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Education and Wages of Vocational Training Graduates

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DOCUMENTO DE TRABAJO 2005-05

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* Previous versions of this paper were presented at the International Conference "Overeducation in Europe: What do we know?" -organised by the Max Planck Institute for Human Development, Berlin, and ROA at Maastricht University-, and at the LoWER Annual Conference 2004. The authors thank participants at the conferences for helpful comments. Anyway, the authors alone are responsible for any omissions or other errors.

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Abstract

This paper attempts to explain individual variation in wages by estimating different wage equations. The study has two goals: first, to analyze the effect of years of schooling on the wages of vocational training graduates using a more precise measure for schooling than that commonly used in wage equations; and second, to analyze the effect on these wages of the match or mismatch between the knowledge and the skills acquired in the schooling and the needs of the job. The analysis shows that knowledge and skills acquired through vocational training (over-/under- education and over-/under- skilling), have a statistically significant influence on wages.

Resumen

El presente trabajo trata de estudiar las variaciones salariales individuales a través de la estimación de diferentes especificaciones de ecuaciones salariales, con la finalidad de alcanzar dos objetivos: 1) Analizar el efecto de los años de educación sobre los salarios de los titulados de Ciclos Formativos, utilizando una medida más precisa que la típica variable de "educación"; 2) Analizar el efecto sobre los salarios del ajuste o desajuste entre los conocimientos y las habilidades adquiridas en el sistema educativo y los requerimientos del puesto de trabajo ocupado. Los resultados del análisis muestran que tanto los conocimientos como las habilidades adquiridas en los ciclos formativos (sobre-/sub- educación y sobre-/sub-habilitación) presentan una influencia estadísticamente significativa sobre los salarios.

Keywords: Overeducation, Skills, Human Capital, Vocational Training, Job Matching, Wages

JEL classification code: J24, J31, J41, C31, C51

1. Introduction

The analysis of the relation between education and wages experimented an important change since Duncan and Hoffman's work (1981). A new investigation line -in which the commonly used factor 'education' is disaggregated into three different components, called 'overeducation', 'undereducation' and 'adequate education'- started after it. By this disaggregation, researchers try to measure the educational mismatch level experimented by people at their jobs, since it is expected a different behaviour in terms of wages of each one of them.

There have been plenty of works since then, with the main objective of measuring the incidence of educational mismatch as well as its returns. Most of them are focused just on a working population, without specializing upon a specific educational level. But since the second half of the nineties, it started to appear studies about educational mismatch of people with a certain educational level. Most of them were focused on the mismatch of people with higher educational level (university graduates and graduates of postcompulsory secondary education). But it was not until the year 2001, when it was published the first specific work focused on vocational training graduates. We mean Allen and Van Der Velden's work (2001) -who used a poll for the Netherlands of higher vocational training graduates together with university graduates-, and Büchel and Pollmann-Schult's work (2001), who centred their research on a subgroup of the German *Life History Study* -those who had a vocational training degree-.

After looking at the literature, it came out that the only countries in which there have been some studies about educational mismatch of vocational training graduates had been (since we know) the Netherlands and Germany; countries in which the vocational training education had a certain *historical social prestige* and which, therefore, have had a certain demand of this kind of studies.

On 1990 it took place an educational reform in Spain, which, among other things, substantially changed the Vocational Training Education, with the aim of *dignifying* it and giving it a social status that it had lost. Though it has passed more that ten years since then, there is still no study related to the educational mismatch of these graduates for the whole

State. It is this fact that moves us to give light inside this situation. Nevertheless, the existing national surveys have not the needed disaggregation level, and that is why we had to conduct our own survey, which was directed to the vocational training graduates, who obtained their degree at the Island of Gran Canaria (Spain) between the courses 1997/98 until 1999/2000.

Through the present paper, therefore, we will analyze the effect of the years of schooling on the wages of these vocational training graduates. On one hand, we will do this by using a more precise measure than the schooling variable which is frequently used in wage equations; and, on the other hand, we will analyze the effect on these wages of the match or mismatch of the education acquired in the educational system related to the post requirements.

In this respect, as the education acquired through vocational training is mainly a practical one, we introduce a novel idea based on Duncan and Hoffman's differentiation of the term 'education'. So, instead of working with just three kinds of educational mismatch ('overeducation', 'undereducation' and 'adequate education'), we work with six different types of mismatch, which derive from the differentiation between knowledge and skill mismatch.

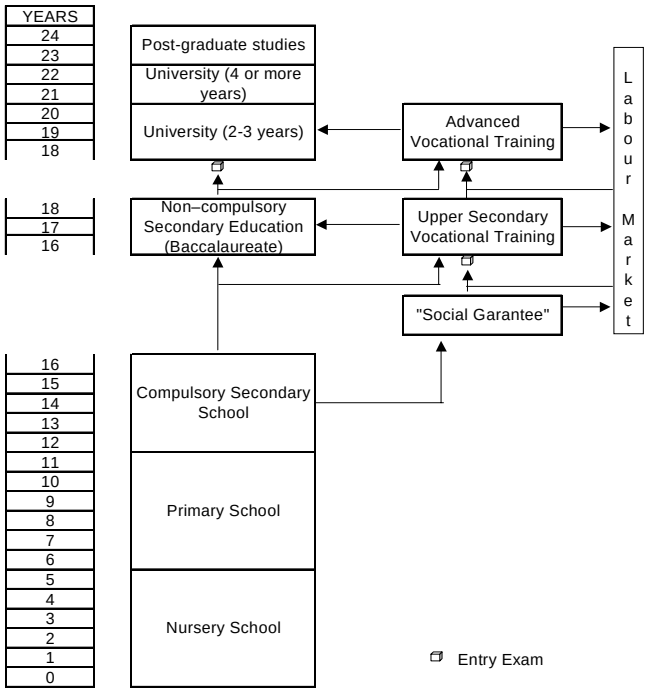
The present paper is structured into six chapters. In the second chapter we describe briefly how the Spanish educational system is organized. In the third one we give information about the data base used in our study. In the fourth one we specify the model used as well as the process of generation of the most relevant variables in our study. In the fifth one we collect the obtained empirical results. And, finally, the sixth chapter shows the main conclusions.

2. The Spanish educational system

In order to understand how we have generated the variables which try to measure the returns to schooling, it is important to know which the structure of the present Spanish educational system is. It is necessary to know how the secondary education is structured, but it is also important to locate it inside the global context of the whole educational system after the last reform carried out in Spain in 1990 (Law on the General Organization of the Educational System).

This new educational system, as we show in Figure 1, modifies the previous organization to structure the undergraduate education into Nursery School (0 to 6 years), Primary Education (6 to 12 years), Compulsory Secondary Education (12 to 16 years) and Post-compulsory Secondary Education (16 to 20 years). Post-compulsory Secondary Education includes "baccalaureate" and both levels of vocational training (upper secondary and advanced). Vocational training is a technical training of secondary education, containing more than a hundred different diplomas, all of them belonging to 25 vocational families. The duration of vocational training is not always the same. It depends on the difficulty of the capacities to develop, and not on the level they may have. Anyway, both levels of vocational training can last between 1300 and 2000 hours, which corresponds to one to two school years.

Figure 1. The Spanish educational system after 1990



In post-compulsory education there is thus no single path but a series of branching paths. The first decision comes at 16 years, when pupils have to choose between continuing with a more general education with the goal of a baccalaureate diploma or entering an upper secondary technical school and selecting a specialty. From then on the different options continue as shown in Figure 1.

There are two ways to access an upper secondary vocational training: 1) by means of a basic certificate, such as having passed the compulsory level of secondary education; or 2) (open only to pupils 18 years or older by the end of the year) by an entry exam. To access advanced vocational training, there are three routes: 1) with a baccalaureate diploma; 2) (open only to pupils 20 years or older) with an entry exam; or 3) (open to those 18 and older) by an entry exam after having obtained an upper secondary vocational training diploma in the same vocational area.

It is therefore possible for someone to finish a university degree and then begin upper secondary vocational training and for someone to have gone through an advanced vocational training sequence and then decide to do an upper secondary one.

As almost any combination to obtain a vocational training diploma in conceivable, this study follows Groot and Oosterbeek (1994) in distinguishing between "structured" academic degrees and others which are not so structured, since not all routes to a diploma are equally efficient. Academic degrees are considered "structured" when the graduate has obtained an upper secondary vocational training diploma after compulsory secondary education, or when the graduate has obtained an advanced vocational training diploma after the baccalaureate. In these cases the shortest route was chosen towards vocational training, and thus, one could consider that the options were not taken at random.

As Groot and Oosterbeek (1994) state, when there are differences between the actual number of years of schooling and the effective number of years of schooling (that is, the years which are really necessary to obtain a certain qualification), besides the possibility of having chosen an inefficient ladder, there may be other reasons. These differences may be the result of course repetitions, skipped courses and years “wasted” on training without a final degree, what they call “dropout years”. In this way, the actual number of years of schooling is equal to the sum of the effective years of schooling, the repeated years of schooling, the “dropout years”, the years of inefficient ladder minus the skipped years of schooling.

3. Data

The data used in this study come from an own telephone survey done to students who had finished their vocational training between the school years 1997/98 and 1999/2000 in Gran Canaria, Spain. This survey was conducted at the University of Las Palmas de Gran Canaria between December 2001 and January 2002 and it contains information referring to each graduate's education, work and socio-cultural characteristics.

The total number of graduates in the target population was 4266, distributed into 21 vocational families. The sampling was designed so that the final sample could be representative for every vocational family. Since with so many strata a stratified sample would have been nearly the population size, it was decided to survey the entire population with the exception of graduates in Office Skills. Since they represented almost a quarter of total graduates, among them a simple random sample was taken.

The final data base of interviews contained 2776 graduates, which included a good representation of each area, since for each between 58% and 89% of the graduates were interviewed. Using the actual distribution of the total graduates by vocational areas, a weighting factor was calculated according to the number of surveys obtained for each area and the number of graduates of the area.

Since the goal was to estimate wage equations, those individuals were omitted who did not reveal how much they earned, after which the data base contained a total of 2748 entries that, weighted, represent the 4266 individuals of the entire population.

4. The model

The objective of this paper is double. First we analyse how the number of years of schooling affect salaries and then how the match between qualification acquired in the educational system and job influences wages.

4.1 The influence of the years of schooling

In relation with the first stated objective, the most widespread approaches to analyze the relation between years of schooling and wages have been based on the theory of human capital, using specifications derived from Mincer's basic wage equation (1974).

$$Ln(WAGE) = \alpha + \beta EDUCA + \gamma_1 EXP + \gamma_2 EXP^2 + \delta I + u \qquad (1)$$

In this basic equation the wage is explained by the person's years of schooling ($EDUCA$), the potential experience in the labour market ($EXP = AGE - EDUCA - 6$), the square value of this potential experience, all those features of the person which are considered relevant for the income (I), and those unobservable characteristics which affect wage (u). The specification is shown logarithmically in order for the regressors to be interpreted in terms of marginal effects. In this way index β is interpreted as the rate of return to schooling.

From this equation there have been plenty of alternative specifications, which differ according to initial hypotheses about the educational and labour markets. Thus, Groot and Oosterbeek (1994), for instance, suggest modifying equation (1) using a more precise measure for the schooling regressor. Instead of using an only variable directly which covers either the actual schooling years or the effective ones, they suggest dividing this information into five different variables whose sum shows the total amount of years really devoted to schooling, which are

$$\begin{aligned} \textit{Actual years of schooling} = \textit{Effective years of schooling} - \textit{Skipped years} + \\ + \textit{Repeated years} + \textit{Inneficiente years} + \textit{Dropout years} \end{aligned} \qquad (2)$$

By this way they can see, depending on the type of education they are referring to, which is the actual rate of return of an extra year of school education.

Following these suggestions, and using four questions of our survey, we have generated the variables suggested by Groot and Oosterbeek, except the one which refers to the dropout years, because we do not have enough information to generate it. These variables are:

- *EDUCA_E*: the time of efficient schooling, or time of actual needed schooling for a given qualification.
- *EDUCA_I*: the time of inefficient schooling, or the number of years devoted to studies not needed for a given qualification.

- *EDUCA_R*: the number of years delayed with respect to the actual time needed to obtain the qualification.
- *EDUCA_S*: the number of years skipped with respect to the actual time needed to obtain the qualification.

Introducing in this way the information referring to the years of schooling in equation (1), our model was specified as follows:

$$Ln(WAGE) = \alpha + \beta_1 EDUCA\_E + \beta_2 EDUCA\_I + \beta_3 EDUCA\_R + \beta_4 EDUCA\_S + \\ + \gamma_1 EXP + \gamma_2 EXP^2 + \delta I + u \quad (3)$$

Normally, wage equations have been estimated without taking into account Sattinger's assignment theory (1993), which predicts that, due to the diversity of jobs, technologies and individuals, worker productivity varies both according to the characteristics of the job and of the individual. According to this theory, both workers and jobs are heterogeneous and total economic output is determined by the offering of human capital, by the demand from enterprises for different kinds of jobs, and by the mechanism which places each worker in a job. For this reason, Sattinger (1993) states that the parameters of the wage function should be determined by those of the offering distribution and also by those of the underlying demand and include both individual factors and job characteristics.

The fit between training and job depends closely on how the workers are placed into the available jobs, so in a wage equation one must control for sectors and occupations in order to estimate the true effect of job match on wage.

Apart from controlling in terms of sectors and occupations, it is also convenient to control if the individual is working at a private or public enterprise, since Vila and Mora (1995) showed in their estimation of wage functions with data from the Spanish Family Budget Survey of 1991 that, in the same way as Mincer's basic equation overestimated the performance of the public sector, their wage function[1] overestimated the performance of the private sector.

[1] Mincer's wage function introducing the interaction between years of schooling and work experience. They called this function the "amplified square function".

Therefore we have to complete the so far defined model introducing also those factors of the labour market which we consider relevant in the determination of wages (W), having then the following specification:

$$Ln(WAGE) = \alpha + \beta_1 EDUCA\_E + \beta_2 EDUCA\_I + \beta_3 EDUCA\_R + \beta_4 EDUCA\_S + \\ + \gamma_1 EXP + \gamma_2 EXP^2 + \delta_1 I + \delta_2 W + u \quad (4)$$

4.2 The mismatch of knowledge and skills

Sattinger (1993) not only talks about labour market factors, but also about individual characteristics and the assignment of specific posts to individuals. Since there are no complete structural models which gather all relevant variables for the allocation of individuals in the job market, as it would be necessary for Sattinger's theory, Green et al. (1999) and Alba-Ramírez (1993), among others, propose a reformulation of Mincer's wage equation which allows to contrast this Sattinger's theory, although in a more reduced way, basing their equations on human capital theory.

The reconciliation of both theories could be done by establishing a new equation in which we would not regress the wage according to the individual's actual years of schooling, as it is normally done, but distinguishing in the equation the years of necessary education to do a job (adequate education) separating it from any extra education in relation with the needs of the post (over-education) or any lack of it (under-education) the individual may have[2].

As Green et al. (1999) have already stated "not all graduates are the same in terms of their skills and productivities. In other words, the educational human capital cannot be characterized as a homogeneous stock". This evidence suggests that the over-educated workers may show having received more years of education to the ones required for their job, but maybe they are not really over-educated in the strict sense of the word, since their education may be of a lower quality or even of the wrong kind.

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[2] The model proposed by these authors is the following: $Y_i = \alpha + \beta S_{ai} + \beta_1 S_{oi} + \beta_2 S_{ui} + u_i$
Y being the wage logarithm; S_a the actual years of schooling; S_o the years of over-education and S_u the years of under-education

Apart from the kind and quality of the acquired education, the person's innate skills also determine whether they are over-educated or not. That is, maybe the over-educated is somehow less able or lacks certain skills necessary for the job, but they make up for it with their highest educational level. In this case, the individual would not actually be over-educated. If this happened, there would normally be a close relationship between the innate skills and the necessary skills to do the job; however, Green et al. (1999), with data from the 1995 International Adult Literacy Survey, find the relationship far from perfect, with a greater mismatch for those with higher educational levels.

Given these findings and the characteristics of our target population, a distinction may be useful between the putative mismatch of knowledge (over- and under-education) and the putative mismatch of skills (over- and under-skilling).

In relation with the mismatch of knowledge, we have decided to measure it through different variables:

- First we used the subjective information obtained from a direct question to the graduates, about the knowledge they considered to have before starting the job. From the responses the following variables were generated:
  KNOW_A: Dummy with value 1 when the person surveyed considers his/her knowledge adequate to the needs of the post.
  KNOW_O: Dummy with value 1 when the person surveyed considers her/his knowledge to be more than the needs of the post.
  KNOW_U: Dummy with value 1 when the person surveyed considers his/her knowledge to be less than the needs of the post.

  Critics of this kind of measure consider it notoriously subjective, as two persons with the same education and job may well answer the same question differently.

- In order to control the unobservable heterogeneity caused by the use of these subjective measures we have considered it convenient to use two other more objective variables.

  The first one, *REL_ST_W*, is a dummy which takes value 1 when the polled person considers that his/her job is indeed related with his/her studies and value 0 otherwise. We

consider that it is important to include this variable inside our model as a control, since it is possible for someone to have answered they are over-educated (*KNOW_O*=1) just because they have a job which is unrelated with their studies. This could be the case of an office clerk working as a gardener for the town hall. Can we consider that this person is really over-educated?

The second variable measures indirectly the employer's opinion about the worker's training level. This is the dummy *TRAINING*, which takes value 1 in case of having received training courses in charge of the enterprise and value 0 otherwise. Therefore we can consider this variable as an indirect measure of the educational mismatch, since if the employers finance training courses it may be because they consider the worker's previous training inadequate.

As we have stated above, we have also considered it convenient to include variables that measure the mismatch in terms of skills. In this study this distinction between skills and knowledge is crucial, for the target population is not made up of university graduates, who receive an education that is mainly theoretical and for whom, a mismatch between training and job would be primarily educational. Although Spanish vocational training graduates receive some theoretical education, most of the training is practical. Hence one needs to know the appropriateness of the skills they acquire at school. Are they the right ones? Do they fit the needs of the post? Has Spain's educational reform succeeded in its main objective, which is to adapt education to the actual needs of the labour market?

In order to collect this type of mismatch we used two questions of our questionnaire. The first one is based on the subjective technique of self-assessment to measure educational mismatch. This way it is also liable to the same criticism aroused in any subjective measure. From this question we created the dummies *SKILL_A*, which takes value 1 when the skills are adequate, *SKILL_H*, when the skills are higher; *SKILL_L*, when the skills are lower; *SKILL_NR*, when the skills are not related with the job. The first three variables are measures of adequate education in skills, overeducation in skills and undereducation in skills. However, the last one shows the possibility of mismatch, more than due to over- or under-skilling, because of incoherence between the acquired skills and the ones really needed by the labour market.

The second question used as a measure of mismatch of skills allows us to create the variable *EFFIC_T*, which is nothing but the time, measured in days, it took the individual to do his/her job effectively. This measure is more objective than the previous one, because it is not as much based on an estimation about the relation between its actual abilities and the ones needed for the post, as on a reality about the time this person felt "sure about his/her abilities" to do his/her job.

Once having introduced the variables of mismatch of knowledge and/or skills, the model would have the following specification:

$$Ln(WAGE) = \alpha + \beta_1 EDUCA\_E + \beta_2 EDUCA\_I + \beta_3 EDUCA\_R + \beta_4 EDUCA\_S + \\ + \gamma_1 EXP + \gamma_2 EXP^2 + \delta_1 I + \delta_2 W + \eta_1 K + \eta_2 S + u \quad (5)$$

where *K* represents the matrix of variables of knowledge mismatch and *S* the matrix of variables of skills mismatch stated before.

4.3 A problem of sampling selection

By estimating directly equation (5) we may commit a mistake of sample selection bias. Heckman (1979) warns about this kind of mistake due to two different reasons. The first one appears when we encounter the existence of a process of self-selection from the individuals from the sampling themselves, while the second is a consequence of the decision of the researcher of selecting just one specific part of the whole sampling. In both cases, when trying of estimating a behavioural equation we should take this aspect into account not to fall into the consequences of this mistake, that is, into the possibility that the estimated equation does not let us make adequate inferences to the population.

In our case, since we have decided to work on the total sampling, the problem of sample selection bias, in case it existed, could only be due to the first reason stated. In particular, it would come due to a problem of selective truncation, since when estimating the wage equation, we only have the wage observations for those who were working at the moment of being polled, while the ones who were not working were obviously impossible to obtain this information from.

In order to detect and solve the problem of sample selection bias, Heckman (1979) suggests a two-step estimation method. First, the participation equation is estimated, consisting in estimating through a Probit the probability, here, of having worked until the moment of the survey for those who finished their vocational training on Gran Canary Island between 1997 – 2000 using the whole sample: workers and non-workers. The Probit results produced an estimation consisting in the inverse of Mill's ratio. In the second step, this estimation is introduced as an additional regressor in the behavioral equation to be estimated –here, the wage equation (5)–.

Formalizing these considerations, in the model with sampling selection we start from a participation equation and the wage equation we are interested in.

1st Step: The participation equation

$$Y^* = \omega' W + v \tag{6}$$

where the unobservable latent variable Y^* is defined through the dummy Y which is observable:

$$Y = \begin{cases} 1 \textit{(the individual works)} & \textit{if } Y^* > 0 \\ 0 \textit{(the individual does not work)} & \textit{if } Y^* \leq 0 \end{cases} \tag{7}$$

$$Prob(Y = 0) = 1 - \Phi(\omega' W)$$

Where $\Phi(\bullet)$ is the distribution function of the Normal Standard Distribution; W is a vector of observable characteristics which influence the decision of working or not; ω' is a vector of parameters to estimate; and *v* is a perturbation term with zero average.

2nd Step: The wage equation

It is none other than equation (5) itself, but re-specifying it we have:

$$Z = \beta' X + u \tag{8}$$

Z being the hourly wage logarithm and X the vector of explanatory variables which collects all the individual, labour market, educational and mismatch characteristics stated above.

As stated, in this study Y and W are observed for all the individuals of our sample, but variable Z is observed only when Y=1 (wage earners). Therefore, following Greene (1999) is obtained:

$$E\left[Z|Y=1\right]=\beta' X+\rho\sigma_u\lambda=\beta' X+\beta_\lambda\lambda \tag{9}$$

where: σ_u is the standard deviation

ρ is the correlation coefficient between the terms of error of the wage equation (u) and the participation equation (v), supposing u and v Normally distributed.

The product '$\rho\sigma_u$' is called β_λ

λ is the same as $\lambda=\dfrac{\phi(\omega' W)}{\Phi(\omega' W)}$, $\phi(\bullet)$ and $\Phi(\bullet)$ being the density and distribution functions of a Normal Standard respectively

To estimate equation (9) with Heckman's method, the Probit is estimated by Maximum Likelihood to obtain the estimators of ω. With them one can calculate

$$\hat{\lambda}=\frac{\phi(\hat{\omega}' W)}{\Phi(\hat{\omega}' W)} \text{ (Mills' ratio)} \tag{10}$$

and then β and β_λ estimating by Least Squares Z using X and λ as regressors. In this the coefficients of the wage equation can be estimated consistently.

5. Empirical Results

5.1 The participation equation

The results derived from the participation equation in the labour market are shown in Table 1. It is estimated from educational and personal factors for the decision to work or not after finishing the studies.

Within the possible personal factors from our survey, we decided to introduce in our equation just the ones which referred to the age and gender of the polled person, as well as the

educational level of the head of the family[3]; and in relation with education factors, we have considered it appropriate to include the ones referring first to the reason why the individual decided to do the vocational training, as well as those variables which refer to the grade done, the vocational family the training belongs to, the years of academic education spent, and having decided to study at a public or private centre.

(Insert Table 1 about here)

From the results of the participation equation, in the case of graduates of our sampling, it is outstanding that it is men (MALE) who have a lower possibility of working (25.1% less than women, in average). This disparity may be due to the high proportion of graduates of our sample that studied Office Skills, which is a predominantly female area and is in high demand in the Canary labour market. The probability that men will work, however, increases more with age than it does for women (AGE*MALE). The educational level of the head of household (HHOLD_HI) is not statistically significant for explaining the occupational probability of these graduates.

Those surveyed who said they chose a particular trade for training because they thought they would get a job more easily (REASON) did, according to our regression, have a greater probability of employment (about 2.8% more) than those who chose their trade program for other reasons.

We would also like to draw some attention to the fact that, paradoxically, those having done an upper secondary vocational training in fact have a higher chance of working than those with an advanced vocational training diploma (VT_ADVAN). This may simply be because the former can access to the labour market faster, their academic stretch is shorter, and therefore they have more time to find a job than the latter. It also may be due to ignorance on the part of Canary employers of the new advanced vocational training programs, which they do not yet distinguish from the upper secondary ones. Nevertheless, those having an advanced one augment their employability with age (VT_ADVAN*AGE) more than those having an

[3] The other possible personal variables which could also have been introduced in the equation, such as marital status and offspring of the polled person, the amount of members inside the family, the monthly wage in the home, the occupation of the head of the family, among others, were not significant at standard levels. Therefore, we finally decided not to include them.

upper secondary one. Variable EDUCA_E points in the same direction, then its coefficient implies that the employability of the graduates increase with the years of efficient formal schooling, which evidently means being older at the end of the studies.

And last, in relation with the choice of the vocational training, it is significant that those who chose an advanced vocational training in the Health Family (VT_ADVAN*FAMILY19), have a particularly low probability of employment. However, we have to take into account the fact that 36% of these graduates affirmed to have chosen them as a path towards other studies, mainly higher degrees in Medicine and Nursing (which are degrees with limited access).

The Chi square value for the contrast which says that all equation coefficients –except the constant– are equal to zero, allows us to reject the null hypothesis and consider our model valid. A further measure of the suitability of our model is the percentage of correct predictions, with a cut-off probability increased from the 50% cut-off level generally used to 90%, in accord with the nature of the sample. The predictive capacity of the model, measured by the percentage of correct predictions is 71% (73% for the employed, 52 % for the unemployed).

5.2 The wage equation

After the first step of Heckman's estimation method, the wage equation can be estimated consistently and it can be known whether the sample has a selection bias. When estimating model (9) we see that the coefficient estimated for LAMBDA[4] is significant in all of the four proposed specifications, so that we do have sample bias. For this reason we follow Heckman's suggestion and do the two step estimation. Table 2 shows the results of these estimations for the different suggested specifications in section 4, where the endogenous variable is the logarithm of the hourly wage, measured in constant Euros of 2001.

(Insert Table 2 about here)

[4] The term LAMBDA is a proxy to the probability of working. Common sense makes us expect the coefficient of this regressor to be positive, since unobservable factors, such as ambition, intelligence, etc., which make a person get a job, are also expected to increase the probability this person is employed. In our case, although it is not significant, the sign of the coefficient is the expected one. Even so, it is also true that other studies champion the possibility of obtaining an estimated coefficient of negative lambda, which is the case of Ermish and Wright (1994) and Dolton and Makepeace (1987) among others.

The first column of Table 2 lists the results of model (3), which included only the variables for educational level and work experience of those surveyed (an extended Mincer equation), as well as individual factors and those related to the job proposed by Sattinger (1993). The second, third and fourth columns are expansions of the first one, with variables, respectively, for the mismatch of knowledge (model (5), without the matrix of variable "S"), for the mismatch of skills (model (5), without variable "K"), and for both kinds of mismatch together (model (5)).

In each of the four estimated models are included 22 dummy variables to control for vocational families and characteristics of the school attended.

In these estimations the influence of schooling variables on wages is almost constant (always significant and with nearly the same coefficient) whether the aspects referring to mismatch are included in the estimated equation or not. Green et al. (1999) showed a general fall in returns to schooling when controlling for skills, but according to Asplund (1994), the decrease in the rate of returns to schooling took place for all educational levels *except* for those students who had done vocational training, which supports our findings, since our sample consists only of vocational training graduates.

Coming closer to the interpretation of the returns to schooling coefficients, we can see that, in all estimated models, each extra year the chosen efficient schooling path takes (EDUCA_E), through the choice of an advanced vocational training or, inside any of its two levels, through the choice of the courses of a higher amount of hours, the wage increases 5.6% for both genders. This result does nothing but guarantee the statements of the human capital theory, according to which the longer someone's schooling takes place, the higher their productivity will be, which in turn will be reflected in higher posts and wages. Therefore, the educational level under this theory resembles a productive factor, as Schultz stated in 1961, saying that "the educational level is a factor which makes people's productivity rise."

Our estimations show that the years of schooling spent through an inefficient path (EDUCA_I) do not have any influence on wages. This shows that not all extra permanence in the school system implies an increase of an individual's productivity which can later on be valued at the labour market. In fact, due to the kind of people we are working on, whose

education is extremely specialized, it is possible that the fact of having another kind of more generic education (as the one given by the Baccalaureate or University) is not valued by employers, who only look for specialization.

On the other hand, in case of taking longer than necessary to finish their studies (EDUCA_R), each extra year in the educational system means a higher wage (between 5.2% and 5.9%). This could be due to the fact that these extra years imply an increase in the individual's human capital, measured in terms of higher maturity when entering the labour market. Variable EDUCA_R could be working as a proxy of variable AGE –which was not significant when introduced in the model–.

Last, in relation with the returns to education coefficients, our estimations aim at an increase in wages per skipped years (EDUCA_S), around 5.4%. The only chance for a graduate to finish a vocational training earlier is having validated his/her training at work centres, which is done during the last months of the grade. This validation can only be carried out in cases where someone can prove that they have worked previously in a post which is related with the vocational training they are doing. Therefore, due to having finished earlier, the graduate's work experience is actually becoming appraisal from the employer, which again guarantees Mincer's theory (1974), though indirectly, about the positive performance of years of experience.

Going on to analyze the results in relation with the social and working characteristics of our sample, we find first that gender (MALE) does not influence on the hourly wage received. González-Betancor (2003), on her monthly wage equation estimation for the same poll, got a strong salary discrimination because of gender, finding out that women's wages were in average 50% lower than men's. The results of the present study show that the fact that women earn monthly less, is due to a bigger incidence of partial work among them.

Secondly, and talking about job characteristics, we see that the returns to seniority at the enterprise (LSENIOR), as we expected, are positive (between 4% and 4.6% for doubling the years of seniority); wages are lower at private enterprises than at public ones (PRIV_E_L to PRIV_E_S), and this difference is even bigger the smaller the private enterprise is; wages are also lower for all those who do not have a permanent contract (CON_) –more than three quarters of our sample–. This difference ranges between 4% and 34% on average. Last, the

wages earned in the service sector (84% of the sample) are lower than the ones in industrial and construction sector (IND_CONS).

The sample was designed in order to be able to compare differences in wages according to the professional areas of the vocational schools. The area of Office Skills was used as a reference group since it is by far the largest.. In relation to this, we can see that the graduates who have done a vocational training belonging to the families of Agricultural Activities (FAMILY01), Physical Education (FAMILY02), Maritime and Fishing Activities (FAMILY03), Building and Civil Work (FAMILY08), Hotel Trade and Tourism (FAMILY11), Food Industry (FAMILY13) or Chemistry (FAMILY18) earn hourly more than those who studied Office Skills. This difference can go from 5.8% more (for the family of Hotel Trade and Tourism) till 83% (for the family of Food Industry). However, those having studied something related to Personal Image (FAMILY12) earn 33% less than those who studied Office Skills.

The return to the year of finishing studies (END98 to END00) also varies, so that the last cohort of graduates –those who obtained their certificate on 2000 or later– earn wages that are 18% higher than the ones of those who finished their studies on 1997 or before. This fact could be meaning an appreciation or a prestige increase of this kind of studies, what at the end means higher wages for the last cohorts of graduates. But, it also could be just due to the global evolution of the Canarian Economy between the year 1997 and 2000 (where the GDP increased 13% during those years).

Other aspects related to the kind of school centre, such as its entitlement (PUB_PRI) or its location (RUR_URB) turned out not being significant.

Finally the estimations in the wage equations obtained for *educational mismatch* were analysed, beginning with the factors for knowledge mismatch (second column of Table 2).

The coefficients of the variables for over- and under-education (KNOW_O, KNOW_U) according to the subjective measure suggested in section 4.2, are not significant. However, the objective measure of under-education in the variable TRAINING for employer-financed training courses was quite significant. The positive sign was expected, because undereducated workers earn more than the others with the same level of studies, who do lower category jobs. The latter will obviously not need training courses, since their knowledge is adequate for their

posts. Therefore, it is logical to obtain a positive return for undereducation (5%) in comparison with those adequately educated.

Also in regard to knowledge mismatch, the coefficient sign of variable REL_ST_W is similarly the expected one, because when there is a relation between vocational training and job, there is logically a better match between the needs of the post and the individual's knowledge, which implies a higher productivity and consequently higher wages. Neuman and Ziderman (1991) pointed out the existence of an important relation between wages and good matching of work and education, concluding that the vocational training produces advantages on wages, compared to post-compulsory secondary education, when the post occupied was related to the studies done. Nevertheless, Hotchkiss (1993), trying to prove it for the United States, came to the conclusion that it depends just on the post occupied, and not on the match between this post and the formal education of the worker.

Then we analyzed the mismatch of skills introducing only the variables defined in section 4.2, as it is stated in the third column of Table 2. It seems that, in general, mismatch of skills has the same effect on salaries as mismatch of knowledge, although the effect is not so strong. Thus, the subjective measure for oveskilling (SIKLL_H) is again not significant, but we have to take into account that just 1.4% of the whole poll considered being overskilled.

The variable for the graduates' opinion about their underskilling (SKILL_L) is also not significant. However, its effect is shown in the model through variables SKILL_NR and its interaction with REL_ST_W. The assumption is that individuals who answered that their skills have no relation with the needs of the post (SKILL_NR=1) but who nevertheless say their job is related with their vocational training (REL_ST_W=1) are really revealing a lack of skills for the adequate performance of their job. This case, therefore, collects the particular aspects of under-skilling, and according to Table 2, it has a return of 9.7%. Again, this result can be explained by the same reasons given for the cases of over-education.

Besides, the individuals who answered both that their skills are not related to the needs of the post (SKILL_NR=1) and their job is not related to their vocational training (REL_ST_W=0), reveal a problem of mismatch in the labour market. In this case the individual will not have the necessary human capital to perform his/her job, so that his/her productivity will not be

enough and his/her wage will be about 5.3% less of the wage a person who reached a better job match will get.

The variable for an objective measure of skills mismatch (EFFIC_T) does not contradict the results obtained since here, then it indicates that the more a worker lasts since he/she performs correctly his/her work, the higher wages he/she will earn (which again speaks about the positive effect of undereducation on wages).

As an end to this study we analyzed the mismatch of knowledge and skills jointly. The estimation results are the ones collected in the fourth column of Table 2. We can see there that the joint estimation of these factors does not cause big differences in relation with the arguments given above.

The fact that the coefficients in the last equation hardly vary in relation with the two previous equations may be indicating the existence of a low correlation between the variables which measure the mismatch of skills and the ones which measure the mismatch of knowledge. This is the desired result, since our objective with these two measures was to collect different aspects of educational mismatch, and we have finally achieved it. The greater evidence to support this affirmation is that 37% of the graduates consider themselves over-educated for the job but just 1.4% think they are over-skilled.

In relation with the main results of this joint estimation, we should say that, the effect of the subjective measures for knowledge mismatch (KNOW_O, KNOW_U) and for skills mismatch (SKILL_H, SKILL_L) continue not being significant; the objective measure of undereducation (TRAINING) keeps on being significant and holds its magnitude (5%); but the one for underskilling (SKILL_NR=1 and REL_ST_W=1) is no longer significant. Thus, in the joint estimation we can see a positive influence of undereducation on the hourly wage, but we cannot see any influence of underskilling on it.

6. Conclusion

This study had the objective of analyzing the effect of education and educational mismatch on the hourly wages of vocational training graduates in Gran Canaria. To this end, a Mincer wage equation was specified in which the usual regressor “years of schooling” was separated

into four different components, following Groot and Oosterbeek (1994). This equation was supplemented by regressors for the graduates' social and work characteristics as well as indicators of educational mismatch. Taking Allen's and Van der Velden's results (2001) into account, who showed the need to distinguish between knowledge and skills, the measure of educational mismatch in our model was separated into indicators of knowledge mismatch and skills mismatch. Both were collected through subjective measures, asking the graduates if they thought their knowledge and skills were the necessary ones to do their job, and also through objective measures, asking if they had received training courses in charge of the enterprises, and the time they had taken to do their job effectively.

The possibility of sample selection bias was tested with Heckman's two-step method, modelling first a participation equation. We estimate four different specifications depending on whether they incorporate the variables of knowledge and skill mismatch, and whether they do it jointly or separately. In the four cases, the estimated parameters are almost invariable in relation with significance and estimated value of the coefficients, which shows the robustness of the suggested model.

Our results in terms of educational return support human capital theory, because it suggests that this return increases according to the number of years devoted to schooling on what we have called a "structured" route, including extra years in trade school due to course repetition.

On the other hand, these results are also in accord with the predictions of assignment theory, for they demonstrate the importance of a good match between the individual's human capital and job features, and that mismatch has a significant relation to wages. As Allen's and Van der Velden's (2001) our results show evidence that under-education and under-skilling have positive effects on wages, but in our study over-education and over-skilling have no effect on them.

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ANNEX

Table 1: Participation equation (PROBIT)

		Beta	z	Marginal Prob. for average values
Constant		-1,278	(0,71)	
AGE	*= Age at the moment of the survey*	-0,018	(1,60)	-0,003
MALE	*= 1 if it is a man*	-1,381**	(2,42)	-0,251
AGE*MALE		0,064**	(2,72)	0,009
HHOLD_HI	*= 1 if the head of household has done higher studies*	-0,167	(1,32)	-0,028
REASON	*= 1 if they chose the vocational training because they thought it was good to find a job*	0,175**	(2,02)	0,027
VT_ADVAN	*= 1 if it is advanced vocational training (CF3)*	-2,026***	(3,43)	-0,364
VT_ADVAN*AGE		0,050**	(2,57)	0,008
VT_ADVAN *FAMILY04	*= 1 if the CF3 belongs to the family of Office Skills*	0,208	(1,48)	0,027
VT_ADVAN *FAMILY06	*= 1 if the CF3 belongs to the family of Trade and Marketing*	-0,249	(1,58)	-0,041
VT_ADVAN *FAMILY11	*= 1 if the CF3 to the family of Hotel Trade and Tourism*	0,153	(0,88)	0,021
VT_ADVAN *FAMILY19	*= 1 if the CF3 to the family of Health*	-0,581***	(3,56)	-0,121
EDUCA_E	*= Years of efficient formal schooling*	0,245*	(1,58)	0,038
PUB_PRI	*= 1 if the school centre was a public one*	0,276	(1,69)	0,043

Endogenous variable: Having worked or not after finishing the Vocational Training Studies
Robust Z statistic in absolute values between brackets
***=Significant al 1% level
**= Significant al 5% level
*= Significant at 10% level

Chi Square	80,94	p=0,000000
Loglikelihood	-728,088	
% of right predictions [+]	70,93	
% of right predictions [+] (particip=1)	72,77	
% of right predictions [+] (particip=0)	52,19	
Number of observations	2556	(2328 employees)

[+] = Cut off point = 0,90

Table 2: Hourly wage equations (Heckman, 1979)

Variable		Equation1		Equation2		Equation3		Equation4	
		Beta	z	Beta	z	Beta	z	Beta	z
(Constant)		0,885***	(5,64)	0,861***	(5,47)	0,902***	(5,70)	0,866***	(5,40)
RETURNS TO EDUCATION:									
School and experience level									
EDUCA_E	= *Years of efficient formal schooling*	0,056***	(4,78)	0,056***	(4,69)	0,056***	(4,70)	0,056***	(4,67)
EDUCA_I	= *Years of inefficient schooling until doing the vocational training*	-0,005	(0,57)	-0,006	(0,59)	-0,006	(0,65)	-0,006	(0,64)
EDUCA_R	= *Repeated years at the vocational training program*	0,052**	(2,15)	0,059**	(2,44)	0,053**	(2,19)	0,058**	(2,40)
EDUCA_S	= *Skipped years at the vocational training program*	0,054*	(1,84)	0,054*	(1,86)	0,054*	(1,85)	0,054*	(1,84)
EXP	= *Potential work experience in years*	-0,005	(1,23)	-0,006	(1,43)	-0,006	(1,45)	-0,007	(1,58)
EXP^2		0,000*	(1,74)	0,000**	(1,97)	0,000*	(1,91)	0,000**	(2,07)
INDIVIDUAL SOCIAL AND WORKING CHARACTERISTICS:									
Individual characteristics (Reference: woman)									
MALE	= *1 if it is a man*	0,224	(1,10)	0,233	(1,15)	0,227	(1,11)	0,236	(1,16)
MALE*EDUCA_E		-0,014	(0,85)	-0,014	(0,90)	-0,014	(0,86)	-0,014	(0,90)
Job characteristics (Reference: public enterprise; service sector; permanent contract)									
LSENIOR	= *Logarithm of the years of seniority*	0,046***	(5,53)	0,042***	(5,01)	0,044***	(5,13)	0,040***	(4,71)
PRIV_E_L	= *1 if a large private enterprise (more than 250 employees)*	-0,096***	(2,71)	-0,103***	(2,94)	-0,093***	(2,62)	-0,102***	(2,92)
PRIV_E_M	= *1 if a small or medium-size private enterprise (11 y 250 employees)*	-0,165***	(5,02)	-0,163***	(5,00)	-0,165***	(5,03)	-0,164***	(5,04)
PRIV_E_S	= *1 if a private micro-enterprise (less than 10 employees)*	-0,237***	(6,85)	-0,230***	(6,64)	-0,240***	(6,92)	-0,232***	(6,68)
SELFEMP	= *1 if a self-employed worker*	-0,042	(0,42)	-0,035	(0,35)	-0,041	(0,41)	-0,036	(0,36)
FARM_FISH	= *1 if an enterprise from the farming and fishing sector*	-0,009	(0,08)	-0,017	(0,17)	-0,009	(0,08)	-0,015	(0,14)
IND_CONS	= *1 if an enterprise from the industrial and construction sector*	0,060**	(2,57)	0,060***	(2,59)	0,056**	(2,41)	0,057**	(2,41)
CON_TEMP	= *1 if they have permanent employment contract*	-0,047**	(2,29)	-0,041**	(1,99)	-0,045**	(2,19)	-0,040*	(1,93)
CON_APP	= *1 if they have an apprentice-type employment contract*	-0,298***	(7,44)	-0,301***	(7,56)	-0,304***	(7,61)	-0,304***	(7,63)
CON_NO	= *1 if they have no contract*	-0,151***	(3,08)	-0,140***	(2,86)	-0,147***	(2,99)	-0,138***	(2,81)
Education characteristics (Reference: Family of Office Skills; finishing before 1998; urban centre and private centre)									
FAMILY01	= *1 if vocational training was in the family of Agricultural Activities*	0,126*	(1,86)	0,129*	(1,93)	0,105	(1,50)	0,106	(1,48)
FAMILY02	= *1 if vocational training was in the family of Physical Education*	0,104*	(1,81)	0,104*	(1,80)	0,106*	(1,83)	0,103*	(1,79)
FAMILY03	= *1 if vocational training was in the family of Maritime and Fishing Activities*	0,290**	(2,24)	0,288**	(2,28)	0,287**	(2,24)	0,286**	(2,24)
FAMILY05	= *1 if vocational training was in the family of Graphic Arts*	0,009	(0,15)	0,013	(0,22)	0,024	(0,39)	0,021	(0,34)
FAMILY06	= *1 if vocational training was in the family of Trade and Marketing*	0,045	(1,38)	0,038	(1,16)	0,042	(1,27)	0,035	(1,06)
FAMILY07	= *1 if vocational training was in the family of Communication, Sound and Image*	0,013	(0,17)	0,016	(0,21)	0,019	(0,25)	0,017	(0,24)
FAMILY08	= *1 if vocational training was in the family of Building and Civil Work*	0,112**	(2,12)	0,113**	(2,14)	0,104**	(1,96)	0,109**	(2,06)
FAMILY09	= *1 if vocational training was in the family of Electricity and Electronics*	0,014	(0,41)	0,010	(0,30)	0,013	(0,39)	0,010	(0,30)
FAMILY10	= *1 if vocational training was in the family of Manufacturing*	0,004	(0,07)	0,002	(0,03)	-0,002	(0,04)	0,001	(0,02)
FAMILY11	= *1 if vocational training was in the family of Hotel Trade and Tourism*	0,060*	(1,86)	0,059*	(1,82)	0,060*	(1,87)	0,058*	(1,80)

Variable		Equation1		Equation2		Equation3		Equation4	
		Beta	z	Beta	z	Beta	z	Beta	z
FAMILY12	*= 1 if vocational training was in the family of Personal Image*	-0,336***	(5,74)	-0,352***	(5,92)	-0,342***	(5,77)	-0,351***	(5,89)
FAMILY13	*= 1 if vocational training was in the family of Food Industries*	0,829***	(4,98)	0,832***	(5,12)	0,833***	(5,36)	0,834***	(5,22)
FAMILY14	*= 1 if vocational training was in the family of Computing*	0,019	(0,45)	0,019	(0,45)	0,023	(0,55)	0,019	(0,45)
FAMILY15	*= 1 if vocational training was in the family of Furniture and Timber*	-0,005	(0,04)	-0,003	(0,03)	-0,009	(0,08)	-0,002	(0,02)
FAMILY16	*= 1 if vocational training was in the family of Self-propelled Vehicle Maintenance*	0,031	(0,84)	0,027	(0,72)	0,025	(0,68)	0,023	(0,63)
FAMILY17	*= 1 if vocational training was in the family of Production Maintenance and Services*	0,082*	(1,65)	0,078	(1,57)	0,077	(1,56)	0,074	(1,51)
FAMILY18	*= 1 if vocational training was in the family of Chemistry*	0,229**	(2,40)	0,236**	(2,49)	0,253***	(2,72)	0,241***	(2,58)
FAMILY19	*= 1 if vocational training was in the family of Health*	0,030	(0,95)	0,032	(1,01)	0,040	(1,26)	0,036	(1,11)
FAMILY20	*= 1 if vocational training was in the family of Sociocultural and Community Services*	-0,064	(1,34)	-0,064	(1,34)	-0,057	(1,19)	-0,064	(1,32)
FAMILY21	*= 1 if vocational training was in the family of Textiles, Clothing and Leather*	-0,204*	(1,83)	-0,202*	(1,85)	-0,190*	(1,72)	-0,194*	(1,78)
END98	*=1 if they finished studies on 1998*	0,024	(0,89)	0,025	(0,91)	0,022	(0,83)	0,023	(0,87)
END99	*=1 if they finished studies on 1999*	0,001	(0,02)	0,003	(0,10)	0,002	(0,08)	0,003	(0,12)
END00	*=1 if they finished studies on 2000 or later*	0,181***	(3,53)	0,167***	(3,26)	0,181***	(3,48)	0,169***	(3,23)
RUR_URB	*= 1 if the school centre was outside the capital*	0,001	(0,08)	0,005	(0,28)	0,003	(0,18)	0,005	(0,26)
PUB_PRI	*= 1 if the school centre was public*	-0,030	(0,66)	-0,030	(0,67)	-0,032	(0,71)	-0,031	(0,69)
EDUCATIONAL MISMATCH:									
Knowledge mismatch (Reference: Adequate knowledge, Job unrelated with vocational training)									
KNOW_O	*= 1 if they consider their knowledge more than the post's needs (overeducation)*			-0,012	(0,60)			-0,010	(0,47)
KNOW_U	*= 1 if they consider their knowledge less than the post's needs (undereducation)*			-0,018	(0,86)			-0,022	(1,03)
TRAINING	*= 1 if they have done training courses in the charge of the enterprise*			0,050**	(2,47)			0,050**	(2,49)
REL_ST_W	*= 1 if they consider their job related to the vocational training*			0,038**	(2,13)			0,034	(1,13)
Skills mismatch (Reference: Adequate skills)									
SKILL_H	*= 1 if they consider their skills higher than the post's needs (overskilling)*					-0,065	(1,02)	-0,056	(0,86)
SKILL_L	*= 1 if they consider their skills lower than the post's needs (underskilling)*					0,004	(0,19)	0,015	(0,63)
SKILL_NR	*= 1 if they consider their skills unrelated with the post's needs*					-0,053***	(2,58)	-0,019	(0,56)
SKILL_NR*REL_ST_W						0,150**	0,064	0,027	(0,93)
EFFIC_T	*= Days it took them to do their job effectively*					0,0004*	(1,88)	0,0005**	(2,14)
EFFIC_T*REL_ST_W						-0,0003	(1,32)	-0,0004*	(1,74)
LAMBDA	*= Mill's ratio inverse*	-0,245***	(5,11)	-0,240***	(4,66)	-0,243***	(4,95)	-0,241***	(4,79)
Number of observations		2328		2328		2328		2328	
Chi Square		443,02		457,58		464,48		472,57	
Probability asociated to the Chi Square		0,000		0,000		0,000		0,000	
Loglikelihood		-2824,79		-2814,92		-2816,76		-2810,46	

Endogenous: Logarithm of the hourly net wage (Constant Euros of 2001)

White Heteroskedasticity-Consistent Standard Errors & Covariance

*** = Significant at 1% level

** = Significant al 5% level

* = Significant at 10% level