SPANISH INDUSTRIAL UNEMPLOYMENT: SOME EXPLANATORY FACTORS (*)

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ABSTRACT

This paper tries to review the evidence of the last twenty years about the main variables that configurate the labour market in Industry and attempts an explanation of the substantial increase in unemployment that has occurred during the period. We have also been able to identify the NAIRU's for the broad periods 1966-72 (before the first oil crisis), 1973-79 (during the first oil crisis) and 1980-84 (during the second oil crisis). During the second period actual unemployment is found to be well below the NAIRU, inducing a rise in inflation, while in the last period actual and equilibrium unemployment are found to be about the same.

1. Introduction

The high level of unemployment is arguably the worst feature of the recent evolution of the Spanish economy. In 1970 the overall unemployment rate stood at 1 per cent of the civilian labour force;in 1984 it is estimated to have gone over the 20 per cent level.This is a substantial increase which has no parallel in any European country. Between 1970 and 1983 the average unemployment rate in the EEC rose by 8.6 percentage points, while over the same period the increase in Spain was of 17 points.

There is wide agreement among Spanish economists that these figures may be overstating the actual extent of the problem. On the one hand, the criteria to define both a labour force participant and an unemployed person differ somewhat from the criteria used in other European countries. On the other, the incidence of the underground economy and of fraudulent practices in unemployment registration may be wider than in most of these countries. Nevertheless, we believe that even taking into account these measurement difficulties, there has been a genuine worsening of the employment situation in Spain relative to that in other western economies.

The purpose of this paper is to review the evidence of the last twenty years about the main variables that configurate the Spanish labour market, and to attempt a preliminary explanation of the increase in unemployment. For the latter task we use the analytical framework recently developed by Layard and Nickell (1984a), and concentrate on those institutional factors that may have influenced the level of unemployment consistent with non-accelarating inflation (NAIRU). The fact that, despite the high levels of unemployment, inflation has continued to be substantial, makes us think that together with the actual rate, the equilibrium unemployment level may have also experienced a significant increase.

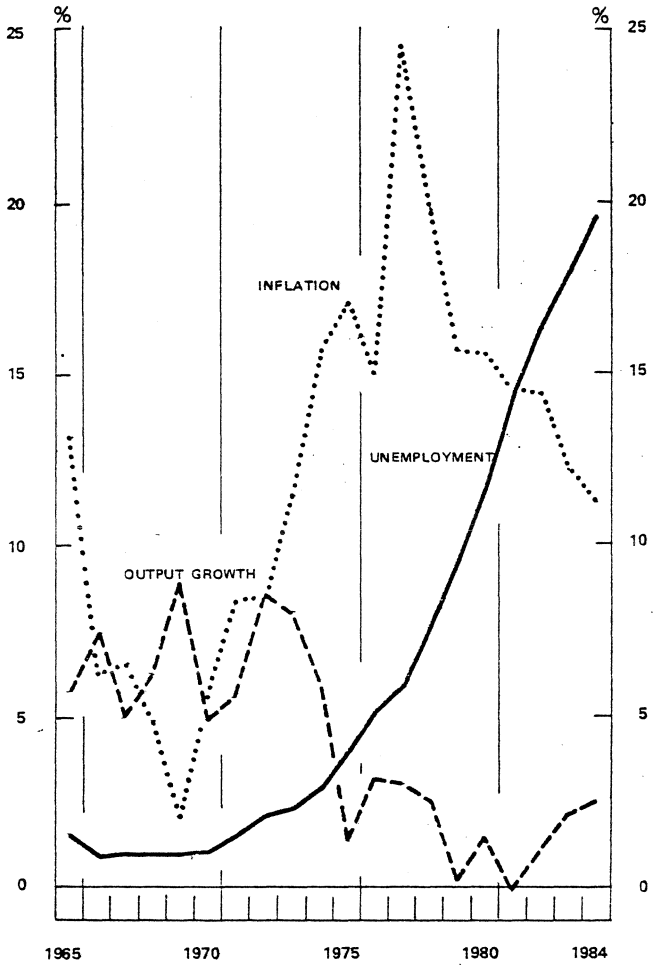
The second section of the paper describes the key facts that we are trying to explain. The third presents the analytical framework that we use, and discusses its theoretical foundations. These are dealt with very briefly, since they are fully explained in Layard and Nickell (1984a). Here we concentrate mostly on the empirical specification and on the description of the variables. The econometric results are presented in the fourth section and the explanation of the unemployment increase is given in the fifth section. The paper ends with a section of conclusions.

2. The facts

Spain's overall economic performance was outstanding during the second half of the sixties and the begining of the seventies, but afterwards has deteriorated substantially. Figure 1 shows the growth of GDP, the rate of inflation and the rate of unemployment during the last twenty

FIGURE 1

GDP GROWTH, INFLATION AND UNEMPLOYMENT



Note: Unemployment: Overall Unemployment Rate of Civilian Labour Force. Inflation: Rate of Growth of CPI. Output Growth: Rate of Growth of GDP.

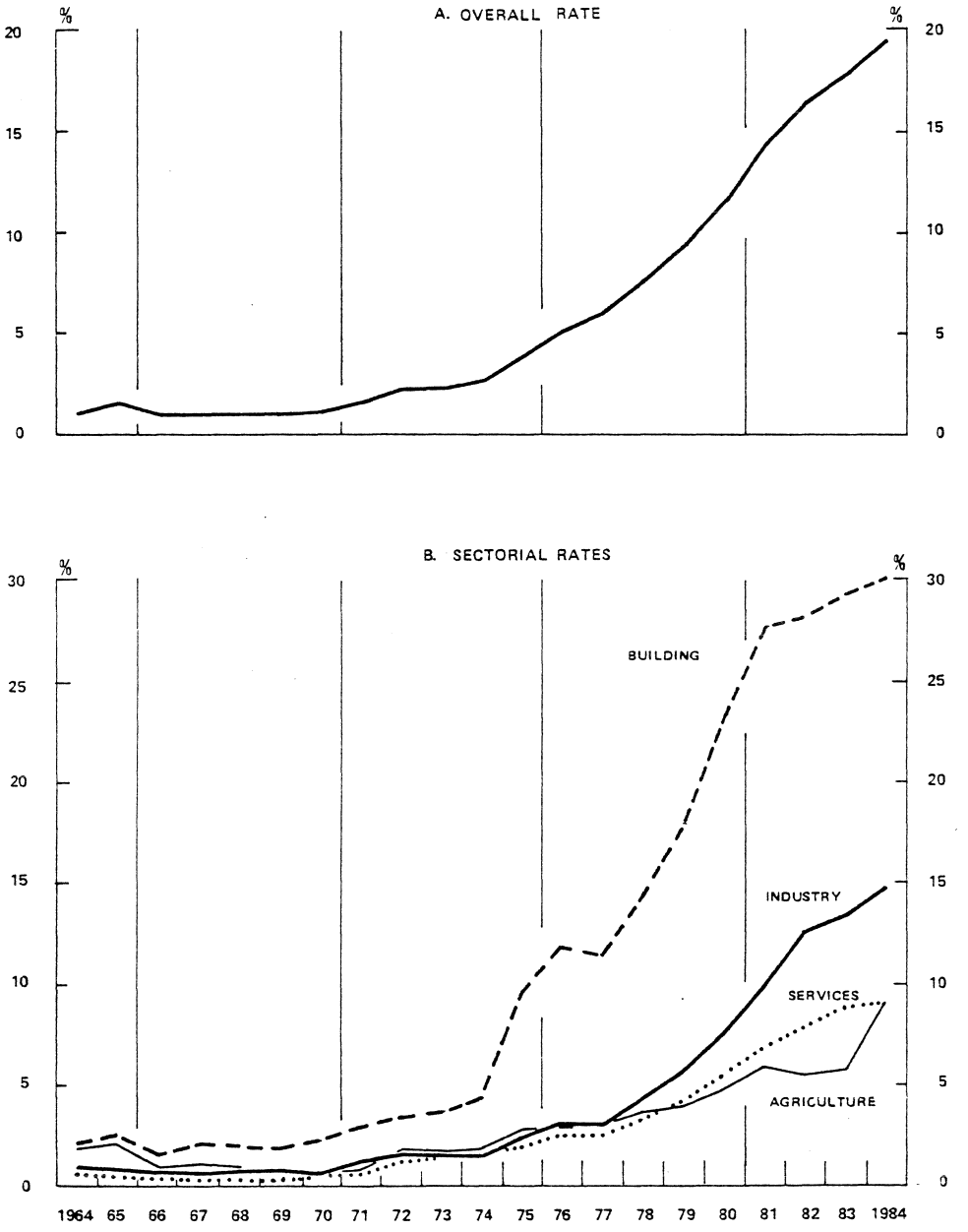
Sources: National Accounts and Bank of Spain.

years. The behaviour of GDP resembles that of other European countries, although the rates of growth during the first ten years of the period were much higher in Spain than elsewhere in Europe. The fall of this rate in 1975, roughly coincides with the general slowdown in economic activity that followed the first increase in the price of oil. The effects of the crisis on GDP are reflected in a decrease of almost 5 points in its average rate of growth. Although real output has managed to keep on growing even in the worst years of the crisis, it has doubtless experienced a severe reduction in relationship with its potential level, since before 1974 the real output was growing on average at more than 8 per cent per year. Inflation has in general run at levels well above those of other European countries, and has proved difficult to curb in the last years of the period, even with widespread unemployment and with very low levels of output growth. Clearly the worst feature of Spain's recent economic performance has been unemployment, which has grown to levels that ten years ago would have seemed unthinkable. We turn now to a more detailed look of this rate, which is going to be the main object of our analysis in this paper.

Figure 2 shows again the evolution of the overall unemployment rate since 1964, and gives details of how the agricultural, industrial, building and service sectors have contributed to this rate. Until 1970 the overall rate was practically stable around the 1 per cent level. From that year onwards it began to show a moderate increase, to reach 2.7 per cent of the labour force in 1974. Since then, the rise has accelerated dramatically, particularly after 1977, and in the fourth quarter of 1984 the unemployment rate was 21.7 per cent; more than twelve times the rate twenty years earlier.

FIGURE 2

UNEMPLOYMENT RATES



Source: Bank of Spain.

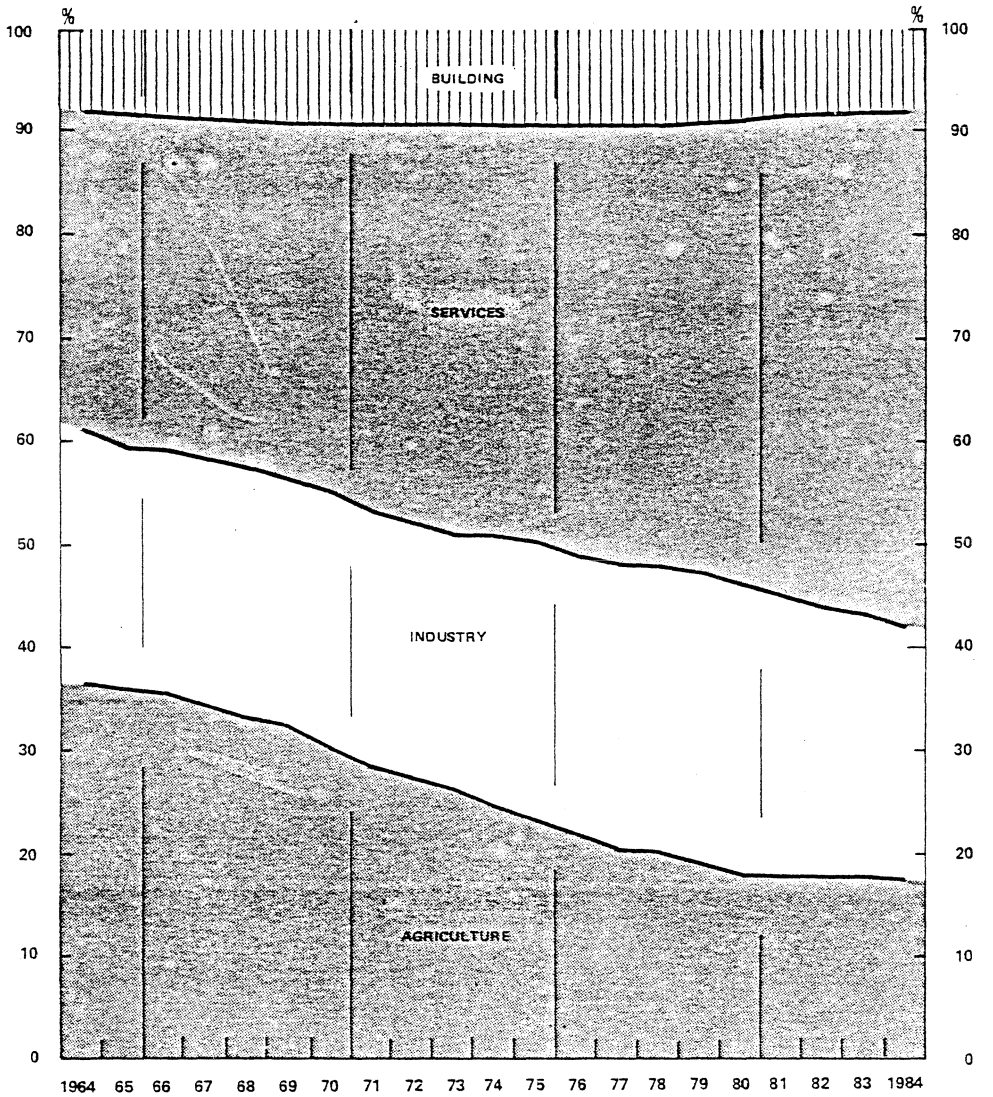
The sectorial rates shown in Panel B of Figure 2 give some idea of the unemployment structure by sector[1]. There was a clear lead in the building sector, where unemployment began to increase markedly in 1975. In the other sectors the change in the trend did not appear until after 1977 but since then, with the exception of Agriculture, unemployment has risen consistently fast in all sectors. There is some deceleration in the rate of growth during the last two or three years. This deceleration hardly shows in the overall rate, but this is due to the substantial increase of unemployed school leavers that has taken place towards the end of the period considered, and which is not taken into account in the sectorial rates.

To see the contribution of these sectorial rates to overall unemployment, it is interesting to consider the change that the Spanish occupational structure has experienced during the last twenty years. As Figure 3 shows, the share of Building and Industry in overall employment has remained more or less constant. That of Agriculture, on the other hand, has gone down dramatically, the fall being completely absorbed by Services. In 1964 agricultural employment represented a 36.5 per cent of total employment, while employment in Services was 31 per cent. In 1984, the shares were 17.6 and 49.0 per cent respectively. This is, by any stantard, a major structural change, which differentiates
Spain from other European countries, and which could have had an influence on the overall unemployment rate.

Another way of looking at these changes in the Spanish industrial structure is to see how employment has grown in the different sectors. Figure 4 shows in Panel A the evolution of the overall employment index, and in Panel B the evolution of employment in the four sectors

FIGURE 3

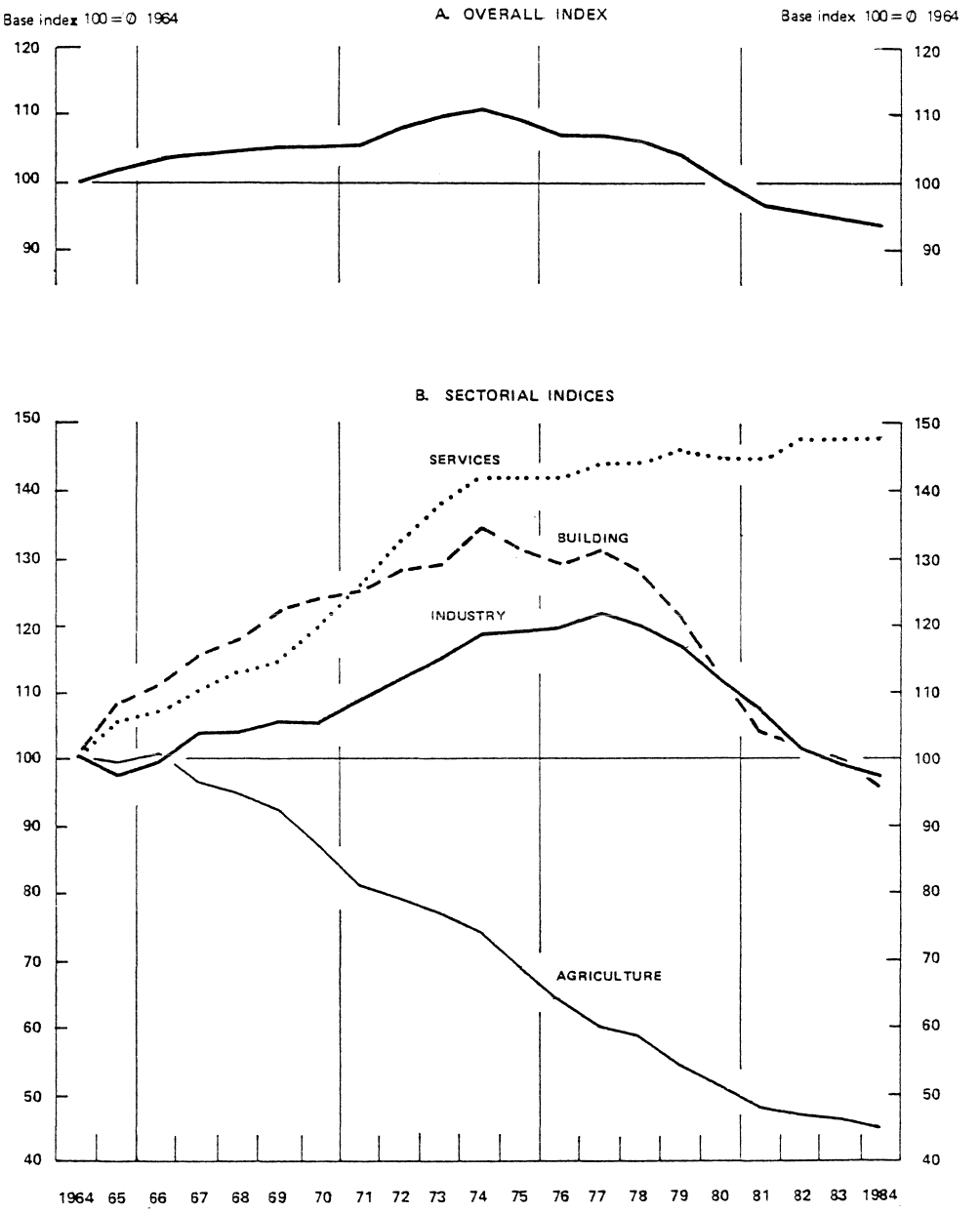
EMPLOYMENT STRUCTURE



Source: Bank of Spain.

FIGURE 4

EMPLOYMENT INDICES



Source: Bank of Spain.

considered. Overall employment grew until 1974 and has steadily fallen since then. In 1984 it is estimated to be 66.3 per cent less than in 1964. As Panel B shows, the only sector that has kept expanding is Services, although after 1974 at a much lower rate than before. Building began its descending trend also in that year, and Industry kept rising until 1977 but after then fell to levels of employment below those in 1964. Agriculture is a case apart, and its almost monotonic fall during the period is just the manifestation of the deep structural change that the Spanish economy has undergone recently.

We will somewhat abstract from these structural changes by concentrating our atention to only the Industrial sector. This is a choice dictated upon us by data availability. Even for Industry it is impossible to go back before 1964 and to obtain reliable annual series of most of the variables of interest. For other sectors, the poor quality of the data, if not its outright absence, prevent any statistical analysis with a minimum hope of rigour(2). By concentrating on the Industrial sector we will also be able to compare some of our estimates with other results that have been obtained by independent research, and thus be able to evaluate more confidently the meaning of our findings(3).

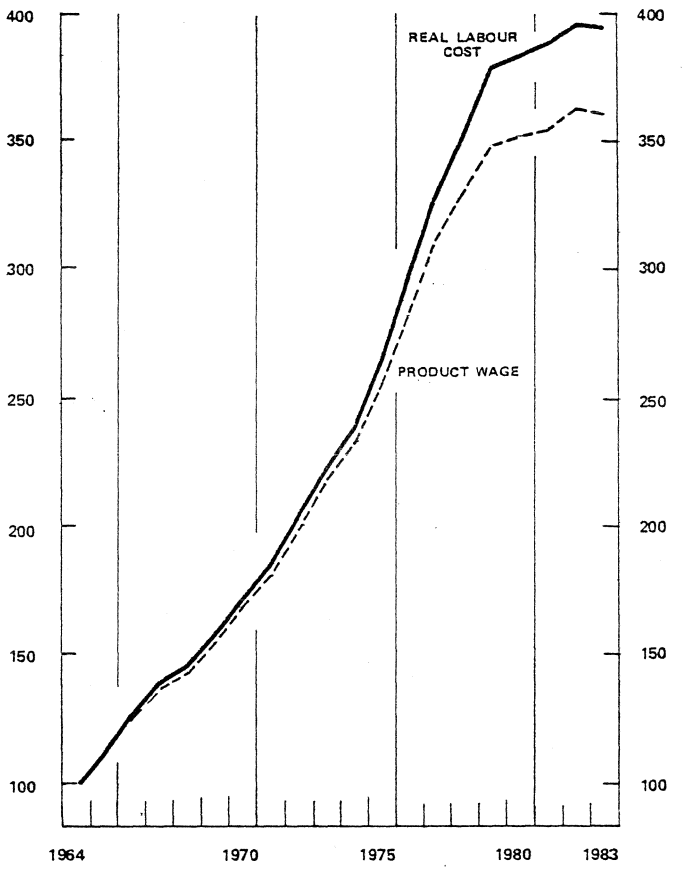
The cost of labour has increased substantially in Spanish industry, and this could be one of the reasons behind the huge rise in unemployment. It is therefore important to look at this issue in detail. There are two dimensions of interest. First, the cost of this producttive factor as seen by the employer. This amounts not only to the gross wage paid to the worker relative to the price of the goods produced -<u>the product wage</u>- but also to the employer

contributions to Social Security and other compulsory schemes. If in addition to the product wage we consider these contributions we have what is known as the real labour cost. Figure 5 presents the evolution of theses two concepts in Spanish industry. Clearly there has been a important rise in real labour costs (in 1984 they had more than trebled with respect to 1964), and also in social contributions paid by the employer. The growth of these contributions is shown by the gap between the real labour cost and the product wage lines, and its widening shape suggests that they have played a significant role in the rise of labour costs. In 1984 the average employer contribution in industry was 26.0 per cent of gross pay, while in 1964 it was only 15.1 per cent.

The second dimension to consider is the take home pay that the worker receives, as this will matter in his willigness to offer labour, as well as being an important parameter in collective agreements. The worker will first care about the purchasing power of his wage, and this can be approximated by taking from his gross wage the social contributions paid by the employee and by referring this pay to the price of consumption, which we measure by the product price plus indirect taxes[4]. This gives us what is known as the real wage, whose evolution is shown in Figure 6. Since employee contributions represent a small fraction of gross pay and since indirect taxes have been roughly constant over the period, the evolution of the real wage is very similar to that of the product wage considered above. However, the consumption wage, which substracts income taxes from pay and is the closest approximation to what workers can potentially devote to consumption, has increased much less than the real wage, the difference being a representation of the evolution of income taxes. While in 1983 the real wage was 3.46 times higher than in 1964, the

FIGURE 5

REAL LABOUR COST AND PRODUCT WAGE

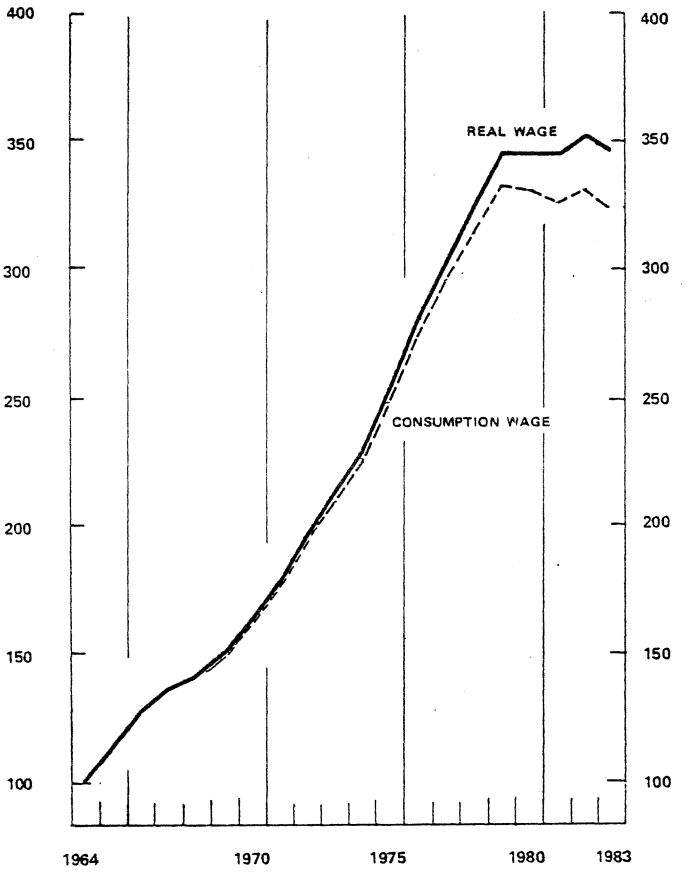


Note: If the product wage is defined as W/P, real labour cost is then defined as $W(1+t_1)/P$, where W is gross pay, P is product price and t_1 is employer's contribution to S.S.

Source: Bank of Spain

FIGURE 6

REAL WAGE AND CONSUMPTION WAGE



Note: The real wage is defined as $[W(1-t_4)/P(1+t_3)]$ where t_4 is employee's contribution to S.S. and t_3, indirect taxes. Consumption wage is defined as $[W(1-t_4)(1-t_2)/P(1+t_3)]$ where t_2 is income tax.

Source: Bank of Spain.

consumption wage was only 3.24 times higher. Direct taxes, which we approximate by labour income tax retentions at the source, represented 1.6 per cent of gross pay in 1964 and have increased to 7.8 per cent of in 1984. This large increase in direct taxation is another important difference with respect to other European countries, which may have played a significant role in wage determination.

Spanish industry has undergone an important process of modernization during the period considered, and it could be argued that most of the increases in labour costs documented above are simply reflecting productivity improvements. This is to some extent true, but we believe that even after taking that into account, labour has recently become a much more expensive factor than it was before. A rough way of accounting for productivity improvements is to consider how real labour costs per unit of output have grown(5). From 1970 until 1982 these increased by 41.6 per cent in Spain, while in Italy (the EEC country with the highest rise) the corresponding index was only 17.5 per cent higher. In other EEC countries the increase was much smaller, and in Denmark and the Netherlands it was even negative. We thus conclude that in comparison with other countries, Spanish industrial labour has become much more expensive than what it was in the sixties, although this must to a certain extent be due to the relatively low level at which these labour costs started.

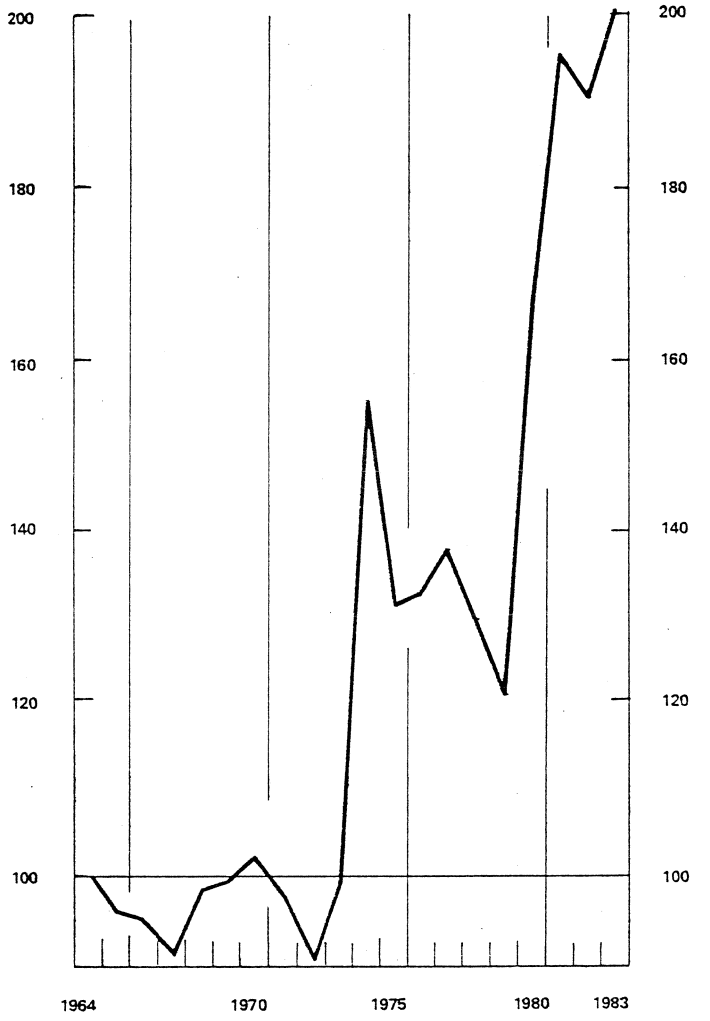
At this stage a few words on the evolution of the institutional functioning of the Spanish labour market may be due. As has been shown in several studies (see e.g. Malo, 1983a,b) the change of political regime has produced a deep alteration in the institutional labour market context. During the 60's and early 70's labour legislation practically

prevented any kind of employment adjustment, due to very large lay-off and firing costs. In the absence of legal trade unions, and since employment changes were almost impossible, firms, which acted in a somewhat monopsonistic fashion, determined pay by adjusting wages around some "efficiency norm". So we have that although quantities almost were fixed, wages tended to be rather flexible. This degree of flexibility may have been reduced with the new regime as a result of the incorporation of trade unions into the bargaining process. This is suggested by the strong increase in the average level of wages and by the reduction in their dispersion across sectors and occupations since 1976, coexisting with employment adjustment costs which have not fallen substantially during the period. It should be mentioned however that these costs have began to fall in the last few years.

While the increase in labour costs is clearly endogenous to the labour market, the increase in the relative price of imported materials, that has also taken place during this period, is to a large extent exogenous. Figure 7 presents the evolution of this relative price during the period, which clearly charts very closely the incidence of the two oil price crises. There are three well differentiated periods. First the period that goes from 1964 to 1973 in which input prices were more or less constant. Second, the period that begins with the first oil price rise which in Spain shows up with a big increase in relative input prices, particularly in 1974, and with some translation of this rise into output prices in the following five years. Despite this rise in output prices, in 1979 the relative price of materials was 21.5 per cent higher than in 1973. Third, the period that goes from 1980 until now, which is dominated by the second oil price shock, and which meant an increase in relative prices of an additional 66.1 per cent

FIGURE 7

RELATIVE IMPORTED INPUT PRICES



Note: Price of imported inputs relative to product price

Source: Bank of Spain

between 1983 and 1979. Overall, in 1983 relative input prices were 100.3 per cent higher than in 1964.

These huge changes in the relative price of labour and other inputs may have also produced a process of accelerated economic obsolescence of capital, which shows up most forcefully in Industry. Some estimates of the stock of capital for that sector show that while between 1964 and 1973 it grew up at an average annual rate of 4.5 per cent, between 1974 and 1978 this rate of growth went down to 3.6 per cent, and between 1979 and 1982 to 1.9 per cent. Thus the squeezed or even negative profit margins experienced by firms may have had serious and durable consequences both on the level of installed capacity and on its potential growth. Since in this paper we take the capital path as given, it is important to consider the effect of economic obsolescence, since otherwise the overestimation of the capital stock could lead to biased results (see Artus, 1985).

We therefore have that in Spain the period under analysis has been characterized by substantial increases in two relative prices: the relative price of labour and the relative price of materials(6). The second has been quite widespread in Europe, but the severity of the first is a rather singular Spanish phenomenon. Both increases could in principle have affected labour demand and thus explain the dramatic upsurge of unemployment in Spain. In the rest of the paper we attempt to consider these factors in the wider context of the labour market and try to evaluate the effect that they, or other possible influences, may have had on the evolution of unemployment.

3. Analytical framework

3.1 Theoretical considerations

The theoretical model is taken from Layard and Nickell (1984a) and consists of three equations: a labour demand equation, a wage equation and a price equation. Probably the best way to go about the description of this model is to start first with the employment and wage equations, and then to introduce the price equation.

The employment and wage equations form together a fairly conventional structural model of the labour market. The main innovations introduced by Layard and Nickell, which we also take into account in our empirical work, are the possibility that cyclical aggregate demand factors enter directly in the employment equation, the specification in level terms of the wage equation, and the much more explicit and detailed consideration of labour demand and supply factors in the wage equation.

The introduction of cyclical demand factors, when output prices are already present in the equation, is justified on the basis of firm behaviour in an imperfect competitive market, which may be the most appropriate characterization for at least some sectors of the economy (see also Bruno, 1979 and Nickell, 1984.) A more general justification is given by price stickiness. To the extent that output prices do not pick up these fluctuations, cyclical demand factors may elicit a direct employment response. This approach conforms better to commonsense than the classical and keynesian views about determination of employment while at the same time encompassing both models in a unique analytical framework.

The specification of the wage equation in level terms is a more general representation of the outcome of wage bargaining than that allowed by a simple first difference specification, which is included as a special case, where the "real wage resistence" model (see Sargan, 1964) is a clear precedent. Also, this formulation enables the model to potentially determine an equilibrium (non-accelerating inflation) level for the real wage. Finally, as specified, the wage equation is consistent with many theories of wage determination. It is consistent with a perfectly competitive market, in which case the factors that will matter most are those that operate through demand and supply. And it is consistent with models of wage determination by firms (Stiglitz, 1984 and Yellen, 1984), by unions or by bargaining between them (Nickell and Andrews, 1983). In these last two cases, in addition to demand and supply factors, outside labour oportunities (as proxied by vacancies or unemployment) will also have a role to play in the wage equation. This encompassing nature of the model is very convenient for us given the institutional changes experienced by the Spanish labour market.

In logarithms, the basic structure of these two equations can be represented as follows.

$$n = -\alpha(w-p) - \beta(p_m-p) + \gamma D + \lambda k + Z \qquad (1)$$

$$(w-p^e) = -\delta(1-n) - \eta(p_m-p) + \rho D + \mu(k-1) + Y \qquad (2)$$

Employment, n, depends negatively on real wages (w-p) and on relative input prices (p_m-p)[7], and positively on a vector of cyclical demand factors, D. Demand for labour is defined for a given stock of capital, k, and under certain assumptions in the long-run it will grow as this stock grows.

Finally, Z is a vector of other demand variables, and all Greek letters are positive parameters. Equations (1) is therefore a fairly standard labour demand equation, in which output has been substituted out, and in which possible direct aggregate demand effects are taken into account[8].

Real wages, defined in terms of the expected price level, are in turn determined by both demand factors - (p_m-p), D and k - and supply factors - l and Y -, where l is the size of the labour force and Y a vector of other supply variables. Factors that raise demand will raise real wages, and factors which raise supply will depress real wages. However, the equation should not be interpreted as a reduced but as a structural form, at least when other variables suggested by wage bargaining models, such as outside labour opportunities -that here we proxy by (l-n)- also enter the model.

Writing the wage equations with actual real wages on the LHS and introducing the price shocks (p^e-p) in the vector Y, we have that equations (1) and (2) determine real wages and employment (or unemployment), given all the other variables in the model. It is interesting, before proceeding with the price equation, to consider in more detail the form of the employment equation. Substituting (2) into (1) we have:

$$n = (1+\alpha\delta)^{-1}[\alpha(\delta+\mu)l+(\lambda-\alpha\mu)k-(\beta-\alpha\mu)(p_m-p)+(\gamma-\alpha\rho)D+(Z-\alpha Y)] \quad (3)$$

Labour force neutrality in the long run requires that unemployment should not depend on the size of the labour force, and this implies that the coefficient on l should be unity, which in turn implies that

$$\mu = 1/\alpha \quad (4)$$

That is, the elasticity of the real wage with respect to the capital labour ratio should be, in absolute terms, the inverse of the wage elasticity in the employment equation.

Stock of capital neutrality in the long run requires that unemployment should be independent of the capital stock, and this implies that the coefficient on k should be zero, or

$$\lambda - \alpha\mu = 0 \qquad (5)$$

That is, the effect of capital on employment via the demand for labour should be compensated by the effect of capital on employment via the wage determination process. Conditions (4) and (5), additionally, imply that $\lambda=1$; that is, that the production function that generates (1) should display constant returns to scale.

Finally, input price neutrality in the long run requires that unemployment should not depend on relative input prices and this implies that the coefficient on $(p_m - p)$ should be zero, or

$$\beta - \alpha\eta = 0 \qquad (6)$$

That is, the effect of input prices on employment via demand should be compensated by the effect of input prices via the wage determination process. In the empirical work of the following section we test whether the data accept these three restrictions.

Should these restrictions be accepted, equation (3) tells us that employment would depend, besides the labour force, on cyclical demand factors, D, and on other, as yet

unspecified,demand and supply factors. This is unsatisfactory because,to the extent that aggregate demand can be controlled by the Government, unemployment could be reduced at will, by simply increasing D[9]. It is therefore more sensible to think of (3) as a relationship that gives pairs of values of n and D that are consistent with labour market equilibrium, but which in itself cannot determine the equilibrium level of employment. For that we need another equation to explain cyclical demand.

Within the context of this model, the only other channel through which demand can exert an influence is through the pricing decisions of the imperfectly competitive firms assumed above. The mark up of prices on costs is determined by cyclical demand, by relative import prices, by the capital-labour ratio and by expectational errors, which in the empirical model below are represented by second-differences on wages[10]. Ignoring these expectational errors, the basic structure of this equation is the following:

$$(p-w) = \sigma D + \phi(p_m - p) - \tau(k-l) + \underset{\sim}{X} \qquad (7)$$

where X is a vector of other variables affecting the pricing decision.

Now, (7) and (1) -the labour demand function- also form a submodel with two equations and three unknowns: the real wage, employment and cyclical demand. And, as previously, we can also eliminate real wages and this time interpret the resulting relationship as giving pairs of values of n and D that are consistent with product market equilibrium.

$$n = (\alpha\sigma+\gamma)D+(\alpha\phi-\beta)(p_m-p)+(\lambda-\alpha\tau)k+\alpha\tau l+(\alpha\underset{\sim}{X}+\underset{\sim}{Z}) \quad (8)$$

For any given level of demand, prices will be determined according to (7) so that demand is satisfied and inflation is constant. But determining prices as a mark up on costs means implicitly determining also the real wage. And this real wage may not be consistent with labour market equilibrium, in the sense that the level of employment that follows may differ from the level of employment given by expression (3). Simultaneous labour and product market equilibrium can only be obtained when both (3) and (8) are satisfied. Imposing on (8) the same neutrality conditions as those imposed on (3), the complete model can therefore be reduced to the following two equations[11].

Labour market equilibrium condition

$$n = 1 + (1+\alpha\delta)^{-1} [(\gamma-\alpha\rho)D+(\underset{\sim}{Z}-\alpha\underset{\sim}{Y})] \quad (3)'$$

Product market equilibrium condition

$$n = 1 + (\gamma+\alpha\sigma)D + (\alpha\underset{\sim}{X}+\underset{\sim}{Z}) \quad (8)'$$

This is a system of two equations in the two unknowns n and D. Any level of demand above the equilibrium D given by (3)' and (8)', will increase employment but at the expense of increasing inflation. The level of n corresponding to equilibrium D gives then the non-accelerating inflation level of employment and, for a given labour force, the non-accelerating inflation rate of unemployment (by setting $p = p^e$ and $w = w^e$ in both equations). In terms of unemployment the two equations are:

$$u = (1+\alpha\delta)^{-1} [-(\gamma-\alpha\rho)D+(\alpha\underset{\sim}{Y}-\underset{\sim}{Z})] \quad (9)$$

$$u = -(\gamma+\alpha\sigma)D-(\alpha\underset{\sim}{X}+\underset{\sim}{Z}) \quad (10)$$

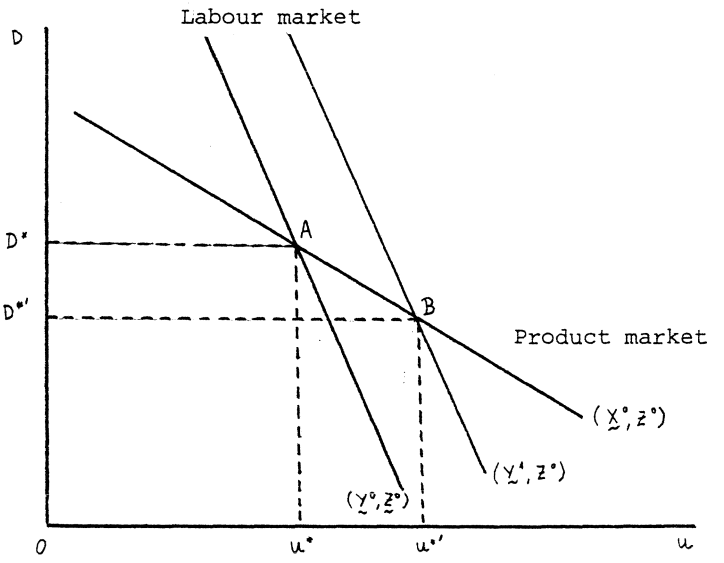
which are graphically represented in Figure 8. Since all parameters are positive it must be the case that:

$$\gamma+\alpha\sigma>(\gamma-\alpha\rho)/(1+\alpha\delta)$$

That is, in terms of Figure 8, the negative slope of the labour market condition must be steeper than that of the product market condition. Then, for example, any change in $\underset{\sim}{Y}$ that tends to increase real wages (see equation 2) will raise unemployment equilibrium and lower demand equilibrium (a move from the initial equilibrium A to a final equilibrium at, say, point B in Figure 8). Similarly positive changes in $\underset{\sim}{X}$ tend to increase the equilibrium value of unemployment and lower demand. Finally positive changes in $\underset{\sim}{Z}$ will lower both the unemployment and demand equilibrium values.

Figure 8

Labour and Product Market Equilibrium Conditions



3.2 Empirical specification

In the following section we present the results of estimating equations (1), (2) and (7) using Spanish data for the industrial sector. Here we want to describe the empirical specification of these equations and the additional variables included in the vectors $\underset{\sim}{Z}$, $\underset{\sim}{Y}$ and $\underset{\sim}{X}$.

Labour demand equation

Employment, n, refers to male and female full time employment in the Spanish industrial sector. We ignore hours worked due to lack of adequate data on this variable for the whole period considered.

The relative price of labour is defined as real labour cost. That is, average gross weekly pay plus employers social security contributions[12], relative to output price. In logarithms, if gross pay is denoted by w, output price by p and employers contributions by t_1, real labour cost is defined as $(w+t_1-p)$. Again, due to lack of reliable data on hours we could not define this variable in terms of hourly earnings.

Relative input prices, (p_m-p), are an index of prices of imported materials relative to output price. Given that in this paper we only consider the industrial sector, it may have been more appropriate to include also an index of intermediate goods from other sectors of the economy. Data limitations prevented us from constructing such index, but given the relative size of the other two sectors which could have contributed inputs to industry (building and agriculture), we doubt that this omission has any significant effect on our results.

We tried several variable to proxy cyclical demand, but in the end the only ones that exerted a significant effect were an index of competitiveness (the real exchange rate) (e) and an after tax real interest rate (r)[13]. Among the variables initially tried, but which proved to be insignificant, there were an index of world trade deviations from trend and a battery of adjusted and unadjusted deficits as a proportion of GDP. We corrected the deficit both for inflation and for the cycle, and we carried out these corrections using several methods, but could never obtain any significant result.

The stock of capital is taken from Dolado and Malo (1983), and in the vector $\underset{\sim}{Z}$ we considered two additional variables: labour-augmenting technical progress (a) and a measure of firing costs (c). Technical progress is defined as in Layard and Nickell (1984b) and the logarithm of the series is smoothed by a trend. We also impose the restriction (accepted by the data) that the elasticity of employment with respect to this variable ought to be equal to the absolute value of the real wage elasticity minus one. The measure of firing costs is defined as the ratio of average redundancy payments to wages, and is included to take into account the increasing relaxation in employment protection legislation that has recently taken place in Spain. Although this definition captures fairly well the actual cost of firing that on average employers have had to face when reducing their labour force, it is somewhat unsatisfactory because it depends on unemployment and this introduces an endogeneity problem. As unemployment has become widespread, redundancy has affected workers with long periods of tenure. And the result of this is that, despite the increasing firing facilities given by the legislation, average redundancy payments as a percentage of wages have

grown since 1977. We adjusted for this endogeneity problem, by defining the redundancy pay for an employee of a given tenure, but then the variable proved not to be significant. Because of this, in the following section we present results both with and without this variable. In the first specification, the variable is instrumented.

Wage equation

The dependent variable of the wage equation is defined alternatively as the product wage or as real labour cost, depending on the set of taxes considered on the right hand side of the equation. Note that in principle the appropiate price variable in this equation is the expected price of consumption. This expected price can be substituted by the actual consumption price by including a term $(p^{ec}-p^{c})$ on the right hand side of the equation, where p^{ec} is the expected consumption price. Also, if we want to define the variable in terms of output prices, as we do in equation (2), we must include indirect taxes (t_3) on the right hand side of the equation.

Given that we only consider the industrial sector, we face an additional problem. To be consistent with the employment equation, the price variable must be defined as the price of industrial output, which clearly it is only one component of the price of consumption. We took this into account by including in the right hand side of the equation also the price of consumption relative to the price of industrial output, but this variable, as well as the expectational error term considered above, was never significant[14].

The labour force is obtained by adding employment as defined above to unemployed people in industry.

The vector $\underset{\sim}{Y}$ includes the following variables:

(i) Taxes

In addition to indirect taxes as a proportion of GDP at market prices (t_3), and employers social security contributions as a proportion of wages (t_1), which have been discussed above, we also include labour income tax and employee social security contributions as a proportion of wages (t_2). As pointed out in the second section these have increased substantially in the recent past and may have played an important role in collective bargaining, exerting some upward pressure on gross wages.

(ii) Firing costs

The reduction that redundancy payments for given tenure have experienced in Spain could also have had a positive influence on gross pay. But we found that, whether corrected or uncorrected, this variable did not have any significant effect on wages.

(iii) Replacement ratio

The larger unemployment benefits are relative to wages, the smaller the amount of labour supplied and, ceteris paribus, the higher the real wage. We tested for this possible influence on wages by including the average replacement ratio, but, as with redundancy payments, this measure is somewhat affected by endogeneity. With the number of unemployed people, unemployed duration has also increased

during the period. Then, since the amount of the benefits paid decrease with duration, the existence of more long term unemployed people has meant that the average replacement ratio has tended to fall. And this despite a consistent improvement of unemployment benefits. So in the empirical analysis we also tried an adjusted replacement ratio, which corrects for this effect by holding constant unemployment duration over the period, but found that this corrected measure was not significant. As in the case of firing costs, this variable, when included, was instrumented.

(iv) Mismatch

Unemployment due to mismatch between demand and supply should not exert any restraining influence on wages. So, one way of taking this into account is to include a measure of mismatch in the wage equation, which should appear with a positive sign. Mismatch is proxied by the absolute change in the proportion of manufacturing over total employment, and to some extent should capture the effect that the structural change of Spanish industry documented above may have had on industrial wages.

(v) Union pressure

This is a difficult variable to define for Spain. During the Franco regime all workers were compulsorily unionized, but this meant little for the real effect unions could have on wages. Also, strikes were forbiden, and there is no reliable record of the number and extent of industrial disputes, although they are known to have grown in importance towards the end of that regime. On the other hand, it is widely acknowledged that unions has a decisive influence on wages during the transition between the previous regime and

the present Constitutional Monarchy, and that subsequently this influence has been greatly mitigated by the existence of regular and wide ranging incomes policies.

We tried several definitions of this variable. Excluding days lost on strike, for lack of data, or union membership, for lack of meaning of this indicador, we were left with the alternative of modelling this variable on the basis of incomes policies. The problem here is that the previous regime can be characterized by a constant application of an incomes policy of some sort, and that during the present regime incomes policies have also played an important and almost permanent role. After experimenting with several alternatives, which included using information on the agreed ceilings on wage growth, we opted for a simple 1-0 dummy, which took the value 0 until 1973, the year of the death of Franco's Prime Minister Mr. Carrero-Blanco, 1 from 1973 until 1977, the year in which the Moncloa Pact was signed between government, opposition and unions, and again 0 since then.

We believe this definition captures well the period during which the pressure of unions on wages was at its highest. Before 1974 political control of unions was too great to allow them any influence. The death of Mr. Carrero-Blanco in that year is accepted to have really signalled the end of the Franco regime, and the signature of the Moncloa Pact in 1977 marked the beginning of a series of agreements on incomes policies which since then have been an almost continuos feature of Spanish economic life.

(vi) Other variables

Since labour-augmenting technical progress has been included in the employment equation,it must also be considered

in the wage equation, where it can have a positive or a negative effect. This variable should in principle fulfill the same neutrality condition as capital, but the data rejected this restriction.

We would have liked to include also variables proxying changes in the intensity of search, but data on vacancies do not exist in Spain, so it was impossible to test whether over the period the relationship between unemployment and vacancies has remained stable or has changed. However, we tried lagged values of the unemployment rate to see whether there is any significant "discouraged worker" effect when unemployment rises fast. If so, changes in the rate of unemployment should affect wages positively[15].

Price equation

Practically all variables that enter into the price equation have already been defined. Demand and relative input prices should have a positive effect on the price mark-up,, and productivity a negative effect. We include technical progress, which should also reduce the price mark-up for given levels of the other variables. Finally, the expectational error term is measured by a second-difference on nominal labour costs, which we expect to have a negative influence on the mark-up. The faster labour costs grow, the more likely is that expectations on wages have fallen short of actual wages, and that the mark-up has been fixed below the optimal level.

4. Empirical results

Employment equation

Table 1 presents the result of estimating equation (1) on annual data on the industrial sector for the period

1964 to 1983. The twenty observations available prevent us from attempting to estimate any complex dynamic structure for the equation or from carrying out proper stability tests[16]. Thus the results should be taken with care and interpreted as preliminary until more data becomes available. However, it is interesting to note that the estimates obtained for this equation are similar to those reported in Dolado and Malo (1983), using quarterly data, to those obtained by Raymond (1983) with annual data and quite consistent (for this and the other two equations) with both economic theory and findings based on data from other countries (Layard and Nickell, 1984b.)

We will present four equations which we call Models 1 to 4. Model 1 is estimated with the uncorrected average redundancy payments and replacement ratio variables. Models 2 to 4 are estimated with the corrected version of these variables and with three different combinations of the set of tax variables.

Both employment equations shown in Table 1 give a similar wage elasticity to that obtained by Dolado and Malo (1983) with quarterly data. The long-run wage elasticity is -.90 in the first equation and -.93 in the second. This compares with -1.2 obtained with quarterly data. Real input prices have an overall negative influence on employment in both equations, which suggests that in the long-run the output effect of relative price changes dominates over the substitution effect. The net effect, however, is much smaller than that exerted by wages -an elasticity between -.2 and -.3.

To investigate possible direct demand effects, we first tried several variables on their own and then, for

Table 1

EMPLOYMENT EQUATION

(Dependent Variable n)

Independent variables	Model 1	Models 2,3,4
n_{-1}	.816(10.3)	.896(14.3)
$(w+t_1-p)^*$	-	.276 (2.2)
$(w+t_1-p)_{-1}$	-.166 (2.8)	-.373 (2.6)
$(p_m-p)^*$	.0512(1.4)	.0386 (2.16)
$(p_m-p)_{-1}$	-.0541(2.6)	-.0415 (4.1)
c*	-.01 (2.1)	-
a	-.0180 $[\chi^2_L(1)=2.1]$	-.007 $[\chi^2_L(1)=2.3]$
k	.184 $[\chi^2_L(1)=3.2]$	.104 $[\chi^2_L(1)=3.0]$
(D,D')*	.095 (2.2)	.073 (2.7)
RHO	-	-.38 (3.2)
s	.011	.009
DW	2.52	2.22
R^2	.99	.99
$\chi^2_{iv}(.)$	6.2(5)	4.5(4)
Wage elasticity	-.902	-.935
Other input pr. elasticity	-.154	-.280
Tech.Progress elasticity	-.098	-.065

Notes:

1. Estimates obtained by IV
2. The demand variables are D = e-1.21r for Model 1 and D' = e-1.95r for Models 2, 3 and 4.
3. RHO is the AR(1) coefficient using Fair's instruments plus some additional instrument; s = is the standard error of the regression; R^2 is the coefficient of determination; DW is the Durbin-Watson statistic; $\chi^2_L(.)$ test for the corresponding linear restriction, $\chi^2_{iv}(.)$ tests for the validity of the instruments.
4. The t-ratio correspond to White's heteroscedasticity consisten t-ratios.
5. (*) denotes instrumented variables.

efficiency, we run the chosen linear combination as one single variable which we call D. Proceeding like this, in addition to overcome some multicollinearity problems, also allows us to have a synthetic definition of demand effects for later use in the other equations(17). Deviations from world trade and several measures of the deficit of the public sector proved not to exert any effect on employment(18) In the end the two variables selected were the real exchange rate and the after tax real interest rate.

The elasticity of technical progress is imposed to be the absolute value of the wage elasticity minus one, and this, which is consistent with the hipothesis of labour-augmenting technical progress, is easily accepted by the data. The unit long-run elasticity of the stock of capital -that is, the assumption of constant returns to scale- is also imposed and also roughly accepted by the data(19).

Finally, in the first equation we include the proxy for employment protection legislation discussed above (average redundancy payments), and the estimate obtained is significant and takes the expected sign(20). The greater the cost of firing employees the smaller will the demand for labour be. However, when we correct this variable for the length of tenure this effect turns out to be very insignificant, and in the second equation the variable is omitted.

Wage equation

Table 2 shows the results of estimating equation (2). As mentioned above, we tried a measure of price surprise in the form of a second-difference on consumption prices, but this was never significant and is therefore not included in the equation. Since on the left hand side of the equation we

Table 2

REAL WAGE EQUATION

(Dependent variable: (w-p) in M.1,2,3 and ($w+t_1-p$) in M.4)

Independent Variables	Model 1	Model 2	Model 3	Model 4
u*	-3.850(7.2)	-3.627(7.0)	-3.536(7.5)	-3.731(5.3)
Δu*	-	1.304(1.3)	1.376(1.0)	1.848(1.2)
$(mm+mm_{-1})$*	.025(2.7)	.015(1.7)	-	-
t_2*	2.321(6.6)	2.385 (5.9)	-	-
t_2+t_3*	-	-	2.220(5.4)	-
$t_1+t_2+t_3$*		-	-	1.802(6.2)
c*	-	-	-	-
$(D,D')_{-1}$	.132(2.0)	.092(1.7)	.192(3.1)	.530(ΔD')(3.8)
rr*	.456(4.9)	-	-	-
UP	.050(2.1)	.095(3.0)	.087(3.2)	.110(5.8)
a*	.03 (1.6)	-	-	-
(k-1)	1.109 $[\chi^2_L(1)=3.3]$	1.070 $[\chi^2_L(1)=2.8]$	1.070 $[\chi^2_L(1)=3.0]$	1.070 $[\chi^2_L(1)=2.9]$
RHO	-.47 (1.9)	-	-	-.69(3.3)
s	.018	.022	.021	.029
DW	2.08	2.37	2.42	2.22
R^2	.99	.987	.989	.97
$\chi^2_{iv}(.)$	6.15(4)	7.23(5)	8.75(6)	7.05(5)

Notes: As for Table 1.

equation we consider the price of industrial output, and the real wage on which workers bargain ought to be defined in terms of overall consumption, we also tried a variable measuring the price of consumption relative to the price of industrial output (see footnote 14), but again this was not significant and is excluded from the equation [21]. A final variable which was not significant, and is omitted from the equation, is the relative price of inputs. Thus, given the effect of this variable in the employment equation, the neutrality restriction (6) is not accepted by the data.

The first equation of the table presents the results when including the uncorrected versions of average redundancy payements (c) and of the replacement ratio (rr), while in the other three we tried to estimate the effect of the adjusted versions of these variables. Average redundancy payments do not appear to have any influence in wages, even when uncorrected for the increase in tenure. The replacement ratio, on the other hand, has a sizeable effect on wages and takes the expected sign. But when we correct this variable for the increase in unemployment duration this effect completely disappears, and the variable is therefore excluded from models 2 to 4. This turns out to be consistent with results for other countries,and is probably more satisfactory than the large influence estimated with the uncorrected version.

The rate of unemployment exerts an important and very significant restraining influence on real wages, as is shown by all four equations in the table. We also find, although this result is not as well determined as the previous one, that this restraining influence is somewhat compensated by changes in the rate of unemployment, which

may suggest the existence of some sort of discouragement effect being present. With the dramatic increase of unemployment in Spain, people may have got more used than before to this status and thus exerted less downward pressure on wages. The attempts to introduce the rate of unemployment in a non-linear form were never sucessful.

Taxes also play an important role in wage determination, but the problem here is that we find it difficult to discriminate between the individual effect of different types of taxes. Both employer social security contributions (t_1) and income taxes (t_2)[22] have grown substantially during the period and are highly correlated ($r=.98$). This has as a consequence that when introduced alone in the wage equation they have a very similar effect, with coefficients always larger than two. On the other hand when one of these two variables is introduced together with the residuals of running the other against it, the variable introduced keeps being significant and the residuals insignificant, whatever the combination tried. This is a typical case of multicollinearity, in which it is difficult to discriminate individual effects. In the equations corresponding to models 1 and 2 we present the effect of income taxes alone, as the large positive sign for social security contributions is theoretically difficult to justify. In model 3 we consider income and indirect taxes together, and here the effect of t_2 clearly dominates, although for the reasons just given it is difficult to attribute this effect only to direct taxation. Probably the safest course of action is to recognize that the data do not allow a proper identification of individual effects, and aim only to the measurement of the overall influence. We do this in model 4, were we define the dependent variable as real labour cost and consider the effect of the whole set of taxes ($t_1+t_2+t_3$)[23].

The estimated effect is much larger than that obtained for other countries, and this may be explained by the substantial increases that both social security contributions and direct taxes have had in the recent past. Taken at face value, it means that workers take taxation quite into account when bargaining over gross pay, and that employers may be willing at the margin to pay more as social security contributions increase. The first result seems reasonable to us, but we have some doubts about the magnitude of the second (an implied coefficient of 0.8). For this reason we keep in the table models 1 to 3, where the effect of t_1 has been constrained to be zero.

The index of cyclical demand takes the expected positive sign and is fairly well determined. In model 4, however, we find that the only effect that demand exerts is temporary. In all cases, the direct positive effect that demand has on employment (through equation (1)) is greater than the negative indirect effect that operates via wages. This is as we would expect and has as a consequence that cyclical demand can help to increase employment in the short run. That is, that the sign of $(\gamma-\alpha\rho)$ in equation (3) is positive.

The mistmach index takes the expected sign and is fairly well determined in the first two equations, but becomes very insignificant (and is dropped from the model) when t_1 or t_3 are considered. The effect of the union pressure dummy, on the other hand, turns out to be quite robust to specification changes, with a positive and very well determined effect in all cases.

The coefficient on the capital-labour ratio is imposed to be the inverse of the absolute value of the wage

elasticity in the labour demand equation, and this neutrality restriction is accepted by the data. The data, however, reject the neutrality condition for technical progress, although this takes the expected positive sign in the wage equation. Thus, long-run unemployment is estimated to be dependent on technical progress. This result, for Spain and for the period considereed, should not be taken as totally unexpected. The index of technical progress has changed quite dramatically during these years, and it would have been quite remarkable that a period of such rapid change could have captured the long-run neutrality property that technical progress we believe should have.

Price equation

Table 3 shows the results of estimating equation (7). Econometrically speaking, the price equation is the one that performs best of the three considered. All variables take the expected sign, are well determined and the dynamic structure of the equation is very robust to specification changes. Perhaps the most interesting result is that relative input prices exert a substantial effect on the price mark-up, despite the fact that we have not been able to detect any input price influence in the wage determination process. Another interesting finding is the slowness with which increases in wages are passed into prices. In both specifications, which differ in the composition of the demand synthetic variable, the wage short run elasticities are around .12 with median lags of around one year. The specific form of the lagged dependent variables results from the imposition of a unitary long-run elasticity with respect to wages in an original specification where the dependent variable was p. The unit elasticity was easily accepted in the long run, but it was rejected in the short run.

Table 3

PRICE EQUATION

(Dependent Variable: $(p-w-t_1)$

Independent Variables	Model 1	Model 2,3,4
$(p_{-1}-w-t_1)$	.440 (5.3)	.406 (5.4)
$(p_{-2}-w-t_1)$	.327(10.1)	.334(10.0)
$\Delta^2(w+t_1)$	-.122 (3.2)	-.145 (2.9)
$(D,D')_{-1}$	.307 (2.6)	.331 (2.7)
$(p_m-p)^*$	.074 (7.2)	.096 (7.9)
a*	-.026 (1.2)	-.0325 (2.2)
(k-1)	-.2584 $[\chi^2_L(1)=2.7]$	-.2782 $[\chi^2_L(1)=3.1]$
RHO	-	-
s	.0065	.0064
DW	2.22	2.31
R^2	.99	.99
$\chi^2_{iv}(.)$	6.34(5)	4.78(5)

Notes: As for Table 1.

5. Explaining Spanish industrial unemployment

5.1. Actual unemployment

We first want to see to what extent these estimates explain the actual evolution of unemployment. That is, we want to evaluate how each of the variables considered, together with the level of cyclical demand, has contributed to the unemployment growth experienced during the last twenty years. Expression (9) above answers precisely this question, and this (following Layard and Nickell, 1984a) is the accounting framework that we use in this section.

The nature of the model estimated in this paper does not allow us much precision about the dynamic structure of causes and effects. So we limit ourselves to explaining changes between averages of fairly large periods. We choose these periods according to the different regimes that can be identified in the explanatory variables. Probably, as far as recent economic history is concerned, the most representative of these is the relative price of imported inputs, which as a result of the oil price crisis has gone through very clearly identifiable stages. As discussed in Section 2 (see Figure 7) there are three well differentiated periods as far as this variable is concerned: a first period of price stability (1964 to 1973); a second period which is dominated by the inital shock in the price of oil (1974 to 1979); and a third period which begins with the second big increase in the price of oil and goes until now (1980 to 1983). Given the small sample size available we have prefered a slightly different distribution in order to make more equal the number of years in each subperiod and still keep the oil price shocks in two different subperiods. So the first subperiod runs from 1965 to 1971, while the second and third subperiods cover the years 1972-1978 and 1979-1983 respectively. Then we

assume that changes between the averages of these periods explain changes between the unemployment averages of the corresponding periods with one year lead; that is 1966-1972, 1973-1979 and 1980-1984[24].

Of the four models considered we use model 4, as we feel it is the one that best reflects our inconclusive results on the effect of taxes. Substituting the estimates obtained for this model into equation (9) we obtain the expression

$$u = -.156\ D' + .062\ (p_m - p) - .083\ \Delta(p_m - p) + .014\ a +$$

$$+ .385\ \Delta u + .375\ (t_1 + t_2 + t_3) + .023\ UP + \text{constant}$$

where we have maintained the first difference in unemployment to see the influence of the discouragement effect identified above, and the first difference in relative input prices to capture the impact of the two shocks that have ocurred in this variable.

In Table 4 we show the actual changes that the explanatory variables have experienced between the three selected periods. It is interesting to note the very large increase in taxes. The tax wedge rose 6 percentage points between the first two periods and 9 points between the second and third, and most of this rise was due to employer contributions to social security and to labour income taxes. Changes in demand are also quite different depending on the period considered. During the first oil price crisis there was an expansion of demand, but during the second shock demand was a clear contractionary factor. The two changes in relative input prices show that the impact of the first oil price rise, although it meant a far higher rate of

Table 4

ACTUAL CHANGES OF EXPLANATORY VARIABLES

Explanatory Variables	Periods	
	1972-78/1965-71	1979-83/1972-78
Δu	.005	.0135
t_1	.042	.053
t_2	.030	.050
$(t_1+t_2+t_3)$	.060	.091
mm	-.15	-.04
D	.111	-.107
D'	.231	-.205
UP	.71	-.71
$\Delta(p_m-p)$	.065	.007
(p_m-p)	.28	.315
a	.526	.170

Note: (p_m-p) has been corrected from real exchange rate changes.

acceleration, was much smaller than that of the second. Finally, the data clearly suggest that technical improvements have taken place during the twenty years considered, but that the rate of modernization was higher between the first two periods that between the second and third.

Table 5 presents the contribution of each of the variables to unemployment growth. Looking first at the growth experienced between the first and second periods (column 1), we see that out of an increase of 2.50 percentage points, the model explains an increase of 2.41. There is evidence of some discouragement effect; the acceleration of unemployment has meant less downward pressure of this variable on wages, and thus a positive effect on unemployment growth. But this contribution is very small in comparison with that of taxes. Between these first two periods the combined effect of taxes on wages and of employer social security contributions on employment would have meant an increase of 2.25 percentage points in the rate of unemployment. Cyclical demand, on the other hand, was clearly expanding and this exerted a significant compensatory influence, reducing the unemployment rate by 3.6 points. Since, as discussed above, the output effect of an increase in the relative price of materials dominates in the long run, the first shock in this variable clearly contributed to unemployment growth. However, in the short term, it is the substitution effect that dominates, and this increased employment and thus reduced unemployment somewhat. The overall effect, nevertheless, was an increase in the unemployment rate of 1.2 percentage points. Technical progress appears to have substituted out labour, increasing the unemployment rate by .74 percentage points. Finally, union pressure, through its effect on wages, also increased unemployment by 1.63 points. Summarizing, the major contributors to unemployment during the first comparison

Table 5

Contribution of Explanatory Variables to the Growth of Unemployment (percentage points)

Explanatory Variables	Periods	
	1966-1972 to 1973-1979	1973-1979 to 1980-1984
Δu	.19	.52
$(t_1+t_2+t_3)$	2.25	3.38
D	-3.60	3.20
(p_m-p)	1.74	1.95
$\Delta(p_m-p)$	-.54	-.06
a	.74	.24
UP	1.63	-1.63
Explained change	2.41	7.60
Actual change	2.50	8.00

were, in this order, the tax wedge, union presure and input prices, which together explain an increase of over 5 points of unemployment. But against this we must also count the effect of demand, whose expansion meant a reduction of 3.6 points of unemployment.

In column (2) of Table 5 we repeat the exercise for the period that goes between the two oil-price shocks. Here out of an actual increase of 8 percentage points, the model explains 7.6 points. The effect of worker discouragement, taxes and input prices all go in the same direction as previously and have a somewhat higher magnitude. The effect of technical progress also goes in the same direction, but there is a clear deceleration due to the much smaller pace of modernization of industry during the latter part of period. Unions now act as a wage moderator and, given the definition of this variable, cancel out the previous effect on unemployment. The main difference with respect to the first comparison is the effect of demand, which now acts as a clear contractionary factor and adds 3.2 points of unemployment. So, the much higher growth of unemployment in the latter part of the period is explained, on the one hand, by the stronger negative effect of taxes and input prices and, on the other, by the contractionary pressure of cyclical demand.

So far we have looked at the factors that explain actual unemployment. But an even more interesting question is to find out how actual employment compares with equilibrium unemployment, as this can give us an idea of what are the policy options and their consequences for inflation. We turn to this question in the following section.

5.2. Equilibrium unemployment

The contributions shown in Table 5 have been calculated conditional on cyclical demand. This level of demand will in general be different from that associated to non-accelerating inflation. What we want to do now is to substitute out demand for the factors that explain their equilibrium level, and to see how the non-accelerating inflation unemployment rate (NAIRU) has evolved during the period. That is, we want to evaluate, on the basis of the estimates shown in Tables 1 to 3, the unemployment equilibrium level that comes out of the solution of equations (9) and (10). For the estimates of model (4) this solution is:

$$u^* = .073\ (p_m - p) - .119\ \Delta\ (p_m - p) - .001\ a +$$

$$+ .419\ \Delta u + .408\ (t_1 + t_2 + t_3) + .025\ UP + constant \quad (11)$$

In principle we could take this expression and evaluate for each period the predicted NAIRU. However, although we have some confidence in having identified the factors that affect changes in the equilibrium unemployment rate, we are not so sure that the model is capable of determining the level of this rate. Because of this, we use as the baseline for the NAIRU the average unemployment rate of the period 1965-1972, when inflation was roughly constant, and for subsequent periods we estimate the corresponding average NAIRU using expression (11).

Table 6 shows the results of this exercise, which we identify as NAIRU (I). It also presents alternative estimates which are obtained adding to NAIRU (I) the part of the growth of actual unemployment that the model cannot explain. That is, we assume that the unexplained gap in

Table 5 is all due to omitted factors which would affect the equilibrium rate. We call this new estimate NAIRU (II)[25]

Table 6

NAIRU Estimates (Model 4)

(percentages)

Unemployment rate	Period		
	1966-1972	1973-1979	1980-1984
Actual rate	.90	3.42	11.42
NAIRU (I)	.90	6.60	11.26
NAIRU (II)	.90	6.69	11.66

Note: NAIRU (I) uses expression (11) to determine the increment over the baseline. NAIRU (II) adds to NAIRU (I) the discrepancy between the explained and the actual change in the unemployment rate in Table 5.

During the period 1973-1979, the actual rate was well below the NAIRU. This means that the success of the expansionary demand policy that took place during this period in keeping the unemployment rate low (see column 1 of Table 5) must have been achieved at the expense of accelerating prices. This is in fact corroborated by the data, which show that over this period inflation was both high and increasing. The last period, on the other hand, is characterized by a much higher NAIRU, and by an actual rate which is more or less around the level of the NAIRU. For this situation, the model predicts that prices should not have accelerated, and this is roughly what we find. In fact inflation has tended

to decrease, although the decreasing trend is to a very large extent determined by the substantial reductions in inflation achieved in the last two years(26).

Given that at the moment the actual unemployment rate appears to be at about the same level as the NAIRU, our results suggest that reductions in unemployment through demand expansion will be difficult to achieve without endangering the present performance on inflation(27). A safer course of action would involve policies directed at reducing the present level of the NAIRU. Our findings indicate that more effective incomes policies could go some way towards this objective. A shift of taxation away from employer social contributions and labour income taxes and towards indirect taxation could also reduce the level of the NAIRU, although our estimates here are not as conclusive as we would wish(28). Finally, if the present tendency towards lower relative input prices is maintained, this should contribute significantly to lower the equilibrium unemployment level, and thus allow more scope to reflationary policies without the danger of increasing inflation. Notice however that the normative implications of the model should be taken with care, given that nothing prevents the parameters of the model from being non structural and therefore subject to the Lucas' critique.

6. Conclusions

This paper has reviewed the evidence of the last twenty years about the main variables that configurate the Spanish labour market, and has attempted an explanation of the substantial increase in unemployment that has occurred during the period.

Our findings suggest that, as compared with the period 1966-1972, the main factors behind the rise of

unemployment during the first oil crisis (roughly, during the period 1973-1979) were taxes, union pressure and relative input prices. But against this we must count the effect of demand, whose expansion meant a reduction of unemployment. These factors, together with other minor influences, explain 96 per cent of the actual unemployment growth. The second oil crisis (roughly, period 1980-1984) meant a further and much larger increase in unemployment, of which the model manages to explain a 95 per cent. Tax and relative input price increases play again an important role, but this time the problem is aggravated by the contractionary pressure of cyclical demand.

We have also been able to identify the unemployment rate consistent with non-accelerating prices. During the first oil crisis actual unemployment is found to be well below the NAIRU, while during the second oil crisis actual and equilibrium unemployment are about the same. This casts some doubt about the effectiveness of expansionary demand policies. Given the present situation, reductions in unemployment through demand expansion should be difficult to achieve without rising inflation.

The model suggests that the policies most suited to reduce unemployment without increasing inflation are those directed at lowering the present level of the NAIRU. This can be achieved by more effective incomes policies and by reductions in employer social contributions and labour income taxation. Our estimates indicate that the maintenance of the decreasing trend of relative input prices could also be an important factor in a future reduction of the NAIRU.

It is important to recall that these results have been obtained with data which are not as abundant and

reliable as we would have liked. Although they conform with what we would expect from economic theory, and although they are quite consistent with findings obtained by researchers in other countries, until better data becomes available we believe they should be viewed with more reserve than that normally accorded to this type of research.

DATA APPENDIX

1. n = log N; N = Total number of employers in Industry (annual average) (BE) (elaborated from GTE and EPA).

2. u = Total unemployment rate in Industry (annual average) It excludes "school leavers" (BE) (elaborated from GTE and EPA).

3. l = log L; L = Total workforce in Industry. Defined as l = u + n.

$$\text{(Note } l-n = -\log\left(1 - \frac{L-N}{L}\right) \simeq u\text{)}$$

4. w = log W; W = Average monthly earnings per employee. (BE) (elaborated from ES).

5. t_1 = Employer's mandatory contributions to Social Security. It is defined as the ratio of the average contribution per employee to the average wage in Industry (CN).

6. $p = \log P$; P = Industrial output index. It is elaborated from the industrial component of the Wholesale Price Index and the Index of Industrial Prices (BE).

7. $p^c = \log P^c$; P^c = Index of Consumer Prices (INE)

8. $p_m = \log P_m$; P_m = Industrial Import Price Index. It is elaborated as a weighted average of an Index of Domestic Prices and the indeces of Unit Value of Imports of Raw Materials and Semi-Elaborated Goods in Industry (BE).

9. $k = \log K$; K = Capital stock. It is elaborated through the integration of flows of "Total Gross Domestic Fixed Capital Formation" of the non financial firms, as defined by the CN. A variable depreciation rate has been used in order to take account of the accelerated economic obsolescence experienced by installed capacity (see Dolado and Malo de Molina, 1983 (BE).

10. $y = \log Y$; Y = Index of Value Added in the Industry (CN)

11. $a = \log A$; A = Index of Labour Augmenting Technical Progress. It is computed as follows. Starting from a value added production function

$$Y = F(NA,K)$$

by taking logs and differencing we find that

$$\Delta y = (1-v_k)(\Delta n + \Delta a) + v_k \Delta k$$

where v_k is the share of capital. Thus we have

$$\Delta a = (1-v_k)^{-1}[\Delta y-(1-v_k)\Delta n-v_k \Delta k]$$

Then the variable is integrated taking an initial value. Since the production function refers to potential value added and we have used actual value

added, the index might be underestimated. In order to somehow correct for this defficiency and to iron out cyclical components, the fitted values from a quadratic have been used.

12. rr = Replacement Ratio. It is defined as the ratio of unemployment subsidies per unemployed person to average earnings per employee (BEL). Due to its potential endogeneity this variable was always instrumented. As an alternative the following "corrected" version was computed: an expected measure for an individual who has a probability of .5 to have a complete unemployment spell equal or less than 6 months, a probability of .3 of being unemployed between 6 and 12 months, a probability of .1 of unemployment between 12 and 18 months and finally a probability of .1 of being unemployed longer than 18 months. The corresponding legal replacement ratios have been .8 for the first spell until 1965, an additional .7 for the second spell between 1966 and 1975, an additional .6 for the third spell between 1976 and 1980 and beyond 1980 an additional .5 for the fourth spell.

13. c = An Index of firing costs. It is defined as the ratio of average redundancy payments as agreed by the Labour Court to the average earnings per employee (BEL). This variable, when used, was always instrumented. An alternative "corrected" version was computed as follows: For a given individual with a duration of 5 years of employment in a firm, the redundancy payments, when fired, accounted for 100% of his (her) annual earnings until 1979 and 90%, 75%, 75% and 70% in 1980, 1981, 1982 and 1983 respectively.

14. mm = An Index of Mismatch. It is defined as the absolute change in the proportion of "Total Employees in Industry (annual average)" relative to "Total Employees (annual average)" (ETE and EPA).

15. t_2 = Labour Income Taxes. It is defined as the ratio between Tax Retentions on Labour Income plus Employées Contributions to Social Security to average earnings per employee (CN).

16. t_3 = Indirect Taxes. It is defined as the ratio of Total Indirect Taxes net of Subsidies to GDP at factor costs (CN).

17. e = log E; E = Real Exchange Rate. It is defined as the ratio of an Index of Export Prices of Industrial Countries in pts. to an Index of Industrial Prices (BE).

18. r = After Tax Real Interest Rate. It is defined as $(1-\tau)R-\Delta p_{+1}$ where τ is the corporate tax rate, R is the interest rate on Bank Credits between 1 and 3 years and p is as above (BE). This variable was always instrumented to take account of the measurement error induced by using Δp_{+1} as opposed to Δp^{e}_{+1}.

19. wt = log WT; WT = Index of World Trade. It is defined as a Quantum Index of Exports by Industrial Countries and LD'C non oil exporting countries. The actual series used in the paper are the deviations of that Index in logs from a third degree polynomial in time (IPS).

20. m = log M; M = M3 nominal holdings in m.m. (BE).

21. AD = Adjusted Budget Deficit as a proportion of GDP. The cyclically adjusted deficit has been taken from Viñals (1985).

ABBREVIATIONS FOR SOURCES

BE = Boletín Estadístico. Bank of Spain
BEL = Boletín de Estadísticas Laborales
CN = Contabilidad Nacional
EPA = Encuesta de Presupuestos Familiares
ES = Encuesta de Salarios
GTE = Grupo de Trabajo del Ministerio de Economía
IFS = International Financial Statistics

Notes

(1) While the overall unemployment rate includes shool leavers, these are excluded from the unemployment rates by industry. The Data Appendix gives a detailed definition of each variable and the sources used.

(2) An attempt to investigate the overall unemployment rate would also have to deal with the substantial migration flows that have existed during these twenty years. During the sixties there was a large net outflow of workers towards Europe, which in the late seventies had turned into a net infow. This clearly has a bearing on the definition of the labour force, but again the poor quality of the data is bound to make any adjustment on this account extremely tentative.

(3) On the other hand, it is evident that the concept of unemployment in a given sector is much more loose that for the whole economy. In particular, as we have pointed out above, school leavers (whatever the length that they have been employed) are excluded from the industrial unemployment rate.

(4) Obviously this is a rough approximation since it neglects the foreign component of consumptions goods.

(5) The relevant concept here is that of "normal productivity". By using observed productivity we do not correct for increases due to adjustments in employment and for the accelerated obsolescence and scrapping of capital and installed capacity (see Rojo (1981) and Viñals (1984) for a detailed discussion of these biases).

(6) A much more detailed analysis of these and other labour market related data can be found in Malo (1983a).

(7) As far as relative input prices are concerned, it is assumed that the output effect dominates the substitution effect, and thus that an increase in relative input prices leads to a long-run fall in employment.

(8) See Symons (1984) and Layard and Symons (1984) for a successful empirical estimation for Britain of a labour demand relationship specified on only relative prices. Dolado and Malo (1983) also obtain satisfactory results with this type of specification using quarterly Spanish data for the manufacturing sector.

(9) We are assuming that the direct effect of demand on employment outweighs the indirect effect via wages.

(10) This rough approximation is based upon the fact that both prices and wages in their univariate time series representations do not diverge from random walks in rates of growth and therefore $p^e - p = -\Delta^2 p$.

(11) Input price, stock of capital and labour force neutrality in (8) imply $\alpha\phi-\beta=0$; $\lambda-\alpha\tau=0$ and $\alpha\tau=1$. These will also be tested in the empirical work below.

(12) Apart from these, there are no other significat employer taxes on labour.

(13) The first variable reflects the fact that we are dealing with an open economy where demand fluctuations are a function of the degree of competitiveness and therefore should be included in D. The second variable is a candidate to pick up monetary and fiscal stance (in fact when deviations of real money balances from trend and adjusted measures of the budget deficit were introduced together with the real interest rate, a high degree of collinearity was present amont the three variables.) Since in an era of floating exchange rates both competitiviness and real interest ratio tend to be correlated, they have been estimated in a synthetic way.

(14) If P es the price of industrial output, P^{ec} is the expected price of consumption and P^{c} the actual price of consumption, then $W/P^{ec}=(W/P)(P/P^{c})(P^{c}/P^{ec})$. Passing the last two parentheses on the right hand side of the equation gives the specification discussed in the text.

(15) We also tried to approximate vacancies by the inverse of the unemployment rate, given that vancancy and unemployment rates appear empirically to be related in a hyperbolic fashion, but the results always failed to support the combined specification.

(16) Usual Chow tests are not valid when using an IV estimation method (see Pagan and Hall, 1984.) In order to use an appropiate Wald test we need to estimate the equation over the full period, including dummy variables and instruments consisting of vectors of zeros for the first period and actual data for the second. Since the maximum number of instruments was 12 in all the estimated equations, it was impossible to compute the tests given the available sample. Nonetheless estimating the equations until 1980 and using Chow tests, there was no sign of serious instability in any of the equations.

(17) In theory the variable proxying cyclical demand deviations should be the same in all three equations.

(18) The contemporaneous effect of both variables was always negative and non significant while the lagged values gave right signs but very low t-ratios, implying in addition a synthetic variable which was also non significant.

(19) From Gallant and Jorgenson (1979) we use the following test statistic in order to test linear restrictions in the IV framework

$$\chi^2_L(q) = \frac{T-k}{\sigma_u^2}(\sigma_u^2 R_u^2 - \sigma_R^2 R_R^2)$$

where σ_U^2 and R_U^2 denote the variance estimate and coefficient of determination from the unrestricted equation; σ_R^2 and R_U^2 denote similar statistics for the restricted equation.

(20) The purpose of including this variable was to lower the high value of the lagged dependent variable, by capturing some of the adjustment costs implied by the lags.

(21) This inability to capture the unanticipated inflation term is in fact a serious problem as pointed out in Nickell and Andrews (1984) since this term might capture demand shocks. If we have not captured these adequately they will be relegated to the error term invalidating most of the current dated instruments related to aggregate demand. In order to deal with this problem we have used only lagged instruments in the equation, except for the capital stock.

(22) As pointed out above, t_2 includes also employee social security contributions.

(23) The actual variable was specified as $\log [(1+t_1)(1+t_3)/(1-t_2)]$.

(24) This procedure, which is also used in Layard and Nickell (1984a), is an approximate way of representing the estimated dynamic structure of the model which, as can be seen in Tables 1 to 3 and depending on the variable considered, varies between zero and two lags.

(25) The level of the NAIRU and its relationship with the actual unemployment rate would be similar if we had used any of the other three models (the results are available from request.)

(26) In 1980 inflation was 15.5 per cent and in 1982 it still was 14.4 per cent. In 1983 it went down by 2.2 points to 12.2 per cent, and in 1984 by 3.2 points to 9.0 per cent.

(27) Note that labour income taxes could also be reduced, for a given revenue, by expanding taxes on income from capital and from professional activities, which at the moment are extremely low in relative terms. This, however, is a policy which may take time to yield positive results and which would need important reforms in income taxation and in the administration of the fiscal system.

(28) Similar results are reached by Mauleón and Pérez (1984) who tackle the consequences of recent high budget deficits in terms of its "crowding-out" effects.

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