THE INFLUENCE OF DEMAND AND CAPITAL CONSTRAINTS ON SPANISH UNEMPLOYMENT

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Este trabajo, elaborado por **Javier Andrés, César Molinas, Miguel Sebastián y Antonio Zabalza**, es la ponencia presentada por los autores en la Conferencia del **European Unemployment Program** celebrada en Londres los días 4 y 5 de enero de 1988. El **European Unemployment Program** es un proyecto de investigación en el que participan Alemania, Austria, Bélgica, Dinamarca, España, Francia, Gran Bretaña, Holanda e Italia, además de los Estados Unidos de América, y cuyo objetivo es el estudio de las causas determinantes del desempleo. El proyecto está financiado por las Direcciones Generales II (Asuntos Económicos y Financieros) y V (Empleo, Asuntos Sociales, y Educación) de la Comisión de la Comunidad Económica Europea.

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1. Introduction

This paper reports some preliminary results on the estimation of a structural model of the Spanish economy, centered around the labour and production sectors. Section 2 describes the main facts to be explained and presents an evaluation of how far the results obtained in the paper can help us to understand the recent evolution of unemployment in Spain. This section, therefore, includes both an introduction to the problem and a summary of the main findings. Section 3 presents a brief outline of the empirical model, which follows closely the common framework agreed for the project, and Section 4 presents the results. The final section summarizes the main conclusions obtained.

2. Main facts and an attempted explanation

2.1 The facts

The main facts under explanation are summarized in Figure 2.1, which plots the evolution for the last 20 years of the labour force and of employment. Until 1974, the increase in the labour force was easily absorbed by a corresponding increase in employment. From 1964 to 1974 the labour force increased by 10.0 per cent, while employment increased by 7.3 per cent. Since then, however, the situation has changed dramatically. In the last ten years, the labour force has

stabilized, with some oscillations, around the level it reached in 1974. Employment, on the other hand, has fallen continuously until 1985, and only in the last two years shows some signs of recovery. In 1974, there were over 13,200 thousand people employed ; by 1985 this figure had fallen to under 10,600 thousand. This means the disappearance of over 2.5 million jobs during the period (almost a 20 per cent fall in employment).

The result of these labour market trends has been a dramatic increase in the rate of unemployment, as can be seen in Figure 2.2. In 1965 the official unemployment rate stood at 1.5 per cent of the labour force and by 1974 it had only increased to 2.6 per cent. By 1985, however, the number of unemployed were almost 3 million, which represented a 21.9 per cent of the labour force.

These unprecedented rates have had as a consequence the appearance of a fairly large number of long-term unemployed and, therefore, of a substantial increase in the duration of unemployment. As Figure 2.3 shows, in 1964 about 80 per cent of the unemployed population had been out of job for less than 6 months, and only 10 per cent had been unemployed for more than one year. In 1985, on the other hand, the former category represented only a 25 per cent of the total unemployed population, and the latter almost a 58 per cent.[1]

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1 Things have began to improve in the last two years, with a halt in the decline of employment which so far seems to be holding. In 1986 employment increased to 10,820 thousands (a 2.4 per cent increase with respect to 1985) and in 1987 it is expected that it will reach 11,134 thousands (a 2.9 per cent annual increase). However, since the labour force has also increased substantially, the creation of jobs is not reflected fully in the unemployment rate, which is expected to only go down to 21.0 per cent in 1987 as compared to the 21.9 per cent level it reached in 1985.

FIGURE 2.1
LABOUR FORCE AND EMPLOYMENT
(IN LOGS)

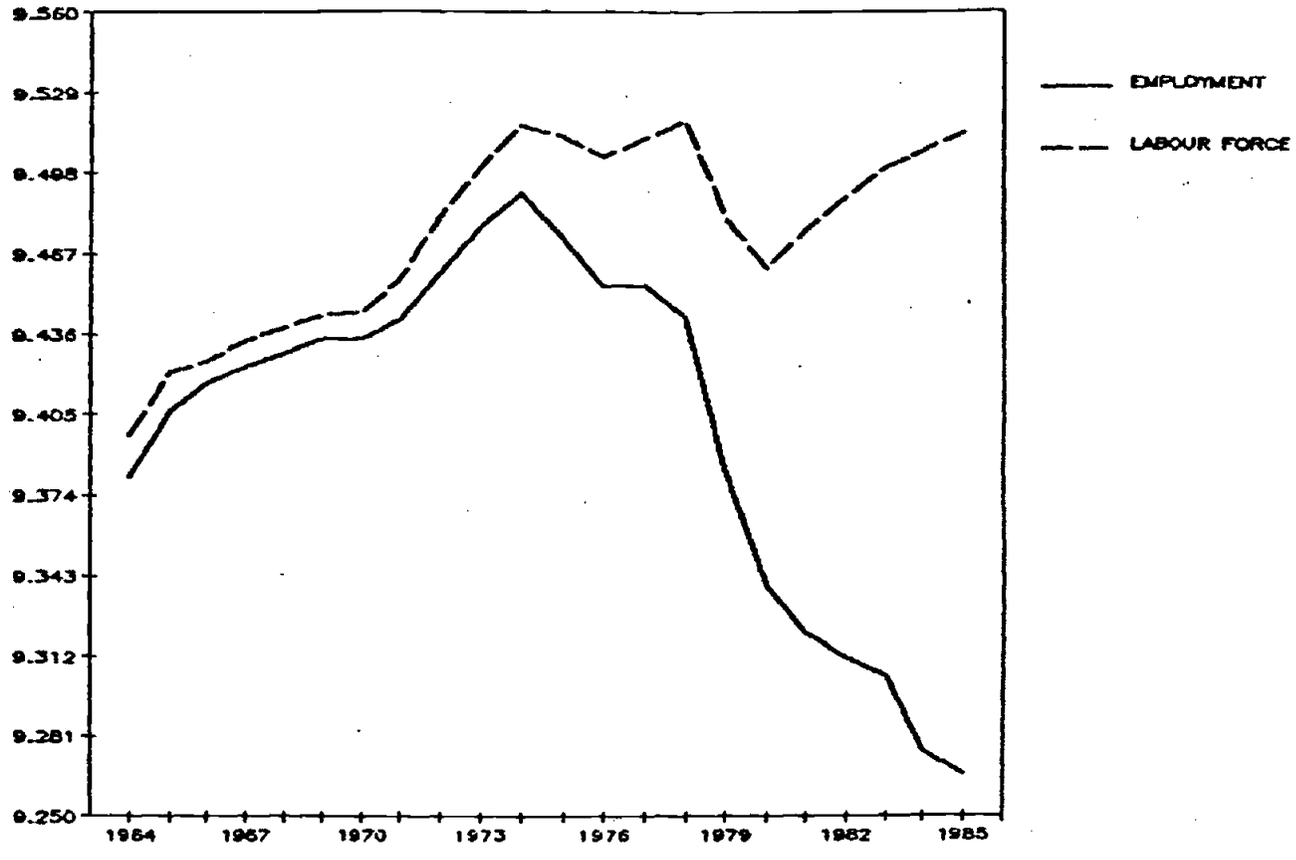
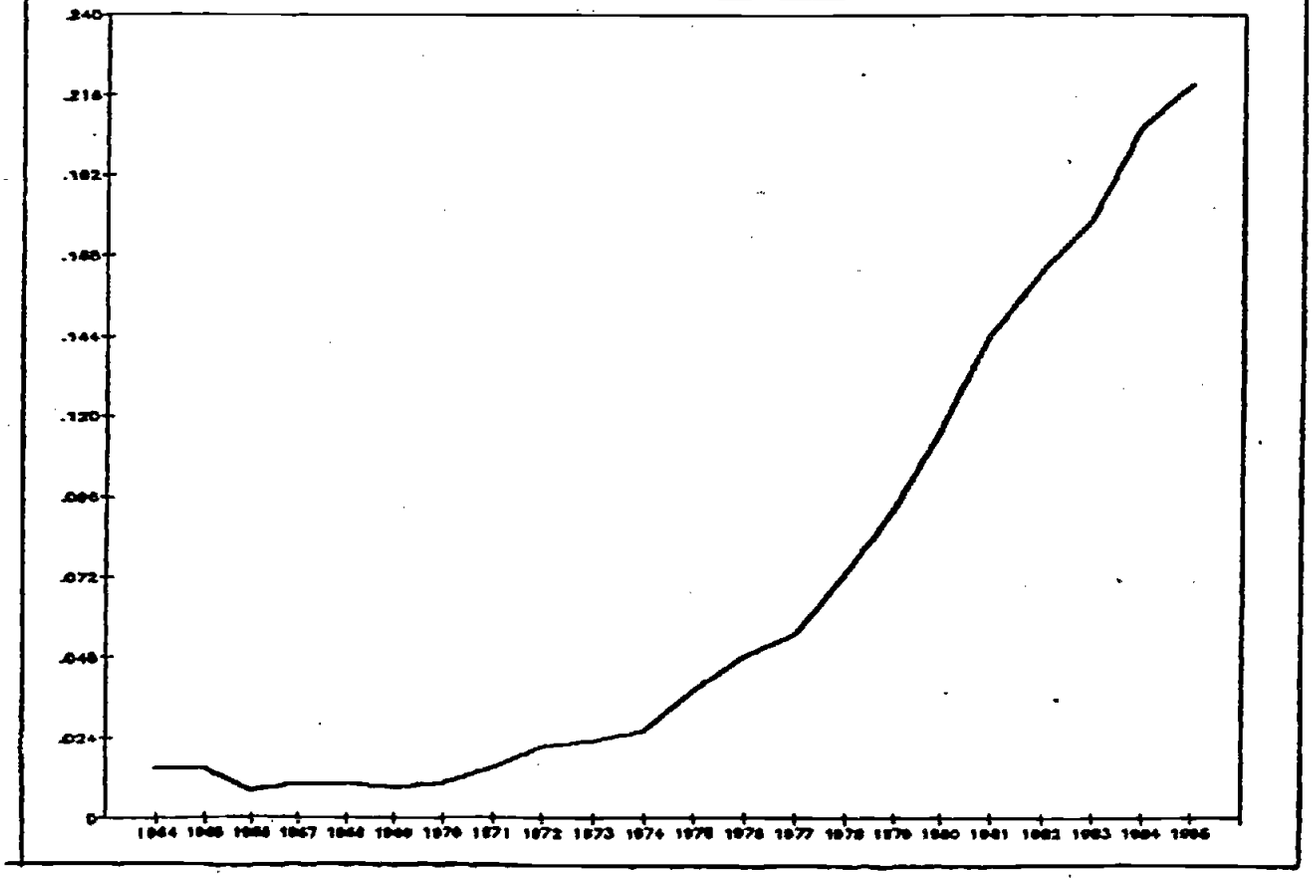


FIGURE 2.2
UNEMPLOYMENT RATE



In the second part of this section we attempt an explanation of these facts based on the empirical results obtained below. Before discussing these results, however, it may be interesting to give a brief account of the evolution of other economic factors which could have had an influence on the rise of unemployment and which give a wider perspective to the problem under study.

One such factor is the substantial change that the Spanish occupational structure has experienced during the last 20 years. There has been a big fall of employment in agriculture and a corresponding rise in services, while the share of building and industry has remained fairly constant (see Figure 2.4). In 1964, agricultural employment represented 36 per cent of total employment, while in 1985 it had fallen to 16 per cent. On the other hand, employment in the service sector represented 31 per cent of total employment in 1964, while in 1985 it had risen to almost 50 per cent. This is a major structural change which has coincided with an important economic crisis and which could therefore have had a significant effect on unemployment.

Another factor which could also have influenced unemployment is the reversal in the flow of emigration that took place after the first oil price shock. Although it is difficult to give precise figures, it has been estimated that in 1973 there were more than 600,000 Spaniards working abroad. Since then this figure has decreased substantially. By 1978 it had been reduced to 350,000, and it could be even lower now. Again, the coincidence of this inflow of workers with the decline of the level of economic activity inside the country, must have meant added difficulties to absorb the available labour supply.

It is interesting to note that despite this inflow of workers, the labour force remained fairly constant. This suggests the presence of

FIGURE 2.3
UNEMPLOYMENT DURATION

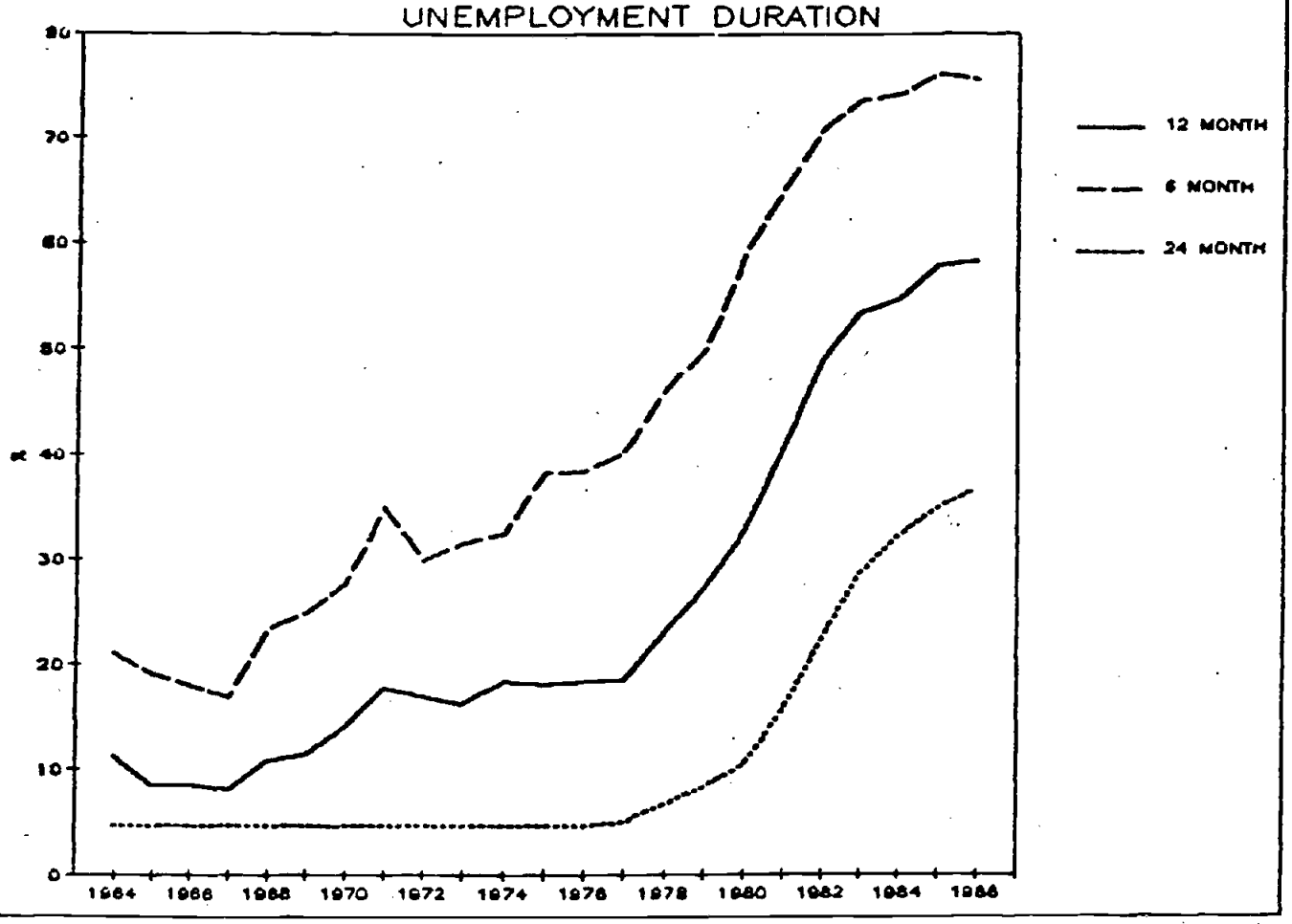
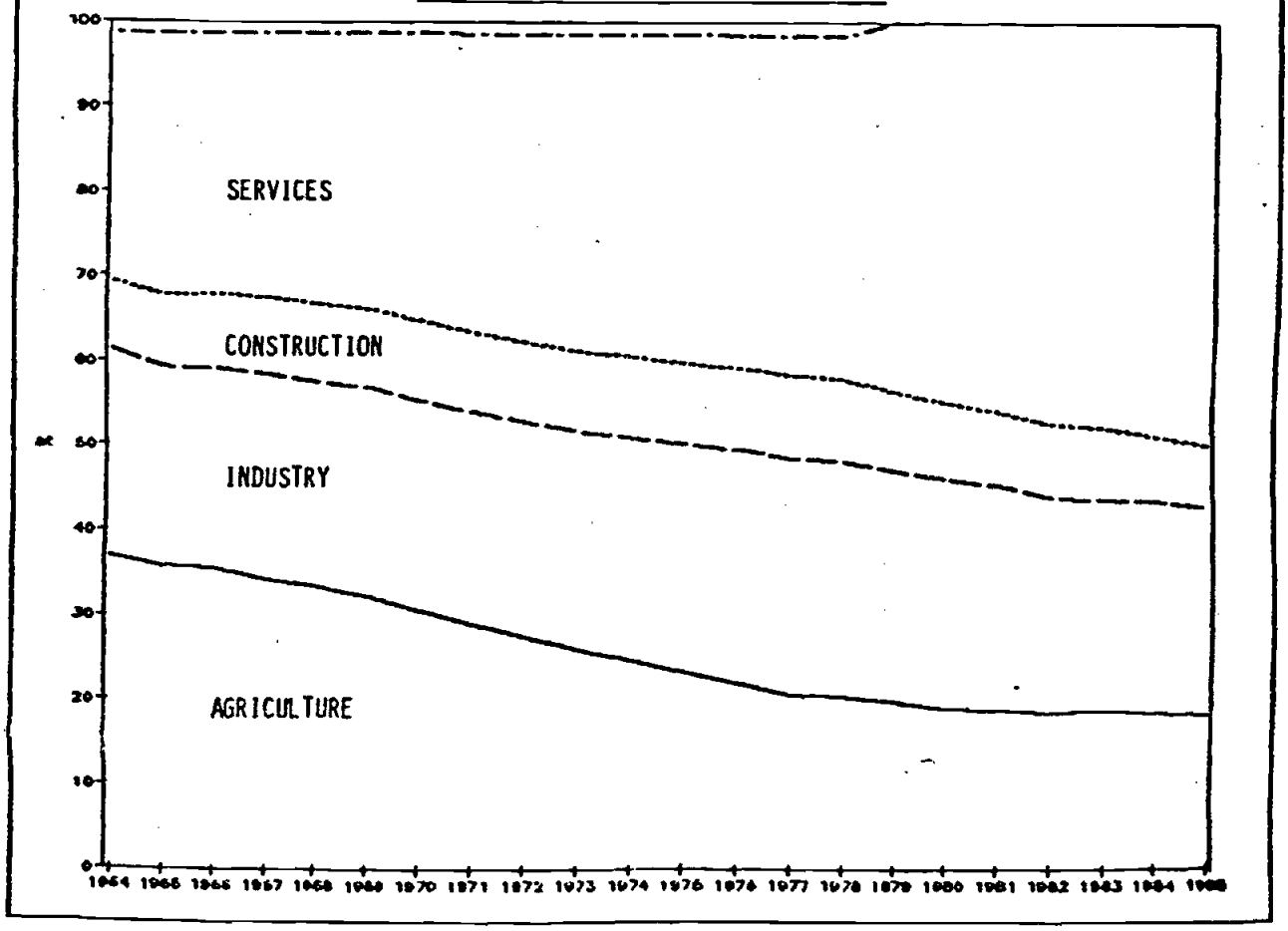


FIGURE 2.4
SECTORIAL EMPLOYMENT



some "discouraged worker" effect, particularly in the height of the crisis, when the labour force actually declined. The deceleration of the labour force that Figure 2.1 shows must be seen in the context of a participation rate which is the lowest in Europe. In 1984 only a 35.6 per cent of the population aged 16 to 65 were in the labour force. This compares with a 47.8 rate in Great Britain, 43.4 in France, 47. 3 Portugal and 41.5 in Italy.

2.2. An attempted explanation

2.2.1 Employment

Figure 2.1 shows that the main reason behind the increase in Spanish unemployment has to do not so much with the evolution of the labour force, but with the loss of jobs. Therefore, a first thing to do is to investigate what could explain the very substantial fall of employment since 1974.

We have some results about the proximate causes of this fall, which we take from an estimated labour demand equation. This equation makes employment to depend on labour costs, the stock of capital in the economy, an index of technical progress, a time trend and an index of cyclical demand proxied by the degree of capacity utilization (see Annex 1).

Table 2.1 shows how the proximate causes have evolved during the period considered. We divide the whole period in three segments: the first one, 1966-1971, is the pre-crisis period; the second, 1972-1978, includes the first oil price shock and the peak of employment; the third, 1979-1985, includes the second oil price shock and covers the years when most of the effects of the crisis were already showing up.

Real labour costs, defined as inclusive of Social Security contributions and relative to the GDP deflator, have increased substantially in the last 20 years. The average for the period 1972-1978 was 35.1 per cent higher than the average for the period 1966-

Table 2.1

Actual Change of Proximate Determinants of Employment

(percentages)

	1966-71/1972-78	1972-78/1979-85
Real labour costs	35.1	19.0
Capital stock	34.3	20.8
Technical progress	36.4	23.5
Capacity utilization	1.4	- 5.4

Table 2.2

Contribution of Proximate Determinants to Employment Growth

(percentages)

	1966-71/1972-78	1972-78/1979-85
Real labour costs	- 37.2	- 20.1
Capital stock	52.8	32.0
Technical progress (plus time)	- 14.9	- 24.2
Capacity utilization	0.9	- 3.2
Total change explained	1.6	- 15.5
Actual change	3.5	- 15.0

1971. And the average for the period 1979-1985 was 19.0 per cent higher than that for the period 1972-1978. Figures 2.5 and 2.6 show the annual rate of growth of real labour costs together with that of employment, output and productivity. Leaving aside the pro-cyclical nature of real labour costs, perhaps the most remarkable feature is their persistent increase during the second half of the seventies in the face of large falls of employment and very small rates of output growth. However, there is a distinct deceleration of labour costs in the last years of the period, which is clearly picked up in Table 2.1.

Figure 2.7 shows the evolution of the stock of capital. There is a clear deceleration in the last ten years, which reflects the small rates of investment after 1975. Consequently, the rate of growth of the stock of capital between the periods 1966-1971 and 1972-1978 is 34.3 per cent, while that between 1972-1978 and 1979-1985 is 20.8 per cent. Table 1 also shows that technical progress advanced more between the first two periods (36.4 per cent) than between the second and third (23.5 per cent).

Finally, the index of capital utilization grew by 1.4 per cent between the two periods, and fell by 5.4 per cent between the second and third. Figure 2.8 plots the level of this variable and the rate of growth of output. The figure illustrates that this is a reasonable variable to pick up the cycle, and that there is a clear fall in demand after 1975.

As can be seen in Table 2.2, the growth of employment between the first two periods is largely explained by the increase in the capital stock, which more than compensated the negative effect of labour costs and of technical progress. Cyclical demand effects, on the other hand, were positive but small. The large fall of employment between the second and third periods can be attributed to the smaller growth of the capital stock, which is not sufficient to compensate the

FIGURE 2.5
REAL GDP, EMPLOYMENT AND REAL LABOR COSTS
(ANNUAL RATES OF GROWTH)

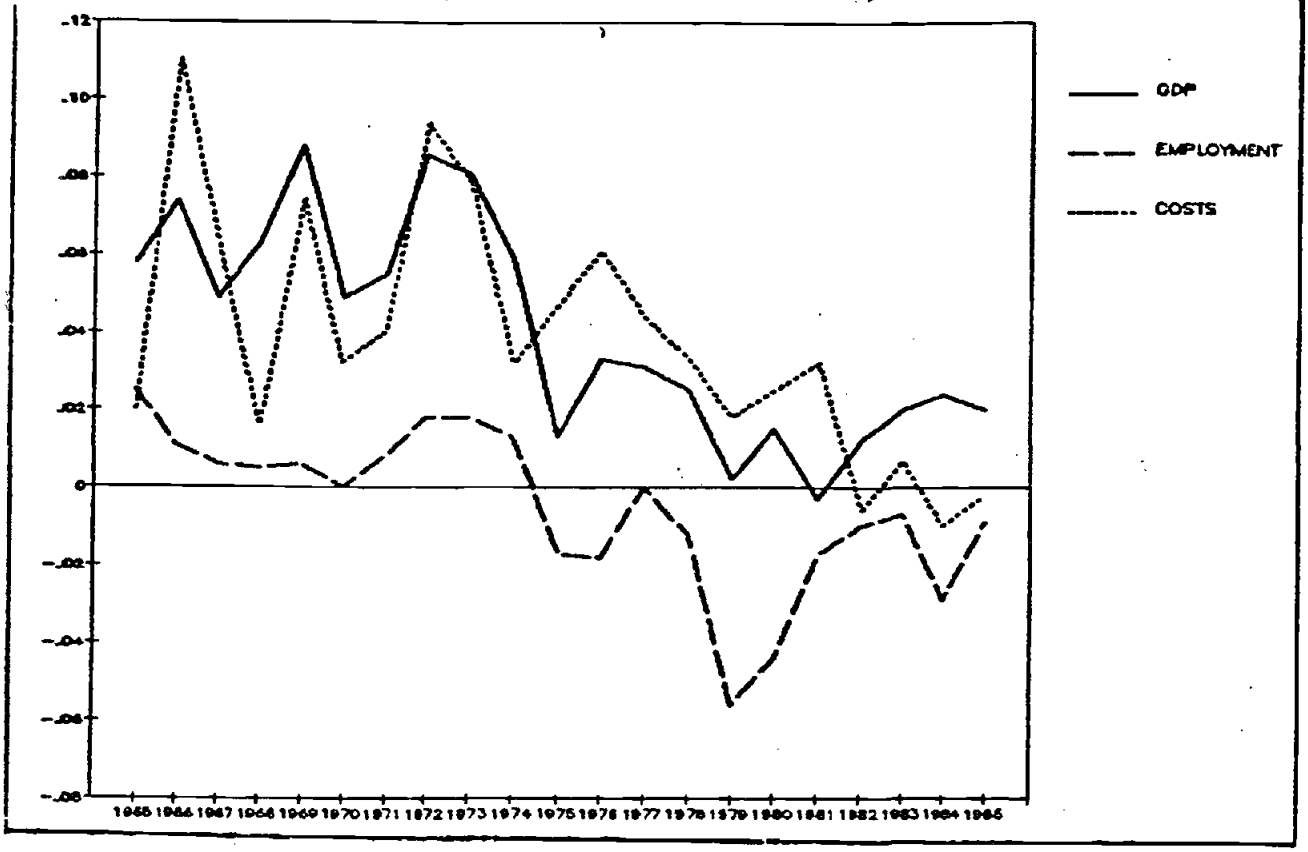


FIGURE 2.6
PRODUCTIVITY, EMPLOYMENT AND REAL LABOR COSTS
(ANNUAL RATES OF GROWTH)

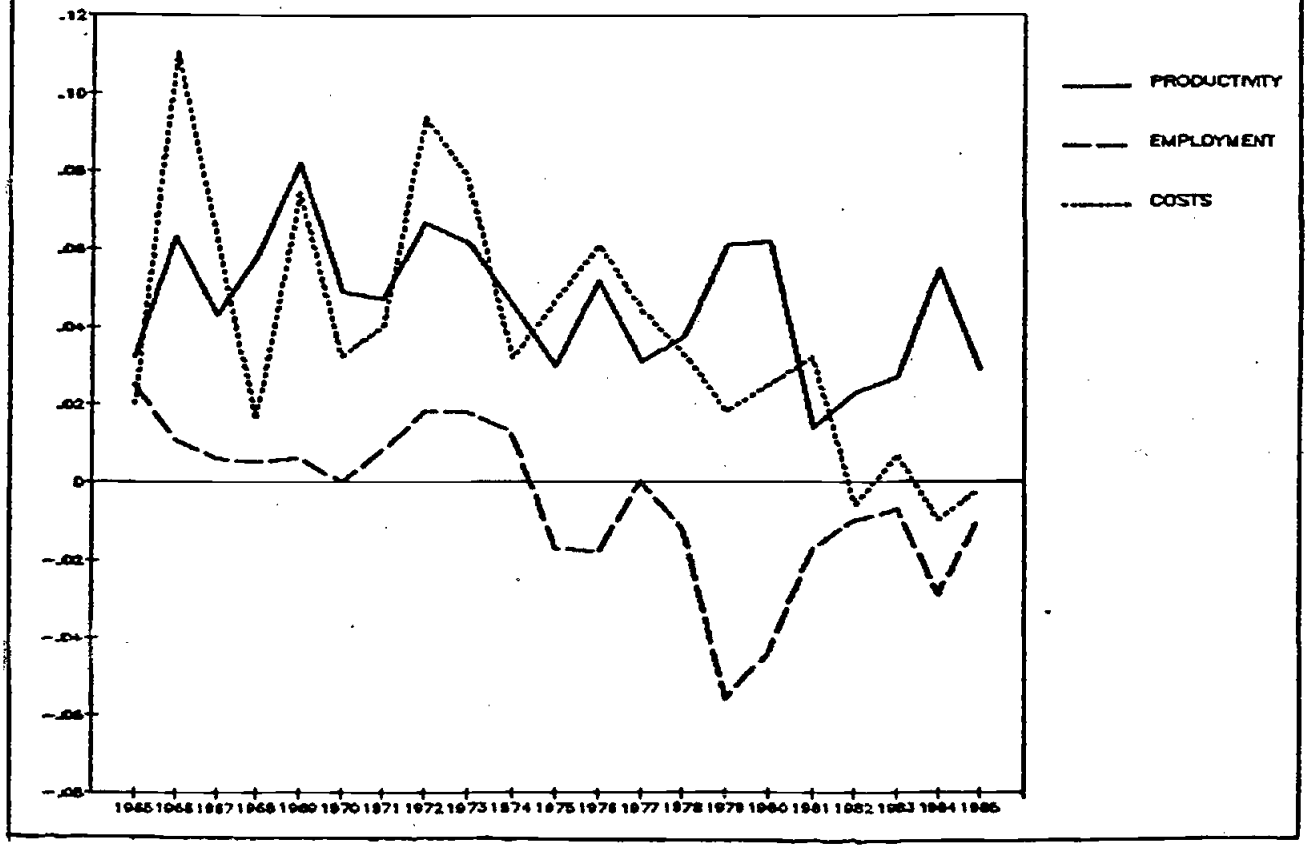


FIGURE 2.7
REAL CAPITAL STOCK
(IN LOGS)

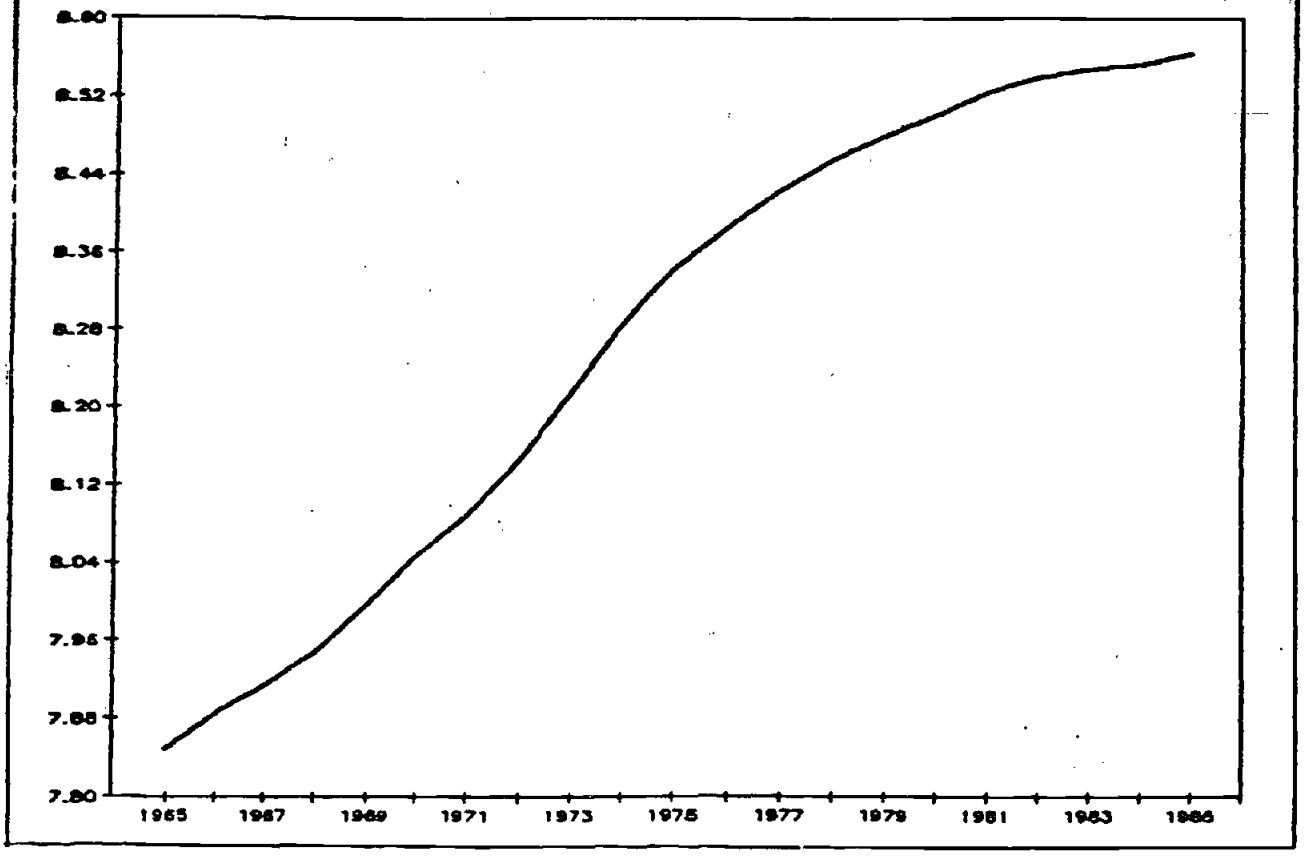
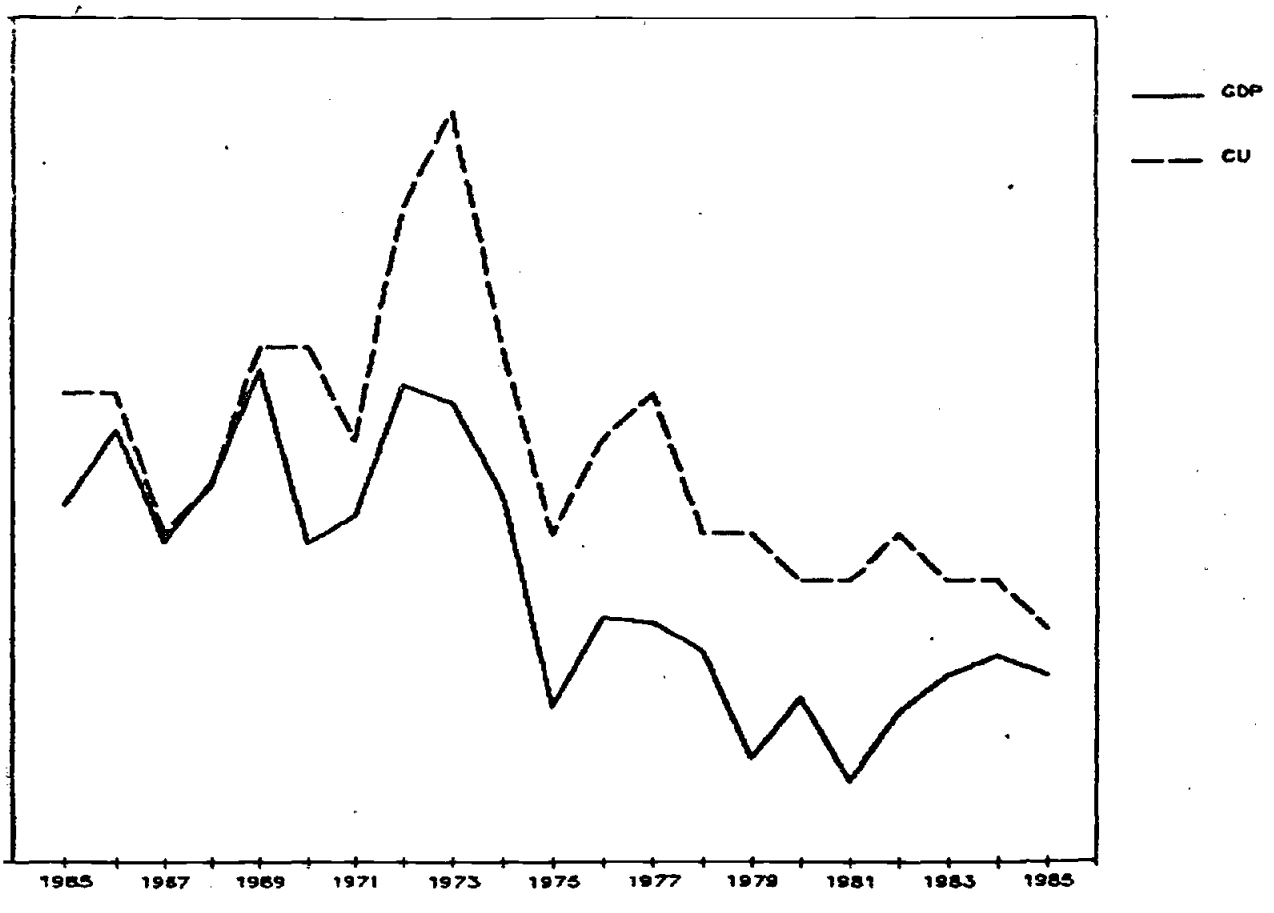


FIGURE 2.8
CAPACITY UTILIZATION AND RATE OF GROWTH OF GDP



negative effect of labour costs and technical progress, and to the negative influence of cyclical demand. It is interesting to note that between the last two periods labour costs exerted a smaller negative influence on employment than between the first and second periods.

2.2.2 Unemployment

The analysis so far, although instructive in order to see the effect of labour costs, is unsatisfactory for two reasons: a) because it does not take into account factors that may have influenced unemployment via labour supply; and b) because it does not say anything about what determines real labour costs and the capital stock.

As we have seen in Figure 2.1, labour supply has been more or less constant during the period in which unemployment has increased most. This, however, does not mean that labour supply effects have been absent in the determination of unemployment, as they could have compensated one another as far as labour supply is concerned. Also, we have identified the effect of labour costs on employment, but real labour costs are endogenous to the model and depend on all factors that determine the wages workers desire and the wages employers are prepared to pay.

We have been able to estimate the influence of some of these factors but overall the results are somewhat disappointing. Although there are reasons to believe that the changes in the Spanish occupational structure described above are relevant, we have been unable to identify any statistical effect coming from them. Nor has it been possible to establish the influence that other factors such as the age structure of the labour force, degree of mistmatch in the labour market, union pressure, firing costs and the replacement ratio may have had on the evolution of unemployment. The only wage push factors that appear to have a significant statistical effect are Social

Security contributions, indirect taxes and real import prices; that is, three of the four elements (the fourth being direct taxes) that form the wedge between real labour costs and the consumption wage.

Another unsatisfactory result of this exercise has been the impossibility of eliminating the long-run effects of the capital-labour ratio and of technical progress on unemployment. The strong effect of the capital stock on employment discussed above should in theory be compensated by an equivalent and opposite effect coming from the labour force so that there is no long run influence on unemployment. However, we find that the influence of trend productivity on the desired wage is larger than its influence on the feasible wage, and this implies the existence of a structural element of inflationary pressure that can only be neutralized by having more unemployment.

We feel this result describes fairly well what has happened since the first oil crisis in the Spanish labour market, but we resist ourselves to accept it as a permanent feature of wage negotiations in the Spanish economy. As discussed above, labour costs have grown substantially in the period 1975 to 1981 despite the existence of widespread and rising unemployment (see Figures 2.5 and 2.6). It must be remembered that this real wage explosion occurred at a time when the previous political regime in Spain was changing into the present constitutional monarchy, and that this political transition may have had a decisive influence on worker's expectations concerning wages. If this is so, the productivity trend may be picking up part of the transitory effect that these institutional changes may have had on wages and investors' expectations, and therefore on unemployment. We have attempted to introduce this latter effect through a variety of union pressure variables, but so far have not been able to detract significantly from the strong effect that the trend productivity variables have on wages.

Table 2.3 shows the actual changes of the variables determining desired and feasible wages. We see that there has been a fairly steady increase in Social Security contributions (although in the last years they are practically stable), and a moderate fall in indirect taxes (although since 1983 they are rapidly increasing). Real import prices (expressed in pesetas) have gone down by 1.3 per cent between 1966-71 and 1972-78, and up by 1.2 per cent between 1972-78 and 1979-85. The evolution of technical progress and capacity utilization has already been described in Table 2.1, and finally we see that the capital-labour ratio has increased substantially throughout the whole period, although, as expected, there is an important deceleration after the first oil crisis.

Table 2.4 shows the contribution of these variables to unemployment. Between the first two periods, of the three wage pressure variables, Social Security contributions are the main contributing factor, while indirect taxes and import prices helped to moderate the rise of unemployment. However, the main result is the strong effect that the productivity variables have. They alone would explain over a 100 per cent of the rise in unemployment between these two periods. Cyclical demand, on the other hand, had only a very weak expansionary effect. Concerning the comparison between the last two periods, we see that the effect of Social Security contributions is similar to that of the previous period, but the moderating influence of indirect taxes is much lower and import prices become a contributory factor. The two productivity variables continue to exert a large positive effect, which now represents about half of the total change explained. Finally, cyclical demand now becomes contractionary and contributes 1.3 points to the rise of unemployment.

Table 2.3

Actual Change of Variables Determining Desired and Feasible Wages (percentages)

	1966-71/1972-78	1972-78/1979-85
Social Security contributions	4.3	5.2
Indirect taxes	- 1.1	- 0.4
Real import prices*	- 1.3	1.2
Capital-Labour ratio	28.8	18.5
Technical progress	36.4	23.5
Capacity utilization	1.4	- 5.4

* Weighted by share of imports in GDP.

Table 2.4

Explanation of Actual Unemployment (percentage points)

	1966-71/1972-78	1972-78/1979-85
Social Security contributions	3.0	3.6
Indirect taxes	- 2.7	- 0.9
Real import prices*	- 1.4	1.3
Capital-Labour ratio	4.9	3.2
Technical progress	3.6	2.4
Capacity utilization	- 0.3	1.3
Total change explained	7.1	10.8
Actual change	3.0	11.9

* Weighted by share of imports in GDP

We must therefore conclude this part of the analysis with some reserves as to the fundamental causes of the rise of unemployment in Spain, due to the fact that the strong effect of the capital-labour ratio and of the index of technical progress may be masking the influence of other variables. Having said that, the results obtained suggest that demand (as proxied by the degree of capacity utilization) had a small part in the explanation of the rise of unemployment after the first oil crisis (it explains a 12 per cent of the total change), while Social Security contributions and import prices were significant factors explaining together more than 45 per cent of the total rise.

What are the implications of these results for the non-inflationary rate of unemployment (NAIRU)? The main one can be gathered from Table 2.4, as the change in the NAIRU can be deduced from the figures presented there excluding the influence of cyclical demand. This gives the changes shown in Table 2.5. According to these results, the NAIRU would have grown more than actual unemployment between the first two periods (7.4 points versus 3.0 points respectively), but less between the last two periods (9.5 points versus 11.9 points).

Table 2.5

Changes in the NAIRU and in actual unemployment

(percentage points)

	1966-71/1972-78	1972-78/1979-85
NAIRU	7.4	9.5
Actual unemployment	3.0	11.9

Figure 2.9 presents the same information, but showing the level of the NAIRU and its annual evolution.[2] We see that the NAIRU has increased substantially over the whole period and has stayed above or very near actual unemployment for most of the years. It is only after 1979 that the NAIRU begins to relatively slow down its rate of increase, to end in 1985 3.4 points below actual unemployment (18.5 per cent versus 21.9 per cent respectively). It must be noted, however, that these conclusions are very sensitive to the period used to define the initial value of the NAIRU. Had this been defined as the average of actual unemployment for the period 1966-73, then the NAIRU would have been below actual unemployment for the whole period, reaching in 1985 a level 5.6 points under the actual rate. For this reason, we feel that the information about changes given in Table 2.5 may be more relevant than the plots of Figure 2.9.

2.2.3 Demand and capital constraints

In the previous sections we have seen that both cyclical demand and the capital stock have been relevant factors in the determination of Spanish unemployment. The stock of capital has played an important role in labour demand, and capacity utilization (our proxy for cyclical demand) seems to have had a significant influence on the feasible wage. Now we want to turn back to these two variables but from another perspective.

The stock of capital sets the size of the productive capacity and, therefore, establishes a limit to the amount of workers that could be

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2 It is assumed that the NAIRU of the period 1966-72 coincides with the average for that period of actual unemployment.

FIGURE 2.9
U and NAIRU

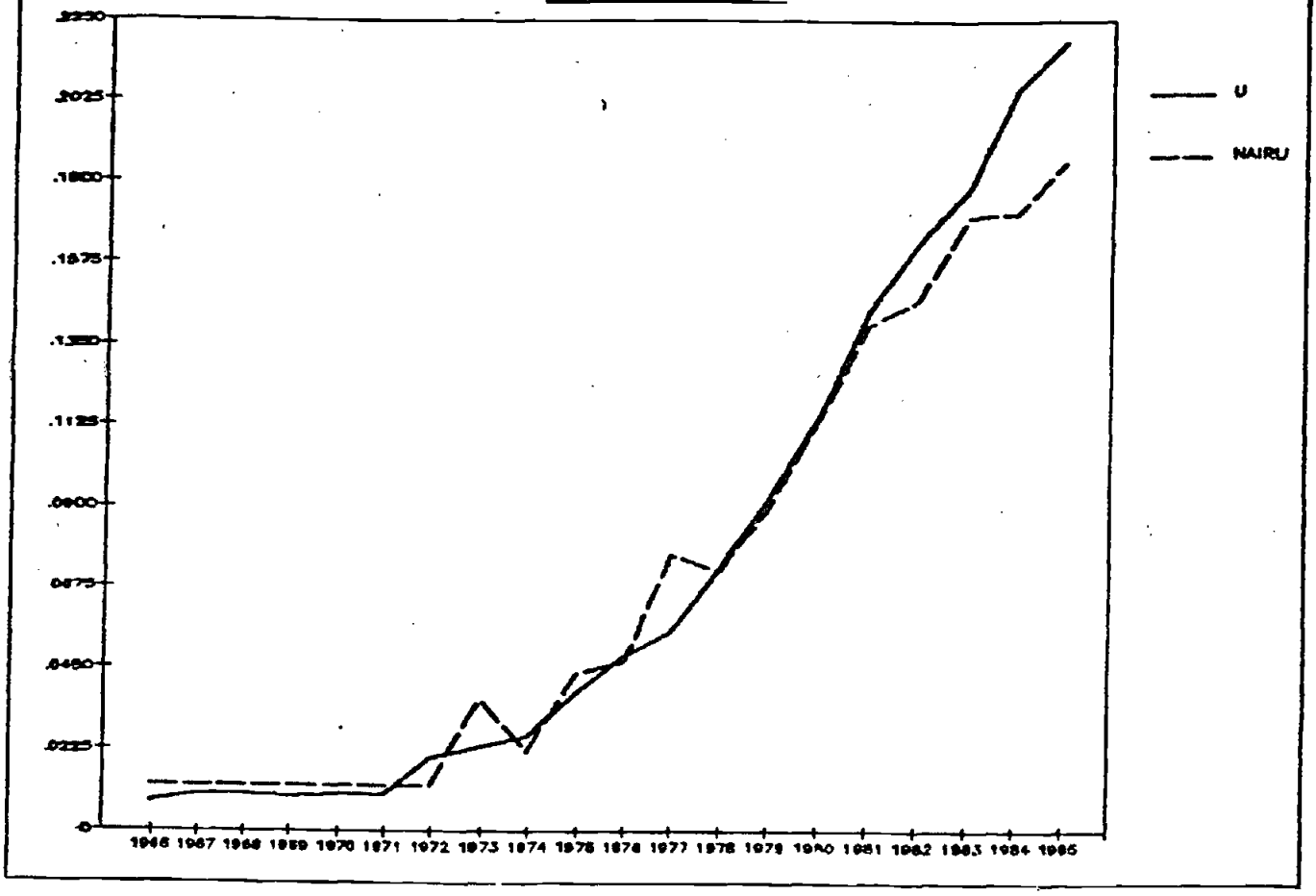
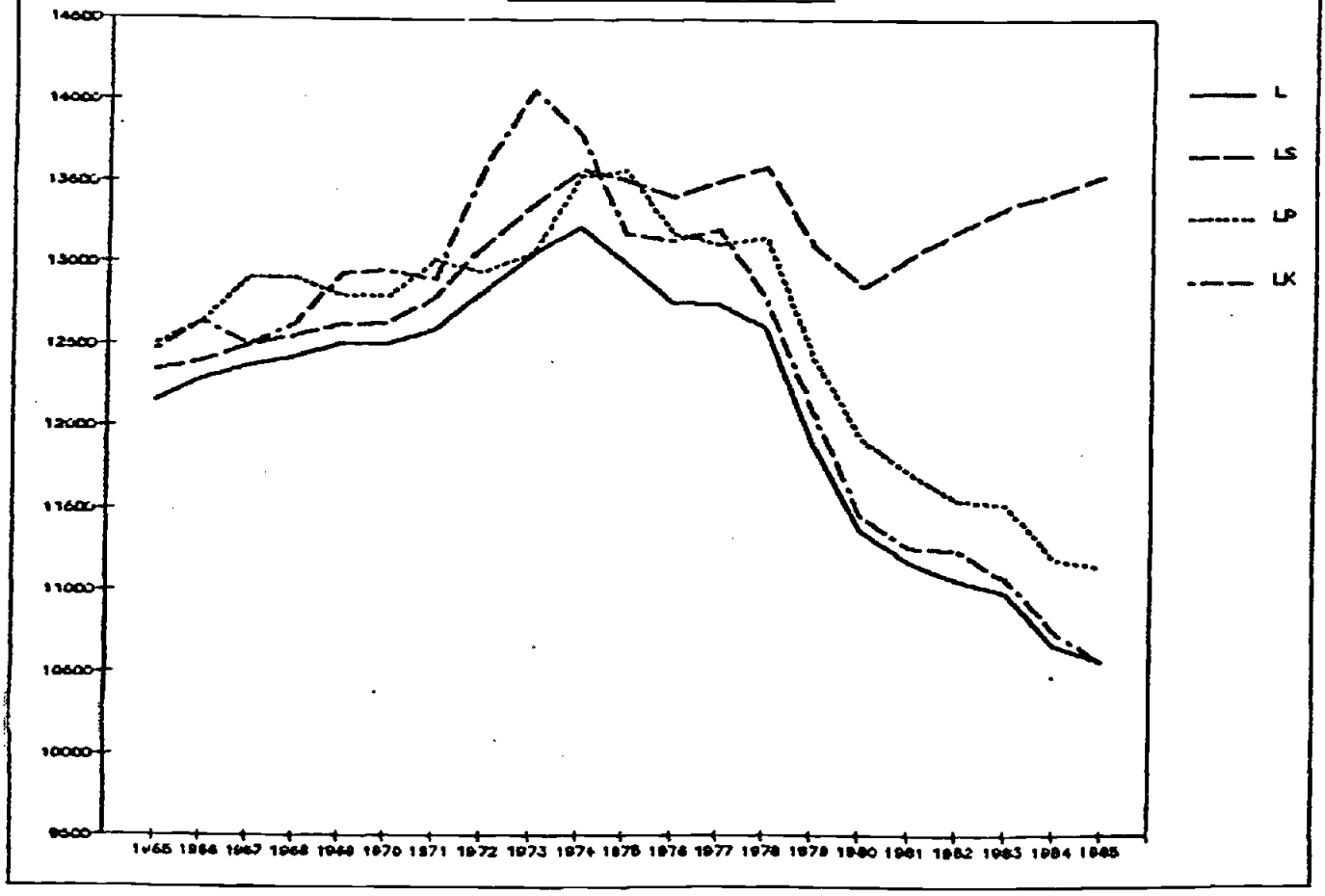


FIGURE 2.10
L, LS, LP and LK



employed when using fully this capacity. In the long run, with flexible relative prices, this capacity should adjust to accommodate the available labour supply, but in the short run, a given capital stock may impose an effective restriction to the amount of workers that can be employed even in the presence of sufficient demand. It is important therefore to find out to what extent unemployment is due to a deficient use of the available capacity, and by how much could employment increase if this capacity was fully used. For this purpose we define the concept of "potential employment" as the level of employment corresponding to full use of the available capital stock.

As far as demand is concerned, we could be in a situation in which although there is capacity, the level of demand is so small that there is no incentive for firms to use fully the capital stock available. In this situation, aggregate demand sets the effective constraint to employment. It is therefore instructive to identify also the extent to which this circumstance has been relevant in explaining the recent evolution of the labour market, and for this purpose we define the concept of "Keynesian employment" as the level of employment corresponding to full satisfaction of demand for domestic output.

Figure 2.10 plots the evolution of "potential employment" (LP), "Keynesian employment" (LK), labour supply (LS) and observed employment (L). Potential employment follows an increasing trend until 1975, growing at an annual rate of 0.8 per cent, and then falls almost monotonically for the rest of the period, at an annual rate of 1.9 per cent. This pattern can be explained by the evolution of the optimal labour-capital ratio, given relative factor prices and production conditions, and by the evolution of the capital stock. Table 2.6 shows the contribution of these two factors. From 1965 to 1975, the increase of the capital stock was 49.3 per cent and that of the optimal labour-capital ratio -40.8 per cent, which sums up to the estimated increase of potential employment of 8.5 per cent. From 1975 to 1985, the

optimal labour-capital stock maintained a similar rate of decline, but the capital stock grew much less than in the previous period, not being able therefore to absorb the amount of workers freed by the much lower requirement of labour per unit of capital.

Table 2.6

Decomposition of the Growth of Potential Employment

(percentages)

	1965 - 1975	1975 - 1985
Optimal labour-capital ratio	- 40.8	- 40.1
Stock of capital	49.3	22.2
Potential employment	8.5	- 17.9

We have then that what really explains the evolution of potential employment, is not so much the changes experienced by the factor mix, which mantained a uniformly decreasing trend over the whole period, but the much lower rate of increase of the capital stock after 1975. Figure 2.7 above shows this deceleration in the stock of capital, and Figure 2.11 the rates of growth of gross capital formation which tell essentially the same story.

Keynesian employment follows a similar pattern as potential employment, althougt much more cyclical and reaching the peak two years earlier (in 1973). From 1965 to 1973 Keynesian employment grew at an annual rate of 1.5 per cent, while from 1973 to 1985 it fell at an annual rate of 2.4 per cent. Here again, the evolution of this type of employment depends on two factors: the evolution of demand for domestic output and the evolution of the labour-output ratio. Table

FIGURE 2.11
INVESTMENT AND GDP
(ANNUAL RATES OF GROWTH)

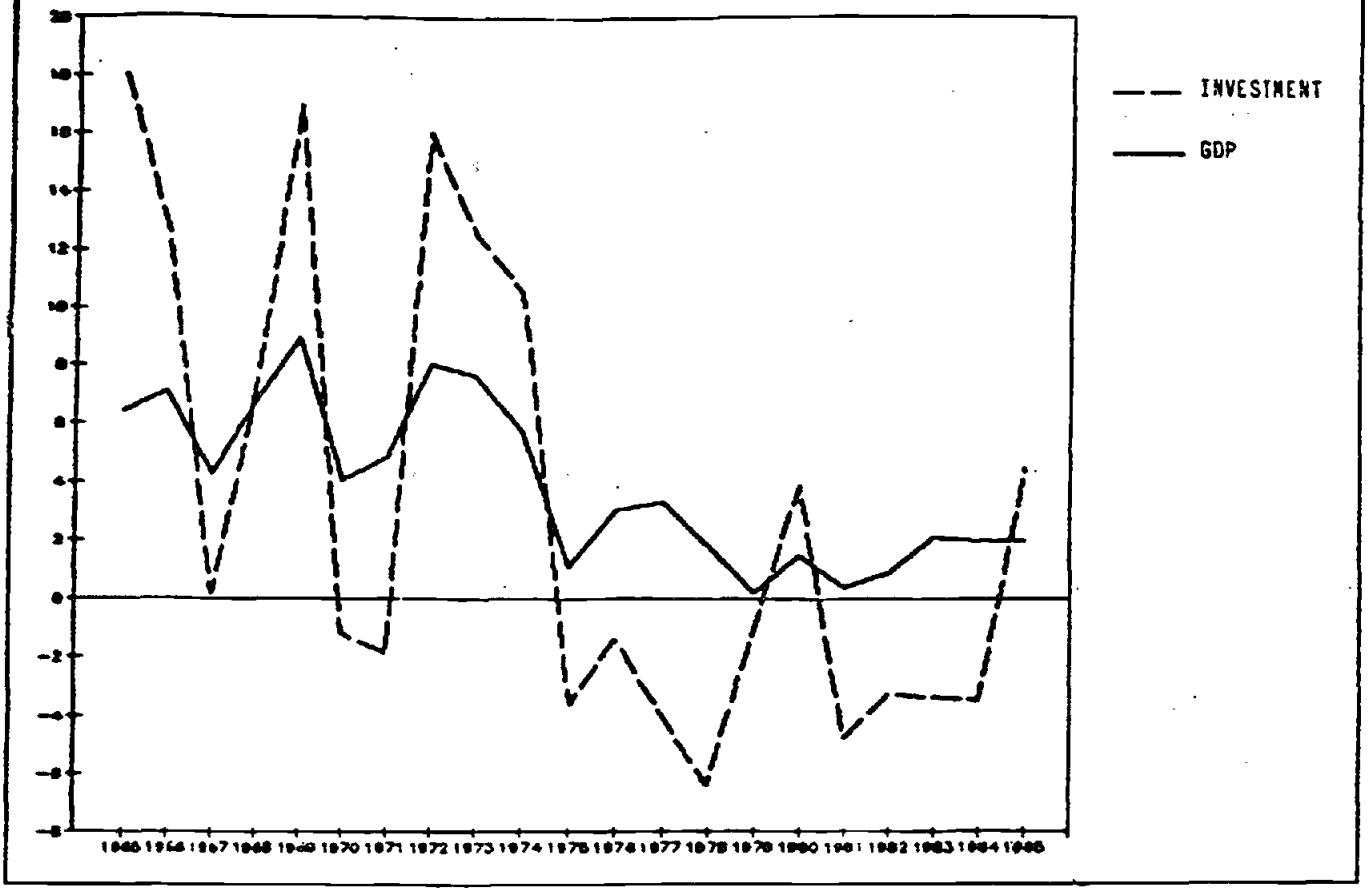
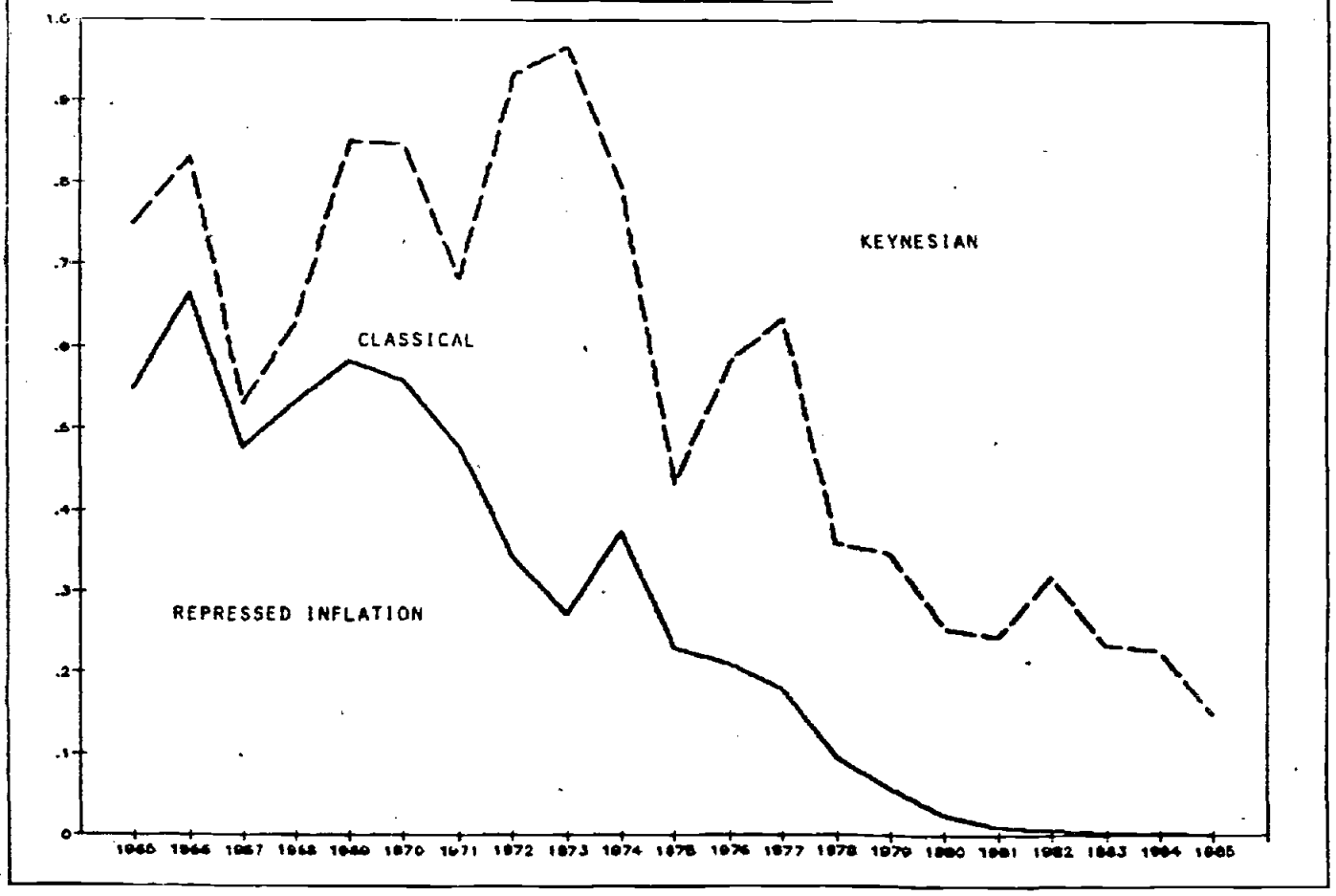


FIGURE 2.12
REGIMES SHARES



2.7 shows that in this casi the main reason for the big fall in Keynesian employment in the period 1973-85 is not the improvement productivity (it in fact decelerated substantially in the second period with an annual rate of increase of 3.2 per cent as compared to 4.8 per cent in the first), but the dramatic fall in demand for domestic output, which in the period 1965-1973 grew at an average annual rate of 5.9 per cent while in the period 1973-1985 grew only at an average annual rate of 1.6 per cent.

Table 2.7

Decomposition of the Growth of Keynesian Employment

(percentages)

	1965-1973	1973-1985
Demand for domestic output	58.4	20.9
Labour - output ratio	- 45.6	- 45.8
Keynesian employment	12.8	- 24.9

Another interesting feature of Figure 2.10 is the relation that LP and LK keep with one another and with observed employment (L) and labour supply (LS). In this respect we can distinguish three periods which roughly coincide with the ones used in the previous section. From 1965 to 1971, LP and LK keep what we consider a normal relationship, with LK above LP in the peak of the cycle and viceversa in the through. Besides, both LP and LK are above labour supply and employment, thus indicating a fairly well functioning economy where actual employment was very near labour supply and existed a certain amount of excess demand for labour, which in 1970 represented a 2.5 per cent of the

labour force.[3] From 1971 to 1978 the relationship between LP and LK is more or less maintained, but LP, practically for the whole period, stays below labour supply, which can be interpreted as a signal of the appearance of some limitations as far as the amount of available capital is concerned. Also, after the peak of 1973 and towards the end of the period, we observe a clear weakening of Keynesian demand for labour, which ends up in 1978 at a level 6.0 per cent below labour supply.The last period, 1978-1985 is completely different from the other two, and picks up the very strong effects of the crisis upon employment. Here, LP stays above LK all the years, thus suggesting that the main constraint to employment growth has been deficient demand, which by 1985 was requiring a level of employment 21.9 per cent below that of labour supply. However, according to our results, demand expansion alone could not have solved this problem as the extra employment required would very soon have hit the capital constraint. In 1985, without increasing the capital stock, the maximum amount of employment would still have been 17.7 per cent below labour supply.[4]

The overall conclusion then is that the problem of unemployment in Spain is both a problem of deficient demand and a problem of deficient capital stock. The second part of this conclusion ties up quite well with the results discussed in Section 2.2.1 and presented in Table 2.2. The first part, although not inconsistent with the results

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3 It should be noted that this situation coexisted with sizeable outflows of workers to other European countries.

4 Figure 2.12 presents the proportions of firms that are restricted by demand, by capital or in a situationof repressed inflation (i.e. limited by labour supply) that are implied by Figure 2.10.

presented in Table 2.2, suggests that the magnitude of this effect may be much larger than what was estimated there.

Naturally, all we have done is to single out demand and capital stock as inmediate constraints limiting the growth of employment, but we have not as yet managed to explain the factors behind the evolution of these two constraints. As far as the capital stock is concerned we need to investigate what determines investment, and concerning demand we need to specify in more detail the remaining macro-economic relationships. Also, we need to do much more work to establish the effect of relative prices on factor proportions and, hopefully, to understand the evolution of prices. The discussion in Section 2.2.2 has attempted to go some way in that direction, but there are still many lacunae to cover. We turn now to the discussion of the empirical framework and results on which this overall evaluation is based.

3. THE ANALYTICAL FRAMEWORK

The model that we estimate in Section 4 is composed of seven equations arranged in two blocks.

3.1. Wage and Price equations

The wage equation takes the following general form:

$$(w+t_1-p) = \alpha_0 + \alpha_1 (w+t_1-p)_{-1} + \alpha_2(B)U + \alpha_3 \Delta^2 P + \alpha_4 x + \alpha_5 \quad Z_1 \qquad (3.1)$$

Where $\alpha(B)$ is a polynomial in the backshift operator, w is the gross monthly wage per employee, p is the value added deflator, t_1 is the employer's Social Security contribution rate, U is the unemployment rate, x an index of trend productivity and Z_1 is a vector of wage push factors (it may include, among others, the tax wedge, the replacement ratio, an index of union pressure, an index of mismatch, the age structure of the labour force, etc.). Small letters denote logarithms but for the tax rates.

Equation (3.1) models the setting of the "target" real wage by wage bargainers. Firms and workers bargain about a real wage target that depends on trend productivity, past real wages and a set of wage push factors. Nominal wages are supposed to be set over expected prices. If actual prices differ over expected prices, real wages will in the short-run deviate from the level at which expectations are fulfilled. This price surprise effect is captured by the second difference on prices.

The "feasible" real wage is set by firms according to the price equation which takes the form of a mark up on average labour costs

$$(p-w-t1) = \beta_0 + \beta_1(p-w-t1)_{-1} + \beta_2(B)\, w + \beta_3 DUK + \beta_4 x + \beta_5 Z_2 \qquad (3.2)$$

where $\beta(B)$ is a polynomial in B, and $\beta(B)w$ allows for sluggish nominal adjustment, DUK is the logarithm of the degree of utilization of capital, which stands for a proxy of demand pressure, and Z_2 is a vector of possible shift factors.

The unemployment rate is the only variable in (3.1) that has a negative effect on the "target" real wage. Solving for U in the long-run version of (3.1) and (3.2), setting to zero nominal surprises and fixing DUK at its average level, we get the NAIRU, i.e. the unemployment rate which matches "feasible" and "target" real wages. If equilibrium unemployment is not to be affected by trend productivity, then $\alpha_4/(1-\alpha_1) = -\beta_3/(1-\beta_1)$.

3.2. Short-run employment block

We use a capital-labour relationship similar to that in Bean and Gavosto (1987). In a constant returns to scale CES technology, cost minimization leads to a relationship between factor proportions and relative factor prices.

$$k - lp = \sigma_0 + \sigma_1 \Gamma(B)\ WPI + \sigma_2\ trend \qquad (3.3)$$

where k is the capital stock, lp is potential employment, WPI is the relative factor price variable, defined as $WPI = \log (w(1 + t_1)/cc)$, cc is the user cost of capital and $\Gamma(B)$ is a polynomial in B that allows for slow adjustment of the capital-labour ratio to changes in relative prices.

Following Bean and Gavosto (1987), we relate the (unobservable) potential employment lp to actual employment l by means of our capacity under-utilization variable $(DUK_{max} - DUK)$:

$$lp = l + \phi_3\ (DUK_{max} - DUK) \quad ; \qquad 0 \leq \phi_3 \leq 1 \qquad (3.4)$$

By substituting (3.4) into (3.3) we obtain:

$$k - l = \sigma_o + \sigma_1 \Gamma(B)\ WPI + \phi_3(DUK_{max} - DUK) + \sigma_2\ trend \qquad (3.5)$$

Then, estimating ϕ_3 in (3.5), we can compute potential employment using (3.4). This gives an estimate of employment at full use of productive capacity.

Keynesian employment is that level of employment that could satisfy total demand for domestic output. If demand for domestic output is large and this generates shortages, these shortages will be met by lower exports and larger imports. In order to estimate the spillovers of internal demand on exports and imports, we use the following equations:

$$(X + \phi_1\ (DUK - (DUK_{min})) = \delta_o + \delta_1(X + \phi_1(DUK - DUK_{min}))_{-1} + \delta_2(B)WT + \delta_3(B)\ PRXI \qquad (3.6)$$

$$(I - \phi_2\ (DUK - DUK_{min})) = \theta_o + \theta_1\ (I - \phi_2(DUK - DUK_{min})_{-1} + \theta_2(B)Y + \theta_3(B)\ PRM \qquad (3.7)$$

Where DUK_{min} is the minimum historical level attained by the degree of capacity utilization, X is exports, WT is world trade, PRXI is relative export prices, I is imports, Y is real GDP, PRM is relative import prices, and $\delta_2(B)$, $\delta_3(B)$, $\theta_2(B)$, $\theta_3(B)$ are lag polynomials. All variables are expressed in logarithms.

Keynesian output demand YK is the level of demand that the economy would face if exports and imports were set to their notional level, that is, to $X + \phi_1(DUK - DUK_{min})$ and $I - \phi_2(DUK - DUK_{min})$. Then, if Y is observed demand, we have that (in logarithms),

$$YK = Y + (\phi_1 S_X + \phi_2 S_I)\ (DUK - DUK_{min}) \qquad (3.8)$$

where S_X and S_I are the ratios X/Y and I/Y respectively.

In order to compute the Keynesian labour demand lk we need a relationship that shows how l would adjust in the short-run to changes in Y. For this purpose we estimate the following relationship,

$$l = a_0 + a_1 l_{-1} + a_2 Y + a_3 K + a_4 A + a_5 \text{ trend} \qquad (3.9)$$

where A is an index of technical progress.

Then we can transform YK into the Keynesian demand for labour lk as follows,

$$lk = l + \frac{a_2}{1 - a_1} (\phi_1 S_X + \phi_2 S_I)\ (DUK - DUK_{min}) \qquad (3.10)$$

Finally, the employment function relates actual employment to Keynesian and potential labour demand and to labour supply. By aggregating over micromarkets, some of which are in excess supply and some of which are in excess demand, we obtain the CES form (see Lambert 1987)):

$$L = (LK^{-\rho} + LP^{-\rho} + LS^{-\rho})^{-1/\rho} \qquad (3.11)$$

where ρ is the inverse of the imputed mismatch variable that can be modelled as

$$\rho = b_0 + b_1 \text{ trend} + b_2 Z_3 \qquad (3.12)$$

where Z_3 is a vector of mismatch variables that may include structural change variables, industrial and global mismatch, etc.

It follows from (3.11) that the elasticities of employment with respect to LK, LP and LS are less than one and correspond to the proportion of firms or micromarkets in Keynesian, Classical and repressed inflation regimes. Denoting by PK, PC and PRI these proportions we have

$$\left.\begin{aligned} PK &= \frac{LK^{-\rho}}{LK^{-\rho} + LP^{-\rho} + LS^{-\rho}} \\ PC &= \frac{LP^{-\rho}}{LK^{-\rho} + LP^{-\rho} + LS^{-\rho}} \\ PRI &= \frac{LS^{-\rho}}{LK^{-\rho} + LP^{-\rho} + LS^{-\rho}} \end{aligned}\right\} \qquad (3.13)$$

Also, if $LK = LP = LS = \bar{L}$, then $\bar{L} = 3^{-(1/\rho)}L$, implying an structural unemployment rate in equilibrium (SURE) equal to

$$(LS - L)/LS = 1 - 3^{-(1/\rho)}$$

4. EMPIRICAL RESULTS

The model of Section 3 has been estimated using instrumental variables. The wage and price equations have been estimated jointly, and so have been the exports and imports equations.

4.1 Wage and price equations

Table 4.1 shows the preferred specifications of the wage and price equations.

The wage equation is estimated to be static, as no lag of the dependent variable proved significant. Its independent variables try to capture: (i) the effect of trend productivity on the target wage, (ii) the effect of unemployment, (iii) a nominal surprise effect, and (iv) shift factors.

(i) Trend productivity effect.

Trend productivity is proxied by the capital-labor supply ratio KLS. An elasticity close to one could be interpreted as workers trying to claim for wages all observed productivity gains. The estimate of a unitary elasticity is very robust both to different specifications of the wage equation and to different specifications of the productivity variable. Also, the technical progress variable A has a significant positive effect on wages.

(ii) Unemployment effect.

Leaving aside price surprises, the unemployment rate is the only variable in the wage equation that can lower the target wage. This effect is very significant and also very robust to different specifications. We have tried several lags of U, its logarithm, first and second differences, long term unemployment, and male unemployment as different

measures of labor market tightness. Neither of them improves the results shown in Table 4.1.

(iii) Nominal surprises.

Nominal surprise, as measured by the second difference of p, exert, as expected, a significant negative effect on real wages.

(iv) Wage pressure effects.

We have tried unsuccessfully a variety of shift variables such as replacement ratios, mismatch, union power proxies, benefit proxies and age structure of the labour force. All of them had very small t-ratios and do not appear in our preferred specification. The only significant shift factors are fiscal wedge variables. In an unrestricted version, the coefficient of t1, the employers' Social Security contribution, was larger than one (implying that the greater is this contribution, the larger the target wage is). This is a recurrent finding in the estimation of wage equation with Spanish data (see for instance, Dolado, Malo and Zabalza (1986)). The coefficient of t2 (direct taxes), was negative, although insignificant. And the coefficient of t3 (indirect taxes) was very significant and larger than expected, implying that a shift from indirect taxes to Social Security contributions would lower labour costs. In order to avoid these anomalies, we have restricted the t1 coefficient to one, the t2 coefficient to zero and the t3 coefficient to 3.5, the latter restriction implying neutrality of shifts from t3 to t1 as far as labour costs are concerned. All restrictions are easily accepted by the data.

TABLE 4.1

Wage equation

$$(w+t_1-p) = 3.6 + 1.02\,KLS - 1.43U + 1^{*}t_1 + 3.5^{*}t_3 + 1.52\,PREL - .21\,\Delta^2 p + .35A$$
$$\qquad\quad (35.9)\ (16.3)\quad (-11.5)\qquad\qquad\qquad (3.9)\qquad (-2.0)\qquad (-5.1)$$

$R^2 = .997$ SEE = .013

$\bar{R}^2 = .996$ D.W. = 2.27 Box-Pierce: $X^2(10) = 5.9$

Price equation

$$(p-w-t_1) = -2.27 + .36(p_{-1}-w-t_1) - .50KLS - .22DUK - .13A$$
$$\qquad\quad (6.8)\ \ (4.0)\qquad\qquad (5.4)\ \ (1.98)\ \ (2.5)$$

$R^2 = .997$ SEE = .009

$\bar{R}^2 = .998$ D.W.= 2.62 Box-Pierce: $X^2(10) = 5.6$

All variables in logs except t1,t3,U

* Denotes restricted coefficient

Method of estimation: Three Stage Least Squares

Sample period 1966-1986

In the price equation we have not imposed unit elasticity of prices to labor costs. We have tested its validity in the short-run and in the long-run by including several lags of w. Unit elasticity is accepted by the data in the long-run but not the short-run. We have not found significant effects of nominal surprises, as measured by $\Delta^2 w$. Our interpretation of this result is that in the determination of the wage target, based upon annual bargaining rounds, nominal surprises have a stronger effect than in the price equation, as firms set prices continously.

Our cyclical demand variable, as proxied by DUK, has a negative influcence on prices. This result is very robust to alternative specifications of demand including the public deficit, competitiveness and internal demand.

The trend productivity variable KLS has the expected negative effect on prices. However, its long-run elasticity is less than the corresponding one found in the wage equation, and the equality restriction is not accepted by the data. This implies non-neutrality of KLS in the determination of the NAIRU, suggesting that, at least during the period concerned, the influence of trend productivity on the desired wage has been larger than its influence on the feasible wage, thus generating structural elements of inflationary pressure that can only be neutralized by having more unemployment. The same comment applies to the technical progress index A. Although it has the expected negative sign, we find again non-neutrality as far as the determination of the NAIRU is concerned.

The NAIRU is computed by solving for U the wage and price equations, setting to zero nominal surprises and DUK to its average level in the sample period. For 1966-1972 we set the NAIRU equal to the average level of observed unemployment. As shown in Figure 2.9, the NAIRU followed a path very close to actual unemployment until 1979. After that date, its rate of growth was lower than the rate of

growth of U. In 1985 the NAIRU was 3.4 points lower than actual unemployment.

4.2 Short-run employment block

4.2.1. Capital-labor ratio

We have estimated equation (3.5) assuming that the cost of capital equals the price of investment goods as several attempts with interest rates have been unsuccessful. In order to estimate the polynomial $\Gamma(B)$ we assume, following Sneesens and Drèze (1986), that it has a geometric distributed lag structure:

$$\Gamma(B) = \frac{1 - \Gamma}{1 - \Gamma B}$$

In order to estimate Γ we use a Koyck transformation in equation (3.5) from which we obtain,

$$(k-l)_t = \phi_o + \Gamma(k-l)_{t-1} + \sigma_1(1 - \Gamma)WPI_t + \phi_3 DUK_t + \phi_4 DUK_{t-1}$$

where the term $\phi_3 DUK_{min}$ is incorporated in the constant term. Using this equation we obtain $\hat{\Gamma} = .73$ with a t - statistic of 5.76.

Then, we define WPIAL as the estimated value of the distributed lag $(1-\Gamma/1-\Gamma B)WPI$

$$WPIAL_t = (1 - \hat{\Gamma})WPI + \hat{\Gamma}\, WPIAL_{t-1}$$

setting the initial value at WPI_{1964}. Then, having a series for WPIAL, we go back to (3.5) and estimate the following capital-labour ratio equation,

$$(k-l)_t = \sigma_o + \sigma_1\, WPIAL_t + \phi_3\, DUK_t + \sigma_2\, D_t$$

D_t is defined in Table 4.2 where the results are summarized.

TABLE 4.2

Capital-labour ratio

$$(k-1)_t = \underset{(101.9)}{-3.8} + \underset{(67.3)}{.96\ WPIAL_t} - \underset{(4.5)}{.40\ DUK_t} + \underset{(13.9)}{.02\ D_t}$$

$R^2 = .999$ DW = 1.72 Box-Pierce: $X^2(10) = 4.5$

Number of observations = 21
Degrees of freedom = 17
Estimation method : Two-stage least squares

$$D = \begin{cases} 0 & \text{for } 1964\text{-}77 \\ t\text{-}14 & \text{for } 1978\text{-}85 \end{cases}$$

A value of Γ of .73 (incidentally, the same that was obtained by Sneesens and Drèze (1986)) means that only 27 per cent of the optimal change in the capital-labour ratio induced by relative prices takes place within a year. We find a unitary elasticity of the capital-labour ratio with respect to the distributed lag of relative prices. The coefficient of DUK is very significant and lies within the plausible range.

Potential employment

Using (3.4) and $\phi_3 = .4$ we can estimate potential employment using:

$$lp_t = l_t + .4\ (DUK_{max} - DUK)_t$$

4.2.2 Exports and imports

Exports

In Table 4.3 we present estimates of the exports equation. Exports are measured as in the National Accounts and include the net revenue from tourism which represents almost a 20% of the total. Alternative specifications separating tourism from exports of goods and services were tried in order to capture differences in the competitiveness or world trade effects. However, the aggregate specification turned out to be the best one.

The dependent variable, X, is divided by the implicit exports deflator.

The independent variables try to capture: (i) World income effects, (ii) competitiveness and (iii) the spill-over effect of domestic demand over sales abroad.

TABLE 4.3

Exports equation

$$X_t = 9.11 + .27\ X_{t-1} + .99\ WT_t - .89\ PRXI_t - .52\ PRXI_{t-1} - .61\ DUK_{t-1}$$
$$\quad\quad (6.99)\ (2.96)\quad\quad (7.49)\quad (3.19)\quad\quad (2.72)\quad\quad (2.92)$$

$R^2 = .996$ SEE = .036

$\bar{R}^2 = .994$ D.W. = 1.73 Box-Pierce $X^2(10) = 8.74$

Period of estimation: 1965-85

Notes:

t ratios in parenthesis

Estimation method: Three stage least squares (jointly with imports)

All variables in logs.

(i) World income effect.

To estimate this effect, we have used a measure of real World trade (WT), which also plays the role of the scale variable in the exports equation. We have also tried, alternative specifications that included two separated variables: World GDP, to catch the income effect, and the ratio World trade/World GDP to catch the effect of world integration. In all cases, the best specification was the one with only the world trade variable.

(ii) Competiteveness.

If we assume that tradable and non-tradables markets are perfectly integrated, only one relative price should be included. Other specifications for Spanish exports (see Bonilla (1978) or Mauleón (1986)) have found two relevant competitive indexes: one for the price of Spanish exports relative to World (or industrial countries) imports, and another for the price of Spanish value added (GDP deflator) to World (or industrial countries) imports. In this work, only the former is included and enters also with a lag. The index of competitiveness is built dividing the price of Spanish exports by the price of international imports times the appropriate exchange rate. We tried two different export competitiveness indexes. One, used in our related work, Molinas, Sebastian, and Zabalza (1987), has the price of world imports as the alternative relevant price. The other is referred to the price of industrial countries imports, where more than 70% of the total Spanish exports actually go. The profiles of both indexes are very different. Considering the World as the relevant market, (PRX), Spanish exports have gained in competitiveness over the last years. On the other hand, considering only industrial countries, (PRXI), such a gain has not taken place. When including the latter, there is a substantial

improvement in the fit, standard error and significance of the coefficients. We later comment on other differences found when using these two indexes.

(iii) Spill-over effect.

Observed and demanded exports differ. An excess demand for domestic goods, represented by high value of capacity utilization relative to a fixed reference benchmark (DUK), has a negative effect on actual exports. Other measures for internal demand were tried and also found suitable. However, we kept the variable DUK for reasons of consistency with the rest of the model.

The short-run world trade elasticity is close to one. However, in the long-run it rises to 1.35. This result is similar to previous estimates of the Spanish exports equation. Bonilla (1978) obtained 1.7, Mauleón (1985) obtained 1.3, and Molinas, Sebastián and Zabalza (1987) obtained 1.1 for the short-run and 1.24 for the long-run.

The estimated price elasticity is -0.9 in the short-run and -1.9 in the long-run. This compares with the long-run elasticity of -0.9 and -0.5 in respectively Bonilla (1978) and Mauléon (1985), and with -0.5 (short-run) and -1.0 (long-run) in Molinas, Sebastián and Zabalza(1987).

These elasticities, as Table 4.3 shows, are obtained using PRXI as the relevant price variable. Should the variable used be PRX, the estimated elasticities would tend to be lower and closer to those found by other researches. Here we find a similar short-run effect but a more sluggish adjustment that rises the overall long-run effect. We opted for this specification, because when using PRXI, the cyclical demand proxy takes the correct sign and becomes very significant, suggesting the presence of important spill-over effects via exports. In addition, when using PRXI, the statistical properties

of the equation improve substantially with respect to specification using PRX.

Imports

The poor fit and unstability of the imports equation that had been detected forced us in previous work to disaggregate imports into its oil and non-oil components. However, in this paper we try a different competitiveness index that remarkably improves the estimation of our aggregate imports equation. We present the aggregate as well as its separate componentes in Table 4.4. We still find that the disaggregated results contain useful infromation that helps us to explain the aggregate results.

The dependent variable, I, is divided by the implicit import deflator. When disaggregating into oil imports, IO, and non-oil imports INO, each component is divided by it own deflator.

The independent variables try to measure (i) income effects, (ii) price competitiveness and (iii) spill-over effects.

(i) Income effect.

We used real GDP as the scale variable, denoted by Y in the equation. Other variables, such as total final demand including imports, were tried but eventually disregarded as results were better with GDP, both for the estimation of this effect and for the statistical properties of the equation.

(ii) Price competitiveness.

We use two indices for price competitiveness, both based on a ratio between import and domestic prices (GDP deflator). The first, PRMC, is defined as the price of consumption imports relative to the GDP delfator. In previous attempts we used the total imports deflator, but it was not

TABLE 4.4

Imports equations

TOTAL IMPORTS

$$I_t = \underset{(7.68)}{-4.33} + \underset{(18.56)}{1.31}\, Y_t + \underset{(4.01)}{0.14}\, PRME_t - \underset{(2.17)}{0.28}\, PRMC_t + \underset{(3.76)}{1.52}\, DUK_t$$

$R^2 = .992$ SEE = .037
$\bar{R}^2 = .990$ D.W. = 1.89 Box-Pierce $X^2(10) = 6.84$

Number of observations: 21
Degrees of freedom: 16

OIL IMPORTS:

$$IO_t = \underset{(3.53)}{-6.28} + \underset{(2.47)}{.33}\, IO_{t-1} + \underset{(4.61)}{1.32}\, Y_t - \underset{(5.74)}{.27}\, PRME_{t-1} - \underset{(3.14)}{1.88}\, DUK_t$$

$R^2 = .980$ SEE = .057
$\bar{R}^2 = .975$ D.W. = 2.11 Box-Pierce $X^2(10) = 3.98$

NON-OIL IMPORTS

$$INO_t = \underset{(12.41)}{-6.49} + \underset{(19.70)}{1.36}\, Y_t + \underset{(3.94)}{.13}\, PRME_t - \underset{(2.44)}{.32}\, PRMC_t + \underset{(3.68)}{1.67}\, DUK_t$$

$R^2 = .990$ SEE = .041
$R^2 = .988$ D.W. = 1.97 Box-Pierce $X^2(10) = 10.40$

significant and statistical properties of the equation were rather poor. Apparently the main channel through which price sensitivity is exerted corresponds to a subset of importable commodities (mainly consumption goods), and the aggregate relative price variable did not manage to take this fact into account. We also include as a separate explanatory variable the relative price of energy imports, PRME, which is strongly significant in all specification. In the disaggregated equations, it exhibits a positive sign in the non-oil imports, that we interpret as a "substitution effect", and a negative sign in the oil specifications. It also appears in the aggregate specification with a positive sign, which implies that the crossed substitution effect with respect to non-oil imports dominates the pure substitution effect over oil imports (this is consistent with the fact of 90% of total imports are non-energy).

(iii) Spill-over effect.

It tries to measure the positive effects on imports of excess of domestic demand. In the disaggregate approach it has a negative sign in the energy equation and a positive sign in the non-energy equation. However, if we weight each coefficient by the share of each component in total imports we obtain practically the same coefficient as that estimated in the aggregate equation.

The income elasticity of imports is 1.3, close to other studies and also quite close to other countries' estimates. (e.g. Bonilla (1978), obtained 1.2; Mauléon (1985), 1.0 though using a different scale variable).

The elasticity of imports to the relative price of consumption importables is -0.28. This is just slightly lower than other countries' estimates but, contrary to other findings that (see

Mauleón (1985)) suggested that Spanish imports were not sensitive to relative prices changes, we have indentified a significant negative elasticity. The elasticity of imports to the relative price of energy is positive for the reasons mentioned above. However, in the disaggregate approach, oil imports are as sensitive to energy prices as non-oil imports to consumption importables prices.

4.2.3 Keynesian labour demand

From the exports and imports equations we obtain the spill-over effects: $\phi_1 = .61$ and $\phi_2 = 1.52$.

The estimation of the labour-output relationship is presented in Table 4.5. All variables take the expected sign and, with the exception of the index of technical progress, all are statistically significant. We obtain a long-run elasticity of employment with respect to output of 1.7, which seems reasonable as it implies a share of labour income of 0.6 close to what we find in reality.

Referring to (3.10), the values of a_1 and a_2 are 0.65 and 0.61 respectively. Therefore, Keynesian labour demand is obtained as follows:

$$lk = l + \frac{.61}{1 - .65} (.61\, S_X + 1.52\, S_I)\, (DUK - DUK_{min})$$

where S_X, S_I are the shares of exports and imports over GDP.

Our estimates of potential employment (LP), Keynesian labour demand (LK), plus the series of labor force (LS) and employment (L) are shown in Table 4.6 and Figure 2.10 (in Section 2).

4.2.4. Employment function

The CES form given in (3.11) is estimated using 2 alternatives, that we present in Tables 4.5, 4.7 and 4.8. The regime proportions are shown in Figure 2.12 (in Section 2). The first alternative specifies the parameter ρ just as a time trend, while the second tries to explain this parameters by wage pressure factors. In the second alternative we have found an encouraging effect coming from the mismatch index MM and changes in the proportion of agricultural employment NAN. Under either alternative the results on frictional unemployment and the shares of firms under Keynesian, Classical or Repressed inflation are almost identical.

Finally, the implied rate of frictional unemployment is lower than expected but similar to the ones obtained in other countries using the same model. Both the regime proportions and the frictional unemployment rate seem to be very robust to alternative specifications.

TABLE 4.5

Labour-output relationship

$$l_t = \underset{(2.5)}{4.7} + \underset{(3.0)}{.65}\, l_{t-1} + \underset{(1.9)}{.61} y_t - \underset{(3.2)}{.40} k_t - \underset{(1.1)}{.23} a_t$$

$R^2 = .97$ DW = 1.72 Box-Pierce: $X^2(10) = 10.1$

Number of observations : 21
Degrees of freedom : 16
Estimation method : Instrumental variables

Employment equation

Alternative 1:

$$\underset{}{p} = \underset{(8.4)}{33.2} - \underset{(4.1)}{6.4}t + \underset{(3.1)}{.19}t^2$$

$R^2 = .997$ DW = 1.37

Alternative 2:

$$p = \underset{(2.1)}{-79.2} + \underset{(1.99)}{2.28}t - \underset{(1.19)}{.96}MM + \underset{(3.6)}{4.07}\, NAN^*$$

$R^2 = .997$ DW = 1.93

*MM is a mismatch index, NAN the proportion of labour force in agriculture.

TABLE 4.6

Values of LT, LK, LP and LS
(in thousands)

	L	LS	LP	LK
1965	12156.8	12340.8	12503.6	12467.2
1966	12291.1	12397.1	12641.8	12637.7
1967	12367.0	12492.0	12908.5	12495.8
1968	12426.0	12552.1	12905.8	12627.6
1969	12504.2	12622.7	12799.5	12933.2
1970	12501.3	12633.8	12796.5	12953.8
1971	12599.0	12791.0	13021.4	12901.5
1972	12825.0	13103.3	12944.9	13593.4
1973	13053.5	13357.0	13056.3	14066.1
1974	13222.1	13575.1	13534.4	13787.2
1975	13000.3	13514.8	13569.6	13181.2
1976	12761.5	13412.6	13189.4	13142.6
1977	12755.8	13504.3	13119.7	13209.1
1978	12604.6	13595.6	13156.5	12784.5
1979	11896.0	13101.3	12416.9	12082.4
1980	11367.0	12858.1	11924.6	11455.9
1981	11172.0	13045.0	11720.0	11258.5
1982	11061.0	13206.0	11545.4	11242.8
1983	10984.0	13353.4	11522.8	11072.6
1984	10668.0	13437.0	11191.3	10758.0
1985	10571.0	13542.0	11146.2	10567.6

TABLE 4.7

Frictional unemployment and regime proportions

(Alternative 1)

	PK	PC	PRI	RHO	SURE
1965	0.251	0.200	0.549	76.994	0.014
1966	0.169	0.166	0.665	71.134	0.015
1967	0.468	0.055	0.477	65.659	0.017
1968	0.370	0.099	0.532	60.568	0.018
1969	0.150	0.268	0.582	55.860	0.019
1970	0.154	0.288	0.558	51.537	0.021
1971	0.317	0.204	0.478	47.598	0.023
1972	0.068	0.588	0.444	44.043	0.025
1973	0.033	0.694	0.273	40.872	0.027
1974	0.207	0.419	0.374	38.086	0.028
1975	0.567	0.201	0.232	35.683	0.030
1976	0.418	0.371	0.211	33.664	0.032
1977	0.366	0.454	0.180	32.030	0.034
1978	0.639	0.264	0.096	30.779	0.035
1979	0.653	0.289	0.058	29.913	0.036
1980	0.746	0.229	0.025	29.431	0.037
1981	0.757	0.233	0.010	29.333	0.037
1982	0.683	0.311	0.006	29.619	0.036
1983	0.768	0.230	0.003	30.289	0.036
1984	0.775	0.225	0.001	31.343	0.034
1985	0.851	0.148	0.000	32.782	0.033

TABLE 4.8

Frictional unemployment and regime proportions

(Alternative 2)

	PK	PC	PRI	RHO	SURE
1965	0.270	0.226	0.503	60.881	0.018
1966	0.172	0.169	0.659	69.715	0.016
1967	0.464	0.064	0.472	61.007	0.018
1968	0.369	0.097	0.533	61.175	0.018
1969	0.144	0.264	0.593	58.257	0.019
1970	0.153	0.288	0.558	51.652	0.021
1971	0.316	0.198	0.486	50.163	0.022
1972	0.067	0.590	0.343	44.470	0.024
1973	0.030	0.702	0.268	42.358	0.026
1974	0.200	0.425	0.376	40.812	0.027
1975	0.561	0.204	0.235	34.835	0.031
1976	0.416	0.370	0.213	32.914	0.033
1977	0.365	0.448	0.187	30.301	0.036
1978	0.650	0.259	0.090	32.066	0.034
1979	0.646	0.293	0.062	28.972	0.037
1980	0.747	0.228	0.025	29.539	0.037
1981	0.741	0.246	0.013	27.394	0.039
1982	0.691	0.304	0.005	30.885	0.035
1983	0.802	0.197	0.001	35.242	0.031
1984	0.787	0.213	0.000	33.122	0.033
1985	0.854	0.146	0.000	33.164	0.033

5. Conclusions

This paper has attempted to provide an explanation of the recent rise of unemployment in Spain. We have approached the problem from several perspectives, but in all cases basing the explanation on the estimation of a macroeconomic model centered around the labour and production sectors. The main conclusions obtained could be summarized as follows.

a) Our results suggest that the problem of unemployment in Spain is both a problem of deficient demand and a problem of deficient capital stock. In 1985, the main constraint to employment growth was deficient demand which in that year required a level of employment 21.9 per cent below that of labour supply. However, according to our results, demand expansion alone could not have solved this problem, as the extra employment required would very soon have hit the capital constraint. In 1985, without increasing the capital stock, the maximum amount of employment would still have been 17.7 per cent below labour supply.

b) To establish these results we have estimated a model in which the observed capital-labour ratio depends significantly on relative prices, on technical progress and on the degree of capacity utilization. Also we have identified correctly signed and significant spillover effects coming from the import and export equations, which have ennabled us to estimate the "Keynesian" demand for domestic output.

c) We have been less fortunate in the explanation of wages and prices, as the influence of trend productivity on the desired real wage is larger than its influence on the feasible real wage, and this implies the existence of a structural element of

inflationary pressure that can only be neutralized by having more unemployment. Leaving aside this anomalous result, we find that the increase of Social Security contributions and real import prices account for more than 45 per cent of the total increase in unemployment experienced between the periods 1972-78 and 1979-85. Cyclical demand also had an important effect on this rise of unemployment via the real wage (it explains about 12 per cent of the total change), but we think that its effect is larger as it may also operate directly through output demand.

d) The next step should be to explain what determines the level of aggregate demand and the capital stock, and this in turn implies to investigate what determines consumption and investment. We leave that for another paper.

ANNEX 1

We present in this Annex the employment equation referred to in Section 2. It has been estimated jointly with the wage and price equation shown in Section 4.

$$l = \underset{(3.1)}{.52}\, l_{-1} + \underset{(3.1)}{.74}\, k - \underset{(3.9)}{.51}\, (w+t1-p)_{-1} - \underset{(3.2)}{.56}\, (w+t1-p) + \underset{(1.7)}{.29}\, DUK$$

$$+ \underset{(2.2)}{.25}\, A - \underset{(2.5)}{.025}\, Trend$$

$R^2 = .974$; SEE = .014 ; DW = 2.03 ;

APPENDIX

LIST OF VARIABLES AND DATA SOURCES

Variables:

A: Labour augmenting technical progress (own estimates).

DUK: Capacity utilization in industry (Survey of Entrepreneur's Opinions, BE).

D: A truncated trend taking 0 value for 1964-77, T-14 for 1978-85.

I: Real imports (in thousands of 1970 pts.) Exports including tourism expenditures (INE,CN).

IO : Real oil imports (in Thousand 1970 pts.). Oil imports (BE) divided by the oil imports unit value (MECO).

INO: Real non-oil imports (in thousands 1970 pts.). Non-oil imports (BE) divided by the implicit non-oil imports deflator obtained from the imports deflator and the oil imports deflator.

KLS: Capital/labour supply ratio. Capital series (own estimates) divided by labour supply (thousands)(INE,EPA).

L : Number of employed (in thousands) (EPA).

MM : An index of mismatch. Sum of absolute changes in the proportion of total employees in each sector relative to total employees (GTE and EPA).

NAN : Proportion of agricultural labor force (GTE and EPA).

PIP: Relative price of investment. Gross fixed investment deflator divided by GDP deflator.

PREL: Ratio of CPI (INE) to GDP deflator (market prices) minus indirect taxes (INE,CN).

PRME: Relative price of oil imports. Oil imports deflator divided by GDP deflator.

PRMC: Relative price of consumption imports goods. Consumption importables unit value divided by GDP deflator.

PRX: Relative price of exports (relative to wold) . Spanish exports unit value (MECO) divided by world exports unit value (IFS) times the appropiate exchange rate.

PRXI: Relative price of exports (relative to industrial countries.). Spanish exports unit value (MECO) divided by industrial countries' unit value (IFS) times de appropriate exchange rate.

t2 : Income taxes. Total income tax colection (IGAE) over GDP (INE, CN).

t3: Indirect tax rate. Total excise collections divided by nominal private consumption (IGAE and INE).

U: Unemployment rate (INE-EPA).

$W(1+t_1)$: Total real labour cost (monthly). W: Real wage (obtained from total monthly labour share on GDP divided by employment (INECN). $(1+t_1)$: Total effective rate of employer's contributions to the Social Security (own estimates).

WPI: $W(1+t_1)$ divided by PIP

WT: Real world trade. World imports in $ (IFS) divided by world ~~imports unit prices in $ (IFS)~~.

X: Real exports (in thousands of 1970 pts.) Exports including tourism expenditures (INE,CN).

Y: Real GDP at factor costs (in thousands 1970 pts.). (INE,CN).

Abreviations for sources

BE Boletín Estadístico (Bank of Spain)

CN Contabilidad Nacional

EPA Encuesta de Población Activa

GTE Grupo de Trabajo del Ministerio de Economía y Hacienda

IFS International Financial Statistics (IMF)

MECO	Ministerio de Comercio
IGAE	Intervención General de la Administración del Estado
INE	Instituto Nacional de Industria

REFERENCES

BEAN, C. and **GAVOSTO, A.**(1987): "A discussion of British Unemployment combining traditional concepts and disequilibrium economics: a preliminary report", CLE Working Paper No.976.

BONILLA, J.M. (1978): "Funciones de Importación y Exportación para la economía española", Estudios Económicos, No. 14,, Banco de España.

DOLADO, J.J.; MALO DE MOLINA, J.L. and **ZABALZA, A.**(1986): "Spanish Industrial Unemployment: Some Explanatory Factors", Economica Vol.53, No. 210.

LAMBERT, P. (1987): "Disequilibrium Macro Models", Cambridge University Press. Cambridge.

MAULEON, I. (1985): "Análisis econométrico de las importaciones españolas". Documento Interno Servicio de Estudios. Banco de España.

MAULEON, I. (1986): "Una función de exportación para la economía española", Investigaciones Económicas, vol. X, No. 2, pág. 357-378.

MOLINAS, C.; SEBASTIAN, M. and **ZABALZA, A.** (1987): "European Unemployment Program: preliminary results on Spanish Unemployment". manuscript.

SNEESSENS, H.R. and **DREZE, J.H.** (1986): "A Discussion of Belgian Unemployment Combining Traditional Concepts and Disequilibrium Economics", Economica, Vol. 53, No. 210.

SNEESSENS, H.R. and **DREZE, J.H.** (1987): "Report on the Project on European Unemployment", CORE, manuscript.