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WAGE CURVES FOR SPAIN

EVIDENCE FROM THE FAMILY BUDGET SURVEY

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SUMMARY:

This study explores the existence of a wage curve for Spain. To quantify this relationship for the Spanish economy, we used individual data from the EPF 1990-1991. The results show the presence of a wage curve with an elasticity of –0.13. The availability of very detailed information on wages and unemployment has also shown that less protected labour market groups – young workers, manual workers and building sector workers- have a higher elasticity of wages to local unemployment. These results could be interpreted as a greater facility of firms in these segments to settle wages as a function of the unemployment rate.

KEY WORDS: wage curve, unemployment rate, regional labour markets

JEL Classification: J30, C23

RESUMEN:

Este trabajo investiga la existencia o no de una curva de salarios en España. Para cuantificar esta relación para la economía española, se han utilizado datos de la EPF 1990-1991. Los resultados obtenidos permiten concluir la existencia de una curva de salarios con una elasticidad de –0.13. La disponibilidad de un elevado nivel de desagregación en la información estadística sobre salarios individuales y desempleo provincial también ha permitido concluir que los colectivos menos protegidos del mercado de trabajo – jóvenes, trabajadores manuales y trabajadores del sector de la construcción – presentan una menor elasticidad de los salarios al desempleo local. Estos resultados pueden interpretarse como evidencia de que en estos segmentos las empresas tienen una mayor facilidad para fijar los salarios en función de la tasa de paro.

PALABRAS CLAVE: **C**urva de salarios, tasa de paro, mercados de trabajo regionales

Clasificación JEL: J30, C23

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1. Introduction

The relationship between unemployment and wages, which has been dominated by the Phillips curve literature for a long time, is being revised from a new frame that takes the work of Blanchflower and Oswald as a starting point, especially their book *The Wage Curve (1994)*. These authors concluded that there was a negative relationship between the level of individual wages in a territory and its unemployment rate. The graph of this relationship is a wage curve with a negative slope and an elasticity of –0.10.

The curve is estimated as a Mincer equation where individual wages are a function of the individual human capital (schooling and experience), other individual characteristics and the kind of job, but augmented with the

[1] Previous versions of this paper were presented in the 40 Congress of the European Regional Science Association and in the IV Encuentro de Economía Aplicada. Comments by participants in both congresses have been very helpful to improve the paper, specially those by J. M. Labeaga and J. L. Roig. Authors wish to thank the National Program of Social and Economic Studies of the CICYT (Project SEC 1999-0432) and the Generalitat de Catalunya (Project 1999SGR00017) for the support received. We would also like to thank the research assistance of Montserrat Álvarez, Juan Carlos Duque and Juan Luis Ollero in compilating the unemployment database. Of course, all remaining errors are own.

consideration of the unemployment rate of the region in which the person is employed. The estimation of this equation with individual data allows a measure of the elasticity of wages to local unemployment. Several authors have carried out this kind of empirical exercise for many countries and most show wage curves with a negative slope and elasticities close to –0.10.

In comparison to the progress of empirical knowledge on the topic, the theoretical explanations of this relationship have not advanced as quickly. The wage curve has been explained in the frame of the theories on wage rigidity, bargaining models and efficiency wages. The latter best explains the empirical evidence, as its predictions are confirmed by econometric studies. However, there are some results that are incompatible with these explanations, therefore further advances in the theoretical approach are required.

This paper tests whether a wage curve is present in the Spanish economy. The analysis of the wage-local unemployment relationship for Spain is especially relevant because of the institutional characteristics of its labour market. In the year of reference of the data (1990), the Spanish labour market was characterised by an intermediate collective bargaining system with high coverage, high firing costs, a quite generous benefit system, and very high rates of unemployment and long-term unemployment. Consequently, a low elasticity of wages to unemployment or even the absence of a wage curve is expected. However, fixed-term contracts represented 35.1% of the total private sector employees, implying a high turnover, and a certain monopsonistic power of

firms to settle wages according to the evolution of the unemployment rate. An additional reason to analyse the relationship between wages and local unemployment for Spain is the limitations of previous studies on this topic. Finally, an analysis of the Spanish labour market from this perspective is facilitated by the availability of a detailed database: the *Encuesta de Presupuestos Familiares* (Family Budget Survey) for 1990/91. This survey includes information at a provincial level (NUTS III), thereby allowing the division of the Spanish territory into 50 local labour markets. This dataset also allows an estimation of disaggregated wage curves for diverse groups taking into account their gender, age, schooling level or the activity sector in which they are employed[2].

In this paper we present an estimate for a wage curve for the whole Spanish economy and other estimates for the diverse activity sectors, genders, age groups, levels of schooling and kind of occupations. Our results show a wage curve with an elasticity of –0.13. There is also evidence that supports a negative relationship between wages and unemployment for the building and services sectors, for men, for young workers (from 20 to 29 years old), for workers with medium education, and for occupations with low and medium qualification requirements. These results are in accordance with most studies

[2] The level of detail of the disaggregated wage curves presented here for the Spanish economy is only available for the United States (Turunen, 1998); Germany (Baltagi and Blien, 1998) and Australia (Kennedy and Borland 2000).

that have addressed the topic, except for the elasticities for the distinct schooling levels, which, in other countries, are higher for workers with fewer schooling years.

In the next section, several theoretical explanations of the wage curve (bargaining models and efficiency wages) are briefly summarised; in the third section, the methodology and the database are described and the empirical results obtained are shown. The paper ends summarising the main conclusions.

2. The wage curve

During the first half of the nineties, Blanchflower and Oswald developed an ambitious research program on the relationship between individual wages and local unemployment rates using several databases for a wide set of countries at the individual level (Blanchflower and Oswald, 1990, 1994a, 1994b, 1995b). The main result of these studies was the finding of an empirical regularity, which was called “the wage curve”. This curve establishes an inverse relationship between individual wages and the local unemployment rate. More precisely, a worker living in an area of high unemployment earns a lower wage than those with identical characteristics living in an area with less unemployment. A more surprising result is that the elasticity of wages to unemployment is very close to –0.10, a value that is quite stable among

countries –with diverse institutional frameworks-, among a range of time periods and for distinct samples or databases.

2.1. Theoretical explanations

A negative relationship between wages and regional unemployment is contradictory –at least, at first sight- with the theory of compensatory wage differences as given initially by Adam Smith and more formally expressed at the territory level by Harris and Todaro (1970) and by Hall (1972). According to the latter, there is a positive relationship between the two variables: the wage rate is higher in the areas of high unemployment to equalize annual earnings or wages plus unemployment insurance, in the different regions. However, both theoretical approaches are compatible as shown below.

Taking into account that the compensatory differences theory postulates a positive relationship between wages and unemployment, it is necessary to give a theoretical explanation of the empirical negative relationship found in the empirical literature by other authors. The explanation must rely on non-competitive labour market models as the competitive theory will not fit this result. In effect, if the labour markets are competitive, there is unemployment only while the wage level adjusts to the new market conditions and, therefore, *ceteris paribus* the higher the wage, the higher the unemployment. The relationship between the two variables is positive.

The most relevant theoretical explanations for the wage curve are twofold: the bargaining model and efficiency wages.

In the bargaining model, wages are the results of a bargaining process between firms and unions. In the model proposed by De Menil (1971) and used by Blanchflower and Oswald (1994b), a wage equation is obtained following this expression: $\omega=a+s(\pi/n)$, where a is the wage that a worker losing his/her job can obtain in the labour market, s is the bargaining power of the union and π/n are the profits by worker. The idea is that the higher the unemployment, the longer it will take a fired worker to find a new job and, consequently, his/her income after being fired (a) will be lower. This decrease in a reduces ω and generates an inverse relationship between the unemployment rate and the wage ω. A complementary possibility is that if unemployment is linked to lower economic activity (at least in the short term) and to lower profits by worker (π/n), then, *ceteris paribus*, wages will be lower. An alternative version of the bargaining model is that in which unions try to maximise the incomes of all workers and not only those employed. In this case, a high level of unemployment implies a change in the preferences of unions towards a higher level of employment, although wages will be lower for workers employed. In this context, wages will be lower when unemployment is higher (Blanchflower and Oswald, 1995a).

This kind of theoretical explanation for the wage curve has, however, some limitations that have been highlighted mainly by Blanchflower and Oswald (1995a) and Card (1995). First, in spite of very similar wage curves between countries, the density and role of unions differ. Second, empirical results are consistent with the finding of high elasticity values of wages to unemployment for unaffiliated workers while for those affiliated to unions very low values or even no wage curve are usually found (Turunen, 1998).

The second explanation of the wage curve is based on the efficiency wages models. Of the versions of efficiency wages[3], two are usually considered in the literature. The first is based on the idea of shirking (Weiss, 1980; Shapiro and Stiglitz, 1984). Workers have a utility function that depends on their wage and on the possibility of eluding their labour responsibility, as the effort derived from work reduces his/her utility. Therefore, the worker will try to shirk the maximum time without losing his/her job. In conditions of low unemployment, the effort will be lower because if discovered and fired he/she will soon find another job. As the monitoring of workers entails costs, an efficient solution is to pay high wages, thereby increasing the cost of shirking. Consequently, a situation of low unemployment and high wages is compatible. In the presence of high unemployment, the opposite happens: finding a new job is difficult,

[3] See Stiglitz (1986) for a review of modern theories of wage setting, and more particularly, about alternative explanations of efficiency wages.

workers increase their efforts receiving low wages, and, as a result, high unemployment and low wages are observed.

The second version used to explain the wage curve is based on the idea of labour turnover caused by quits (Phelps, 1970; Stiglitz, 1982). In this model, workers obtain utility from their wage and from the positive characteristics of the job. Therefore, they try to find jobs with favourable combinations of wages and desired characteristics (or labour conditions). Leaving the job voluntarily is a way to allot resources (time) to the search for a better job. These entail costs for firms because of undesired turnover. Firms try to minimise turnover by paying higher wages to retain workers. *Ceteris paribus*, these wages will be higher when the unemployment rate is low because the search time for a new job will be lower and the probability of finding one will be greater (and the quits rate also higher). In this context, the negative relationship between wages and unemployment reappears[4].

The distinct levels of unemployment in regions allow us to observe the negative relationship at a territorial level between individual wages and local unemployment, as in areas with low unemployment, wages will be higher to

[4] Campbell and Orszag (1998) develop a model of the wage curve based in this explanation of quits and they find an interesting result: the elasticity of wages to unemployment does not depend on institutional characteristics or on the employment policy of the considered country but on the elasticity of quits to the unemployment rate. According to these authors, this fact could explain that different studies have found an elasticity to wages to unemployment close to –0.10 in countries with different labour market institutions.

discourage people from leaving jobs voluntarily and from shirking, while in areas with high unemployment firms assure the same result even if they pay less.

Theoretical explanations should also take into account the possibility of migration, as workers in areas of high unemployment and low wages move to regions with improved conditions. In equilibrium, in the long term regions should offer the same utility, which is derived from the combination of wages and unemployment. Given that migration entails costs, workers do not move in response to changes in contemporaneous unemployment rates, but only when permanent differences are observed. In the long term, firms in regions with high permanent unemployment should compensate this disadvantage by paying higher wages. Blanchflower and Oswald (1995b) admit that there may be a positive long-term association between the expected wage and the average unemployment rate. However, in the short term, while migratory flows do not compensate the net advantage of the different regions, the relationship observed between wages and contemporary unemployment is negative.

In addition, efficiency wage models not only explain the negative slope of the wage-unemployment curve but also generate forecasts that are compatible with empirical evidence. According to this approach, the effort of a group of workers –young workers, for example- depends on the cost for them to find a new job after being fired for shirking. This cost depends on the situation and characteristics of the labour market for this group rather than the evolution of the aggregate labour market. In this regard, if the labour segment for young

workers is characterised by higher unemployment and high turnover, the prediction will be that firms assure the maximum effort of this group without having to pay high wages. In other words, firms can exert their monopsonistic power with this segment, which implies a wage curve with a higher slope. The same happens with other groups: manual workers, non-affiliated earners, workers in certain activity sectors and ethnic minorities. And this is simply the result obtained unanimously by the empirical literature on the wage curve. Therefore, we can conclude that this efficiency wage models best explain the empirical regularity found by Blanchflower and Oswald.

More recently, Sato (2000) proposed an explanation of the wage curve on the basis of search models. In the absence of migration, a search model combined with regional variations in productivity generates a negative relationship between wages and unemployment. In regions with high productivity, wages and vacancy supply will be higher, thereby generating a lower unemployment level. Nevertheless, the possibility of migrating produces a massive movement of labour to areas of higher productivity (higher wage and low unemployment). In Sato's model (2000), this migratory flow decreases as a result of incorporating congestion costs derived from the hypothesis of a monocentric structure. These are commuting costs and housing costs, which increase when the population grows. In equilibrium, there is no migration because congestion costs compensate the differences in productivity (of wages and unemployment).

In spite of these theoretical explanations, and the good predictions of efficiency wage models, it is necessary to make further progress in this field, as some empirical results are not compatible with any of these explanations. For example, the high elasticity of wages to unemployment rates of self-employed workers detected by Turunen (1998).

2.2. Empirical evidence

The empirical literature on the wage curve includes evidence from many countries (Table 1) for which a wage curve has been found[5].

There is also extensive empirical evidence on the disaggregation of the curve for distinct groups of workers that shows that these elasticities (the slopes of the curve) differ for each group.

This evidence can be explained by the fact that the reactions of diverse groups of workers to the conditions of the local labour market differ (Card, 1995; Turunen, 1998). In this context, wages of the internal labour market –with higher tenure in the firm- will be less sensitive to the economic cycle. The same is expected for workers with higher levels of specific human capital –because of tenure or qualification-, for workers protected by a strong union or by higher firing costs, and for public sector workers.

[5] Blanchflower (2001) also analyses Slovenia and Kyrgyzstan but no wage curve is found for them.

A complementary explanation could be derived by considering the ways in which wages are measured (Card, 1995). The best way of estimating the wage curve is using data on hourly wages, although generally there is none available for this variable. For this reason, annual wages are usually used. However, annual wages are the result of the product of the hourly wage by the annual number of hours worked. In empirical studies, the elasticity of wages to unemployment obtained could be overestimated, as it is the sum of the elasticity to unemployment and of the elasticity to hours worked. When considering the specific curves for groups of workers the incidence of this phenomenon could be relevant and could help to explain the differences in the values of the elasticities estimated. For example, if the number of hours worked by unskilled employees decreases more rapidly than the number of hours worked by skilled employees, the annual wages of the former will decrease faster than the latter. In this context, and even if the hourly wage is constant, the elasticity of wages to unemployment for the unskilled segment will be higher.

3. Features of the Spanish labour market, methodology and results

The analysis of the wage-local unemployment relationship for Spain is especially relevant because of the institutional characteristics of its labour market. In 1990, year of reference of the data base considered, the Spanish labour market was characterised by an intermediate collective bargaining system

–like most continental European countries- with a reduced union density (13%), but with a high coverage (76%) (OECD, 1997). Moreover, firing costs were high (OECD, 1994, chapter 6). These features indicate a high bargaining strength of insiders. Moreover, the benefit system was quite generous until 1992, especially in terms of the replacement ratio but also in terms of duration (OECD, 1988). Long-term unemployment accounted for about 53% of total unemployment and the underground economy was considerable. These data allow us to conclude that there was low search intensity and a low eligibility of unemployed and, consequently, a reduced pressure on wages to decrease. Because of these characteristics, a low elasticity of wages to unemployment or even no wage curve is plausible.

Moreover, the unemployment rate in 1990 was 16.3%, nearly double the unemployment rate in the member states of the European Union. This data also suggests low elasticity as international evidence show that the curve is flatter when the unemployment rate is higher.

However, other institutional characteristics suggest the contrary: a higher elasticity of wages to unemployment. From 1984, fixed-term contracts were introduced into the Spanish labour market. In 1990, this kind of contract accounted for 30.4% of total employees and 35.1% of the private sector total wage earners. This situation implied higher turnover and a higher exposure of workers –and their wages- to labour market conditions. It is interesting, then, to test the dominant effect -institutional rigidities versus contractual flexibility- and

to analyse whether there was a dual labour market between these two collectives: those with fixed-term contracts and those with permanent contracts.

An additional reason to analyse the relationship between wages and unemployment for the Spanish economy is the limitations of previous studies on this topic. Canziani (1997) worked with Spanish data from the *Encuesta de Estructura, Conciencia y Biografía de Clase* of 1991 where the unemployment rate is not disaggregated at territorial level. This author considers labour markets by gender and age (eight labour markets: gender by four age groups) and obtained an elasticity of wages to unemployment of –0.13. However, the values in that study cannot be accepted as estimates of a "Blanchflower and Oswald wage curve", as the elasticity was not related with territory. Montuenga (2000) used the European Community Household Panel (ECHP) for 1995 to estimate a wage curve for Spain. However, the limited territorial detail of the data, which only allowed the study of seven large regions (NUTS I), makes it impossible to apply proper econometric methods. Consequently, the reliability of those results is limited. In a more recent study, Montuenga *et al.* (2003) tried to overcome this econometric limitation using unemployment data not only by regions but also by age and gender. In this regard, the analysis in that study cannot be strictly considered a wage curve analysis *à la* "Blanchflower and Oswald" as it contrasted the presence of the curve using a definition of unemployment that involved variables other than territory. Therefore, there are no wage curve estimates for Spain using micro data with high enough territorial detail to use

local labour market unemployment rates. Consequently, disaggregated wage curves by gender, age or other personal characteristics are not available[6].

3.1. Methodology

Here we applied a methodological approach that is usual in the literature. In particular, the logarithm of annual wages was regressed on a number of control variables related to personal and job characteristics and the local unemployment rate. In particular, a semi logarithmic function, which, according to Mincer (1974), is the most appropriate functional form, was estimated, where the logarithm of annual wages depends on a vector of individual and job characteristics, and the local unemployment rate.

The initial model proposed is the following:

$$w_{ij} = f(z_{ij}, u_j) + e_{ij} \qquad (1)$$

[6] From a different perspective, Bentolila and Dolado (1991) estimate regional wage equations using macro data for the 17 Spanish Autonomous Communities (NUTS II). Their results show that the growth rate of average regional wages do not react quickly to regional unemployment rate above the national one. Villaverde (1999) using also regional data for the period 1980-1995, confirms that the growth rate of regional wages is not influenced by the evolution of regional unemployment. However, in both works the methodology consists in estimating Phillips-curve type relationships using time series models.

where w_{ij} is the natural logarithm of the annual wage of the individual *i* that lives in the province *j*, z_{ij} is a set of individual factors that can affect wages of the individual, such as the level of schooling, his/her experience or other characteristics such as gender or the kind of occupation, u_j is the unemployment rate in territory *j* and, finally, e_{ij} is a random error term which follows a normal distribution with zero average and constant variance.

The data used in this study are from the *Encuesta de Presupuestos Familiares* (Family Budget Survey) carried out by the INE (the Spanish Institute of Statistics) for the second quarter of 1990 to the first quarter of 1991. The main aim of this survey was the study of expenditure on goods and services by families in Spain. Nevertheless, the survey collected information of diverse types about families. In this additional information we found data on personal and job characteristics and wages, among others. The availability of this broad individualised information, and the fact that it is available at the provincial level (NUTS III) made it ideal for our purposes, as it was then possible to analyse 50 territorial labour markets[7].

The earnings variable from this data is the annual income from paid employment. To avoid the inclusion of inaccurate data, we used only information about the 12,494 individuals who worked in private non-agricultural

[7] As Card (1995) highlights, in the estimates of the wage curve the number of degrees of freedom are determined by the different number of considered labour markets and not by the number of individual observations. This fact is even clearer when the model is estimated using the cell-means procedure.

industries and for who all the additional information was available (Table 7). Therefore, the sample analysed did not include information about employees in the public or agricultural sectors.

Public sector workers were excluded because their wages respond in a different way to changes in the unemployment rates than those of other sectors (Turunen, 1998). The wages of public sector workers are fixed in a centralised way and usually there is no bargaining process. For this reason, wages are highly insensitive to the local labour market conditions.

However, the reason to exclude agricultural workers is related to the definition of the endogenous variable from the statistical information provided by the EPF. In particular, the information on individual wages provided was the annual nominal wage. In this regard, because of the seasonality of agricultural work and, as a result, its temporality annual wages are clearly influenced by the number of hours worked. Therefore, this could affect the results and we chose to omit this group of workers from the analysis.

This problem not only affects agricultural workers but the whole sample. However, the effect of the number of hours worked on the wages can be considered less relevant in other labour sectors. Card (1995) and Blanchard and Katz (1997), among others, state that it is inappropriate to use annual wages as the endogenous variable of a wage curve analysis. According to these authors, this kind of analysis requires information on the hourly wage. However, the results found by Blanchflower and Oswald (1994b) and Kennedy and Borland

(2000) show that the estimated coefficient and the statistical significance of the regional unemployment rate is robust to the diverse definitions of wages[8]. Moreover, for the Spanish economy, it is not possible to use information on the hourly wage in this kind of analysis and keep a high level of territorial detail.

Regarding the Z_{ij} included in equation (1), the information from the EPF about individuals allows the control of the following characteristics: gender, main income provider, potential experience and its square, part-time job, level of schooling (4 categories), occupation (2 categories) and activity sector (3 categories)[9].

Unemployment data by provinces (the higher territorial detail provided by the EPF) for non-agricultural sectors were obtained from the *Encuesta de Población Activa* (EPA) (Labour Force Survey). In particular, the average unemployment rate of the three last quarters of 1990 and the first quarter of 1991 was used, as this is the time when the *Encuesta de Presupuestos Familiares* was conducted. Data for provincial unemployment rates by gender and by activity sectors were obtained from the same source using the same procedure.

However, because the EPA does not provide this information with the required level of detail, provincial unemployment rates by age and levels of

[8] Collier (2000) found the same results working with wage per hour and with the monthly wage.

[9] Although the available information in the EPF will permit to use a higher number of categories for some variables, we reduced its number due to econometric reasons that will be further explained.

schooling were obtained from the *Censo de Población* (Population Census) for 1991. In this regard, it is important to highlight that this source provides data on the situation of individuals at March 1st 1991.

The unemployment rate was included in the specification in logarithms, as this is the specification used by Blanchflower and Oswald (1994b) and the one generally used in the literature. Moreover, given that individual wages are also expressed in logarithms, this specification allows a direct interpretation of the coefficient value as the elasticity of wages to unemployment.

Having specified the model and defined the endogenous and explanatory variables, the next step consists of estimating equation (1). However, a difficulty arises because this equation includes an explanatory variable of interest (the unemployment rate of the territory *j*), which is defined at a higher level of aggregation (province) than the dependent variable (individual). As Moulton (1986) shows, the estimation by ordinary least squares of this kind of equation will biase upward the values of the test of individual significance for this variable. In other words, the significance of the unemployment rate, and the presence of a wage curve could be accepted as a consequence of the estimation procedure applied. As Kennedy and Borland (2000) demonstrated, in the case of the wage curve, this could happen when the wages of workers of each region have a common component that cannot be fully explained by their individual characteristics or by the unemployment rate and, then, the error term would be correlated for wages of the same region.

To overcome this problem, we estimated equation (1) by grouping the data of the dependent variable and for each explanatory variable by calculating the average for individual groups (for the individuals in every territory *j*). This procedure is known as "cell-means" estimation. Therefore, the equation to estimate is as follows:

$$\overline{w}_j = f(\overline{z}_j, u_j) + \overline{e}_j \qquad (2)$$

where the notation of the variables is similar to that used in equation (1) and the subindex *j* is related to all the territories considered.

However, when working with grouped data the OLS estimator is unbiased but inefficient (Greene, 1998, pp. 374-376). For this reason, it is better to estimate the model using weighted least squares using $\sqrt{n_j}$, as weights where n_j is the number of individuals in each group considered[10].

An undesired consequence of this estimation procedure is that it reduces considerably the number of observations and the number of degrees of freedom. Because of this and although the EPF 1990/91 offers detailed information on

[10] An alternative solution to the problem of the inefficiency of the OLS estimator consists in applying generalized least squares or maximum likelihood. In practice, the three methods offer similar results (although with different computational costs) if there is no heteroscedasticity in the regression with grouped data (see Dickens, 1990). For this reason, in every model shown we tested the presence of heteroscedasticity using White's test. In any case, the null hypothesis could be rejected.

individual characteristics, it was necessary to define wider categories for control variables because the number of observations available once the averages by group were calculated were clearly lower than the number of explanatory variables. In this regard, the empirical evidence by Kennedy and Borland (2000) shows that a reduction in the number of explanatory variables does not greatly affect the empirical results for the value or the statistical significance of the coefficient associated with the unemployment rate.

However, and even after estimating by cell-means, there is another problem associated with the estimation of equation (2): the possible omission of relevant variables at the territorial level. If relevant variables are not included, the coefficient associated with the unemployment rate (the only territorial variable in the regression) could pick up part of these effects when unemployment is correlated with these omitted variables. To take this possibility into account, the usual approach in the literature consists of including regional fixed effects in each model; however, this is impossible when information is available for only one time period (year). Nevertheless, these provincial differences can be considered if regional fixed effects at a higher territorial aggregation level are included, for example, at the autonomous community level (NUTS II). However, in addition to the collinearity problems derived from the partial coincidence of the NUTS II and NUTS III classification (7 out of 17), the cell-means estimation procedure implies a substantial reduction in the number of

observations and makes it impossible to include such a wide set of explanatory variables in the model.

The problem can be tackled by including other variables at the territorial level that could help to explain the provincial wage differences once individual characteristics have been controlled. The literature describes several possibilities: the cost of living, climate, degree of unionisation, productive structure, among others.

Again, the simultaneous introduction of all these variables would imply a reduction in the degrees of freedom and, consequently, a choice must be made. Finally, we chose to include the level of regional prices for 1990 in the specification of equation (2), as Kennedy and Borland (2000) (p.789) found that the results obtained when including the variable "average housing price" (in relation to a wider set of regional variables) are the closest to the model with regional fixed effects.

Data on the level of regional prices was obtained from Lorente (1992). Following the directives of EUROSTAT, the INE carried out the *Encuesta Regional de Precios* during 1989 and Lorente forecasted these prices for 1988-1991 by applying the annual increase of regional prices to the levels of 1989. However, the limitations of this statistical source for our analysis are relevant. On the one hand, data on the level of prices are given for autonomous communities and not for provinces. Therefore, the same level of prices was assigned all provinces in the same autonomous community. With the exception of the seven

autonomous communities that have only one province, this is a generalisation that limits the explanatory power of this variable. Moreover, data collection by the INE includes only information about large cities in the autonomous community. In spite of these limitations, this is the only indicator available on the level of regional prices.

Taking into account the limitations of the variables related to price differentials, we also included an additional control variable: the average non-agricultural productivity level in the province. Data for 1991 on Gross Added Value (GAV) and employed was obtained from the *Fundación BBV* regional dataset.

The next section shows the results of estimating equation (2) augmented with the variables of regional prices and provincial productivity with the aim of testing whether there is a wage curve for the Spanish economy.

3.2. Results

We first estimated a "traditional" wage curve: a regression of individual wages, the control variables and the local unemployment rate (for non-agricultural sectors). The results of estimating this model using "cell means" are shown in the first column of table 2 (to save pages in every table the results for

the control variables have been omitted)[11]. A significant and negative relationship between individual wages and the contemporaneous regional unemployment rate was observed, confirming the results obtained on wage curves for other countries. Moreover, the value of the coefficient, which can be interpreted as the elasticity of the curve, was –0.13[12], a value close to the –0.10 found by Blanchflower and Oswald. Our results show that the features of the Spanish labour market (the institutional framework or the characteristics of unemployment and its duration) do not appear to affect the sensitivity of individual wages to local unemployment.

To control the possible endogeneity of unemployment, we estimated this same equation but used the past unemployment as an instrument variable[13]. The sign of the elasticity of wages to contemporaneous unemployment had not changed and its magnitude had slightly decreased although it was statistically

[11] These results are available from the authors on request.

[12] The results of estimating a wage curve using individual data and applying ordinary least squares (using White heteroscedasticity consistent standard errors) confirm the need to use the cell-means procedure: although the value of the coefficient is very close to the one obtained using cell-means, -0.11, the t-statistic is significantly higher, -7.23.

[13] This variable is the usual in the literature: see, for example, Blanchflower and Oswald (1994b), Hoddinot (1996) or Kennedy and Borland (2000). However, in the Spanish case, and due to the high persistence of unemployment, this variable presents some limitations that we have tried to overcome considering different lags (from one to four) of the unemployment rate.

significant at the usual levels[14]. Therefore, it is reasonable to consider the unemployment rate as an exogenous variable.

Next, we estimated disaggregated wage curves by activity sectors using the EPA unemployment rates. The second column in Table 2 shows the elasticity of wages to local-sectorial unemployment rates. When these 150 labour markets were considered (50 provinces by three non-agricultural activity sectors), the value of the elasticity was very similar to the previous one, -0.13 but with a lower standard error. These results confirm that there is a wage curve for Spain a wage curve with an elasticity of close to –0.10. However, results differ when the elasticity is calculated for each of the three sectors considered. No wage curve was found for manufacturing while it was detected for the building and services sectors.

In Spain the manufacturing sector probably has the highest level of unionisation and the oldest workers. According to international evidence, these two characteristics should generate a lower elasticity of wages to unemployment and even a flat curve. Moreover, as the data did not allow the separation of the diverse manufacturing activities[15], the effect of unemployment to wages in each branch may be compensated among them. The characteristics of the building sector differ as the very nature of this activity promotes the use of fixed-term

[14] These results are also available from the authors on request.

[15] The EPA and the Population Census only offer data for four activity sectors (agriculture, manufacturing, building and services) at the provincial level.

contracts (53.6% of total employees in 1990). Consequently, there is a high turnover that permits moderate wages when unemployment is high, but also makes it necessary to increase wages to retain workers when the economy grows and unemployment is low. The result is high elasticity (-0.15), greater than the total elasticity (-0.13). The elasticity of the services sector (-0.14) is clearly influenced by the fact that we excluded public sector workers. Although the services sector includes large firms in financial and transportation services, those remaining are usually small and usually offer less contractual stability[16], and as a result, wages are clearly influenced by the unemployment rate.

The results of estimating a wage curve by disaggregating wages and unemployment rates by gender are shown in Table 3. When assuming two labour markets in each province, one for men and the other for women (first column), a wage curve was found but at the 10% significance level and with a elasticity value of wages to unemployment close to –0.05. A more robust wage curve is found, however, for men with a significant elasticity of –0.09 at the 5% level. For women, no effect of unemployment on wages is found. These values could indicate that these two groups do not operate in separate labour markets

[16] The percentage of fixed term contracts of the services sectors in 1990 was 26.8%, higher than the 24.9% of manufacturing. However, the relevant rate in this study is that corresponding to private activities of the services sector. Although there is no detailed enough statistical information, one can think that it was higher than the 30% or even 35% as the percentage of fixed term contracts of the public sector was of 15.8%. For example, the percentage in tourism activities was higher than 39%.

but in a total one. In this regard, the legal framework does not allow discrimination between men and women in terms of wages.

To test this hypothesis, we estimated an equation for men but included the aggregate unemployment rate as an explanatory variable and then did the same for women. Our results, which are available on request, show that men's' wages are more responsive to changes in the total unemployment rate (-0.12) than to the unemployment rate for men only (-0.09). The elasticity for women was not statistically different from zero, although its significance has increased.

The empirical evidence for other countries is contradictory. Blanchflower and Oswald (1994a) for the United Kingdom, Baltagi and Blien (1998) for Germany, Canziani (1997) for Italy and Card (1995) for the United States obtained a higher elasticity for men than for women. However, Baltagi *et al.* (2000) reported the opposite result for East Germany. Finally, Janssens and Konings (1998) for Belgium, Groot *et al.* (1992) for the Netherlands and Collier (2000) for the United Kingdom did not find evidence of a wage curve for women. To explain their results, Groot *et al.* (1992) hold that unemployment not only affects wages but also participation decisions: a high level of unemployment increases the number of discouraged workers, thereby reducing the labour supply and increasing wages. Where this effect is low –for example, among men- the initial negative effect on wages will clearly dominate, but if this

effect is relevant –for example, for women- both effects will be opposite showing no evidence of a wage curve[17].

With the aim of considering other individual characteristics in the analysis of disaggregated wage curves, we also estimated wage equations, taking into account the distinct categories of age and schooling levels. We divided the sample in four age groups trying to approximate the segments of the Spanish labour market: workers from 20 to 24 years old, from 25 to 29, from 30 to 44 and from 45 to 64[18]. The first column in Table 4 shows the results of an equation in which unemployment rates are defined for each age group but all the workers considered were included in the estimation. An elasticity value of –0.09 was found, which is lower than the initial value of –0.13. This result can be interpreted as workers of distinct ages competing for the same jobs[19].

The disaggregated results (columns 2 to 5 of Table 4) confirm the evidence obtained in other studies: the wages of young workers are most

[17] To solve the problem, they estimated a simultaneous equation system formed by a wage equation and a participation equation. Their results show a wage curve for women in some years.

[18] We prefered to exclude workers from 16 to 19 years old from the analysis as required information was only available for 818 individuals.

[19] This result, and the previous one obtained when disaggregating by gender, cast doubts on the reliability of the estimates by Canziani (1997) and Montuenga *et al.* (2003) for Spain. Both authors defined regional labour markets by gender and ages, that are not strictly independent.

responsive to unemployment rates[20]. In particular, the maximum values of the coefficients estimated were –0.28 for the 20 to 24 year age group and –0.19 for those aged from 25 to 29 years, while no wage curve was detected for those over 30. Several explanations can be offered to account for these results. Young workers have occupied the same post for less time (they are not in the internal labour market of the firm) and have not had time enough to accumulate specific human capital in the firm. Moreover, in the case of the Spanish economy, most have fixed term contracts (69.2%). These characteristics make young workers a very weak group in the labour market and firms can use their monopsonistic power to settle wages on the basis of the current unemployment rate.

Wage curves for each educational level were also estimated from the data in the Population Census (Table 5). The joint consideration of three educational levels in each province (150 labour markets) provided an elasticity of –0.07, which was also lower than the initial results. The disaggregated results (in columns 2 to 4) show that there is a negative and significant relationship only between wages and unemployment for workers with medium education (at a significance level of the 10%). This result partially contradicts international evidence, which usually shows a decreasing elasticity with the number of

[20] Similar evidence can be found in Baltagi and Blien (1998) for Germany, Blanchflower and Oswald (1994a) for the United Kingdom and Card (1995) for the United States.

schooling years[21]. The only reasonable explanation for this result[22] is that in Spain there has been a large increase in the schooling level of young generations, who usually end secondary education or even university degrees. For this reason, data on the educational levels are related to ages. For example, most illiterate workers are older and something similar is observed with workers who achieved the secondary level of education: most are young people. Given that fixed term contracts are very common for young workers, it is not strange that the negative relationship between wages and unemployment is found for secondary education.

The last disaggregation considered is related to occupation. In particular, we split the sample into two kinds of occupations: those in which highly qualified workers are needed and those that can be done by low and medium qualified workers. The information in the Population Census does not allow a proper calculation of the unemployment rate for these groups. For this reason, we used the total unemployment rate, which implies that we implicitly assume that qualified and non-qualified workers are in the same labour market. This assumption is not plausible for workers occupying high-qualified jobs but it is quite reasonable for those in low and medium-qualified jobs (as any worker,

[21] See the works by Blanchflower and Oswald (1994b) for the United States, Canada and the United Kingdom, Card (1995) for the United States and Turunen (1998) also for the United States.

[22] Blanchflower and Oswald (1994b) found a similar anomaly when working with data for Australia that was confirmed by Kennedy and Borland (2000).

whether qualified or not, can try to obtain this kind of job). In support of this notion, a wage curve was found for those in low and medium qualified occupations (elasticity of –0.11) while for those in high-qualified occupations no effect of unemployment on wages was observed (Table 6). These findings are similar to those obtained in previous studies for other countries such as Germany (Baltagi and Blien, 1998) and the United States (Turunen, 1998).

4. Conclusions

The analysis in this paper found that there is a wage curve with a negative slope for the Spanish economy. This result is similar to those found by Blanchflower and Oswald for other countries. The estimates of the elasticity of individual wages to local unemployment rates was –0.13 when using provincial data, a value that is very close to those obtained by Blanchflower and Oswald and by other authors. Therefore, this result seems to confirm that differences in the institutional framework among countries do not affect the sensitivity of individual wages to local labour market conditions.

The disaggregation of statistical information for groups of workers taking into account gender, age, educational level, activity sector and occupation showed considerable differences in the slope of the curve for each group. In this regard, a clear negative wage curve was found for men, while the wage for

women was not affected by unemployment rates, probably to the discouraged worker effect.

By age, for young workers (from 20 to 29 years), a group with fixed-term contracts, there is a wage curve with a high elasticity, while no wage curve was detected for those over 30.

Similarly, the wages of low-educated workers (most of them older) do not react to differences in local unemployment rates. However, for workers with medium educational levels, a wage curve with negative slope was found (most are young workers). Although, this result is not very usual in the literature, it is similar to the situation reported in Australia. Wage curves were also obtained for workers in the building and private service sectors, and for those employed in low-qualified occupations.

In summary, for the less protected groups of the labour market, young workers, manual workers and building sector workers, a high negatively sloped wage curve was found. This result is similar to reports for other countries and is also consistent with the conclusions from efficiency wage theoretical models.

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6. Tables

Table 1.

Country	Reference
Australia	Blanchflower and Oswald (1994b) Kennedy and Borland (2000)
Austria	Blanchflower and Oswald (1994b) Winter-Ebner (1996)
Belgium	Janssens and Konings (1998)
Bulgaria	Blanchflower (2001)
Canada	Blanchflower and Oswald (1994b)
Côte d'Ivoire	Hoddinot (1996)
Czech Republic	Blanchflower (2001)
East Germany	Pannenberg and Schwarze (1998) Baltagi, Blien and Wolf (2000) Blanchflower (2001) Elhorst, Blien and Wolf (2002)
Estonia	Blanchflower (2001)
France	Montuenga, García and Fernández (2003)
Germany	Blanchflower and Oswald (1994b) Wagner (1994) Baltagi and Blien (1998) Longhi, Nijkamp and Poot (2002)
Hungary	Blanchflower (2001)
Ireland	Blanchflower and Oswald (1994b)
Italy	Blanchflower and Oswald (1994b) Canziani (1997) Montuenga, García and Fernández (2003)
Latvia	Blanchflower (2001)
Netherlands	Groot, Mekkelholt and Oosterbeck (1992) Blanchflower and Oswald (1994b)
New Zealand	Morrison and Poot (1999) Morrison, Papps and Poot (2000)
Norway	Blanchflower and Oswald (1994b)
Poland	Blanchflower (2001)
Portugal	Montuenga, García and Fernández (2003)
Russia	Blanchflower (2001)
Slovak Republic	Blanchflower (2001)
South Korea	Blanchflower and Oswald (1994b)
Spain	Canziani (1997) Montuenga (2000) Montuenga, García and Fernández (2003)
Switzerland	Blanchflower and Oswald (1994b)
United Kingdom	Blanchflower and Oswald (1994a) and (1994b) Bell, Nickell and Quintini (2000) Collier (2000) Montuenga, García and Fernández (2003)
United States	Blanchflower and Oswald (1994b) Card (1995) Bratsberg and Turunen (1996) Turunen (1998)

Table 2.

Estimation by *cell-means*	Provinces	Provinces and sectors	Provinces-manuf.	Provinces-building	Provinces-services
Ln unempl.: coef. (t)	-0.13 (-2.49)*	-0.13 (-4.78)*	-0.04 (-0.77)	-0.15 (-3.58)*	-0.14 (-2.53)*
Adjusted R^2	0.70	0.69	0.78	0.53	0.45
F	9.14	24.76	15.79	5.59	4.38
Degrees of freedom	35	135	37	37	37
N	50	150	50	50	50

The dependent variable is the natural logarithm of the annual nominal wage. Each model includes control variables for the following characteristics: gender, main income provider, potential experience and its square, part-time job, level of schooling (illiterate-without studies, elementary, medium and high) and occupation (low-medium qualification, high qualification). Each model also includes two variables that control for the levels of regional prices and provincial productivity. The models of the first and second columns also include variables that control the activity sector (manufacturing, building and services).

* Significant at the 5% level.

Table 3.

Estimation by *cell-means*	Provinces and gender	Provinces-men	Provinces-women
Ln unempl.: coef. (t)	-0.05 (-1.68)**	-0.09 (-2.64)*	-0.00 (-0.06)
Adjusted R^2	0.90	0.74	0.53
F	64.36	12.00	5.26
Degrees of freedom	85	36	36
N	100	50	50

The dependent variable is the natural logarithm of the annual nominal wage. Each model includes control variables for the following characteristics: gender, main income provider, potential experience and its square, part-time job, level of schooling (illiterate-without studies, elementary, medium and high), activity sector (manufacturing, building and services) and occupation (low-medium qualification, high qualification). Each model also includes two variables that control for levels of regional prices and provincial productivity. The model of the first column also includes a variable that controls the gender of the individual.

* Significant at the 5% level.

** Significant at the 10% level.

Table 4.

Estimation by *cell-means*	Provinces and ages	Prov. 20-24	Prov. 25-29	Prov. 30-44	Prov. 45-64
Ln unempl.: coef. (t)	-0.09 (-2.90)*	-0.28 (-2.73)*	-0.19 (-2.21)*	-0.04 (-0.78)	-0.02 (-0.43)
Adjusted R^2	0.84	0.31	0.44	0.59	0.71
F	63.25	2.55	3.71	6.10	9.54
Degrees of freedom	182	35	35	35	35
N	200	50	50	50	50

The dependent variable is the natural logarithm of the annual nominal wage. Each model includes control variables for the following characteristics: gender, main income provider, potential experience and its square, part-time job, level of schooling (illiterate-without studies, elementary, medium and high), activity sector (manufacturing, building and services) and occupation (low-medium qualification, high qualification). Each model also includes two variables that control for levels of regional prices and provincial productivity. The first model also includes control variables for each of the age groups studied.
* Significant at the 5% level.

Table 5.

Estimation by *cell-means*	Prov. and studies	Prov. – illiterate or elementary	Prov. – medium	Prov. – high
Ln unempl.: coef. (t)	-0.09 (-3.23)*	-0.06 (-1.22)	-0.17 (-2.00)**	-0.15 (-1.65)
Adjusted R^2	0.82	0.61	0.40	0.44
F	54.92	7.88	3.93	4.46
Degrees of freedom	136	38	38	38
N	150	50	50	50

The dependent variable is the natural logarithm of the annual nominal wage. Each model includes control variables of the following characteristics: gender, main income provider, potential experience and its square, part-time job, activity sector (manufacturing, building and services) and occupation (low-medium qualification, high qualification). Every model also includes two variables that control for the levels of regional prices and provincial productivity. The first model also includes control variables for the levels of studies (illiterate-without studies, elementary, medium and high).
* Significant at the 5% level.
** Significant at the 10% level.

Table 6.

Estimation by *cell-means*	Provinces-high qualification	Provinces-low-medium qualification
Ln total unempl.: coef. (t)	0.06 (1.01)	-0.11 (-2.30)*
Adjusted R^2	0.43	0.67
F	3.83	8.73
Degrees of freedom	36	36
N	50	50

The dependent variable is the natural logarithm of the annual nominal wage. Each model includes control variables for the following characteristics: gender, main income provider, potential experience and its square, part-time job, level of schooling (illiterate-without studies, elementary, medium and high) and activity sector (manufacturing, building and services). Each model also includes two variables that control for levels of regional prices and provincial productivity.
* Significant at the 5% level.

Table 7. Description of the available sample from the EPF 90/91: Individuals by category

Distribution by sectors

Manufacturing	4432
Building	1814
Services	6248
Total	12494

Distribution by gender

Men	8776
Women	3718
Total	12494

Distribution by level of schooling

Illiterate-without studies-Elementary	9442
Medium	2008
High	1044
Total	12494

Distribution by ages

From 16 to 19 years	818
From 20 to 24 years	2049
From 25 to 29 years	1975
From 30 to 34 years	4538
From 45 to 64 years	3114
Total	12494

Distribution by occupations

High qualification	1648
Low-medium qualification	10846
Total	12494

Distribution by provinces

Alava	289
Albacete	201
Alicante	472
Almería	149
Avila	106
Badajoz	170
Baleares	370
Barcelona	521
Burgos	199
Cáceres	189
Cádiz	306
Castellón de la Plana	220
Ciudad Real	193
Córdoba	211
Coruña (La)	350
Cuenca	105
Girona	289
Granada	181
Guadalajara	175
Guipúzcoa	339
Huelva	113
Huesca	206
Jaén	216
León	238
Lleida	182
Rioja (La)	262

Lugo	130
Madrid	601
Málaga	288
Murcia	320
Navarra	290
Orense	143
Asturias	217
Palencia	177
Palmas (Las)	252
Pontevedra	310
Salamanca	112
Sta. Cruz Tenerife	298
Cantabria	231
Segovia	142
Sevilla	409
Soria	149
Tarragona	257
Teruel	150
Toledo	167
Valencia	548
Valladolid	215
Vizcaya	433
Zamora	113
Zaragoza	290
Total	12494

Table 8. Correspondence between the occupations studied and the occupations available in the EPF 90/91

	Description	Codes of the occupations available in the EPF
High qualification occupations	Masters in science and engineering	1,2,3,4,5,6,8
	Bachelors in science and engineering	7
	Writers, actors, sportsmen	14,15,16,17,18
	Teachers and other qualified workers	9,11,12,13,19
	Firm managers	20,21,40,41,50,51
	Office managers	31,35,36
	Sales executives	42,43,44
	Technicians in mining and manufacturing.	70
Low-medium qualification occupations	Other administrative staff	32,33,34,37,38,39
	Shop assistants and similar	45,49
	Hotel staff and individual services	53,56,57
	Protection and security	58
	Rest of services	52,54,55,59
	Specialised building workers	93,95
	Specialised mining workers	71,72,83,84,85,86,87
	Other specialised workers	73,74,75,76,77,78,79,80,81,82,88,89,90,91,92,94
	Technicians in equipment machinery	96,97,98
	Labourers	99