CHAPTER 4

Labour Markets and Supply-side Policies

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Supply-side policies refer to those that shift the wage- or price-setting curves. Changes in unemployment benefits, minimum wages, union and employment protection legislation, child-care policy and participation by the government in negotiations with unions and employers’ associations may shift the $WS$-curve. Changes in competition policy or in taxes may shift the $PS$-curve. Taxation has effects on both the aggregate demand and supply sides of the economy: on the one hand it may be used to stabilize aggregate demand and on the other, it has supply-side implications. It has also been suggested that government expenditure programmes on training or education may be able to reduce equilibrium unemployment by raising productivity. In many instances, supply-side policies are implemented to support government objectives other than those associated with macroeconomic stabilization. For example, the government may seek to alter the distribution of income, to reduce child poverty, to boost innovation and entrepreneurship, etc. It is nevertheless important for the consequences for employment and inflation of such policies to be examined.

In the first section we set out how supply-side policies and labour market institutions affect the wage- or price-setting curve and hence, equilibrium unemployment. The shift in equilibrium unemployment in turn implies a shift in the monetary rule in the Phillips diagram. We set out how output and inflation change in response to a supply side shift and show the reaction of the central bank. In the face of a positive supply side shift, the central bank lowers the interest rate since inflation falls below target; in the face of a deterioration on the supply side, inflation goes up and prompts the central bank to raise the interest rate.

Section 2 focuses on the set of factors that can shift the $WS$ curve and the $PS$ curve. These factors include the tax wedge, training provision, product market competition, industrial relations legislation and agreements between unions and employers (that may also include the government) known as wage accords or incomes policies. Section 3 takes a closer look at the way in which the institutions of wage-setting can affect equilibrium unemployment. We set out the logic of the so-called Calmfors-Driffill model, which proposes an inverse-U shaped relationship between the degree of centralization of wage-setting and equilibrium unemployment, i.e. both highly decentralized and highly centralized wage-setting structures produce low unemployment.

In section 4, we explain the way in which a period of sustained unemployment due to weak aggregate demand can feed back to the supply side of the economy and result in a rise in equilibrium unemployment. This phenomenon is known as hysteresis. In the final section, we introduce the so-called flow approach to the labour market. In labour economics, job search theory has focused on the process by which the unemployed are matched with vacancies. We explain how the matching process can be represented in a downward sloping relationship between the vacancy rate and the unemployment rate known as the Beveridge Curve and show how this can be related to the $WS/PS$ model to provide a richer analysis of equilibrium unemployment.

1. Supply-side structures, policies and shocks

The charts in Chapter 1 show that unemployment rates differ widely across countries and that there are persistent trends in unemployment in some of them. This data suggests that we cannot rely on a model with a constant or time-invariant $ERU$ but need to model how the $ERU$ shifts about

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over time. In this section, we identify a set of factors that can shift either the WS- or the PS-curve and therefore shift the ERU.

Before looking at the likely causes of shifts in the WS- and PS-curves, we clarify the mechanics. For brevity, we refer to any shift in the WS- or PS-curve as a supply-side shift or a supply-side shock. What is the implication of a supply-side shift for the medium-run equilibrium and how does the economy adjust following such a shift? In Fig.1, we show the initial equilibrium at point $A$. Inflation is at its target level. Let us suppose the WS-curve shifts down because union power is weakened by a change in legislation. There is a new medium-run equilibrium at $Z$ with higher employment and with inflation at the original rate: the supply-side shift lowers the ERU. The assumption that the PS-curve is flat means that the real wage in the new equilibrium is the same as it was originally. This is a rather striking result: lower union bargaining power means a lower ERU but an unchanged real wage. With a downward-sloping PS-curve, the real wage is lower in the new equilibrium.

If the central bank had correctly anticipated the shock, it would have dropped the interest rate so as to boost aggregate demand and move the economy down the IS curve raising output to $y = y'_c$. The economy would jump straight from $A$ to $Z$ (see Fig.1) and inflation would remain on target at $\pi^T$. With lags in response and in adjustment, this is unlikely. As an example of how adjustment occurs when there are nominal rigidities, assume that the central bank is using a monetary policy rule to target inflation (Fig.1). The shift in the WS-curve means that the vertical Phillips curve shifts to the right, to $y'_c$, which implies that the Phillips curve $PC(\pi^T = 4)$ shifts as well: it goes through the point marked $Z$. The Phillips curves associated with the new ERU are shown as dashed lines. Following the shift in the WS, a gap opens up between the existing real wage, $w_0$ and point $B'$ on the new WS curve. The first thing to happen as a consequence is that inflation falls to 2% as shown by the new $PC(\pi^T = 4, y'_c)$: the economy goes from $A$ to $B$. Inflation falls because at the current output level, in the face of the new situation in the labour market, workers are too weak to secure wage increases that would maintain the wage at $w_0$. Money wages rise by less than the previous period’s inflation. Firms’ costs therefore rise by less than in the past and they put their prices up by less. The fall in inflation triggers a reaction from the central bank: it cuts the interest rate. The Phillips curve facing the central bank is $PC(\pi^T = 2, y'_c)$. In the usual way, it chooses its preferred position on this Phillips curve, say point $C$. This dictates the required cut in the interest rate to raise output to $y'$. The economy then adjusts from $C$ to $Z$ with the central bank adjusting the interest rate and the Phillips curve shifting until it gets to $PC(\pi^T = 4, y'_c)$.

The time profile of inflation is shown in Fig.2. Inflation drops once wages and prices begin to adjust to the supply shift (presumably at the next wage round) and then it gradually returns to its initial level.\footnote{The adjustment process would be fairly similar in the case where the central bank fixes the growth rate of the money supply. As we have seen in Chapter 3, the main difference is that the fall in inflation triggers a rise in the real money supply, which in turn pushes down the interest rate and boosts demand and output.}

For completeness, Fig.3 shows the supply shock analysis in the same format as we have used for the inflation and aggregate demand shocks, i.e. with the IS-diagram above the Phillips diagram. As we have just seen, a supply shock differs from the inflation and demand shocks because it shifts the MR schedule so that it goes through the point where inflation is at target and output at the new equilibrium: this is $MR'$. In the IS-diagram, we can see explicitly the cut in the interest rate from its initial level of $r_s$ to $r'$. Once the economy is on the new monetary rule line, $MR'$, adjustment from $C$ to the new equilibrium at $Z$ takes place in the usual way.

### 2. Factors that shift the WS- and PS-curves

The factors shifting the ERU can be divided into:

- wage-push factors that shift the WS curve and
- price-push factors that shift the PS curve.
2. FACTORS THAT SHIFT THE WS- AND PS-CURVES

2.1. The tax wedge. Before providing examples of the wage and price-shift variables, one clarification is needed. To this point, we have used $W$ as the money wage and $P$ as the price level without worrying about their precise definition. In what follows we have to be clear about what $W$ and $P$ measure and which measure we show on the axis in the labour market diagram. This is a matter of choosing a convention and we find it convenient to show the real consumption wage in the
labour market diagram. This entails measuring \( W \) as the post-tax money wage paid to the employee and to measure \( P_c \) as the consumer price index, i.e. inclusive of indirect taxes.

\[
P_c = P \cdot (1 + t_v).
\]

This means that when we show \( W/P_c \) on the axis of the labour market diagram, this is the real consumption wage — the concept relevant from the perspective of the utility of the worker.

By contrast, the real wage that is of relevance to the employer is the real product wage, which is the full cost of labour to firms — inclusive of income tax and non-wage labour costs such as social security contributions paid by employers and employees — divided by the price the firm gets for its product (i.e. excluding indirect taxes). This is called the producer price. The difference between the real consumption wage and the real product wage is called the tax wedge. Given the way we have defined the labour market diagram in terms of \( W \) and \( P_c \), the wedge shows up as a price-push factor. Any increase in either direct or indirect taxation reduces the price-setting real wage and therefore shifts the \( P/S \)-curve downwards.

This is clear when we derive the \( P/S \)-curve including taxes. The wage element of costs for firms is the full cost of labour to firms — i.e. the gross wage paid to the worker (which includes the income tax and social security payments that have to be made by the worker) plus the employer’s social security contributions. All direct taxes are summarized in the tax rate, \( t_d \). This is shown in the pricing equation, where \( P \) is the producer price:
2. FACTORS THAT SHIFT THE **WS-** AND **PS-CURVES**

\[
P = \frac{1}{1 - \mu} \cdot \frac{W^{\text{gross}}}{\lambda}
\]

(price equation)

\[
P = \frac{1}{1 - \mu} \cdot \frac{W \cdot (1 + t_d)}{\lambda}
\]

In order to derive the price-setting real wage in terms of the real consumption wage, \(\frac{W}{P_c}\), we rearrange the pricing equation and substitute \(\frac{P_c}{1 + t_v}\) for \(P\) to get:

\[
P_c = \frac{(1 + t_v)}{1 - \mu} \cdot \frac{W \cdot (1 + t_d)}{\lambda}
\]

The **PS**-equation including the tax wedge is:

\[
\frac{W}{P_c} = \frac{\lambda (1 - \mu)}{(1 + t_d)(1 + t_v)}
\]

(PS-equation including tax wedge)

Any fall in the wedge, for example, a fall in income tax, implies an upward shift in the **PS**-curve, indicating that the real wage is higher at any level of employment since the tax take is smaller. The smaller wedge means that **WS**- and **PS**-curves cross at higher employment: there is a lower **ERU** because a higher real consumption wage on the **WS**-curve is consistent with equilibrium for price-setters (on the new higher **PS**-curve). It is very important to note that what matters for shifting the **PS**-curve and therefore for affecting equilibrium unemployment is the tax wedge as a whole: a rise in income tax or in indirect tax will push equilibrium unemployment up. There is nothing special about the effect of the so-called payroll taxes, i.e. the employer and employee social security contributions. Cross country studies of unemployment that control for many other determinants of unemployment show rather consistent results for the estimated impact of the tax wedge on unemployment: a ten percentage point higher tax wedge is associated with a higher unemployment rate of between one and two percentage points.

2.2. **Price-push factors.** We incorporate the tax wedge as one of the price-push factors and write the **PS**-curve compactly as:

\[
\frac{W}{P_c} = \lambda \cdot f(\mu, z_p)
\]

(PS-curve including price-push factors)

where \(z_p\) is a set of price push variables including the tax wedge. The **PS**-curve shifts up when there is a

- fall in the tax wedge, which is included in \(z_p\)
- fall in the mark-up, \(\mu\), due, for example, to a change in competitive conditions
- rise in productivity, \(\lambda\).

Other factors included in \(z_p\) may be regulations that increase the cost of employment, such as business registration and some employment regulations. Such regulations do not necessarily have the effect of increasing price push and therefore raising the **ERU**. For example, although regulations enforcing health and safety standards impose costs on firms, they may have a compensating positive effect on productivity.

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3Baker et al. (2002) survey six studies, with estimates of the impact of a ten percentage point rise in the tax wedge on the unemployment rate that range from 0.91 to 2.08. Dean Baker, Andrew Glyn, David Howell and John Schmitt (2002). 'Labor Market Institutions and Unemployment: A Critical Assessment of the Cross-Country Evidence’ No 2002-17, CEPA Working Papers
2.3. **Wage-push factors.** We can write the $W$-$S$-equation:

$$\frac{W}{P_c} = b(E, z_w)$$  \hspace{1cm} (WS-curve)

where $z_w$ is a set of wage push variables. The $z_w$’s include institutional, policy, structural and shock variables.

It is often argued that the $WS$-curve shifts down when

- there is a fall in the level of unemployment benefits (or more precisely in the replacement ratio, which is the ratio of benefits to the average wage) or its duration because this shifts the balance toward accepting a job at a lower real wage at any given unemployment rate.
- unions are given less legal protection because this reduces the difference between the $WS$-curve and the labour supply curve.
- unions are weaker, for example as measured by a lower proportion of trade union members amongst employees (lower trade union density) or when a lower proportion of employees who are covered by collective bargaining agreements (lower collective bargaining coverage).
- unions agree to exercise bargaining restraint in the context, for example, of a wages accord because this lowers the real wage that is acceptable to unions at a given unemployment rate.

2.3.1. **Productivity increases.** There is considerable debate about whether labour productivity, $\lambda$, should appear in the $WS$-equation as well as in the $PS$-equation, as follows:

$$\frac{W}{P_c} = \lambda \cdot b(E, z_w).$$

To support including $\lambda$ in the $WS$-equation in a symmetrical way to its role in the $PS$-equation, one may appeal to the stylized fact that productivity has been continuously rising but unemployment has not been continuously falling. If the $WS$-equation takes this form, then a rise in productivity has no effect on the $ERU$: the wage aspirations of wage-setters rise in line with productivity. We return to this debate in Chapter 15 in the context of the discussion of efficiency wages in the Appendix.

An interesting empirical question arises when the model is put into a dynamic setting with productivity growth. One plausible scenario is that wage-setters build the underlying growth in productivity into their wage-setting equation so that underlying productivity growth sets the base-line for wage-setters’ real wage claims. This would then be modified by the state of the labour market, i.e. by $E$ and by the wage-push factors, $z_w$. The question is what happens when trend productivity growth rises or falls? If wage-setters are able to spot that the trend has changed then they will adjust their wage demands accordingly and the $ERU$ is unchanged. If it takes time for the change in trend to make its way into wage-setters’ behaviour, then a slow-down in productivity growth will raise the $ERU$ and a speed-up will lower the $ERU$. Effects of this kind appear to have been observed following the generalized slow-down in productivity growth in the advanced countries after 1970 and following the speed-up in productivity growth in the US in the mid 1990s. To reflect the uncertainty about the precise role of productivity in the wage equation, we put $\lambda$ inside the $b$ function. This indicates that a rise or fall in productivity in the static context or a rise or fall in productivity growth in the dynamic one does not necessarily result in a shift of the $WS$-curve exactly in line with that of the $PS$-curve.

$$\frac{W}{P_c} = b(\lambda, E, z_w).$$  \hspace{1cm} (WS-curve, including wage-push factors)

2.3.2. **Training programmes.** There are two channels through which increased government expenditure on training may lower equilibrium unemployment. First, if the training is effective, a more highly trained work-force will be characterized by higher productivity and this will shift the $PS$ curve upwards. As discussed above, the rise in productivity may also shift the $WS$ curve upwards.
Through a quite different mechanism, increased training may weaken the bargaining power of employees and operate to shift the WS curve downwards, helping to lower equilibrium unemployment. Whereas a shortage of skilled workers will tend to increase union bargaining power, the reverse will be the case if a shortage is reduced by higher levels of training. Programmes that enhance the skills of the unemployed (such as those in the ‘Welfare-to-work’ programme in the UK) can be interpreted in the same way — i.e. if they improve the supply of workers able to actively compete in the labour market, the WS curve is shifted downward and equilibrium unemployment falls.

2.3.3. Wage accords, incomes policies and industrial relations legislation. The idea of using a ‘wage accord’ or ‘incomes policy’ to reduce equilibrium unemployment derives from the possibility of introducing measures that lower the WS curve. As we shall see in the next section, differences in the institutional arrangements for wage-setting in different economies (e.g. the degree to which wage-setting is coordinated either by unions or by employers across the economy) are likely to generate different degrees of wage restraint. In this section, we provide a more general argument that links wage restraint to government policy and industrial relations legislation.

At each level of employment, union negotiators have a choice as to how hard they push wage negotiations. The limits to this choice are set at the upper end by employers and at the lower end by individual union members. The ceiling for bargaining intensity can be referred to as the $WS(\text{ceiling})$: this is the real wage that unions can secure if they use their bargaining power to the full, i.e. if they use all the weapons at their disposal, including strikes. Changes in the environment in which unions operate such as changes in industrial relations legislation, the density of union membership or the coverage of collective bargaining agreements may affect the weapons available to the unions and hence will shift the $WS(\text{ceiling})$. The position of the $WS(\text{ceiling})$ will also depend on the ability of firms to pay the wage and on their willingness to resist union demands. The employers will seek a minimum cost outcome by trading off the costs of a settlement against the costs of industrial action. Employer resistance to wage claims may well be strengthened by employers acting in concert in wage negotiations, drawing on such weapons as strategic lock-outs, where employers react to union strikes at key plants by locking workers out at other plants.

The floor to the real wage actually negotiated by the unions is set by the $WS(\text{floor})$, which is defined as the highest real wage that individual workers at local level will insist on, in the sense that they cannot be prevented by the union leadership from striking for it. Should the union leadership decide to operate on a $WS$ curve below the $WS(\text{floor})$, we would expect to observe unofficial strike action as workers sought to negotiate higher wages at local level. The $WS(\text{floor})$ can be interpreted as a many-sided constraint covering minimally acceptable conditions of work such as the intensity or speed of work, as well as wages, hours or work, holidays, etc. Should any of these constraints be violated, then the workers would go on strike if this were necessary to rectify the shortfall in their minimum acceptable conditions of employment. In general, there will be a gap between the $WS(\text{ceiling})$ and $WS(\text{floor})$, which we define as the zone of bargaining discretion available to the unions between the constraints set by the employers and by their members. Bargaining discretion exists because individual workers or small groups of workers would generally be unable to gain as favourable a settlement as could the union for the industry as a whole (see Fig.4).

The wage-setting curve along which negotiations actually take place, i.e. the $WS$, generally lies in the zone of bargaining discretion. This raises the obvious question of why should unions exercise any bargaining discretion, i.e. why does $WS$ not coincide with $WS(\text{ceiling})$? One rationale for such behaviour is union concern for the long run future of the industry. The use of maximum bargaining intensity and the use of the associated weapons of industrial disruption might be thought likely to jeopardize investment plans in the industry.

A wage accord (or incomes policy) is a situation in which unions in their negotiations with employers agree to exercise bargaining discretion and shift the $WS$ curve downwards within the zone of bargaining discretion. Such an accord may be part of a broader settlement in which the government agrees to undertake policy measures supported by the unions and or to give the unions an enhanced
role in government economic policy making. An example in Europe is the 1982 Wassenaar Accord in the Netherlands between employers and unions, which was later endorsed by the government and which continues to affect wage-setting. Unions offered wage restraint and more local flexibility in wage setting; employers agreed to a reduction in working time. The unions agreed that reductions in working time would not increase labour costs. Although the accord was bilateral between the unions and employers, the government agreed to deal with its fiscal problems (a burgeoning public sector deficit). A second example is Ireland, where there have been a series of tripartite national wage agreements since 1987 to the present. As in the Dutch case, the phase of successful wage accords followed a period of unruly labour relations and unsatisfactory macroeconomic outcomes. In the 1980s, Ireland was experiencing rapid productivity growth and the accords were designed to ensure that real wage growth was not excessive. The government committed itself to respond to wage restraint with tax cuts and improved social benefits. As we shall see in Chapter 18, both the Netherlands and Ireland succeeded in reducing unemployment very markedly in the 1990s. In each case, the wage accord appears to have played a part.

It is useful to note why it can be difficult to achieve agreement amongst unions on a wage accord. If there are many unions in the economy, the problem is that for each individual union there is a temptation to defect from any wage accord since it will then secure higher wages. However if all unions act this way, the wage accord collapses (the $WS$ curve shifts upwards) and macroeconomic policy must be tightened to prevent inflation from rising. This problem has the structure of the famous prisoner’s dilemma game: two prisoners implicated in the same crime are held in separate cells and cannot communicate. They are told that if both confess, they will each serve 10 years; if one confesses and the other does not, the one that confesses goes free and the other serves 20 years whereas if neither confess, both get 2 years on a lesser charge. Each prisoners reasons as follows: if I confess and my partner does not, I go free; whereas if he, too, confesses, I get 10 years. On the other hand, if I deny the charge but he confesses, I go down for 20 years; if he too denies, then we both get 2 years. Whether my partner confesses or not, I always get a shorter sentence by confessing: 10 rather than 20 (if he confesses) or zero rather than 2 (if he doesn’t confess). The implication — attributing the same reasoning to both prisoners — is that both confess and get 10 years, whereas their joint utility maximizing strategy would be for both to deny, leaving each with a 2 year sentence.

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The structure of this game is one in which there is a so-called dominant strategy, in the sense that one strategy (‘confess’) is preferred irrespective of the strategy chosen by the other party.

The parallel with the unions is that just like the prisoners, the temptation to defect (for the prisoner, by confessing whilst the other one denies; for the union, by breaking the wage accord whilst the others stick to it) makes agreement to the accord problematic. Yet in both cases, the failure to coordinate leaves the parties worse off. Economies characterized by highly centralized wage-setting or where there is a single acknowledged leader union will find the achievement of a wage accord agreement easier than economies in which there are a number of competing unions. We turn now to a model that connects wage restraint to the institutional structure of wage-setting.

3. Unions, wage-setting arrangements and the ERU

A standard argument is that greater union strength measured by the proportion of employees that belong to a union (known as union density) or by the proportion of employees whose wages are covered by union wage agreements (known as coverage) is a wage push factor that implies a higher WS curve and therefore raises the ERU. However, an influential article written by Lars Calmfors and John Driffill in the late 1980s argued that there was a hump-shaped relationship between the degree of centralization of wage-setting and the ERU. The Calmfors-Driffill model showed that a low ERU was consistent with either very decentralized wage-setting or with very centralized wage-setting; the worst institutional arrangement was a so-called intermediate level of wage-setting. This is an interesting result because it highlights the possibility that union strength is not necessarily associated with an upward push in the WS-curve. If union strength is associated with a particular structure of wage-setting then it may, on the contrary, be associated with low unemployment. This argument provides a way of understanding the very low unemployment rates typical of a number of Nordic countries and Austria in the 1970s and 1980s, when it rose elsewhere.

The key insights of the Calmfors-Driffill result can be explained intuitively. The model assumes that workers are unionized and compares three different contexts for wage setting: at firm-level, at industry-level and at the level of the economy as a whole.

- ‘Firm-level’ or ‘decentralized’ means a situation in which there is a union specific to each firm that sets the wage in the firm.
- ‘Industry-level’ or ‘intermediate’ means there is a union that sets the wage for all workers in an industry (e.g. the engineering industry union; the banking industry union).
- ‘Economy-wide’ or ‘centralized’ means there is a single union that sets the wage for all workers in the economy. As we shall see, wage-setting does not have to be literally centralized for the ‘economy-wide’ outcome to prevail: what matters is the extent to which wage-setters take into account the economy-wide implications of their wage-setting decisions. For this reason, the term ‘coordinated’ is often preferred to ‘centralized’.

In each case it is assumed that the union has the same utility function in which utility increases with employment and with the real wage. For simplicity, it is assumed that the wage is chosen by a monopoly union rather than by bargaining between the union and the employer (or the employers’ association). The union unilaterally sets the wage and the employer chooses the level of employment.

There are two different forces for wage moderation — the first concerns the way in which the union expects employment to respond to a change in the wage and the second concerns the extent to which the union takes into account the impact of its decisions on the economy-wide price level. In relation to the first, as wage-setting becomes more decentralized, the union becomes more concerned about the effect on the employment of its members if it increases the wage. It is worried that a wage increase in the firm will make the firm less competitive as compared with others. As a consequence the firm will decrease employment, which will have a negative impact on the utility of union members. This acts to limit the exercise of union power when wages are set by the union at firm-level. By contrast, when wages are set by an industry union, the union will view the impact of

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6A version based on micro-foundations is set out in Chapter 15.
its wage increase on the demand for industry output and hence on industry employment as limited. This is because the degree of substitutability between the products of different industries (e.g. between engineering equipment and textiles) is much less than between the products of different firms in the same industry (e.g. between the fork-lift trucks produced by firm A and firm B). Hence, the industry union will exercise less restraint and choose a higher wage than the firm-level union.

The second force for wage moderation is of a quite different kind. It arises from consideration of what are referred to as the general equilibrium effects of the wage increase. A union that is operating at the level of the firm, takes as given the economy-wide price level and when setting the money wage, assumes that this sets the real consumption wage for the workers in the firm (i.e. $W_i/P_i$, for firm $i$), which is what its members care about. However, if the union is setting the wage for all workers in the economy, the impact of its decision on the economy-wide price level cannot be ignored. The union will therefore recognize that any increase in the wage it sets will call forth an increase in the price level as costs in the economy rise in line. The outcome will therefore be that the real consumption wage does not rise. Another way to put this is to say that when making its decision, the centralized union takes into account the fact that the economy will end up on the price-setting curve after wages and prices have been set. The centralized union realizes that it cannot achieve a real wage higher than that on the $PS$-curve. In the simple case of a horizontal $PS$-curve, the real wage is constant so when the centralized union picks its best point along the $PS$-curve, it will choose to maximize employment. This implies that the centralized union chooses not to exercise its monopoly power in wage negotiations: its utility is maximized at the employment level where the labour supply curve cuts the $PS$-curve. To relate this outcome to the previous section’s discussion about the prisoner’s dilemma game, in the case of a centralized union, it solves the coordination problem by having a single decision maker who is able to maximize the joint utility of the members.

To see the above argument diagramatically, we begin with the union indifference curves (see Fig.5). These are best thought of as comprising two components: on the one hand workers and hence their unions are interested in maximizing the wage bill and this produces a downward-sloping indifference curve in the real wage-employment diagram. The second component is that there is a disutility of work so eventually the indifference curve slopes upward. The labour supply curve, $E_S$ is derived by taking any real wage and finding the optimal amount of labour supplied so this goes through the minimum points of the indifference curves.

We now consider the case where unions are organized at industry level. As explained above, such unions believe that their wage decision will have little impact on employment since the degree of substitutability between the products of different industries is low. This is reflected in the rather steep industry-level labour demand curves. The industry-level union optimizes by choosing the highest indifference curve subject to the constraint of the labour demand curve. Three labour demand curves for different levels of aggregate demand in the economy are shown. By joining up the points of tangency, the wage-setting curve for the case of wage-setting by industry-level unions is derived, $WS^{IND}$ (see Fig.5). As we move to a more decentralized context for wage-setting, the union becomes more concerned about the impact of its wage decision on employment of its members: if it raises its wage, the firm will raise its price and demand will switch to other suppliers. The greater elasticity of demand produces flatter labour demand curves as shown in the diagram, with the consequence that the wage-setting curve for decentralized wage-setting lies below that for industry-level wage-setting.

To draw out the implications for equilibrium unemployment, we note that once wages are set, firms set prices. Returning to the level of the economy as a whole, we therefore have the $PS$ curve as shown in Fig.6. Equilibrium employment for the case of industry-level wage-setting is shown by the intersection of the $WS^{IND}$ and the $PS$. This is below that for the case of firm-level wage-setting. As argued above, the centralized case brings in the second element in the Calmfors-Driffill story: the wage decision affects prices and as the number of sectors involved in wage-setting shrinks, it becomes impossible for the union to ignore the consequences of its wage decision for the economy-wide price level and hence for the real consumption wage, which enters its utility function.
3. UNIONS, WAGE-SETTING ARRANGEMENTS AND THE ERU

The centralized union uses the labour supply curve as its wage-setting curve, leading to equilibrium employment at $E_c(C)$. We can see the implications for the ERU if Fig. 7: it is low in the case of centralized or de-centralized wage-setting and high when unions set wages at industry level. This is what produces the hump-shaped relationship between the centralization of wage-setting and the ERU. In Chapter 18, we look at how different arrangements for wage-setting have been measured and their role in accounting for differences across countries in unemployment patterns.
4. Introduction to hysteresis: actual \(U\) affects the \(ERU\)

We have seen that the equilibrium rate of unemployment is shifted by supply-side factors. The policy implication is twofold:

1. aggregate demand shocks have a short-run effect on unemployment but not a medium-run one
2. whilst aggregate demand policies have a role to play in stabilizing the economy around the \(ERU\), they cannot influence its level.

However, it has been argued that if actual unemployment stays above equilibrium unemployment for an extended period, it could have a damaging effect on the supply-side of the economy with the result that the \(ERU\) is raised. This is an example of so-called hysteresis, in which the equilibrium of the system depends on the actual history of the system. Often the term ‘path-dependence’ is used to describe this phenomenon. In this section we provide examples unemployment persistence stemming from mechanisms that work through the \(WS\) curve:

- the ‘insider-outsider’ effect, where wages are set to benefit those in work, i.e. the insiders;
- the ‘long-term/short-term’ unemployment effect, where the long-term unemployed (the outsiders) lose touch with the labour market and cease to influence wage-setting.

In Chapter 18, we look at the attempt to find empirical support for the role of hysteresis and persistence mechanisms in explaining European unemployment.\(^7\)

4.1. The insider-outsider effect\(^8\). We assume that the economy is initially at equilibrium employment, \(E_e\) in Fig.8 and that there is a fall in aggregate demand that reduces employment to \(E_1\). Our usual assumption is that the falling inflation at \(E_1\) leads the central bank to cut the interest rate and boost aggregate demand so that the economy returns to \(E = E_e\). If, however, the central bank is inactive and if the impact of falling inflation on aggregate demand via the real balance effect on the demand for money or on consumption is weak, then the economy may remain for some time at \(E_1\). Two groups of workers may then be identified: the unemployed outsiders and the insiders who

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are currently employed at $E_1$. They are in a strong bargaining position because, for example, their firm-specific skills mean that the firm cannot simply sack them and replace them with new workers. Insiders are presumed to be interested in maintaining their own employment and increasing their real wage; they attach no importance to the creation of employment for those currently unemployed. The consequence is that the $WS$ curve becomes vertical at $E_1$ as shown in Fig. 8. Any increase in aggregate demand will simply be reflected in a rise in the real wage until the $w^{WS} = w^{PS}$, after which, higher aggregate demand will produce rising inflation: equilibrium employment has fallen to $E_1 = E'_e$. This is a model of pure hysteresis in the sense that once unemployment has risen and insiders have emerged with wage-setting power, equilibrium unemployment goes up and remains at the new level. Although the rise in equilibrium unemployment originated with a fall in aggregate demand (that was not offset), only a supply-side change, which alters wage-setting arrangements can reduce equilibrium unemployment. The microeconomic working of the model is explained in more detail in Chapter 15.

**4.2. Long-term unemployment and unemployment persistence.** An example of the interaction between aggregate demand and equilibrium unemployment focuses on the role of the long-term unemployed in the labour market. The long-term unemployed are viewed as having in effect withdrawn from participation in the labour market because of a progressive loss of skills and erosion of psychological attachment to working life. They are therefore only poor substitutes for those in work and exert little competitive pressure in the labour market. The higher is the proportion of long-term unemployed in the overall pool of unemployment, the less impact will any given level of unemployment have on wage-setting. If this is the case, then since a long period of high unemployment is likely to eventually push up the proportion of the long-term unemployed, equilibrium unemployment will rise. In the $WS/PS$ diagram, the $WS$-curve shifts upwards. This in turn weakens the self-equilibrating process through which high unemployment dampens wage inflation. The objective of reducing the scarring effects of unemployment lies behind “welfare-to-work” programmes. The aim of such programmes is to reconnect unemployed workers with the labour market by using combinations of sticks (e.g. loss of benefits if active search is not undertaken) and carrots (e.g. grants for travel to job interviews, training for interviews).

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9Note that implicitly in our usual discussions of wage-setting, the utility function of workers (and unions) is based on a representative (or average) worker’s preferences before they know whether they are employed or unemployed.

Begin at A. Government cuts $E$ in order to reduce inflation.
At $B$, LTU rises, WS shifts up ($B$ to $C$) and disinflation is weaker.
New equilibrium employment at $D$.
At $D$, LTU begins to fall and WS shifts down.
Initial equilibrium at $A$ is attainable as LTU is reduced.

**Figure 9. Unemployment persistence: the role of long-term unemployment**

To explain how the emergence of long-term unemployment can lead to a prolonged period of high unemployment, we take as an example the case of an economy initially in equilibrium with constant inflation at point $A$ in Fig. 9. Let us assume that inflation is stable but high at point $A$ and a new government is elected that wishes to reduce inflation to $\pi_L$. This leads it to reduce aggregate demand to $E_1$ and to keep activity low until inflation has been reduced to $\pi_L$. However, with high unemployment at $E_1$, the share of long-term unemployment begins to rise: it rises to LTU$_H$, at which point it stabilizes. With a large pool of long-term unemployed, the WS curve shifts upward as explained above: this is $WS(LTU_H)$. As is clear from the diagram, disinflation is slowed down by the upward shift of the WS curve. If we assume that inflation is brought down to $\pi_L$ then the government will want to move the economy back to $E_e$. However, because of the presence of high share of long-term unemployed, equilibrium unemployment is now at $E_2$. But unlike the insider-outsider model, in this case, the economy will eventually return to equilibrium at $A$. The reason is that at point $D$, the share of long term unemployed will begin to decline (since unemployment is lower than at $E_1$) and the $WS(LTU)$ curve will shift down. Gradually, as employment recovers, the share of long-term unemployed will shrink and the economy will be back at $A$. If the “scarring” effect of long term unemployment is very serious, specific policies targeted at reintegrating the long-term unemployed back into jobs may be necessary in order for the equilibrium at $A$ to be attained.

Once back at $A$, the government will have achieved its objective of reducing inflation but the process will be protracted if workers become disconnected from the labour force during the phase of high unemployment. The dashed flatter $WS$ curve in the diagram shows the wage-setting curve when the long-term unemployment share is unchanging. As we have seen, beginning with an initially low share of long-term unemployment at $B$, it rises, stabilizing at the share denoted by LTU$_H$.

It is the intersection of the dashed $WS$ and the $PS$ that fixes the ‘long-run’ equilibrium rate of unemployment: the shifting $WS$ slows down the return to $A$ and the economy will be observed at ‘medium-run’ constant inflation equilibria such as at point $D$.

It is also possible for persistence to operate through the price-setting curve in a way that is analytically similar to the long-term unemployment model. The intuition is as follows: depressed economic activity leads to the scrapping of capital stock. When demand rises again, high rates of
capacity utilization are encountered at higher unemployment rates than previously. It is plausible that firms increase their profit margins at very high rates of capacity utilization since they believe that pervasive shortage of capacity in the economy means it is safe to do so. Diagramatically this implies that the $PS$ curve turns downwards as shown in Fig.10. If we assume that the economy shifts initially from equilibrium at $A$ to higher unemployment associated with $E_1$ perhaps as the result of the disinflation policy used in the previous example, then after a prolonged period of high unemployment and associated capital scrapping, the capital stock declines with the consequence that the downward sloping part of the $PS$ curve occurs at lower employment. When aggregate demand is subsequently increased, it is clear that equilibrium unemployment is higher: there is a new equilibrium with constant inflation at $C$. However, the economy will eventually return to the original equilibrium because high capacity utilization at $C$ will stimulate investment. Eventually the economy will return to ‘normal’ capacity utilization at equilibrium unemployment.

5. The Beveridge curve approach to unemployment

A quite different tradition of labour market analysis from the wage- and price-setting model focuses on the flows of people into and out of unemployment or employment. This is often referred to as the flow approach and belongs to part of labour economics known as job search theory. We explain the essence of this approach without getting into the technical details and show how it can be related to the $WS$-$PS$ model. It is a useful additional tool when analyzing unemployment as is demonstrated in Chapter 18. In the job search tradition, unemployment is in equilibrium when flows into and out of unemployment are equal. With a constant labour force, labour market equilibrium in the flow approach means that hires are equal to separations from employment. The central idea is that workers and jobs are heterogeneous (a factor that has been neglected until now) with the consequence that an important aspect of how the labour market works is how well it achieves the matching of unemployed workers with unfilled job vacancies.

A simple version of the matching function can be explained as follows. It is assumed that $U$ is the number of unemployed and $V$ is the number of vacancies and $\alpha$ is the parameter that describes how efficient the matching process is in the economy. It is normally assumed that the matching function is characterized by constant returns to scale. We can therefore write the matching function as

$$M = \alpha \cdot m(U, V),$$
where a higher number of matches is associated with higher matching efficiency \((\alpha > 0)\). It is important to note that \(M, U\) and \(V\) are flows per period and that the period can be of any length as long as matches, unemployment and vacancies are measured consistently. This describes how the unemployed are matched with the vacancies. Holding the matching efficiency and the number of vacancies constant, higher unemployment is associated with more matches since there are more applicants for each job and similarly, holding unemployment constant, more vacancies are associated with more matches. If we assume that the flow of workers from employment to unemployment is \(sE\) where \(s\) is the exit rate from employment, then the labour market will be in a flow equilibrium when the flow into unemployment, \(sE\) is equal to the flow out of unemployment into jobs, \(M\):

\[
sE = \alpha \cdot m(U, V).
\]

Using the assumption that matching takes place under constant returns to scale and assuming for simplicity that the separation rate is an exogenous constant (i.e. that it does not depend on economic factors), we have:

\[
s = \alpha \cdot m\left(\frac{U}{E}, \frac{V}{E}\right).
\]

If we draw a diagram with the ‘unemployment rate’ \((u \equiv U/E)\) on the horizontal axis and the vacancy rate \((v \equiv V/E)\) on the vertical axis, the labour market equilibrium can be plotted as shown in Fig.11. The vacancy/unemployment curve depicting labour market equilibrium in the flow model is called the Beveridge curve. The curve is downward sloping because at high unemployment, then with a given matching technology, it will be necessary for vacancies to be low to deliver the constant number of matches required to balance the fixed separation rate, \(s\). Conversely at low unemployment with fewer people looking for work, more vacancies are required to ensure that the number of those taking jobs is equal to the separation rate. Any decline in the efficiency of matching, \(\alpha\), will shift the curve to the right with the implication that flow equilibrium at a given unemployment rate will require a higher rate of vacancies in the economy.

But how does this approach to labour market equilibrium relate to the \(WS-PS\) model? To this point, vacancies have been ignored. However, once heterogeneity between workers and jobs is introduced, vacancies represent a measure of pressure in the labour market. Holding all the other determinants of the wage- and price-setting curves constant, then for a given employment (or unemployment) rate, higher vacancies in the economy increase the wage workers can bargain for or employers need to set to attract good workers. The \(WS\)-equation written in terms of employment is:

\[
\frac{W}{P_c} = b(E, v, z_w),
\]

\((WS\text{-curve})\)
where $v$ is the vacancy rate. The $WS$-curve shifts up when the vacancy rate increases. As Fig.12 shows, a higher rate of vacancies implies a lower equilibrium employment rate and hence higher equilibrium unemployment. In other words, there is a positive relationship between vacancies and equilibrium unemployment (at which $WS$ and $PS$ are equal). In the Beveridge Curve diagram, we

![Beveridge Curve Diagram](image)

**Figure 12. The $WS$-$PS$ curve and vacancies**

can now include the positively sloped line showing the wage- and price-setting equilibrium (Fig.13). In the Beveridge curve diagram, full equilibrium in the labour market is shown by the intersection

![Beveridge Curve with Wage and Price Equilibrium](image)

**Figure 13. The Beveridge Curve and the $WS$-$PS$ equilibrium**

of the Beveridge curve and the $WS = PS$ line. It is clear from the diagram that there will be higher unemployment, $u^*$, if the ability of the economy to match workers to jobs worsens (an outward shift of the Beveridge curve). In this case, both unemployment and vacancies will be higher in the new equilibrium (at $u_1^*$). The adjustment of the economy to the new equilibrium can be explained as follows: if such a deterioration in matching occurs, vacancies rise thereby pushing the $WS$-curve upwards and raising inflationary pressure (as in Fig. 12). Equilibrium unemployment has gone up and aggregate demand will have to be reduced. The economy moves to the new equilibrium shown by $u_1^*$ (in Fig.13).

Alternatively, if there is a rise in wage- (or price-) push in the economy but the Beveridge curve remains unchanged, then the $WS = PS$ curve shifts to the right and equilibrium occurs at higher unemployment (at $u_1^*$) but with a lower vacancy rate. The intuition in the second case is that higher unemployment is associated with a lower vacancy rate (for matching reasons) and this somewhat offsets the effect of higher wage pressure, leaving equilibrium unemployment lower than would be
the case if the vacancy rate did not fall. If equilibrium unemployment goes up with little change in the vacancy rate, this suggests that there has been a shift in both the \(WS/PS\) curves and in the Beveridge curve (as in the move from \(u_1^*\) to \(u_2^*\)).

By introducing the flow approach to the labour market, we have widened the set of factors that can account for changes in equilibrium unemployment. In addition to those that shift the \(WS\) or the \(PS\) curves, we now include features of the way the labour market brings workers and jobs together. Barriers to occupational and geographical mobility imply weaker matching and will shift the Beveridge curve outward; similarly policies to overcome these barriers by improving the efficiency of employment and training agencies or the operation of the housing market can have the opposite effect. Some forms of employment protection legislation may affect the willingness of employers to hire workers, weakening the matching process. Some factors will in principle shift both curves: for example, anything such as an increase in unemployment benefit duration, that weakens search intensity, shifts the Beveridge curve to the right and as a wage-push factor, it also shifts the \(WS\) upwards and hence the \(WS = PS\) to the right. These effects are reinforcing, worsening equilibrium unemployment.

6. Conclusion

In this chapter, we have explored the implications for inflation and the \(ERU\) of shifts in the wage- and or price-setting curves. If the \(WS\) curve is pushed up or the \(PS\) curve is pushed down, the equilibrium rate of unemployment rises. The reverse — i.e. a fall in equilibrium unemployment — is the case for a downward shift in \(WS\) or an upward shift in \(PS\). In the case of a negative supply shift, inflation goes up and the central bank will respond to this by raising the interest rate. Unemployment will be pushed above the new higher \(ERU\) in order to squeeze the higher inflation out of the economy. The central bank will then guide the economy along the new \(MR\) to the new higher \(ERU\) and inflation will return to its target rate.

Institutional and policy-related wage- and price-push factors have been identified. The price-setting curve shifts downwards when there is
- a rise in the tax wedge
- a rise in the mark-up (i.e. when monopoly power rises)
- a fall in productivity
- more employment regulation, to the extent that this is not offset by higher productivity or by an offsetting moderation of wage demands.

The wage-setting curve shifts upwards when
- there is a rise in the replacement ratio, i.e. when unemployment benefits become more generous in relation to the average wage
- unions are accorded more legal protection, e.g. in relation to the right to take industrial action or become more powerful as reflected in union density or in collective bargaining coverage
- unions exercise less wage restraint, e.g. as the consequence of the collapse of a wage accord
- there is a change in wage-setting structures toward an intermediate level of wage-setting either away from a more decentralized structure or from a more coordinated one.

It is controversial as to whether a change in productivity (or in the trend of productivity growth) affects the equilibrium rate of unemployment. A slow-down in productivity growth (or a fall in productivity in a static context) will shift the \(PS\) curve downwards. Unless and until wage-setters adjust their behaviour in line with this, the consequence will be a rise in the \(ERU\). It has been argued that a prolonged period of high unemployment can lead to a deterioration in the effectiveness with which the unemployed compete for jobs, which in turn shifts the \(WS\) curve upwards. This is known as hysteresis.

We have seen how the flow approach to the labour market, with its emphasis on how unemployed workers and vacancies are matched adds a dimension to our understanding of the determinants of
equilibrium unemployment. The Beveridge curve is downwards sloping in the unemployment / vacancy diagram and shows the flow equilibrium in the labour market. For a given exit rate from employment and given the institutions in the economy that facilitate the matching of the unemployed with vacancies, a high unemployment rate will be associated with a low vacancy rate and vice versa. The Beveridge curve will be shifted to the right if there are increased barriers to occupational or geographical mobility or if employment protection measures impair the matching process. We can combine the analysis of the impact on equilibrium unemployment of the factors that shift the $WS$ and or the $PS$ with those that shift the Beveridge curve.