

Wages, Productivity and Efficiency: an Empirical Study for the Portuguese Manufacturing Sector

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In this paper we provide an explanation for the relative flexibility of the Portuguese labour market. We find that in Portugal, contrary to what happens in the rest of Europe, unemployment exerts a significant downward pressure on manufacturing wages.

We obtain a long-run Phillips curve where the labour share (adjusted for the minimum wage) is found to respond significantly to the slack in the labour market. This accounts for the low level of unemployment and small unemployment persistence registered in Portugal, when compared with other countries.

The theoretical framework used is a bargaining model, where unions and firms try to optimize their goals.

1. INTRODUCTION

The purpose of this paper is to investigate the relationships between wages and productivity in Portugal.

According to some authors¹, in most European countries productivity gains tend to be rapidly fed into wage increases. In the limit in some countries it has been reported² that contract wages have been shaped according to the unions neutrality doctrine, i.e., wage increases are made equal to the sum of expected inflation and productivity growth.

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1 See on this issue the results obtained by a group of researchers of the European Unemployment Program and reported on Drèze and Bean (1990).

2 See for example Neuman et al (1990).

This phenomenon, that is not present in the US, leads to capital-labour substitution aggravating therefore the unemployment problem. Moreover as it has also been found empirically that wages in Europe do not respond significantly to unemployment conditions, some authors have considered the situation to be one of a self-perpetuating vicious circle.

In Portugal, on the contrary, the labour share declined steadily during the eighties. Unemployment decreased and in the beginning of the 90's it was commonly believed that full employment had been reached in some sectors. It seemed therefore interesting to investigate what were the characteristics of the Portuguese labour market that allowed for the breaking of this unemployment-wages vicious circle present in some other European countries.

We decided therefore to build a model intended to capture, in the most simplified way, the relationships between wages and productivity in order to serve as a basis for empirical work with Portuguese data. We wanted to use this framework to test empirically some relevant hypotheses namely:

- i) are increases in productivity quickly passed into wage increases
- ii) does unemployment exert a downward pressure on wages.
- iii) are price increases completely fed into wage increases.

Therefore we also decided from the beginning to consider a rather general specification (that would let the data speak) while trying to preserve simplicity.

The framework that naturally emerged from these considerations consisted of two equations: an employment or productivity equation and a wage-setting function, that could be consistent with several theoretical interpretations.

However, later on we realized that implicitly we were assuming that the employment equation was a labour demand curve. This meant that we were imposing, from the start, a bargaining model of the right-to-manage type.

Even if this type of bargaining model seems to be the rule in the real world³, it has one important drawback: it is not Pareto efficient as shown by Leontief (1946) and popularized by McDonald and Solow (1981). This inefficiency suggests, that probably one should not impose a priori a right-to-manage set up but, instead, try to sort out which of the alternatives - right-to-manage (R.T.M.) or efficient bargain (E.B.) - contracts is more appropriate.

This has led us to the question that finally is what the paper is about: could we hope to discriminate empirically which of the models, R.T.M. or E.B., was the rule in Portugal and then use it to discuss the relationships between wages and productivity?

The remainder of the paper is organized as follows. In section 2 we present briefly the two alternative bargaining models (R.T.M. and E.B.) and discuss and present the testing procedure. In section 3 our basic model is presented and estimated using sectorial data for the Portuguese manufacturing sector. Some final remarks are given in section 4.

2. TWO BARGAINING MODELS

The two bargaining parties considered are a union and a firm. It is traditional to assume that the union's preferences can be represented by a utility function $U(w,L)$ increasing in both arguments, which merely states that unions care about wages and employment. However, as Pencavel (1985) remarks, we know little about the exact form of this function. In the literature the two most popular choices have been a quasi-concave

³ See on this issue the survey results reported in Oswald (1987) and Oswald and Turnbull (1985).

utility function, frequently of the Stone-Geary type, and an expected-utility or utilitarian function⁴. While the second approach has been defended for its microeconomic foundations it is certainly more restrictive, as it implies that unions should care more about employment than wages. This is justified at the individual worker level by risk aversion, but we do not see why this should be valid at the union level⁵. The objective of the union is to maximize its utility function.

The firm maximizes profits $\pi(w,L)$, given by the difference between revenue $R(L)$ and the wage bill wL :

$$\pi(w,L) = R(L) - wL$$

We will assume that the firm's profit function displays strict concavity and twice differentiability.

The R.T.M. model postulates that firms and unions bargain over wages, but employment is set by firms. The outcome of this bargaining can be represented by the generalized Nash Bargaining Solution, that is the solution to the problem

$$\begin{aligned} \max_w \{ & U(w,L) - \bar{U} \}^{1-\beta} \{ \pi(w,L) - \bar{\pi} \}^\beta \quad 0 \leq \beta \leq 1 \\ \text{s.t. } & R'(L) = w \end{aligned}$$

where \bar{U} and $\bar{\pi}$ are the status quo points, i.e., the levels of utility and profits that would arise in the presence of a conflict⁶ (see Binmore et al (1986) and Sutton (1986)). The parameter β reflects the alternative bargaining strength of the parties.

If the firm and the union bargain both over wages and employment, the bargaining process leads to an efficient outcome that can be

⁴ See Oswald (1985) for a survey.

⁵ This hypothesis only makes sense at the union level under the assumption that union members are homogeneous.

⁶ In the remainder of the paper we will assume that \bar{U} and $\bar{\pi}$ are zero. This means that there are no strike payments nor alternative wages or unemployment benefits during a conflict (which is definitely true for Portugal), and that when production stops, profits are zero.

represented by the generalized Nash Bargaining Solution, that is the solution to

$$\max_{w,L} \{U(w,L) - \bar{U}\}^{1-\beta} \{\pi(w,L) - \bar{\pi}\}^{\beta} \quad 0 \leq \beta \leq 1$$

The first order conditions for each problem imply that in the R.T.M. model we will have

$$R'(L) = w \quad (1)$$

while in the E.B. model we obtain

$$R'(L) = (1+\epsilon)w \quad (2)$$

where ϵ is the elasticity of substitution of wages for employment along an indifference curve of the union.

Expression (1) is nothing but the labour demand curve. This means that in the R.T.M. all the possible combinations of wages and employment must be on the firm's labour demand schedule. The precise point that will be chosen, that determines the division of the rent, depends on the relative strength of each party in the bargaining process.

Turning now to expression (2) it gives us all the wage-employment combinations that are Pareto efficient. It is normally called the contract curve and corresponds to the points of tangency between the firm's isoprofit curves and the union's indifference curves. As $\epsilon \leq 0$ one can see that along the contract curve $R'(L) \leq w$. This means that for each level of wages, employment is pushed beyond the point where it would maximize profits. The contract curve on the (w,L) space lies always therefore to the right of the firm's labour demand schedule. It is also frequently assumed that it slopes upwards. However this statement is only valid if union's preferences are such that it cares more about employment than wages. In the limit if the union is indifferent to employment, i.e., if the unions indifference curves are horizontal, the contract curve is nothing but the labour demand curve (in this case $\epsilon = 0$). This point, that has been stressed by Oswald (1985), implies that the distinction between the R.T.M. and the E.B. outcomes is not that sharp in the sense that equilibria

on the labour demand curve may be Pareto optimal. The R.T.M. model can therefore be seen as a special case of the E.B. model⁷.

Again in the E.B. model the precise point on the contract curve that will be chosen, and that determines the division of the rent, depends on the relative bargaining power of each party in the same manner as in the R.T.M. model. Therefore if one wants to test which of the two models has been the rule, one has to be able to use data on wages and employment to choose between specifications (1) and (2).

It is immediately obvious that if ϵ is a constant or if it varies with variables that determine $R'(L)$, such a test is not possible. This means that we have to choose a specification for the union's utility function such that ϵ varies with variables that do not affect the firm's profit function⁸.

The Stone-Geary function

$$U(w, L) = (w - \bar{w})^\theta L^{1-\theta} \quad 0 < \theta < 1$$

where \bar{w} is some acceptable minimum level of wages, fulfills this requirement.

With this specification expression (2) becomes

$$R'(L) = \left[1 - \left(\frac{1-\theta}{\theta} \right) \right] w + \left(\frac{1-\theta}{\theta} \right) \bar{w} \quad (3)$$

and $w \geq \bar{w}$.

With $\theta = 1$, we obtain the labour demand curve. For $\theta = 0.5$ ⁹ the contract curve is vertical. For $0.5 < \theta < 1$ we have therefore contract curves that are negatively sloped and for $0 < \theta < 0.5$ the contract curve slopes upward in the (w, L) space. No matter what the value of θ , the contract curve intersects the labour demand curve at $w = \bar{w}$.

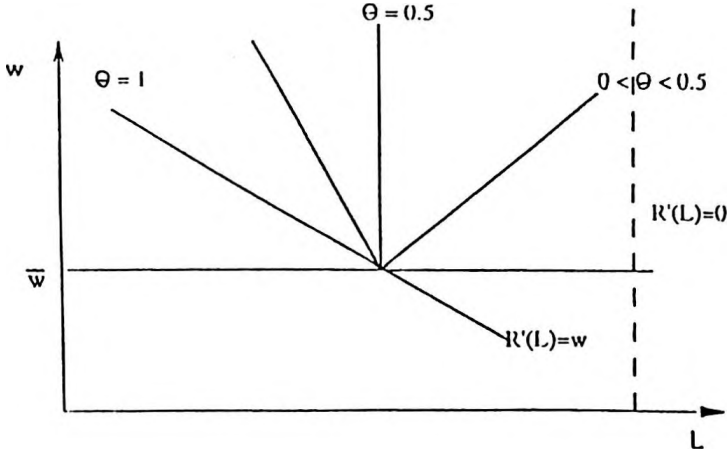
7 Moreover Espinoza and Rhee (1989), criticizing both the E.B. and the monopoly union model, as failing to capture the dynamic aspects of wage bargaining, show that both models can be regarded as particular cases of a repeated wage bargaining game with certain discount rates. Note that the monopoly union model is a special case of the R.T.M. model for $\beta = 0$.

8 See Brown and Ashenfelter (1986) for a similar procedure.

9 In this case unions are maximizing the rents from unionization.

In Figure 1 we have draw the various possibilities for the contract curve.

Figure 1



In order to discriminate between (1) and (3) empirically we have to select a functional form for $R'(L)$. We considered a CES production function with constant returns to scale.

$$Y = A[\alpha L^{-\rho} + (1-\alpha)K^{-\rho}]^{-1/\rho}$$

Therefore if the firm is a price setter

$$R'(L) = \frac{p}{m} \frac{\partial Y}{\partial L} = \frac{p}{m} A^{-\rho} \alpha \left(\frac{Y}{L}\right)^{1+\rho}$$

where $m \geq 1$ is the mark-up. In the competitive case $m = 1$.

With this specification expression (1) becomes

$$\ln\left(\frac{Y}{L}\right)_t = \sigma \ln\left(\frac{w}{p}\right)_t + \rho \sigma \ln A_0 - \sigma \ln \alpha + \sigma \ln m + \rho \sigma \lambda t \quad (4)$$

where we have introduced disembodied Hicks neutral technical progress:

$$A_t = A_0 e^{\lambda t}$$

and where $\sigma = 1/1 + \rho$.

Similarly expression (3) is now

$$\ln\left(\frac{Y}{L}\right)_t = \sigma \ln \left\{ \left[1 - \left(\frac{1-\theta}{\theta} \right) \right] w + \left(\frac{1-\theta}{\theta} \right) \bar{w} \right\}_t - \sigma \ln p_t + \quad (5)$$

$$+ \rho \sigma \ln A_0 - \sigma \ln \alpha + \sigma \ln m + \rho \sigma \lambda t$$

The difference between (4) and (5) lies therefore with the wage variable considered. In (4) we simply have the observed wage rate while in (5) we have a weighted average of the observed wage and the minimum wage.

Testing between (4) and (5) amounts therefore to see whether or not the minimum wage rate exerts any positive significant impact on average labour productivity.

Before presenting the empirical implementation of this test, it is worth referring a problem that arises in the context of the E.B. model once we postulate a neo-classical production function.

Along the contract curve $R'(L) \leq w$. Also as $w \geq \bar{w}$, for $0 < \theta < 0.5$ we will have $R'(L) < \bar{w}$ and there will be some sections of the contract curve where $R'(L) \leq 0$. This possibility is ruled out with a neo-classical production function. One can argue that this is not a serious problem because this situation will never happen for relevant levels of employment¹⁰. However if $\bar{w} = 0$ all along a positively sloped contract curve $R'(L) < 0$. This means that the E.B. model with $0 < \theta < 0.5$, once we consider a neo-classical production function, is not compatible with $\bar{w} = 0$, which is a disturbing feature of this model.

¹⁰ By this we mean that the isoprofit curve associated with the minimum acceptable level of profits (it may be $\pi = 0$ or some other positive level) is reached first, or that $R'(L) = 0$ for a value of L that exceeds the number of workers the union actually cares for.

2.1. Empirical results

In order to discriminate between the two models we used a dynamic version of equation (5), that assumed an error correction mechanism. The data used refer to the three branches of the Portuguese manufacturing sector:

Branch C - Consumption Goods Industries

Branch Q - Intermediate Goods Industries

Branch K - Capital Goods Industries

for the period 1977 to 1988. The reader can find a more detailed presentation of the data basis in the Data Appendix.

The variable \bar{w} considered was the same for the three branches and was simply the minimum wage¹¹ that in Portugal is fixed by the Government. This choice had to do with the fact that $w \geq \bar{w}$ and with the availability of data.

As the w_t and \bar{w}_t series display considerably collinearity our choice was to perform a grid search for values of θ between 0 and 1. The sum of squared residuals decreased monotonically with increasing values of θ , reaching a minimum for $\theta = 1$ for all the three branches, implying that equation (5) never performed better than expression (4). Moreover we also tried non-linear least squares and very rapidly (within two iterations) we were getting $\theta > 1$, implying a negative impact of \bar{w} on Y/L which contradicts the predictions of the E.B. model.

Summarizing, we find no evidence suggesting that the consideration of the minimum wage variable provides any additional information in the productivity equation, once we have included the wage rate.

These results tend to support the R.T.M. model, implying that employment and wage combinations lie on the firm's labour demand schedule. Of course these results are conditional on the \bar{w} variable

¹¹ In Portugal actually there are three different minimum wages. One is for agriculture, other for domestic services and another for all remaining activities. We considered this last one.

chosen, and on the functional forms selected, both for the union's utility function and for the firm's revenue function. Nevertheless, given those choices, we have found that expression (4) performed better than equation (5) and therefore for the rest of our empirical work we will retain (4).

3. THE MODEL

The model considered and that will be used as a basis for empirical work with Portuguese data, for the three manufacturing branches, contains two equations:

- a productivity equation that we have already discussed in the previous section;

- a wage equation that we will now present.

3.1. The wage equation

Both the R.T.M. and the E.B. models (with the functional forms we have chosen) imply that the contract wage will be a weighted average of the minimum wage and of the average revenue product of labour.

In the E.B. we obtain

$$w = \frac{\theta(1-\beta)}{\theta(1-\beta)+\beta} \frac{R(L)}{L} + \frac{\beta}{\theta(1-\beta)+\beta} \bar{w} \quad (6)$$

while in the R.T.M. we have:

$$w = \frac{(1-\beta) [(1-\theta)\eta^*+\theta]}{(1-\beta)[(1-\theta)\eta^*+\theta]+\beta} \frac{R(L)}{L} + \frac{\beta}{(1-\beta)[(1-\theta)\eta^*+\theta]+\beta} \bar{w} \quad (7)$$

where $\eta^* = \eta \left[\frac{w-\bar{w}}{w} \right]$ and η is the wage elasticity of labour demand.

When $\theta = 1$ both expressions collapse to

$$w = (1 - \beta) \frac{R(L)}{L} + \beta \bar{w} \quad (8)$$

Expressions (6), (7) and (8) can all be written as

$$w - \bar{w} = k \left[\frac{R(L)}{L} - \bar{w} \right] \quad (9)$$

and in this form we can interpret them as a share rule where the share that matters is defined in terms of the rent that is left to distribute, $(R(L) - \bar{w}L)$, as it is settled that workers will get at least $\bar{w}L$.

Expression (9) will be the basis for our wage equation. However instead of treating k as a constant we felt that it was important to let k vary with the unemployment rate. This hypothesis implies that the bargaining strength of workers is greater when unemployment is low. The specification we admitted was

$$\ln k_t = \ln k_0 + \beta_2 (u - \bar{u})_t$$

where $\beta_2 < 0$, u_t is the unemployment rate and \bar{u} is the natural rate of unemployment¹².

Therefore the wage equation becomes

$$\ln \left[\frac{w - \bar{w}}{p} \right]_t = \ln k_0 + \ln \left[\frac{Y}{L} - \frac{\bar{w}}{p} \right]_t + \beta_2 (u - \bar{u})_t \quad (10)$$

This expression can be interpreted as giving us the wage rate that is compatible with the preservation of the relevant labour share when there is full employment. Moreover it can be seen as a long-run Phillips curve that relates a "wage-gap" concept with the deviations of unemployment from its natural rate.

However expression (10) is a static relation that we expect to hold in the long-run. For our empirical work the corresponding dynamic version

¹² Actually for the R.T.M. model, k is not constant (except if $\theta = 1$) as it varies with η^* . However for this case we still approximate k_t in the same way:

$$\ln k_t = \ln k_0 + \beta_2 (u - \bar{u})_t$$

selected was (11): an error correction mechanism with a long-run solution given by (10).

$$\begin{aligned} \Delta \ln(w - \bar{w})_t = & \text{const} + B_1 \Delta \ln \left[\frac{Y}{L} - \frac{\bar{w}}{P} \right]_t + B_2 \Delta \ln p_t + B_3 \Delta (u - \bar{u})_t + \\ & + B_4 (u - \bar{u})_{t-1} + B_5 \left\{ \ln \left[\frac{Y}{L} - \frac{\bar{w}}{P} \right]_{t-1} - \ln \left[\frac{w - \bar{w}}{P} \right]_{t-1} \right\} \end{aligned} \quad (11)$$

Note that (11) nests other wage equations frequently used in empirical work. Moreover it will enable us to test empirically whether unemployment exerts a significant downward pressure on wages, and if price and productivity increases are quickly passed into wages.

3.2. Empirical results

Whether our wage equation (11) is already a dynamic equation, that is perfectly suited for empirical work, the same does not happen with the productivity equation. We had therefore to dynamize it and again we selected an error correction mechanism formulation¹³.

The model that will be estimated is, therefore, the following:

$$\begin{aligned} \Delta \ln \left(\frac{Y}{L} \right)_t = & \text{const} + \gamma_1 \sigma \Delta \ln \left(\frac{w}{P} \right)_t + (1 - \gamma_3) \left[\sigma \ln \left(\frac{w}{P} \right)_{t-1} + \right. \\ & \left. + \rho \sigma \lambda (t-1) - \left(\frac{Y}{L} \right)_{t-1} \right] \end{aligned} \quad (12)$$

¹³ Our preference towards the error correction mechanism dynamic specification has to do with the following facts: It allows for a clear distinction of transitory and more permanent effects, nests other classes of dynamic specifications and implies a parsimonious parameterization (See on this issue Hendry and Richard (1983)). In our case, due to the size of our sample, the third aspect was crucial and therefore the error correction mechanism emerged as the most suitable dynamic specification.

$$\begin{aligned} \Delta \ln(wN - \bar{w})_t = & \text{const} + \lambda_{11} \Delta \ln \left[\frac{Y}{L} - \frac{\bar{w}}{pc} \right]_t + \lambda_{12} \Delta \ln pc_t + \\ & + \lambda_{13} \beta_2 \Delta(u - \bar{u})_t + (1 - \lambda_3) \left\{ \beta_2 (u - \bar{u})_{t-1} + \right. \\ & \left. + \ln \left[\frac{Y}{L} - \frac{\bar{w}}{pc} \right]_{t-1} - \ln \left[\frac{wN - \bar{w}}{pc} \right]_{t-1} \right\} \end{aligned} \quad (13)$$

where p is the price of value added, pc is the consumer price, w is the wage rate and wN is the take home or the wage net from the social security contributions.

For a brief description of the data used, the reader is referred to the Data Appendix.

Both equations were estimated for the three industrial branches, using annual data from 1977 to 1988. The estimation method used was Instrumental Variables¹⁴. The results obtained are presented in Table 1 below.

One can see that all the estimated parameters have the correct sign and magnitude and the overall fit of the equations is not bad, although a few problems remain¹⁵. However in the wage equation the unemployment effect never came out significantly estimated. This is not astonishing, as the same empirical result is present in most of the wage equations estimated for other countries. In our opinion, it does not mean that unemployment does not affect wages, but simply that in the short-run wages are driven by productivity, prices and lagged wages, so that there is left little to be explained once these variables are in the model. What is more interesting is that the long-run values that we obtain for the unemployment impact are bigger than those which are normally obtained

14 Our model is a simultaneous equation model. Moreover, current price variables are also determined jointly with wages and productivity. This makes the OLS estimators of the equations in the model inconsistent. One should, therefore, use IV in order to obtain consistent estimators. However, due to the size of our sample, it is not clear that IV estimators will be better than the OLS ones. Nevertheless we decided to use them. The results obtained do not differ significantly from the OLS ones.

15 The DW statistics obtained suggest dynamic problems. However due to our reduced sample size it seemed pointless to refine our dynamic specification.

Table 1 a)

Productivity Equation

$$\Delta \ln \left(\frac{Y}{L} \right)_{it} = A_0 + A_1 \Delta \ln \left(\frac{w}{p} \right)_{it} + A_2 \ln \left(\frac{w}{p} \right)_{it-1} + A_3 (t-1) + A_4 \ln \left(\frac{Y}{L} \right)_{it-1}$$

$i = C, Q, K$

Branch	A1	A2	A3	A4
C	0.4658 (1.313)	0.3437 (1.049)	0.0098 (0.687)	-0.3117 (-1.017)
	SEE=0.036	R ² =0.600	DW = 1.55	
Q	0.6420 (2.173)	0.5144 (1.556)	0.0110 (1.699)	-0.4626 (-1.548)
	SEE=0.032	R ² =0.640	DW = 1.64	
K	1.5693 (1.462)	0.9177 (1.153)	0.0106 (0.800)	-0.8542 (-1.145)
	SEE=0.066	R ² =0.243	DW = 2.17	

Wage Equation

$$\Delta \ln (WN - \bar{w})_{it} = B_0 + B_1 \Delta \ln \left[\frac{Y}{L} - \frac{\bar{w}}{pc} \right]_{it} + B_2 \Delta \ln pc_t + B_3 \Delta (u - \bar{u})_t + B_4 (u - \bar{u})_{t-1} - B_5 \ln \left[\frac{Y}{L} - \frac{\bar{w}}{pc} \right]_{it-1} + B_5 \ln \left[\frac{WN - \bar{w}}{pc} \right]_{it-1}$$

$i = C, Q, K$

Branch	B0	B1	B2	B3	B4	B5
C	—	0.6194 (1.527)	—	—	-2.6470 (-0.901)	-0.1398 (-7.394)
	SEE=0.052	R ² =0.961	DW = 2.60			
Q	—	1.0641 (0.904)	—	—	-1.8104 (-0.509)	-0.1196 (-2.751)
	SEE=0.071	R ² =0.902	DW = 1.22			
K	-0.4683 (-1.825)	0.5046 (2.320)	0.9946 (2.269)	—	-0.8351 (-0.387)	-0.7120 (-2.358)
	SEE=0.038	R ² =0.768	DW = 2.36			

a) Values in parentheses are t-statistics.

for other European countries¹⁶. In Table 2 we present the long-run coefficients and the dynamic adjustment parameters of our model:

Table 2

Long-run coefficients and dynamic adjustment parameters

Productivity Equation					
Branch	σ	$\rho \sigma \lambda$	γ_1	γ_3	
C	1.1025	0.0346	0.4225	0.6883	
Q	1.1119	0.0263	0.5774	0.5374	
K	1.0742	0.0133	0.4609	0.1457	

Wage Equation					
Branch	β_2	λ_{11}	λ_{12}	λ_{13}	λ_3
C	-18.9338	0.6194	—	—	0.8602
Q	-15.1399	1.0641	—	—	0.8804
K	-1.1729	0.5046	0.9946	—	0.2880

We can see that the long-run semi-elasticities of wages to deviations of unemployment from its natural rate are similar for branches Q and C, and much bigger than the one obtained for branch K. However, in European terms, the long-run unemployment effect in branch K can still be considered slightly above average. These results agree with what one

¹⁶ Drèze and Bean (1990) report values of the long-run semi-elasticities of the real wage to the unemployment rate that range from -0.4, in Germany, to -2.8, in Austria.

would expect intuitively. In branch K, workers are more skilled and qualified with more insider power and therefore the response of wages to unemployment is much smaller. The same phenomenon is patent in the fact that only in branch K are price increases completely fed into wage increases in the short-run. For the other branches, although this happens in the long-run, in the short-run wages do not respond to price increases¹⁷ which implies a loss of purchasing power of nominal wages in the short-run.

Turning now to the productivity equation, in the long-run for all the three branches the elasticity of substitution is remarkably close to one, implying an underlying long-run production function of the Cobb-Douglas type. However the short-run elasticity of substitution for branch K is quite different from the ones obtained for branches Q and C, implying different speeds of adjustment.

Summing up, the main conclusions from this exercise are the following:

i) the downward effect of unemployment in manufacturing wages is bigger in Portugal than in other European countries, although the coefficients are not precisely estimated. This feature of the Portuguese manufacturing sector can explain the non-existence of an unemployment-wage vicious circle in Portugal;

ii) wages responses to unemployment vary across branches. The bigger the qualification and skill of the average worker, the smaller the dampening effect of unemployment on wage growth. This suggests that, once the structure of the Portuguese manufacturing sector evolves to a situation where the relative weight of skilled industries is bigger, we would stop having significant responses of wages to unemployment. This means that, in the future, it might be not so easy to break the wages-unemployment vicious circle;

¹⁷ In the wage equation, for branches C and Q, the coefficient associated with the current growth rate of consumer prices did not come out significantly and, in some cases, had the wrong size.

iii) productivity gains are quickly passed into wage increases, with short-term elasticities ranging from 0.5 to 1, with a long-run elasticity of unity;

iv) the long-run underlying production function is of the Cobb-Douglas type for all three branches, although in the short-run branches have different elasticities of substitution;

v) in the long-run our model implies a Phillips curve that relates the share of labour (adjusted for the minimum wage) to deviations of unemployment from its natural rate;

vi) our model also implies that the adjusted share of labour consistent with the natural rate of unemployment varies with the relative power of workers in the wage bargaining process.

In order to further test these two last implications of our model, we decided to see how our long-run wage equations (10) fitted the data.

In Figures 2, 3 and 4 we have plotted the evolution of the deviations of the logarithm of the adjusted labour share from its long-run value¹⁸, which we interpret as a wage gap, together with the evolution of $\beta_2(u - \bar{u})_t$. One can see that for branches C and Q the pattern of the two series is similar specially before 1983¹⁹. However we have the feeling that our β_2 values for these branches are overestimated as one observes that $\beta_2(u - \bar{u})_t$ varies more than the wage gap. For branch K, on the contrary, the wage gap series shows a greater variance suggesting that we may have underestimated β_2 . However, for his branch, for some years the two series move in opposite directions. This suggests that, in this branch, the unemployment situation does not explain so well the wage gap, as it does for the other two.

18 We have proxied the long-run value of the logarithm of the adjusted labour share by its sample mean.

19 The year of 1988 for all three branches is clearly an outlier. Moreover we do not have much confidence on 1988 figures because they have not been revised by the Portuguese Statistical Institute and also because (as it is explained in the Data Appendix) some of the series were not available and therefore were constructed using growth rates of series from other sources, with a classification not always perfectly compatible. In estimation, therefore, we introduced, when relevant, a dummy variable for 1988.

Figure 2 - Branch C

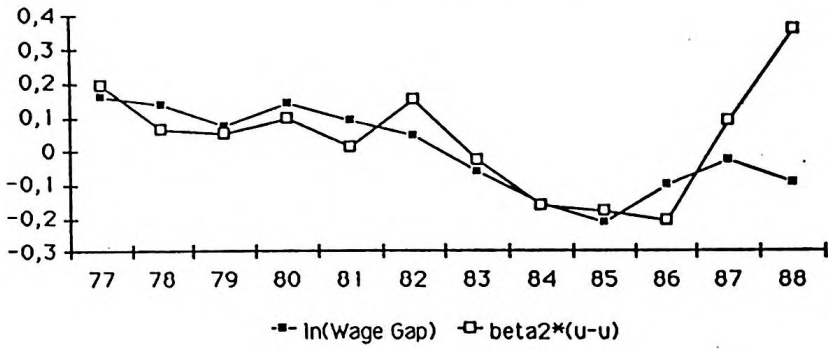


Figure 3 - Branch Q

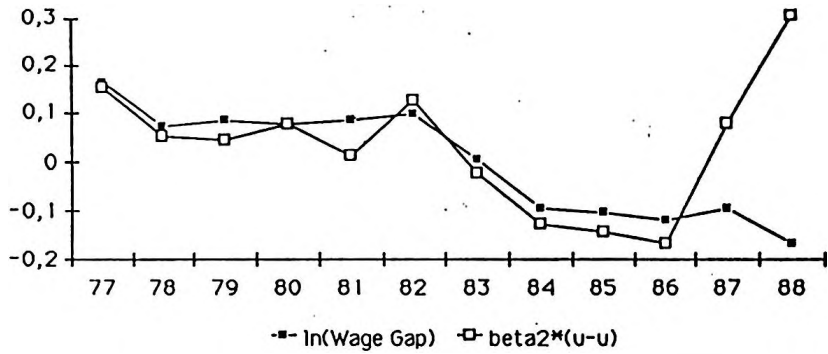


Figure 4 - Branch K

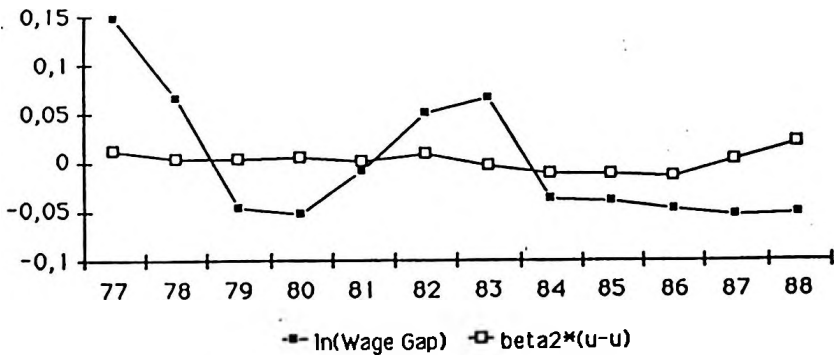


Figure 5 - Branch C

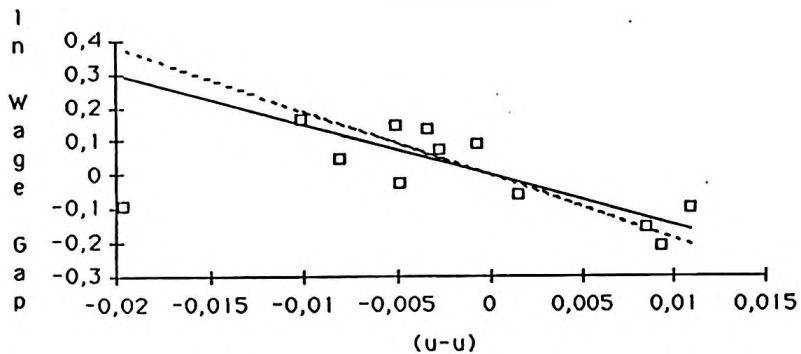


Figure 6 - Branch Q

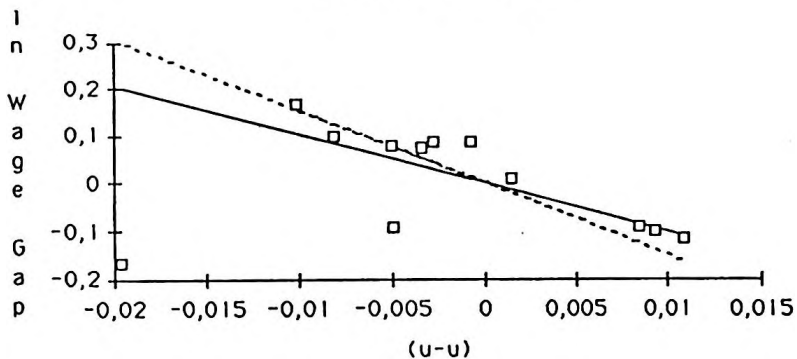
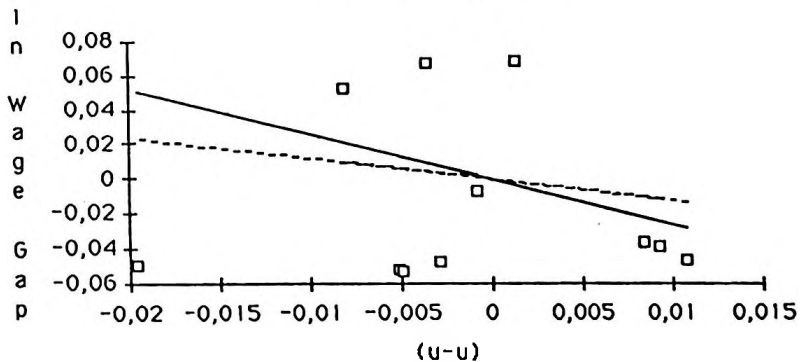


Figure 7 - Branch K



In order confirm our suspicious regarding the values of β_2 , we have in Figures 5 to 7 drawn our estimated long-run wage equations with the observed pairs of points (wage gap, deviations of unemployment from its natural rate). One can see that the majority of points lies on the north-west and south-east zones as expected. We have also drawn in the same figures the relation obtained when the wage gap is directly regressed on $(u - \bar{u})_t$. For branches C and Q this last schedule is less steep, while in branch K it implies an impact of $(u - \bar{u})_t$ on the wage gap greater than the one suggested by our model.

The results of these OLS regressions, for 1978 to 1987, are presented in Table 3:

Table 3

Wage Gap Equation

$$\ln \left[\frac{w_{it} - \bar{w}_t}{pc_t} \right] - \ln \left[\left(\frac{Y}{L} \right)_{it} - \frac{\bar{w}}{pc_t} \right] - \ln k_{oi} = \beta_2 (u - \bar{u})_t$$

Branch	β_2	SEE	R ²	DW
C	-14.915 (-4.238)	0.072	0.666	1.64
Q	-10.243 (-3.448)	0.061	0.569	0.87
K	s -2.567 (-1.063)	0.049	0.112	1.32

These results confirm our previous findings. Indeed, the unemployment situation explains the long-run evolution of the wage gap in Portuguese manufacturing, specially for branches C and Q. The long-run impact of unemployment on the wage gap varies between branches. The ranking of β_2 across sectors is maintained, but now we obtain a lower dispersion. Nevertheless the values of β_2 now obtained are still

significantly bigger than those usually found for other European countries.

Up to now, we have found empirical support for the long-run wage equation implied by our model. However our theoretical model also predicts that the adjusted share of labour consistent with full employment is identical to the relative power of workers in the wage bargaining process ($1-\beta$), when $\theta = 1$ (see expression (8)). Proxying the long-run values of the adjusted labour share by its average within the sample period, we obtain the following values for the sectorial ($1-\beta$), if $\theta = 1$:

Branch	$1-\beta$
C	0.275
Q	0.312
K	0.522

To our knowledge, in Portugal, there is no other quantitative information regarding the relative strength of unions in wage negotiations. Therefore we cannot verify the plausibility of our figures nor advance any considerations regarding the implicit value of θ . However interpreting k_0 as $(1-\beta)$, we obtain sensible magnitudes for the relative power of workers, which might not be the case for different values of θ .

Our framework of analysis also provides other interesting insights in the explanation of the recent evolution of the Portuguese reality. As workers are concerned with the preservation of the adjusted share of labour, the Government can, through \bar{w} , influence the wage setting function²⁰. Indeed, if the growth rate of the minimum wage exceeds the growth rate of productivity, the labour share increases if the adjusted one is to be maintained. As the long-run production function is of the Cobb-Douglas type, this cannot be sustained in the long-run. Therefore for some subsequent years the trend must be reversed. We believe that this explains a great deal of the evolution of the labour share in Portugal after 1974. In the years that followed, the minimum wage was introduced and

²⁰ Note that this influence will be bigger in sectors where the observed wage rate is closer to the minimum wage, i.e., where insiders power is not very important.

experienced rates of growth that exceeded the growth rate of productivity. Therefore the labour share increased dramatically. After 1977, the pattern was reversed and the labour share declined until 1986.

4. CONCLUDING REMARKS

The central question addressed in this paper has to do with the explanation of the relative flexibility of the Portuguese labour market, when compared with other European countries. We find that in Portugal, contrary to what happens in the rest of Europe, unemployment exerts a significant downward pressure on manufacturing wages. We obtain a long-run Phillips curve where the adjusted labour share is found to respond significantly to the slack in the labour market. This accounts for the low level of unemployment and small unemployment persistence registered in Portugal, when compared with other countries.

Moreover other interesting empirical facts also emerge from our analysis. Productivity gains seem to be quickly passed into wages increases. However, for the more traditional industrial branches (C and Q), workers are not able to fully incorporate price increases into their nominal wages in the short-run. This implies a loss of purchasing power of nominal wages in the short-run and disturbs the labour share.

We also find that the ability of workers in incorporating nominal productivity gains in their wage or in preventing the adjusted labour share from varying with unemployment is related with their insider power. Therefore, once the Portuguese manufacturing sector becomes more dependent on skilled workers, it might not be so easy to control unemployment.

We believe that these findings are consistent with intuition and other studies on the Portuguese reality. The idea that workers are concerned with the preservation of the adjusted labour share can explain the evolution of the labour share in the last decade. Moreover, it also suggests that the Government, by manipulating the minimum wage, can influence the division of national income in the short-run.

DATA APPENDIX

The database used in the estimation of our model was constructed in order to include the most recent series available for Portugal. The main sources used were the Portuguese Statistical Institute (INE) and the Bank of Portugal.

Our objective was to use a fully compatible database to allow comparisons between the various branches considered. This fact imposed a strong restriction upon the database size.

From 1977, the INE published the new National Accounts according to the European Accounting System, with complete information on the branches value added, wage bill and employment. This information is available up to 1988 for the value added and wage bill. Employment series are only published until 1986, and for the subsequent years these series were completed using the annual growth rates of employment from the Employment Survey of INE. Value added is published in current and preceding year's prices, from which an implicit price was calculated.

The branch aggregation was carried out as shown in Table A.1:

Table A.1

	<u>National Accounts</u>	<u>Employment Survey</u>
Branch C	7 to 12 and 29	Food, Textile, Wood and Paper and Other Related Industries
Branch Q	13 to 16	Chemical and non-Metallic Industries
Branch K	17 to 28 and 30	Metallurgic and Metal Fabrication Industries

The consumer price index used was taken from the Reports of the Bank of Portugal.

Finally the unemployment series was obtained from the Permanent Survey on Employment (until 1982) and from the Employment Survey (from 1983), using annual averages. It should be noted that the figures up to 1982 include workers looking for the first job, while from 1983 the unemployment is taken in a restrictive sense.

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