MODULE 4

Unemployment

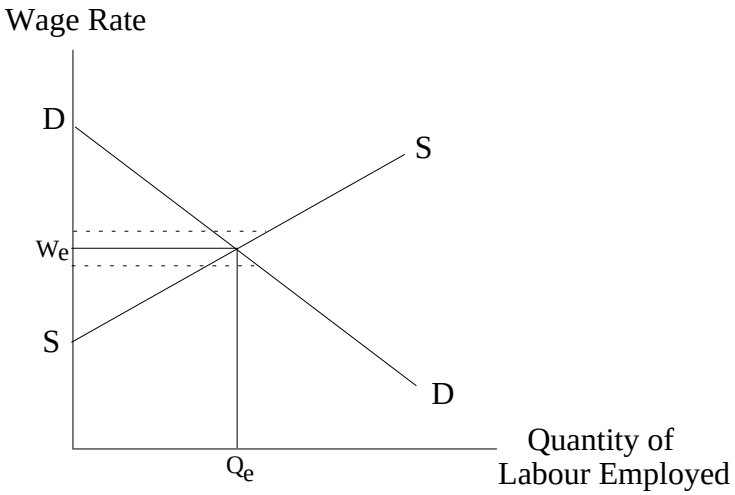
This module deals with why there can be unemployment in the economy. It starts with the traditional classical analysis of the determination of wages in a particular industry and in the economy as a whole, noting that unemployment arises when wage rates are fixed at above-market levels. We then begin relaxing the traditional assumptions that workers and firms have perfect information and are homogeneous, having no influence on wages paid. First an auction theory is presented according to which unemployment arises because workers have imperfect information, mistaking movements in aggregate demand for movements in demand in their own industries. Next we develop a search model that explains the time it takes for unemployed workers to find jobs when workers and firms are non-homogeneous and imperfectly informed. A contract theory is then developed to explain why firms lay off workers in recessions rather than cut wages—firms provide workers with wage and employment stability based on seniority in return for paying lower wages. After an analysis of the Phillips curve trade-off between inflation and unemployment the module closes with a discussion of efficiency wages and insider-outsider theories of wage determination.

1. Wage Rates and the Supply and Demand for Labour

This module deals with the reasons why there might be unemployment in the economy—why people who are willing to work at or below prevailing wage rates cannot find employment. We start with the question of what determines market wage rates.

The supply and demand for labour in the production of a particular commodity is represented in Figure 1.1. The vertical axis measures the nominal wage per unit of labour.

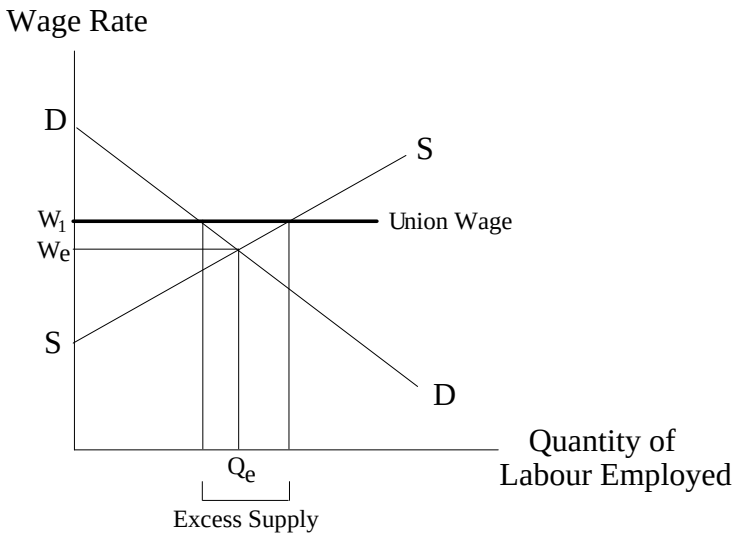
Figure 1.1:



The demand for labour is negatively sloped because, first, a rise in the wage rate increases firms' costs, leading them to reduce output and the quantity of labour employed and, second, it makes labour more expensive relative to capital, causing firms to substitute capital for labour. The supply curve is positively sloped because it takes higher wage rates to induce additional workers to seek employment in the industry.

If the wage is free to adjust in response to market forces it will move to W_e. Unemployment can only result if the wage is above the market equilibrium and some institutional force keeps it from being bid down—for example, a union-industry agreement might fix the wage at W_1 in Figure 1.2.

Figure 1.2:



This does not mean that there will be unemployment in the economy as a whole because the workers who are displaced from this industry will simply bid wages down in the non-unionized sector to obtain employment there.

To think about the cause of unemployment in the economy as a whole we must think in terms of an aggregate demand and aggregate supply of labour—that is, in terms of the demand and supply of labour in the economy as a whole. This is shown in Figure 1.3. Here we put the real wage rate on the vertical axis. The aggregate demand for labour will be negatively related to the real wage rate for the same reason that the demand curve for labour in any industry is negatively sloped. The aggregate supply curve for labour, however, unlike the supply curve to a particular industry, may not be positively sloped throughout its range. The reason is that the positive wealth effect of increased wages on the demand for leisure will tend to cause the quantity of labour workers choose to supply to decline. At the higher wage levels, this may offset workers' tendency to substitute work for leisure in response to the increase in the opportunity cost of leisure consequent upon the rise in the real wage rate.

Figure 1.3:

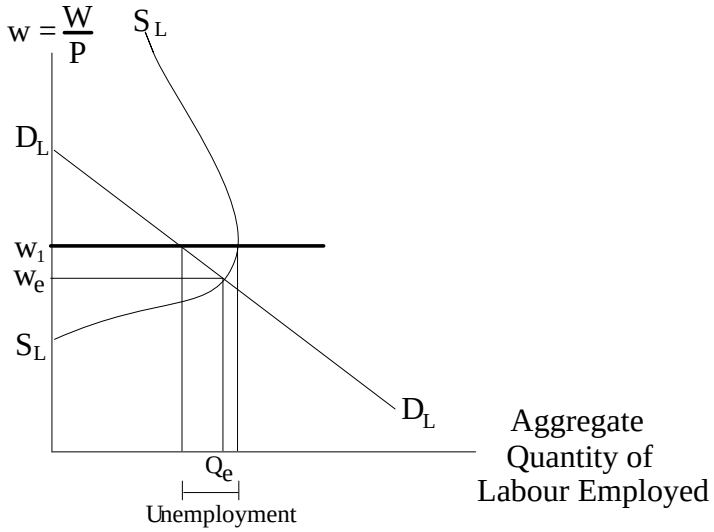


Figure 1.3 shows clearly the effect of an institutionally fixed minimum wage, whether imposed by the government or by union power, on aggregate employment in the economy. Anyone whose marginal product of labour is less than the minimum real wage w_1 will not find employment anywhere in the economy.

Industrialized economies like those of Canada and the United States are nowhere near completely unionized. Minimum wages are in force but they are typically quite low and would displace only the most unskilled workers from employment. Before addressing the issue of why these economies nevertheless experience substantial unemployment from time to time, two preliminary issues must be dealt with.

First we must recognize the nature and existence of *frictional unemployment*, the normal level of which is termed the *natural rate of unemployment*. It reflects the fact that ongoing technological change inevitably makes some jobs redundant and creates new types of jobs. Frictional unemployment does not appear in Figure 1.3. The supply curve SS reveals workers' response to various wages rates when they are fully informed about alternative opportunities and can choose jobs immediately—workers in the process of becoming informed are not part of the analysis.

Second, supply and demand diagrams, by construction, assume that individual buyers and sellers have no influence on the market price. This

raises the fundamental question of the nature of the process by which prices change. If every buyer and seller takes the price as given, there is no one in the market that performs the act of actually changing the price! The supply and demand diagram assumes that prices get bid up and down while every market participant takes them as given. It is as though there were an auctioneer in the background calling out prices to which suppliers and demanders respond. But few auction markets for setting prices exist—mostly markets for stocks and bonds and commodities like wheat, gold, cattle and pork bellies. These are markets for commodities whose quantities can be precisely defined and measured. Labour is not such a commodity.

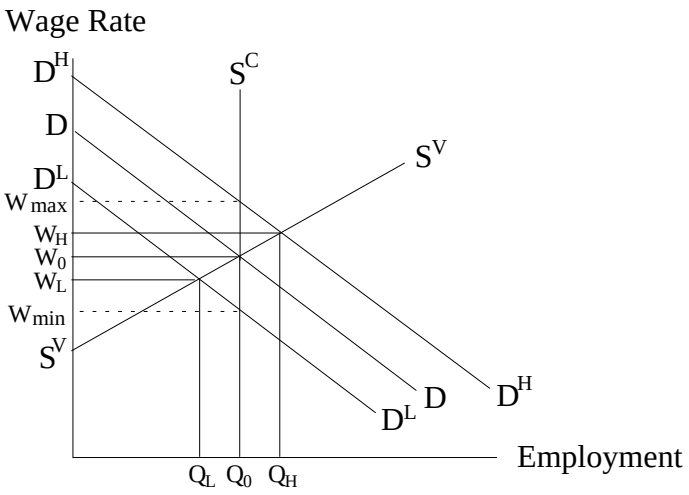
For most supply and demand analysis, including labour market analysis, the precise mechanism through which price changes occur is unimportant—all that is required is that prices somehow adjust to equalize demand and supply. When it comes to understanding the process by which workers find or fail to find jobs, however, the institutional details of wage adjustment become important. Essentially, the assumption that labour is a homogeneous commodity for which a unique market price exists must be abandoned and workers must be viewed as imperfect competitors, each selling a unique product to firms who are also imperfect competitors in labour markets, each offering a variety of unique jobs.

2. An Auction Model of Cyclical Unemployment

We begin our analysis of economy-wide fluctuations in the level of employment by making the absolute minimum departures from the neoclassical assumptions that both workers and firms are homogeneous, perfectly informed and have no individual influence on wages paid. An auction mechanism is assumed in the background to effect an immediate response of wages to market conditions. The term *cyclical unemployment* us used to refer to movements of employment over what is commonly called the business cycle, as opposed to changes in the natural or frictional level of aggregate unemployment.

Wage determination in a typical non-unionized industry is shown in Figure 2.1. Given the general price level in the economy as a whole, the demand for labour in the industry is on average DD, but shifts up to D^HD^H for half the time and down to D^LD^L for the rest of the time. These fluctuations reflect shocks to the demand for output in this industry relative to other industries and not aggregate demand shifts in the economy as a whole. Movements in the wage rate along the vertical axis represent real wage changes in the industry relative to the rest of the economy.

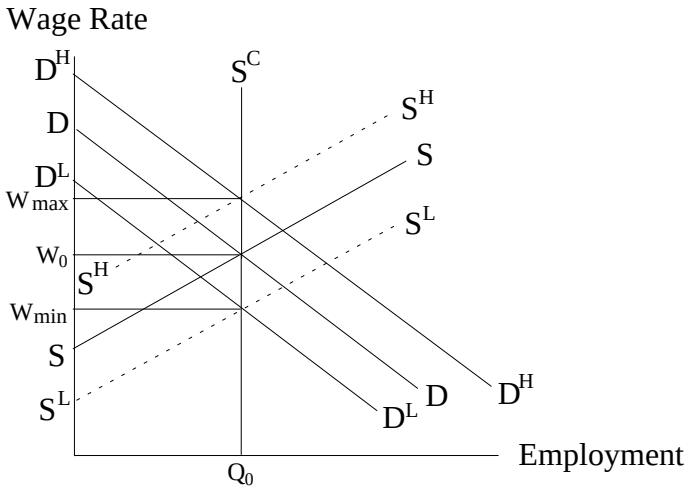
Figure 2.1:



The supply curve is positively sloped because workers will choose to work more in boom periods, when the wage rate is high, and less in slack periods when the wage rate is low—this response is given by the curve $S^V S^V$.

Now consider fluctuations in the demand for output in the industry of the same magnitude as before that represent fluctuations in nominal aggregate demand and are thus common to all industries in the economy. When all workers and firms know the nature of these fluctuations the result is portrayed in Figure 2.2.

Figure 2.2:



All workers and firms in the economy will find it in their interest to adjust wages and prices to keep output and employment constant. The nominal wage rate will thus fluctuate between W_{min} and W_{max} and the general price level will move in the same proportion with real wages remaining constant. Workers shift their supply curve (which shows their response to nominal wage movements at a constant general price level) upward to S^HS^H and downward to S^LS^L to maintain their real wage rates and employment constant in the face of the rising and falling general price level as nominal aggregate demand shifts. Firms pass these nominal wage increases and decreases through to their product prices, maintaining the real prices of their outputs in terms of aggregate output constant. The situation is one of complete wage and price flexibility in response to economy-wide inflation and deflation of nominal aggregate demand.

Now, as a third possibility, let us suppose that workers and firms observe the nominal demand shocks but do not know whether these shocks are specific to their industry or economy-wide. When economy-wide shocks are extremely rare and specific industry shocks are frequent, it is natural for them to interpret observed nominal demand shifts as the result of local-industry shocks. In this case, the response will be the same as that in Figure 2.1.[1] But when the shock is positive and economy-wide, the nominal wage

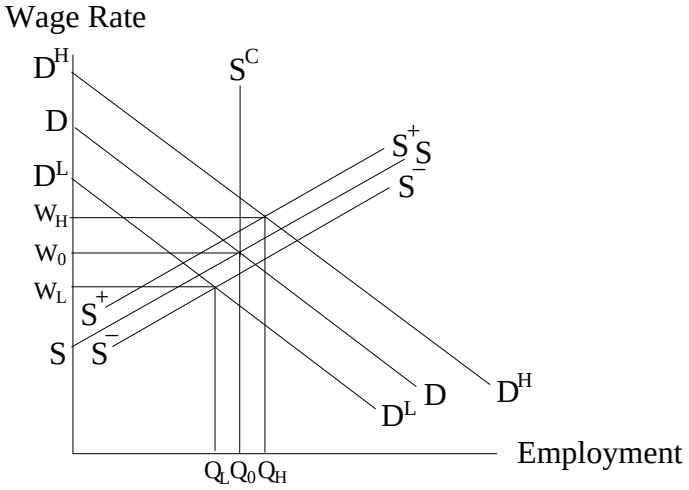
[1] In the module this figure is reproduced as Figure 2.3.

rate will have to rise to W_{max} to maintain the real wage constant. Since it will rise only to W_H, the real wage rate will fall. When the shock is negative the nominal wage rate will fall to W_L and the real wage rate will rise.

The level of employment changes to Q_H in boom periods and to Q_L in recessions. These employment fluctuations are involuntary in the sense that workers would have chosen to set their wages at W_{max} and W_{min} and keep employment constant at Q_0 had they known that the shocks were economy-wide. The aggregate unemployment rate in the economy will thus fluctuate about its natural level due to misinformation on the part of workers and firms as to the source of the shocks to demand in their individual industries. Workers and firms think the shocks are industry specific when in fact they are economy-wide.

When both industry-specific and economy-wide shocks occur frequently, workers and firms will attach some probability to an observed shock being economy-wide. The supply labour supply curve will shift upward or downward to reflect the expected shift of the price level as indicated in Figure 2.4.

Figure 2.4:



If industry-specific shocks have been frequent and economy-wide shocks infrequent in the past, workers and firms will attach a small probability to an observed shock being economy wide. The labour supply curves will shift

by small amounts in response to observed shocks as shown in Figure 2.5, and the fluctuations in employment around its natural level in response to economy-wide shocks will be large. If economy-wide shocks have been frequent in comparison to industry-specific shocks in the past, workers and firms will attach a high probability to a given shock being economy-wide. The labour supply curves will shift by a large amount and the fluctuations in employment about its natural level will be small as shown in Figure 2.6. The points a, b and e represent the nominal wage rates at which the real wage rate is expected to be constant. At e the expected price level is the current price level, so the real wage rate will remain constant if the nominal wage rate remains unchanged. Point a gives the nominal wage rate that will maintain the real wage rate constant in the face of the expected increase in aggregate demand, so the distance between e and a gives the expected increase in the price level. Similarly, the distance between e and b gives the expected fall in the price level in the face of the expected decline in aggregate demand since b is the nominal wage rate expected to maintain the real wage rate constant.

Figure 2.5:

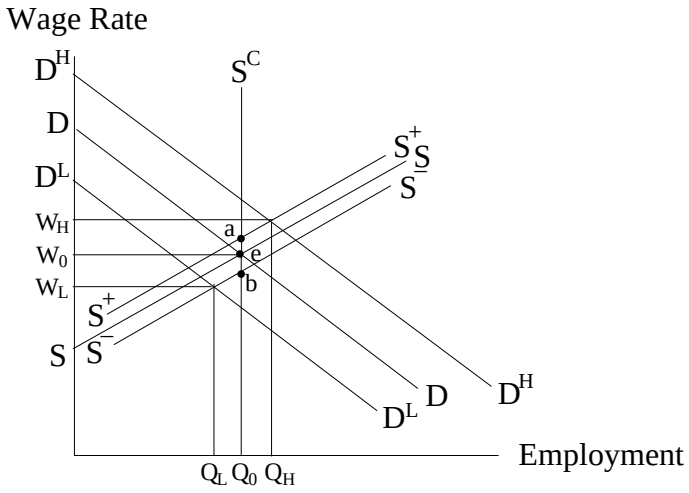
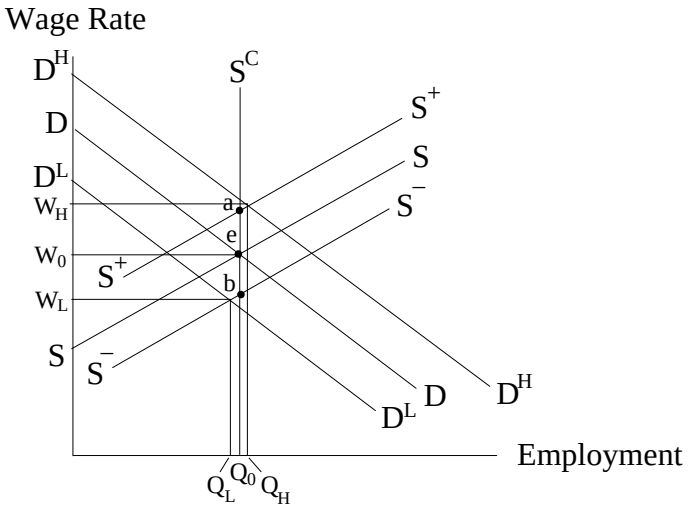


Figure 2.6:



Because wage increases get passed through to prices, the actual price level increases relative to the expected price level when employment increases above its natural level and declines relative to the expected price level when employment falls below its natural level. Given that aggregate output will rise above its natural or long-run equilibrium level when aggregate employment rises above its natural level, and fall below its natural level when employment falls below its natural level, we can postulate the following equation describing aggregate supply:

$$Y = Y_f + \beta\,(P - P^e) \tag{1}$$

where Y_f is the natural or full-employment level of output, P^e is the expected price level and $\beta > 0$. This equation is called the Lucas-Supply Curve.

We thus arrive at a theory explaining fluctuations of aggregate output and employment about their natural or full-employment levels. Less-than-full-employment arises when aggregate demand unexpectedly falls, resulting in declines in the level of nominal wages. Because they do not realize that aggregate demand has fallen, workers think that real wages in their industries have fallen below normal levels and mistakenly substitute leisure for work, moving to the left along what turns out to be the wrong supply curve of labour. In periods of expansion, the opposite happens. Workers fail to realize that aggregate demand has expanded and think that the observed

increase in their wage rates represents a rise in real wages resulting from a temporary positive shock to the demand for output in their industry. They then substitute work for leisure in response to what they think are temporarily high wage rates.

This theory of unemployment shows how far we can get by dropping only one assumption of traditional neo-classical economics—the assumption that everyone has perfect information. Nevertheless, it is quite unsatisfactory in that it would have us believe that in recessions workers mistakenly decide to take time off, thinking that real wages are below normal levels—in fact, people want jobs at prevailing wages but no firms will employ them.

More generally, the auction theory is unsatisfactory because it implies that workers tend to quit their jobs to take leisure in recessions and hang on to their jobs in boom periods to work harder. The empirical evidence suggests the opposite: that workers tend to quit jobs for better opportunities in good times and desperately hang on to their jobs in bad times. Moreover, the auction theory provides no explanation of the tendency of firms to lay off workers in bad times and hire extra workers in good times.

3. A Search Theory of Cyclical Unemployment

We now break with the neo-classical tradition by assuming that workers and jobs are not homogeneous and, leaving the explanation of layoffs to the next topic, address the issue of the length of time it takes an unemployed worker to find a job.

Workers can be thought of as setting reservation wage rates, adjusted to compensate for expected job satisfaction, and then presenting themselves sequentially to firm after firm until they are hired. The waiting time until employment is found is a random variable that depends on the luck of the draw as the worker goes from firm to firm. There is a small probability of being hired very quickly, a large probability of having to wait for a considerable time and a small probability of having to wait a long time. Moreover, we would expect the average, mean, or expected waiting time to increase as the reservation wage increases. In Figure 3.1, the line OA gives the relationship between mean waiting time and the reservation wage. Centered on the mean waiting time associated with each reservation wage is a probability distribution of actual waiting times. The probability distribution associated with the mean waiting time WT_0 is blown up in Figure 3.2.

Figure 3.1:

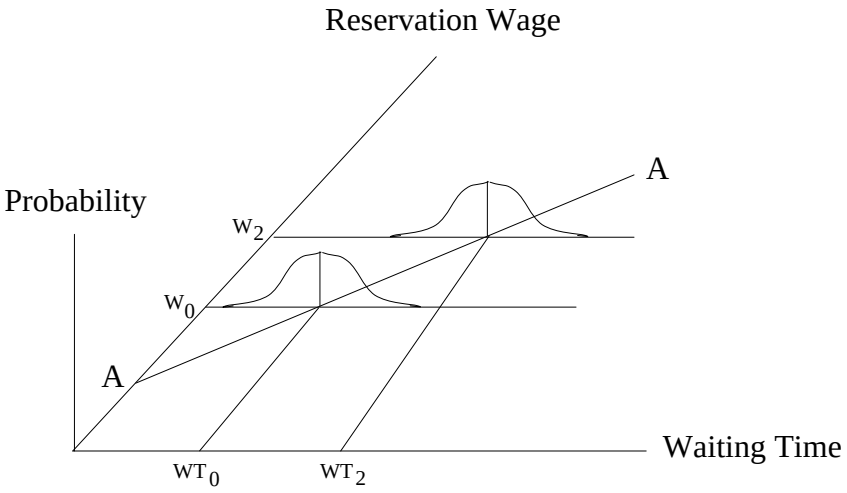
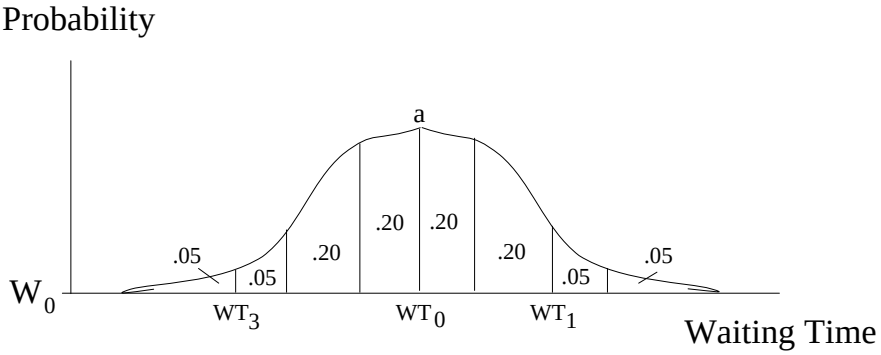


Figure 3.2:

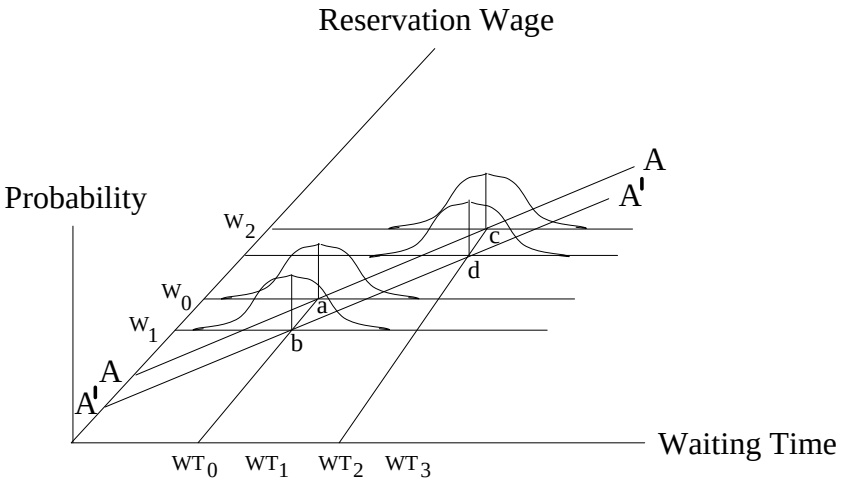


The unit area under the curve in Figure 3.2 is divided into regions. The probability that the waiting time will be between the boundaries of each region along the horizontal axis is equal to the area of that region as a fraction of unity.

Now suppose that the central bank reduces the money supply, or that the demand for money increases, so that the new full-employment equilibrium

nominal wage rate becomes W_1 in Figure 3.3. A reduction in the price level and all nominal wage rates proportional to the reduction in the money supply or increase in the demand for money must ultimately occur, with the real wage rate remaining constant. If everyone in the economy knows what has happened. Workers' new probability distribution of waiting times at nominal wage rate W_1 is given by the probability density function centered at point b.

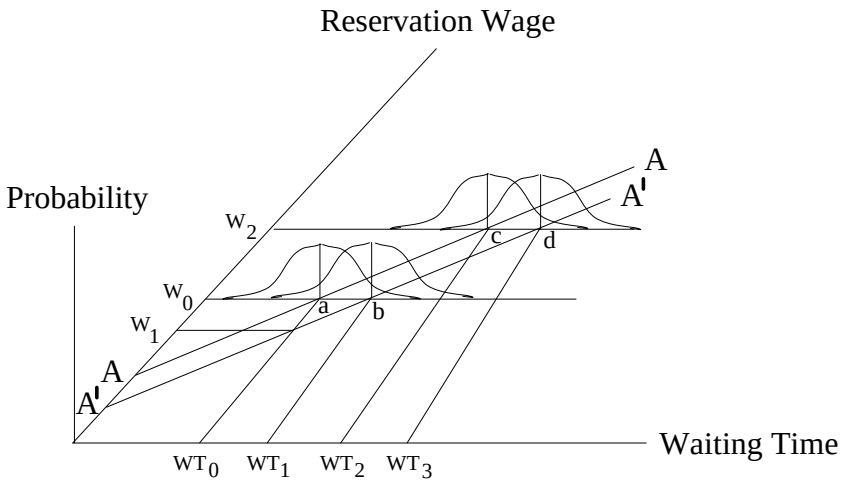
Figure 3.3:



Since workers know what is happening, it is in their interest to reduce their reservation wage to W_1—given the proportional fall in the price level, their real wage rate will remain constant at that point. Average waiting time will remain at WT_0 and unemployment will remain at its natural or "full-employment" level.

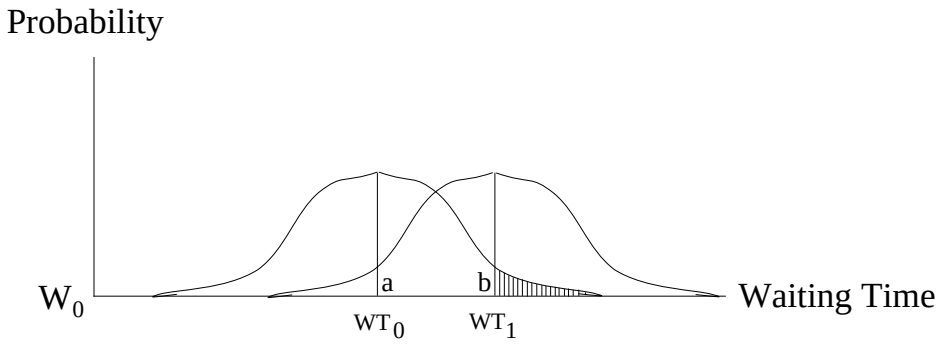
Now suppose that workers do not know that monetary conditions have tightened and the new full-employment equilibrium wage rate has fallen to W_1. In the absence of any knowledge that things have changed, they maintain their reservation wage rate at W_0. At that reservation wage rate, the probability distribution of waiting times has shifted to the right to the one centered on point b in Figure 3.4. As a result, the average waiting time of workers before finding jobs will rise to WT_1. And unemployment will rise above its natural rate.

Figure 3.4:



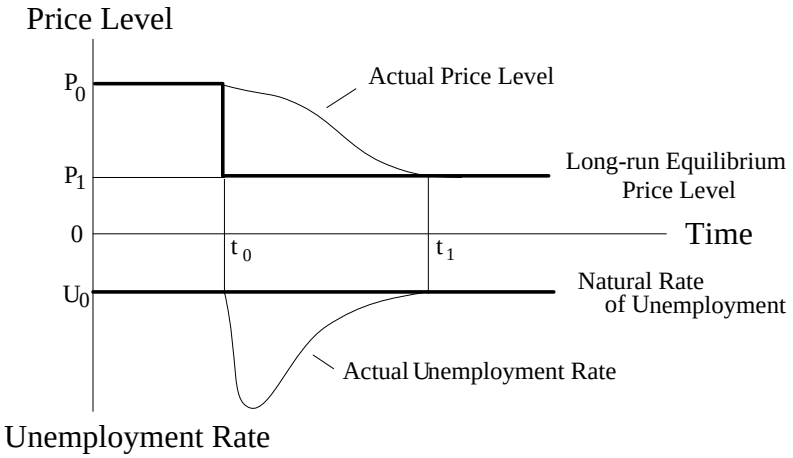
As this happens workers will observe that it is taking them longer to find jobs than they expected. But until the problem has persisted for some time, they will have no way of knowing that the higher waiting time is not a low-probability event that, as shown by the shaded area in Figure 3.5, would have, say, a 10 percent chance of occurring at unchanged aggregate demand and mean waiting time. Only after higher waiting times have persisted for some time will workers realize that the decline in aggregate demand has occurred. Once they realize this, they will reduce their reservation wage to W_1 and average waiting time and the unemployment rate will return to their equilibrium levels. Unemployment—i.e., a rise of the unemployment rate above its natural level—thus occurs as a result of shifts in aggregate demand that take workers by surprise. Once they realize the extent of any aggregate demand shift they will adjust nominal, and hence, real wages to levels consistent with normal waiting times to find jobs. And the unemployment rate will then return to its natural level.

Figure 3.5:



The time-path of adjustment of the unemployment rate and price level to a decline in nominal aggregate demand is illustrated in Figure 3.6.

Figure 3.6:



Similarly, unexpected positive shocks to aggregate demand will cause the unemployment rate to fall below its natural level.

The above analysis provides a very good explanation of observed fluctuations in the unemployment rate as the economy goes through periods of boom and bust. But it leaves important details unaddressed. It does not explain why firms actually lay off workers. Nor does it explain why workers quit their jobs more frequently in boom periods when wages are rising and desperately hang onto jobs in recessions when wages are declining.

The question arises as to what determines the natural rate of unemployment. One obvious factor is the degree of labour turnover in the economy. A faster rate of technological change, for example, will require more frequent displacement of workers from old-technology jobs and their movement to jobs using new technology. A second is the government's policy with respect to unemployment insurance. If there is generous public provision of unemployment insurance it will be less costly for workers to be unemployed and they will have less incentive to find jobs quickly. They will be inclined to set their reservation wages higher and expect to take longer to find jobs with the result that the natural rate of unemployment will increase.

4. A Contract Theory of Layoffs and Unemployment

While the previous theoretical sketches explain many common features of cyclical unemployment they give us no understanding of why firms lay workers off in recessions and refuse to hire people willing to work at or below the wages currently being paid. We now develop a contract theory that will explain this phenomenon. Our theory will contain relevant features of the several contract theories that have been devised by economists during the past three decades.

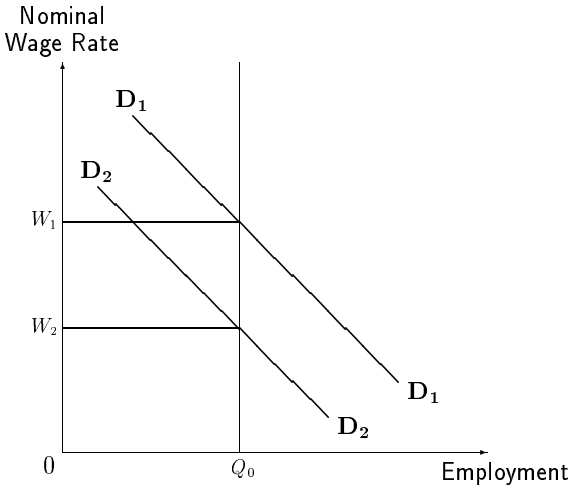
Most workers have large fractions of their wealth invested in their human skills, making their wealth portfolios highly undiversified, and will therefore pay a price in terms of lower wages to achieve income stability. The owners of firms, on the other hand, have ample opportunity to diversify their wealth-holdings across a wide portfolio of assets. The owners of firms can therefore gain by absorbing increased variability of profits, which they can diversify away by holding a wide variety of assets, in return for maintaining stable levels of employment at steady but sufficiently lower wages to achieve higher long-run average profit levels. And workers can thereby achieve security in return for accepting lower wages.

The security workers buy in this way will frequently extend well beyond the mere stabilization of wages across booms and recessions, encompassing

pension plans, paid sick leave, medical insurance, and so forth.

These contracts between workers and firms are implicit ones, often called quasi-contracts, enforced not by courts of law but by the needs of firms to maintain their reputations. They are designed to protect workers against a wide variety of unforeseen shocks such as obsolescence of skills, not just cyclical changes in demand. Only when the survival of the firm is in jeopardy will layoffs in violation of the the terms of the contract be widely perceived as justified.

Figure 4.1:

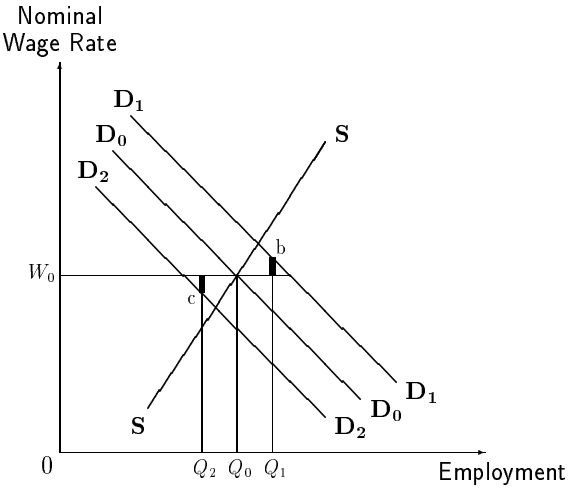


These implicit contracts are based on real wages. A well-known and fully anticipated downward shock to aggregate demand that lowers equilibrium nominal wages and prices in the economy by 10 percent will cause an immediate 10 percent downward adjustment of nominal wages with the agreement of all concerned. The situation for typical firm is shown in Figure 4.1. Due to a shift in aggregate demand in the economy as a whole the firm's demand for labour shifts from D_1D_1 to D_2D_2. Nominal wages fall immediately from W_1 to W_2 with employment unchanged.

Problems arise when economy-wide changes in aggregate demand are perceived either as temporary economy-wide changes or temporary firm-specific changes. Firms have contractual reasons not to make wage adjustments in response to these shifts. Analysis can proceed with reference

to Figure 4.2. Suppose that demand shifts alternately between D_1D_1 and D_2D_2. The firm will hold wage rates constant at some average level W_0 reflecting the average level of demand and vary employment between Q_1 and Q_2. Were the firm to vary wages, workers would vary employment offered along the supply curve SS. This supply curve is drawn with the understanding that all other firms in the industry, and the whole economy, would be making the same wage adjustments in response to the same shocks to their demand curves for labour.

Figure 4.2:



Instead of varying wages, however, the firm adjusts employment by laying off and rehiring workers at a fixed wage rate reflecting its estimate of long-term market conditions. As a result the value marginal product of labour, measured by the distance between the demand curve and the horizontal axis, is below the wage rate in periods of slack demand and above it in periods of excessive demand, as shown by the thick line-segments at points c and b. A crucial part of the argument is that workers are indexed along the horizontal axis by seniority, starting with the most senior worker at the origin with increasingly less senior ones out along the axis to the right. As the firm varies employment between Q_1 and Q_2 less senior workers are layed off first and rehired last. The firm could increase its current-period profits by hiring less workers than Q_2 in bad times and more workers than

Q_1 in good times. But this would in fact lower its long-run profits because it would then have to pay a wage rate above W_0 to compensate its workers for the greater uncertainty of income and employment.

The contract theory just developed explains why firms lay off workers in recessions. Even if everyone knows that the level of nominal aggregate demand is below normal, it pays for layoffs to occur instead of wage cuts to provide income stability for the more senior workers. And in periods when aggregate demand is temporarily high, it pays firms to maintain wage stability, rehiring workers that they had layed off in previous slack periods or hiring new workers who will accept the current wage in order to build up seniority. Under the contract theory, employment will fluctuate around its natural level when aggregate demand fluctuates even if the state of aggregate demand is always known.

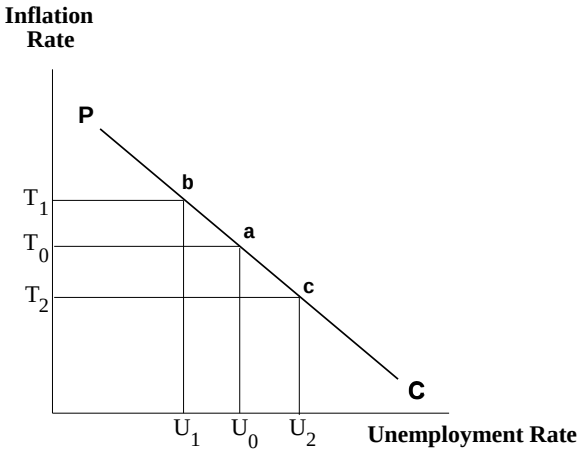
It should now be obvious that the contract theory explains why workers do not quit their jobs in recessions. Moves between jobs occur in boom periods when firms are hiring.

When there is a permanent change in the equilibrium rate of inflation in the economy, the time path of nominal wages will respond immediately when the change is known and there are quasi-contracts between firms and workers because there is no incentive to delay the path of nominal adjustment. But with union contracts that are in writing there may be an incentive on the part of one or both parties to not renegotiate previously agreed-upon multi-year wage rate provisions.

5. The Phillips Curve

This topic focuses on the so-called Phillips curve trade-off between inflation and unemployment. Although Phillips' original paper related the rate of growth of nominal wage rates to the unemployment rate, it has become customary to express the Phillips curve as a relationship between the inflation rate and the unemployment rate, as shown by the curve *PC* in Figure 5.1.

Figure 5.1:



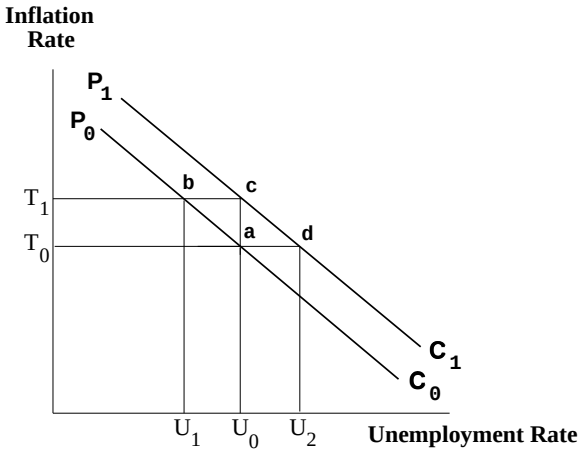
An unexpected expansion of the nominal money supply or decline in the demand for money will increase the long-run equilibrium price level. Workers and firms, unaware that the aggregate demand for output has increased, will increase wages and prices by less than will be required for equilibrium to be achieved. Output and employment will increase above their natural levels. As long as some price level response to the increase in aggregate demand occurs, the rate of inflation will increase as the unemployment rate declines.

In the 1960s and early 1970s many economists believed that society faced a tradeoff between inflation and unemployment—by creating a higher inflation rate the authorities could engineer a reduction in the unemployment rate. But obtaining a long-run reduction the unemployment by generating a higher inflation rate is an illusion. Once workers and firms realize that the equilibrium rate of inflation has increased they will increase wages and prices by that equilibrium amount and the natural level of employment will be continuously reestablished.

To reduce the unemployment rate beyond the short-run the authorities have to create a further increase in the inflation rate whenever wage and price setters come to anticipate the last increase, and then further again escalate the inflation rate when that increase has become fully anticipated, and so forth. But this too will fail because wage and price setters will come to realize that the government is increasing the equilibrium rate of inflation rate at an accelerating rate and, respond with an equivalent acceleration in

the rate at which they increase wages and prices.

Figure 5.2:



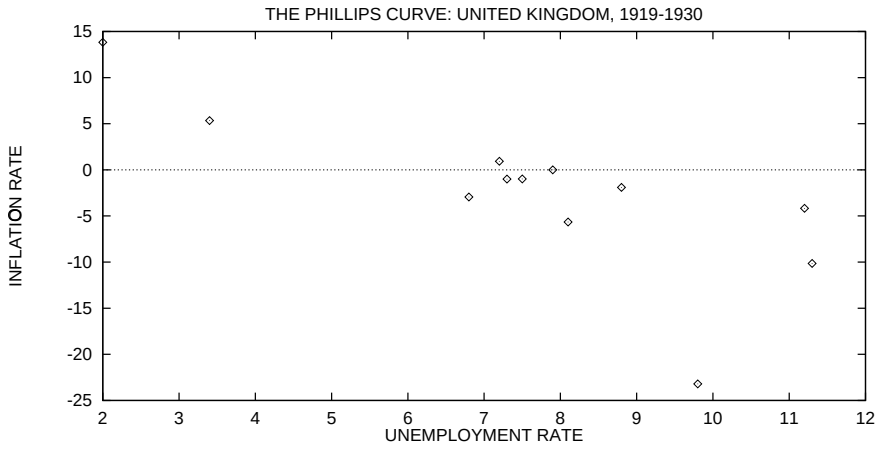
The situation is analyzed in Figure 5.2. Suppose that the authorities increase the inflation rate from T_0 to T_1 and maintain it there. At first workers and firms, not realizing how much the equilibrium inflation rate has risen, increase wages and prices by too little, with the result that the unemployment rate falls to U_1 at point b. As time passes and wage and price setters realize what is happening, however, they appropriately increase wages and the unemployment rate returns to U_0 at the maintained inflation rate T_1 as indicated by point c. The long-run result is an increase in the inflation rate with no reduction in unemployment.

The level of the Phillips curve thus depends on the expected rate of inflation. When the expected rate of inflation rises from T_0 to T_1 the curve shifts up from P_0C_0 to P_1C_1. The natural rate of unemployment U_0 is then associated with the higher equilibrium inflation rate T_1. The government can temporarily reduce the unemployment rate along this new Phillips curve by unexpectedly increasing the equilibrium rate of inflation, but as soon as workers and firms realize what has happened the Phillips curve will again shift up and the unemployment rate will return to U_0.

Though government policy makers face a short-run tradeoff between inflation and unemployment, any attempt to exploit it will ultimately result

in a permanent increase in the inflation rate. Moreover, once that permanent increase in the inflation rate has occurred, the government will only be able to eliminate it at the cost of an increase in unemployment above the natural rate. Suppose the government lowers the equilibrium inflation rate from T_1 to T_0 in Figure 5.2. Until workers and firms realize what has happened the unemployment rate will rise to U_2 at point d. The authorities could prevent this increase in unemployment if they could convince workers that they really are going to lower the equilibrium inflation rate to T_0. But the government has an incentive to lie to wage and price setters. If it can convince them that it is going to lower the equilibrium inflation rate to T_0 so that the Phillips curve shifts down to P_0C_0, and then renege on that commitment, the political party in power will take credit for a reduction of the unemployment rate from U_0 to U_1. Such deception can be irresistible when the next election is in sight. Because of the problem of credibility, it turns out to be very difficult for governments to reduce their countries' inflation rates without causing temporary increases in unemployment rates.

Figure 5.3:



In concluding this topic we examine some of the evidence on the Phillips curve. Figure 5.3 shows a clear Phillips curve for Great Britain during the period 1919-1930, and Figure 5.4 shows a somewhat less tight relationship

between the inflation rate and unemployment rate in that country for the period 1986-1997.

Figure 5.4:

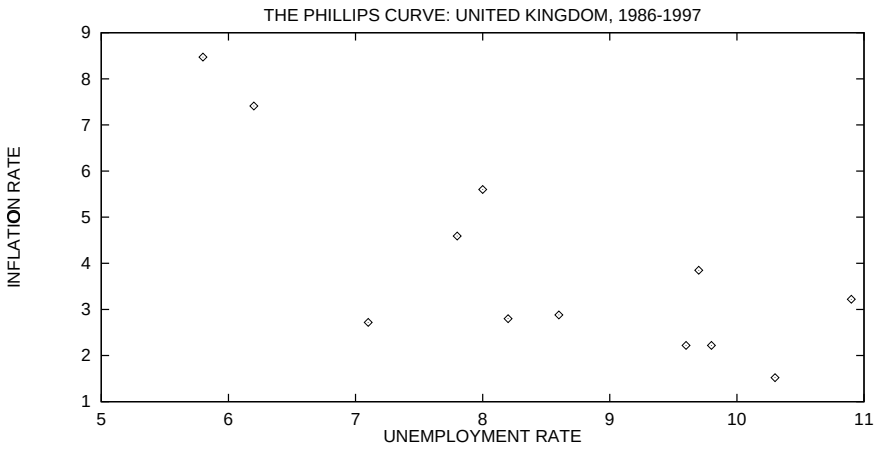


Figure 5.5:

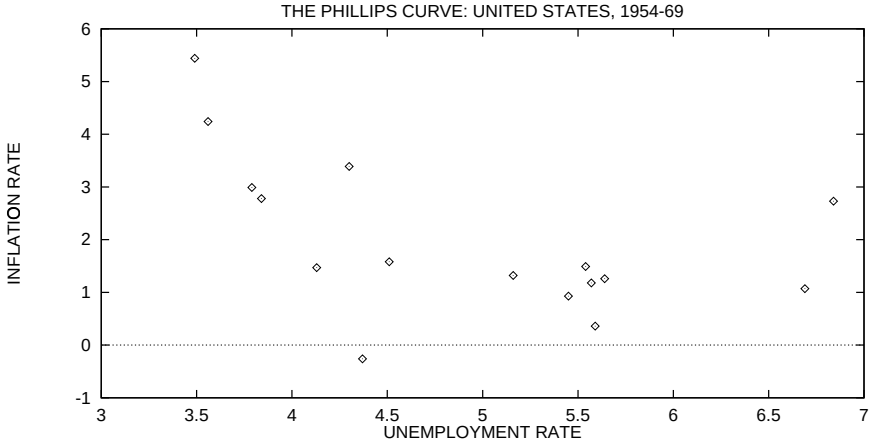


Figure 5.6:

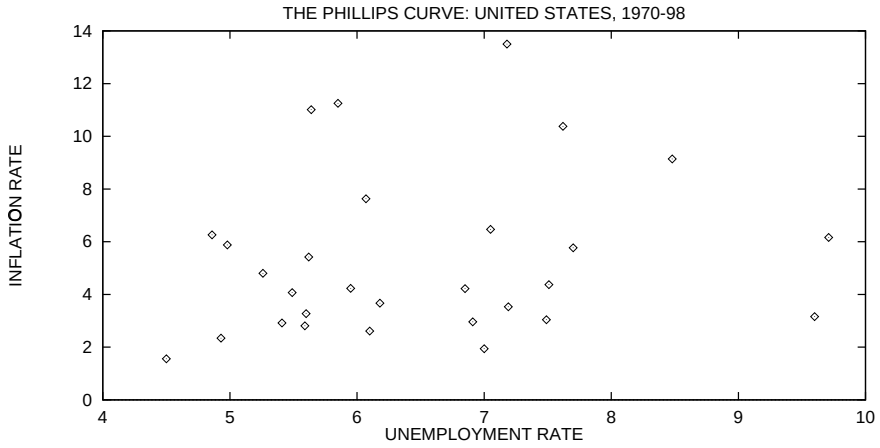
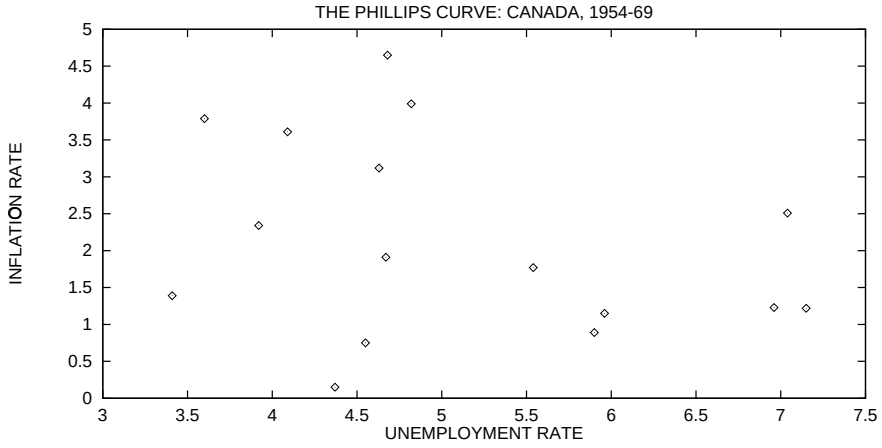


Figure 5.7:

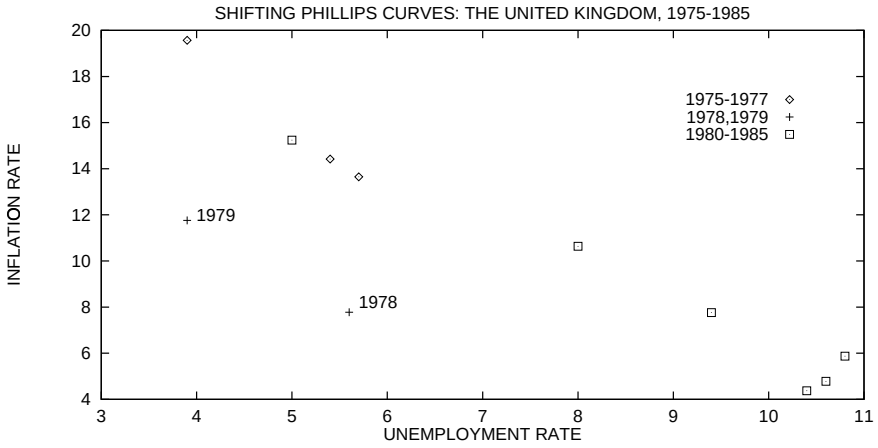


While a fairly clear Phillips-curve relationship for the U.S. for the years 1954-1969 appears in Figure 5.5, there is no obvious negative relationship between the inflation and unemployment rates in the period 1970-1998 for the U.S. in Figure 5.6. It would seem that the Phillips curve shifted upward

in response to the rise in the inflation rate in the 1970s and then back down again when the inflation rate declined in the 1980s.

And for Canada we cannot observe a very coherent Phillips curve even in the period 1954-69, as shown in Figure 5.7. Here the situation may have been complicated by shifts in the natural rate of unemployment because the actual (and hence, presumably, the expected) inflation rate did not vary much over the period. Finally, the data for Great Britain for the period 1975-85 are particularly interesting. As shown in Figure 5.8, the inflation-rate, unemployment-rate combinations for the years 1975-77 and 1980-85 seem to lie on the same Phillips curve. The two years 1978 and 1979 are outliers which suggest that wage and price setters were temporarily fooled by the abortive 1977 inflation reduction effort (undertaken in connection with a loan from the International Monetary Fund) into believing that the high inflation rate would decline.

Figure 5.8:



6. Efficiency Wages: Insiders and Outsiders

We end this module with a brief review of two other theories of wage rigidity—*efficiency wage* theories and *insider-outsider* theories.

Efficiency wage theory arises from the observation that workers will work harder when firms pay them wages in excess of market levels. If all firms pay above-market wages and refuse to hire workers for less, wage rates in the economy will be above market-clearing levels and unemployment will result.

Firms fix the wage rate independently of the reservation wages of workers because of the assumed production function:

$$Y = F[e(w)n] \tag{1}$$

where Y is output, $e(w)$ is effort per worker as an increasing function of the real wage rate w and n is the quantity of labour employed—$e(w)n$, total effort, is the single variable input in the production function.

To maximize its profits the firm must maximize the excess of output over the variable cost of producing it, the fixed cost of employing capital being constant. This profit function can be written

$$x = F[e(w)n] - wn \tag{2}$$

where x is is the excess of revenue over marginal cost. To maximize its profits the firm must choose the levels of w and n for which x is a maximum—these levels will be those for which the changes in x resulting from small changes in either w or n will be zero.

Taking the partial derivatives of x with respect to n and setting it equal to zero we obtain[2]

$$F'[e(w)n]e(w) - w = 0 \tag{3}$$

which can be reorganized to yield

$$F'[e(w)n] = w/e(w). \tag{4}$$

And taking the partial derivative of x with respect to w and setting it equal to zero we obtain

[2]For students who have difficulty with calculus, an intuitive argument is also presented.

$$F'[e(w)n]ne'(w) - n = 0 \tag{5}$$

Dividing both sides by n and rearranging the terms, we can convert this expression into

$$F'[e(w)n]e'(w) = 1. \tag{6}$$

Profit maximization requires that both (4) and (6) hold simultaneously. Substituting (4) into (6) to eliminate $F'[e(w)n]$, we obtain

$$we'(w)/e(w) = 1. \tag{7}$$

The basis for this result—called the Solow condition—can be seen intuitively. For any initial number of workers hired, it always pays the firm to increase the wage rate if the resultant percentage increase in effort exceeds the percentage increase in the wage—this will mean that effort per dollar spent is increasing or, alternatively, that cost per unit of effort is falling. Any given level of output can then be produced with fewer workers and at lower cost. On the other hand, if the resulting percentage increase in the level of effort is less than the percentage increase in the real wage it will pay the firm to reduce the wage, the reduction in labour cost being greater than the decline in the value of output produced.

Accordingly, the firm will set the wage rate at that level for which a tiny percentage increase in the real wage will induce an equal percentage increase in worker-effort. Thus, in equilibrium,

$$de/e = dw/w, \tag{8}$$

which implies[3]

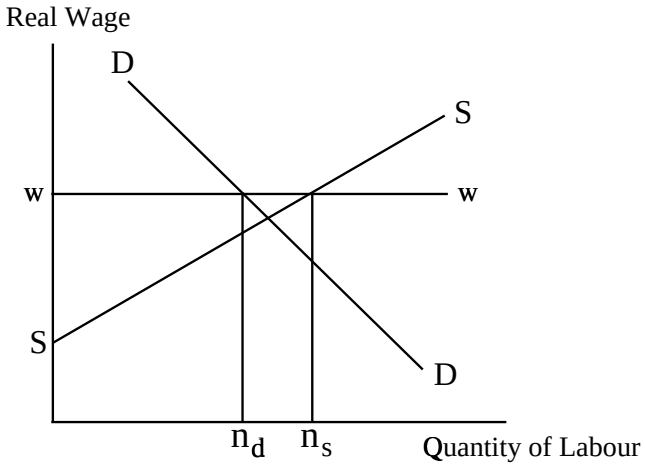
$$de/dw\ w/e = 1. \tag{9}$$

After choosing the wage rate for which this Solow condition holds, the firm will choose the number of workers for which the marginal value of output produced will equal the real wage rate. The wage rate will thus be set independently of the level of employment although the level of employment subsequently chosen will depend on the real wage rate.

[3]This is identical with (6) because $de/dw = e'(w)$ and $e = e(w)$.

An important implication of this can be seen with reference to Figure 6.1. At the profit maximizing wage rate ww there is equilibrium unemployment in the economy. Although there is no reason why the optimal quantity of labour demanded by firms at the profit maximizing wage need be less than workers are willing to supply, nothing rules out permanent unemployment.

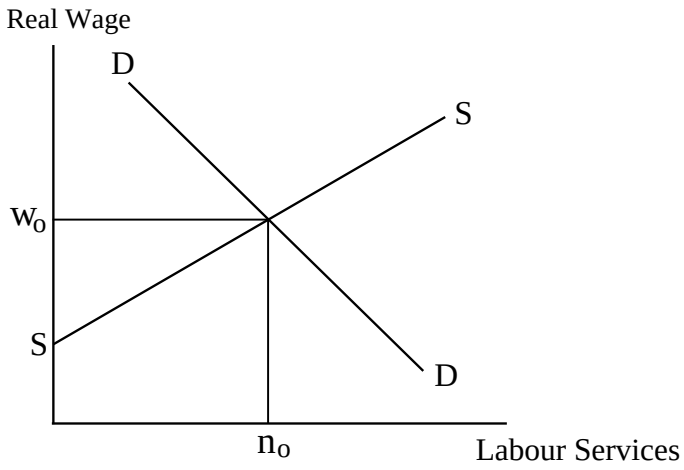
Figure 6.1:



This seemingly pathbreaking result follows from two very restrictive assumptions of the model. First, the function $e(w)$ relating effort to the wage rate is defined independently of socio-economic conditions. If worker-effort depends on economic conditions, why would workers choose wage-effort combinations that leave them permanently unemployed? Second, the assumption that all that matters in production is total labour effort, regardless of the number of units of labour generating that effort, is also very restrictive.

Moreover, in many industries in an economy firms can monitor worker effort and make explicit or implicit contracts with workers to each deliver a specific quantity of effort at a specific wage. This would mean that wages would be set along a quality-of-work adjusted labour supply curve as shown in Figure 6.2. This supply curve reflects the quantity of labour services delivered. And any given quantity of labour services indicated along the curve will be associated with a particular number of workers who happen to be supplying those services. Anyone who wishes to supply labour services at the wage offered per unit of service can obtain employment.

Figure 6.2:



Some firms will find it profitable to pay higher-than-average wages and demand correspondingly higher-than-average effort. This will enable them to select workers of above-average quality. Other firms will find it profitable to operate with lower-quality labour.

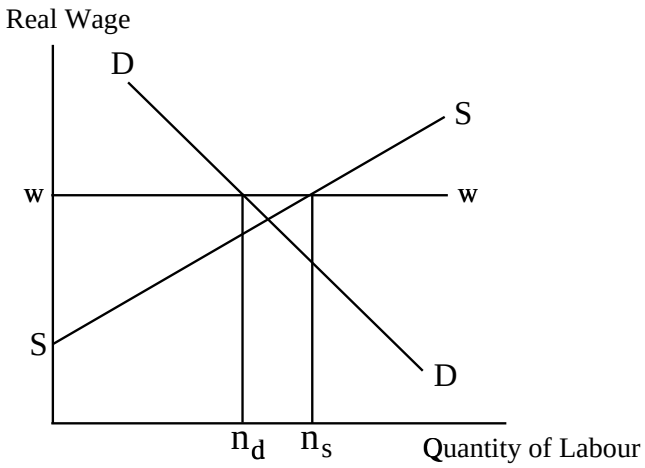
At worst, the efficiency-wage model in Figure 6.1 would apply only to certain industries in any economy. If fewer workers obtain jobs in those industries than want to work at the wages offered, the displaced workers will go to other industries and bid down wages there. Aggregate unemployment thus need not occur and Figure 6.2 will remain an adequate representation of the market for labour in the economy as a whole.

Like efficiency wages, insider-outsider theories can give useful insights into employment in particular firms and industries but provide little basis for economy-wide unemployment. In topic four above we noted that it is in the interest of firms to guarantee wage and employment stability to senior workers. Workers will accept lower wages in return for job security. It is also the case that currently employed workers are worth more to a firm at any given wage than new hires without in-firm experience. This is because the firm has had an opportunity to evaluate and train its current employees and to weed out incompetents.

Given that workers currently inside the firm are worth more to it than those outside, they can attempt to capture these rents by demanding benefits in excess of the wage that would be paid to new hires from the outside. These insiders can demand higher wages and restrict employment to equivalently

raise their marginal products by refusing to work cooperatively with new workers hired from the outside. According to the insider-outsider theory, this will cause wages offered by the firm to be permanently above the market-clearing level—there will be outsiders willing to work at the going wage that the firm will refuse to hire. Generalized across the whole economy, this will result in the labour market situation illustrated by Figure 6.3. There will be permanent unemployment.

Figure 6.3:



The problem with this theory is that, while it could easily apply to specific firms and industries in an economy, it is hard to imagine that every sector of the economy can be represented in this fashion. In many occupations, especially those requiring little skill, the competence of a worker can be evaluated very quickly and established workers can be rewarded by a small raise after a short time on the job. To the extent that there are industries to which the insider-outsider theory does not apply, workers banned from elsewhere by insiders will simply bid down wages in these industries. Although there will be more people willing to work in industries dominated by insiders than jobs provided, everyone who wants a job will be able to find one somewhere in the economy.

The notion of insiders vs. outsiders can be extended to the political sphere. Workers having political influence can be thought of as insiders who are able to lobby governments for policies that discriminate in their

favor against less skilled and influential workers, the outsiders. One example of this is pressures by skilled workers for minimum wage legislation. A minimum wage above the going wage of unskilled workers will price them out of the labour market, increasing the demand for and wages of skilled workers who are competitors for the same work.

Another example is the concern by affluent wage-earners in the developed industrial countries over the use of child labour in less developed countries. A law preventing importation of goods produced with child labour deprives children in poor countries of their best opportunity to earn income, forcing them onto the street to beg and shine tourists' shoes. At the same time, the elimination of competition from cheap foreign goods raises wages of skilled workers in advanced countries.

Of course, government policies that create aggregate unemployment cannot be blamed entirely on the activities of insiders in the labour market. Many well-meaning but misinformed people support such policies.

Study Questions

True or false? Explain your answer.

1. A permanent reduction of the fraction of unemployed individuals who find jobs each period will result in a permanent increase in the unemployment rate.

2. The payment of efficiency wages by some firms in the economy will result in an increase in the country's unemployment rate.

3. Unionization of workers causes unemployment.

4. The contract theory of unemployment is more consistent with the observed facts than either the auction theory or the search theory.

5. A negative Phillips curve relationship between the unemployment rate and the inflation rate cannot occur in the long run.

6. The natural rate of unemployment is independent of domestic economic policy.

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Knut Sydsaeter and Peter J. Hammond, *Mathematics for Economic Analysis*, Prentice Hall, 1995, p. 145 and pp. 503-505 and earlier material as required.

N. Gregory Mankiw, *Macroeconomics*, 1992, 1994 or 1997 edition, Worth Publishers, Chapter 5. (Be careful with Mankiw's argument about the effects of unions on unemployment because it ignores the fact that workers displaced from the unionized sector of an economy will obtain jobs in the non-unionized sector by bidding down wage rates there. Also, Mankiw shows you how to answer the first study question.)

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