

**Discussion of "The cyclical behavior of equilibrium unemployment and vacancies in the US and Europe" by Alejandro Justiniano and Claudio Michelacci**

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There is now a fast growing literature extending real business cycle (RBC) models to include search and matching frictions. The aim of the literature is to explore the business cycle properties of the labor market, as what the basic mechanisms are, and which shocks that matter. This is a very interesting area of research, and the literature has made considerable progress over the last 5-7 years. The paper of Justiniano and Michelacci makes a valuable contribution to this literature along several lines. First, it develops a more elaborate model than the existing ones, including novel shocks and mechanisms. Second, it uses a rather advanced estimation method, with a full information Bayesian method. Third, it includes a broader empirical application, analyzing the empirical performance of the US and five European countries (France, Germany, Norway, Sweden and the UK).

In the discussion, I will first briefly describe the key elements of the model, for then to consider some of them in more detail. Finally I will discuss what we can learn from this paper, as well as from the literature to which it belongs. As will be clear, my overall view of the paper and the literature in general is favorable. Yet I also think that the analysis gives a somewhat exaggerated picture of how much of the variation in the data that the model is really able to explain. Future research should explore the validity of the key shocks and mechanisms, also by use of other methods and other type of data.

## ***The model***

The basic framework is a real business cycle model extended to include search and matching frictions. There is one consumption good in the economy, which is produced using capital and a labor intensive intermediate good as inputs, and where production is subject to a neutral technology shock. The capital is owned by the households, who rent it out to the firms. There is adjustment costs to the investment in new capital, and there is also an investment-specific technology shock affecting the profitability of new investments.

The labor intensive intermediate good is produced in jobs which consist of firm-worker pairs. Firms may open vacancies at no cost, but they must purchase recruitment services which are sold in a perfectly competitive market. The recruitment services consists of two parts, one that is proportional to the number of open vacancies and one that is proportional to the number of hired workers (training costs). The producers of recruitment services are subject to adjustment costs which slow down the adjustment of vacancies. The firm-worker pairs are subject to job destruction shocks, but workers may reduce the probability of a negative shock by investing in the maintenance of the job.

The wage setting follows the Gertler-Trigari (2009) assumption that with probability  $\theta$ , the wage is set equal to a predetermined value  $\omega$  (rigid wage), and with probability  $1-\theta$  the wage is given by the Nash bargaining solution with the outside options as threat points. Finally, there is an aggregate resource constraint ensuring that total output is equal to the sum of private consumption and investment, exogenous aggregate demand (representing government purchases and the net trade balance), and output used for job creation purposes. There is a shock to the household discount factor as well as a shock to the exogenous aggregate demand.

The model is estimated for each of the six countries mentioned above, using full information Bayesian methods and combining quarterly and annual data. As noted by the authors, the model accounts reasonably well for the differences in labor market dynamics between Europe and North-America. Indeed, the technology shocks can by themselves explain pretty well the variation in GDP, investment and vacancies for all countries except Norway, cf Figure 3.

## ***Wage setting and trend growth***

The model is based on the common assumptions in the relevant literature, as well as extensions that are already in use in related areas of research. To an outsider, it is impressive to see the number of different mechanisms that can be taken into account and made subject to a serious empirical investigation. Yet it is a concern that several of the mechanisms are convenient formulations made for tractability, but which nevertheless may be questionable both from a theoretical and an empirical point of view. Reflecting my own research interests, I will start with the wage setting.

A crucial assumption for the wage setting is that the rigid or predetermined wage also applies to new hires. This assumption is criticized in recent contributions by among others Haefke, Sonntag and Van Rens (2008) and Pissarides (2009) on both theoretical and empirical grounds. While Justiniano and Michelacci find considerable wage rigidity for some countries, it is an open question whether this in reality captures the effect of other mechanisms. The authors' case is weakened by the fact that they find the highest wage rigidity estimate for the US, which would imply that wages are more rigid in the US than in Europe. The authors' explanation that European trade unions target their demand for wages in new jobs to aggregate labor market conditions is clearly possible, but it runs against the standard insider-outsider story arguing the opposite relationship (e.g. Lindbeck and Snower, 1988, and Blanchard and Summers, 1987) To my mind, it seems more plausible that the wage of new hires is linked directly to the wage of existing employees when the firm is covered by a collective agreement, as is typical in four of the European countries included (less in the UK, but still more than in the US). This would suggest that if anything, the wage of new hires is more rigid in Europe than in the US.

Another key part of the wage setting is the assumption that the rigid wages increase at the steady state productivity growth rate. This is of course a convenient formulation. Yet it is not clear that it is consistent with the argument of the authors, following Hall (2005), that the wage is rigid because it is within the bargaining set, i.e. the wage is such that it is not profitable for either party to leave the relationship. The authors do not discuss what the mechanism is that ensures that the wage increases at a predetermined rate. In earlier contributions explaining wage rigidity by an existing wage contract where no party could credibly enforce a renegotiation (MacLeod and Malcomson, 1993; Holden, 1994), the outcome was nominal wage rigidity reflecting a contract written in nominal terms. MacLeod

and Malcomson discussed how indexation of the contract to external conditions, e.g. coal contracts to external prices, could be used to avoid renegotiation. However, indexation to steady state productivity growth seems harder to implement, as it is not clear that what extent it is measurable and verifiable in real time – indeed, such indexation is not often seen in the real world. Holden (1997) shows that with incomplete labor contracts, the workers may be able to use threats of reducing productivity while still observing the contract obligations (work-to-rule) to ensure an increase in the wage relative to the wage of the previous contract period. This would imply an upward trend in rigid wages, as long as the wages remain within the bargaining set.

A third aspect of the wage setting is the assumption that the wage rigidity parameter  $\theta$  is constant over time. A theoretically more consistent assumption would be to assume that the wages is rigid as long as it is within the bargaining framework, and flexible otherwise.<sup>1</sup> Indeed, it is hard to see why a party that can choose between several attractive potential partners should not exploit this to increase his/her share of the surplus. Holden, Holden and Holden (2010) explore the dynamic wage setting process in a bilateral relationship, and find an equilibrium where wage adjustments follow a Ss-process, i.e. that the wage is adjusted whenever the deviation of the existing wage from the adjustment outcome is greater than a certain threshold. This could be interpreted as wages being completely rigid whenever the labor market and other relevant factors are fairly stable, and completely flexible if there is a significant change in variables affecting the wage setting.

In line with almost all contributions within the business cycle literature, Justiniano and Michelacci de-trend the data prior to the empirical analysis. There are of course good reasons for doing this, in terms of theoretical and empirical tractability. Yet one might be concerned about the possible implications for the explanation of the labor market variables. There are now several papers advocating a link between growth and unemployment; recently, Elsby and Shapiro (2011) argue that higher productivity growth increases the return from experience, which raises non-employeds' gain from obtaining a job. There is also stylized evidence suggesting that unemployment is lower in times of high productivity growth (Staiger, Stock and Watson, 2001, figure 8a). Justiniano and Michelacci will not capture such medium term

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<sup>1</sup> The authors seem to assume that the wage is always within the bargaining set in the rigid case, cf. footnote 12.

changes. More importantly, this may also affect the analysis of the short run changes, as it is difficult to distinguish short and medium run changes.

### ***“First principles” or “reverse engineering”?***

Ceteris paribus, economists prefer simpler models to more complex ones. However, to explain key macro and labor market variables in several different countries, a fair amount of shocks and mechanisms must be included. As noted above, the present model includes a number of different shocks and mechanisms, all with some micro foundation. More importantly, the result is an impressive explanatory power of some of the variables, for some countries. The cross-correlogram for the US in Figure 2 shows that the model does fairly well overall, and the historical decomposition based on technology shocks (general and investment specific) mentioned above indicates a generally high explanatory power for three to four of the variables (Figure 3). Yet one can question to what extent the model really explains what is going on, or whether the proposed mechanisms and shocks in the model in reality capture variation that is caused by other mechanisms and processes. My concern here is related to the critique of Dynamic Stochastic General Equilibrium (DSGE) models by Blanchard (2010), where he argues that the requirement that “all dynamics must be derived from first principles” ... have implied that “Reconciling the theory with data has led to a lot of unconvincing reverse engineering”. Caballero (2011) raises a similar criticism.

Let me mention three aspects where I think that the model includes mechanisms or assumptions that are less plausible than relevant alternatives. First, a perhaps somewhat cheap critique concerns the assumption that the aggregate demand shock is exogenous. As the aggregate demand shock is assumed to capture also the net trade balance, the exogeneity assumption precludes that higher output leads to increase imports e.g. caused by increased demand for inputs, or because of an increase in imported consumption and investment goods.

Second, the model introduces adjustment costs in the recruitment services, so as to slow down the adjustment of vacancies. I will not argue that there are no adjustment costs in recruitment; indeed, one may argue that in principle there should be at least some adjustment costs to everything. Yet it is hard to understand that the costs of changing the number of hirings can be large, as compared to the other mechanisms that can influence hiring - for example costs of creating a job (which here can be done without costs and instantaneously).

Third, as is common in recent DSGE modeling, it is assumed that capital owners adjust the utilization of the physical capital so as to save depreciation costs, usually referred to as “variable capital utilization”. In DSGE models, this assumption plays an important role to generate persistence in output, cf. e.g. Christiano, Eichenbaum and Evans (2005). As above, it is hard to argue that this effect does not exist. However, my guess is that in most sectors of the economy, this effect plays a negligible role when firms make decisions on output and prices. In most cases, I would argue, a reduction in the capital utilization is the outcome of a reduction in the demand for the firm’s output, and not the result of an explicit decision by the firm of reducing the depreciation of capital. Again, I would argue that the mechanism just captures persistence that is there for other reasons.

Similar doubts can also be raised against some of the other mechanisms and shocks. Perhaps most importantly, and also discussed by the authors, one can argue that the neutral technology shock to a large extent also captures changes in aggregate demand. As the policy implications in general will be different, more research on the validity of the different mechanisms, and the appropriate interpretation of the various shocks, seems pertinent.

### ***What can we learn?***

The critique above could lead to a conclusion that the nothing can be learned from this and related studies. But this conclusion would be unfair and wrong. In my view we can learn primarily at two levels. First, this study as well as the related literature reveal limitations and problems in previous research, showing that some of the conclusions of the past must be changed or nuanced. Second, the studies point at which relationships are important for the variation in the data, even if the exact interpretation of these relationships in terms of type of mechanism or friction is still open. The study by Justiniano and Michelacci makes considerable progress along these lines, not least by exploring cross-country differences.

The progress in the literature is however not properly balanced. There is rapid progress in extending the models to allow for new mechanisms derived from first principles, and to include new shocks leading to a better fit to the data. However, in my view there is not sufficient attention as to whether each of these mechanisms really should be included. For this purpose it is certainly not sufficient to see how well the mechanisms work in these models. One must also evaluate the mechanisms by other methods, and using other type of data.

## **Referanser**

- Blanchard, O. (2010). The state of macro. *Annual Review of Economics* 1, 209-228.
- Blanchard, O. and L.H. Summers. (1986). Hysteresis and the European unemployment problem. NBER working paper 1950.
- Caballero, R.J. (2011). Macroeconomics after the crisis: Time to deal with the pretence-of-knowledge syndrome. Forthcoming in *Journal of Economic Perspective*.
- Christiano, L.J, M. Eichenbaum, and C.L.Evans (2005). Nominal rigidities and the dynamic effects of a shock to monetary policy. *Journal of Political Economy* 113(1), 1-45.
- Elsby, M. and M. Shapiro (2011). Why Does Trend Growth Affect Equilibrium Employment? A New Explanation of an Old Puzzle. Forthcoming in *American Economic Review*.
- Gertler, M. and A. Trigari (2009). Unemployment fluctuations with staggered Nash wage bargaining. *Journal of Political Economy* 117(1), 38-86.
- Haefke, C, M. Sonntag, and T. Van-Rens. (2008). Wage rigidity and job creation. IZA Discussion paper 3714.
- Hall, R. (2005). Employment fluctuations with equilibrium wage stickiness. *American Economic Review* 98, 50-65.
- Holden, S. (1994). Wage bargaining and nominal rigidities. *European Economic Review* 38, 1021-1039.
- Holden, S. (1997). Wage bargaining, holdout and inflation. *Oxford Economic Papers* 49, 235-255.
- Holden, H., L. Holden, and S. Holden (2010). Contract adjustment under uncertainty. *Journal of Economic Dynamics and Control* 34, 657-680.
- Lindbeck, A. and D. Snower (1988). *The Insider-Outsider Theory of Employment and Unemployment*, MIT Press, Cambridge, Massachusetts.
- MacLeod, B. and J. Malcomson (1993). Investment, holdup and the form of market contracts. *American Economic Review* 83 (4), 811-837.
- Pissarides, C. (2009). The unemployment volatility puzzle: Is wage stickiness the answer? *Econometrica* 77(5), 1339-1369.
- Staiger, D. J.H. Stock and M.W. Watson (2001). Prices, wages and the U.S. NAIRU in the 1990s. NBER Working Paper 8320.