

WAGE DETERMINANTS IN SPAIN (1980-2000)

JOSÉ AIXALÁ *
CARMEN PELET †

Abstract

This paper provides evidence about the nominal wage determinants in Spain during the period 1980-2000. We estimate a wage equation, using time series analysis applying an error correction mechanism. Our aim is to analyse the extent to which the evolution of wages is influenced by the unemployment, prices and productivity.

The results reveal that the unemployment rate has no effect on the evolution of nominal wages. The variable that explains the evolution of nominal wages in the long term is prices, showing slightly inflationary behaviour. In the short term, wages are explained by their past values, reflecting a nominal inertia.

Keywords: Wages; Unemployment; Productivity; Time series; Institutional framework

JEL classification: J31, J59, J69

1 Introduction

The objective of this paper is the analysis, by means of the time series technique, of the wage determinants in the Spanish economy during the period 1980-2000. We have chosen this period because it starts with the approval of the “*Estatuto de los Trabajadores*” – a fundamental norm that regulates the frame of the labour relations in Spain–, and it ends after the introduction of the Euro –the moment in which Spain loses the monetary and exchange rate policies as instruments of adjustment. Thus, main labour reforms took place throughout this period in order to provide sufficient flexibility in the labour market, and the current system of collective bargaining has been developed. The first contribution of this paper is to analyse these determinants for a period that has not been tested yet in spite of its importance. It is a very extensive period and takes in several economic cycles as well as important changes in the institutional framework of the labour market which have decisively influenced wage formation.

The cyclical changes in the Spanish economy during this period are reflected in the behaviour of variables such as inflation, unemployment and productivity, all of which are related by the literature with the evolution of

* University of Zaragoza, Department of Applied Economics. Address: Facultad de Ciencias Económicas y Empresariales, Gran Vía, 4. 50005 Zaragoza, España. Email: jaixala@unizar.es

† cpelet@unizar.es

wages. Both in times of crisis and in growth, the setting of an adequate wage level has been one of the principal concerns of economic policy.

The institutional changes mentioned above have also influenced wage evolution because during this period the current system of collective bargaining and the wage agreement policy were developed and several labour reforms have been carried out. The influence of these institutional factors has modified the relationship shown by the original Phillips curve, as has been empirically observed in many countries over the last few decades, with simultaneous increases of wages and of unemployment.

Thus, the main contribution of this paper has a twofold direction. Firstly, we contrast whether there has existed a price-wage spiral due to the intermediate level of centralisation in the collective bargaining existing in Spain. This hypothesis is based upon [Bruno & Sachs \(1985\)](#) and [Calmfors & Driffill \(1988, 2002\)](#) models, which analyse how the level of centralisation in the collective bargaining influences wage evolution.

Secondly, we contrast if unemployment has influenced wage moderation. The existence of important institutional rigidities in the Spanish labour market, which explain the high structural unemployment level (NAIRU), would lead to the lack of relationship between unemployment level and wage moderation. This hypothesis is based upon [Layard & Nickell \(1985\)](#) and [Layard et al. \(1991\)](#), who point out that wages depend on the unemployment rate and the deviations of such rate from the NAIRU.

Within this context of reference, we test for a cointegration relationship between nominal wages and their determinants in Spain, as well as the short-term relationship between them and the adjustment to long-term equilibrium, by estimating an error correction mechanism. This is an additional contribution of the paper as this technique has not been used in papers dealing with the Spanish labour market. We have chosen to specify an equation where the dependent variable is nominal wages because this allows us, as well as to test the flexibility of wages with respect to unemployment and productivity, to analyse whether there is a prices- wages spiral in the long term and nominal wage inertia in the short term.

The rest of the paper is organised as follows. Section 2 introduces the theoretical framework that analyses wage determinants from a macroeconomic perspective. Section 3 presents the model and the methodology used. Section 4 gives the main results of the tests, while Section 5 contains the most relevant conclusions. The bibliographical references close the paper.

2 Review of the literature

The theoretical framework related to wage determination based on the relationship established by the Phillips curve, has evolved from linking the evolution of wage increases negatively with unemployment rates and their variations to establishing a relationship between the setting of wages and prices in a framework of negotiation, with an unemployment rate that, in equilibrium, coincides with the structural unemployment rate or NAIRU.

Thus, the approach initially adopted by [Phillips \(1958\)](#) has undergone successive improvement with the contributions of [Phelps \(1967\)](#) and [Friedman \(1968\)](#) about the natural unemployment rate. Following this theoretical proposal, [Lipsey & Parkin \(1970\)](#) point out that the flexibility of wages with

respect to the unemployment rate is reduced when social agreements are applied, which shows the existence of rigidities in the institutional framework of the labour market. This weak explanatory power of the unemployment rate with respect to wages is also reflected in [Parkin et al. \(1976\)](#) and in [Brandsma & VanderWindt \(1983\)](#), the first paper finding a strong influence of prices on the determination of nominal wages.

[Layard & Nickell \(1985\)](#) and [Layard et al. \(1991\)](#) explain wage determination through the policy of price setting by the firms and the negotiation process. In this context, if there is no compatibility in the setting of prices and wages, an inflationary spiral will appear which will depend on the relation between the NAIRU and the effective unemployment rate. The authors cited above define a dynamic wage equation where unemployment, prices, productivity and institutional factors play an important role. In this theoretical framework, [Nymoen \(1989\)](#) finds a significant effect of consumer prices on wages in the short term, while productivity emerges as significant in the long run.

More recently, [Akerlof et al. \(1996, 2000\)](#) propose a model in which the downward nominal wage rigidity is contemplated, as well as the role of the expectations in the wage bargaining. A model with similar characteristics has been tested by [Napolitano \(2000\)](#), and shows the existence of an inflationary spiral and a trend of wage growth over time. [Broersma & denButter \(2002\)](#) also find that wages depend on their past values and on the variation of past prices. For [Ascari \(2003\)](#), the lack of mobility of the labour factor plays a key role in explaining the nominal rigidity in models of wage setting. [Nymoen & Rodseth \(2003\)](#) also find a low flexibility and that income policies only have visible effects on wages when they are implemented with strong legal measures. [Karanassou et al. \(2005, 2008a\)](#) analyse the persistence of prices and wages observed in most countries in recent years, showing that wages adjust faster than prices, that the long-run elasticity of wages with respect to productivity indicates that about two thirds of productivity gains are translated into wage increases. Finally, unemployment puts downward pressure on wages.

With respect to the Spanish economy, the existing papers show, in general, a significant influence of the unemployment rate on wages for different periods. Among them, we can cite [Dolado et al. \(1986\)](#) who also find a significant effect of the bargaining variables. [Coe \(1988\)](#), however, finds that the unemployment rate and inflation have no significant influence on changes of wages. [Andrés & García \(1990\)](#) highlight, along with the significance of unemployment already mentioned, the lack of inertia in wage growth as well as its rapid response to changes in prices. [López \(1991\)](#) points out that the estimated value of the elasticity of real wages with respect to the unemployment rate is negative and slightly above unity. For [Anderton \(1993, 1998\)](#), wages are negatively related to unemployment, a structural break appearing after the 1984 reform, which introduced greater flexibility into the hiring system. [Karanassou et al. \(2008b\)](#) observe that in Spain wages are inversely related to the unemployment rate and positively related to productivity, and there is a substantial effect of prices on wages.

The aforementioned papers test a wage equation with different explanatory variables. However, they do not incorporate any hypotheses which relate the institutional framework of the labour market with the influence of such variables upon wage evolution. This relationship, which we consider of great importance, is studied in this paper from two institutional perspectives: the

collective bargaining system and the labour reforms. Both perspectives have been the object of priority attention by the economic authorities and the Spanish social agents throughout the period under study.

With respect to the bargaining system, [Bruno & Sachs \(1985\)](#) model analyses its importance upon wage determination, depending on the level of centralisation in such bargaining. According to this model, in countries with a centralised system, trade unions bear in mind the inflationary effects of wage increase. This will lead them to moderate their demands. Conversely, in countries with a less centralised system, an individual trade union considers that the effect of its demands on the general price level is low. Thus, we are in the presence of a non-cooperative game which will lead to a superior wage level.

[Calmfors & Driffill \(1988\)](#) introduce in their model the effect of a highly decentralised system on wages, showing that the relationship between the level of centralisation in the bargaining process and the levels of wage inflation would be represented by means of an inverted U-shape curve. This is so because, if there exists a highly decentralised bargaining system at the firm level, wage demands will have a direct effect on its competitiveness. This will lead to less employment so trade unions will moderate their demands. Thus, countries with highly centralised or highly decentralised systems will have higher wage moderation than countries with intermediate centralisation levels. This thesis is again developed in [Calmfors & Driffill \(2002\)](#).

As regards labour reforms, these aim to achieve higher flexibility in the labour market, thus allowing a closest relationship between unemployment level and wage moderation, avoiding simultaneous wage and employment increase. [Layard et al. \(1991\)](#) model claims that wages depend on the unemployment rate and the deviations of such rate from the NAIRU. Only an unemployment level higher than the NAIRU can have effects on wage moderation and decrease trade union's ability to put pressure. If structural unemployment is high, wage moderation is low. Hence, NAIRU should be reduced influencing upon the institutional factors that determine it, among which we can highlight: labour force composition, geographical and functional mobility, generous unemployment benefits, workers' willingness and capacity to find a job and existence of training policies.

3 Empirical model and methodology

Following the theoretical framework developed in the previous section, that reviewed the determination of wages, in this section we specify the following equation to measure the effect on nominal wages of both the competitive component, through the unemployment rate, and of the prices and productivity variables that influence the negotiation process:

$$W_t = \beta_0 + \beta_1 U_t + \beta_2 P_t + \beta_3 q_t + \epsilon_t \quad (1)$$

where W_t are the nominal wages measured by the total payments of all the sectors of the economy; P_t is the average price level taken from the Consumer Price Index (CPI), U_t is the aggregate unemployment rate and q_t is the productivity, measured with a proxy defined as the ratio between the GDP and the level of employment.

The data are quarterly and the variables are expressed in logarithms. The data come from the Synthesis of Economic Indicators series of the Ministry

of Economy for wages, prices and productivity, and from the Spanish Labour Force Survey of the National Institute of Statistics for unemployment.

As pointed out previously, the methodology used in this paper is based on the analysis of time series with the error correction mechanism. Sargan (1980) was the pioneer in the use of this technique applied to the wages equation. Later, Nymoan (1989), Dibooglu & Enders (2001), and Broersma & denButter (2002) have used it in their work referring to other countries.

Most time series variables are better characterised as integrated processes than under the hypothesis of stationarity. Therefore, it is necessary to analyse the variables individually to determine their order of integration. To do so, we have applied several unit root tests. We begin with the Augmented Dickey-Fuller test (ADF), applied to a model with a constant and a trend (except for unemployment, which only presents a constant), for a maximum number of lags of the differentiated variable $lmax = 5$, following the proposal of Ng & Perron (1995), expressed as follows:

$$y_t = \mu + \beta_t + \rho y_{t-1} + \sum_{i=1}^l \phi_i \Delta y_{t-i} + \varepsilon_t$$

Then we apply the GLS (DFGLS) Dickey-Fuller test proposed by Elliot et al. (1996). Later we apply the Z_t Phillips & Perron (1988) test, estimating the long term variance. To confirm the results obtained with these tests, we use the Kwiatkowski et al. (1992) (KPSS) test, where the null hypothesis is that of stationarity¹.

Having analysed the order of integration, if the series are $I(1)$ and their linear combination, when applying the cointegration vector, is stationary (the residuals of the cointegration relation are $I(0)$), it means that there is a long-term equilibrium relation between the variables of the model. This cointegration relation is analysed by applying the method of Engle & Granger (1987) (E-G), estimating the cointegration vector by ordinary least squares (OLS) and applying the ADF test to the residuals of the regression (1). In general, the components of vector X_t are cointegrated of order d, b , with $d \geq b \geq 0$ expressed as $X_t \sim CI(d, b)$, if all the components of the vector are $I(d)$ and there is a cointegration vector $\alpha \neq 0$ such that $Z_t = \alpha' X_t \sim I(d - b)$, with $b > 0$. We propose to test the null hypothesis $Z_t \sim I(1)$ against the alternative $Z_t \sim I(0)$ using, as we said, the ADF tests.

Furthermore, there is a close relation between cointegration and the error correction models. The Granger Representation Theorem (Engle & Granger 1990) proves that the variables are cointegrated only if the relation between them can be explained through an error correction model. The idea is that part of the disequilibrium of a period is corrected in the following and, using this method, the speed of adjustment to long-term equilibrium can be measured, allowing a dynamic specification of the model in which the short- and long-term relation between the variables is taken into account.

These models relate the change in the dependent variable with past equilibrium errors, as well as with past changes in the explanatory variables.

¹It should be pointed out that the autocorrelation functions in levels and first differences for each variable do not allow us to discard the no-stationarity of the series. Nevertheless, they do not show the presence of no-stationarity in the seasonal component and we decided not to carry out seasonal unit root tests.

Table 1: Unit root tests

	ADF	DF ^{GLS}	Z_t	KPSS
W_t	-0.18	-0.85	-1.71	3.22***
U_t	-2.03	-1.53	-2.22	3.04***
P_t	-1.16	-1.68	-3.44	2.15***
q_t	-0.75	-1.34	-3.29	0.20**

Note: definition of the variables, the data sources and the explanations of the unit root tests are in Section 3

The critical values are tabulated in Maddala and Kim (1999).

** significant at 5%

*** significant at 1%

In this way, for a vector time series X_t , the model can be represented as $A(B)(1-B)X_t = -\gamma Z_{t-1} + u_t$, where u_t is a stationary multivariate disturbance, with $A(0) = I$, $A(1)$ has all the elements finite, $Z_t = \alpha' X_t$, $\gamma \neq 0$, and B is the backshift operator.

In this paper, we apply an error correction mechanism (ECM) using OLS on the equation (1) in differences, where all the variables are stationary, taking as the explanatory variable the lagged residuals of the long-term relation that offer a link between the long- and the short-term relation of the variables of the model.

4 Results of the estimation

The analysis of the order of integration, applying the tests referred to in the previous section, allows us to conclude that, in no case, can the null hypothesis of the existence of a unit root in the series be rejected. They all present a stochastic trend in their data and, therefore, are integrated of order one (Table 1).

After analysing the order of integration, we tested for the existence of a cointegration relation between the variables of the model. From the nominal wage equation (1), we obtain the following results (Table 2)²: Estimation M_1 , which includes only unemployment as the explanatory variable, shows a spurious relation. Estimations M_2 and M_3 present a high R^2 and an absence of correlation, as the Durbin-Watson statistic indicates. The ADF test applied to the residuals of the regression allows us to reject the null hypothesis of no cointegration. As for the value of the coefficients of the model, the variable unemployment presents a low and positive value and, thus, does not have a moderating effect on monetary wages³. On the other hand, the coefficient of the prices variable is superior to one and highly significant. Therefore, the

²The seasonal dummy variables, Q1, Q2, Q3, are included to correct for seasonability problems. Another variable, FU9400, which takes the values of unemployment during 1994-2000 and zero in the other years, reflects the change of trend in the rate of unemployment during this period. Furthermore, an institutional dummy variable, D8083, is introduced to measure the effect of income policy during the period 1980-1983 and captures the structural break of the model which is reflected by CUSUM S-Q test at 5% significance. The introduction of these dummies greatly improves the specification, increasing the explanatory power of the model.

³This lack of significance of unemployment also appears in Coe (1988) and in Abraham et al. (2000).

Table 2: Estimation of nominal wages, 1980-2000. E-G

Dependent variable: W_t

	M_1	M_2	M_3
Constant	12.71 (30.50)	6.53 (90.92)	5.57 (5.65)
U_t	-0.27 (-1.95)	0.04 (2.85)	0.03 (2.40)
P_t		1.19 (99.62)	1.15 (23.49)
q_t			0.16 (0.97)
D8083	-0.74 (-11.28)	0.07 (6.86)	0.07 (6.66)
FU9400	0.02 (9.81)	$-5.6E-04$ (-1.85)	$-7.6E-04$ (-2.08)
Q_1	-0.07 (-3.39)	-0.14 (-27.14)	-0.14 (-27.10)
Q_2	-0.16 (-2.82)	-0.13 (-24.96)	-0.13 (-24.93)
Q_3	-0.07 (-1.22)	-0.05 (-10.18)	-0.05 (-9.92)
n	83	83	
R^2	0.83	0.99	0.99
R^2 (adj.)	0.81	0.99	0.99
D-W	0.33	1.79	1.80
ADF-EG	-2.89	-5.43**	-5.37***

Note: The data sources and the explanation of the Engle and Granger (E-G) cointegration test are in Section 3. The definition of the variables are in Sections 3 and 4. In brackets, t-ratios to analyse individual significance. The critical values are tabulated in Engle and Yoo (1987)

** significant at 5%.

*** significant at 1%

behaviour of nominal wages is explained by the evolution of prices, wages being slightly inflationary⁴. Productivity shows a non-significant coefficient while the dummy D8083 is significant, capturing the structural break that represents a change in wage policy, based, after this period, on a social pacts policy⁵.

Below, we carry out a short-term estimation of the model using OLS (Table 3), where the variables are defined in differences and the lagged residuals of the long-term model previously analysed are also included. Furthermore, we incorporate several lags of the dependent variable in differences and a lag of the prices variable in differences as well as the dummy that measures the effect of income policy in the period 1980-83 and the seasonal dummies mentioned above. The results obtained are the following:

The two models estimated present good statistical properties, with an R^2 of 0.98 and a Durbin-Watson close to 2. The lagged residuals, in both cases, have a negative and significant coefficient, reflecting the existence of a cointegra-

⁴Screpanti (2000) and Napolitano (2000) also find inflationary wage behaviour.

⁵Nymoer & Rodseth (2003) analyze, similarly, the effect of income policy on the wages in different countries.

Table 3: Short-term estimation of monetary wages ECM by OLS

Dependent variable: dW_t		
	1	2
Constant	0.02 (1.84)	0.02 (2.17)
$dW_t(-1)$	0.18 (1.89)	0.18 (2.05)
$dW_t(-4)$	0.47 (5.63)	0.48 (6.04)
dU_t	-0.02 (-0.27)	
dP_t	0.14 (0.57)	
$dP_t(-1)$	0.01 (0.02)	
dq_t	-0.14 (-0.55)	
Q_1	-0.1 (-5.95)	-0.1 (-6.26)
Q_2	0.01 (0.71)	0.01 (0.83)
Q_3	0.02 (2.26)	0.02 (2.58)
D8083	0.01 (0.91)	0.01 (1.36)
Res(-1)	-0.79 (-5.45)	-0.79 (-5.79)
n	78	78
R^2	0.98	0.98
D-W	2.36	2.35

Note: The data sources and the explanation of the Error Correction Mechanism (ECM) test are in Section 3. The definition of the variables are in Sections 3 and 4. In brackets, t-ratios to analyse individual significance

tion relation between the variables. This coefficient, with a value of around -0.80, shows the speed of adjustment to long-term equilibrium.

The analysis of the explanatory variables gives the following results. The lags of the dependent variable present significant coefficients. Thus, the short-term variation of wages is, to a great extent, explained by its lagged values, showing the presence of nominal inertia. The variables unemployment, prices and productivity present low and non-significant coefficients. The dummy that measures the effect of income policy has a non-significant coefficient. In consequence, only lagged wages determine the behaviour of monetary wages in the short term.

To explain the results obtained, the dynamic of the increase of nominal wages above the increase of prices found in the long-term relation, as well as the existence of an important short-term nominal inertia, can be attributed to the characteristics of the system of collective bargaining. The hypothesis of Calmfors & Driffill (1988, 2002) proposes that the relation between the degree of centralisation and the practice of wage moderation is not linear. In intermediate bargaining, larger wage increases are normally agreed on than in more decentralised bargaining, in which the situation and economic results of each firm are taken into account, or at the more centralised national level,

where more attention is paid to the possible negative effects of high wage increases on inflation and the level of employment.

Following this hypothesis, we could ask ourselves how the Spanish model of bargaining has evolved over recent years. The answer is that, although the number of agreements signed with firms has increased, the percentage of workers tied to the provincial and regional sector has continued to grow. Consequently, intermediate bargaining predominates, giving rise to wage increases that are parallel to or, sometimes, slightly higher than inflation⁶. The wage agreement policy and the successive labour reforms in recent decades have tried to modify this structure of collective bargaining, proposing greater links between the different levels of bargaining and adapting to the particular conditions of the firms.

Lastly, the lack of response of wages to unemployment is explained by the rigidities of the institutional framework that come from the strong regulation of the labour market and have led to high levels of structural unemployment (NAIRU)⁷. Only an unemployment level above the NAIRU will be able to exert a significant influence on wages, managing to moderate their growth. Among these institutional rigidities, we can highlight the generous unemployment benefits, together with the absence of training policies; the lack of labor mobility; non co-ordinated collective bargaining; a high income tax level and the indexing of wages to inflation. Thus, the labour reforms of the period were aimed at a greater flexibility of the institutional framework, to permit a reduction of the NAIRU, a better adjustment between wage increases and the growth of productivity, as well as a wage moderation in line with macroeconomic objectives⁸.

5 Conclusions

In this paper, we have presented evidence about the variables that determine the evolution of wages in Spain during the period 1980-2000. To do so, we adopt a theoretical model of the augmented Phillips curve, that incorporates the institutional framework into a context of bargaining, as a reference. The estimation was carried out using the time series technique with an error correction mechanism, allowing us, as well as to test for the existence of a cointegration relation, to analyse the short-term relation and the speed of adjustment to long-term equilibrium.

The results obtained permit us to affirm that the evolution of nominal wages in Spain during the period 1980-2000 is mainly explained by prices. There is a long-term equilibrium relation between these two variables, with a coefficient of prices that is significant, positive and higher than one, which reflects that nominal wages were slightly inflationary. In the above cointegration relations, the unemployment rate is also included, with the result that unemployment has not had a significant influence on nominal wages moderation.

In the estimation of the error correction mechanism, it can be concluded, first, that there is a cointegration relation between the variables of the model,

⁶Rodríguez (2004).

⁷Estrada et al. (2002) show a very high level of NAIRU for the Spanish economy during this period, very close to the existing unemployment rate.

⁸See Segura (2004).

correcting the short-term deviations, as the coefficient of the residuals of the long-term relation shows. Second, nominal wages present, in the short term, a strong nominal inertia, because their behaviour is mainly explained by past values of wages. Lastly, the other variables are not significant in the evolution of monetary wages in the short term.

When trying to explain these results, the structure of collective bargaining, which has sometimes generated a prices-wages spiral and a nominal inertia, should be borne in mind. Furthermore, the rigidities of the institutional framework of the labour market have meant that nominal wages grew without a connection to unemployment. The labour reforms carried out during the period under study have tried to correct these problems. These reforms, essentially, aim to modify the structure of the collective bargaining, the systems of hiring, the conditions of firing, the generosity of the unemployment benefit, functional mobility and active labour market policies.

Nevertheless, the achievements of each of these objectives during the period analysed were not totally satisfactory, leaving space for an agenda of future reforms. Thus, the predominance of the intermediate level in the collective bargaining has made the practice of wage moderation difficult, in spite of the attempts to foment the sector level of bargaining on a national scale and the recent trend towards decentralisation with the increase of firm agreements. As for the new systems of hiring that arose from the different reforms with the aim of easing access to employment and, thus, reducing structural unemployment, they have led to a high level of temporary employment and a segmentation of the labour market that has impeded the flexibility of wages with respect to unemployment. Finally, the measures taken to foment functional and geographical mobility and active labour market policies, with the aim of reducing the NAIRU, have been insufficient.

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