Demand rationing and capital constraints in the Spanish economy

1964–88

F.C. Ballabriga, C. Molinas, M. Sebastián and A. Zabalza

We adopt a disequilibrium approach to specify and estimate a structural model for the Spanish economy centred around the labour and production sectors Our results suggest that the predominant regimes in the late 1960s and early 1970s were repressed inflation and capital constraints, it was a period with record growth rates and low unemployment Demand constraints appear in the late 1970s and become dominant in the early 1980s Capital constraints again become binding from 1986 on, a period of extraordinary recovery and lowering of unemployment An estimated measure of structural unemployment suggests that more than a third of Spanish jobless are in this category

Keywords Demand rationing, Employment, Spanish economy

This paper reports the estimation results of a structural model of the Spanish economy aiming to explain the fators behind the evolution of employment in the last 25 years During this period the Spanish economy has experienced the worst crisis of recent history, with very severe consequences for employment In 1974, the peak year of the period, overall employment stood at 13 042 000, in 1985, the year of highest unemployment, the level fell to 10 855 000 The loss of 2 187 000 jobs in 11 years is a rate of almost 200 000 jobs per year

The period considered is of economic interest not only because it includes this substantial fall which needs to be explained, but also because it covers two subperiods of recovery the second half of the 1960s and the recent recovery that started in 1986 In addition to explaining why the Spanish economy was so vulnerable to the economic crisis of the 1970s, it will be of interest to discover the similarities and discrepancies between these two periods of employment growth

The remainder of the paper is organized as follows The next section describes the main facts to be explained and presents an evaluation of how far the results obtained in the paper can help us understand the evolution of employment over a period of this length This section therefore includes both an introduction to the problem and a summary of the main findings The following section presents a brief outline of the model and the third section discusses the results obtained The paper ends with a section that carries out several simulations that should give a feel of the main properties of the estimated model

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An explanation of Spanish employment for 1964–88

The facts

The main facts under explanation are summarized in Figure 1, which plots the evolution of the labour force and of employment for the last 23 years Until 1974 the increase in the labour force was easily absorbed by a corresponding increase in employment From 1966 to 1974 the labour force increased by 9 0%, at a rate of 1% per year, while employment increased by 7 0%, at a rate of 0 8% per year Since then, however, the situation has changed dramatically In the period from 1974 to 1985, the labour force kept growing, although at a slower pace (0 4% per year) Employment, on the other hand, fell continuously over all these years In 1985 overall employment stood at 10 855 000, while in 1974 it had reached 13 042 000 a loss of almost 2 2 million jobs, at a rate of almost 200 000 jobs per year Since then there has been a strong recovery, with

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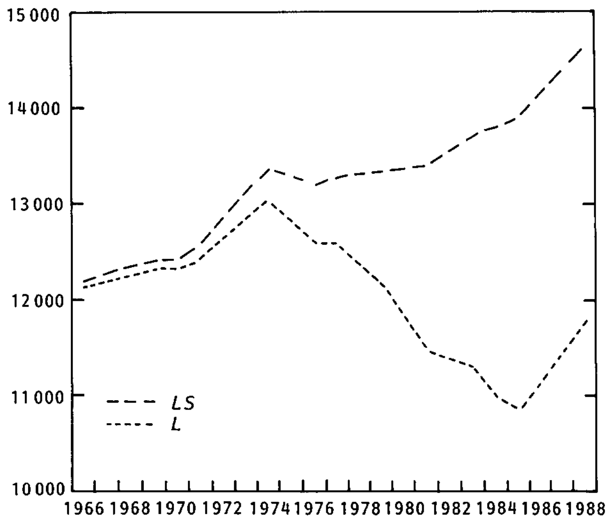

Figure 1. Employment (L) and labour force (LS) (thousands)

employment increasing to 11 781 000 in 1988, an increase of 926 000 jobs in three years, at a rate of over 300 000 jobs per year This 2 8% growth per year has more than absorbed the also large growth of the labour force (1 7% per year)

The evolution of unemployment is the mirror image of these facts In 1974 the unemployment rate stood at 2 3% of the labour force while in 1985 it had reached 21 9% The very rapid recovery of employment in the last three years has not had an equivalent impact on unemployment due to the considerable growth of the labour force noted above Nevertheless, the unemployment rate in 1988 had already gone down to 19 5%

The years considered in Figure 1 are of interest because they include four distinct periods two of recovery and two of crisis The first period goes from the late 1960s to the peak of 1974, and covers the last years of the upward cycle that spanned the 1960s The second period, which compares the mean levels of the years 1971–74 with the mean levels of the years 1975–82, captures the depressing effects of the first oil crisis The third, which compares the mean levels of the years 1975–82 with those of 1983–86, covers the effects of the second oil crisis And finally, the fourth period, dealing with the mean levels of 1983–86 versus those of 1987–88, contains information on the consequences for employment of the continuing recovery

The following data provide some quantification for these four periods During the first period employment grew 3 4%, during the second it fell by 4 7%, during the third it also fell by a further 9 0% and in the last period it increased 5 1% In annual rates, these are 1 6, −0 8, −1 5 and 1 7% respectively

An attempted explanation

What factors can explain the evolution of employment depicted in Figure 1? The following two sections of this paper estimate an empirical model of the Spanish economy that attempts to identify some of the factors and their relative importance Here we present a non-technical discussion of the results

The model in question considers employment as the result of decisions by firms that may find themselves in three different situations The first situation is when firms find they would like to hire more labour than is available at the going wage rate, because they have the necessary stock of capital to employ this labour and sufficient demand at the going output price to sell all the resulting production In this case, firms are constrained by the available labour supply (LS)

The second situation is when firms, in the short run, find themselves with a given stock of capital which imposes an effective restriction on the number of workers who can be employed, even when these workers are available and there is sufficient demand These firms are restricted by the stock of capital, and the employment that they can generate is called potential employment (LP) This is the level of employment corresponding to the full use of the available stock of capital

The third situation is when firms find themselves with sufficient capacity but with a level of demand so small that there is no incentive for them to fully use the capital stock available In this situation, aggregate demand sets the effective constraint to the level of employment that can be generated This is demand determined employment (LD), and is defined as the level of employment corresponding to a full satisfaction of demand for domestic output

At any moment in time some firms will be constrained by the available labour supply, others by capacity and still others by demand The actual level of employment is a combination of these three situations, the respective weight depending on the proportion of firms in each regime Naturally, these proportions are not constant through time and their evolution helps to understand the nature of the cycle Before attempting to explain the relative role of these forces in explaining employment through the four periods defined above, it is convenient to see how the concepts of potential employment and demand determined employment have evolved through time and how they compare with both the labour force and actual employment

Figure 2 plots the evolution of potential employment (LP), demand determined employment (LD), labour supply (LS) and actual employment (L) Potential employment follows an increasing trend until 1975, growing at an annual rate of 0 7%, and then falls monotonically until 1985, at an annual rate of 1 5% Finally, in the last three years, it begins to increase

Table 1 Contributions of capacity employment, demand determined employment and labour supply to changes in actual employment

	1971–74 / 1969–70	1975–82 / 1971–74	1983–86 / 1975–82	1987–88 / 1983–86
Capacity employment (*LP*)	0 006	−0 021	−0 056	0 015
Demand determined employment (*LD*)	0 003	−0 048	−0 059	0 025
Labour supply (*LS*)	0 013	0 001	0 001	0 002
Structural mismatch	−0 004	−0 033	−0 033	0 000
Degree of labour utilization (*DUL*)	−0 006	0 019	0 006	−0 009
Explained change in employment	0 012	−0 082	−0 141	0 033
Actual change in employment	0 020	−0 077	−0 129	0 038

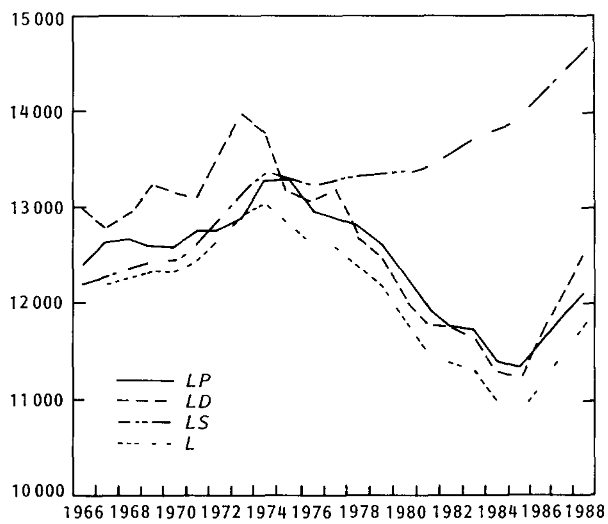

Figure 2. Employment (thousands), *L*, *LP*, *LD* and *LS*

again at an annual rate of 2 2% Demand employment follows a similar pattern, although it presents more oscillations and peaks two years earlier than potential employment The respective annual rates of growth are 1 6% in the period up to 1973, −1 8% in the period 1973–85 and 3 7% in 1985–88 The relation between the two schedules suggests that the capital stock was a more important constraint than demand until 1975 It also indicates that from then until 1985 the reverse was true, although both constraints exerted a very similar effect Finally, after 1985 the capital constraint again started to be stronger than the demand constraint While until 1975 both constraints tended to be more important than labour supply, after that date they are clearly less important

How have these constraints combined to generate the observed evolution of employment? Table 1 attempts to answer this question For each of the four periods considered it shows how the three types of employment have contributed to explaining the change in actual employment In addition it considers the effect of structural mismatch and labour hoarding

During the first period actual employment grew by 2 0% [1] The results obtained in this paper suggest that capacity, demand and availability of labour would together explain an increase in employment of 3 6%, and that the increase in the level of mismatch and labour hoarding reduce this effect by 1 6 percentage points [2] The first oil price shock brings a fall in employment of 7 7% The reduction of capacity explains a quarter of this effect, and the reduction in demand almost 60% The other factor that contributes negatively to employment is the worsening of the mismatch which explains 40% of the total effect These influences are partially compensated by less labour hoarding and more labour supply The explanation of the 12 9% fall in employment during the second oil price shock is very similar to that of the first, although the relative influence of capacity is larger Finally, the 3 8% increase in the recent recovery is again mainly explained by demand

Overall, the results in Table 1 suggest that

(i) Demand tends to have a larger effect than either capacity or labour availability on the determination of employment
(ii) Despite this, the influence of capacity has been growing over time, while that of mismatch has decreased
(iii) As expected, labour hoarding tends to increase in periods of depression and diminish in periods of expansion

The results (i) and (ii) are consistent with the evolution of the estimated proportions of firms in each of the three rationing regimes, as shown in Figure 3

Naturally, these results say little unless we also find out how the evolution of capacity employment, demand employment and labour supply are determined Table 2 takes the latter as given and provides

[1] This is measured as the difference between the means of the subperiods considered (eg 1969–70 and 1971–74) and refers to non-public employment only
[2] This applies the predicted combinations of each variable to the actual observed employment change

Table 2 Contributions of technical coefficients, demand and capital stock to changes in capacity employment and demand determined employment.

	1971–74 / 1969–70	1975–82 / 1971–74	1983–86 / 1975–82	1987–88 / 1983–86
Labour technical coefficient (*A*)	−0 164	−0 250	−0 184	−0 065
Capital technical coefficient (*B*)	−0 060	−0 138	−0 085	0 012
Capital stock	0 238	0 334	0 148	0 080
Explained change in capacity employment (*LP*)	0 014	−0 054	−0 121	0 027
Labour technical coefficient (*A*)	−0 164	−0 250	−0 184	−0 065
Notional demand	0 183	0 136	0 061	0 126
Explained change in demand determined employment (*LD*)	0 019	−0 114	−0 123	0 061

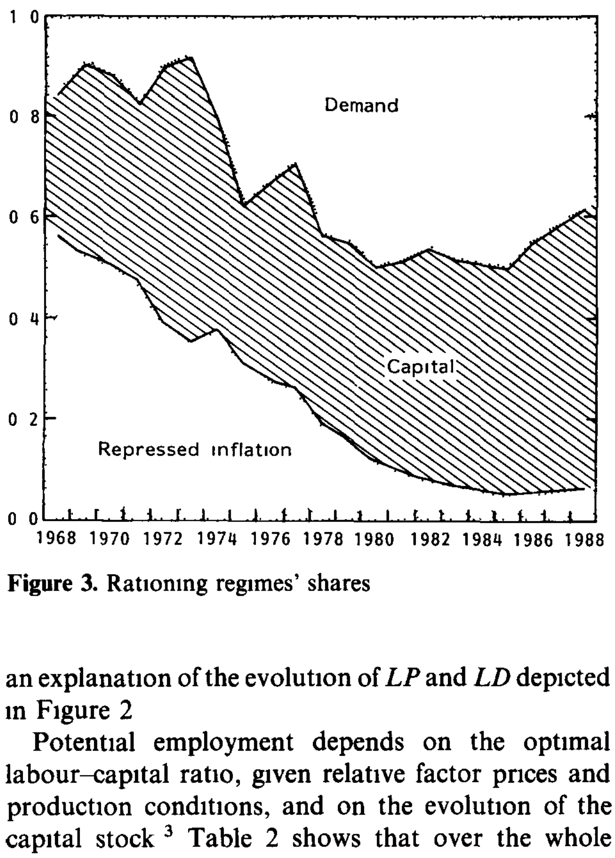

Figure 3. Rationing regimes' shares

an explanation of the evolution of *LP* and *LD* depicted in Figure 2

Potential employment depends on the optimal labour–capital ratio, given relative factor prices and production conditions, and on the evolution of the capital stock [3] Table 2 shows that over the whole period there has been a decreasing trend in the optimal labour–capital ratio, together with a deceleration in the rate of increase of the capital stock [4] In the first period capital stock grew more than enough to absorb the number of workers freed by the lower requirement of labour per unit of capital, and this produced an increase in employment In the second and third periods, however, the capital stock grew much less than in the first, not being able to absorb all workers freed by the lower labour–capital ratio Finally, in the last period the rate of growth of the capital stock picks up again, compensating for the lower labour requirement

Something similar has happened as far as the level of demand determined employment is concerned There is an upward trend in labour productivity, which is more than compensated by the increase in notional demand in the first and fourth periods, but not in the second and third It is interesting to point out the substantial drop of notional demand during the years of crisis The annual rate of growth of notional demand was 9 1% in the first period, 2 7% in the second and 1 2% in the third In the last period of recovery, on the other hand, it picks up to a 6 3% annual rate

What explains the substantial increase in labour productivity and the more moderate fall in capital productivity? We show in the sections below that the evolution of labour productivity (technical coefficient *A*) depends on the real labour cost and on the relative price of energy, and that of capital productivity (technical coefficient *B*) on the user cost of capital and also on the relative price of energy Table 3 identifies the contribution of these factors in each of the four periods considered The increase in labour productivity was, to a large extent, a response to the increase of real labour costs, partially compensated in the first three periods by the rise in energy prices, and compounded in the last period by the fall in these prices The fall in capital productivity, on the other hand, was much more severely affected by the rise in energy prices which, particularly in the two intermediate periods, explains the practical totality of this downward trend

Table 4 brings together all these results and shows the contribution to employment of the basic explanatory variables Focusing attention first on the two intermediate periods, we see that the increase in real labour costs and in the degree of structural mismatch

[3] In turn, the optimal labout–capital ratio can itself be expressed as the product of the inverse of labour productivity times capital productivity (both at the optimal input mix) Since the model estimates these two productivities empirically, the table is also expressed identifying both of them In the text here, however, we turn directly to the effect of the labour ratio, which is simply the sum of the two first rows of the table

[4] This statement takes into account the different length of the periods considered

Table 3 Change in technical coefficients contributions of relative factor prices

	1971–74 / 1969–70	1975–82 / 1971–74	1983–86 / 1975–82	1987–88 / 1983–86
	Labour technical coefficient (*A*)			
Real labour cost	0 131	0 321	0 257	0 061
Relative price of energy imports	0 006	−0 081	−0 067	0 012
Explained change in *A*	0 137	0 240	0 190	0 073
Actual change in *A*	0 164	0 250	0 184	0 064
	Capital technical coefficient (*B*)			
User cost of capital	−0 044	−0 012	0 002	−0 050
Relative price of energy imports	−0 005	−0 139	−0 075	0 056
Explained change in *B*	−0 049	−0 151	−0 073	0 006
Actual change in *B*	−0 059	−0 138	−0 085	0 012

Table 4 Changes in employment. final contributions

	1971–74 / 1969–70	1975–82 / 1971–74	1983–86 / 1975–82	1987–88 / 1983–86
Real labour cost	−0 079	−0 261	−0 242	−0 057
User cost of capital	−0 020	−0 004	0 001	−0 008
Relative price of energy imports	−0 006	0 011	0 062	0 004
Capital stock	0 110	0 132	0 068	0 043
Notional demand	0 026	0 057	0 030	0 051
Labour supply	0 013	0 001	0 001	0 002
Structural mismatch	−0 004	−0 033	−0 033	0 000
Degree of labour utilization	−0 006	0 019	0 006	−0 009
Explained change in employment	0 034	−0 078	−0 107	0 026
Actual change in employment	0 020	−0 077	−0 129	0 038

are the main reasons behind the substantial fall of employment between 1974 and 1985 As a result of these two factors, other things being equal, employment would have fallen by 29 4% in the 1971–74 to 1975–82 period, and by 27 3% in the 1975–82 to 1983–86 period Naturally, things did not remain equal, and the main compensatory factors for these negative effects were capital accumulation and demand, which together would have produced a rise in employment of 18 9% and of 9 8% for each of the two periods While the effects of labour costs and mismatch were very similar in both periods, those of capital stock and demand were somewhat different The positive effects of capital stock on employment are much smaller in the second half of the crisis than in the first In addition, aggregate demand management was more accommodating in the first half, contributing a 5 7% increase in employment, than in the second, when it only contributed a 3 0% increase

Another result worth remarking in these two periods of crisis is the effect of the relative price of energy Somewhat counterintuitively, this effect is positive and, particularly in the second oil crisis, sizable (1 1 and 6 2%) The reason is that, in the way it is specified, this result captures the pure factor substitution effect generated by the increase in the price of energy The output effect, which is undoubtedly negative, is already taken into account through other variables

There are also some noticeable differences between the two recovery periods In the first one (1969–70 to 1971–74), the negative impact of the rise in input costs (9 9%) is more than compensated by the positive effect of capital accumulation and demand, which together produce an employment rise of 13 6%, most of the effect coming from the increase in the stock of capital In the second (1983–86 to 1987–88), the negative impact of input prices is much smaller (6 5%), the positive effect of capital accumulation is also smaller (4 3%), but demand picks up again with an effect of 5 1%, about twice as large as that in the first period of expansion, and even larger than the capital stock effect

Overall the results of this paper confirm the significant negative impact that labour costs have had on employment between 1974 and 1985, and present additional evidence suggesting that structural mismatch during the period may have aggravated the problem The deceleration in capital accumulation also had an influence, but throughout the period its effect on employment was positive Finally, we are also able to corroborate that demand was stronger during the first than the second oil crisis

The model

The sample period under study combines episodes of both record growth and unemployment As is well known, the difficulties lie in the explanation of the stagflation period of the late 1970s and early 1980s In this section we present an outline of the theoretical model used in this paper aimed to address these issues The model is based on the work of Layard and Nickell [12], Sneessens and Drèze [16], Sneessens [15] and Bean and Drèze [7]

Inflationary pressures are mainly caused by distortions in the distribution mechanism Employment, on the other hand, is affected by a variety of factors The second generation disequilibrium models are a useful framework for assessing the relative importance of different factors such as capital shortages, low aggregate demand, labour supply developments, structural mismatches and long-run permanent changes in relative prices [5] Given the importance of the determinants of aggregate demand and capital accumulation, the labour market block must be enlarged to account for the evolution of investment, consumption, trade balance etc so that it becomes a small macro model

The main assumptions that underline the theoretical set up of the model can be summarized as follows

(i) Firms and workers set wages before prices and employment are known Bargaining refers only to expected real wages (W/P^e) and the firm retains the right to decide about prices and employment
(ii) There are n firms which operate in a monopolistic competition framework Each firm i faces a downward sloping demand curve on its price relative to the aggregate price level $d(P_i/P)$ Aggregate demand is given by YD The firm sets its price as a mark up over normal unit costs, taking into account the expected price of its competitors (in aggregate, P^e) before the actual value of exogenous random disturbances on demand (e_i), capacity (ε_i) and labour supply (v_i) are known
(iii) Technology is of the putty–clay type, with large *ex ante* substitution possibilities and fixed *ex post* factor proportions Assuming separability, the firm's value-added Y_i is subject to the following short-run constraints (Sneessens [15])

$$Y_i \leq d\left(\frac{P_i}{P^e}\right)\frac{YD}{n} e_i \equiv YD_i \quad (1)$$

$$Y_i \leq A \; LS_i v_i \equiv YS_i \quad (2)$$

$$Y_i \leq B \; K_i \varepsilon_i \equiv YP_i \quad (3)$$

The firm chooses *ex ante* the optimal technical proportions (A^*, B^*) and capacity (K_i) to minimize long-run costs LS_i is the labour supply exogenously given to the firm
(iv) Labour is the only variable factor and it is chosen once P_i/P, e_i, v_i, ε_i are known
(v) Finally, we consider a large number of firms

Wages and prices

Prices (feasible mark up) Given the stochastic structure of the model it is assumed that each firm sets its price as a mark up over normal unit costs defined at the full employment level of resources Firms also take into account the expected price of rivals and hence prices are set according to

$$P_i = g\left(\mu \; W \frac{E(LS_i)}{E(YP_i)}, P^e\right) \quad (4)$$

where μ is the mark up, W is the nominal labour cost, $E(LS_i)$ represents the expected available labour force and $E(YP_i)$ the expected output at full capacity or potential output as defined in Equation (3) If we assume (Nickell [14]) that g is homogeneous of degree one in both arguments, dividing by P_i and solving, we can rewrite

$$\frac{P_i}{W} = \mu\left[\frac{E(LS_i)}{E(YP_i)}\right] h\left(\frac{P_i}{P^e}\right) \quad (5)$$

The mark up, μ, may be a function of cyclical demand pressure which we represent by $E(YD_i)/E(Y_i)$, and we proxy by the degree of capacity utilization On the other hand, we assume $E(LS_i)/(E(YP_i) = \alpha(K_i/L_i)$, a measure of productivity

Aggregating over firms and taking logs, our price equation is

$$P/W = P/W(P/P^e, DUC, K/L, Z_P) \quad (6)$$

[5] By second generation we mean the set of models in which an overall disequilibrium regime characterizing the economy at a point in time is substituted by a distribution of regimes across markets which can hence suffer from different disequilibrium situations

where Z_P is a vector of fiscal policy or imported price effects which may influence (5)

Real wages (desired mark up) We obtain our wage equation as the outcome of a bargaining process over *ex ante* desired real wages, which can be thought of as coming from a Nash bargaining type model

$$W/P = W/P(P/P^e, U, K/L, Z_W) \tag{7}$$

where U is the unemployment rate and Z_W is a vector of push factors including some measure of union power and the variables driving a wedge between the producer price (P) and the consumer price index (PC) Among these we consider indirect taxes (T_3) and social security contributions (SS), as well as a function of the ratio of imported goods prices over the CPI, (PC/P), which takes into account terms of trade effects

As in Layard and Nickell [12], solving out Equations (6) and (7) we could obtain an expression that has the conventional Phillips curve interpretation, where distributional factors are explicitly allowed for It is not a theory of unemployment, for it involves other endogenous variables such as price surprises and the degree of capacity utilization, yet such an expression shows how much inflation is required to make the desired and feasible mark ups consistent for a given level of unemployment and demand pressure In order to turn this into an operative theory of inflation we need independent explanations of unemployment and demand This is the main subject of what follows, where we only explain one side of the story since we consider labour supply exogenous

The determinants of employment

Production coefficients Given a CES technology, the joint choice of factor proportions and firm size is the outcome of the cost minimization problem

$$\min(WLP_t + CCK_t)$$

subject to

$$YP_t = f(LP_t, K_t) \tag{8}$$

The first order conditions result in technical coefficients associated with the optimal factor proportions

$$A^* = \frac{YP_t}{LP_t} = A^*\left(\sigma, \frac{W}{CC}\right) \tag{9}$$

$$B^* = \frac{YP_t}{K_t} = B^*\left(\sigma, \frac{W}{CC}\right) \tag{10}$$

where W and CC are the nominal wage rate and user cost of capital respectively, σ is the (constant) elasticity of substitution and LP_t is the level of employment corresponding to a full utilization of K_t, which is required to produce YP_t We implicitly use the assumption of n identical firms

Assuming that in the long run prices are set as a mark up over total unit costs and that there is free entry yielding zero normal profits, we can write, in aggregate

$$P = WA^{*-1} + CCB^{*-1}$$

which allows us to write A^* and B^* in terms of W/P and CC/P respectively

In the short run, as factor prices change, A^* and B^* cannot be reached instantaneously The relation between the given technical coefficients A and B and their optimal values follow a partial adjustment process

$$A_t = A_t^{*\theta^A} A_{t-1}^{1-\theta^A} \tag{11}$$

and similarly for B

Combining Equations (9), (10) and (11) we obtain

$$A \equiv Y/LU = a((Y/LU)_{-1}, W/P)$$
$$B \equiv Y/KU = b((Y/KU)_{-1}, CC/P) \tag{12}$$

where LU and KU stand for the use of labour and capital respectively

Short-run employment function aggregation over regimes At a given point in time, the firm takes K_t, A and B as given, there are therefore no substitution possibilities The production set is then represented by right-angle isoquants Prices have been fixed before the realization of the shocks, and when these take place, each firm will face one of the following disequilibrium regimes

(i) Capital becomes the binding constraint If there are no constraints elsewhere, labour demand must lie along the ray through the origin (optimal proportions) Use of labour will then be given by the labour demand at its potential level

$$LU_t = LP_t = A^{-1}BK_t \quad \text{if} \quad LP_t < LS_t \quad YP_t < YD_t \tag{13}$$

(ii) The firm is in a sales constraint Since prices are set prior to the realizations of e_t and v_t, it may be the case that the firm's demand (YD_t) falls short of YP_t If that is the case, employment is

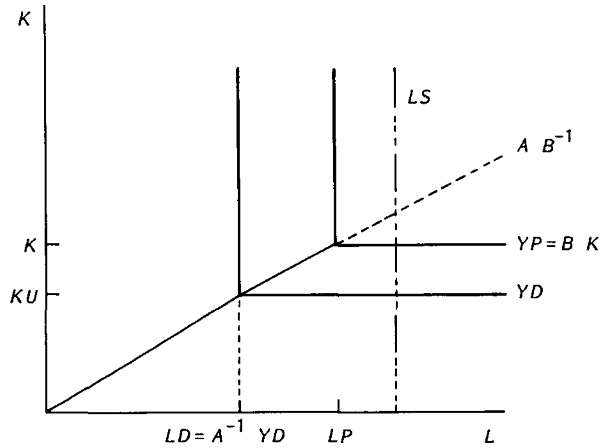

Figure 4. Disequilibrium regimes

given by

$$LU_t = LD_t = A^{-1}YD_t \qquad \text{if} \quad LD_t < LS_t \qquad (14)$$
$$YP_t > YD_t$$

This is the situation portrayed in Figure 4

(iii) Alternatively, labour availability is short, hence

$$LU_t = LS_t \qquad \text{where} \quad LS_t < \min(LP_t, LD_t)$$

The three situations can be represented in a more compact fashion by the traditional min condition

$$LU_t = \min(LP_t, LD_t, LS_t) \qquad (15)$$

which can also be written, in the output space, as

$$LU_t = \min(A^{-1}YP_t, A^{-1}YD_t, LS_t) \qquad (16)$$

If the number of firms is very large, the aggregate demand for labour will be given by $LU = nE(LU_t)$

Under some assumptions about the joint distribution of e_t, v_t, ε_t, it can be shown (Lambert [17]) that (16) can be written as a CES type function

$$LU = [(A^{-1}YD)^{-\delta} + (A^{-1}BK)^{-\delta} + (LS)^{-\delta}]^{-1/\delta} \qquad (17)$$

A similar expression can be obtained in the output space Y The parameter δ is an index of the degree of uncertainty about demand, capacity and labour supply It introduces a frictional element that makes employment always lie below its notional demand, capacity level and labour availability Note that if $LS = LP = LD$, then $LU = 3^{-1/\delta}LS < LS$ (a measure of structural unemployment) This is represented in Figure 5, in both labour and output spaces

Each of the following changes will shift the L locus leftwards a fall in the labour supply LS, a fall in LP due to capital stock or technical coefficient changes, a fall in LD and an increase in the structural mismatch (measured by $1/\delta$) The fifth element behind the determination in L is the degree of labour hoarding, $LU < L$ Both the use of capital KU and the use of labour LU are not observable, and are related to installed K and hired L through some measure of the degree of capital and labour utilization

$$LU = lu(L, DUL) \qquad KU = ku(K, DUC) \qquad (18)$$

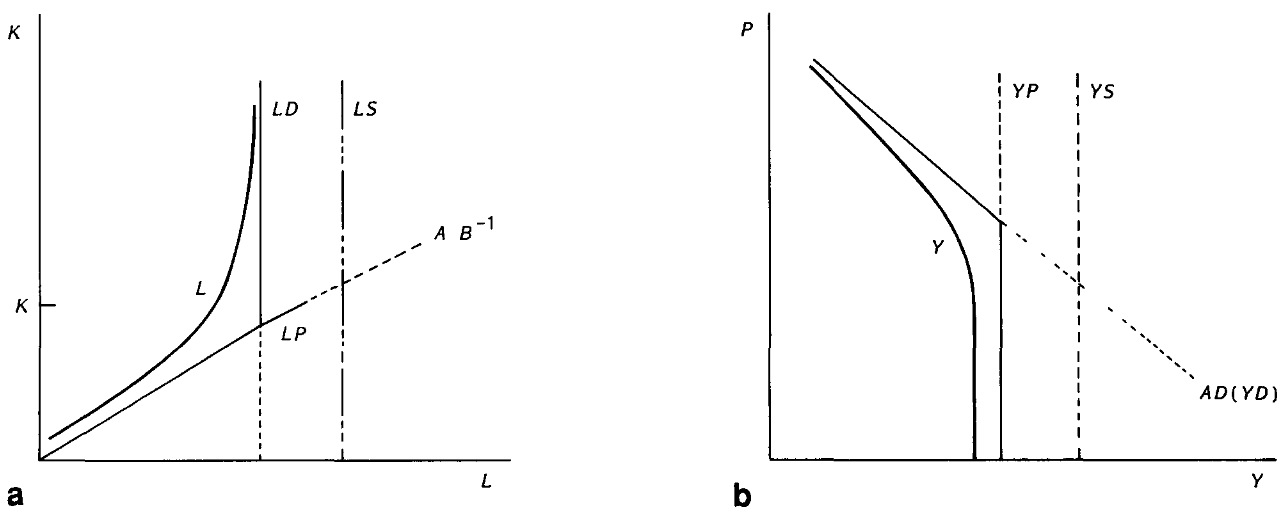

Figure 5. Structural unemployment

This allows us to estimate actual actor productivities rather than technical coefficients

Given (17), the elasticity of aggregate employment with respect to LP, LD and LS will be time varying and smaller than one, and given the CES type function, it will be equal to the proportion of firms in each disequilibrium regime This has important policy implications since it means that the implicit policy multipliers are not only endogenous, but also change over time depending upon the dominant regime that prevails at the moment of the intervention

Demand The change in technical coefficients is induced either by technical progress or long lasting changes in relative prices, which can only be compensated by increase in aggregate demand and the capital stock

In this sense, YD and K become the main determinants of L If we want to explain the ultimate causes of the evolution of labour growth, we need to know the determinants of both notional demand (YD) and investment (I) YD itself is unobservable, so we use an operational expression for it

Notional demand can be expressed as

$$YD = CD + ID + GD + XD - MD$$

We shall assume that domestic absorption is never rationed and that any potential excess demand is satisfied by increasing imports or reducing exports Hence

$$YD = C + I + G + XD - MD \tag{19}$$

XD and MD are functions of the fundamental determinants of exports and imports

$$XD = XD(WT, PRX) \tag{20}$$

$$MD = MD(Y, PRM)$$

where WT is an index of world trade, Y of real GDP and PRX, PRM are some competitiveness indices for exports and imports respectively

The discrepancies between actual and notional values of foreign trade will depend on how tight domestic markets are Using the deviation of DUC with respect to its minimum value as a proxy for such tightness, we can specify

$$\log X = \log XD - \phi_X(\log DUC - \log DUC\,\mathrm{min}) \tag{21}$$

$$\log = M = \log MD + \phi_M(\log DUC - \log DUC\,\mathrm{min})$$

where ϕ_X and ϕ_M are positive parameters, as internal demand overheats, actual exports fall below their notional level and imports rise above theirs

Consumption and investment are left unrationed and therefore they have not been considered to correct GDP for spill overs However, it is still interesting to analyse these two components of GDP, not only as major determinants of total demand, but also to provide an explanation of the evolution of the stock of capital and of savings

The consumption function is a standard one, real disposable income and real wealth being its long-run determinants, and allowing for short-run effects of inflation tax and real interest rate

The investment function comes from (10), where we have taken an exogenously given desired capacity level In such a case, (10) becomes an investment function where we have assumed that firms wish to satisfy expected total demand in the long run

Aggregating (10) over firms and taking its inverse we obtain

$$\frac{K}{YD} = g\left(\frac{CC}{P}\right) \tag{22}$$

This specification implies that an additional spill over effect $YD/Y = \Omega(DUC)$ runs from excess demand to accelerated investment

$$\frac{K}{Y} = \frac{K}{YD}\ \Omega(DUC) = k\left(\frac{CC}{P}, DUC\right) \tag{23}$$

Equation (22) can be reinterpreted as a proper investment function assuming that the rate of growth of the capital stock is small relative to the depreciation rate and not too volatile, it can be shown (see Bean [5]) that the long-run determinants of the I/Y ratio are those of K/Y

A summary of the model

Figure 6 portrays a graphical summary of the model taken from Bean and Drèze [7] Labour force, capital stock and technical coefficients, on the supply side, determine both full employment and potential output (or employment) The notional demand side determines the other possible constraint The interaction between demand and supply defines both utilization of capacity and of labour, and unemployment These affect directly the technology, and the external spill over and the wage settlement processes Wages and prices will, in turn, feed back on the technological coefficients, and via competitiveness, on the demand side

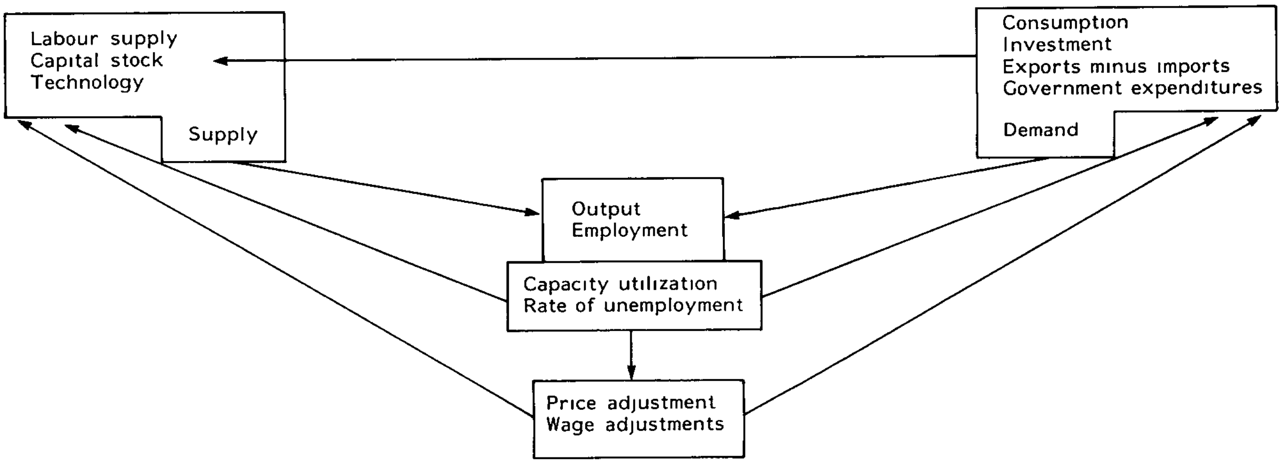

Figure 6. Model of Bean and Drèze [7]

Table 5 Wages

Equation

$$\log(W/P(1+SS))=\beta_0+\log(1+T3)+\beta_1\log(PC/P(1+T3)) +\beta_2\log K(-1)/L+\beta_3 U+\beta_4 DUM$$

Definition of variables

W	nominal labour cost
P	GDP deflator (factor cost)
PC	private consumption deflator
SS	employers' social security contributions
$T3$	indirect tax rate
K	capital stock
L	employment
U	unemployment rate
DUM	dummy with value 0 5 in 1970, 1 in 1971, 0 elsewhere

Estimation results

		Coefficient	*t*-statistic
Constant	β_0	−0 922	−85 69
Terms of trade effect	β_1	0 730	8 04
Capital/employment ratio	β_2	0 688	60 38
Unemployment	β_3	−1 232	−23 22
Dummy	β_4	−0 087	−10 65

$\bar{R}^2=0\ 999$ DW$=2\ 05$ SEE$=0\ 008$
Estimation period 1967–88
Estimation method non-linear 3SLS jointly with prices

Table 6. Prices

Equation

$$\log P=\alpha_0+\alpha_1\log W+(1-\alpha_1)\log P(-1)+\alpha_2\log(K(-1)/L) +\alpha_3\log[(PC(-1)/P(-1)\ (1+T3(-1))]+\alpha_4 DUM$$

Definition of variables

P	GDP deflator (factor cost)
W	nominal labour cost
K	stock
L	employment
PC	private consumption deflator
$T3$	indirect tax rate
DUM	dummy with value 0 5 in 1970, 1 in 1971, 0 elsewhere

Estimation results

		Coefficient	*t*-statistic
Constant	α_0	0 496	27 74
Labour cost	α_1	0 636	25 61
Capital/employment ratio	α_2	−0 343	−22 62
Imports effect	α_3	0 300	3 24
Dummy	α_4	0 050	5 70

$\bar{R}=0\ 999$ DW$=2\ 19$ SEE$=0\ 008$
Estimation period 1967–88
Estimation method non-linear 3SLS, jointly with wages

Empirical results

In this section we present the most relevant equations estimated, and we refer to other equations that close our model

Wage and price equations

Tables 5 and 6 present the results of the estimation of (6) and (7) Real labour costs are divided by the social security contributions rate in order to convert them into gross wages Indirect taxes are also included to get market prices The elasticity of real wages to unemployment is high Productivity, measured by (lagged) capital over employment is very significant Push factors include the wedge between consumer prices and producer prices which tries to pick up the effect of prices of imported consumption goods There is also a dummy variable reflecting price and wage controls in 1970–71

Our price equation conveys a partial adjustment process from labour costs to mark ups In the long run the elasticity of prices with respect to productivity, close to −1, is higher in absolute value than that with respect to wages The opposite happens in the short run

Table 7 Technology

Equations

Labour productivity

$$\log Y/L = a_0 + (1-\theta_A)\log(Y/L)_{-1} + \theta_A \log W/P + a_1 \log DUC - a_1(1-\theta_A)\log DUC_{-1} + a_2 \log PRM_{-1}$$

Capital productivity

$$\log Y/K = b_0 + (1-\theta_B)\log(Y/K)_{-1} + \theta_B \log CC/P + b_1 \log DUC - b_1(1-\theta_B)\log DUC_{-1} + b_2 \log PRM$$

Definition of variables

Y	GDP factor costs
L	private sectors' total employment
K	capital stock
DUC	capacity utilization
W	nominal labour cost
CC	user cost of capital
P	GDP deflator (factor cost)
PRM	relative price of imported energy

Estimation results

Labour productivity	Coefficient	*t*-statistic	Capital productivity	Coefficient	*t*-statistic
a_0	0 066	4 5	b_0	−0 154	−3 9
a_1	0 30	–[a]	b_1	0 65	–[a]
a_2	−0 012	−3 3	b_2	−0 020	−2 3
θ_A	0 123	20 7	θ_B	0 154	20 1

Labour productivity: $R^2=0\ 998$ DW $=2\ 3$ SEE $=0\ 011$

Capital productivity: $R^2=0\ 991$ DW $=2\ 1$ SEE $=0\ 013$

Estimation period 1965–88
Estimation method non-linear 3SLS

[a] Denotes restricted coefficient

Table 8 Short-run production aggregation over regimes

Equation

$$Y = [YD^{**}(-c_0 - c_1 D - c_2 PRM - c_3 MM) + YP^{**}(-c_0 - c_1 D - c_2 PRM - c_3 MM) + YLS^{**}(-c_0 - c_1 D - c_2 PRM - c_3 MM)]^{**} \times \left(\frac{-1}{c_0 + c_1 D + c_2 PRM + c_3 MM}\right)$$

Definition of variables

D	time trend
PRM	relative price of imported energy
MM	a measure of sectoral mismatch
Y	real GDP
YP	capacity output
YD	notional demand
YLS	full employment output

Estimation results

		Coefficient	*t*-statistic
Constant	c_0	24 4	19 2
Trend	c_1	−0 64	−9 6
Energy price	c_2	−3 2	−5 5
Mismatch	c_3	−10 1	−1 8

$R^2=0\ 998$ DW $=1\ 95$ SEE $=0\ 007$

Estimation period 1968-88
Estimation method non-linear least squares

Production coefficients and aggregation

Table 7 presents the results of the observed factor productivity equations We combine the partial adjustment process of technical coefficients (12) with the estimation of the degree of utilization of labour and capital (18) Since data for DUL are not available, we used DUC to account also for the degree of labour hoarding From Table 7 it follows that

(i) Factor proportions adjust in a very sluggish fashion The partial adjustment is roughly 15%
(ii) The relative price of imported energy attempts to capture the negative effects that the two oil shocks may have had on value-added, either directly or via the industrial reorganization that those shocks implied
(iii) The technical coefficients A and B needed to obtain YP, LP and LD are derived by correcting the observed productivities Y/L, Y/K for labour hoarding and capital underutilization, so that we abstract from cyclical considerations
(iv) Given $\hat{A}$ and $\hat{B}$ we get YP, LP and LD from (13) and (14), where YD is obtained as mentioned below The results are shown in Figure 2 and the regime proportions in Figure 3 Once LP and LD are estimated, with LS being exogenous, we estimate the aggregation equation (17) to obtain actual output or employment The estimation is carried out in the output space, using $YP=B\ K$ and $YS=A\ LS$, YD is estimated directly Table 8 presents these results

The measure of frictional unemployment, $1/\delta$, is explained by a time trend, the relative prices of imported energy, and a measure of sectoral shift among agriculture, industry and services, that we take as an index of mismatch

Demand

Government expenditure is taken to be exogenous The other components of demand are estimated using an error correction mechanism around a long-run relationship determined using cointegration analysis

The export equation, which excludes tourism in order to isolate the spill over effect of internal demand, is reported in Table 9 An index of Spanish trade with OECD countries is the scale variable Cointegration analysis suggested the inclusion of a competitiveness index, built as the relative price of Spanish exported goods to world import prices times the appropriate exchange rate (a version of the real exchange rate) The equation was estimated in first differences, but an error correction coefficient equal to one was obtained

Table 9 Exports.

Equation

$$\log XR_t = \beta_1(1-L)\log WT_t + \beta_2(1-L)^2 WT_t + \beta_3(1-L)\log PRX_t + \beta_4 DIF_t + \beta_5 D76_t + \beta_6 D86_t + \alpha_0 + \alpha_1 \log WT_{t-1} + \alpha_2 \log PRX_{t-1} + \alpha_3(\log DUC_{t-1} - \log DUC_{min})$$

Definition of variables

XR	real exports (excluding tourism)
WT	index of real world trade
PRX	competitiveness index of Spanish exports
DIF	inflation differential with respect to OECD countries
DUC	degree of capacity utilization
$D76$	dummy with value 1 in 1976, 0 elsewhere
$D86$	dummy with value 1 in 1986, 0 elsewhere

Estimation results

Long-run equation

		Coefficient	t-statistic
Constant	α_0	0 858	3 1
World trade (lagged)	α_1	1 699	159 1
Competitiveness (lagged)	α_2	−1 190	−22 4
Capacity utilization (lagged)	α_3	−0 413	−3 8

Short-run equation

		Coefficient	t-statistic
Change in world trade	β_1	0 791	9 8
Acceleration in world trade	β_2	0 681	8 8
Change in competitiveness	β_3	−0 709	−10 1
Inflation differential	β_4	−0 364	−3 9
$D76$	β_5	−0 175	−8 1
$D86$	β_6	−0 083	−5 5

$R^2 = 0\ 999$ DW = 2 40 SEE = 0 0126

Estimation period 1966–88
Estimation method non-linear 3SLS, jointly with imports

Table 10 Imports

Equation

$$(1-L)\log MR_t = \beta_1(1-L)\log I_t + \beta_2(1-L)\log I_{t-1} + \alpha_3(1-L)\log DUC_t + \beta_3(1-L) \times \log DUC_{t-1} + \Gamma[\log MR_{t-1} - \alpha_0 - \alpha_1 \log GDP_{t-1} - \alpha_2 \log PRMNE_{t-1} - \alpha_3(\log DUC_{t-1} - \log DUC_{min})] + \varepsilon_t$$

Definition of variables

MR	real imports
I	real productive private investment
DUC	degree of capacity utilization
GDP	real GDP, market prices
$PRMNE$	relative price of non-energy imports

Estimation results

Long-run equation

		Coefficient	t-statistic
Constant	α_0	−8 002	−9 3
Real GDP	α_1	1 659	18 6
Competitiveness	α_2	−0 249	−2 3
Capacity utilization	α_3	0 930	2 9

Short-run equation

		Coefficient	t-statistic
Private investment	β_1	0 717	9 2
Private investment (lagged)	β_2	0 254	3 6
Capacity utilization	α_3	0 930	2 9
Capacity utilization (lagged)	β_3	−1 194	−5 1
Error correction	Γ	−0 414	−4 0

$R^2 = 0\ 924$ DW = 1 97 SEE = 0 0224

Estimation period 1966–88
Estimation method non-linear 3SLS jointly with exports

so that it was rewritten in levels The long-run elasticity with respect to world trade, 1 7, is similar to other studies on Spanish exports The spill over coefficient that differentiates notional from observed exports is low, but significant Short-run variables include the inflation differential to account for services, whose prices are not included in our competitiveness index, and for those goods which have not been exported for price reasons The dummy variables capture the evidence of statistical problems for 1976 and the loss of the Latin American and OPEC markets in 1986 (see Fernández and Sebastián [10])

The imports equation is presented in Table 10 It includes both energy and non-energy purchases The long-run equation is determined by real GDP and a competitiveness index defined as the price of non-energy imports relative to the GDP deflator The spill over effect is much higher than for exports, being close to unity In the short run, the key variable happens to be the change in real investment (both current and lagged) The change in demand pressure is also a significant variable, with the same elasticity as in the long run Notional exports and imports, XD and MD, are obtained using (2)

Investment and consumption are reported in Tables 11 and 12 For consumption, the cointegration relationship includes real disposable income and households' real wealth, defined as the sum of real productive plus residential capital, real bonds and money holdings In the short run, changes in the inflationary tax, the real interest rate and the unemployment rate, the latter picking up distributional effects (see Andrés *et al* [3]), appear to have a very significant influence

The investment function is estimated following the right-hand side of (23) Inflation appears not only in the user cost of capital but also negatively affecting the ratio investment/output Imperfect information or expected transaction uncertainty justifies this specification (see Andrés *et al* [2])

Simulations

The main purpose of this section is to provide a feeling of how the model works We try to illustrate how

Table 11 Investment

Equation

$$(1-L)\log(I/Y)_t=\beta_1(1-L)\log(I/Y)_{t-1}+\beta_2(1-L)\log DUC_t+\beta_3(1-L)(CC/P)_t+\beta_4(1-L)(CC/P)_{t-1}+\beta_5(1-L)^2\pi_t+\Gamma[\log(I/Y)_{t-1}-\alpha_0-\alpha_1(CC/P)_{t-1}-\alpha_2\log DUC_{t-1}-\alpha_3\pi_{t-1}]+\varepsilon_t$$

Definition of variables

I	real private productive instrument
Y	real GDP (factor cost)
DUC	degree of capacity utilization
CC/P	user cost of capital
	$CC=P_I(r+\delta-\pi_I)$
P	GDP deflator (factor cost)
P_I	private investment deflator
π	rate of inflation as of GDP deflator
π_I	rate of inflation as of investment deflator

Estimation results

		Coefficient	*t*-statistic
Long-run equation			
Constant	α_0	−0 578	−2 5
User cost of capital	α_1	−4 552	−4 5
Capacity utilization	α_2	1 883	4 0
Inflation	α_3	−3 011	−3 3
Short-run equation			
I/Y ratio (lagged)	β_1	0 625	5 6
Capacity utilization	β_2	2 415	7 8
User cost of capital	β_3	−1 491	−4 5
User cost of capital (lagged)	β_4	0 833	3 5
Inflation tax	β_5	−1 670	−4 9
Error correction	Γ	−0 623	−5 7

$\bar{R}^2=0\ 830$ DW$=2\ 30$ SEE$=0\ 0311$

Estimation period 1966–88
Estimation method non-linear 3SLS, together with consumption

Table 12 Consumption

Equation

$$(1-L)\log C_t=\beta_1(1-L)\log Y_t^d+\beta_2(1-L)^2\log WE_t+\beta_3(1-L^2)\log IT_t+\beta_4(1-L)r_t+\beta_5(1-L^2)U_t+\Gamma(\log C_{t-1}-\alpha_0-\alpha_1\log Y_{t-1}^d-\alpha_2\log WE_{t-1})+\varepsilon_t$$

Definition of variables

C	real domestic private consumption
Y^d	households' real net disposable income
WE	households' real wealth
IT	inflation tax
r	real (*ex post*) long-term interest rate
U	unemployment rate

Estimation results

		Coefficient	*t*-statistic
Long-run equation			
Constant	α_0	0 383	3 1
Real disposable income	α_1	0 801	21 6
Real wealth	α_2	0 131	5 9
Short-run equation			
Real disposable income	β_1	0 494	7 6
Acceleration in real wealth	β_2	0 484	4 6
Inflation tax	β_3	−0 007	−2 5
Real interest rate	β_4	−0 151	−5 5
Unemployment rate	β_5	−0 356	−5 9
Error correction	Γ	−0 708	−8 5

$\bar{R}^2=0\ 983$ DW$=2\ 11$ SEE$=0\ 0035$

Estimation period 1966–88
Estimatiom method non-linear 3SLS together with investment

different the response of the endogenous variables to exogenous shocks is, depending on the disequilibrium regime prevailing in the economy demand rationing, capital constraints or labour supply shortages

We carry out two sets of simulations those generated by demand shocks (eg changes in the pattern of world trade) and those generated by supply shocks (eg changes in the labour force and in the exogenous component of real wages)

In order to endogenize the exchange rate and the nominal interest rate, R, we use a demand for money and a balance of payments equation We tie up most of the prices to the GDP deflator at factor cost (the behavioural equation), except for those where a reduced form is estimated A reduced form for *duc* is used which allows us to close up the model For presentational purposes, the estimation errors are added to the above equations so that the baseline path is recovered However, there are no convergence difficulties when these errors are not included

We report results for the following endogenous variables trade balance (TB), as a measure of the external constraint, unemployment (U), real wages (W/P), GDP, inflation (INF) and for some cases, employment (L) Tables 13–17 report the deviations from the baseline

World trade

In this simulation we replace the exogenous world trade series by a variable that for 1964–73 includes its actual values, for 1974–83 follows an annual growth rate of 4% and for 1984–88 grows at 8% The actual average growth rates were 2 7% for 1974–83 and 7 9% for 1984–88 That is, we try to simulate the effects of a better international stance during the main years of the crisis

The results are shown in Table 13 As expected, the higher values for the world trade variable in 1974–83 imply a cumulative reduction in unemployment, given the important role of the demand constraint in our estimated model The release of the demand constraint, however, rapidly hits the capital ceiling, and real wages per worker increase This explains the slowdown in

Table 13 Simulation 1 increase in world trade [a]

	U	TB	W/P	GDP	Inf
1976	−0 2	0 7	0 1	0 3	0 4
1977	−0 3	0 5	0 2	0 3	0 5
1978	−0 4	0 6	0 3	0 6	0 9
1979	−0 4	0 3	0 3	0 6	0 6
1980	−0 6	1 3	0 5	1 0	1 3
1981	−0 9	1 9	0 8	1 5	1 8
1982	−1 2	2 8	1 0	2 0	2 4
1983	−1 5	3 3	1 4	2 5	2 9
1984	−1 3	3 1	1 6	2 3	2 5
1985	−1 3	4 1	1 9	2 5	2 5
1986	−0 8	3 2	2 1	1 8	1 6
1987	−0 6	3 0	2 3	1 6	1 8
1088	−0 6	2 8	2 3	1 6	1 8

[a] TB, trade balance $X-M/GDP$ (in nominal terms) (deviations from baseline), Inf, inflation rate (deviations from baseline), U, unemployment rate (deviations from baseline), L, employment (percentage growth with respect to baseline), W/P, real labour cost (percentage growth with respect to baseline), GDP, real GDP (deviations from baseline)

Table 14 Simulation 2 increase in labour force in 1970 $LS' = LS + (0\ 03LS\ (1970))$.

	U	L	W/P	GDP	Inf
1970	1 4	1 5	−2 6	1 4	−3 3
1971	1 0	1 9	−2 1	1 5	−2 6
1972	0 8	2 0	−2 0	1 5	−1 9
1973	0 6	2 2	−2 0	1 5	−1 4
1974	0 3	2 5	−2 0	1 7	−1 1
1975	0 2	2 6	−2 0	1 7	−0 9
1976	0 1	2 7	−2 0	1 8	−0 7
1977	−0 1	2 9	−1 9	2 0	−0 2
1978	−0 3	3 1	−1 8	2 2	0 1
1979	−0 4	3 2	−1 7	2 3	0 5
1980	−0 5	3 4	−1 6	2 4	0 6
1981	−0 5	3 4	−1 5	2 5	0 7
1982	−0 5	3 4	−1 4	2 6	0 7
1983	−0 5	3 4	−1 3	2 6	0 7
1984	−0 4	3 2	−1 2	2 6	0 6
1985	−0 4	3 1	−1 1	2 5	0 5
1986	−0 3	3 0	−1 0	2 5	0 4
1987	−0 3	2 9	−0 9	2 4	0 4
1988	−0 3	2 8	−0 8	2 4	0 4

employment and output growth In spite of the high elasticity of exports with respect to world trade, from 1986 onwards there is a relative deterioration in the trade balance The explanation lies in the fact that the competitiveness indices and the degree of utilization of capital both affect imports more strongly than exports

Labour force

We first simulate a 3% increase in the labour force in 1970, the corresponding constant being added to all ensuing years This amounts to approximately 400 000 people who, if considered jobless in that year, would raise the unemployment rate from 0 8 to 3 4% However, in this period labour availability was scarce, so we would expect a relatively high increase in employment We then simulate the same innovation from 1980 onwards, a period where the labour supply was not binding, expecting a smaller impact on employment The results of both simulations are presented in Tables 14 and 15

In the first simulation, as expected, there is a strong growth in employment, consistent with the labour availability constraint prevailing in the early 1970s The release of this restriction implies an initial reduction in real wages, but this reduction becomes smaller as the economy generates additional employment and output Note that, eventually, the scale of the economy's productive resources has grown, output is higher and unemployment lower All this happens with a small deterioration in competitiveness and in the capacity ceiling, so that the final effect on the current account is negligible

In the second simulation, as expected, initial impact

Table 15 Simulation 2 continued 3% increase in labour force in 1980

	U	*L*	*W/P*	*GDP*	*Inf*
1980	1.8	1.0	−2.7	0.7	−4.2
1981	1.1	1.7	−2.2	1.2	−2.7
1982	0.4	2.4	−1.9	2.0	−1.2
1983	0.0	2.9	−1.8	2.3	−0.3
1984	−0.2	3.1	−1.7	2.4	0.0
1985	−0.4	3.3	−1.6	2.5	0.2
1986	−0.5	3.4	−1.5	2.6	0.4
1987	−0.5	3.4	−1.4	2.6	0.5
1988	−0.5	3.4	−1.4	2.6	0.5

Table 16 Simulation 3 1% increase in real wages (exogenous) starting 1976, log $W' = \log W + 0.01$

	U	*TB*	*W/P*	*GDP*	*Inf*
1976	0.2	0.1	0.8	−0.1	1.5
1977	0.3	−0.1	0.7	−0.2	1.3
1978	0.5	−0.2	0.7	−0.3	0.9
1979	0.6	−0.1	0.7	−0.5	0.5
1980	0.8	0.2	0.7	−0.6	0.2
1981	0.9	0.3	0.7	−0.7	0.1
1982	0.9	0.2	0.7	−0.8	0.0
1983	1.0	0.1	0.7	−0.9	−0.2
1984	1.0	0.0	0.7	−0.9	−0.2
1985	1.0	0.0	0.7	−1.0	−0.1
1986	1.0	0.0	0.7	−1.0	−0.1
1987	1.0	0.0	0.7	−1.0	−0.1
1988	1.0	0.0	0.7	−1.0	−0.1

Table 17 Simulation 3 continued increase in real wages starting 1982

	U	*TB*	*W/P*	*GDP*	*Inf*
1982	0.3	0.2	0.8	−0.2	1.3
1983	0.5	0.0	0.7	−0.5	0.8
1984	0.7	−0.1	0.7	−0.7	0.4
1985	0.8	0.0	0.7	−0.8	0.2
1986	0.8	0.1	0.6	−0.8	0.2
1987	0.9	0.2	0.6	−0.8	0.1
1988	0.9	0.1	0.6	−0.8	0.0

on employment is about half the size of the first, so that most of the increase in labour supply becomes unemployed However, the final effect is very similar and the economy catches up to the new situation very rapidly

Real wages

We finally run a simulation regarding the growth rate of the exogenous (unexplained) component in labour costs As the wage equation is specified in levels, we include a trend component which allows us to simulate a cumulative change in the path of real wages We assume two different shocks a 1% annual increase from 1976 onwards and a 1% annual increase starting in 1982 The results are shown in Tables 16 and 17 The employment series is not reproduced, given that all its relevant information is embodied in the unemployment column As expected, there is a negative impact on unemployment which feeds back into the endogenous component of wages so that only 70% of the exogenous change in wages actually takes place On the other hand, prices rise rapidly so that real wages stabilize at the new level without a permanent episode of inflation In the long run there exists a one to one negative impact on both employment and output, the new stationary levels being reached very rapidly In the short run, the model predicts only a slight deterioration in the current account, since the worsening of competitiveness is compensated by the demand and imports slowdown

Interestingly enough, the results are quite independent of the year in which the shock takes place This is due partly to the fact that labour supply, whose regime share is the one that differs most in 1982 with respect to 1976, is assumed to be exogenous in our model

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Appendix

List of variables and data sources

Variables

C	real domestic private consumption (in thousand 1980 pesetas) (INE-CN)
CC	user cost of capital $= P_I\ (r+\delta-\pi_I)$ For P_I, π_I (INE-CN), δ own estimates, *r* see below
DIF	inflation differential between CPI of Spain (INE) minus that of OECD countries (IFS)
DUC	capacity utilization in industry (*Survey of Entrepreneur's Opinions*, BE)
DUM	a dummy variable taking 0 5 value for 1970, 1 in 1971, 0 elsewhere
D76	a dummy variable taking value 1 in 1976, 0 elsewhere
D86	a dummy variable taking value 1 in 1986, 0 elsewhere
GDP	real GDP, market prices (thousand 1980 pesetas) (INE-CN)
I	real productive private investment total investment (thousand 1980 pesetas) minus public investment minus residential investment (INE-CN and own estimates)
IT	inflation tax lagged real money holding (BE, INE) times current inflation rate (INE)
K	capital series (own estimates)
L	number of employed (thousand) (INE-EPA)
LS	labour supply (thousand) (INE-EPA)
MR	real imports (thousand 1980 pesetas) (INE-CN)
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)
P	GDP deflator, factor cost (INE-CN)
PC	private consumption deflator (INE-CN)

PI	private investment deflator (INE-CN)
PRM	relative price of oil imports oil imports deflator divided by GDP deflator (INE, MECO)
PRMNE	relative price of non-energy imports non-energy imports deflator divided by GDP deflator (INE-CN, MECO)
PRX	relative price of exports (relative to world) Spanish exports unit value (MECO) divided by world exports unit value (IFS) times the appropriate exchange rate
r	real interest nominal interest rate (BE) minus CPI inflation rate (INE)
SS	social security contributions (IGAE, own estimates)
*T*3	indirect tax rate total excise collections divided by nominal private consumption (IGAE and INE)
U	unemployment rate (INE-EPA)
W	nominal labour cost (INE-CN)
WE	households' real wealth (see text) (INE, BE)
WT	industrial countries' trade OECD exports in US dollars (IFS) divided by OECD exports unit prices in US dollars (IFS)
XR	real exports (thousand 1980 pesetas) excluding tourism expenditure (INE-CN)
Y	real GDP at factor costs (thousand 1980 pesetas) (INE-CN)
Y^d	real disposable income (INE-CN, IGAE)

Abbreviations for sources

BE	*Boletín Estadístico* (Bank of Spain)
CN	*Contabilidad Nacional* (INE)
EPA	*Encuesta de Población Activa* (INE)
GTE	Grupo de Trabajo del Ministerio de Economia y Hacienda
IFS	*International Financial Statistics* (IMF)
MECO	Ministerio de Commercio
IGAE	Intervencion General de la Administracion del Estado
INE	Instituto Nacional de Estadistica