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# DETERMINANTS OF OCCUPATIONAL MATCHING: AN EMPIRICAL ANALYSIS BASED ON ADMINISTRATIVE RECORDS*

*MAITE BLÁZQUEZ*
*AINHOA HERRARTE*
*FELIPE SÁEZ*
*Universidad Autónoma de Madrid*

Using data from administrative records of public employment offices, we study the main factors determining occupational matching, measured by the relationship between the occupation demanded by jobseekers on their job applications and the corresponding final occupation in the job they find. The demanded occupation is a more comprehensive concept about individuals' human capital as it involves not only educational level, but also other relevant aspects such as their specific work experience, precise skills and tasks, and workers' preferences for working in a precise occupation. Using an econometric approach based on proportional hazard models that account for unobserved factors, our results suggest that occupation-specific work experience is the main determinant of occupational matching, especially among men, older workers, and individuals with vocational education.

*Key words:* occupational matching, labour transitions, occupational mobility, job-specific experience.

*JEL classification:* J20, J24, J62.

Traditional labour markets have come to their end, giving way to a new paradigm of transitional labour markets that permit and promote mobility over the life course between a wide range of labour market statuses. This implies an understanding of the labour market not as an adjustment process of supply and demand, but as a mobility space integrated into a wider space including out-of-paid work positions in a flow approach. These modern day labour markets –far more complex than stylised, perfectly competitive ones– suffer, however, from numerous imperfections including wage rigidities, imperfect information on applicants' skills, matching frictions, and limited geographical mobility of workers. Such imperfections give rise to several types of skill imbalances ranging from skill shortages to qualification and skill mismatches [Quintini (2011)]. Skill mismatch has important economic implications at various levels. At the individual level, it affects job satisfaction and wages. At the firm level, it reduces productivity and increases on-the-job search

(*) We are grateful to the Editor and two anonymous referees for their comments on previous versions of this paper. All remaining errors are our own.

and turnover. Finally, at the macroeconomic level, it contributes to structural unemployment and reduces economic growth. For instance, there is recent evidence that mismatch in the UK labour market may explain as much as half of the movement of actual and steady state unemployment during the financial crisis [Smith (2013)].

This has led to a wide range of academic papers aimed at analysing the determinants and labour market consequences of skill mismatch. Education mismatch (or qualification mismatch) has been the most widely studied concept of mismatch because relevant data have been relatively easy and cheap to collect [see, for example, Alba (1993), Dolado *et al*. (2000), and Alba and Blázquez (2004) for the Spanish case, and Leuven and Oosterbeek (2011) for an international survey of the economics literature on overeducation]. However, education/qualification may be an imperfect proxy of individuals' skill endowment, which is certainly the case for those who left the education system years ago. Other papers have focused on skill mismatch; a concept that has been considered more suitable insofar as it allows considering important dynamic elements which surround the mismatch phenomena, such as the possibility for skill gain or loss on the supply side and the changing content of jobs on the demand side. In fact, there is evidence suggesting that skill mismatches are only weakly related to education mismatches [Allen *et al*. (2013)]. Nonetheless, the literature on skill mismatch is rather limited, particularly compared with the literature on overeducation and qualification mismatch. This is due to the difficulty of identifying good measures of skills and the paucity of databases that include such measures[1].

In this paper we address the issue of skill mismatch from the perspective of "occupational mismatch", which refers to the relationship between the occupation demanded by individuals involved in the job search process and the corresponding occupation in the job they find. In contrast to education, the demanded occupation is a more comprehensive concept about individuals' human capital as it does not only involve educational level, but also other relevant aspects such as their occupation-specific work experience, precise skills and tasks, and workers' preferences for working in a precise occupation. A priori, we would expect that workers would search for a job in an occupation suited to their education and labour market experience. Since each occupation is associated to specific tasks related to particular skills, when workers demand a precise occupation this could be reflecting some unobserved characteristics related to their abilities that we could not account for if we only look at educational level. For instance, workers with the same educational level could search alternatively for jobs as "Clerical workers with customer services" or "Clerical workers without customer services". This last case could be indicative of a lack of interpersonal skills, while we would expect high levels of communication skills among workers demanding an occupation "with customer services". Workers' preferences for employment across occupations are also embedded in the demanded occupation. For instance, we could observe workers demanding occupations that do not fully reflect their educational attainments or previous labour market experiences, just because they prefer jobs with more flexible working times or jobs with less responsibility or simply because they desire to change their professional career.

(1) Some exceptions are Mavromaras and McGuinness (2012), Mavromaras, *et al*. (2013) and Cedefop (2010, 2012).

An important aspect of this study is that we analyse the determinants of occupational matching for the case of jobseekers who use public employment services (PES) in the job search process. Therefore, our analysis contributes to the knowledge about PES intermediation actions in order to improve their functioning. To achieve this aim, we combine information from two administrative records – jobseekers and contracts records – provided by the PES of the Community of Madrid (Spain) corresponding to the period 2006-08[2]. The Community of Madrid is the seventh largest region[3] in the EU, representing 1.4% of the economically active population of the EU28 and 2.1% of the euro area. Within the EU, all regional or national PES function autonomously and are structured differently. In June 2014, the EU adopted the Decision[4] to create a European Network of PES to guarantee the cooperation of all PES of the Member States in order to maximise their efficiency. The Network would allow comparing the performance of PES activities, identifying good practices, and fostering mutual learning. As set out in the text of the Decision, one of the aims of the Network of PES is "the identification of skills shortages and the provision of information on their extent and location, as well as the better matching of the skills of job-seekers with the needs of employers". Thus, exploiting the data collected by any European PES can serve to show the high potential of administrative records to identify which occupations and which social groups could achieve a good skill match, as well as determine the most vulnerable groups. At the same time, this type of analysis could be used to assist any PES in the placement process.

One important novelty of the database is that it contains information on job search characteristics and hence on the demanded occupation, thus allowing us to analyse the determinants of occupational matching. To the best of our knowledge, the information provided by this database has not yet been exploited to carry out this type of analysis.

The rest of the paper is organised as follows. Section 1 describes the role of PES as intermediaries in the job search process. It also offers a detailed description of the data extracted from the administrative records. Section 2 explains the database and contains descriptive evidence of occupational matching rates and occupational transitions in those cases where occupational matching failed to be reached. Section 3 provides an econometric analysis of the main determinants of occupational matching. Finally, section 4 concludes.

## 1. Public Employment Services

PES are the authorities that facilitate the connection between jobseekers and employers. Since the 1970s, PES have been used as an instrument by most EU governments in an attempt to tackle growing unemployment rates. Although PES have

(2) The data were provided by the Regional Employment Observatory belonging to the Council for Education and Employment of the Community of Madrid. The Community of Madrid covers 14.8% of the Spanish active population in 2006 (Spanish Labour Force Survey).

(3) Eurostat Regional Statistics (NUTS 2).

(4) Decision No 573/2014/EU of the European Parliament and of the Council of 15 May 2014 on enhanced cooperation between Public Employment Services.

no automatic right to deliver active labour market policies, in practice they have become both the gateway and the gatekeeper for such policies in many countries. Because of this, PES have recently undergone substantial changes as governments have tried to improve the effectiveness and flexibility of labour market measures. For instance, PES often play a direct delivery role in job search assistance programmes that include self-help provision, group activities, and individual assistance. They also take an active role in the provision of training and education programmes, which is not only to inform participants about these programmes, but may also extend to the organisation and sponsorship of them.

In sum, PES provide tools and assistance to jobseekers and potentially help them to find employment more rapidly or with a better match than might otherwise be the case. In this sense, PES may support and coordinate the job matching process through various types of actions: i) vocational orientation at different levels (basic orientation, personalised attention, individualised tutoring, etc.) for which the unemployed formalise their commitment to participate in the actions planned; ii) participation in vocational training courses at different content levels (initial, professional, retraining, etc.); and iii) performance of certain employment activities in return for a basic income managed by the corresponding PES (the so-called 'active insertion income').

Examining the performance of jobseekers registered at public employment offices might be of special relevance for policymakers, especially in designing the most appropriate programmes intended to improve the matching of labour supply and demand. This requires exploiting the information contained in the administrative records provided by the public employment offices of any country at the micro level.

At the international level, the literature that analyses the placement role and the efficiency of PES in the labour market is quite extensive, with a general finding that PES work better for individuals with unfavourable labour market prospects [see among many others Dolton and O'Neil (1995, 1996), Gorter and Kalb (1996), Heckman *et al*. (1999), OECD (2003), Van Reenen (2003), Crépon *et al*. (2005), Fougère *et al*. (2005)][5]. For the Spanish case, we should mention the work of Alujas (2007) that analyses the labour intermediation of PES at both national and regional levels, the work of Albert and Toharia (2007) that focuses on the administrative data of the region of Andalusia, and the study of Suárez and Mayor (2009) that analyses the existence of regional differences in PES intermediation. Other papers have also made use of the administrative records provided by public employment offices to analyse the labour market outcomes of workers that search for a job via this channel. Some of these works also examine the importance of unemployment benefits on unemployment hazard rates [Cebrián *et al*. (1996), Arranz and Muro (2004a, 2004b), Jenkins and García-Serrano (2004), Alba *et al*. (2007)].

(5) Some empirical studies report that jobseekers using public employment agencies have longer unemployment spells than those using other methods [see Holzer (1988) and Blau and Robbins (1990) for the US, Osberg (1993) for Canada, Böheim and Taylor (2002) for the United Kingdom, and Addison and Portugal (2002) for Portugal].

### *1.1. The new PES information system: Administrative records*

In May 2005, the so-called Information System of Public Employment Services (SISPE) entered into operation in Spain. The SISPE aims at improving the role of labour mediation carried out by the PES. It is based on the active collaboration between national and regional authorities to improve the quality of data collection and therefore to obtain better labour market statistics[6]. Following the creation of the SISPE, more accurate information on both the supply and demand side of the labour market has become available to researchers interested in examining different aspects of the job matching process. In this paper, we make use of part of this information (specifically that referring to jobseekers and contracts records) to analyse the quality of job matching through what we define as "occupational matching rates".

As in other EU countries, a considerable proportion of unemployed workers[7] in Spain are registered at public employment offices[8], independently of whether they really use this channel in the job search process. Registration in the jobseekers record is voluntary, except for those receiving benefits. Enrolment is also a pre-requisite for jobseekers who want access to active labour market measures and support for active job search. It should be noted that although PES help match labour market supply and demand for all jobseekers, their primary focus is on those individuals for whom it is more difficult to find employment, mainly low-skilled workers, vulnerable groups, and those furthest away from the labour market. Hence, jobseekers registered at employment offices tend to have different personal characteristics, as well as less knowledge of the labour market and weaker professional networks.

When registering, a worker can become a candidate if his professional profile matches any of the job offers available at the employment offices. The PES and their network of local agencies inform unemployed workers about available job vacancies. For those jobseekers that are not selected by any employer, the local employment office continues to channel offers to them while they remain unemployed. When this situation persists for a long time, the office could force jobseekers to participate in active labour market policies as a condition to continue receiving unemployment benefits. When jobseekers get a job, they are subsequently removed from the jobseekers record. Similar to what occurs in other European countries, employers in Spain have no legal obligation to register their job vacancies with the PES, but they do have to inform the PES if they fill a vacancy. Thus, every employment contract must be registered in the contracts record.

The jobseekers record includes, among other workers' characteristics, the occupation demanded by the unemployed worker. When jobseekers get a job, the information regarding the requested occupation can be linked to information about the occupation corresponding to the contract, which is extracted from the contracts record. Consequently, the possibility of combining both types of records enables us to carry out an analysis of the determinants of occupational matching.

(6) See Toharia and Malo (2005) and Hernando (2007) for a detailed description of the role of the SISPE.

(7) According to the Spanish Labour Force Survey, 70% of unemployed workers are registered in public employment offices.

(8) The Spanish PES comprise the regional employment services of the 17 Autonomous Communities, which collect regional data about job offers, job requests, and contracts.

## 2. Data and descriptive analysis

Our database combines information from two administrative records of the PES in the Community of Madrid in Spain: the jobseekers record and the contracts record. Taking into account that the determinants of occupational matching could be affected by the strong contraction in GDP and employment that occurred in Spain in 2009 due to the economic crisis [see Lacuesta and Izquierdo (2012), Carrasco *et al*. (2012), Anghel *et al*. (2014)], we have restricted the period of analysis to the non-crisis period (February 2006-December 2008).

The jobseekers record includes the universe of jobseekers registered at public employment offices each month. We focus on unemployed workers, who account for 80% of total jobseekers. In order to ensure that the jobseekers are similar in terms of the duration of their unemployment spells and that they started searching for a job under similar economic conditions, we have restricted the sample to unemployed workers who were enrolled in the PES for less than a month in the same specific period, concretely in February 2006. The jobseekers record contains information regarding personal characteristics such as gender, age, educational level, and others. However, what is most relevant for our purposes is the fact that the record contains information on the characteristics of the job search. In particular, there are several variables which contain very detailed information on the occupation being sought. Precisely, the data let us know the 4-digit demanded occupation[9] of the National Classification of Occupations (CNO-94) of jobseekers, as well as the specific occupational experience they have. On their applications, jobseekers may indicate more than one acceptable occupation.

The contracts record includes all the employment contracts that have been secured during a specific period of time. Since the registration of contracts is mandatory, this record contains all the contracts that an individual has had, as well as information on the characteristics of the contract and some employer characteristics. Among contract characteristics, the main variable for our aims is the occupation in the job at a 4-digit level. For the purposes of this paper, we have selected all contracts registered from February 2006 to December 2008. After excluding jobseekers older than 60 in February 2006, disabled people, and those seeking occupations in the "Armed Forces" category, we end up with a sample of 40,269 unemployed people[10]. Table A1 in the Appendix contains descriptive statistics of the selected sample. As can be seen, the percentage of women is higher than that of men, while the majority of the sample is aged 16-44 years old and jobseekers with lower secondary education are the most representative group[11]. Regarding the occupation requested

(9) The original database provides information about the 8-digit demanded occupation. We only focus on the 4-digit level as this is the maximum level of disaggregation in the contracts record.

(10) We have also eliminated outliers from the analysis. Specifically, we have eliminated those individuals whose number of contracts during the period Feb. 2006-Dec. 2008 is 10 times higher than the standard deviation of the whole sample.

(11) As we pointed out previously, jobseekers registered at employment offices tend to exhibit different personal and labour characteristics than individuals who are not registered. Consequently, our subsample of jobseekers differs somewhat from the corresponding non-employed individuals accounted for in the Spanish Labour Force Survey. In particular, our dataset comprises a higher percentage of women and individuals above the age of 30, as well as a higher percentage of individuals with only primary education and a lower proportion of jobseekers with tertiary education.

by the jobseekers, our data reveals the predominance of a demand for low-skilled occupations. More than 25% of jobseekers state that they are searching for a job within the category of "Elementary occupations". Nonetheless, the demanded occupation is linked to the personal characteristics of the jobseekers. In the Appendix, Tables A1, A2, and in more detail Table A3, show that both men and women with primary education demand jobs in "Elementary occupations". "Service and sales workers" are highly demanded by women, while jobs within the group of "Craft workers" are mostly demanded by men. Among jobseekers with secondary or tertiary education, the most frequently demanded occupations are "Professionals" and "Technicians", but this is only true for men, insofar as women are more prone to demand jobs as "Clerical workers" instead of "Technicians". A second aspect to be noted from Table A3 is that more educated jobseekers –both women and men and independently of their age– demand a wider set of occupations. For example, 47% of men older than 30 with secondary or tertiary education focus their job search on two main occupations, while the corresponding figure for men with less education is 63%.

After merging both records, we construct the "occupational matching rate" by comparing the demanded occupation to the occupation linked to each of the contracts held by the individuals. Specifically, we define as "occupational matching" when the first or second demanded occupation on jobseekers' job applications at period *t* perfectly matches the occupation of the contract observed at *t*. As jobseekers may modify their job search characteristics across time[12], we also consider that an occupational match has been achieved if the occupation of the contract at period *t* is the same as the occupation the jobseeker requested in February 2006. Situations where the individual has not had a job during the period of analysis are considered as no occupational matching. Occupational matching can be computed at several levels. The most detailed level at which it can be calculated is the 4-digit level of disaggregation of the CNO-94.

Table 1 presents descriptive information regarding occupational matching and the main personal and job characteristics. The average 4-digit occupational matching rate amounts to 30.22% but there are differences depending on personal characteristics. The matching rate increases with the age of the individual until mid-age. Attending to educational levels, the highest values of occupational matching are found among individuals with no schooling or only primary studies. This result should not be necessarily understood as a symptom of worse labour market outcomes among highly educated workers. Instead, it might be explained by the higher degree of professional versatility that characterises these workers. Table 1 shows that the matching rate is, however, higher for jobseekers with more years of experience in the occupation. While individuals with no occupational work experience exhibit an occupational matching rate of 15.2%, the figure is over 38% for those jobseekers with more than two years of specific occupational experience. Table A3 in the Appendix displays the occupational matching rate for more detailed sociodemographic groups.

(12) In our database, only 11.3% of individuals changed the demanded occupation during the period analysed. For these individuals, we will consider that occupational matching is achieved either if they get a job in an occupation that coincides with the demanded occupation at t or one that coincides with the demanded occupation in February 2006. This last group comprises 13.9% of the abovementioned 11.3% of jobseekers.

Table 1: FOUR-DIGIT OCCUPATIONAL MATCHING RATE BY PERSONAL AND JOB CHARACTERISTICS

| | Total Jobseekers N obs. | 4-digit occupational matching rate | 4-digit occupational matching rate (over jobseekers with ≥ 1 contracts) | Jobseekers with no contracts (%) |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Total | 40,269 | 30.22% | 49.55% | 39.01% |
| Men | 18,144 | 30.19% | 49.19% | 38.64% |
| Women | 22,125 | 30.25% | 49.84% | 39.31% |
| < 30 years | 16,594 | 19.27% | 48.64% | 60.38% |
| 30-44 years | 16,816 | 38.61% | 48.62% | 20.60% |
| 45-60 years | 6,859 | 36.14% | 53.50% | 32.44% |
| Primary education and no schooling | 10,914 | 34.19% | 59.66% | 42.70% |
| Lower secondary education | 13,025 | 30.51% | 52.43% | 41.81% |
| Vocational upper secondary education | 2,647 | 30.90% | 49.97% | 38.16% |
| Academic upper secondary education | 6,304 | 27.52% | 43.26% | 36.37% |
| Vocational tertiary education | 2,129 | 29.22% | 42.60% | 31.42% |
| Academic tertiary education | 5,250 | 24.55% | 35.61% | 31.05% |
| Spanish | 32,487 | 27.13% | 47.10% | 42.41% |
| Foreign | 7,782 | 43.13% | 57.36% | 24.81% |
| First demanded occupation | | | | |
| Managers | 643 | 17.57% | 26.90% | 34.68% |
| Professionals | 4,139 | 23.29% | 34.66% | 32.81% |
| Technicians | 4,005 | 25.22% | 38.67% | 34.78% |
| Clerical workers | 6,039 | 25.88% | 41.85% | 38.15% |
| Service and sales workers | 7,622 | 32.72% | 58.92% | 44.46% |
| Skilled agricultural workers | 429 | 25.17% | 44.08% | 42.89% |
| Craft workers | 5,139 | 35.75% | 56.21% | 36.41% |
| Operators and assemblers | 1,950 | 34.56% | 49.63% | 30.36% |
| Elementary occupations | 10,303 | 33.06% | 57.64% | 42.65% |
| Previous occupational work-experience | | | | |
| No experience | 10,068 | 15.21% | 36.18% | 57.97% |
| ≤ 1 year | 10,066 | 29.89% | 50.78% | 41.13% |
| > 1 & ≤ 2 years | 4,540 | 35.81% | 53.52% | 33.08% |
| > 2 years | 15,595 | 38.49% | 52.82% | 27.12% |
| Demanding only 1 occupation | 11,317 | 28.70% | 50.90% | 43.62% |
| Demanding more than 1 possible occupation | 28,952 | 30.81% | 49.07% | 37.21% |

Source: Own calculations using administrative records from the PES of the Community of Madrid.

The highest occupational matching rates are found among men above the age of 30 with primary education (45.3%), followed by their female counterparts (40.9%), while young people with primary education display the lowest figures.

It is interesting to observe the differences in the occupational matching rate of the major occupational categories. The matching rate reaches its highest value within the group of "Craft workers" (35.7%) and is closely followed by the groups of "Operators and assemblers" (34.6%) and "Elementary occupations" (33.1%). The lowest values of the 4-digit occupational matching rates are found among "Managers" (17.6%).

The corresponding 4-digit occupational matching rate calculated over the subsample of jobseekers who found a job is reported in column 3. Overall, the figures are in line with the previous ones. Finally, in column 4 we report the percentage of jobseekers that did not get a job during the period of analysis.

For jobseekers who found a job but who did not reach a perfect 4-digit occupational match, we calculate two additional indicators intended to provide further insight on the type of occupations they secured. Column 1 in Table 2 displays the same 4-digit occupational matching rate displayed in column 2 of Table 1. In column 2 of Table 2, we report the share of the total jobseekers that ends up in occupations within the same 1-digit occupational group, while column 12 shows the percentage of individuals who secured a job in occupations that completely differ from the demanded occupation. Finally, column 13 shows the percentage of jobseekers that did not find any job.

Some points are worth noting when looking at these indicators. First, there are some occupational categories that do not only register low values of 4-digit occupational matching rates, but also record low values at the 1-digit level. This occurs in the groups of "Managers" and, to a lesser extent, "Technicians". In addition, we find the highest values in column 12 for these groups and "Professionals", suggesting that they tend to end up in occupations that completely differ from the demanded occupation. This could be a symptom of a high level of mismatch but it could also suggest a high level of professional versatility. In contrast, only around 10-12% of jobseekers with demanded occupations in the categories of "Elementary occupations" and "Craft workers" found a job in occupations belonging to a different category at the 1-digit level.

Second, some occupational groups, such as "Clerical workers" and "Professionals", display a slight 4-digit occupational matching rate, but high values at the 1-digit level, thus indicating the existence of common tasks among occupations classified in these major groups[13].

As a final point, columns 3 to 11 of Table 2 contains a matrix of occupational transitions from demanded to final occupations for the 5,930 jobseekers that did not achieve any occupational match. In some cases this implies an occupational upgrading if the final occupation involves higher-skilled tasks than the requested occupation, whereas in other cases jobseekers experience occupational downgrading. The former situation is observed especially among "Elementary occupations", for which the majority of flows go towards occupations belonging to the groups of "Service and sales workers" (4.2%) and "Clerical workers" (2.1%).

(13) Table A4 in the Appendix contains a list of the most frequently skills used at work by occupations at 1-digit level in Spain. The information is based on the OECD Survey of Adult Skills (PIAAC).

Table 2: Occupational matching rates and occupational transitions

| | Occupational mismatch<br>Occupation in the job (major groups) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Demanded occupation* | 4-digit OM (1) | 1-digit OM (2) | Managers (3) | Prof. (4) | Tech. (5) | Cleric. wks (6) | Serv. Sales wks (7) | Skilled Agric. (8) | Craft wks (9) | Operators (10) | Elem. occup. (11) | Total occ. mismatch (12) | No contracts (13) |
| Total | 30.2% | 16.0% | 0.4% | 0.9% | 2.0% | 3.3% | 2.9% | 0.2% | 1.0% | 0.9% | 3.2% | 14.7% | 39.0% |
| 1. Managers | 17.6% | 15.7% | – | 6.2% | **9.8%** | 8.2% | 4.7% | 0.0% | 0.6% | 1.1% | 1.4% | 32.0% | 34.7% |
| 2. Professionals | 23.3% | 19.7% | 1.4% | – | 6.7% | **10.4%** | 2.6% | 0.0% | 0.5% | 0.6% | 2.0% | 24.2% | 32.8% |
| 3. Technicians | 25.2% | 16.8% | 0.8% | 3.3% | – | **8.0%** | 3.9% | 0.1% | 1.9% | 1.0% | 4.0% | 23.1% | 34.8% |
| 4. Clerical workers | 25.9% | 21.4% | 0.4% | 1.1% | 3.2% | – | **4.5%** | 0.2% | 0.4% | 0.6% | 4.0% | 14.5% | 38.2% |
| 5. Service and sales workers | 32.7% | 12.0% | 0.2% | 0.5% | 1.3% | 2.7% | – | 0.2% | 0.8% | 0.6% | **4.4%** | 10.8% | 44.5% |
| 6. Skilled agricultural workers | 25.2% | 13.5% | 0.0% | 0.7% | 0.2% | 2.6% | 3.7% | – | 2.3% | 0.5% | **8.2%** | 18.2% | 42.9% |
| 7. Craft workers | 35.7% | 15.9% | 0.0% | 0.3% | 1.2% | 1.0% | 2.0% | 0.2% | – | 1.9% | **5.3%** | 11.9% | 36.4% |
| 8. Operators and assemblers | 34.6% | 17.0% | 0.1% | 0.4% | 1.7% | 1.8% | 3.0% | 0.4% | 3.7% | – | **6.9%** | 18.1% | 30.4% |
| 9. Elementary occupations | 33.1% | 14.2% | 0.1% | 0.4% | 0.8% | 2.1% | **4.2%** | 0.3% | 1.3% | 0.9% | – | 10.0% | 42.6% |

Numbers in bold: Highest frequency.

Note: Transitions are computed considering the modal value of the 4-digit occupation of all the contracts they secured during the period of analysis.

Source: Own calculations using administrative records from the PES of the Community of Madrid.

Occupational upgrading, in contrast, is less likely when the demanded occupation involves high-skilled tasks, such as "Professionals", "Technicians" and especially "Managers". For these occupational categories we observe, as expected, higher rates of occupational downgrading. For example, 10.4% and 8% of jobseekers whose demanded occupations are respectively "Professionals" and "Technicians" end up being employed as "Clerical workers".

Despite these general patterns, when we analyse the corresponding transitions between occupations for different sociodemographic groups attending to gender, age, education, and demanded occupation, some differences stand out that could be considered relevant information for PES in their labour market intermediation process, and especially in the profiling of unemployed. This information is summarised in Table A3 in the Appendix. For example, men above the age of 30 with primary education who demand jobs as "Craft workers" exhibit a 4-digit occupational matching rate of 51.9%. 13.1% of these jobseekers find a job in the same occupational category at the 1-digit level, 11.5% go towards jobs in "Elementary occupations", and 3.3% end up as "Operators". Finally, 15% of these jobseekers did not secure a contract during the period of analysis.

Some other aspects are worth noticing when looking at the results of Table A3. First, individuals with primary education exhibit large flows between "Elementary occupations" and "Service and sales workers". Nonetheless, these flows are especially significant for women, while transitions between "Elementary occupations" and "Craft workers" are more relevant for men. Second, there is a strong association between "Professionals" and "Technicians" among more educated individuals, but once more we can observe gender differences: these transitions are more common among men, whereas the transitions between "Professionals" and "Clerical workers" are observed more frequently for women. Regarding this finding, there is a relevant aspect to be noted. As we pointed out previously, one of the most demanded occupations by men and women older than 30 with secondary or tertiary education is "Professionals", and both of them achieved very similar 4-digit occupational matching rates (23.2% and 23.3%, respectively). Nevertheless, when they do not achieve a 4-digit occupational match, the major flows for men go towards other occupations belonging to the same 1-digit category of "Professionals" (15.1%), while in the case of women they get jobs as "Technicians" (17%), and only 11.7% end up in occupations belonging to "Professionals". This pattern is also observed for their counterparts younger than 30. This result might suggest that when educated women cannot achieve a perfect occupational match they tend to experience an occupational downgrading. Moreover, it could be also related to the fact that women exhibit lower employment probabilities and longer unemployment durations than men, so that they are more likely to accept jobs in occupations that differ from the one they were initially seeking.

Third, although occupational upgrading is less frequent among more educated jobseekers, we can observe some situations that are worth mentioning. Though the most relevant flows for young men with secondary or tertiary education with a demanded occupation of "Technicians" go towards occupations within the same 1-digit occupational family (7.5%), the flows towards "Professionals" are of similar magnitude (7%). Regarding their female counterparts, and to a lesser extent, we can also observe an occupational upgrading from "Clerical workers" to "Technicians" (for 4.8% of young women and 6.7% of women older than 30).

All in all, these results suggest that an occupational mismatch does not necessarily mean occupational downgrading insofar as the final occupational category of mismatched workers involves the performance of higher-skilled tasks in some cases.

Summing up, our results might be very useful for PES in their role of "profiling". In particular, the identification of "target groups" of jobseekers according to their occupational matching probabilities might help PES counsellors in assessing the needs of unemployed individuals and their relative 'fit' to opportunities within the current labour market, which constitutes the basis for allocating or targeting the most effective employment services and for matching jobseekers to the appropriate vacancies. In this respect, employment offices might channel jobseekers not only towards job offers related to the occupation specified in their application, but also towards those for which we observe a high rate of flows. This should be accompanied by specific orientation services (basic orientation, personalised attention, individualised tutoring, etc.) in order to guide the job search process and to help jobseekers find employment more rapidly and with a better match. Such orientation measures might be complemented with specific training programmes, especially for the less educated, long-term unemployed and jobseekers that are not able to find a job in their demanded occupation. This last case would require more detailed information on the tasks and skills required in the job vacancy descriptions, which would help PES in their role of 'making workers fit for the market'. Further research would be necessary in this regard, with the development of skills-based profiling and matching tools intended to support jobseekers and assist PES in placement, thus improving the matching process (in terms of quality, efficiency, and potential for automation). In particular, these tools should be intended to empower jobseekers by giving them the knowledge of those skills that will enable them to move between jobs, occupations, and sectors. In addition, this knowledge may help jobseekers to better diagnose their individual strengths and weaknesses, and employment offices to provide the most effective training programmes. Nonetheless, since matching is bidirectional, its quality is determined by the level of detail being achieved in the profiling process for both jobseekers and in the specification of vacancies. Therefore, the development of these tools would require a common understanding and common language of skills and competencies that allows for the construction of standardised lists that should be linked to existing occupational classifications. This would imply a coordinated strategy involving all relevant stakeholders in the job matching process: employers, individual workers, central and local governments, PES, and social partners.

## 3. Determinants of occupational matching

### *3.1. Econometric model*

This section provides an econometric analysis of the determinants of occupational matching. For this purpose, we model the length of "occupational mismatch" spells using an econometric approach based on duration models. Since our selected sample comprises unemployed jobseekers who were registered for less than one month in the PES in February 2006, and we observe them until December 2008, we can distinguish two types of duration data. First, those who did not find an occupational matching at the 4-digit level at the end of the observed period (censored or in-

complete duration data); and second, those who left the occupational mismatch state during that interval (uncensored or completed duration data)[14]. The final database is an unbalanced panel with T = 35.

We estimate a discrete-time duration model in which the proportional-hazard assumption implies that each hazard $h(j)$ takes the complementary log-log form [Jenkins (1995, 2005)], where $j$ is the duration of the occupational mismatch. Thus, the general specification of the estimated hazard rate is given by:

$$h_i(j) = 1 - \exp\{-\exp(y_i(j))\}, \qquad j = 1 \ldots T \qquad [1]$$

For each individual $i$, $y_i(j)$ is expressed as follows:

$$y_i(j) = h_{i0}(j) + \beta X_i(j) + \theta_{iu} \qquad [2]$$

where $X_i(j)$ is a vector of explanatory variables that summarise observed differences between individuals, $\beta$ is the vector of parameters to be estimated, and $h_{i0}(j)$ captures the duration dependence. Finally, since unobserved heterogeneity may be an important concern in the context of duration analysis, we follow Meyer (1990) and apply the Prentice and Gloeckler (1978) model augmented with a gamma mixture distribution[15] to describe unobserved individual heterogeneity, $\theta_{iu}$.

The vector of characteristics includes time-invariant characteristics (gender, education, nationality, a dummy indicating if the person demands more than one occupation, and the employment rate in the demanded occupation[16]) and time-varying characteristics. Among the latter, we include age and its square, labour market situation at t-1 (employed or unemployed not receiving unemployment benefits), several dummies indicating the number of months until benefit expiration at t-1, occupational work experience, and the cumulative number of previous contracts at t-1 (and its square). We also include a set of quarterly dummies in order to control for potential seasonality. Duration dependence is expressed in logarithm terms, including also its square. Finally, the binary indicator variable $y_i(j)$ takes the value of 1 if a 4-digit occupational match is reached at period t[17] and 0 otherwise.

### *3.2. Results*

The estimation results with and without unobserved heterogeneity are presented in Table 3. To better understand the results, both the estimated coefficients and odds ratios are reported.

The first thing to be noted is that the likelihood ratio test suggests statistically significant frailty and, for all the regressors, the coefficients are larger in the model

(14) Notice that the occupational mismatch state includes both unemployment and employment without occupational matching.

(15) We use the pgmhaz8 Stata module coded by Jenkins (2004a).

(16) Percentage of contracts in occupation k over the total number of individuals demanding occupation k from February 2006 to December 2008.

(17) As we pointed out in section 3, jobseekers may change their demanded occupation across time. For these individuals, we consider that occupational matching is reached if they get either a job in an occupation that coincides with the demanded occupation at t or one that coincides with the demanded occupation in February 2006.

with unobserved heterogeneity, thus indicating that not controlling for unobserved factors would underestimate the effect of the covariates[18].

We obtain a positive and statistically significant duration dependence which suggests that the probability of occupational matching increases with the time an individual spends in an occupational mismatch state. To some extent, this result is in line with the matching theory [Diamond (1982), Mortensen (1982), Pissarides (1990)], which states that both workers and employers need time to get a good match that properly satisfies their needs. Nonetheless, the negative coefficient of the variable "Ln(Duration)^2" suggests that the effect becomes negative for longer spells.

Regarding the rest of the variables, we observe that the results of the econometric analysis are generally in line with those obtained in the descriptive analysis. Ceteris paribus, women register higher occupational matches than men. Family characteristics, such as the presence of children in the household, might explain this result to some extent. Insofar as childcare responsibilities reduce the time that females can spend on training activities resulting from accepting jobs in occupations that differ from the demanded occupation, they would be less likely to accept such jobs. In this sense, Leira (2000) and Pettit and Hook (2005) highlighted that family relations are factors that influence women's occupational choices[19]. Analysing the correspondence between higher education and the obtained profession for a Swedish population of individuals aged 26-28, Berggren (2011) also found that women are more likely to find a better match than men.

Our results show that occupational matching increases with age. This could be related to two facts. First, insofar as adults have more labour experience than young jobseekers, they are likely to be more realistic in their job applications. Second, the opportunity cost of switching occupations is higher for older jobseekers. On the one hand, as we specified before, accepting jobs in occupations that differ from the demanded occupation implies the need to invest time and money in training. On the other hand, as older individuals are closer to retirement they would receive the future returns of the new occupation for a shorter period of time than young people. In addition, switching occupations entails greater uncertainty about the development of the individual in a "new professional environment". Since older workers are more risk averse than their young counterparts, they are less likely to change their demanded occupation, thus resulting in a higher probability of occupational matching.

An interesting result from our estimations is that once gender, age, and job-specific experience is controlled for, the occupational matching probability seems to decrease with educational level. The largest differences are found for jobseekers with tertiary education (vocational and academic), who show around a 30.6% lower probability of matching than workers with primary education or no schooling. This re-

(18) To check for robustness, we have replicated the estimations under alternative assumptions of the unobserved heterogeneity distribution. Specifically, we use the Stata module hshaz coded by Jenkins (2004b) that estimates the Prentice and Gloeckler (1978) model augmented with a discrete mixture distribution to account for unobserved individual heterogeneity, as proposed by Heckman and Singer (1984). Our results are robust to this procedure. For the sake of clarity, the results are not shown but are available upon request.

(19) Unfortunately, our data does not include information about family characteristics and hence our empirical analysis does not control for household characteristics.

Table 3: Determinants of occupational matching. Total sample

| | Without Unobserved heterogeneity | | | With Unobserved heterogeneity | | |
|---|---|---|---|---|---|---|
| | Coeff. | SE | Odds Ratio | Coeff. | SE | Odds ratio |
| Ln(Duration) | 0.753 | (0.041) *** | 2.12 | 0.865 | (0.044) *** | 2.38 |
| Ln(Duration)^2 | -0.404 | (0.011) *** | 0.67 | -0.405 | (0.011) *** | 0.67 |
| Female | 0.064 | (0.019) *** | 1.07 | 0.054 | (0.023) ** | 1.06 |
| Age | 0.307 | (0.008) *** | 1.36 | 0.362 | (0.012) *** | 1.44 |
| Age*Age | -0.004 | (0.000) *** | 1.00 | -0.004 | (0.000) *** | 1.00 |
| Secondary (1st) (ref: primary) | -0.130 | (0.024) *** | 0.88 | -0.150 | (0.030) *** | 0.86 |
| Secondary (2nd) | -0.236 | (0.028) *** | 0.79 | -0.265 | (0.034) *** | 0.77 |
| Tertiary | -0.328 | (0.031) *** | 0.72 | -0.365 | (0.038) *** | 0.69 |
| Foreign | 0.336 | (0.023) *** | 1.40 | 0.421 | (0.031) *** | 1.52 |
| Occup. work experience: < 1 year | 0.581 | (0.033) *** | 1.79 | 0.660 | (0.039) *** | 1.93 |
| Occup. work experience: 1-2 years | 0.714 | (0.037) *** | 2.04 | 0.826 | (0.045) *** | 2.28 |
| Occup. work experience: > 2 year | 0.745 | (0.031) *** | 2.11 | 0.867 | (0.039) *** | 2.38 |
| Demanding more than 1 occupation | 0.105 | (0.021) *** | 1.11 | 0.155 | (0.026) *** | 1.17 |
| *Labour situation at t-1 (1)* | | | | | | |
| Employed | -1.163 | (0.035) *** | 0.31 | -1.183 | (0.037) *** | 0.31 |
| Unemployed not receiving unemployment benefits | -0.607 | (0.027) *** | 0.54 | -0.583 | (0.029) *** | 0.56 |
| 7-12 months remaining until benefit expiration | -0.273 | (0.042) *** | 0.76 | -0.286 | (0.044) *** | 0.75 |
| ≥ 13 months remaining until benefit expiration | -0.528 | (0.045) *** | 0.59 | -0.548 | (0.048) *** | 0.58 |
| Number of previous contracts | 0.316 | (0.015) *** | 1.37 | 0.364 | (0.017) *** | 1.44 |
| Number of previous contracts ^2 | -0.016 | (0.002) *** | 0.98 | -0.018 | (0.002) *** | 0.98 |
| 1-digit occup. employment rate | 2.528 | (0.226) *** | 12.53 | 3.359 | (0.298) *** | 28.76 |
| Ln (Gamma variance) | – | | – | | -0.067 | |
| Gamma variance | – | | – | | 0.936 *** | |
| N (observations) | | | 1,105,215 | | | |
| N (individuals) | | | 40,269 | | | |

LR test of Gamma var. = 0: chibar2(01) = 61.9954 Prob. ≥ chibar2 = 0.0000

*** Significant at 99%; ** Significant at 95%; * Significant at 90%. Estimations include a constant term and 3 quarter dummies.

(1) Reference category: Unemployed with 1 to 6 months remaining until benefit expiration.

Source: Own estimations using administrative records from the PES of the Community of Madrid.

sult is in line with the overeducation literature which argues that most educated workers experience a higher risk of overeducation[20]. Instead, it is usually the case that more educated people have a higher degree of professional versatility, which can be translated into a wider diversity of job offers. Thus, failing to get an exact occupational match does not necessarily imply a negative outcome since these workers may be employed in similar or even higher-skilled occupations than those demanded. The higher adaptability, as well as the greater capability of these individuals to develop new skills in order to perform new tasks, may contribute to increasing their employment probabilities, but could also reduce their likelihood of occupational matching. This result coincides with Stijepic (2016), who analysed occupational changes within firms and between firms, finding that educational attainment has a strong positive effect on internal and external workers' job mobility. Another explanation for the lower occupational match among highly educated workers could be derived from Boskin (1974): following the human capital theory, a worker will be willing to change his occupation if the future returns of the new occupation are large enough to cover the costs of training and other related costs. Nevertheless, not all workers have the same opportunities to invest in their own training, as these opportunities are mainly determined by their wealth position. In this sense, as highly educated workers are supposed to have the highest wages when employed, they are also supposed to be those that can better afford the necessary investment in training to switch occupations. Finally, it should be mentioned that more educated individuals are supposed to have greater abilities to learn new tasks and competencies, thus reducing the opportunity cost related to switching occupations.

Our results reveal that occupation-specific work experience is the most relevant determinant of occupational matching. Specifically, and taking jobseekers without any experience as the reference category, the probability of occupational matching is 2.4 times higher for those reporting more than two years of experience. This finding is in line with the human capital theory suggesting that the more job-specific human capital a worker has, the higher the losses of switching occupation and hence the less willing the jobseeker would be to accept jobs in occupations that differ from the demanded occupation [Becker (1962, 1975), Mincer (1962), Oi (1962), Miller (1984)]. In addition, the positive effect of occupational work experience could be explained by the fact that employers are more prone to hire workers with occupation-specific work experience as they would have to invest less in their training.

We find a positive coefficient of the dummy variable that captures whether individuals include more than one occupation on their application. This result suggests that workers who are more flexible in their job search exhibit a higher likelihood of occupational matching. Our estimations suggest that job mobility, measured by the number of previous contracts and its square, positively affects the rate of the job matching process. This result is in line with the matching theory [Jovanovic (1979)], which supports the idea that mismatched workers are expected to improve their job match over time. Nonetheless, the effect turns negative when the jobseeker has had too many contracts. This might be explained by the fact that changing jobs very often might be viewed as a negative signal by employers.

(20) See McGuinness (2006) for a review of the literature on overeducation.

Table 4: DETERMINANTS OF OCCUPATIONAL MATCHING BY GENDER

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | Coeff. | SE | OR | Coeff. | SE | OR |
| Ln(Duration) | 0.951 | (0.067) *** | 2.59 | 0.801 | (0.059) *** | 2.23 |
| Ln(Duration)^2 | -0.451 | (0.017) *** | 0.64 | -0.376 | (0.015) *** | 0.69 |
| Female | – | – | – | – | – | – |
| Age | 0.364 | (0.017) *** | 1.44 | 0.346 | (0.016) *** | 1.41 |
| Age*Age | -0.004 | (0.000) *** | 1.00 | -0.004 | (0.000) *** | 1.00 |
| Secondary (1st) (ref: primary) | -0.107 | (0.041) *** | 0.90 | -0.183 | (0.043) *** | 0.83 |
| Secondary (2nd) | -0.261 | (0.049) *** | 0.77 | -0.249 | (0.046) *** | 0.78 |
| Tertiary | -0.410 | (0.058) *** | 0.66 | -0.330 | (0.050) *** | 0.72 |
| Foreign | 0.352 | (0.042) *** | 1.42 | 0.461 | (0.044) *** | 1.59 |
| Occup. work experience: < 1 year | 0.678 | (0.064) *** | 1.97 | 0.664 | (0.049) *** | 1.94 |
| Occup. work experience: 1-2 years | 0.826 | (0.071) *** | 2.28 | 0.855 | (0.060) *** | 2.35 |
| Occup. work experience: > 2 year | 1.004 | (0.064) *** | 2.73 | 0.770 | (0.050) *** | 2.16 |
| Demanding more than 1 occupation | 0.078 | (0.035) ** | 1.08 | 0.245 | (0.040) *** | 1.28 |
| *Labour situation at t-1 (1)* | | | | | | |
| Employed | -1.252 | (0.054) *** | 0.29 | -1.133 | (0.051) *** | 0.32 |
| Unemployed not receiving UB | -0.647 | (0.043) *** | 0.52 | -0.523 | (0.040) *** | 0.59 |
| 7-12 months until UB expiration | -0.213 | (0.060) *** | 0.81 | -0.381 | (0.064) *** | 0.68 |
| ≥ 13 months until UB expiration | -0.437 | (0.063) *** | 0.65 | -0.727 | (0.073) *** | 0.48 |
| Num. of previous contracts | 0.353 | (0.025) *** | 1.42 | 0.382 | (0.025) *** | 1.47 |
| Num. of previous contracts^2 | -0.015 | (0.003) *** | 0.98 | -0.021 | (0.003) *** | 0.98 |
| 1-digit occup. employment rate | 3.328 | (0.356) *** | 27.89 | 2.656 | (0.510) *** | 14.2 |
| Ln (Gamma variance) | -0.377 | (0.249) | 0.69 | -0.004 | (0.208) | 1.00 |
| Gamma variance | 0.686 | (0.170) *** | | 0.996 | (0.207) *** | |
| LR test of Gamma var. = 0: chibar2(01) | 19.679 | | | 29.155 | | |
| Prob. ≥ chibar2 | 0.000 | | | 0.000 | | |
| N (observations) | | 494,728 | | | 610,487 | |
| N (individuals) | | 18,144 | | | 22,125 | |

*** Significant at 99%; ** Significant at 95%; * Significant at 90%.

Estimations include a constant term and 3 quarter dummies.

(1) Reference category: Unemployed with 1 to 6 months remaining until benefit expiration.

Source: Own estimations using administrative records from the PES of the Community of Madrid.

Table 5: Determinants of occupational matching by age groups

| | < 30 years | | | 30-44 | | | 45-60 years | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | SE | OR | Coeff. | SE | OR | Coeff. | SE | OR |
| Ln(Duration) | 1.367 | (0.097) *** | 3.92 | 0.803 | (0.061) *** | 2.23 | 0.774 | (0.102) *** | 2.17 |
| Ln(Duration)^2 | -0.565 | (0.024) *** | 0.57 | -0.361 | (0.015) *** | 0.70 | -0.388 | (0.025) *** | 0.68 |
| Female | 0.147 | (0.061) ** | 1.16 | -0.001 | (0.030) | 1.00 | 0.061 | (0.052) | 1.06 |
| Age | 0.530 | (0.022) *** | 1.70 | 0.024 | (0.058) | 1.02 | 0.634 | (0.139) *** | 1.89 |
| Age*Age | – | – | – | 0.000 | (0.001) | 1.00 | -0.007 | (0.001) *** | 0.99 |
| Secondary (1st) (ref: primary) | 0.109 | (0.091) | 1.12 | -0.151 | (0.040) *** | 0.86 | -0.260 | (0.059) *** | 0.77 |
| Secondary (2nd) | 0.079 | (0.098) | 1.08 | -0.317 | (0.046) *** | 0.73 | -0.520 | (0.077) *** | 0.59 |
| Tertiary | 0.124 | (0.105) | 1.13 | -0.642 | (0.056) *** | 0.53 | -0.762 | (0.105) *** | 0.47 |
| Foreign | 0.618 | (0.085) *** | 1.86 | 0.391 | (0.041) *** | 1.48 | 0.334 | (0.064) *** | 1.40 |
| Occup. work experience: < 1 year | 0.744 | (0.080) *** | 2.11 | 0.579 | (0.056) *** | 1.78 | 0.828 | (0.104) *** | 2.29 |
| Occup. work experience: 1-2 years | 1.008 | (0.095) *** | 2.74 | 0.708 | (0.064) *** | 2.03 | 0.949 | (0.120) *** | 2.58 |
| Occup. work experience: > 2 year | 1.082 | (0.085) *** | 2.95 | 0.744 | (0.057) *** | 2.10 | 0.807 | (0.094) *** | 2.24 |
| Demanding more than 1 occupation | 0.320 | (0.069) *** | 1.38 | 0.174 | (0.035) *** | 1.19 | 0.293 | (0.059) *** | 1.34 |
| *Labour situation at t-1 (1)* | | | | | | | | | |
| Employed | -0.838 | (0.070) *** | 0.43 | -0.892 | (0.045) *** | 0.41 | -1.221 | (0.080) *** | 0.30 |
| Unemployed not receiving UB | -0.143 | (0.056) *** | 0.87 | -0.292 | (0.033) *** | 0.75 | -0.586 | (0.052) *** | 0.56 |
| 7-12 months until UB expiration | – | – | – | – | – | – | – | – | – |
| ≥ 13 months until UB expiration | – | – | – | – | – | – | – | – | – |
| Num. of previous contracts | 0.528 | (0.040) *** | 1.70 | 0.199 | (0.020) *** | 1.22 | 0.288 | (0.042) *** | 1.33 |
| Num. of previous contracts^2 | -0.024 | (0.004) *** | 0.98 | -0.007 | (0.002) *** | 0.99 | -0.014 | (0.005) *** | 0.99 |
| 1-digit occup. employment rate | 2.984 | (0.849) *** | 19.8 | 2.941 | (0.394) *** | 18.9 | 3.493 | (0.661) *** | 32.9 |
| Ln (Gamma variance) | 1.203 | (0.101) *** | 3.33 | -0.640 | (0.410) | 0.53 | -0.375 | (0.481) | 0.69 |
| Gamma variance | 3.330 | (0.335) *** | 0.527 | (0.216) ** | | 0.688 | (0.331) ** | | |
| LR test of Gamma var. = 0: chibar2(01) | 185.65 | | 6.611 | | | 5.245 | | | |
| Prob. ≥ chibar2 | 0.000 | | 0.005 | | | 0.011 | | | |
| N (observations) | | 501,471 | | | 427,895 | | | 175,849 | |
| N (individuals) | | 16,594 | | | 16,816 | | | 6,859 | |

*** Significant at 99%; ** Significant at 95%; * Significant at 90%.

Estimations include a constant term and 3 quarter dummies.

(1) Reference category: Unemployed with 1 to 6 months remaining until benefit expiration.

Note: Due to problems of convergence, estimations for age and educational level groups do not include controls for the number of months remaining until unemployment benefit expiration. In those cases, the reference category is unemployed receiving unemployment benefits. Estimations for youth < 30 years old does not include age squared as a control.

Source: Own estimations using administrative records from the PES of the Community of Madrid.

Table 6: Determinants of occupational matching by educational levels

| | Primary education or less | | | Vocational upper secondary | | | Academic upper secondary | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | SE | OR | Coeff. | SE | OR | Coeff. | SE | OR |
| Ln(Duration) | 0.936 | (0.058) *** | 2.55 | 0.818 | (0.177) *** | 2.26 | 0.851 | (0.120) *** | 2.34 |
| Ln(Duration)^2 | -0.397 | (0.014) *** | 0.67 | -0.405 | (0.043) *** | 0.67 | -0.360 | (0.029) *** | 0.70 |
| Female | -0.025 | (0.034) | 0.98 | 0.182 | (0.097) * | 1.20 | -0.010 | (0.067) | 0.99 |
| Age | 0.446 | (0.016) *** | 1.56 | 0.380 | (0.057) *** | 1.46 | 0.371 | (0.038) *** | 1.45 |
| Age*Age | -0.005 | (0.000) *** | 0.99 | -0.005 | (0.001) *** | 1.00 | -0.005 | (0.000) *** | 1.00 |
| Secondary (1st) (ref: primary) | – | – | – | – | – | – | – | – | – |
| Secondary (2nd) | – | – | – | – | – | – | – | – | – |
| Tertiary | – | – | – | – | – | – | – | – | – |
| Foreign | 0.630 | (0.038) *** | 1.88 | 0.087 | (0.291) | 1.09 | 0.386 | (0.093) *** | 1.47 |
| Occup. work experience: < 1 year | 0.712 | (0.053) *** | 2.04 | 0.704 | (0.176) *** | 2.02 | 0.720 | (0.110) *** | 2.05 |
| Occup. work experience: 1-2 years | 0.854 | (0.061) *** | 2.35 | 0.876 | (0.193) *** | 2.40 | 0.991 | (0.134) *** | 2.69 |
| Occup. work experience: > 2 year | 0.962 | (0.053) *** | 2.62 | 1.026 | (0.180) *** | 2.79 | 0.830 | (0.110) *** | 2.29 |
| Demanding more than 1 occupation | 0.238 | (0.037) *** | 1.27 | 0.238 | (0.122) * | 1.27 | 0.178 | (0.077) ** | 1.20 |
| *Labour situation at t-1 (1)* | | | | | | | | | |
| Employed | -0.978 | (0.044) *** | 0.38 | -1.168 | (0.133) *** | 0.31 | -0.899 | (0.092) *** | 0.41 |
| Unemployed not receiving UB | -0.405 | (0.033) *** | 0.67 | -0.336 | (0.093) *** | 0.71 | -0.250 | (0.072) *** | 0.78 |
| 7-12 months until UB expiration | – | – | – | – | – | – | – | – | – |
| ≥ 13 months until UB expiration | – | – | – | – | – | – | – | – | – |
| Num. of previous contracts | 0.339 | (0.023) *** | 1.40 | 0.411 | (0.071) *** | 1.51 | 0.428 | (0.050) *** | 1.53 |
| Num. of previous contracts^2 | -0.013 | (0.002) *** | 0.99 | -0.021 | (0.008) *** | 0.98 | -0.024 | (0.006) *** | 0.98 |
| 1-digit occup. employment rate | 2.901 | (0.423) *** | 18.20 | 5.961 | (1.475) *** | 388.1 | 5.131 | (0.910) *** | 169.10 |
| Ln (Gamma variance) | 0.373 | (0.116) *** | | 0.097 | (0.623) | | 0.658 | (0.284) ** | |
| Gamma variance | 1.452 | (0.169) *** | | 1.102 | (0.687) | | 1.930 | (0.547) *** | |
| LR test of Gamma var. = 0: chibar2(01) | 103.489 | | | 3.037 | | | 14.969 | | |
| Prob. ≥ chibar2 | 0.000 | | | 0.041 | | | 0.000 | | |
| N (observations) | | 643,381 | | | 72,038 | | | 178,358 | |
| N (individuals) | | 23,989 | | | 2,647 | | | 6,304 | |

*** Significant at 99%; ** Significant at 95%; * Significant at 90%. Estimations include a constant term and 3 quarter dummies.

Note: Due to problems of convergence, estimations for age and educational level groups do not include controls for the number of months remaining until unemployment benefit expiration. (1) Reference category: unemployed receiving unemployment benefits The estimation for jobseekers with academic tertiary education does not include a control for unemployed not receiving unemployment benefits. The reference category in this case is unemployed at t-1.

Source: Own estimations using administrative records from the PES of the Community of Madrid.

Table 6: Determinants of occupational matching by educational levels (continuation)

| | Vocational tertiary | | | Academic tertiary | | |
|---|---|---|---|---|---|---|
| | Coeff. | SE | OR | Coeff. | SE | OR |
| Ln(Duration) | 0.877 | (0.225) *** | 2.40 | 1.105 | (0.143) *** | 3.02 |
| Ln(Duration)^2 | -0.437 | (0.050) *** | 0.65 | -0.425 | (0.035) *** | 0.65 |
| Female | 0.204 | (0.103) ** | 1.23 | 0.080 | (0.080) | 1.08 |
| Age | 0.314 | (0.085) *** | 1.37 | 0.049 | (0.037) | 1.05 |
| Age*Age | -0.004 | (0.001) *** | 1.00 | -0.001 | (0.000) * | 1.00 |
| Secondary (1st) (ref: primary) | – | – | – | – | – | – |
| Secondary (2nd) | – | – | – | – | – | – |
| Tertiary | – | – | – | – | – | – |
| Foreign | 0.317 | (0.338) | 1.37 | -0.195 | (0.193) | 0.82 |
| Occup. work experience: < 1 year | 0.547 | (0.181) *** | 1.73 | 0.782 | (0.135) *** | 2.19 |
| Occup. work experience: 1-2 years | 0.706 | (0.244) *** | 2.03 | 1.191 | (0.175) *** | 3.29 |
| Occup. work experience: > 2 year | 0.883 | (0.215) *** | 2.42 | 1.079 | (0.150) *** | 2.94 |
| Demanding more than 1 occupation | 0.206 | (0.145) | 1.23 | 0.132 | (0.093) | 1.14 |
| *Labour situation at t-1 (1)* | | | | | | |
| Employed | -0.905 | (0.145) *** | 0.40 | -0.840 | (0.089) *** | 0.43 |
| Unemployed not receiving UB | -0.228 | (0.125) * | 0.80 | – | – | – |
| 7-12 months until UB expiration | – | – | – | – | – | – |
| ≥ 13 months until UB expiration | – | – | – | – | – | – |
| Num. of previous contracts | 0.599 | (0.111) *** | 1.82 | 0.392 | (0.055) *** | 1.48 |
| Num. of previous contracts^2 | -0.047 | (0.012) *** | 0.95 | -0.020 | (0.006) *** | 0.98 |
| 1-digit occup. employment rate | 2.997 | (1.397) ** | 20.02 | 2.709 | (0.991) *** | 15.02 |
| Ln (Gamma variance) | -0.026 | (1.400) | | 0.788 | (0.460) * | |
| Gamma variance | 0.974 | (1.364) | | 2.199 | (1.012) ** | |
| LR test of Gamma var. = 0: chibar2(01) | 0.578 | | | | 5.752 | |
| Prob. ≥ chibar2 | 0.224 | | | | 0.008 | |
| N (observations) | | 58,899 | | | 152,539 | |
| N (individuals) | | 2,129 | | | 5,250 | |

*** Significant at 99%; ** Significant at 95%; * Significant at 90%. Estimations include a constant term and 3 quarter dummies.

Note: Due to problems of convergence, estimations for age and educational level groups do not include controls for the number of months remaining until unemployment benefit expiration. (1) Reference category: unemployed receiving unemployment benefits The estimation for jobseekers with academic tertiary education does not include a control for unemployed not receiving unemployment benefits. The reference category in this case is unemployed at t-1.

Source: Own estimations using administrative records from the PES of the Community of Madrid.

Unemployment benefits have traditionally been considered as a brake for the job search process [Akin and Platt (2012)]. Nonetheless, besides providing economic relief to fulfil the basic needs of unemployed workers, the aim of such benefits is to support individuals during the job search in order to allow them to find a job that is suited to their professional characteristics. In this sense, we would expect unemployment benefits to have a positive effect on the probability of occupational matching. Our estimations seem to support this idea. Nevertheless, this positive effect diminishes as the time until benefit exhaustion increases. In particular, we find that jobseekers whose benefits will expire in more than one year's time have a 42.2% lower probability of occupational matching than those who have less than six months remaining.

Given that the determinants of occupational matching may be significantly affected by gender and age differences, as well by the educational level of jobseekers, in what follows we conduct a separate analysis for different sociodemographic groups. Regarding the level of education, we examine the determinants of occupational matching for primary, secondary, and tertiary education. As there may be differences between vocational and academic programmes, we split the results of secondary and tertiary education between academic and vocational programmes. Table 4 presents the results for gender and Table 5 and Table 6 display the results for age groups and educational levels respectively.

As for the whole sample, we find that women tend to register higher probabilities of occupational matching. Nevertheless, the differences are only significant for individuals with vocational education and for youths under 30. In all estimations, foreigners display higher probabilities of occupational matching, while its effect seems to be more intense among men and youth. This result might be related with the fact that foreigners are much more prone to demand low-skill occupations, which have higher occupational matching rates[21]. Precisely, when we look at separate estimations for educational levels (Table 6), it can be seen that the coefficient of nationality is only statistically significant among less educated jobseekers.

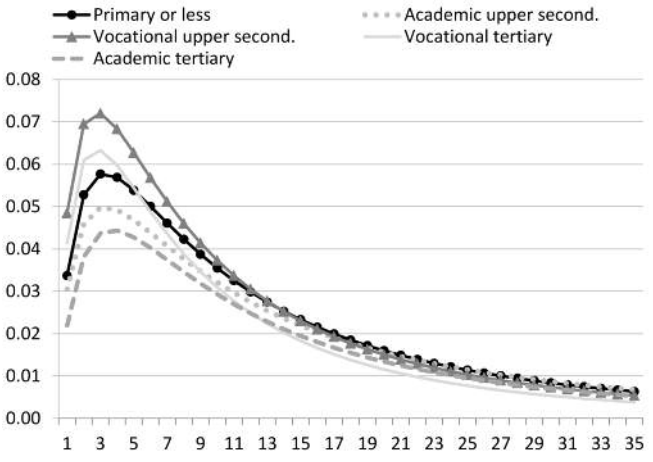
Although separate estimations for gender and age groups show that the effect of education on the probability of occupational matching is the same for almost all of the groups, it should be noted that differences are not significant among youth.

In Figure 1 we compute the corresponding hazard rates from the separated estimations by the educational groups displayed in Table 6. As can be observed, both secondary and tertiary vocational programmes exhibit higher hazard rates than the corresponding academic programmes. This finding highlights the importance of vocational education, which combines work experience in regular firms with schooling in order to improve students' occupation-specific skills [Kerckhoff (2001)] and hence their chances of achieving an occupational match. Thus, our results are, to some extent, in line with the "network theories", which posit that insofar as vocational education programmes give people access to the networks through which employers recruit young workers, such programmes are expected to exert a positive effect on individuals' labour market outcomes [Rosenbaum *et al*. (1990)].

As occurs for the whole sample, separate estimations by gender, age, and education confirm that the most relevant determinant of occupational matching is previous occupational work experience. This result is highlighted in Figures 2 to 4 that

(21) See Table A1 in the Appendix.

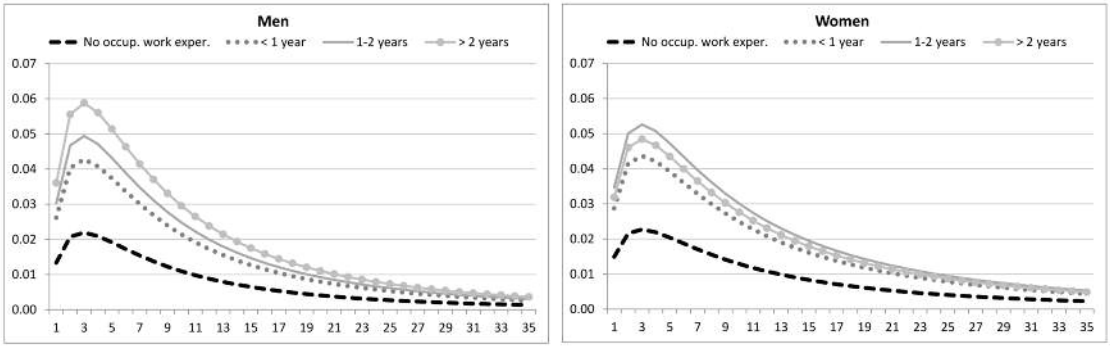
Figure 1: HAZARD RATES BY EDUCATIONAL GROUPS




Note: Hazard rates computed from separated estimations for an individual of reference: Spanish woman aged 34 years old with more than 2 years of occupational work experience, who demands more than one occupation, is unemployed, does not receive unemployment benefits at t-1, and has not had a previous contract.

Source: Own estimations using administrative records from the PES of the Community of Madrid.

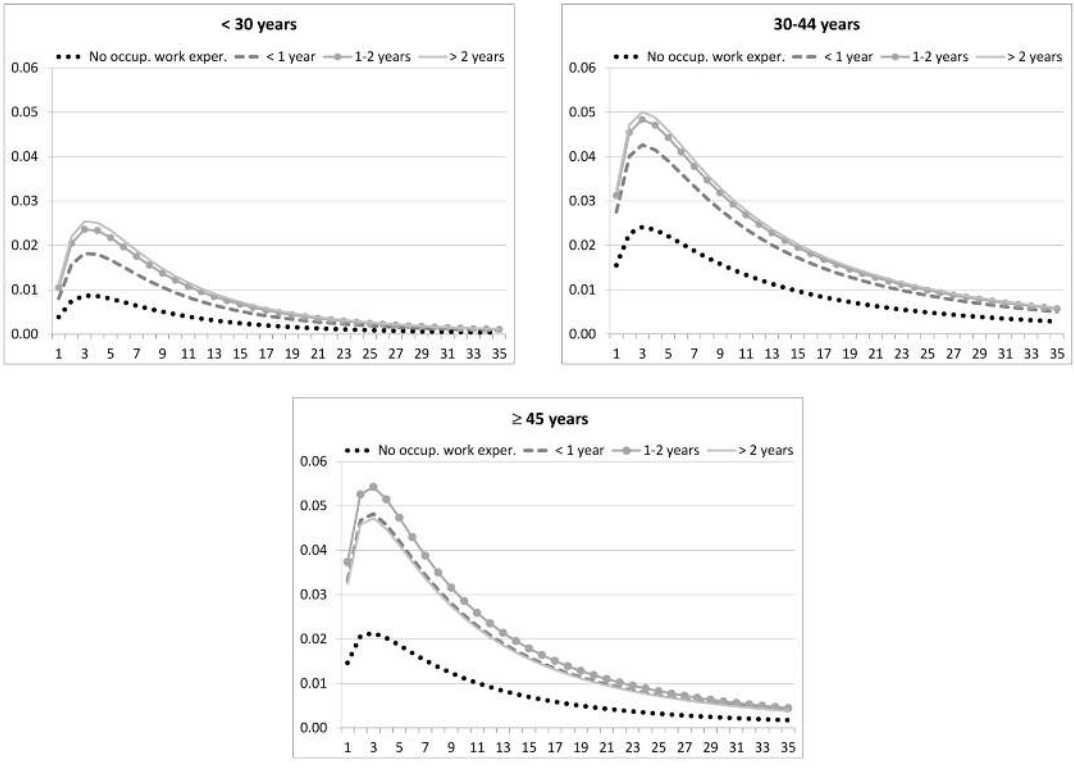
Figure 2: HAZARD RATES BY GENDER AND PREVIOUS OCCUPATIONAL WORK EXPERIENCE




Note: Hazard rates computed from separated estimations for an individual of reference: Spanish jobseeker aged 34 years old with lower secondary education, who demands more than one occupation, is unemployed, does not receive unemployment benefits at t-1, and has not had a previous contract.

Source: Own estimations using administrative records from the PES of the Community of Madrid.

Figure 3: HAZARD RATES BY AGE AND PREVIOUS OCCUPATIONAL WORK EXPERIENCE



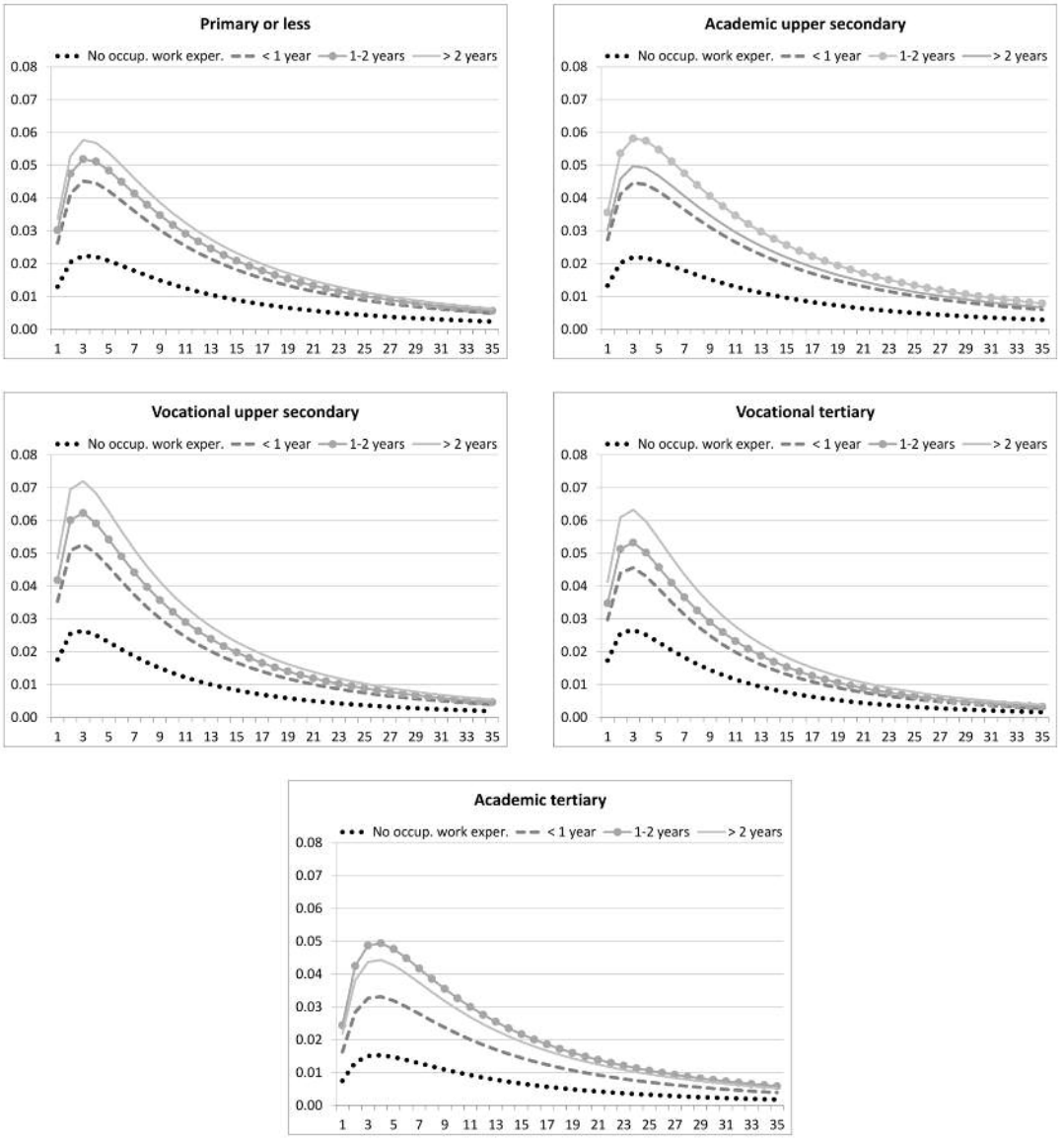

Note: Hazard rates computed from separated estimations for an individual of reference: Spanish woman with lower secondary education, who demands more than one occupation, is unemployed and does not receive unemployment benefits at t-1, and has not had a previous contract. Age of reference: 25 years for youth < 30; 38 years for workers aged 30-44; 53 years for workers ≥ 45 years.

Source: Own estimations using administrative records from the PES of the Community of Madrid.

show the hazard rates for specific groups attending to their previous occupational work experience. Nonetheless, some points are worth noticing. First, the rewards of occupational work experience in terms of occupational matching seem to be higher among men (see Figure 2). This finding might suggest that the labour market views the job-specific capital of female workers in a different manner, which translates into lower returns of occupation-specific human capital among women.

By age groups, the positive effect of occupational experience is higher for older workers. This result is explained by the fact that the average years of experience in the category "Occup. work experience: > 2 years" is significantly higher for these workers than for their young counterparts.

Figure 4: HAZARD RATES BY EDUCATIONAL LEVELS AND PREVIOUS OCCUPATIONAL WORK EXPERIENCE




Note: Hazard rates computed from separated estimations for an individual of reference: Spanish woman aged 34 years old, who demands more than one occupation, is unemployed, does not receive unemployment benefits at t-1, and has not had a previous contract.

Source: Own estimations using administrative records from the PES of the Community of Madrid.

Finally, the hazard rates computed separately by educational levels reveal that the positive effect of occupational experience is especially relevant for individuals with vocational education.

Summing up, our results confirm that occupational experience is the most important factor in explaining the probability that jobseekers end up employed in occupations that match the demanded occupation. This result could be relevant to PES for the design of the most effective measures intended to improve occupational matching. In particular, jobseekers with low occupational work experience might be considered as vulnerable individuals and, as a consequence, PES should devote more efforts in assisting these workers in their job search process. Furthermore, our results highlight the importance of vocational education in terms of occupational matching.

## 4. Conclusions

Within the context of the European Employment Strategy and the Europe 2020 strategy, PES have become a relevant tool in European countries to combat the persistently high levels of structural unemployment, as well as to create more and better jobs. PES participate in the labour market as intermediaries between jobseekers and employers to facilitate the job matching process, and thus play a central role in contributing to the achievement of the Europe 2020 employment rate (75% of the working-age population 20-64 years).

The European Network of Public Employment Services has been constituted to promote the cooperation of PES in all Member States, allowing good practices that could be transferable to other PES in the Union to be identified. Among its aims, the network must allow "the identification of skills shortages and the provision of information on their extent and location, as well as the better matching of the skills of job-seekers with the needs of employers". The information contained in PES administrative records thus constitutes a very valuable tool to evaluate PES performance. Exploiting these data allows identifying the specific characteristics of the jobseekers registered at employment offices and how these characteristics may affect their labour market outcomes. This knowledge will allow PES to improve their services, design better and more specific policies targeted at precise social groups, and contribute to reducing structural unemployment and skill mismatches.

In this article, we have analysed the determinants of skill matching, defined as occupational matching of unemployed jobseekers registered at public employment offices. Occupational matching is defined as a perfect match between the 4-digit occupation demanded by jobseekers on their job applications and the 4-digit occupation in the job.

In contrast to traditional studies based on educational matching where the educational attainments of workers are compared to the educational requirements of jobs (occupations), an important contribution derived from the use of PES administrative records is that they allow focusing on the occupation demanded by individuals.

Our results show that occupational matching significantly differs across occupational groups, with the highest values observed among "Craft workers" and "Operators and assemblers", while "Managers" register the lowest levels. Our estimations suggest that the likelihood of achieving a perfect occupational match decreases with

education. The higher arrival rates of job offers among highly educated workers, which provide them with a higher degree of professional versatility, could explain this result.

Consistently with the fact that workers and employers need time to get a good match, our results suggest a positive duration dependence on the probability of getting a perfect occupational match, although its effect becomes negative for the longest durations.

Finally, previous occupational work experience is found to be the main determinant of occupational matching, especially for men, older workers, and individuals with vocational education.

In view of the results, some recommendations may be made in terms of labour market policies. Firstly, the high degree of professional versatility observed among certain groups of occupations provides public employment offices with a wide margin to manoeuvre in the labour intermediation process. This might be the case of designing job-search assistance and training programmes for the unemployed. On the one hand, knowledge about the determinants of occupational matching, as well as the occupations with higher job vacancy rates and the degree of versatility across occupations, allow PES to guide jobseekers towards those occupations that are most suited to their specific characteristics and professional preferences.

On the other hand, and keeping in mind the abovementioned phenomenon of professional versatility, labour market performance might be improved by, for instance, including training measures in the form of transversal modules that cover tasks/skills common to certain groups of occupations. At the end of the day, such measures may result in a reduction of frictional and structural unemployment; an important outcome that should not be underestimated.

More effort should be put in the elaboration of skills-based profiling and matching tools intended to provide support to jobseekers in broadening the occupational job search, and to enable them to explore the transferability of their skills to new occupational choices.

Table A1: Sample characteristics and first demanded occupation

| | Total | | | First 1-digit demanded occupation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Total | 40,269 | 100% | 100% | 1.6% | 10.3% | 9.9% | 15.0% | 18.9% | 1.1% | 12.8% | 4.8% | **25.6%** |
| Men | 18,144 | 45.1% | 100% | 2.5% | 8.2% | 11.3% | 7.1% | 10.5% | 1.7% | **26.4%** | 8.7% | 23.6% |
| Women | 22,125 | 54.9% | 100% | 0.8% | 12.0% | 8.9% | 21.5% | 25.9% | 0.6% | 1.6% | 1.7% | **27.2%** |
| < 30 years | 16,594 | 41.2% | 100% | 0.3% | 9.7% | 10.0% | 14.4% | 22.1% | 1.2% | 12.8% | 3.9% | **25.5%** |
| 30-44 | 16,816 | 41.8% | 100% | 2.3% | 12.0% | 10.5% | 16.2% | 16.9% | 1.0% | 11.7% | 5.2% | **24.1%** |
| ≥ 45 | 6,859 | 17.0% | 100% | 2.9% | 7.4% | 8.3% | 13.5% | 16.2% | 0.9% | 15.1% | 6.2% | **29.4%** |
| Primary education and no schooling | 10,914 | 27.1% | 100% | 0.2% | 0.3% | 1.8% | 4.1% | 18.2% | 1.8% | 21.5% | 5.3% | **46.8%** |
| Lower secondary education | 13,025 | 32.3% | 100% | 0.4% | 0.9% | 5.3% | 14.1% | 25.1% | 1.2% | 15.6% | 7.4% | **30.0%** |
| Vocational upper secondary education | 2,647 | 6.6% | 100% | 0.9% | 1.6% | 10.4% | 28.1% | **31.5%** | 0.7% | 10.9% | 5.3% | 10.5% |
| Academic upper secondary education | 6,304 | 15.7% | 100% | 3.2% | 9.4% | 18.9% | **29.0%** | 17.6% | 0.6% | 4.8% | 3.2% | 13.4% |
| Vocational tertiary education | 2,129 | 5.3% | 100% | 1.8% | 5.7% | **38.6%** | 26.9% | 13.0% | 0.6% | 6.9% | 3.3% | 3.3% |
| Academic tertiary education | 5,250 | 13.0% | 100% | 5.9% | **61.5%** | 15.8% | 11.5% | 2.8% | 0.1% | 0.5% | 0.1% | 1.7% |
| Spanish | 32,980 | 81.9% | 100% | 1.9% | 12.1% | 11.5% | 17.0% | 19.1% | 1.0% | 11.2% | 5.1% | **21.1%** |
| Foreign | 7,289 | 18.1% | 100% | 0.2% | 2.1% | 2.9% | 6.1% | 18.4% | 1.2% | 19.7% | 3.7% | **45.7%** |
| No previous occupational work experience | 10,068 | 25.0% | 100% | 0.3% | 12.5% | 8.6% | 13.6% | 19.2% | 1.4% | 7.8% | 2.4% | **34.1%** |
| ≤ 1 year | 10,066 | 25.0% | 100% | 0.4% | 8.4% | 8.2% | 14.3% | 20.6% | 1.4% | 10.9% | 4.4% | **31.6%** |
| 1-2 years | 4,540 | 11.3% | 100% | 1.0% | 9.5% | 9.3% | 14.4% | 18.7% | 1.3% | 14.4% | 5.3% | **26.0%** |
| > 2 years | 15,595 | 38.7% | 100% | 3.4% | 10.3% | 12.2% | 16.5% | **17.7%** | 0.6% | 16.7% | 6.6% | 16.1% |
| No unemployment benefits | 32,062 | 79.6% | 100% | 1.3% | 10.5% | 9.6% | 14.6% | 19.3% | 1.2% | 11.9% | 4.5% | **27.2%** |
| 1-6 months remaining until UB expiration | 2,604 | 6.5% | 100% | 1.2% | 8.3% | 10.0% | 15.3% | 18.3% | 1.0% | 16.1% | 6.0% | **23.9%** |
| 7-12 months remaining until UB expiration | 2,406 | 6.0% | 100% | 1.8% | 8.2% | 10.6% | 14.8% | 17.8% | 0.8% | 18.2% | 5.5% | **22.3%** |
| ≥ 13 months remaining until UB expiration | 3,197 | 7.9% | 100% | 5.2% | 10.8% | 12.9% | **19.0%** | 16.5% | 0.4% | 15.1% | 6.4% | 13.7% |
| Demanding only 1 occupation | 11,317 | 28.1% | 100% | 3.1% | 9.9% | 10.7% | 11.2% | 16.0% | 0.8% | 17.5% | 5.4% | **25.4%** |
| Demanding more than 1 possible occupation | 28,952 | 71.9% | 100% | 1.0% | 10.4% | 9.7% | 16.5% | 20.1% | 1.2% | 10.9% | 4.6% | **25.6%** |

Selected sample: Unemployed jobseekers enrolled in PES for less than a month in February 2006.

1 Managers; 2 Professionals; 3 Technicians; 4 Clerical workers; 5 Service and sales workers; 6 Skilled agricultural workers; 7 Craft workers; 8 Operators and assemblers; 9 Elementary occupations.

Numbers in bold in the table indicate the most frequently demanded occupation by each specific group of jobseekers.

Source: Own calculations using administrative records from the PES of the Community of Madrid.

Table A2: First demanded occupation by gender and educational level

| | Primary | Vocational upper secondary | Academic upper secondary | Vocational tertiary | Academic tertiary | Total |
|---|---|---|---|---|---|---|
| Men | | | | | | |
| First demanded occupation | | | | | | |
| Managers | 0.5% | 2.0% | 5.1% | 3.3% | 12.0% | 2.5% |
| Professionals | 0.7% | 2.4% | 10.4% | 8.0% | **57.6%** | 8.2% |
| Technicians | 4.8% | *15.7%* | **23.0%** | **45.3%** | *16.6%* | 11.3% |
| Clerical workers | 4.0% | 12.7% | *16.3%* | 12.9% | 7.6% | 7.1% |
| Service and sales workers | 11.7% | 11.3% | 12.0% | 5.2% | 2.5% | 10.5% |
| Skilled agricultural workers | 2.2% | 1.5% | 0.9% | 0.8% | 0.2% | 1.7% |
| Craft workers | **34.9%** | **28.3%** | 9.8% | *14.4%* | 1.0% | **26.4%** |
| Operators and assemblers | 10.3% | 12.3% | 6.7% | 7.1% | 0.3% | 8.7% |
| Elementary occupations | *31.1%* | 13.7% | 15.8% | 2.9% | 2.3% | *23.6%* |
| Total | 100% | 100% | 100% | 100% | 100% | 100% |
| Women | | | | | | |
| First demanded occupation | | | | | | |
| Managers | 0.1% | 0.3% | 1.8% | 0.6% | 2.8% | 0.8% |
| Professionals | 0.6% | 1.2% | 8.6% | 4.1% | **63.6%** | 12.0% |
| Technicians | 2.6% | 7.5% | 15.7% | *33.6%* | *15.4%* | 8.9% |
| Clerical workers | 15.0% | *36.6%* | **38.6%** | **37.0%** | 13.5% | 21.5% |
| Service and sales workers | *31.9%* | **42.8%** | *21.9%* | 18.6% | 3.0% | *25.9%* |
| Skilled agricultural workers | 0.8% | 0.2% | 0.4% | 0.5% | 0.1% | 0.6% |
| Craft workers | 2.2% | 1.3% | 0.9% | 1.5% | 0.2% | 1.6% |
| Operators and assemblers | 2.6% | 1.4% | 0.5% | 0.5% | 0.0% | 1.7% |
| Elementary occupations | **44.1%** | 8.7% | 11.5% | 3.6% | 1.4% | **27.2%** |
| Total | 100% | 100% | 100% | 100% | 100% | 100% |

Numbers in bold: Highest frequency. Numbers in italics: Second highest frequency.

Source: Own calculations using administrative records from the PES of the Community of Madrid.

Table A3: 4-DIGIT OCCUPATIONAL MATCHING RATE AND OCCUPATIONAL TRANSITIONS BY GENDER, AGE, AND EDUCATION

| | Most demanded occupation | Occupational matching and occupational transitions |
|---|---|---|
| Total sample<br>N = 40,269 | Total occupations | • 4-digit occup. matching (30.2%)<br>• 1-digit occup. matching (16.0%)<br>• Other occupations (2.3%)<br>• No contracts (39.0%) |
| Men < 30 years<br>Primary education<br>N = 5,367 | Elementary occup. (37.8%) | • 4-digit occup. matching (13.4%)<br>• Elementary occup. (2.9%) (1-digit occ.match.)<br>• Craft workers (2.3%)<br>• Service and sales workers (1.7%)<br>• No contracts (76.5%) |
| | Craft workers (32.0%) | • 4-digit occup. matching (19.3%)<br>• Elementary occup. (5%)<br>• Craft workers (4.2%) (1-digit occ.match.)<br>• Operators (1.5%)<br>• No contracts (66.9%) |
| Men < 30 years<br>Secondary or tertiary education<br>N = 2,621 | Technicians (24.4%) | • 4-digit occup. matching (21.4%)<br>• Technicians (7.5%) (1-digit occ.match.)<br>• Clerical workers (7.4%)<br>• Professionals (7%)<br>• No contracts (44.9%) |
| | Professionals (18.7%) | • 4-digit occup. matching (20.2%)<br>• Professionals (14.3%) (1-digit occ.match.)<br>• Clerical workers (11.8%)<br>• Technicians (9.8%)<br>• No contracts (35.1%) |
| Men ≥ 30 years<br>Primary education<br>N = 6,425 | Craft workers (37.2%) | • 4-digit occup. matching (51.9%)<br>• Craft workers (13.1%) (1-digit occ.match.)<br>• Elementary occup. (11.5%)<br>• Operators (3.3%)<br>• No contracts (15%) |
| | Elementary occup. (25.4%) | • 4-digit occup. matching (41.2%)<br>• Elementary occup. (13.9%) (1-digit occ.match.)<br>• Craft workers (11.6%)<br>• Services and sales workers (5.1%)<br>• No contracts (19.3%) |
| Men ≥ 30 years<br>Secondary or tertiary education<br>N = 3,731 | Professionals (24.7%) | • 4-digit occup. matching (23.2%)<br>• Professionals (15.1%) (1-digit occ.match.)<br>• Technicians (11.3%)<br>• Clerical workers (8.9%)<br>• No contracts (28.5%) |
| | Technicians (22.5%) | • 4-digit occup. matching (29%)<br>• Clerical workers (10.1%)<br>• Technicians (9.6%) (1-digit occ.match.)<br>• Elementary occup. (8.2%)<br>• No contracts (21.8%) |

Table A3: 4-DIGIT OCCUPATIONAL MATCHING RATE AND OCCUPATIONAL TRANSITIONS BY GENDER, AGE, AND EDUCATION (continuation)

| | Most demanded occupation | Occupational matching and occupational transitions |
|---|---|---|
| Women < 30 years<br>Primary education<br>N = 4,551 | Service and sales (42.5%) | • 4-digit occup. matching (17.3%)<br>• Clerical workers (3.0%)<br>• Service and sales (3.0%) (1-digit occ.match.)<br>• Elementary occup. (2.3%)<br>• No contracts (72.8%) |
| | Elementary occup. (35.1%) | • 4-digit occup. matching (19%)<br>• Service and sales workers (6.4%)<br>• Elementary occup. (5.2%) (1-digit occ.match.)<br>• Clerical workers (3.1%)<br>• No contracts (64.6%) |
| Women < 30 years<br>Secondary or tertiary education<br>N = 4,055 | Clerical workers (26.5%) | • 4-digit occup. matching (24%)<br>• Clerical workers (13.3%) (1-digit occ.match.)<br>• Technicians (4.8%)<br>• Service and sales (4.8%)<br>• No contracts (48%) |
| | Professionals (26.4%) | • 4-digit occup. matching (24.2%)<br>• Clerical workers (14.5%)<br>• Professionals (9%) (1-digit occ.match.)<br>• Technicians (8.3%)<br>• No contracts (38.7%) |
| Women ≥ 30 years<br>Primary education<br>N = 7,596 | Elementary occup. (49.6%) | • 4-digit occup. matching (47.6%)<br>• Service and sales (10.1%)<br>• Elementary occup. (8%) (1-digit occ.match.)<br>• Clerical workers (3.8%)<br>• No contracts (27.6%) |
| | Service and sales (25.6%) | • 4-digit occup. matching (41.5%)<br>• Elementary occup. (11.4%)<br>• Service and sales (8.5%) (1-digit occ.match.)<br>• Clerical workers (7.4%)<br>• No contracts (26.7%) |
| Women ≥ 30 years<br>Secondary or tertiary education<br>N = 5,923 | Clerical workers (31.4%) | • 4-digit occup. matching (32.8%)<br>• Clerical workers (19.6%) (1-digit occ.match.)<br>• Service and sales (6.8%)<br>• Technicians (6.7%)<br>• No contracts (25.1%) |
| | Professionals (25.4%) | • 4-digit occup. matching (23.3%)<br>• Clerical workers (17%)<br>• Professionals (11.7%) (1-digit occ.match.)<br>• Technicians (9.3%)<br>• No contracts (30.4%) |

Source: Own calculations using administrative records from the PES of the Community of Madrid.

Table A4: Most frequently skills used at work by 1-digit occupations in Spain (*)

| 1. Managers | 2. Professionals | 3. Technicians |
|---|---|---|
| • Organising own time: 97%<br>• Planning own activities: 95%<br>• Problem solving - Simple problems: 82%<br>• Sharing work-related info: 81%<br>• Negotiating with people: 76%<br>• Advising people: 73%<br>• Planning others activities: 71%<br>• Influencing people: 68%<br>• Selling: 66%<br>• Time cooperating with co-workers: 60%<br>• Teaching people: 52% | • Organising own time: 91%<br>• Planning own activities: 91%<br>• Sharing work-related info: 85%<br>• Problem solving - Simple problems: 82%<br>• Advising people: 67%<br>• Teaching people: 66%<br>• Influencing people: 52%<br>• Problem solving - Complex problems: 50% | • Organising own time: 88%<br>• Sharing work-related info: 83%<br>• Planning own activities: 79%<br>• Problem solving - Simple problems: 74%<br>• Advising people: 55%<br>• Time cooperating with co-workers: 53%<br>• Using hands or fingers: 51% |
| **4. Clerical workers** | **5. Service and sales workers** | **6. Skilled agricultural workers** |
| • Sharing work-related info: 85%<br>• Organising own time: 78%<br>• Planning own activities: 69%<br>• Problem solving - Simple problems: 69%<br>• Time cooperating with co-workers: 55% | • Organising own time: 76%<br>• Planning own activities: 71%<br>• Sharing work-related info: 68%<br>• Problem solving - Simple problems: 60%<br>• Time cooperating with co-workers: 59%<br>• Advising people: 58%<br>• Working physically for long: 58%<br>• Using hands or fingers: 57%<br>• Selling: 52% | • Working physically for long: 84%<br>• Organising own time: 81%<br>• Using hands or fingers: 81%<br>• Planning own activities: 77%<br>• Time cooperating with co-workers: 70%<br>• Sharing work-related info: 56% |
| **7. Craft workers** | **8. Operators and assemblers** | **9. Elementary occupations** |
| • Using hands or fingers: 91%<br>• Working physically for long: 83%<br>• Organising own time: 78%<br>• Sharing work-related info: 78%<br>• Planning own activities: 72%<br>• Problem solving - Simple problems: 69%<br>• Time cooperating with co-workers: 62% | • Sharing work-related info: 79%<br>• Using hands or fingers: 74%<br>• Working physically for long: 71%<br>• Problem solving - Simple problems: 69%<br>• Organising own time: 65%<br>• Planning own activities: 58%<br>• Time cooperating with co-workers: 51% | • Working physically for long: 80%<br>• Using hands or fingers: 72%<br>• Organising own time: 67%<br>• Sharing work-related info: 59%<br>• Planning own activities: 57% |

(*) Percentage of workers in each occupation that declare they use the skill at work "every day" or "at least once a week but not every day".
Only listed those skills for which there are at least 50% of workers declaring they use the skill every day or at least once a week.
Source: Own calculations using the OECD (2013) Survey of Adult Skills (PIAAC, Spanish sample).

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RESUMEN

Utilizando datos de registros administrativos de los servicios públicos de empleo, en este artículo estudiamos los principales determinantes del emparejamiento ocupacional, medido a partir de la relación entre la ocupación demandada por los demandantes de empleo y la ocupación del contrato cuando encuentran trabajo. La ocupación demandada es un concepto más amplio sobre el capital humano de los individuos, pues recoge su nivel de formación, su experiencia ocupacional específica, sus habilidades y las tareas asociadas al empleo que buscan, así como sus preferencias sobre el tipo de ocupación en la que desean trabajar. A partir de la estimación de modelos de duración en tiempo discreto y controlando por heterogeneidad inobservable, los principales resultados sugieren que la experiencia ocupacional específica es el principal determinante de la probabilidad de emparejamiento ocupacional, siendo más intenso entre los hombres, los trabajadores de más edad y los individuos con estudios de formación profesional.

*Palabras clave:* emparejamiento ocupacional, transiciones laborales, movilidad ocupacional, experiencia laboral específica.

*Clasificación JEL:* J20, J24, J62.