Further Evidence on Disaggregated Wage Curves: The Case of Spain

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Abstract

Individual data from the Spanish Family Budget Survey (EPF 1990-1991) are used to estimate disaggregated wage curves (industry sector, gender, age, schooling, and occupation). The results show a wage curve for all employees with an elasticity of -0.13. It is also concluded 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 indicate a greater facility of firms in these segments to set wages as a function of the unemployment rate and they are supportive of efficiency wage theoretical models.

1. Introduction

From the seminal contributions by Blanchflower and Oswald (1990, 1994b), several authors have estimated wage curves for many countries (see table 1). The curve is estimated as a Mincer equation where individual's wages are a function of human capital (schooling and experience), other characteristics, and the kind of job, but augmented by the unemployment rate of the region of employment. This empirical literature reveals a curve with a negative slope and elasticity close to –0.10.[1] However, there are only a few contributions where disaggregated wage curves have been analysed. Although in several studies some disaggregation is attempted, detailed evidence is only available for five countries: the United States (Turunen, 1998), Germany (Baltagi and Blien, 1998), Australia (Kennedy and Borland, 2000), Turkey (Ilkkaracan and Selim, 2003) and Chile (Berg and Contreras, 2004).

TABLE 1

Our objectives here are twofold. The first is to provide further evidence on disaggregated wage curves, taking into account several individual characteristics: industry sector, gender, age, schooling, and occupation; the second is to achieve a better understanding of the Spanish labour market by estimating wage curves for different groups.

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[1] In a recent paper, Nijkamp and Poot (2005) apply meta-analytic techniques on a sample of 208 elasticities derived from the literature and find that an unbiased estimate of the wage curve elasticity at the means of study characteristics is about -0.07.

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The analysis for Spain is especially relevant because of the institutional characteristics of its labour market. In 1990, the reference year for our database, the Spanish labour market was characterised by an intermediate collective bargaining system - like most continental European countries - with low union density (13 per cent), but with a high coverage (76 per cent) (OECD, 1997). Moreover, firing costs for workers with permanent contracts were very 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 per cent of total unemployment, and the informal sector was considerable. As a consequence, there was low search intensity and reduced pressure on lowering of wages. Because of these characteristics, a low elasticity of wages to unemployment, or even no wage curve, is plausible, especially for insiders.

However, other institutional characteristics suggest the contrary, namely a higher elasticity of wages to unemployment. From 1984, fixed-term contracts were introduced into the Spanish labour market. In 1990, such contracts accounted for 30.4 per cent of all employees and 35.1 per cent of all private sector wage earners, implying greater 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 - in the context of, possibly, a dual labour market between two groups: those with fixed-term contracts and those with permanent contracts.

An additional reason to analyse the Spanish case is the limitations of previous studies of disaggregated wage curves for Spain. 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. García-Mainar and Montuenga-Gómez (2003) and Montuenga *et al*. (2003) used the European Community Household Panel (ECHP) to estimate a wage curve for Spain, but the limited territorial detail of the data (seven large regions), forced them to use unemployment data only by broad regions (but did allow disaggregation by age and gender). At present, therefore, there are no wage curve estimates for Spain using micro data with high enough territorial detail to use local labour market unemployment rates.[2]

The *Encuesta de Presupuestos Familiares* (Family Budget Survey) for 1990/91, which includes information at a provincial level (50 local labour markets, NUTS III level), allows an estimation of a Spanish wage curve overcoming these limitations. This dataset also allows an estimation of disaggregated wage curves for diverse groups by taking into account gender, age, schooling level, occupation and the industry sector of employment. The level of detail of the disaggregated wage curves for the Spanish economy presented here is only available for the five economies mentioned previously (Australia, Chile, Germany, Turkey, and United States). Estimated wage curves for the different labour market groups of workers permits an analysis of the unequal incidence of unemployment on wages and the effect of the institutional characteristics of the Spanish labour market for each group.

The rest of the paper is structured in three sections: in the second section, the applied methodology is described; in the third section, the results of estimating wage curves for the Spanish economy are presented; and the paper concludes with a summary of the main findings.

[2] According to Blanchflower and Oswald (1995, p. 153), the wage curve indicates 'that if a region has a rise in unemployment in a particular year, those who live there will have a fall in their wages in that year'.

2. Wage Curves. Methodology

We apply a standard methodological approach to the estimation of Spanish wage curves. The logarithm of individual wages was regressed on a number of control variables related to personal and job characteristics and the local unemployment rate. A semi-logarithmic function, which, according to Mincer (1974), is the most appropriate functional form, was utilised. In the estimation model, the logarithm of annual wages is a function of a vector of individual and job characteristics and the local unemployment rate:

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

where w_{ij} is the natural logarithm of the wage of the individual i who 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 occupation, u_j is the unemployment rate in territory j and, finally, e_{ij} is a random error term which is assumed to follow a normal distribution with mean zero and constant variance.

Our data are from the *Encuesta de Presupuestos Familiares* (EPF, 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 principal purpose of this one-off survey was the study of expenditure on goods and services by Spanish families. In fact, it was the most exhaustive statistical operation carried out in Spain to date to collect information not only about expenditures but also about families.[3] 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 purpose, as it was thus possible to analyse 50 territorial labour markets.[4] However, it is important to remark that data regarding the kind of contract of the worker (fixed-term or permanent) are not available in this survey, and this impedes a direct test of the effect of this feature on the elasticity of wages to regional unemployment.

The earnings variable in these data is annual income from paid employment. This limited the data that could be used to the 12,494 individuals who worked in private non-agricultural industries and for whom all the additional information was available. The sample analysed did not include information about employees in the public or agricultural sectors.

Public sector workers were excluded because their wages respond differently to changes in the unemployment rates than those of other sectors (Turunen, 1998). The wages of public sector workers are fixed centrally and, typically, not through a bargaining process. Therefore, they are highly insensitive to local labour market conditions.

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[3] It is worth mentioning that the *Encuesta de Presupuestos Familiares* has been replaced by the *Encuesta Continua de Presupuestos Familiares* (Continuous Budget Family Survey) which has been carried out each quarter since the first quarter of 1985. Due to its sample size, from the first quarter of 1985 to the third quarter of 1997, this new survey does not provide reliable data at the territorial level. From that date, regional data are provided for the 17 Comunidades Autónomas (NUTS II level) which, to our understanding, are not appropriate for this kind of study. Other possible data sources for individual wages, such as the *Encuesta de Estructura Salarial* 1995, do not provide higher territorial detail.

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

The reason that agricultural workers are excluded is because the seasonality and temporary nature of agricultural work means that annual earnings for these workers are especially influenced by the number of hours worked. The problem of seasonality affects not only agriculture workers but, potentially, the whole sample. However, the effect of the number of hours worked on the wages can be considered less critical in other labour sectors.

Card (1995) and Blanchard and Katz (1997), among others, argue that it is inappropriate to use annual wages as the dependent variable in a wage curve analysis. According to these authors, this analysis requires information on the hourly wage.[5] However, the results found by Blanchflower and Oswald (1994b), Kennedy and Borland (2000), and Collier (2000) show that the estimated coefficient and the statistical significance of the regional unemployment rate is robust to diverse definitions of wages. In any case, 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.[6]

Regarding the z_{ij} independent variables included in equation (1), the EPF yields information about gender, main income provider, potential experience, full-time or part-time job, the level of schooling (4 categories), occupation (2 categories), and industry sector (3 categories) for individuals.[7]

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). The average unemployment rate for 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 industry sectors were obtained from the same source using the same procedure. However, because the EPA (LFS) does not provide this information with the required level of detail, provincial unemployment rates by age and levels of schooling were obtained from the *Censo de Población* (Population Census) for 1991. Note that this source provides data on the situation of individuals as of March 1st 1991. [8]

Having specified the model and defined the independent 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*) that 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 bias upward the values of the test of individual significance for this variable. In other

[5] Hart (2003) goes a step further and highlights that property estimated elasticities should be obtained using hourly wages without including overtime payments.

[6] We have estimated a panel data model with fixed effects for periods and regions relating worked hours to unemployment rates using data from 1995 to 2004. We have obtained an estimate of the elasticity of 0.005 with a t-value of 1.39. So, we can conclude that annual income is an adequate dependent variable for our analysis. Regional time series of the average number of worked hours by year have been obtained from the *Boletin de Coyuntura Laboral* of the Ministerio de Trabajo y Asuntos Sociales.

[7] Although the available information in the EPF will permit a higher number of categories for some variables, we reduced their number for reasons that will be explained below.

[8] The definitions of the unemployment rate used in the Labour Force Survey and the Census are identical. However, obtained unemployment rates are not equal due to the different reference dates and to the different coverage of the Labour Force Survey (sample of the population) and the Census (total population). However, the correlations between unemployment rates by schooling levels, ages and regions from the two sources are very high: 0.80, 0.96 and 0.94.

words, the statistical significance of the unemployment rate, and thus hypothesis of the presence of a wage curve may not be rejected because of the estimation procedure applied, clearly an unsatisfactory state of affairs. As Kennedy and Borland (2000) demonstrated, this could happen when the wages of workers of each region have a common component that cannot be fully explained by included individual characteristics or by the unemployment rate so the error term would be correlated with 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.[9] Therefore, our estimated equation 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, 374-6). 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, despite the fact that the EPF offers detailed information on individual characteristics, it was necessary to define wider categories for control variables. This was because the number of observations available once the averages by group were calculated were clearly lower than the number of explanatory variables. But, the empirical evidence of 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 consider this possibility, the usual approach is to include regional fixed effects in each model; however, this is impossible when

[9] Other alternative approaches to addressing Moulton's problem consist of using individual level data with the correction proposed by White (1984) for arbitrary intra-region correlation and to apply cell-means in a two stage procedure: first, regress wages on all regressors other than regional variables (i.e, the unemployment rate) and then average the residuals within regions and regress them on the regional variables. In a more general context, the results by Bertrand *et al*. (2004) show that the performance of three procedures is similar and all are superior to the OLS method, while in the specific case of the wage curve estimation, Kennedy and Borland (2000, p. 787) conclude that the cell-means procedure is less sensitive to the problem of omitted regional variables. Consequently, we have chosen to apply the cell-means procedure with simple averaging.

[10] An alternative solution to the problem of the inefficiency of the OLS estimator consists of applying generalised 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 for the presence of heteroscedasticity using White's test. In every case, the null hypothesis could not be rejected.

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. Again, the simultaneous introduction of all these variables would imply a reduction in the degrees of freedom and, consequently, a choice must be made among the different possibilities described in the literature. We have chosen to include in the specification of equation (2) the level of regional prices and the level of regional productivity. The reasons to include the level of regional prices are related to the fact that our dependent variable is nominal wages, but also because 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. Regarding regional productivity, there can be wage differences - not explained by previous control variables - related to unequal efficiency levels or to the limited mobility of some factors. Moreover, this variable can capture the effects of different productive structures in each region, which probably are insufficiently controlled for by industry sector dummies because of the low level of sectoral detail of the EPF.

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* (Regional Prices Survey) during 1989 and Lorente forecasted these prices for 1988-1991 by applying the annual increase of regional prices to the levels of 1989.[11] Data for non-agricultural productivity in the province for 1991 were 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.

3. Wage Curves. Results

We first estimated an aggregated wage curve: a regression of individual wages, the control variables and the local unemployment rate. The results of estimating this model using 'cell means' are shown in table 2.

TABLE 2

Variables related to human capital - educational level and years of potential experience - were significant and showed the expected signs, detecting a positive relationship between educational levels and wages. Workers with educational levels above elementary levels received higher

[11] These data have two important limitations. 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 to the provinces in the same autonomous community. With the exception of the seven autonomous communities that have only one province, this generalisation limits the explanatory power of this variable. Moreover, data collection by the INE includes only information about large cities in the autonomous community. However, this is the only indicator available for the level of regional prices.

wages. The accumulation of professional experience also had a positive effect on wages, although the concavity of the relationship- revealed by the negative value of the coefficient of the variable square of the experience - indicated decreasing returns for investment in specific human capital and even the existence of a starting age from which additional experience had a negative influence on wages. People who work only part-time, defined as a third of the usual working hours, received a wage of about a 40 per cent less than those who work full-time. The results also indicated that the wages of women are substantially lower than those of men. One could attribute this fact to female labour discrimination when the remaining factors are held constant. But it should not be forgotten that in the case of women the variable experience - due to the way it is constructed - is probably not expressing the true work experience of women, given the possibility of more frequent periods of inactivity or unemployment among women.

The dummy variables related to the occupations expressed the effect of job characteristics as well as the additional required qualifications. Taking jobs requiring low level of qualifications as the base category, the estimation results showed that, when controlling for other factors, workers in jobs requiring high qualifications earned about a 25 per cent more. The information related to industry sectors allowed, on the one hand, for control for the effect of the various productive and employment structures in the various provinces and, on the other, to provide more information about job characteristics not previously considered. Unfortunately, the low level of segregation of industry sectors limited the efficiency of this variable in covering the defined objectives. We could only consider three industry sectors: manufacturing, building and services. Taking the services sector as base category, wages were significantly higher in the manufacturing sector, while are not significantly different in the building sector.

Regarding unemployment, a significant and negative relationship was found, 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, 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 for the possible endogeneity of unemployment, following Blanchflower and Oswald (1994b), Hoddinot (1996) and Kennedy and Borland (2000), we estimated this same equation but used the past unemployment as an instrumental variable. We also considered different lags (from one to four) for the unemployment rate. The sign of the elasticity of wages to contemporaneous unemployment did not change, its magnitude only slightly decreased and it remained statistically significant at the usual levels.[12] Therefore, it is reasonable to consider the provincial unemployment rate as an exogenous variable.

TABLE 3

Next, we estimated disaggregated wage curves by industry sectors using the EPA (LFS) unemployment rates. The first row in table 3 shows the elasticity of wages to local-sectorial unemployment rates (to save space the results for the control variables in each model have been omitted).[12,13] When these 150 labour markets were considered (50 provinces by three

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

[13] In order to check the robustness of our results, the annex shows the results obtained for all the wage curves considered in this section using ordinary least squares, the White (1984) correction method (as implemented with the 'cluster option' in STATA) and the cell-means procedure based on averaging the residuals. The results are quite robust in respect of the different estimation procedures. However, it is worth mentioning that, as expected,

non-agricultural industry sectors), the value of the elasticity was very similar to the previous one, -0.13 but with a lower standard error. These results support the hypothesis 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 (even a flat curve). Moreover, as the data did not allow the disaggregation of manufacturing activities,[14] the effect of unemployment on wages in each branch may be confounded through aggregation. The characteristics of the building sector differ as the very nature of this industry promotes the use of fixed-term contracts (53.6 per cent 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,[15] and as a result, wages are evidently influenced by the unemployment rate.

The results of estimating a wage curve by disaggregating wages and unemployment rates by gender are also shown in table 3. When assuming two labour markets in each province, one for men and the other for women, a wage curve was found but at the 10 per cent statistical 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 an elasticity of –0.09 at the 5 per cent level of significance. 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 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 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 increased.

The empirical evidence for other countries is contradictory. Blanchflower and Oswald (1994a) for the United Kingdom, Card (1995) for the United States, Canziani (1997) for Italy, Baltagi and Blien (1998) for Germany, Baltagi *et al.* (2000) for East Germany and Berg and Contreras (2004) for Chile find evidence of a wage curve for women. However, Groot *et al.*

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the OLS and White (1984) methods yield lower standard errors than the two version of cell-means procedures. The only significant differences between the two sets of estimates by cell-means are related to the wage curve for workers in the manufacturing sector and for workers with elementary studies only (or illiterate).

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

[15] The percentage of fixed-term contracts of the services sectors in 1990 was 26.8 per cent, higher than the 24.9 per cent of manufacturing. However, the relevant rate in this study is that of private activities of the services sector. Although there is no adequately detailed statistical information, it can be assumed that it was higher than the 30 per cent, or even 35 per cent, as the percentage of fixed-term contracts of the public sector was 15.8 per cent. For example, the percentage of fixed-term contracts in the tourism sector was over 39 per cent.

(1992) for the Netherlands, Janssens and Konings (1998) for Belgium, Collier (2000) for the United Kingdom and Ilkkacaran and Selim (2002) for Turkey did not find evidence of a wage curve for women. To explain their results, Groot *et al.* (1992) argue 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 – as it may be, for example, among men - the initial negative effect on wages will clearly dominate, but if this effect is relevant - as it might be for women - both effects will counteract one another, thus lessening any evidence of a wage curve. Summarising, if women tend to have higher labour force participation elasticities than men, a given change in wages will raise the probability that they change their labour force participation relative to than men. For this reason, employers will be less able to change the wages of women in response to changes in the unemployment rate.[16]

To consider 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 into 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.[17] Table 3 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.[18]

The disaggregated results confirm the evidence obtained in other studies: the value of the elastiticity of wages to unemployment is higher for young workers (Blanchflower and Oswald, 1994a; Card, 1995; Baltagi and Blien, 1998; Ilkkaracan and Selim, 2003). 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 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 per cent). These characteristics make young workers a very weak group in the labour market, and firms can set wages for this group that reflect the current unemployment rate.[19]

Wage curves for each educational level were also estimated from the unemployment data in the Population Census (table 3). 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 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 per cent). This result partially contradicts international evidence,

[16] We are grateful to an anonymous referee for the suggestions received in relation to this point.

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

[18] 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.

[19] So, it is surprising that, opposite to our results, and to the international evidence, García-Mainar and Montuenga-Gómez (2003) do not find a wage curve for Spanish young workers. Probably, their result could be related to data limitations when analysing disaggregated wage curves.

which usually shows a decreasing elasticity as schooling years increase.[20] The only reasonable explanation for this result in Spain is that there has been a large increase in the schooling level of young generations, who usually end secondary education or even complete university degrees. For this reason, data on the educational levels are related to age. Most illiterate workers are older, and workers who achieved the secondary level of education 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-to-medium-qualified workers.[21] 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, i.e. we implicitly assume that highly qualified and low qualified workers are in the same labour market. This assumption is not plausible for workers occupying jobs requiring high qualificationsbut it is quite reasonable for those in low-and medium-qualified jobs (as any worker, 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 3). These findings are similar to those obtained in previous studies for other countries such as Germany (Baltagi and Blien, 1998), the United States (Turunen, 1998) and Turkey (Ilkkaracan and Selim, 2003) and support the theoretical explanation of the wage curve based on efficiency wages.

4. Conclusions

We argue that this paper has provided two novel contributions. First, we estimated a wage curve for the Spanish economy using regional unemployment rates at a level of detail close to the local labour market level (without combining it with other characteristics). Second, we estimated disaggregated wage curves by gender, age, schooling level, occupation, and industry sector for the Spanish economy for the same reference year.

Our analysis found a wage curve with a negative slope for the Spanish economy. 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 for other countries. Therefore, this result seems to confirm that differences in the institutional framework among countries does not seem to affect (or only slightly affects) 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, industry sector, and occupation showed considerable differences in the slope of the curve for each group. In this regard, a clear negative wage

[20] See Blanchflower and Oswald (1994b) for the United States, Canada and the United Kingdom, Card (1995) for the United States, Turunen (1998) also for the United States, Ilkkaracan and Selim (2003) for Turkey and Berg and Contreras (2004) for Chile. However, Blanchflower and Oswald (1994b) found a similar anomaly when working with data for Australia that was confirmed by Kennedy and Borland (2000).

[21] High qualification occupations have been defined as, writers, actors, sportsmen, teachers and other qualified workers, firm managers, office managers, sales executives and technicians in mining and manufacturing; while low-medium qualification occupations have been defined as other administrative staff, shop assistants and similar, hotel staff and individual services, protection and security, rest of services, specialised building workers, specialised mining workers, other specialised workers, technicians in equipment machinery and labourers.

curve was found for men, while the wage for women was not affected by unemployment rates, probably to the discouraged worker effect. For young workers (from 20 to 29 years), a group with a higher incidence of 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 negatively sloped wage curve was found with an elacsticity similar to international evidence. In spite of the differences in labour market institutions, the Spanish labour market does not seem to be significantly different from other countries in the OECD.

Appendix

Results for Disaggregated Wages Curves Using Alternative Estimation Procedures

Disaggregated Wage Curves for the Spanish Economy (FBS, 1990/91)	*Elasticity of Wages to Regional Unemployment and t-statistic in Brackets*			
	OLS	*White (1984) Correction*	*Cell-means (residual aggregation)*	*Cell-means (simple aggregation)*
Provinces	-0.11 (-7.13)**	-0.11 (-3.54)**	-0.11 (-3.24)**	-0.13 (-2.49)**
Provinces and sectors	-0.14 (-9.96)**	-0.13 (-5.71)**	-0.13 (-5.84)**	-0.13 (-4.78)**
Provinces-manufacturing	-0.14 (-6.13)**	-0.14 (-2.85)**	-0.12 (-3.09)**	-0.04 (-0.77)
Provinces-building	-0.16 (-6.76)**	-0.16 (-5.30)**	-0.15 (-4.52)**	-0.15 (-3.58)**
Provinces-services	-0.12 (-4.64)**	-0.11 (-2.92)**	-0.11 (-2.49)**	-0.14 (-2.53)**
Provinces and gender	-0.08 (-6.79)**	-0.08 (-4.66)**	-0.08 (-3.45)**	-0.05 (-1.68)*
Provinces-men	-0.08 (-7.57)**	-0.08 (-5.50)**	-0.08 (-4.06)**	-0.09 (-2.64)**
Provinces-women	-0.07 (-2.27)**	-0.07 (-1.34)	-0.05 (-1.18)	-0.00 (-0.06)
Provinces-men (total unemp. rate)	-0.11 (-6.58)**	-0.11 (-4.45)**	-0.12 (-6.85)**	-0.11 (-3.59)**
Provinces-women (total unemp. rate)	-0.10 (-3.15)**	-0.11 (-1.72)	-0.04 (-0.51)	-0.09 (-1.82)
Provinces and ages	-0.13 (-8.00)**	-0.13 (-5.97)**	-0.03 (-1.92)*	-0.09 (-2.90)**
Provinces 20-24	-0.27 (-4.70)**	-0.27 (-3.59)**	-0.27 (-3.47)**	-0.28 (-2.73)**
Provinces 25-29	-0.17 (-3.41)**	-0.17 (-3.92)**	-0.16 (-2.55)**	-0.19 (-2.21)**
Provinces 30-44	-0.07 (-2.49)**	-0.07 (-2.02)**	-0.07 (-1.68)*	-0.04 (-0.74)
Provinces 45-64	-0.04 (-1.35)	-0.04 (-1.06)	-0.04 (-1.04)	-0.02 (-0.43)
Provinces and schooling	-0.12 (-8.83)**	-0.12 (-4.48)**	-0.12 (-4.84)**	-0.09 (-3.23)**
Provinces - illiterate or elementary	-0.12 (-8.16)**	-0.12 (-3.91)**	-0.12 (-3.74)**	-0.06 (-1.22)
Provinces - medium	-0.17 (-3.36)**	-0.17 (-3.13)**	-0.17 (-2.35)**	-0.17 (-2.00)*
Provinces - high	-0.15 (-2.09)**	-0.15 (-2.28)**	-0.13 (-1.61)	-0.15 (-1.65)
Provinces-high qualification	0.01 (0.11)	0.01 (0.12)	-0.01 (-0.20)	0.06 (1.01)
Provinces-low-medium qualification	-0.12 (-7.57)**	-0.12 (-3.63)**	-0.12 (-3.41)**	-0.11 (-2.30)**

The dependent variable is the natural logarithm of the annual nominal wage. Control variables consider 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), industry sector (manufacturing, building and services) and occupation (low-medium qualification, high qualification). Controls for levels of regional prices and provincial productivity have also been included. * Significant at the 10% level. ** Significant at the 5% level.

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Tables

Table 1 International Evidence on the Wage Curve

Pub. Year	*Authors*	*Country*
1992	Groot, Mekkelholt and Oosterbeck (1992)	Netherlands
1994	Blanchflower and Oswald (1994a)	United Kingdom
	Blanchflower and Oswald (1994b)	Australia, Austria, Canada, Germany, Ireland, Italy, Netherlands, Norway, South Korea, Switzerland, United States
	Wagner (1994)	Germany
1995	Card (1995)	United States
1996	Bratsberg and Turunen (1996)	United States
	Hoddinot (1996)	Ivory Coast
	Winter-Ebner (1996)	Austria
1997	Canziani (1997)	Italy, Spain
1998	Baltagi and Blien (1998)	Germany
	Janssens and Konings (1998)	Belgium
	Pannenberg and Schwarze (1998)	East Germany
	Turunen (1998)	United States
1999	Morrison and Poot (1999)	New Zealand
2000	Baltagi, Blien and Wolf (2000)	East Germany
	Collier (2000)	United Kingdom
	Kennedy and Borland (2000)	Australia
	Morrison, Papps and Poot (2000)	New Zealand
2001	Blanchflower (2001)	Bulgaria, Czech Republic, East Germany, Estonia, Hungary, Latvia, Poland, Russia, Slovak Republic
	Papps (2001)	New Zealand
2002	Bell, Nickell and Quintini (2002)	United Kingdom
	Boushey (2002)	United States
	Elhorst, Blien and Wolf (2002)	East Germany
2003	García-Mainar and Montuenga-Gómez (2003)	Spain
	Hart (2003)	United Kingdom
	Ilkkaracan and Selim (2003)	Turkey
	Montuenga, García and Fernández (2003)	France, Italy, Portugal, Spain, United Kingdom
2004	Berg and Contreras (2004)	Chile
	Longhi, Nijkamp and Poot (2004)	Germany
	Wu (2004)	China

Table 2 'Cell Means' Estimates of an Aggregate Wage Curve

Dependent Variable:	*Cell Means Estimates*	
Natural Logarithm of the Annual Nominal Wage	*Coefficient*	*t-statistic*
Intercept	10.50	13.08***
Gender: woman	-0.30	-2.72***
Main income provider	0.42	2.63**
Experience	0.04	2.28**
Square of experience	0.00	-1.87*
Part-time	-0.52	-14.84***
Schooling: medium	0.33	1.96*
Schooling: high	0.49	2.45**
Industry sector: manufacturing	0.08	6.57***
Industry sector: building	-0.01	-0.41
Occupation: high-qualification	0.22	11.07***
Regional prices (ln)	0.43	2.26**
Regional productivity (ln)	0.57	7.29***
Regional unemployment rate (ln)	-0.13	-2.49**
R squared	0.70	
Observations	50	
F-statistic	9.14***	

Base category: man, not main income provider, illiterate-without studies or with elementary schooling level, working full time in the services sector and with a low-qualified occupation. * significant at the 10% level. ** significant at the 5% level. ***significant at the 1% level.

Table 3 'Cell Means' Estimates of Disaggregated Wages Curves

Disaggregated Wage Curves for the Spanish Economy (FBS, 1990/91)	*Estimation by Cell Means (simple aggregation)*				
	Ln unempl.: coef. (t)	*Adj. R2*	*F*	*DF*	*N*
Provinces and sectors	-0.13 (-4.78)**	0.69	24.76	135	150
Provinces-manufacturing	-0.04 (-0.77)	0.78	15.79	37	50
Provinces-building	-0.15 (-3.58)**	0.53	5.59	37	50
Provinces-services	-0.14 (-2.53)**	0.45	4.38	37	50
Provinces and gender	-0.05 (-1.68)*	0.90	64.36	85	100
Provinces-men	-0.09 (-2.64)**	0.74	12.00	36	50
Provinces-women	-0.00 (-0.06)	0.53	5.26	36	50
Provinces-men (total unemp. rate)	-0.12 (-6.85)**	0.75	12.40	36	50
Provinces-women (total unemp. rate)	-0.04 (-0.51)	0.53	5.31	36	50
Provinces and ages	-0.09 (-2.90)**	0.84	63.25	182	200
Provinces 20-24	-0.28 (-2.73)**	0.31	2.55	35	50
Provinces 25-29	-0.19 (-2.21)**	0.44	3.71	35	50
Provinces 30-44	-0.04 (-0.78)	0.59	6.10	35	50
Provinces 45-64	-0.02 (-0.43)	0.71	9.54	35	50
Provinces and schooling	-0.09 (-3.23)**	0.82	54.92	136	150
Provinces - illiterate or elementary	-0.06 (-1.22)	0.61	7.88	38	50
Provinces– medium	-0.17 (-2.00)*	0.40	3.93	38	50
Provinces – high	-0.15 (-1.65)	0.44	4.46	38	50
Provinces-high qualification	0.06 (1.01)	0.43	3.83	36	50
Provinces-low-medium qualification	-0.11 (-2.30)**	0.67	8.73	36	50

The dependent variable is the natural logarithm of the annual nominal wage. Control variables consider 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), industry sector (manufacturing, building and services) and occupation (low-medium qualification, high qualification). Controls for levels of regional prices and provincial productivity have also been included. *Significant at the 10% level. **Significant at the 5% level.