Modelling the Labour Market

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1 Overview

The previous two lectures have stressed that the main failures of the neoclassical model related to the labour market. In particular, the model fails to account convincingly for the large fluctuations in employment over the cycle in the absence of any movements in wages. Exactly where to progress from this point is not clear, a plethora of different approaches exist. In this lecture we focus on three extensions to the basic model. We choose these approaches for the following reasons: (i) they are all choice theoretic, that is they try and analyse the labour market in terms of rational agents making optimal decisions, (ii) they all assume Rational Expectations, (iii) they each differ in their welfare implications. We focus on three models:

1. Lotteries; tries to reconcile inelastic labour supply at the individual level with elastic labour supply at the aggregate level

2. Efficiency wages; introduces moral hazard considerations that introduce real wage rigidity

3. Search; these are non-Walrasian models which model in detail how unemployed workers and how firms fill vacancies

2 Key readings

The standard textbook treatment of unemployment is Romer chapter 9, which covers efficiency wage models, search and a few other models. The original papers on lotteries are Hansen “Indivisible Labour and the Business Cycle” Journal of Monetary Economics 1985 and Rogerson

### 3 Key concepts

Unemployment, real rigidity, aggregate vs individual labour supply elasticity, efficiency wages, search

### 4 Lotteries

Amending the labour market model is crucial if RBC models are to explain the data. The way round this problem has been to utilise the models of labour market lotteries. These models offer a very neat way around the problem that neoclassical models require significant intertemporal substitution effects whereas the data show no evidence in favour of this idea (see Lecture 1). The Hansen indivisible labour model makes individual estimates of the intertemporal elasticity of substitution irrelevant to the issue of aggregate fluctuations.

Assume that each individual’s utility function is of the form

\[ U(c_t, l_t) = \log c_t + \alpha \log(1 - l_t) \]

However, there is a fixed cost to working (this should be thought of as commuting time, childcare etc). Because of this fixed cost it is efficient for individuals to work either \( h \) hours
or none at all. Hansen’s model aims at explaining labour market fluctuations purely as fluctuations in the number of people working and not as fluctuation in how many hours each person works. That is all fluctuations are due to the extensive not intensive margin (as is approximately the case with US data). However, while each individual will work either 0 or \( h \) hours we still have to determine how it is decided what each individual does. Hansen assumes the existence of a lottery (motivated by the insurance market). With probability \( \pi_t \) this lottery involves an individual working \( h \) hours and with probability \( 1 - \pi_t \) it implies 0 hours. Regardless of the outcome of the lottery all individuals receive the same income\(^1\). Under this assumption (and normalising \( T = 1 \)) we have that expected utility for each agent is:

\[
U(c_t, l_t) = \pi_t \left[ \log c_t + \alpha \log (1 - h) \right] + (1 - \pi_t) \left[ \log c_t + \alpha \log (1) \right] \\
= \log c_t + \alpha \pi_t \log (1 - h)
\]

Because hours worked in the economy \( l \) equal \( \pi_t h = l_t \) we have

\[
U(c_t, l_t) = \log c_t + \frac{\alpha \log (1 - h)}{h} l_t
\]

so the utility is linear in \( l \). Examination of EL from Lecture 1 shows that this implies that for the representative consumer of an aggregate economy there can be an infinite intertemporal elasticity even though each individual has a low elasticity. This change has the desired effect of making hours almost as volatile as output. However, because all fluctuations are assumed at the extensive margin, all employment fluctuations are absorbed into employment rather than hours. This is clearly an extreme assumption.

The Hansen labour market model is now incorporated as standard in simple RBC models. This is because it ensures high aggregate intertemporal elasticity of substitution regardless of individual estimates. As a modelling trick it is ingenious, few people however subscribe to it as a meaningful model of actual labour markets. Further, even with this assumption the model still performs badly in failing to predict the acyclical nature of real wages and the observed lack of correlation between wages and productivity. This can be seen from Table 4 below:

\(^1\)Naturally this caused some controversy as it implies that the unemployed are better off as they get the same income as the employed but higher utility because they take more leisure.
Table 3: US Labour Markets and RBC Models
from Hansen and Wright “Labour Markets in Real Business Cycle Theory”

corr(x, y) denotes the correlation between x and y. \( \sigma_i \) is the standard deviation of variable i. \( \sigma_i/\sigma_y \) is the ratio of the standard deviation of variable i to variable \( j \). \( y \) is GNP, \( c \) is non-durable consumption, \( i \) is investment, \( h \) is total hours worked, \( w \) is the wage rate. SGM is stochastic growth model, K+P is Kydland and Prescott.

5 Efficiency wages

The basic notion of efficiency wages is that labour productivity is related to wage paid. Ideally, a firm would like to maximise productivity per wage. In the figure below, this occurs at a productivity/wage of \( w^* \). Simple reasons for the wage/productivity relationship are nutritional (important in poor countries) and morale considerations. Importantly, notice that if there is unemployment at the wage \( w^* \) then:

1. Firms have no incentive to lower wages

2. Unemployed workers are worse-off than employed workers - they would be willing to work for a lower wage
This seems to be a pure example of involuntary unemployment. Note that efficiency wages create incentives for firms to adjust employment along the extensive not intensive margin. We will consider the Shapiro-Stiglitz model, where efficiency wages are endogenously created by asymmetric information and moral hazard considerations.

5.1 The Shapiro-Stiglitz model

One reason why a firm may pay high (real) wages is that it induces its workers to work hard: they do not want to lose a well-paid job. We now model this formally.

There are $N$ workers. In general we should write their utilities as $U(w, e)$, where $w$ is the wage and $e$ is the effort level. But for simplicity, suppose the workers are risk neutral and their disutility of effort can be measured in money terms:

$$U(w, e) = w - e.$$  

Rather than allow $e$ to vary continuously, think of it taking just two values:

$$e \equiv \text{no shirking}$$

$$0 \equiv \text{shirking}$$

If a worker shirks then his productivity is (we assume) zero, so a firm must ensure that in equilibrium none of its workers have an incentive to shirk. However, we assume that the firm cannot constantly monitor any individual’s effort. Rather, it randomly inspects workers such that the probability of a given worker being inspected per unit time is $q$, which we take as exogenous. If the worker is caught shirking then they are dismissed.
Let $r$ be the worker’s discount rate and let their discounted utility stream from being unemployed be $V_U$. Define:

$$V^S_E \equiv \text{discounted utility stream from shirking if currently employed}$$

$$V^N_E \equiv \text{discounted utility stream from not shirking if currently employed}$$

The labour market is such that there is a probability $b$ per unit time of leaving the firm, e.g. on account of having to move location or the firm having to move or close down. Thinking of the worker’s status as an asset, we can write down asset equations for each of $V^S_E$ and $V^N_E$:

$$r \equiv \text{interest rate}$$

$$V^S_E = w + \frac{(b + q)(V_U - V^S_E)}{r + b + q}$$

$$V^N_E = (w - e) + \frac{b(V_U - V^S_E)}{r + b}$$

For a derivation of these from first principles see footnote 8 of Shapiro and Stiglitz, although be warned that in their derivation $V^S_E$ should have a superscript $S$ and their $b$ should be $b + q$. Asset equations such as these are now part of the standard toolkit of economists. Rearranging the asset equations:

$$V^S_E = \frac{w + (b + q)V_U}{r + b + q}$$

$$V^N_E = \frac{(w - e) + bV_U}{r + b}$$

In order to discourage shirking the firm must choose $w$ so that $V^N_E > V^S_E$, i.e. $w$ must satisfy the No Shirking Condition (NSC):

$$w \geq rV_U + \frac{(r + b + q)e}{q} = \tilde{w},$$

and $q(V^S_E - V_U) > e$ which implies $V^S_E > V_U$. The last inequality highlights the fact that there has to be a penalty from being laid off for shirking. That is, if a worker found another job immediately on being laid off then $V_U$ would equal $V^S_E$ and everyone would shirk.

The RHS of the (NSC) is the minimum wage $\tilde{w}$ which the firm must pay in order to discourage shirking. Notice that it goes up as:

1. the required effort $e$ goes up
2. the discounted utility $V_U$ from being unemployed goes up
3. the probability \( q \) of being caught shirking goes down

4. the discount rate \( r \) goes up

5. the exogenous separation rate \( b \) goes up.

We now add firms to the model. At any given time there are \( M \) identical firms, each with production function \( f(L) \) where \( L \) is the number of (non-shirking) workers. If we normalise their output so that its price is 1 then \( f(L) \) is also the revenue function. Given that it has to pay \( \tilde{w} \) to discourage shirking, firm \( i \)'s labour demand is given by \( L_i = L_i(\tilde{w}) \) where this solves:

\[
f'(L_i) = \tilde{w}.
\]

Aggregate labour demand \( L = L(\tilde{w}) \) is given by \( L_1(\tilde{w}) + L_2(\tilde{w}) + \ldots L_M(\tilde{w}) \). To calculate equilibrium in the model, let the \( a \) be the probability per unit time of being hired out of unemployment. Then in equilibrium it must be the case that inflows into unemployment equal outflows from unemployment:

\[
bL = a(N - L). \tag{3}
\]

If \( b \) is exogenous and \( L \) is determined by the marginal productivity considerations then \( a \) is endogenous and this means that, in steady state, firms replace workers from whom they have been separated. Assuming this, we can calculate \( V_U \) is much the same way as we calculated \( V^S_E \) and \( V^N_E \):

\[
rV_U = \underbrace{y}_{\text{unemployment benefits}} + \underbrace{a}_{\text{probability of being hired}} \underbrace{(V^N_E - V_U)}_{\text{capital gain if hired}}. \tag{4}
\]

Notice that we use \( V^N_E \) not \( V^S_E \) in this expression because no-one shirks in equilibrium. We can use the asset equations (1), (2), (4), equilibrium flows equation (3) and the NSC to solve for \( \tilde{w} \) as a function of employment \( L \) and exogenous variables. We get an equilibrium NSC condition:

\[
w \geq e + y + \frac{e}{q} \left( bN \frac{1}{N - L} + r \right) = \tilde{w}.
\]

Putting this (NSC) in a wage/employment diagram, we conclude that the firms will never
It can be seen that for any (finite) wage there is always some unemployment \((L < N)\). This accords with our earlier finding that \(V^S_E\) has to exceed \(V_U\), otherwise everyone would shirk. Moreover, this is involuntary unemployment: laid off workers would like to displace otherwise identical working colleagues but cannot do so because they cannot offer a credible promise not to shirk. This is at the heart of the model.

We can now superimpose the aggregate labour demand schedule in order to determine the equilibrium levels of unemployment \(L^*\) and wage \(w^*\).

In a general downturn the aggregate labour demand schedule shifts downwards. Notice that unemployment increases, since the wage cannot fall to maintain unemployment. It must lie on the NSC constraint. In the shirking model we have in effect replaced the (relatively)
inelastic individual labour supply functions with a (relatively) elastic aggregate labour supply function. This is exactly what we need in our macroeconomic model. The NSC defines a relationship between employment and the real wage so we have $w_t = w_t(L_t)$. This is known in the macro literature as *real rigidity*. Assuming the aggregate production function can be written in the form $f(L_t)$ and log-linearising, we obtain:

$$\hat{\dot{w}}_t = \frac{1}{\alpha} \hat{\dot{y}}_t.$$

$\alpha > 1$ measures the degree of real rigidity in the economy. It arises in the Shapiro-Stiglitz model because changes in output lead to smaller changes in the real wage along the NSC. In other words, wages are rigid. In the classical model with no shirking considerations $\alpha = 1$ and real wage changes proportionately with output. A typical DSGE model calibrates $\alpha$ around 3.

The model can be extended to cope with shocks to the economy. The no shirking condition will hold in each period - the wage will track the NSC - but notice that the no shirking condition is a dynamic forward-looking condition which will be governed by:

$$V^N_E(t) = V^S_E(t).$$

Out of steady state, asset equations become more complicated:

$$r V^S_E(t) = w(t) + (b + q)(V_U(t) - V^S_E(t)) + \dot{V}^S_E(t),$$

and if the NSC holds at each instant then:

$$\dot{V}^N_E(t) = \dot{V}^S_E(t).$$

What happens if the labour demand curve shifts in an unanticipated way to the left? There will be too much labour in firms. If firms can hire/fire without cost then we could jump to a new steady state. But if there is sluggishness, new hiring will be halted whilst employment is reduced and the NSC will jump downwards.

6 Search

The basic insight of search models is to assume away the Walrasian auctioneer who is implicitly coordinating activity in the neoclassical model. In the neoclassical model the auctioneer costlessly matches those individuals who want a job with those looking to fill vacancies. Search
models are in contrast non-Walrasian in assuming that trading (that is the process whereby unemployed individuals find a vacancy) actually requires inputs, whether these be time or monetary costs. From this insight can be derived a theory of unemployment and a number of implications which reconcile the neoclassical model with observed data. The non-Walrasian assumption is a natural way to introduce persistence into the labour market. If, without an auctioneer, trade takes longer to accomplish then the effects of a random impulse will be spread out over a longer period of time.

Search models are becoming increasingly common as a means of understanding the macroeconomics of the labour market, see the “Turbulence laboratory” of Hansen and Sargent (2005, CEPR discussion paper). One reason for this is a number of empirical studies which have examined the behaviour of labour markets over the business cycle. These studies reveal a number of different phenomena such as:

1. Even in recessions large numbers of firms have unfilled vacancies and in booms some firms are laying off workers

2. In every period there are large gross labour market flows, that is movements in job creation and job destruction. The change in unemployment reflects net flows only (e.g. job destruction less job creation) and so is only a part of the overall labour market story

3. Job creation is slightly procyclical but job destruction is strongly counter-cyclical with big spikes in recessions. In other words, big increases in unemployment are caused by occasional large periods of job destruction. The fact that job creation and job destruction have different cyclical properties suggests that labour market allocation is not well-coordinated - it takes several periods for the unemployed to find vacancies.

These facts imply that there is a great deal of heterogeneity in the labour market which is ignored in simple aggregate representative agent models. It also suggests that focusing on employment or unemployment is missing a lot of details, it is probably flows in and out of the labour market that are particularly important for understanding the cyclical behaviour of unemployment.

6.1 A basic model

The model we outline below is a very simple search model and will concentrate more on the process by which individuals become employed that how job destruction occurs. The latter
has however been the subject of much work including Mortensen and Pissarides (1994, *Review of Economic Studies*). At the heart of this model is a matching function, this is the trading equivalent of a production function. Each period there are a number of individuals looking for a job \( U \) and a number of firms with vacancies to fill \( V \). The matching function determines how \( U \) and \( V \) combine to determine the number of new hires \( R \) in a period, that is the matching function \( m(\cdot) \) is defined as:

\[
R_t = m(U_t, V_t),
\]

so that the rate of hiring is influenced by both sides of the labour market. The evidence in Blanchard and Diamond (1989) in Jackman, Layard and Pissarides (1989) *Oxford Bulletin of Economics and Statistics* “On Vacancies” suggests that constant returns to scale is probably the best characterisation\(^2\), in which case we have:

\[
\frac{R_t}{V_t} = m \left( \frac{U_t}{V_t}, 1 \right) = g(\theta_t), \tag{5}
\]

where \( g(\cdot) \) is the probability that a vacancy is filled in a period and \( \theta_t \) is \( U_t/V_t \) and measures labour market tightness. Equation (5) shows a very important deviation from standard neoclassical models - the probability that a firm fills a particular vacancy \( g(\cdot) \) depends on how many other firms are seeking to fill positions (through \( \theta \)). In other words, there is a congestion externality which plays an important role in search models. Notice that from (5) we also have that the probability of an unemployed worker finding a job in a period is \( g(\theta)/\theta \) so that unemployed individuals also face a congestion externality.

Equation (5) explains how job creation occurs (that is how vacancies are filled) but we also require a model of job destruction, that is the inflow into unemployment. The simplest assumption is that every period a proportion \( s \) of firms receive a shock which forces them to close down and throw their workforce into unemployment. This should be thought of as a relative price/demand shock. In other words, in the economy there is always ongoing allocative moves between different firms, consistent with observed facts on job creation and job destruction. Therefore if \( u \) denotes the unemployment rate, then every period \( s(1-u) \) individuals are being made unemployed, where \( s \) denotes the separation rate, i.e. the risk of a worker being made redundant. From (5) we have that every period \( g(\cdot)u/\theta \) individuals are also finding employment. In the steady state it must be the case that unemployment is

\[^2\text{See Diamond (1992, *Journal of Political Economy*) for the implications of increasing returns in the matching function.}\]
constant between periods so we have that:

\[ s(1 - u) = g(\theta)u/\theta \]

or

\[ u = \frac{s\theta}{g(\theta) + s\theta}, \tag{6} \]

so that the equilibrium unemployment rate depends on \( s \), the rate of job destruction, and \( g(\cdot) \) the rate of job creation. Given that \( \theta = U/V \) equation (6) defines a relationship between \( v \) (the vacancy rate) and \( u \) (the unemployment rate) which can be represented by means of the following diagram.

The curved line shows a convex combination of vacancies and unemployment and is called the \( UV \) or Beveridge curve and plays a very important role in search models. The \( UV \) curve slopes downwards due to the properties of the matching function. For a high level of vacancies the matching function predicts that unemployment will be low, and so the \( UV \) curve slopes down. The \( UV \) curve is convex because the matching function is characterised by diminishing marginal returns. The position of the \( UV \) curve depends on \( s \), the job destruction process, and \( g(\cdot) \), the efficiency of the matching process. Increases in \( s \) or decreases in matching efficiency involve an outward shift of the \( UV \) curve and so a higher level of unemployment for any given level of vacancies. As we shall see later, stochastic variations in \( s \), or allocative shocks, are an important part of search models which come close to explaining real world data.

Consider the following very simple model of a firm in a search model. We shall assume that every period the firm has an unfilled vacancy it costs \( \gamma_0 \). This is the cost to the firm of searching for a suitable applicant, the simplest motivation is that these are the costs of advertising and of running a personnel department. We shall assume that these costs are proportional to the wage rate, e.g. \( \gamma_0 = \gamma w \) where \( w \) is the real wage rate. The new hires of
a firm are given by:

\[ R_{i+1}^i = g(U_{i+1}/V_{i+1})V_{i+1}^i - sN_{i+1}^i \]

so that

\[ V_{i+1}^i = \frac{N_{i+1}^i - N_{i+1-1}^i + sN_{i+1-1}^i}{g(\theta_{i+1})}. \]

The firm wishes to maximise its expected present discounted value which (ignoring capital) can be written as:

\[
\max E_0 \sum_{j=0}^{\infty} \beta^j (Y_j^i - w_j N_j^i - \gamma_0 V_j^i)
\]

so that

\[
\max E_0 \sum_{j=0}^{\infty} \beta^j \left( Y_j^i - w_j N_j^i - \frac{\gamma w_j}{g(\theta_j)} \left[ N_j^i - N_{j-1}^i + sN_{j-1}^i \right] \right).
\]

The Euler equation from this problem (the first order condition from choosing \( N \)) is:

\[
\frac{\partial Y_j}{\partial N_j} = E_j w_j \left( 1 + \frac{\gamma}{g(\theta_j)} - \frac{\beta \gamma (1-s) w_{j+1}}{g(\theta_{j+1}) w_j} \right). \tag{7}
\]

If there are no search costs (\( \gamma=0 \)) then (7) collapses to the standard neoclassical condition that the marginal product of labour equals the real wage rate. However, in the presence of search costs there are two effects. The first is that the higher are expected search costs this period (\( \gamma/g(\theta_j) \)) then the greater is the marginal product of labour, which implies that the firms require fewer workers. However, the greater search costs are expected to be next period the lower is today’s marginal product of labour and so the higher is today’s employment. Essentially, firms substitute vacancies across time periods, avoiding recruitment when vacancies are expected to be costly because they would be difficult to fill. Equation (7) says that the demand for labour depends on both wages and the tightness of the labour market (\( U/V \)).

In the standard neoclassical model, labour demand (equation (7) with \( \gamma=0 \)) and a labour supply equation are enough to determine wages and unemployment. However, (6) and (7) are two equations in three unknowns (\( N, w \) and \( \theta \)) and so we need another equation before we can solve the model. Why is this? The reason is very simple. The reason why the neoclassical model only requires two equations is that it maintains perfect competition in the labour market, both firms and workers treat the wage as given so equilibrium is given by the intersection of supply and demand curves. However, in search models this is no longer the case. Both the firm and the employee have economic rents to bargain over so each has some monopoly power. Where do these rents arise from? In the neoclassical model, if a worker leaves a job both the worker

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and the firm immediately find a replacement. Therefore the worker cannot threaten the firm with loss of output if they resign. However, in a search model this is not the case. If either the firm or the worker terminates the relationship it make take several periods before each find another match. During this period each party will experience a loss (the firm will incur recruiting costs, the worker lost income). Therefore, both firm and worker can bargain with each other. As a result, perfect competition does not hold in the labour market and wages are determined by a bargaining process between firm and worker. It is for this reason that (7) and a labour supply equation are not enough to solve the model.

There are several ways to set up a bargaining model. The simplest approach is to assume Nash bargaining. In this model each party to a bargain receives what it would if the match were to break down plus a share of the joint surplus created by the match (the surplus is the output produced by the match less the sum of what each individual party would achieve outside of the match). How much of the surplus each partner receives depends on their bargaining power, we shall denote the bargaining power of workers by $\pi$. Outside of the match the workers receive unemployment benefit which we shall assume is a fixed proportion of the wage given by $bw$, where $b$ is the replacement ratio. The outside option of the firm is the vacancy cost $-\gamma w$. This Nash assumption implies:

$$w_j = bw_j + \pi [Y_j - (b - \gamma)w_j],$$

$$profits = -\gamma w_j + (1 - \pi) [Y_j - (b - \gamma)w_j].$$

Thus we can write the real wage as:

$$w_j = \frac{\pi Y_j}{1 - (1 - \pi)b - \pi \gamma}.$$

From (8) we see (i) the real wage is increasing in $b$, the replacement ratio, (ii) the real wage is increasing in labour’s bargaining power, (iii) the real wage is increasing in hiring costs (because the worker can extract more from the firm due to higher rents from the match). Equations (8), (7) and (6) can be used to solve for the model. Focussing on the steady state ($w_t = w_{t+1}, \theta_t = \theta_{t+1}$) we can use (8) and (7) to get:

$$\frac{\partial Y}{\partial N} = \frac{\pi Y}{1 - (1 - \pi)b - \pi \gamma \left(1 + \frac{\gamma}{g(\theta)} [1 - \beta(1 - s)]\right)}.$$

This equation defines a positive relationship between $v$ and $u$, which we shall call the VS line, which can be added to our earlier diagram. The VS line describes how jobs are supplied (vacancies determined) when firms are maximising profits and unemployment and
vacancies are in equilibrium. It is upward sloping for the simple reason that the higher is the unemployment rate relative to vacancies then the lower are expected hiring costs. In other words, the more slack there is in the labour market, the greater the probability of filling a vacancy and so the more vacancies are posted.

Equilibrium unemployment and vacancies are determined by the intersection of the UV curve and the VS curve. Depending on the source of shocks in the model, different unemployment dynamics are predicted. If most shocks are of a sectoral/allocative kind (that is through $s$) and $s$ is small then the UV curve will move more over the cycle than the VS curve and so unemployment and vacancies will move together. However, if aggregate shocks are most important ($Y$) then it is the VS curve that moves and unemployment and vacancies move in opposite directions. Increases in labour demand shift the VS curve to the left so that when labour demand increases vacancies should rise and unemployment fall. It may also be the case that aggregate shocks and allocative shocks are related (in boom years there may be less reallocation going on in the labour market) so it may be that both UV and VS curves are shifting over the cycle. The empirical evidence firmly points to aggregate disturbances as being the key to explaining unemployment over the business cycle - vacancies fall in recessions and rise in booms and unemployment does the opposite (see the debate in Lillien (1982) “Sectoral shocks and cyclical unemployment”, Journal of Political Economy and Abraham and Katz (1986) “Cyclical unemployment: sectoral shifts or aggregate disturbances?”, Journal of Political Economy.

The UV and VS curves can be used to try and understand a wide range of labour market issues. The best way to think of this model is as trying to explain both the Phillips curve (a relationship between wage growth and unemployment) and the Beveridge curve (a relationship between unemployment and vacancies). By extending the model to focus on both
unemployment and vacancies it clearly enables an analysis of key facts about how the labour market varies over the cycle. The recent popularity of search models is due to a combination of empirical success and the detailed microfoundations it offers.

Most of the search literature focuses purely on its implications for the labour market. However, Merz (1995) *Journal of Monetary Economics* takes a similar model to that outlined above and simulates it in the context of an RBC economy. These simulations show that introducing trading frictions into the labour market improves the performance of RBC models.

### 7 Conclusions

There is still no consensus about how to model the labour market in a neoclassical framework. Increasing attention is being placed on search but this research strategy is still too recent to assess its performance. A number of studies which compare labour market models suggest that the key to understanding the cyclical behaviour of labour markets is to try and understand which margins a firm can adjust freely and which the firm has to treat as fixed. In the search model, the firm can choose vacancies freely but inherits an employment stock. Understanding these rigidities and their causes and the optimal responses of firms and workers to these rigidities is clearly a crucial issue.

The other important thing to notice about most of the models in this lecture is that they seek to improve the performance of the model by introducing additional shocks: the most promising search models have aggregate and allocative shocks. This is increasingly how RBC models are being developed, with widespread opinion being that productivity shocks alone cannot explain business cycle fluctuations. Essentially, these models are trying to explain the zero correlation between wages and employment over the business cycle by letting both the labour supply and labour demand curves shift.