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DOCUMENTO DE TRABAJO 2008-32

Serie Economía de la Salud y Hábitos de Vida
CÁTEDRA Fedea – la Caixa

Serie Capital Humano y Empleo
CÁTEDRA Fedea – Santander

September 2008

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ISSN:1696-750

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N.I.F. G-78044393

The Consequences on Job Satisfaction of Job-Worker Educational and Skill Mismatches in the Spanish Labour Market: a Panel Analysis

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(September 2008)

Abstract:

The effects of job-worker mismatches on job satisfaction are examined using the eight waves (1994-2001) of Spanish data taken from the European Community Household Panel (ECHP). The impacts of both educational and skill mismatches are estimated considering unobserved heterogeneity, state dependence and attrition bias. Dynamic analysis shows that skill mismatches emerge as a much better predictor of job satisfaction than educational mismatches as the effects of the latter are related to unobserved heterogeneity among workers. Moreover, the current level of job satisfaction appears to be influenced by workers' previous job perceptions, suggesting a dynamic structure for job satisfaction.

Keywords: *educational mismatches; skill mismatches; job satisfaction; unobserved heterogeneity; attrition bias*

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We would like to thank the Spanish Ministry of Education and Science for their support through the SEJ2004-07924 research project, and the SEJ2005-08783-C04 02/ECON project contract, which has been co-financed by the European Regional Development Fund.

Introduction

Job-worker mismatches occur when the key requirements of a job are not accurately fulfilled by the characteristics of the worker that currently performs it. Education and skills are attributes that workers typically acquire at a cost and these are ranked against current job requirements to assess how accurate the match between a worker and his/her job is. Job-worker mismatches, in either education or skills, reflect inefficiencies in the allocation of resources in the economy, as workers' investments in education or in skills development are not adequately used in the production system. As inefficiencies, job-worker mismatches are expected to have negative effects on the benefits workers obtain from their jobs. So far, research has focused on the wage effects of educational mismatches, whilst skill mismatches have received less attention. Indeed, a number of papers deal with educational and skill mismatches as equivalents in spite of evidence which shows that they are only weakly related (Allen & van der Velden, 2001; Di Prieto & Urwin, 2006; Green & McIntosh, 2007). Evidence of the consequences of educational mismatches on wages has shown that workers with a lower level of formal education than that required in their jobs (undereducated workers) usually earn higher wages than comparable workers who have the right level of education for the job (adequately educated workers), while those who have a higher level of education than that required (overeducated workers) face wage penalties (Verdugo & Verdugo, 1989; Sicherman, 1991; Alba-Ramírez, 1993; Bauer, 2002; Rubb, 2003; Frenette, 2004). Additionally, the rate of return to one year of overeducation is positive but lower than the return to one year of required education, while a year of undereducation usually has a negative rate of return (Duncan & Hoffman, 1981; Sloane, Battu, & Seaman, 1999; Daly, Büchel, & Duncan, 2000; Groot & Maassen van den Brink, 2000; Ng, 2001; Groenelveld & Hartog, 2004). This implies that undereducated workers earn lower wages than their well-matched co-workers, while overeducated workers earn higher wages. Such analyses, however, only take into account the effects of educational mismatches on the pecuniary rewards from work, neglecting the fact that well-matched workers, either in terms of education or skills, are likely to reap additional benefits from jobs that are better suited to their

own preferences in diverse working aspects. Non-wage benefits linked to personal preferences may be derived from a variety of sources such as working in an attractive environment, performing creative or challenging tasks, holding responsibilities, and having greater work autonomy, better working hours or shorter commuting times, or even enjoying good relationships with subordinates, supervisors and co-workers (Vila, 2005). These non-pecuniary benefits from work represent true gains from a worker's viewpoint and should be considered in the analysis of the consequences of job-worker mismatches.

Job satisfaction provides a meaningful insight into total returns from work since it indicates how workers value the whole package of both pecuniary and non-pecuniary rewards according to their own expectations and personal preferences. Researchers have used survey responses on job satisfaction as proxy data for benefits from work, with job satisfaction being in turn a key determinant of well-being for working individuals. To date, most of the discussion surrounding this has focused on the effects of observable attributes of jobs and workers, such as wages, company size, trade union membership, age, race and gender (Sloane & Williams 1996; Watson, Storey, Wynarczyk, Kease, & Short, 1996; Hamermesh 2001; Blanchflower & Oswald 2002). The analysis of job satisfaction can also be used to clarify the consequences of job-worker mismatches on benefits from work. So far, however, the results have been inconclusive and rather limited. Research on educational mismatches has found strong negative effects. Both overeducation (Tsang, Rumberger, & Levin, 1991; Battu, Belfield, & Sloane, 1999 and 2000; Johnson & Johnson, 2000) and undereducation (Hersch, 1991) have been reported to reduce workers' job satisfaction. Additionally, analyses including both educational and skill mismatches conclude that workers with a higher level of skills (overskilled workers) and those with a lower level of skills (underskilled workers) than those required to carry out their job are less satisfied than workers with the right amount of skills (adequately skilled workers), while educational mismatches often show neutral effects (Allen & van der Velden, 1991; Green & Mcintosh, 1992). These results are typically reached by estimating ordered discrete choice models for a cross-section of data including job-worker mismatches as explanatory variables along with the standard determinants of job satisfaction (wages, current labour-market status,

education level and other controls). Nevertheless, the accuracy of such estimates depends on two crucial assumptions (Cameron & Trivedi, 2005) that are seldom tested in empirical research into job-worker mismatches. The first one is that workers' characteristics, and more generally explanatory variables in the models for satisfaction, are not correlated with unobserved factors that also affect satisfaction. The second assumption is that a worker's job satisfaction is not state dependent and, consequently, the current scores of job satisfaction are not influenced by previous experiences. If these assumptions do not hold, estimates of mismatch coefficients would capture a mixture of their true effects along with those of unobserved heterogeneity among workers plus those derived from the dynamics of job satisfaction.

Longitudinal analysis based on panel data provides a more accurate estimate of the effects of educational and skill mismatches on work benefits by taking both the possibilities of state dependence and unobserved factors potentially correlated to explanatory variables into account. The use of longitudinal data, in turn, requires the examination of the attrition problem in the panel data. An attrition bias appears when participants either continue or stop responding to the questionnaire over time for non-ramdom reasons. This implies that the survival of an individual in the sample depends on his/her own personal and socioeconomic characteristics. Treatment of the attrition bias is important to guarantee consistent estimates of the impacts of mismatches on job satisfaction when using panel data.

This paper intends to provide additional evidence on the effects of job-worker mismatches by estimating the influence of both educational and skill mismatches on subjective scores of job satisfaction using a panel of Spanish workers. Assuming that job satisfaction reflects the total benefits workers obtain from job-related sources, the empirical analysis addresses three main issues seldom considered in previous research on the effects of job-worker mismatches:

(a) Total job-related returns to educational mismatches and skill mismatches may differ both in sign and amount.

(b) Unobserved heterogeneity among workers may be correlated with observed heterogeneity.

(c) The current level of job satisfaction may depend on previous levels of job satisfaction.

The results of the analysis carried out show that job-worker skill mismatches reduced the level of job satisfaction even after controlling for unobserved heterogeneity among workers and state dependence. However, the effects of educational mismatches were only significant when unobserved heterogeneity was not taken into account, and disappeared when it was controlled for. This implies that educational mismatches are related to unobserved heterogeneity among workers. Additionally, the dynamic analysis suggests that workers' perceptions of their jobs last over time as both the initial condition and state dependence are found to be significant determinants of the current level of job satisfaction.

The rest of this article is organised as follows: section two describes the data set and selection of variables, section three discusses estimators for panel data and specifies the empirical models, section four presents the main findings, and section five details our conclusions.

Data and Variables

This paper uses Spanish data taken from the European Community Household Panel (ECHP) survey using all the eight available waves, from 1994 to 2001. This survey includes detailed information which allows us to examine and distinguish between the effects of both educational and skill mismatches on workers' job satisfaction. A set of control variables related to the individual's personal characteristics (gender, and marital status), human capital (educational level, job tenure, work experience, and quadratic work experience), and labour status (part-time/full-time job, sector, natural logarithm of average hourly wage, unemployment episodes) were also considered. The sample used was restricted to wage-earners aged between 16 and 64 who worked at least 15 hours per week in their main job. It excluded trainees, those working in unpaid jobs, those who either did not participate in the first wave or only took part in this one

and workers with missing values in some of the required variables. The sample thus contained 15,685 valid records for analysis.

'Table 1 here'

Although Table 1 shows detailed information about variable definitions and sample descriptions, the procedure used to identify educational and skill matches was explored further. The so-called 'modal' procedure, proposed by Kiker, Santos and De Oliveira (1997), was used to identify the educational accuracy of the job-worker pairing. Under this criterion, the level of education required by a given job is defined as the modal education level among workers in jobs within the same occupational category[1]. Thus, a worker is adequately educated, overeducated or undereducated when his/her own level of education is, respectively, equal to, higher than, or lower than the modal educational level of workers in the same job category. The extent of a worker's educational mismatch was determined by comparing the number of years of education required by his/her job with the number of years of the education level attained:

$$Yrs.\,Overeducation = Schooling\ years - Required\ education\ years$$

$$if\ \ Schooling\ years > required\ years\ ;\ \ 0\ \ otherwise$$

$$Yrs.\,Undereducation = Required\ education\ years - Schooling\ years$$

$$if\ \ Schooling\ years < required\ years\ ;\ \ 0\ \ otherwise$$

The job-worker skill match was established using workers' self-assessments when answering the following two questions in the ECHP survey:

(i) "Have your studies or your training provided you with the skills needed for your current type of work?"

(ii) "Do you feel that your skills or personal capabilities would allow you to do a more demanding job than the one you do now?" [2]

'Figure 1 here'

As Figure 1 shows, individuals who answered 'yes' to both questions were classified as overskilled workers because they had a surplus of skills for their current job. Workers who answered 'yes' to the first question and 'no' to the second one were classified as adequately skilled workers because they had enough skills for their current job, although they could not carry out a more demanding job. Respondents who answered ‘no’ to both questions were classified as underskilled workers because they did not have enough skills to do their current job. Finally, respondents who answered 'no' to the first question and ‘yes’ to the second one were classified as wrongly skilled workers because they did not have enough skills to carry out their current job yet felt they could perform well in a more demanding job, suggesting that their skills were wrong for their current job. Strictly speaking, wrongly skilled workers can be considered a special type of underskilled workers since they reported that their skills were not the right ones required to carry out their current jobs. This paper distinguish between wrongly skilled and underskilled workers when analysing job-satisfaction consequences.

‘Table 2 here’

Table 2 shows that 29.5% of workers are overeducated, 38.4% adequately educated, and 32% of workers are undereducated. Skill matches in the job-worker pairing show that 34.9% are overskilled workers, 24.8% are adequately skilled and 40.2% are underskilled, affecting the wrong skill endowment to 18.9% of workers. The bi-variate distribution of educational and skill matches in the job-worker pairing shows that only 35.1% of workers have the same kind of fit in their jobs under both classification criteria. This suggests that the relationship between educational and skill matches is weak, since if there had been a strong link between them, the percentages along the main diagonal of Table 2 would have added up to 100%. Furthermore, although Pearson’s χ^2 allows us to reject the independence null hypothesis between educational and skill matches, the degree of association is low, as Cramer’s V takes the value of 0.06 on a scale from 0 (no association) to 1 (perfect association). These findings infer that both educational and skill mismatches are two very different labour market phenomena, and highlight the importance of examining the consequences on job satisfaction of these two kinds of job-worker mismatches, since most previous literature has either only examined the

consequences of educational mismatches or simply treated educational and skill mismatches as the same phenomenon. Furthermore, literature about the effects of job-worker mismatches on job satisfaction is rather scarce.

Models

The twofold aim of this piece of research is to show the importance of distinguishing and considering the consequences of both educational and skill mismatches on workers' job satisfaction, and to highlight the importance of using accurate estimation mechanisms based on panel data. Thus, we firstly carried out a similar analysis to the research found in previous literature, using only cross-sectional data. We then examined the consequences of educational and skill mismatches using longitudinal analyses that took attrition bias, unobserved heterogeneity and state dependence into account.

Using previous research into the consequences on workers' job satisfaction as a result of educational and skill job-worker mismatches as a starting point, we estimated equation (1) using our data as a pool that does not exploit the longitudinal characteristics of the panel data. This job satisfaction specification can be written as:

$$js_{it}^{*} = \beta_1^{'} mm_{it} + \beta_2^{'} x_{it} + \omega_{it} \quad (i = 1, \dots, N) \ (t = 2, \dots, T_i)^{3} \qquad (1)$$

where mm_{it} represents the explanatory variables related to educational and skill job-worker mismatches of individual *i* at time *t*; x_{it} contains a set of control variables associated to personal characteristics, human capital and labour status of worker *i* at time *t*; ω_{it} is a time and individual-specific error term which is assumed to be normally distributed, and uncorrelated with the explanatory variables; js_{it}^{*} is a latent variable, since what is observed is an indicator variable in which the worker identified his/her degree of job satisfaction by means of an ordered scale from 1 (very dissatisfied) to 6 (completely satisfied) in each wave. This indicator variable

can be defined for each *j* alternative as $js_{it} = j \;\; if \;\; \mu_{j-1} < js_{ij}^{*} \leq \mu_j, \;\; j = 1, \ldots, m$, when μ_j and $\mu_0 = -\infty, \; \mu_j \leq \mu_{j+1}, \; \mu_m = \infty$ are the cut points.

This specification of job satisfaction presupposes two strong assumptions (Cameron & Trivedi, 2005). The first one is that unobserved heterogeneity is not correlated with observed heterogeneity, which can lead to inconsistent or misleading estimates, and the second one is that workers' job satisfaction has no inter-temporal dependence, and thus the current job satisfaction of a worker is not influenced by his/her own previous job perception. For this reason, we advance on previous literature by developing a longitudinal analysis of job satisfaction that takes unobserved heterogeneity among workers and state dependence into account. In order to highlight the importance of both factors, firstly a job satisfaction equation that controlled for unobserved heterogeneity was estimated and, secondly, a dynamic ordered probit model that took both unobserved heterogeneity and state dependence into account was estimated. These two job satisfaction specifications can be expressed as follow:

$$js_{it}^{*} = \delta_1^{'} mm_{it} + \delta_2^{'} x_{it} + \alpha_i + \varepsilon_{it} \quad (i = 1, \ldots, N; \; t = 2, \ldots, T_i) \qquad (2)$$

$$js_{it}^{*} = \gamma_1^{'} mm_{it} + \gamma_2^{'} x_{it} + \gamma_3^{'} js_{it-1} + \alpha_i + \theta_{it} \quad (i = 1, \ldots, N; \; t = 2, \ldots, T_i) \qquad (3)$$

where α_i is an individual-specific and time-invariant random component that involves the systematic unobserved heterogeneity associated to microeconomic data; js_{it-1} is the observed worker's previous job satisfaction, which implies that the state dependence of individual *i* is taken into account; ε_{it} and θ_{it} are time and individual-specific error terms which are assumed to be normally distributed and uncorrelated across individuals and waves, and uncorrelated with α_i. The terms ε_{it} and θ_{it} are assumed to be strictly exogenous.

This paper models the unobserved individual effect α_i with a twofold aim. The first allows the observed explanatory variables to be correlated with the unobserved individual effect, as ignoring this correlation can lead to biased estimations (Hsiao, 2003). Thus, we parameterized the unobserved individual effect considering the within-individual means of the regressors, as

developed by Mundlak (1978). The second justification for parameterizing the unobserved individual effect was to address the problem of the initial condition (Heckman, 1981). Ignoring the latter amounts to assuming that the observations corresponding to the first time period are exogenous variables, which is untrue when the initial period of the survey is not the start of the process and the error process is not serially independent, a more likely situation in our case. In addition, ignoring initial conditions also implies that the marginal probabilities have reached a time-invariant value, which is not possible when some variables that vary with time, such as work experience and job tenure, have been included in the model. So, to address the initial conditions problem, the distribution of the unobserved effect is conditioned on the initial value of the dependent variable, as Wooldridge (2005) suggests. Thus, the individual-specific and time-invariant random component is parameterized as:

$$\alpha_i = \alpha_0 + \alpha_1 \overline{mm}_i + \alpha_2 \bar{x}_i + \alpha_3 sj_{i1} + u_i \qquad (4)$$

where u_i is considered to be independent of the mm and x variables, the initial conditions and the error terms ε_{it} and θ_{it}.

So, substituting (4) in (2) and (3) the job satisfaction specifications have random effect structures that can be expressed as:

$$js_{it}^{*} = \delta_1' mm_{it} + \delta_2' x_{it} + \alpha_0 + \alpha_1 \overline{mm}_i + \alpha_2 \bar{x}_i + \alpha_3 sj_{i1} + u_i + \varepsilon_{it} \quad (5)$$

$$js_{it}^{*} = \gamma_1' mm_{it} + \gamma_2' x_{it} + \gamma_3' js_{it-1} + \alpha_0 + \alpha_1 \overline{mm}_i + \alpha_2 \bar{x}_i + \alpha_3 sj_{i1} + u_i + \theta_{it} \quad (6)$$

Once parameterization of the unobserved heterogeneity was considered, we then had to determine whether equations (5) and (6) were to be estimated by random effect ordered probit or by pooled ordered probit estimators. This decision depended on whether there was attrition bias. Attrition bias appears when survey participants either continue or stop responding to the different survey waves for non-random reasons. This implies that the survival of an individual in the sample depends on his/her level of job satisfaction, job-worker match, and socioeconomic status among other factors. Thus, those who survive all the waves may be the workers who are

more satisfied, are better matched, and have a better socioeconomic status, etc. This is why not taking attrition bias into account can result in misleading conclusions. To test for attrition bias we used the tests proposed by Verbeek & Nijman (1992, p. 688), according to which the specifications of equations (5) and (6) are increased by including one of the following three variables: (i) a dummy variable that indicates whether or not the individual responds in the next wave; (ii) a dummy variable that shows whether or not the respondent answers all eight waves; (iii) a variable that indicates the number of waves a worker has been included in the panel. These provide three different attrition tests. If at least one of these three variables has a significant effect on workers' job satisfaction, then there are significant systematic differences between those who do not answer and those who do, and therefore attrition bias cannot be ruled out (we have carried out the attrition tests using both random-effect ordered and pooled ordered probit models). In order to correct for attrition bias, inverse probability weighted (IPW) estimators (Robin, Rotnitzky, & Zhao, 1995; Fitzgerald, Gottschalk, & Moffitt, 1998; Moffitt, Fitzgerald, & Gottschalk, 1999; Wooldridge, 2002) can be used, but only with the pooled ordered probit estimator since these can only be applied to an objective function which is additive across observations (Contoyannis, Jones, & Rice, 2004) and so cannot be used in the log-likelihood function for the random effects specification[4]. It is worth noting that IPW pooled ordered probit estimator yields consistent (but inefficient) estimates for equations (5) and (6) even if the intra-individual correlation in the composite error term, $u_i + \theta_{it}$, originating in u_i is ignored. In fact, this procedure is the quasi-maximum likelihood (or partial maximum likelihood) estimator for the correctly specified model. As shown by Cameron and Trivedi (2005, p. 150), the consistency of quasi-maximum likelihood estimation does not require the correct specification of the joint density of the vector $\boldsymbol{j_i} = (j_{i2}, j_{i3}, \ldots, j_{iT})$; it is sufficient to correctly specify the marginal density of each of its elements j_{it}. It is important to note, however, that the standard error estimates are not consistent, and therefore we use an estimator of the matrix of variances and covariances that is robust to the autocorrelation in the composite error term $u_i + \theta_{it}$.

Two different types of IPW estimators can be considered. Both are obtained from binomial probit models, and more precisely from the estimated probability of response $(\hat{p}_{it})$ of individual *i* in each wave *t* (t= 2,…,8). However, one of them depends on a set of variables[5] that are valued as in the first wave (t=1), while the second type of IPW estimators depends on the same variables but these take the value of the previous wave (t-1). This implies that the latter IPW estimators are updated over time, and the interviewee never re-enters the panel. Nevertheless, as probability is estimated by the sample from the previous wave, they are not representative of the population that was originally sampled at t=1, and so do not provide a consistent estimator. Thus, the predicted probability of individual *i* at wave *t* $(\hat{r}_{it})$ has to be adapted by using cumulative estimated probability, $\hat{p}_{it} = \hat{r}_{i2} \dots \hat{r}_{it}$, (Wooldridge, 2002).

On the other hand, as the coefficients estimated in the ordered discrete choice models only indicate the direction of the marginal effects on the extreme levels of the dependent variable, but do not show the magnitude or the direction of the marginal effects on the intermediate levels, the probability that a reference individual is more or less satisfied with his/her job has to be predicted, as well as the marginal effects associated with the main variables of the equation (6) in order to quantify the magnitude of the effect of job-worker mismatches after controlling for attrition bias, unobserved heterogeneity, and state dependence. Thus, the reference individual[6] is adequately matched in his/her job, both in terms of education and in terms of skill, and the rest of the reference individual's characteristics coincide with the mean of the population distribution for continuous variables and with the modal category for dummy variables.

Results

Table 3 presents the results from equation (1), which was estimated by means of a similar procedure to the one used in previous research which examined the job satisfaction consequences of both educational and skill mismatches, i.e. without exploiting the longitudinal characteristics of the panel data. The results show that both educational and skill mismatches

had a significant effect on worker's job satisfaction. Estimates indicate that years of overeducation decreased the probability of job satisfaction, while the job-worker mismatch attributed to undereducation increased job satisfaction, which suggests that this was a good match from a worker's viewpoint. On the other hand, all skill mismatches were perceived as unfavourable from a worker's viewpoint, as they had a significant and negative influence on job satisfaction. As far as the other variables included in the model were concerned, we can highlight that the probability of greater job satisfaction was higher among those who worked in the public sector and among those with higher wages, while the probability decreased when a worker's job tenure was under 11 years (the exception was job tenure of less than a year as this did not have a significant impact on worker's job satisfaction). The effect of work experience on job satisfaction had a U shape, since this tended to decrease the probability of satisfaction until the length of work experience tended to increase job satisfaction.

'Table 3 here'

The above results were obtained without using the longitudinal characteristics of the Spanish panel data from the ECHP, so they do not take attrition bias, unobserved heterogeneity and state dependence into account, which implies that the results obtained from equation (1), as in previous literature examining both educational and skill job-worker mismatches, may be misleading. Therefore, could previous results be due to the influence of unobserved heterogeneity and state dependence in workers' latent job satisfaction?

To answer this, we firstly examined the likelihood of there being attrition bias in the panel data used. Table 4 presents the results of the attrition tests applied to the job satisfaction specifications in equations (5) and (6). The estimates were carried out using pooled ordered and random effect ordered models that took robust estimators of variance into account which allowed for intra-group correlation. The results indicated that significant correlation between workers' job satisfaction and the response in the next wave depended on the job satisfaction specification and the estimation model. However, those who responded to all waves of the

survey were more likely to be completely satisfied with their job in all the estimated models, which implies that there is a significant positive correlation between permanence in the panel and workers' job satisfaction, and that survival throughout the waves is not due to individuals' random characteristics. The robustness of this finding is indicative of the problem of attrition bias in the data used to develop our analyses and corroborates the ECHP results obtained by Peracchi (2002). The problem of attrition bias led us to use IPW estimators so attrition could be treated as an ignorable non-response. As explained in the previous section, to obtain IPWs we estimated binomial probit models of response from individual *i* in each wave *t* by using regressor values from the first wave on the one hand, and regressor values from the previous wave on the other. However, the comparison of both estimates for each year using Akaike and Bayesian information criteria showed a clear preference for obtaining IPW estimators using the second method, as this makes the ignorability assumption more likely. This is why we used these estimators to weight the observations in estimating equations (5) and (6) by a pooled ordered probit model.

'Table 4 here'

Table 5 presents the estimations of equations (5) and (6) using robust estimators of variance that allowed for intra-group correlation. These show that after taking unobserved heterogeneity into account, most of the important determinants of job satisfaction found from estimating equation (1) lost their significance, which highlights the importance of taking the systematic unobserved individual effect into account. We also found that once the unobserved heterogeneity was considered, educational mismatches did not influence workers' job satisfaction, while job-worker skill mismatches still had a very significant and negative impact on it. In addition, we found that workers' job satisfaction for the first wave of the panel had a significant influence on their unobserved latent job satisfaction. This suggests that workers who were more satisfied with their jobs during the initial wave were more likely to still be satisfied, which suggests that any event that alters a worker's job satisfaction has a long-term impact. On the other hand, the likelihood-ratio test indicates that the fit of the estimation of equation (5)

was worse than that of equation (6), since the former can be considered as a subset of the latter. We found that state dependence was a very important determinant of the degree of workers' current job satisfaction. As a matter of fact, those who were more satisfied in their jobs in the previous period were more likely to still be satisfied with them at the moment, which again reinforces the notion that workers perceptions of their jobs tend to persist. Other significant determinants of workers' job satisfaction after allowing for unobserved heterogeneity and state dependence were wages and job sector. Results show that those who had higher wages and those who worked in the public sector were more likely to be more satisfied with their jobs.

'Table 5 here'

Table 6 presents the marginal effects associated with job-worker mismatches and state dependence. This shows that in terms of skill mismatches, wrongly skilled workers were less likely to be satisfied with their jobs than those who were underskilled or overskilled. All of these groups were less likely to be satisfied with their jobs than adequately matched workers. Wrongly skilled workers were 4.4% less likely to be completely satisfied with their job than adequately matched workers. These percentages were 4.0% for underskilled workers and 3.1% for those who underutilized their skills in their jobs. Results show that state dependence had a huge positive impact on workers' current job satisfaction. We found that if the previous degree of job satisfaction was 1 (very dissatisfied) and not 5^7 (very satisfied), the current likelihood of being completely satisfied with their job decreased by 9.8%. This drop was 5.7%, 5.6%, and 3.0% respectively when the previous job satisfaction degree was, 2, 3 or 4 (not 5), while the probability of being completely satisfied increased by 8.1% when a worker's previous job satisfaction was 6 and not 5. This also implies that a change in a worker's current degree of job satisfaction will affect his/her future job perception. Therefore, a change from an accurate skill match situation to a skill mismatch one will have negative consequences on both a worker's current level and long-term job satisfaction level. On the other hand, if the job changes from being a skill mismatch situation to an accurate skill match, a worker's degree of job satisfaction will be positively affected beyond the moment in which the mentioned change happens.

'Table 6 here'

Conclusions

This paper belongs to the scarce body of research that examines the job satisfaction consequences of both educational and skill mismatches in the job-worker pairing. This analysis has allowed us to explore in greater depth how these two kinds of mismatches affect the value that workers give to the fulfilment of both pecuniary and non-pecuniary work expectations, and how job-worker mismatches influence the total benefit workers derive from their jobs. Using Spanish ECHP data from 1994 to 2001, we have shown the importance of examining the consequences of workers' job satisfaction vis-à-vis skill mismatches, despite the fact that this has not been studied by most of previous literature which has mainly focused on the effects of education mismatch in job-worker pairings. On the other hand, we have demonstrated the importance of considering attrition bias, unobserved heterogeneity and state dependence, which were not allowed for in previous research on educational and skill mismatches in the job-worker pairing.

The importance of considering educational and skill mismatches as two different phenomena in the labour market has been highlighted as a result of the weak relationship established between the two. Around 65% of workers have a different kind of fit under both classification criteria and Cramer's V showed that its degree of association was 0.06 on a scale from 0 (no association) to 1 (perfect association). These findings show the need to differentiate and take both kinds of matches into account as two different labour market phenomena, although most previous literature has only focused on educational mismatches and often used educational mismatches as a way of examining skill mismatches.

To analyse the relevance of attrition bias, unobserved heterogeneity and state dependence in the study of job satisfaction consequences as a result of educational and skill mismatches in job-worker pairings, we firstly estimated their influence on workers' job satisfaction without

exploiting the longitudinal characteristics of the panel data used. This analysis showed that both educational mismatches and skill mismatches were important determinants of workers' job satisfaction, as were other variables such as work experience, job tenure, wages, job sector and unemployment episodes. However, once the attrition bias associated with the panel data was controlled, and the unobserved heterogeneity among workers was taken into account, the educational mismatch lost its significant effect on job satisfaction, as did most of the other aforementioned variables, whilst skill mismatches continued to have a negative effect on workers' job satisfaction. This finding suggests that the influence of educational mismatches in job satisfaction when the data is a cross-section is misleading and a consequence of the relationship between educational mismatches and the unobserved time-invariant characteristics of individuals. However, mismatches in terms of skills matter to workers. In fact, those who are less likely to be satisfied in their jobs are those whose skills are not related to the kind of jobs they do (wrongly skilled workers), followed by those who feel that they are not able to do their job accurately because of a shortage of skills (underskilled workers) and by those who feel that their skills are underutilised (overskilled workers).

We should also highlight that a change in a worker's perception of his/her job will not only affect the total benefits workers obtain from work at the time it actually happens. In fact, we have found that both workers' job satisfaction during the initial wave of panel data and their degree of job satisfaction from a previous wave have a very significant influence on workers' current job satisfaction level, suggesting that events that either positively or negatively affect a worker's current job perception will also have consequences on their total future benefits from work.

Notes

1. The occupational classification used is the 1988 International Standard Classification of Occupations (ISCO88) to two-digit level.

2. Vieira (2005) used the affirmative answer to this question to determine overskilled workers in the Portuguese labour market, even though some of the participants who answered 'yes' may have had the wrong skills required to do their job. These workers are not overskilled. They do not have enough skills to do their current job and so are underskilled for it. Moreover, they are wrongly skilled.

3. The first wave of data has not been utilised to consider the same individuals in the analyses developed in this paper, as it takes into account inter-temporal dependence using a dynamic model.

4. The log-likelihood function of the random effects specification involves the product of the contribution of an individual's observations for panel waves.

5. The variables used are those included in mm_{it} and x_{it} in equations (5) and (6), as well as workers' self-assessment of his/her health status and his/her degree of job satisfaction.

6. The reference individual is male, adequately matched in terms of both education and skills in his job, he is married, has worked in the same firm for over ten years, in a full-time job, in the private sector, his level of formal education corresponds to an International Standard Classification of Education (ISCED) level lower than 3, his degree of job satisfaction for the previous period and to the initial wave was 5, and his experience, hourly wage, unemployed episodes, and the continuous variables utilized to parameterize the unobserved heterogeneity take the mean value of the population distribution.

7. The previous degree of job satisfaction of the reference individual was 5.

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Tables and Figures

Table 1
Definition of Variables and Sample Descriptives

Variable	Variable definition	Mean	Std. Dev.
Job satisfaction	Ordered variable from 1 (very dissatisfied) to 6 (completely satisfied)	4.36	1.20
Personal characteristics			
Woman	It takes value 1 if woman, and 0 otherwise	0.32	0.47
Separated & divorced	It takes value 1 if separated or divorced, and 0 otherwise	0.03	0.18
Single	It takes value 1 if single, and 0 otherwise	0.20	0.40
Human capital			
Work Experience	Potencial work experience = Age - Schooling years - 6	25.90	11.21
Quadratic work experience/100	(Potencial work experience)^2/100	7.96	6.45
Tenure < 1 yr.	It takes value 1 if job tenure is lower than 1 year, 0 otherwise	0.07	0.26
Tenure: 1 - 5 yrs.	It takes value 1 if job tenure is between 1 to 5 years, 0 otherwise	0.21	0.41
Tenure: 6 - 10 yrs.	It takes value 1 if job tenure is between 6 to 10 years, 0 otherwise	0.18	0.38
ISCED[a] 3	It takes value 1 if level 3 of ISCED[a], 0 otherwise	0.21	0.41
ISCED 5-6, and doctorate	It takes value 1 if level 5 or 6 of ISCED or doctorate, 0 otherwise	0.23	0.42
Labour status			
Ln(wage)	Natural logarithm of hourly wage deflacted by Consummer Price Index	1.51	0.55
Part-timer job	It takes value 1 if part-timer job, and 0 otherwise	0.03	0.18
Public sector job	It takes value 1 if public sector job, and 0 otherwise	0.32	0.47
Unemployment episodes	Number of unmployment episodes in the last five years	0.54	1.42
Job-worker mismatches			
Overskilled	It takes value 1 if overskilled worker, and 0 otherwise	0.35	0.48
Underskilled	It takes value 1 if underskilled worker, and 0 otherwise	0.21	0.41
Wrongly skilled	It takes value 1 if wrongly skilled worker, and 0 otherwise	0.19	0.39
Yrs. Overeducation	Years of overeducation	1.11	2.05
Yrs. Undereducation	Years of undereducation	1.08	1.87

a. International Standard Classification of Education.

Figure 1

Identification of Skill Job-Worker Matches

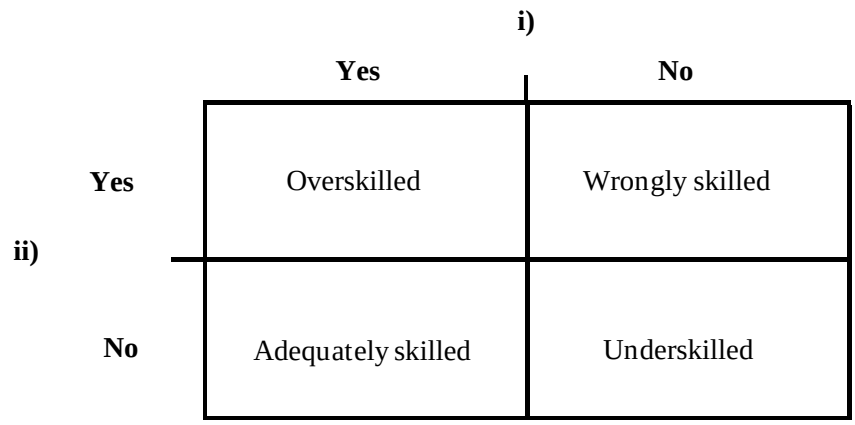

Table 2
Joint Distribution of Education and Skill Job-Worker Matches

	Overeducated	Adequately educated	Undereducated	Total
Overskilled	12.0	12.9	10.0	34.9
Adequately skilled	6.1	9.9	8.9	24.9
Underskilled[a]	11.4	15.6	13.2	40.2
Total	29.5	38.4	32.0	100.0
Pearson's χ^2		123.246		
P-value		0.000		
Cramér's V		0.063		

[a] Wrongly skilled workers are included as a special case of underskilled workers.

Table 3
Estimation Results for Job Satisfaction. Equation (1)

	Ordered probit		
	Coefficients		Robust Std. Error
Woman	0.043		0.029
Separated & divorced	-0.015		0.080
Single	-0.007		0.034
Work Experience	-0.019	***	0.005
Quadratic work experience/100	0.032	***	0.009
Tenure < 1 yr.	-0.023		0.050
Tenure: 1 - 5 yrs.	-0.080	***	0.037
Tenure: 6 - 10 yrs.	-0.074	***	0.033
ISCED 3	-0.056		0.035
ISCED 5-6, and doctorate	-0.030		0.042
Ln(wage)	0.279	***	0.029
Part-timer job	-0.103		0.070
Public sector job	0.147	***	0.029
Unemployment episodes	-0.020	***	0.010
Yrs. Overeducation	-0.011	*	0.006
Yrs. Undereducation	0.018	***	0.006
Overskilled	-0.169	***	0.025
Underskilled	-0.275	***	0.030
Wrongly skilled	-0.389	***	0.031
Cut 1	-2.065		0.103
Cut 2	-1.493		0.101
Cut 3	-0.821		0.101
Cut 4	-0.102		0.100
Cut 5	1.046		0.100
Log likelihood	-23377.165		
N	15685		

*p<0.10, **p<0.05, ***p<0.001

Table 4
Verbeek and Nijman Tests for Attrition. Equations (5) and (6)

	Ordered probit with unobserved heterogeneity				Dynamic ordered probit with unobserved heterogeneity			
	Pooled model		Random effect model		Pooled model		Random effect model	
	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error
Next wave	0.056**	0.027	0.061**	0.026	0.024	0.025	0.060**	0.026
All waves	0.071***	0.025	0.076***	0.029	0.059***	0.021	0.070***	0.026
Number of waves	0.008	0.006	0.006	0.007	0.007	0.006	0.007	0.007

*p<0.10, **p<0.05, ***p<0.001

Table 5
Estimations Results[a] of Job Satisfaction. Equations (5) and (6) Using IPW[b]

	Ordered probit with unobserved heterogeneity			Dynamic ordered probit with unobserved heterogeneity		
	Coefficients		Robust Std. Error	Coefficients		Robust Std. Error
Woman	0.043		0.038	0.038		0.031
Separated & divorced	-0.025		0.160	-0.035		0.146
Single	-0.129		0.105	-0.137		0.097
Work Experience	0.011		0.018	0.006		0.017
Quadratic work experience/100	-0.059	*	0.032	-0.041		0.029
Tenure < 1 yr.	0.119		0.095	0.146		0.095
Tenure: 1 - 5 yrs.	0.071		0.078	0.043		0.075
Tenure: 6 - 10 yrs.	-0.081		0.059	-0.092		0.058
ISCED 3	0.049		0.097	0.026		0.099
ISCED 5-6, and doctorate	-0.160		0.156	-0.105		0.150
Ln(wage)	0.168	***	0.053	0.137	***	0.052
Part-timer job	-0.044		0.149	-0.011		0.131
Public sector job	0.149	*	0.076	0.154	**	0.073
Unemployment episodes	-0.120		0.160	-0.133		0.144
Yrs. Overeducation	-0.005		0.009	-0.004		0.008
Yrs. Undereducation	0.004		0.010	0.004		0.010
Overskilled	-0.126	***	0.034	-0.118	***	0.035
Underskilled	-0.133	***	0.044	-0.155	***	0.046
Wrongly skilled	-0.186	***	0.045	-0.175	***	0.046
Satisfaction in wave=1: degree 1	-0.719	***	0.110	-0.441	***	0.093
Satisfaction in wave=1: degree 2	-0.416	***	0.079	-0.234	***	0.063
Satisfaction in wave=1: degree 3	-0.384	***	0.047	-0.226	***	0.041
Satisfaction in wave=1: degree 4	-0.193	***	0.042	-0.116	***	0.035
Satisfaction in wave=1: degree 6	0.376	***	0.047	0.265	***	0.040
Satisfaction in t-1: degree 1				-0.890	***	0.088
Satisfaction in t-1: degree 2				-0.704	***	0.062
Satisfaction in t-1: degree 3				-0.490	***	0.043
Satisfaction in t-1: degree 4				-0.257	***	0.030
Satisfaction in t-1: degree 6				0.308	***	0.036
Cut 1	-2.344		0.157	-2.527		0.133
Cut 2	-1.744		0.158	-1.897		0.133
Cut 3	-1.011		0.158	-1.131		0.133
Cut 4	-0.266		0.158	-0.357		0.132
Cut 5	0.919		0.158	0.863		0.132
Log likelihood	-19602.469			-19170.427		
N	13380			13380		
Likelihood-ratio test (equations (5) and (6)): Chi-squared = 864.08 P-value = 0.000						

a. Coefficients for the regressors of the within-individual means available on request.

b. Inverse probability weights estimated by using observed values of previous wave.

*p<0.10, **p<0.05, ***p<0.01.

Cut 1 - Cut 5 are the estimated cut points.

Table 6

Predicted Probability Distribution of Job Satisfaction for a Reference Individual[a] and Marginal Effects[b]. Equation (6) with IPW[c] Estimators

	Job satisfaction degree					
	1	**2**	**3**	**4**	**5**	**6**
Probability (Y)[a]	0.006	0.023	0.101	0.232	0.445	0.193
Yrs. Overeducation	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Yrs. Undereducation	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Overskilled	0.002 (0.001)	0.006 (0.002)	0.018 (0.005)	0.018 (0.006)	-0.014 (0.005)	-0.031 (0.009)
Underskilled	0.003 (0.001)	0.009 (0.003)	0.024 (0.007)	0.024 (0.007)	-0.020 (0.008)	-0.040 (0.012)
Wrongly skilled	0.004 (0.001)	0.010 (0.003)	0.027 (0.007)	0.027 (0.007)	-0.023 (0.008)	-0.044 (0.012)
Satisfaction in t-1: degree 1	0.013 (0.005)	0.031 (0.009)	0.072 (0.016)	0.057 (0.010)	-0.075 (0.023)	-0.098 (0.018)
Satisfaction in t-1: degree 2	0.005 (0.002)	0.014 (0.005)	0.037 (0.011)	0.035 (0.009)	-0.033 (0.012)	-0.057 (0.015)
Satisfaction in t-1: degree 3	0.005 (0.001)	0.014 (0.003)	0.035 (0.007)	0.034 (0.006)	-0.032 (0.009)	-0.056 (0.010)
Satisfaction in t-1: degree 4	0.002 (0.001)	0.006 (0.002)	0.017 (0.005)	0.018 (0.005)	-0.014 (0.006)	-0.030 (0.009)
Satisfaction in t-1: degree 6	-0.003 (0.001)	-0.011 (0.002)	-0.034 (0.006)	-0.046 (0.007)	0.013 (0.008)	0.081 (0.013)

a. The reference individual is male, adequately matched in terms of both education and skills in his job; he is married, has worked in the same company for over ten years in a full-time job within the private sector. His level of formal education corresponds to a level of International Classification of Education (ICSED) lower than 3 and the job satisfaction degree corresponding to the previous period and to the initial wave is 5. His experience, hourly wage, unemployed episodes and the continuous variables utilised to parameterize the unobserved heterogeneity take the mean value of the population distribution.

b. The marginal effects of the dummy variables show the discrete change from 0 to 1. The robust estandard error is in brakets.

c. Inverse probability weights estimated by using the regressors values of the previous wave.

n.s. indicates no significant effect.

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