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Understanding unemployment flows

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Abstract This article reviews the current state of research on unemployment dynamics in macroeconomic models. In particular, it discusses the increasingly widespread use of the labour-market flow approach as implemented via a search and matching process and presents main policy considerations that arise from this approach related to unemployment benefit systems and employment protection. It reviews the implications of the labour-flow approach for dynamic properties of macroeconomic models and discusses policy implications for macroeconomic and labour-market policies. Finally, it presents new evidence on the effectiveness of policies to influence unemployment in- and outflows.

Key words: labour-market flows, determinants of unemployment, search and matching theory, labour-market policies, employment protection, segmented labour markets, temporary employment

JEL classification: J63, J08, J65

I. Introduction

Rarely has a Nobel Prize come at a more timely moment than that awarded to Peter A. Diamond, Dale T. Mortensen, Christopher A. Pissarides in 2010. With unemployment rates skyrocketing in many advanced economies and unemployment duration increasing rapidly, recognition for a theory and conceptual framework that has profoundly changed our ways of looking at labour-market dynamics and understanding its policy implications seems well deserved. Such recognition has not always been granted to what has come to be known as the flow approach to labour-market analysis. In particular, the macroeconomic literature took a long and winding road to incorporate some but certainly not all of its elements into its conceptual framework. Even today, the promise of the labour-market search and matching framework has not yet been fully exploited in helping understand macroeconomic dynamics and its interaction with job creation and unemployment. Contributing to this debate, this paper discusses the current position of the macro-labour debate that has incorporated the flow

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approach in the light of earlier theories and looks at some of the major policy conclusions that can be derived from it.

Understanding unemployment has been a major policy concern ever since the Great Depression caused massive human casualities, a loss in welfare, and more than a decade of declines in living standards. Today, unemployment stands at much lower rates, at least as measured by internationally comparable indicators, but remains a widespread reality almost everywhere (see Table 1, column 1). Indeed, looking at the stocks of unemployment across a range of OECD countries, it is rare that more than 15 per cent of the labour force are out of work over longer periods of time. In most countries unemployment rates are actually single digit. However, at similar unemployment rates, countries differ widely in the average unemployment duration and/or the average job tenure (see Table 1, columns 2 and 3). In addition, flows in and out of unemployment follow very different patterns across countries—both in terms of their levels and their cyclical variation—which is part of the reason for these large differences in the duration of unemployment and the risk of job loss (see Figure 1).

Such differences in unemployment dynamics are likely to have substantial consequences for the living and working conditions of the labour force.

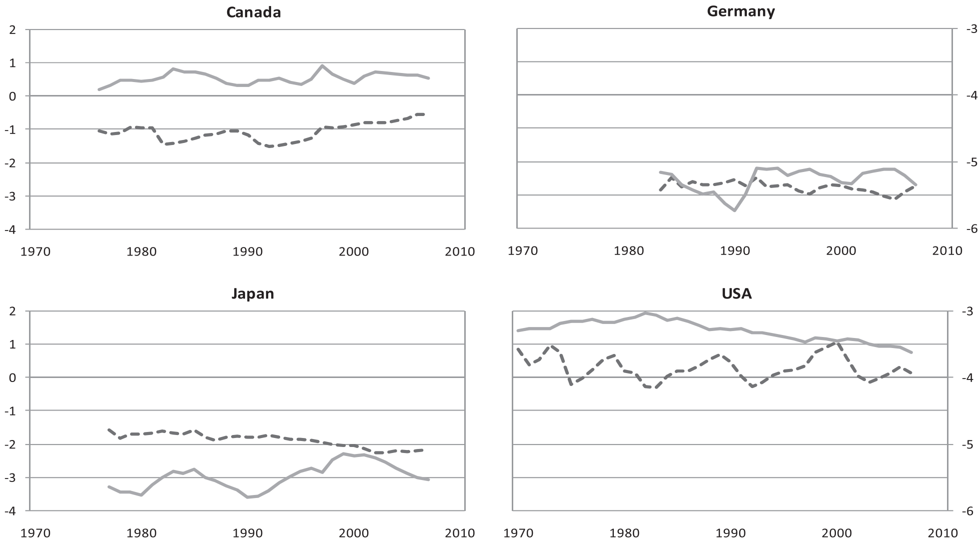
- First, a high turnover rate of unemployed workers allows job-seekers to find alternative employment opportunities quickly, thereby avoiding long spells of unemployment and preventing depreciation of human capital. At the same time, higher flow rates at any given rate of unemployment imply that more of the currently employed people are being affected by (short spells of) unemployment, raising job insecurity.
- Second, unemployment in- and outflow rates affect the cyclical behaviour of the macroeconomy and influence a country's capacity to recover its labour market quickly after a recession. For instance, countries which display strong cyclical patterns in unemployment outflows have a better chance of reducing unemployment that has been built up during a recession than those where unemployment outflows are unresponsive to business-cycle conditions.

Table 1: Unemployment and job tenure for selected OECD countries

	Unemployment rate	Average unemployment duration	Average job tenure
Austria	3.0		10.7
Switzerland	3.2	13.8	9.5
Norway	4.2	7.9	9.5
Australia	5.4	2.5	
United States	5.6	3.8	
Czech Republic	5.8	16.2	9.2
United Kingdom	6.8		8.4
Belgium	8.1		11.7
Hungary	8.3	16.4	9.0
Germany	8.4		10.6
France	9.6	14.0	11.3
Finland	10.1	8.7	10.4
Poland	13.8	14.2	11.5
Spain	15.6	19.2	9.8

Note: To avoid business-cycle effects, average values between 1990 and 2008 have been taken. Unemployment rate in % of the labour force; average unemployment duration in months; average job tenure in years. Countries have been ranked according to their unemployment rate.
Source: OECD, Labour Force Surveys.

Figure 1: Unemployment in- and outflow rates in selected OECD countries



Note: Inflow rates, smooth line, right-hand scale; outflow rates, dotted line, left-hand scale. Flow probabilities have been logit-transformed.
Source: Elsby *et al*. (2008); authors' calculations.

– Flows in and out of inactivity complete the overall dynamic picture of the labour market. Changes in the numbers of discouraged workers over the business cycle have implications for the recovery process, as fluctuations in inactivity affect the job creation rate. With increasing inactivity during a downturn, firms expect larger hiring difficulties during the upswing, which depresses their opening of new vacancies.
– Finally, macroeconomic and labour-market policies are likely to affect flow rates differently, thereby affecting aggregate unemployment through both job creation rates and the length of unemployment spells. Understanding these dynamic implications of policies on the macroeconomy has proved essential for a finer evaluation of the effectiveness of policy interventions. In this respect, the labour-flow approach helps assess policies in more detail, to understand which flows are being affected and in which direction.

Documenting these differences and understanding how they are linked to institutional and policy determinants is therefore of major concern for policy-makers and helps improve the setting of the proper policy stance of both macroeconomic and targeted labour-market instruments. The labour-flow approach has provided a new toolbox to analyse and understand such unemployment dynamics.

At the heart of this approach lies the decentralized matching process between labour demand and supply, a result of the simultaneous existence of job-seekers and job vacancies at any point in time. Traditional macroeconomic models have difficulties reconciling these phenomena with the idea of a well-functioning market economy and put forward different plausible theories on institutional rigidities that might have prevented unemployed workers finding a job (e.g. minimum wages, trade unions, efficiency wage, insider–outsider theories). In response to these difficulties, the labour-market flow approach—representing unemployment stocks by a continuous flow in and out of unemployment that corresponds to an ongoing process of job creation and destruction—constituted a major improvement. This approach comes with a fundamental insight: labour markets do not clear, in general. This is in stark contrast to the prediction of standard microeconomic theory, which suggests that in the absence of wage rigidities and with employment adjusting to optimal levels, no—involuntary—unemployment should prevail in equilibrium. In the search and matching framework, on the other hand, frictions are an unavoidable part of the functioning of labour markets and preclude a simultaneous match of all job vacancies with those willing to pick up employment at the going wage. In addition, any adjustment to the actual level of employment through job churning, i.e. the process of job creation and destruction, will necessarily take time and prevents the economy from reaching its new equilibrium situation immediately. Such a dynamic adjustment process will impact on other macroeconomic developments, including the rate of inflation, the loss of output and employment following an adverse shock, and the rate of productivity growth. Finally, search frictions introduce inefficiencies, opening the possibility of welfare-enhancing policy interventions, an aspect that will constitute the main focus of this paper.

The paper is organized as follows. The next section presents the traditional as well as the labour-flow approaches to understanding unemployment. Thereafter, current developments in macroeconomic modelling with labour flows are introduced and their policy implications discussed. A specific section looks into the role of employment protection in shaping unemployment dynamics. Next, new empirical estimates of policy multipliers in a macroeconomic labour-flow model are presented. A final section concludes.

II. Traditional versus stock-flow approaches to understanding unemployment

(i) Unemployment dynamics in traditional macroeconomic models

Traditional approaches linking unemployment dynamics to macroeconomic conditions have been concentrated on stocks: employment, labour force, and working-age population. In these models, employment was tightly linked to output growth, almost in a mechanical manner that allowed macroeconomic analysis to be limited to the main components of the national accounts. Labour supply was considered to be either exogenous—as in most Keynesian models—or supplied elastically by households depending on the on-going wage. Demographic changes, finally, did not play any role and remained outside the analytical framework.

This approach was underlying the development of the Philips curve as the main tool for macroeconomic analysis, linking unemployment developments (either its rate of variation or its deviation from a long-term trend) to inflationary pressures. The implied trade-off reflected an empirical regularity between (wage) inflation and unemployment, first identified by William Phillips in 1958. With the advent of the monetarist revolution in the 1960s, the Philips curve was further refined, adding to the short-run trade-off a long-run vertical NAIRU (the non-accelerating inflation rate of unemployment) to reflect the structural unemployment rate, unaffected by macroeconomic policies. Employment adjustment frictions, persistent real shocks, and structural rigidities such as wage indexation, collective bargaining procedures, and employment protection were alone held responsible for (shifts in) the position of the NAIRU.

As unemployment rose in many OECD countries without a corresponding deceleration of inflation during the 1970s and remained high in the 1980s, the NAIRU approach came increasingly under scrutiny. The rapid shift in the structural unemployment rate that was implied by these empirical observations could not easily be reconciled with an institutional environment that was evolving much more slowly. The flows on the labour market—reflected, for instance, by a rapidly lengthening unemployment duration and an increasing incidence of long-term unemployment—seemed to be related to these shifts. As a consequence, one strand of the literature investigated models of labour-market hysteresis in which the reduction in *flows* out of unemployment was linked to a depreciation in human capital, reductions in the job-search efforts of the unemployed, and an increase in the number of discouraged workers (Blanchard and Summers, 1986).

At the same time, macroeconomic models based on a newly developed dynamic framework involving Walrasian labour markets and economic agents with rational expectations ('real business cycle' models) ran into difficulties correctly displaying the employment variation over the business cycle. Employment dynamics proved to be too volatile, driven exclusively by labour supply decisions. In reality, large shifts in unemployment were observed to take up the slack on the labour market, with labour supply conditions adjusting only moderately to cyclical conditions. It is in this context that alternative labour-market models based on a *flow* analysis have successfully gained ground since the early 1990s and promised to open up new perspectives on understanding unemployment dynamics in macroeconomic models and the role they play in shaping policy transmission mechanisms.

(ii) Understanding labour-market flows as a search process

Observation of the link between stocks and flows on the labour market dates back at least to work in the 1940s by William Beveridge, who noticed an inverse relationship between the number of job vacancies and the unemployment rate (Blanchard and Diamond, 1989). In the Walrasian world of perfect match-making, such large discrepancies between labour supply and demand should not exist in principle. In reality, however, labour markets display large flows of workers across the economy, between and within firms. At the same time, jobs are constantly being created and destroyed, sometimes even without a particular worker being hired or dismissed (Davis *et al.*, 1998). The observation of large gross worker and job flows triggered a lively new field within labour-market economics and generated a growing wealth of statistical material useful to analyse the phenomenon further. At the heart of this paradigm lies the idea of decentralized markets, with buyers and suppliers of goods and services meeting in a sequential, time-consuming manner. The (opportunity) costs of this process generate a wedge between the actual wage or price being paid and the reservation wage or price that each market side is ready to accept in the absence of search frictions. As a consequence, markets never clear, much as in reality. More importantly, a rent can be earned inside a match, which makes it worthwhile entering a match rather than remaining out of work. In the world of the labour-flow approach, unemployment is never voluntary.

Seminal work by Mortensen and Pissarides (1994) and Pissarides (1985, 2000) has offered a tractable way of analysing the corresponding labour-market flows equilibrium (see Box 1). In particular, the probability at which a job-seeker is successfully matched to a job is summarized in a stylized matching function that links the dynamics of unemployment flows to those of vacancies. In equilibrium, unemployment arises as the result of the interplay

Box 1:A summary of the labour-flow approach

Changes between time *t-1* and *t* in unemployment result from the difference between labour force growth, ΔL_t, and employment growth, ΔE_t, equivalent to the difference between unemployment in- and outflows:

$$\triangle u_t = \triangle L_t - \triangle E_t = IN_t - OUT_t.$$

Considering labour supply to be fixed and job destruction to happen at an exogenous rate, σ, the changes in unemployment are determined by the rate at which job-seekers match with open vacancies, V_t:

$$\triangle u_t = IN_t - OUT_t = \sigma E_t - m(V_t, U_t)$$

where $m(V_t, U_t)$ is a constant-returns-to-scale matching function. In equilibrium, when $\Delta u = 0$, and the labour force is normalized to unity ($E_t = 1 - U_t$), the equilibrium unemployment rate results in:

$$\bar{u} = \frac{\sigma}{\sigma + m(\bar{\theta}, 1)} \qquad \text{(Beveridge curve)}$$

where $\theta_t = V_t / U_t$ represents the tightness of the labour market and $\bar{u}$ and $\bar{\theta}$ represent values at equilibrium.

Wages are determined through a Nash bargaining process. Workers' fall-back option is the unemployment benefit revenue, R; at maximum, they can recoup the rent of the match, $p(1 + c\theta_t)$ where p represents the seller's price, c the instantaneous vacancy costs (e.g. advertising a post, cost of applicant selection), and $pc\theta_t$ the average hiring cost of an unemployed worker. Using a Nash bargaining framework with bargaining power, β, the negotiated wage derives as a weighted average between these two extreme values:

$$w_t = (1 - \beta)R + \beta p(1 + c\theta_t).$$

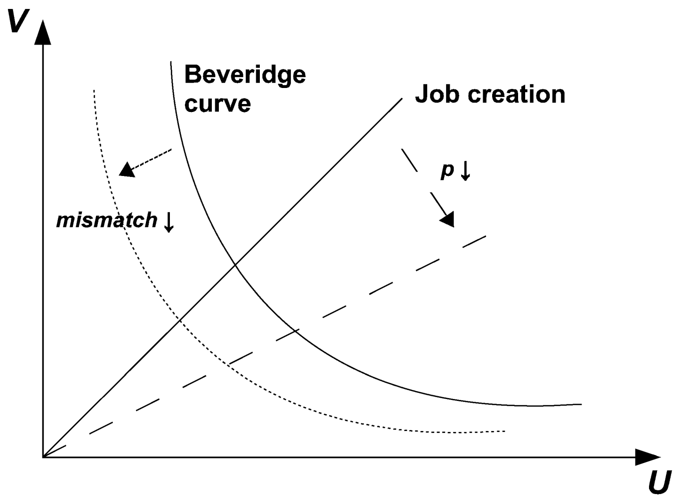
Finally, a new vacancy will be opened, if the firm expects its net profits prior to the match, $(p + w_t) \cdot m(1, 1/\theta_t)$, to equal the flow costs of opening a vacancy that results from hiring costs, pc, $(r + \sigma)pc$, i.e.

$$p - w = \frac{(r + \sigma)pc}{m(1, 1/\theta_t)}.$$

Combining the wage setting and the labour demand schedule gives:

$$(1 - \beta)(p - R) - \frac{(r + \sigma)\beta m(\theta_t, 1)}{m(1, 1/\theta_t)} pc = 0. \qquad \text{(Job creation)}$$

Together with the Beveridge curve, this job creation curve determines the equilibrium in the vacancy–unemployment space:



The efficiency with which vacancies are matched to job-seekers determines the position of the Beveridge curve: lower mismatch rates shift the curve downwards (dotted curve). Factors lowering the firm's profitability, *p*, rotate the job creation schedule to the right (dashed line). In the base model with its partial equilibrium structure, unemployment benefits, *R*, for instance, will depress job creation as they raise the negotiated wage rate. This partial equilibrium framework constitutes one of the major limitations of the first-generation models that have been built on the basis of a labour-flow analysis.
Note: Based on Pissarides (2000, ch.1).

between a time-consuming search process, represented by the Beveridge curve, and a standard labour demand curve. Labour demand in these models depends on both the expected probability at which a firm is able to identify an appropriate job-seeker and the wage costs of an employee. Search frictions introduce a distinction between the market-clearing wage and the wage actually achieved, a wedge that is at the origin of equilibrium unemployment. More importantly, they imply a socially inefficient creation of vacancies in almost all circumstances. Indeed, for the search equilibrium to be (constrained) socially efficient, firms must be remunerated such that their share of the match rent exactly covers their costs of vacancy creation (the so-called Hosios principle; see Hosios (1990)). This is only the case when the parameter that reflects the firm's bargaining power corresponds to the elasticity of the matching function with respect to unemployment, which in general will not be the case. As a consequence, vacancy creation will be either too high or too low with respect to the pool of unemployed, leading either to a wasteful creation of job openings (and hence aggregate consumption that is too low) or to too high an unemployment rate.

The wage determination process plays a key role in search models and has been a matter of intensive ongoing research with noticeable consequences for the dynamic behaviour of unemployment in these models. Generally speaking, wage determination depends on the way the match rent is being shared between workers and employers. In principle, this is entirely idiosyncratic and may depend on the specific characteristics of each single worker and firm.

In contrast to the Walrasian auctioneer, there is no natural dynamics that would drive the price to any particular level, except from in the limit case of no search friction. Two main variants have been developed to make this approach more tractable and to allow for a closed-form solution of the equilibrium wage: (i) a Nash bargaining approach, whereby a different degree of bargaining power is assigned to each side of the market, which helps to pin down the equilibrium wage at a unique level across the economy; (ii) a wage-posting model, whereby firms post wages to attract workers, which typically opens up the possibility of a (non-degenerate) equilibrium wage distribution across firms independently of any inherent differences across workers or jobs (Burdett and Mortensen, 1998).[1]

Besides the wage determination mechanism, the matching technology also plays an important role in pinning down the equilibrium allocation and has received continued interest from both theoretical and empirical research. The matching rate depends on the interplay of two search-related externalities: a positive size externality and a (negative) congestion externality. For each side of the market, an increase in its own side causes congestions, whereas an increase of the other market side improves matching possibilities. In most applied work, these two externalities are assumed to cancel each other out such that the matching function can be assumed to be homogeneous of degree one (i.e. exhibiting constant returns to scale). Empirical evidence regarding the observed nature of the matching process has so far remained inconclusive with some studies seeming to confirm the assumption (e.g. Pissarides and Petrongolo, 2001) whereas others point towards—sometimes large—increasing returns to scale (Gross, 1997; Anderson and Bugess, 2000). Most of the theoretical models, however, have retained the assumption of constant-returns-to-scale, mainly for reasons of analytical tractability.

III. Labour-flow dynamics in macro models

The extension of macro models using the labour-flow approach proved to be useful in understanding unemployment dynamics at different business-cycle intervals and in improving the evaluation of business-cycle shock transmission. Moreover, it allowed a better integration of labour supply dynamics through considering inactivity dynamics. Finally, it offered a new way of understanding the implications of employment protection on employment volatility and business-cycle characteristics. In the following, some examples are discussed.

(i) Job churning, labour flows, and productivity growth

To make the labour-market flow approach suitable for a macroeconomic understanding of unemployment dynamics, it needs to be introduced in a larger macroeconomic framework. Most models following the search approach have done so using dynamic general equilibrium

[1] To generate wage differentials, some authors have introduced directed search instead of the traditional random search process (Albrecht *et al.*, 2006; Julien *et al.*, 2000). In this set-up, jobseekers send out several applications simultaneously of which only some give rise to concrete job offers. In equilibrium, this may cause some unemployed receiving more than one job offer whereas others receive none. The effective wage for those workers receiving more than one offer is then determined via an auction, which under the assumption of Bertrand competition leads to the worker catching the entire match rent. Workers that only receive one offer are being paid their reservation wage. As a consequence, even absent any worker heterogeneity, there is wage dispersion across workers.

models with rational expectations where current consumption is linked to expected future consumption and the time preference rate through an Euler equation. Macroeconomic applications of the labour-flow approach typically retain Nash bargaining to pin down wages, partly for reasons of analytical tractability, partly because it offers an immediate justification for policy interventions given that, in most cases, the Hosios principle for constrained efficiency in this framework is not satisfied.

The breakthrough for the search approach in macroeconomics came alongside the introduction of Schumpeterian ideas of firm and job creation and destruction. Indeed, the labour-market search theory had interesting parallels with ideas developed during the 1990s in the endogenous growth literature (Aghion and Howitt, 1994; Eriksson, 1997). Combining the process of job creation and destruction with endogenously determined changes in productivity and output growth allowed the identification of important short- or even long-run costs of faster technological progress for employment growth. On the one hand, existing jobs can be shown to be destroyed faster as productivity accelerates; on the other hand, it is more difficult to create new ones as the average duration of a match is shorter with more Schumpeterian creative destruction. In equilibrium, these approaches demonstrated at least the possibility for unemployment to rise with faster output growth, a stark contrast to the traditional growth–employment relationship.

(ii) Labour flows in macro models: a case for activist macroeconomic policies?

The introduction of the flow approach in a macroeconomic framework sheds new light on the implications of matching frictions for the optimal stance of macroeconomic policies and allows us to improve upon the partial equilibrium framework in which most original work on labour flows has been conducted. Indeed, the rational expectations framework based on Walrasian market assumptions had difficulties in replicating the observed high variability of employment over the cycle. Starting with the seminal work by Merz (1995), authors relied increasingly on the adjustment dynamics resulting from the matching process to explain business-cycle dynamics (Andolfatto, 1996) and inflation persistence (Walsh, 2005; Ravenna and Walsh, 2008; Gertler and Trigari, 2009; Trigari, 2009). As employment cannot be adjusted immediately, but only through a time-consuming search process, shocks take longer to be fully absorbed, generating long lags before inflation and output return to equilibrium. By consequence, it also affects the optimal setting of monetary policies, as policy shocks take longer to be transmitted. More importantly, business cycles now come with substantially increased welfare costs as employment levels do not correspond to the optimal levels along the cycle, creating an ‘unemployment asymmetry gap’ (Hairault *et al.*, 2010). In these models, much in contrast to earlier monetarist approaches, only strictly positive inflation targets are welfare enhancing in such economies, in order for agents to account properly for their search externalities (Wang and Xie, 2003; Thomas, 2008).

Recently, the search approach has also gained prominence in trying to understand the implications of fiscal stimulus packages and calculating the size of fiscal multipliers (Faia *et al.*, 2010; Monacelli *et al.*, 2010). Indeed, most rational expectation models have difficulties in accounting for large positive effects of government spending on employment, given Ricardian equivalence that pins down the real long-term interest rate. The theoretical hypothesis clashed with the empirical observations that fiscal stimulus can help support job creation and consumption, in particular during crisis times. In trying to explain the observed effects of such interventions, earlier attempts relied on *ad hoc* assumptions regarding the existence of non-optimizing households or the differences in time preference rates between governments and households owing to an overlapping-generations structure, without necessarily yielding dynamic properties that matched observed business cycles. Using the search approach, a positive shock on government expenditure is expected to increase the match surplus and thereby strengthen incentives to open vacancies and stimulate job creation. So far, however, this attempt has not brought about results that would sufficiently match the observed fiscal employment multipliers, absent additional modelling assumptions. Nevertheless, two important lessons emerge from this literature. Realistic model features on both labour and product markets—including imperfect competition and nominal price rigidities in combination with search frictions—can go some way to explaining large fiscal output and employment multipliers (Monacelli *et al.*, 2010), but the sole reliance on the labour market as a transmission mechanism for public spending on aggregate activity may not be sufficient or may even yield counter-intuitive results (such as falling real wages as a reaction to spending shocks). In addition, the search approach facilitates the analysis of specific labour-market policy interventions such as hiring incentives (Faia *et al.*, 2010) or the role of public job creation (Quadrini and Trigari, 2007; Gomes, 2009) and helps differentiate between measures depending on their impact on employment.

(iii) Endogenous participation and labour supply

The macro labour-flow approach has also been extended to understand the role of labour force participation in shaping the macroeconomic outcomes. Originally, the flow approach considered labour supply to be exogenous. In a macro context such an assumption is hardly warranted as households can adjust their labour supply through various channels, including their participation decisions. Endogenizing participation decisions allow the introduction of two additional flow margins that are potentially driven by different determinants: labour-market entry and exits (Garibaldi and Wasmer, 2005). The additional margins in and out of inactivity constitute an essential element in improving the dynamic properties of macroeconomic models. In particular, they allow a magnification effect of technological shocks on employment as wages adjust more sluggishly over the cycle when the labour force is endogenous (Haefke and Reiter, 2006). This is important for understanding the high observed unemployment volatility and the negative correlation between unemployment and output, features that more traditional macroeconomic models have difficulties in replicating. In addition, the size of these margins interacts with the degree of search frictions: workers will stay longer in the labour market if they expect a higher job-finding rate and a larger surplus from employment in the future, even if their current value from participation is below their reservation rate ('employment hoarding'). In other words, the margin at which workers quit the labour market is below what a traditional Walrasian labour market would predict, which helps to explain the low variability of inactivity over the business cycle.

Taking this additional flow margin into account can have significant policy implications. Unemployment benefits, for instance, are affecting observed unemployment rates through at least three different margins: a (positive) incentive effect on lowering job search effort; a (negative) matching-quality effect that improves employment survival rates; and a (negative) aggregate demand effect. In this respect, Garibaldi and Wasmer (2005) demonstrate the existence of a positive labour-participation effect of higher unemployment benefits, i.e. rising unemployment benefits (or extending their duration) might lower inactivity, even though the effect of the unemployment rate can be ambiguous. Similarly, as further discussed in the next section, employment protection legislation affects employment dynamics through two margins: the lay-off rate and the hiring rate. In a calibrated model for the US, Moon (2011) demonstrates that rising costs of firing lower the hiring rate more than the lay-off rate, thereby increasing unemployment and the length of unemployment spells. More importantly, the lower job-finding rate also has an adverse effect on labour-force participation, with more discouraged workers staying out of the labour market.

IV. Employment protection and unemployment flows

Employment protection has taken a prominent place in labour-flow models, given its effects on unemployment in- and outflows and its prominent place in the policy debate surrounding the importance of labour-market flexibility for employment creation. More recently, the debate has moved towards analysing the impact of different contract types that would introduce labour-market segmentation, a pervasive labour-market phenomenon that has been at the heart of explanations for high and persistent unemployment rates in Europe.

A first strand of the literature focuses exclusively on the role of employment protection on shock transmission. An influential debate has arisen around the question of the extent to which high(er) employment protection among European countries has led to a strong and permanent rise in unemployment during the 1970s and 1980s, that was only slowly reversed in comparison to a similarly strong increase and decline in the US. In this respect, several authors have stressed the differential impact on unemployment outflows arising from skill differences when employment protection is tight. As employment protection reduces both unemployment in- and outflows, human capital depreciation for laid-off skilled workers worsens with higher firing costs as it will take them longer to return to employment (Ljungqvist and Sargent, 2007). When macroeconomic shocks are few or small, the negative effect of employment protection on unemployment flows will dominate and bring the aggregate unemployment rate down. However, when turbulence increases owing to more frequent shocks, the skill depreciation effect dominates, reducing overall economic efficiency, lowering the growth rate, and hence increasing unemployment. This result remains controversial, however, as it depends on worker separation rates uniquely determined by firms' lay-off decisions. To the extent that higher employment protection will also lead to fewer quits—as workers expect more difficulties in finding new employment opportunities with higher firing costs—the effect of employment protection on flows into unemployment may remain sufficiently strong regardless of the size of firing costs for unemployment to be lower than in the absence of such costs (den Haan *et al.*, 2005).

A different strand of the literature focused on the existence of differences in employment contracts between permanent and temporary workers in order to understand the high employment volatility in countries that experienced a strong increase in non-standard or temporary work arrangements. These models focus on labour-market heterogeneity arising from institutional and contractual differences, not due to inherent worker characteristics. The existence of non-degenerate segments of the labour market is then a result of demand-side factors, with implications for the dynamics of unemployment flows. These flows are to a large extent determined by firms' responses to changes in the macroeconomic environment. In the face of uninsurable macroeconomic shocks, the use of temporary workers allows them to be more flexible in their employment strategy and to incur substantially lower dismissal costs and administrative burdens than when employing only permanent workers.

Among the first to integrate such segmentation in a labour-flow model, Cahuc and Postel-Vinay (2002) extended the Mortensen–Pissarides model for permanent and temporary work contracts. Jobs differ only in the degree of firing costs; wage bargaining is carried out in a similar fashion on either type of job and with the same degree of bargaining power. No wage rigidity is present as firms can renegotiate wages after the productivity shock has been realized. The presence of search frictions to hire new workers (whether permanent or temporary) implies a fixed cost for job creation that needs to be recovered by the match rent. Given that the productivity shock is only realized after the worker has been hired, this generates demand by firms to hire temporary workers in order to make sure that these fixed costs can be recovered (by laying off workers) even in cases of low productivity realizations. A major consequence of having temporary workers is that job destruction is actually higher over the business cycle compared to a situation of only permanent contracts, increasing average unemployment and reducing aggregate welfare.

The volatility implications of labour-market segmentation with temporary contracts are further explored by Sala *et al.* (2008) and Costain *et al.* (2010). Comparing unemployment fluctuations in segmented labour markets with those arising in a model where firms are constrained to offer a unique permanent contract, the authors conclude that the volatility increases when temporary contracts become available, as firms use these contracts to absorb shocks, raising inflows into unemployment during recession times, but also increasing outflows into new jobs when recovery sets in. Other labour-market policies interact with temporary work. For instance, Costain *et al.* (2010) demonstrate that unemployment benefits will further increase job volatility by making the use of temporary contracts even more attractive to firms to lower wage costs from permanent employees. Taken together, unemployment fluctuations gradually increase with the number of temporary contracts, reaching the limit case of a fully flexible labour market when no permanent contracts are offered. However, these models fail to identify a mechanism by which unemployment fluctuations in segmented labour markets would even be higher than under full labour-market flexibility, somewhat at odds with recent evidence that suggest that countries with large shares of temporary workers fared particularly badly during the crisis (Bentolila *et al.*, 2010).

V. New evidence on government spending effects on labour-market flows

Accounting for labour flows in macro models opens the possibility of a more detailed understanding of the transmission of policies on to employment dynamics.[2] Most existing macro-labour models evaluate government interventions only at a very aggregate level. No account is given of the more detailed spending categories through which, in particular, labour-market policies are being implemented. However, information on labour flows recently made available allows the delivery of a more detailed picture of such government interventions at the different margins of labour-market adjustment. In this respect, integrating the microeconomic dynamics of the labour-flow approach into a macroeconomic framework

[2] Preliminary results of the evidence discussed in this section have been presented in IILS (2010).

able 2: Policy contributions to unemployment dynamics

	Equation (1)				Equation (2)			
	Government consumption				Government wage consumption			
	Unemployment inflows	Unemployment outflows	Government consumption	Real long-term interest rate	Unemployment inflows	Unemployment outflows	Government wage consumption	Real long-term interest rate
low (lagged)	0.961*** (0.076)		0.012*** (0.004)		0.908*** (0.078)		–0.000 (0.003)	
nployment rate gged)	4.685*** (0.766)				4.240*** (0.794)			
pulation growth gged)	6.632*** (2.242)				10.879*** (2.574)			
P growth	0.094 (0.086)				0.229** (0.095)			
eal long-term erest rate gged)	0.019*** (0.005)				0.034*** (0.006)			
hare of indirect xes (lagged)	1.872** (0.884)				2.796** (1.114)			
nemployment tflows	–0.378*** (0.061)				–0.376*** (0.065)			
are of vernment nsumption gged)	–3.205** (1.303)	4.711*** (1.125)						
nployment otection gislation (lagged)	–0.009 (0.036)	–0.047 (0.032)			0.019 (0.042)	–0.037 (0.036)		
nemployment tflows (lagged)		0.675*** (0.050)	–0.014*** (0.003)			0.651*** (0.051)	–0.009*** (0.002)	
nployment rate		4.707*** (0.672)				3.234*** (0.719)		
er cost of capital		0.007 (0.005)				–0.004 (0.006)		
age–Interest rate io		–0.053*** (0.018)				–0.060*** (0.021)		
oss fixed capital rmation		3.934*** (0.663)				4.231*** (0.777)		

Table 2. Continued

	Equation (1)				Equation (2)			
	Government consumption				Government wage consumption			
	Unemployment inflows	Unemployment outflows	Government consumption	Real long-term interest rate	Unemployment inflows	Unemployment outflows	Government wage consumption	Real long-term interest rate
owth in real sposable usehold income		0.037 (0.391)				0.200 (0.497)		
low into employment		–0.070 (0.087)				–0.108 (0.086)		
overnment net nding (lagged)				–0.246*** (0.051)				–0.090* (0.051)
quid liabilities tal economy; gged)				–6.340*** (1.253)				–4.418*** (1.169)
hare of vernment wage nsumption gged)					–0.916 (2.056)	6.527*** (1.749)		
hare of vernment non-age consumption gged)								
rect job creation gged)								
ring incentives gged)								
aining penditures gged)								
blic employment rvices (lagged)								
pending on employment nefits (lagged)								
oservations	150	150	150	150	130	130	130	130
squared	0.972	0.981	0.929	0.474	0.966	0.985	0.947	0.433

Table 2. Continued

Table 2. Continued

	Equation (3)				Equation (4)			
	Government non-wage consumption				Direct job creation			
	Unemployment inflows	Unemployment outflows	Government non-wage consumption	Real long-term interest rate	Unemployment inflows	Unemployment outflows	Direct job creation	Real long-term interest rate
low (lagged)	0.911*** (0.085)		0.010*** (0.003)		0.949*** (0.076)		0.001*** (0.000)	
nployment rate gged)	4.260*** (0.895)				2.625*** (0.788)			
pulation growth gged)	6.460*** (2.442)				9.660*** (2.673)			
P growth	0.231*** (0.086)				0.250*** (0.097)			
al long-term erest rate gged)	0.021*** (0.006)				0.018*** (0.005)			
are of indirect xes (lagged)	1.075 (0.781)				0.654 (0.992)			
employment tflows	–0.426*** (0.071)				–0.239*** (0.055)			
are of vernment nsumption gged)								
nployment otection islation gged)	–0.104** (0.047)	–0.107** (0.042)			–0.032 (0.035)	–0.023 (0.036)		
employment tflows (lagged)		0.568*** (0.055)	–0.005** (0.002)			0.605*** (0.052)	–0.000 (0.000)	
nployment rate		4.563*** (0.817)				3.689*** (0.967)		
er cost of pital		0.007 (0.005)				0.007 (0.005)		
age–Interest e ratio		–0.054*** (0.019)				–0.086*** (0.023)		
oss fixed capital mation		3.923*** (0.785)				4.594*** (0.856)		

	Equation (3)				Equation (4)			
	Government non-wage consumption				Direct job creation			
	Unemployment inflows	Unemployment outflows	Government non-wage consumption	Real long-term interest rate	Unemployment inflows	Unemployment outflows	Direct job creation	Real long-term interest rate
owth in real posable usehold income		–0.237 (0.434)				0.363 (0.489)		
ow into employment		–0.129 (0.094)				–0.038 (0.096)		
vernment net ding (lagged)				–0.239*** (0.050)				–0.166*** (0.053)
uid liabilities tal economy; ged)				–2.471** (1.150)				–6.109*** (1.350)
are of vernment wage nsumption gged)								
are of vernment non- ge consumption gged)	–8.552*** (2.443)	2.752 (2.140)						
ect job creation gged)					–62.276*** (13.590)	9.273 (14.472)		
ing incentives gged)								
aining penditures gged)								
blic employment rvices (lagged)								
ending on employment nefits (lagged)								
servations	130	130	130	130	140	140	140	140
squared	0.969	0.984	0.813	0.435	0.969	0.986	0.622	0.484

Table 2. Continued

	Equation (5)				Equation (6)			
	Hiring incentives				Training expenditures			
	Unemployment inflows	**Unemployment outflows**	**Hiring incentives**	**Real long-term interest rate**	**Unemployment inflows**	**Unemployment outflows**	**Training expenditures**	**Real long-term interest rate**
ow (lagged)	0.895*** (0.073)		0.001*** (0.000)		0.894*** (0.073)		0.000 (0.000)	
nployment rate gged)	2.785*** (0.749)				3.689*** (0.860)			
pulation growth gged)	9.180*** (2.373)				11.317*** (2.936)			
P growth	0.283*** (0.085)				0.278*** (0.101)			
al long-term erest rate gged)	0.016*** (0.004)				0.016*** (0.005)			
are of indirect es (lagged)	–1.211 (0.891)				–0.022 (1.204)			
employment tflows	–0.241*** (0.052)				–0.291*** (0.057)			
are of vernment nsumption gged)								
nployment otection islation gged)	0.004 (0.034)	0.006 (0.037)			0.006 (0.037)	–0.016 (0.034)		
employment tflows gged)		0.590*** (0.051)	–0.000 (0.000)			0.581*** (0.050)	–0.001*** (0.000)	
nployment rate		3.566*** (0.940)				4.254*** (0.898)		
er cost of pital		0.000 (0.005)				0.006 (0.005)		
age–Interest e ratio		–0.068*** (0.021)				–0.070*** (0.021)		
oss fixed pital formation		4.173*** (0.773)				5.307*** (0.762)		

Table 2. Continued

	Equation (5)				Equation (6)			
	Hiring incentives				Training expenditures			
	Unemployment inflows	Unemployment outflows	Hiring incentives	Real long-term interest rate	Unemployment inflows	Unemployment outflows	Training expenditures	Real long-term interest rate
owth in real sposable usehold income		0.656 (0.460)				0.512 (0.444)		
low into employment		–0.146 (0.101)				0.005 (0.088)		
overnment net nding (lagged)				–0.159*** (0.053)				–0.148*** (0.053)
quid liabilities tal economy; gged)				–6.508*** (1.325)				–5.541*** (1.319)
are of vernment wage nsumption gged)								
are of vernment non- ge consumption gged)								
ect job creation gged)								
ring incentives gged)	–9.271 (15.468)	71.203*** (18.955)						
aining expenditures gged)					27.543* (15.282)	26.080* (13.730)		
blic employment rvices (lagged)								
ending on employment nefits (lagged)								
oservations	140	140	140	140	140	140	140	140
squared	0.972	0.985	0.863	0.484	0.972	0.986	0.855	0.481

Table 2. Continued

Table 2. Continued

	Equation (7)				Equation (8)			
	Public employment services				Unemployment benefits			
	Unemployment inflows	Unemployment outflows	Public employment services	Real long-term interest rate	Unemployment inflows	Unemployment outflows	Unemployment benefits	Real long-term interest rate
ow (lagged)	0.972*** (0.075)		–0.000 (0.000)		0.949*** (0.076)		0.005*** (0.001)	
nployment rate gged)	4.717*** (0.986)				0.807 (0.781)			
pulation growth gged)	7.097** (3.156)				4.388** (2.199)			
P growth	0.352*** (0.108)				0.120 (0.079)			
al long-term erest rate gged)	0.034*** (0.006)				0.006 (0.005)			
are of indirect es (lagged)	2.963** (1.433)				0.340 (0.839)			
employment tflows	–0.236*** (0.058)				–0.293*** (0.065)			
are of vernment nsumption gged)								
nployment tection legislation gged)	–0.090 (0.070)	–0.057 (0.060)			0.016 (0.035)	–0.017 (0.035)		
employment tflows gged)		0.578*** (0.054)	–0.000 (0.000)			0.789*** (0.057)	–0.006*** (0.001)	
nployment rate		4.559*** (1.083)				2.760*** (0.946)		
er cost of capital		0.006 (0.006)				0.031*** (0.005)		
age–Interest e ratio		–0.077*** (0.025)				–0.070*** (0.018)		
oss fixed pital formation		5.718*** (0.913)				3.797*** (0.694)		

	Equation (7)				Equation (8)			
	Public employment services				Unemployment benefits			
	Unemployment inflows	Unemployment outflows	Public employment services	Real long-term interest rate	Unemployment inflows	Unemployment outflows	Unemployment benefits	Real long-term interest rate
owth in real posable usehold income		0.247 (0.512)				0.116 (0.396)		
ow into employment		0.067 (0.085)				–0.101 (0.098)		
vernment net ding (lagged)				–0.095* (0.051)				–0.168*** (0.051)
uid liabilities tal economy; ged)				–7.362*** (1.197)				–4.809*** (1.228)
are of government ge consumption gged)								
are of vernment non- ge consumption gged)								
ect job creation gged)								
ing incentives gged)								
aining expenditures gged)								
blic employment rvices (lagged)	70.153* (41.456)	50.128 (40.310)						
ending on employment nefits (lagged)					–19.648*** (4.498)	8.734* (4.477)		
servations	128	128	128	128	140	140	140	140
squared	0.972	0.986	0.815	0.545	0.971	0.976	0.685	0.478

ote: All equation systems are estimated using 3SLS. All regressions contain country fixed effects. Standard errors in parentheses: ***p < 0.01, **p < 0.05, *p < 0.1.

allows us to obtain a more robust picture of policy intervention on aggregate unemployment dynamics.

Macroeconomic conditions are likely to affect significantly the microeconomic effectiveness of labour-market interventions. When aggregate demand is severely impaired, standard activation policies, for instance, are unlikely to develop the same effectiveness as during more tranquil times. So far, there are no studies to assess the effectiveness of labour-market policies under macroeconomic and financial sector crisis conditions. These conditions need to be taken into account, however, if countries want to select the right mix of policies, as policy multipliers vary widely depending on the general macroeconomic environment. In the following, a novel approach is presented that is meant to overcome—at least partially—this missing link between labour-market policies and the aggregate state of the economy and employment, making use of the labour-flow approach. In particular, the analysis includes bi-directional effects between unemployment dynamics and fiscal variables to account for potential adverse effects from the costs of labour-market policies at the macroeconomic level. This allows us to take the fiscal implications of labour-market policies explicitly into account and provides a more accurate picture of policy effectiveness under the current circumstances.

In the following, and starting from the base model outlined in Box 1, two inter-connected unemployment in- and outflow equations are inserted in a reduced-form macro model. Most of the determinants of the two flow equations can be derived from the original labour-flow model (see Pissarides, 2000; Carlsson *et al.*, 2006), complemented with macroeconomic and labour-market policy variables. To account for policy endogeneity, government interventions are linked to changes in unemployment in- and outflows (*Policy*). The model is closed by a standard aggregate supply equation, linking flows-of-funds constraints to real long-term interest rates (RIRL). The entire model has been estimated in a system-of-equation approach using the following set-up:

$$\begin{aligned}
Inflows_t &= Outflows_{t-1} + Macro_t + LM_t + Policy_t + \alpha_{ij,t} + \varepsilon_{i,t}\\
Outflows_t &= Inflows_{t-1} + Macro_t + LM_t + Policy_t + \alpha_{oj,t} + \varepsilon_{o,t}\\
Policy_t &= Outflows_t + Inflows_t + \alpha_{pj,t} + \varepsilon_{p,t}\\
RIRL_t &= Policy_t + Debt_t + Savings_t + \alpha_{rj,t} + \varepsilon_{r,t}
\end{aligned}$$

where the variable $Macro_t$ refers to macroeconomic conditions (e.g. output gap, import pressure), LM_t to labour-market conditions, $Policy_t$ to (fiscally relevant) policy interventions, $RIRL_t$ to the real long-term interest rate, $Debt_t$ to public-sector debt, and $Savings_t$ to private-sector financial assets. The system also contains equation-specific country fixed effects, $\alpha_{ij,t}$ $\alpha_{oj,t}$, and $\alpha_{pj,t}$ as well as error terms, $\varepsilon_{i,t}$, $\varepsilon_{o,t}$, and $\varepsilon_{p,t}$. Policies are measured in terms of spending on particular programmes with respect to GDP, so as to properly account for the budgetary burden that is implied by different fiscal and labour-market policy options.[3]

In order to distinguish in more detail between different policy interventions, total government consumption (excluding interest payments) is split into wage and non-wage government spending, the former being principally related to spending on public employment, whereas the latter relates to policies directly relevant to support consumption in the private sector. Within this category also fall various labour-market programmes. A first distinction of these labour-market programmes has been made between active and passive measures. The active measures have further been differentiated into direct job creation, hiring incentives,

[3] See the Appendix for the presentation of the data used for the estimation.

training programmes, and spending on public employment services. The passive measures, on the other hand, regroup all those pertaining to income maintenance, at least temporarily.

The estimates reported below suggest that general government spending has a strong impact on unemployment dynamics, increasing outflows and lowering inflows in an economically meaningful and statistically significant wage (see Table 2, equation 1). The impact does not seem to be particularly affected by feedback effects resulting from higher real long-term interest rates (note that government net lending takes positive values for surpluses). Looking at the components (Table 2, equations 2 and 3), public employment seems (weakly) related to lower unemployment inflows but not significantly to unemployment outflows. In contrast, government non-wage consumption is significantly linked to both unemployment in- and outflows.

The analysis also makes it possible to give a more detailed picture of various labour-market programmes, including both passive and active measures. Moreover, the particular macroeconomic focus and the detailed analysis of competing labour-market programmes provide a more detailed understanding of the different policy trade-offs that countries are currently facing. In particular, direct job creation outside the public sector seems to come with a high amount of deadweight costs as it seems to have a statistically significant effect only on unemployment inflows and not on unemployment outflows. In other words, the programmes often seem to benefit those already in a job or who would have been hired even in the absence of such policies (see Table 2, equation 4). Note also that unemployment outflows do not seem to have a significant effect on spending for direct job creation, an indication that these programmes are set up without reference to business-cycle conditions. In contrast to these programmes, hiring subsidies seem to have the expected effect on outflows but do not influence unemployment inflows (the estimated effect is statistically not significantly different from zero, see Table 2, equation 5), an outcome to be expected in light of the particular set-up of these incentive schemes (that only kick in when a firm is planning to open a new vacancy).

Expenditures on training programmes and public employment services have the expected (positive) effects on unemployment outflows, confirming existing evidence in the literature. The estimated effects in Table 2, equation 7, do not take into account the particular design of public employment services (PES) or training programmes in the countries of this sample. Some countries may actually experience much better effects of these policies on unemployment dynamics by combining them with appropriately designed unemployment benefits. Nevertheless, it should be noted that these programmes come with a strong increase in unemployment inflows as well. This seems to be an indication that measured unemployment rates depend significantly on programme design in as much as that the participation in certain programmes requires official inscription in the unemployment register. As such, these programmes are not only an effective way of bringing unemployed workers back to employment, but they also seem to constitute a useful instrument to activate those that currently have very limited ties with the labour market or have dropped out of the labour force altogether. Moreover, as we will see in the following section, the steady state effects of these programmes have a negative effect on inflows as much as other labour-market policies, an indication as to their long-run effectiveness. Finally, unemployment benefit schemes come with highly significant effects on both unemployment in- and outflows in the expected direction (see Table 2, equation 8).

(i) Short- versus long-run effects

Statistical significance and quantitative importance of different policy instruments are not necessarily related in the estimates presented above. In addition, the short-run—'on-impact'—estimates are different from the steady-state effects that arise when the dynamics of the above model are allowed to play out fully. In the following, therefore, we compare the contributions of the eight different policy instruments to the dynamics of unemployment flows.

The contribution rates are calculated as the share of the panel variance of unemployment in- and outflows explained by the variance of each individual policy instrument weighted by its regression coefficient:

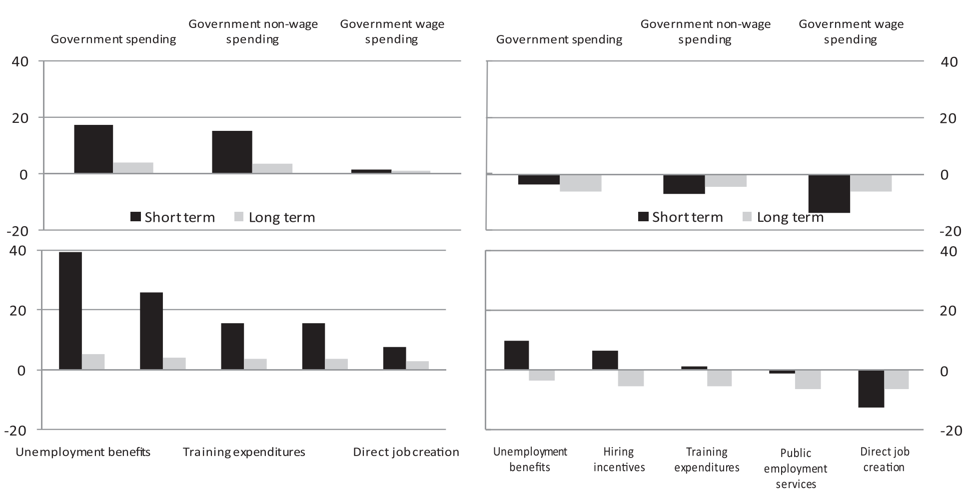
$$Contribution\ Rate = \beta^{Policy} \cdot \frac{Var(Policy)}{Var(Unemployment\ Flow)}$$

where *Policy* stands for one of the eight policy instruments, *Unemployment Flow* for unemployment in- or outflows, β^{Policy} for the estimated policy regression coefficient taken from Table 2, and *Var* for the panel-wide variance of the variable under consideration.

Results for individual policy options are presented in Figure 2 and demonstrate that general government spending has a strong impact on unemployment dynamics, increasing outflows and lowering inflows in an economically and statistically significant way (see

Figure 2: Policy contributions to unemployment flows

(*a*) Outflows (short versus long term) **(*b*) Inflows (short versus long term)**



Note: The chart presents the contributions (in %) to unemployment in- and outflow of different fiscal and labour-market policies in a panel of 14 OECD countries. Contributions are calculated with respect to the average spending shock across the country sample for each individual policy. Short-term effects are based on contribution rates at impact; long-term effects are steady-state contributions of the corresponding policy measures. Both calculation stake the impact of an increase in government debt on real long-term interest rates into account. Unemployment in- and outflow equations are jointly estimated together with a wage curve as a 3SLS, including as control variables the (real long-term) interest rate, the growth in real disposable household income, and total factor productivity growth.

Figure 2, upper left and right panels). Looking at the components, public employment seems only (weakly) related to lower unemployment inflows and higher unemployment outflows in contrast to government non-wage consumption. This lack of public employment to influence job creation may have to do with the particular sample (period) used here, during which public employment remained either stable or declined (sometimes substantially as in the case of Sweden) in comparison to private-sector employment.

Distinguishing between different labour-market programmes, direct job creation outside the public sector seems to be least efficient in generating stronger flows out of the unemployment pool (see Figure 2, lower left panel). In contrast, hiring subsidies and, to a lesser extent, training expenditures and public employment services seem to contribute much more to higher outflows, confirming existing evidence in the literature. As discussed before, this may be related to the fact that the estimated effects do not take into account the particular design of public employment services or training programmes, depressing the estimated effect. Moreover, in the short run these programmes come with a strong increase in unemployment inflows, an indication that measured unemployment rates depend significantly on programme design and the official inscription in the unemployment register. In contrast, the steady-state effects of these programmes show a negative effect on inflows as much as other labour-market policies, an indication as to their long-run effectiveness. Finally, unemployment benefit schemes come with highly significant effects on both unemployment in- and outflows in the expected direction.

VI. Conclusion

The labour-market flow approach has become a standard tool in understanding unemployment dynamics and is increasingly being used in macroeconomic modelling. Replacing the Walrasian illusion of a frictionless labour market with one where firms and workers search for appropriate opportunities to match, has led to a fundamental overhaul of the understanding of labour-market dynamics. In particular, closer analysis of labour-market dynamics has shown its intricate nature with the aggregate growth process, generating persistent effects of shocks related to slow adjustment process on labour markets. More importantly, as this paper has documented, the labour-flow approach has started to help improving our understanding of policy effectiveness and the role different labour-market adjustment margins play in shaping policy transmission.

The labour-flow approach has become the benchmark in labour economics. As it became increasingly used in a macroeconomic framework, these models have been put under scrutiny as well. The work focused in particular on the capacity of these models to replicate observed unemployment dynamics over the business cycle under a reasonable calibration of the model's parameters. Some authors have questioned the capacity of the basic framework to replicate the high volatility of the unemployment rate over the cycle (Rogerson *et al.*, 2005; Shimer, 2005; Costain and Reiter, 2008). Others have criticized the unrealistic dynamics resulting from the Nash bargaining framework with continuous renegotiation of firm level wages (Hall, 2005). Despite these shortcomings that still need to be fully resolved, the labour flow remains the most promising innovation in labour economics in recent decades to better understand unemployment dynamics in the face of macroeconomic and labour shocks and to grasp the effectiveness of policy interventions. Finally, as this paper has argued, to be fully useful such analysis necessarily requires a macroeconomic framework to account for feedback effects from policy interventions through aggregate demand effects.

Appendix: Data

Unemployment flows come from Elsby *et al.* (2008). The data are constructed on the basis of OECD information regarding unemployment stocks and the incidence of unemployment at different lengths of unemployment spells. In contrast to earlier attempts to construct unemployment flow information, the data by Elsby *et al.* (2008) allow for a systematic cross-country analysis. In our case, we also want to take advantage of the increased number of degrees of freedom (within a panel-data context) in order to test for a larger variety of determinants of unemployment flows.

The database has been complemented with information taken from the OECD Economic Outlook database and the OECD Main Economic Indicators. In particular, data regarding vacancy rates, total employment and labour-force developments, capital stock estimates, and interest rates are taken from there. In addition, an indicator of real share price increases has been developed on the basis of OECD information, using the GDP deflator to deflate nominal share prices. Finally, information regarding unionization rates, the degree of wage-bargaining coordination, and employment protection legislation is taken from the OECD Employment Outlook.

References

Aghion, P., and Howitt, P. (1994), 'Growth and Unemployment', *Review of Economic Studies*, **61,** 477–94.

Albrecht, J., Gautier, P. A., and Vroman, S. (2006), 'Equilibrium Directed Search with Multiple Applications', *Review of Economic Studies*, **73**(257), 869–91.

Anderson, P. M., and Bugess, S. M. (2000), 'Empirical Matching Functions: Estimation and Interpretation Using State-level Data', *Review of Economics and Statistics*, **82**(1), 93–102.

Andolfatto, D. (1996), 'Business Cycles and Labor-market Search', *American Economic Review*, **86**(1), 112–32.

Bentolila, S. *et al.* (2010), *Two-tier Labor Markets in the Great Recession: France vs Spain*, Bonn, Institut for the Study of Labor (IZA).

Blanchard, O. J., and Diamond, P. (1989), 'The Beveridge Curve', *Brookings Papers on Economic Activity*, **1**, 1–60.

— Summers, L. H. (1986), 'Hysteresis and the European Unemployment Problem', in S. Fischer (ed.), *NBER Macroeconomics Annual*, Cambridge, MA, MIT Press 15–90.

Burdett, K., and Mortensen, D. T. (1998), 'Wage Differentials, Employer Size, and Unemployment', *International Economic Review*, **39**(2), 257–73.

Cahuc, P., and Postel-Vinay, F. (2002), 'Temporary Jobs, Employment Protection and Labor Market Performance', *Labour Economics*, **9,** 63–91.

Carlsson, M., Eriksson, S., and Gottfries, N. (2006), 'Testing Theories of Job Creation: Does Supply Create its own Demand?', Bonn, Institute for the Study of Labor (IZA).

Costain, J. S., and Reiter, M. (2008), 'Business Cycles, Unemployment Insurance, and the Calibration of Matching Models', *Journal of Economic Dynamics and Control*, **32**(4), 1120–55.

— Jimeno, J. F., and Thomas, C. (2010), *Employment Fluctuations in a Dual Labour Market*, Madrid, Banco de Espana.

Davis, S. J., Schuh, S., and Haltiwanger, J. C. (1998), *Job Creation and Destruction*, Cambridge, MA, MIT Press.

den Haan, W. J., Haefke, C., and Ramey, G. (2005), 'Turbulence and Unemployment in a Job Matching Model', *Journal of the European Economic Association*, **3**(6), 1360–85.

Elsby, M., Hobijn, B., and Sahin, A. (2008), *'Unemployment Dynamics in the OECD'*, NBER Working Paper No. 14617.

Eriksson, C. (1997), 'Is there a Trade-off between Employment and Growth?', *Oxford Economic Papers*, **49,** 77–88.

Faia, E., Lechthaler, W., and Merkl, C. (2010), *Fiscal Multipliers and the Labour Market in the Open Economy*, Kiel, Kiel Institute for the World Economy (IfW).

Garibaldi, P., and Wasmer, E. (2005), 'Equilibrium Search Unemployment, Endogenous Participation, and Labor Market Flows', *Journal of the European Economics Association*, **3**(4), 851–82.

Gertler, M., and Trigari, A. (2009), 'Unemployment Fluctuations with Staggered Nash Wage Bargaining', *Journal of Political Economy*, **117**(1), 38–86.

Gomes, P. (2009), 'Fiscal Policy and the Labour Market: The Effects of Public Sector Employment and Wages', Bonn, Institute for the Study of Labor (IZA).

Gross, D. (1997), 'Aggregate Job Matching and Returns to Scale in Germany', *Economics Letters*, **56,** 243–8.

Haefke, C., and Reiter, M. (2006), *Endogenous Labor Market Participation and the Business Cycle*, Bonn, Institut for the Study of Labor (IZA).

Hairault, J.-O., Langot, F., and Osotimehin, S. (2010), 'Unemployment Dynamics and the Cost of Business Cycles, *Review of Economic Dynamics*, **13**(4), 759–79.

Hall, R. E. (2005), 'Employment Fluctuations with Equilibrium Wage Stickiness', *American Economic Review*, **95**(1), 50–65.

Hosios, A. J. (1990), 'On the Efficiency of Matching and Related Models of Search and Unemployment', *Review of Economic Studies*, **57**(2), 279–98.

IILS (2010), *World of Work Report 2010: From One Crisis to the Next?*, International Institute for Labour Studies, Geneva, International Labour Organization.

Julien, B., Kennes, J., and King, I. (2000), 'Bidding for Labor', *Review of Economic Dynamics*, **3,** 619–49.

Ljungqvist, L., and Sargent, T. (2007), 'Understanding European Unemployment with Matching and Search-island Models?', *Journal of Monetary Economics*, available at http://linkinghub.elsevier.com/retrieve/pii/S0304393207001274

Merz, M. (1995), 'Search in the Labor Market and the Real Business Cycle', *Journal of Monetary Economics*, **36,** 269–300.

Monacelli, T., Perotti, R., and Trigari, A. (2010), 'Unemployment Fiscal Multiplier', *Journal of Monetary Economics*, **57**(5), 531–53.

Moon, W. (2011), 'Endogenous Labor Force Participation and Firing Costs', *Labour Economics*, available at http://linkinghub.elsevier.com/retrieve/pii/S0927537111000066

Mortensen, D. T., and Pissarides, C. (1994), 'Job Creation and Job Destruction in the Theory of Unemployment', *Review of Economic Studies*, **61**(3), 397–415.

Pissarides, C. (1985), 'Taxes, Subsidies, and Equilibrium Unemployment', *Review of Economic Studies*, **52,** 121–33.

— (2000), *Equilibrium Unemployment Theory*, Cambridge, MA, MIT Press.

— Petrongolo, B. (2001), 'Looking into the Black Box: A Survey of the Matching Function', *Journal of Economic Literature*, **39**(1), 390–431,

Quadrini, V., and Trigari, A. (2007), 'Public Employment and the Business Cycle', *Scandinavian Journal of Economics*, **109**(4), 723–42.

Ravenna, F., and Walsh, C. E. (2008), 'Vacancies, Unemployment, and the Phillips Curve', *European Economic Review*, **52**(8), 1494–521.

Rogerson, R., Shimer, R., and Wright, R. (2005), 'Search-theoretic Models of the Labor Market: A Survey', *Journal of Economic Literature*, **43,** 959–88.

Sala, H., Silva, J. I., and Toledo, M. E. (2008), *Flexibility at the Margin and Labor Market Volatility in OECD Countries*, Bonn, Institute for the Study of Labor (IZA).

Shimer, R. (2005), 'The Cyclical Behavior of Equilibrium Unemployment and Vacancies', *American Economic Review*, **95**(1), 25–49.

Thomas, C. (2008), 'Search and Matching Frictions and Optimal Monetary Policy', *Journal of Monetary Economics*, **55**(5), 936–56.

Trigari, A. (2009), 'Equilibrium Unemployment, Job Flows and Inflation Dynamics', *Journal of Money, Credit and Banking*, **41**(1), 1–33.

Walsh, C. (2005), 'Labor Market Search, Sticky Prices, and Interest Rate Policies', *Review of Economic Dynamics*, **8**(4), 829–49.

Wang, P., and Xie, D. (2003), 'Real Effects of Steady Inflation in the Presence of Labor-market Search Frictions: Might Mundell–Tobin be Right?', Vanderbilt University, mimeo.