labor markets. I think it is fair to say that the analysis of the demand side is considerably less developed and that the marginal returns to research efforts focusing on employers' behaviors are most likely greater. In this short article I hope to have shown that the extended Mortensen-Pissarides model of the interaction of worker and job flows offers a new promising framework for analysis of micro-level labor adjustment. But this framework seems also general and flexible enough to be useful also for analyses of firms' adjustment at other margins than employment, such as output, productivity and wages. In Finland, and the other Nordic countries, we have excellent, representative micro-level panel data sources, which is precisely what you need for carrying out this type of analyses. Here Nordic scholars have an opportunity to make important contributions that they should not miss.

As for the findings from the so far relatively small empirical literature on firms' labor adjustment to macroeconomic shocks I have discussed above, they indicate one potentially important thing, namely that cross-country differences in firms' adjustment technologies are quite small, even for economies with rather diverse labor market institutions. In fact, they are smaller than what one would expect on the basis of a large research literature suggesting that differences in labor market institutions explain the differences in unemployment and employment experiences between countries hit by common large shocks. Although it may be somewhat premature to conclude that the estimates are inconsistent with this conventional wisdom, they nevertheless suggest that this is an area worth exploring more.

In the application to Denmark, the results from a period covering three decades show remarkable stability in firms' labor adjustment technologies. There is no visible trend in the aggregate hires and separations rates over time nor changes in the relationship between job and worker flows at the level of firms, implying that the fluidity and dynamics of the Danish labor market has not changed. Thus, the "flex" part of the flexicurity system appears to continue a good job, and so far there are no strong indications of hysteresis effects re-emerging in the Danish labor market.

[14] *The paper by Abowd et al. (1999) found not only that hiring was the more important margin of employment adjustment (even for declining establishments) but also a considerably higher churning rate than has been observed for other countries.*

[15] *An ongoing project includes new estimates from more comparable data from the U.S. and France as well as first estimates from Canada.*

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