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inscribed at Public Employment Offices

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Occupational matching: The case of job seekers inscribed at Public Employment Offices

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Abstract

Using administrative records from Public Employment Offices, this paper studies the main factors determining occupational matching between labour supply and demand. This is measured by matching the demanded occupation by job seekers and the occupation they finally secure. The results show that occupational matching is greater among women, young workers and least-educated people. Higher rates of occupational matching are also found in medium-sized companies and among temporary workers. The results also show that certain occupations are strongly associated with a high degree of professional versatility, or instead that their corresponding tasks may be adequately performed by professionals from distinct backgrounds.

Keywords: occupational matching, employment probability, labour transitions, occupational mobility

JEL Codes: J20, J24, J62

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1. Introduction

Various aspects should be taken into account when determining the labour market success of workers involved in a job search process. Employment probabilities have been commonly used as a good measure. Nonetheless, economists have recently focused on other aspects related to the quality of the job match. Broadly speaking, this refers to the degree to which job characteristics actually match the targets of the job seekers.

Reaching a good match between the two sides of the labour market is not only important at the individual level, but at the macro level as well. A labour market with high matching rates between job vacancies and unemployed job seekers will register, *a priori* and among other potential effects, lower unemployment rates, shorter unemployment durations, and less job mobility. With these ingredients, the labour market is very likely to display higher levels of productivity, a lower risk of over-education, and similarly a lower risk of lack of coverage in certain occupations (Elliot, 1991).

It is also worth noting the clearly positive implications in terms of public budget, reducing the public expenditure for unemployment benefits, and the application of active labour policies. With respect to the latter, the appropriate management of the intermediation process between job vacancies and job seekers may significantly improve employment probabilities, especially among certain types of workers. This is, for instance, the case of school leavers who encounter important difficulties in the school-to-work transition process; not only in finding a job, but also in achieving an appropriate match. Both international (Ryan, 2001; Addison and Portugal, 2002; Boone and Van Ours, 2004; OECD, 2005; Eberts, 2005) and national evidence (Blázquez, 2005; Herrarte and Sáez, 2007; Herrarte et al., 2006, Cueto and Mato, 2008, 2009) has been found in this regard.

The role of Public Employment Offices in the job matching process may be of paramount importance in order to improve both the employment probabilities of job seekers –

especially for those who face a weaker position in the labour market – and the quality of the job matching. Despite not being the most commonly used channel to search for a job, we should keep in mind the considerable amount of public spending devoted to this end. Thus, to the extent that the labour market performance of workers who search for a job via this channel might be improved through the different actions taken by regional employment services, we should achieve a more efficient use of public resources[1]. This necessarily requires obtaining better knowledge of labour market outcomes in those cases where Public Employment Offices act as intermediaries in the job matching process. This is precisely the main objective of this paper.

Apart from employment probabilities, *occupational matching* may constitute a good and complementary measure of the quality of the match between labour supply and demand (Blázquez and Herrarte, 2011). In particular, we refer to the relationship between the demanded occupation by the worker and the corresponding final occupation of the contract. Nonetheless, it is very common that the available databases do not offer information on requested occupations. This requires using other characteristics of the worker such as educational level. Due to such data restrictions, most studies in the job matching literature have focused on the relationship between the educational attainments of the workers and the educational requirements of the jobs (see, for example, Alba, 1993; Dolado et al., 2000; Alba and Blázquez, 2004 for the Spanish case; and Leuven and Oosterbeek, 2011 for an international survey of the economics literature on over-education).

In the present study we aim at filling this gap in the job matching literature. To do so, we combine information from two administrative records: job seekers and contracts records provided by Public Employment Offices. We then construct *occupational matching rates* by comparing the demanded occupation by job seekers to that observed in the contracts record. It

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[1] Unfortunately, it is not possible to know which percentage of job seekers are searching for a job using an additional channel.

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is important to highlight that occupational matching is a more comprehensive measure of job matching. Occupational matching not only includes job matching related to the educational attainment of workers, but also and probably more importantly, it includes tasks and skills related to very specific occupations. However, due to the lack of statistical information referring to both tasks and skills, the majority of studies in the empirical job matching literature have focused on educational matching.

We make use of the administrative records provided by the Spanish Public Employment Services to analyse occupational matching by directly comparing demanded and effective occupations. These considerable new administrative records are, at present, the best data for evaluating Public Employment Services. However, to the best of our knowledge, the information provided by this data bank has not been exploited to carry out this type of occupation analysis.

In particular, we extract information from the Regional Employment Service of the region of Madrid (*Autonomous Community of Madrid*) corresponding to the period 2005-2009[2]. Given the representativeness of this region over the whole Spanish labour market, its analysis will provide us with a general vision of the most important determinants of occupational matching. In turn, whenever a perfect matching is not reached, we study the degree of versatility of the distinct professional profiles. This is especially interesting for occupations that involve the performance of similar tasks or even when workers end up employed in higher-skilled occupations.

Furthermore, this versatility analysis may be useful in the labour intermediation process carried out by public (or private) employment services. This would be the case when programming which Public Employment Services are the most appropriate to improve the employment probabilities of different types of workers.

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[2] The data were provided by the Regional Employment Observatory belonging to the Council for Education and Employment of the Community of Madrid.

The rest of the paper is organised as follows. Section 2 describes the role of Public Employment Services as intermediaries in the job-search process. It also offers a detailed description of the data extracted from the administrative records; specifically job seekers and contracts. In Section 3 we present a descriptive analysis of the selected sample, as well as descriptive evidence of occupational matching rates and occupational transitions in those cases where occupational matching failed to be reached. Section 4 provides an econometric analysis of the main determinants of occupational matching. Finally, Section 5 concludes.

2. Public Employment Services

Public Employment Services (PES hereafter) are the authorities that facilitate the connection between job seekers and employers. Since the 1970s, PES have been used as an instrument for most EU governments in an attempt to tackle growing unemployment rates. In many circumstances, these high unemployment rates have been the consequence of frictions and limited and incomplete information caused by labour markets characterised by heterogeneous workers and firms. These frictions make the job matching process uncoordinated, time-consuming and costly for both firms and workers (see Pissarides, 2000). Thus, the presence of institutions and agencies that facilitate the matching of labour supply and demand becomes reasonable.

With the European Employment Strategy, much emphasis has been directed at the role of PES in implementing preventive and proactive measures against long-term unemployment. Although the PES have no automatic right to deliver these types of active policies, in practice it has become both the gateway and the gatekeeper for them in many countries. Because of this, the PES have undergone substantial changes in recent decades 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, the PES provide tools and assistance to job seekers and potentially help them to find employment more rapidly or with a better match than might otherwise be the case. In this sense, regional employment services 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 public employment service (the so-called 'active insertion income').

Thus, examining the performance of job seekers registered in 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 at the micro level.

At the international level, the literature that analyses the placement role and the efficiency of the 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 others Dolton and O'Neil, 1995, 1996; Meyer, 1995; Fay, 1996; Gorter and Kalb, 1996; Heckman et al., 1999; OECD, 2003; Van Reenen, 2003; Crépon et al 2005; Fougère et al, 2005)[3]. For the

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[3] Some empirical studies report that job seekers using public employment agencies have longer unemployment spells than those using other methods (see Carpenter and Wieglosz, 1987; Holzer, 1988; and Blau and Robbins,

Spanish case, we should mention the work of Alujas (2007) that analyses the labour intermediation of the PES both at 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) who analyse 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).

2.1 The new PES information system: Administrative records

In May 2005, the so-called Information System of Public Employment Services (SISPE) entered into operation. The SISPE aims at improving the role of labour mediation carried out by the PES. The system 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[4]. With 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 job seekers and contracts records) to analyse the quality of job matching through what we define as occupational matching rates.

1990 for the US; Osberg, 1993 for Canada; Böheim and Taylor, 2002 for the United Kingdom; and Addison and Portugal, 2002 for Portugal).

[4] See Hernando (2007) for a detailed description of the role of the SISPE.

As in other EU countries, a considerable proportion of unemployed workers[5] in Spain are registered at Public Employment Offices[6], independently of whether they really use this channel in the job search process. Registration in the *job seekers record* is voluntary, except for those receiving an unemployment subsidy. When doing so, workers can become a candidate if their professional profile matches any of the job offers given to the employment offices. The PES and its network of local agencies inform unemployed workers of available job vacancies. The services provided by these agencies are free for both employers and unemployed workers. When unemployed workers get a job, they are subsequently removed from the data bank of job seekers. When this occurs, they appear in the database as "unregistered due to an employment contract". 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 job seekers record includes, among other important workers' characteristics, the demanded occupation by the unemployed worker. On their applications, unemployed workers may indicate more than one acceptable occupation. For our purposes, however, we consider that the first choice specified by job seekers is the occupation that best fits their skills and competences. When job seekers 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 occupational matching.

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[5] According to the Spanish Labour Force Survey, 70% of unemployed workers are registered in Public Employment Offices.

[6] The National Public Employment Service of Spain comprises the regional employment services of the 17 regional authorities (called Autonomous Communities). The regional employment services collect data about job offers, job requests and contracts.

3. Sample selection and descriptive analysis

3.1. Job seekers record

Within the job seekers database, individuals are classified according to their administrative situation as "registered" (*altas*), "unregistered" (*bajas*) or "temporary suspensions" (*suspensiones*).

Individuals actively searching for a job appear as "registered". This administrative situation may be due to two causes: 1) individuals who appear for the first time in the job seekers database; and 2) reactivations of previous records, that is, individuals who were previously in an "unregistered" situation. "Unregistered" situations include individuals who searched for a job through this channel in the past, but they are not currently involved in the job search process (either because they are working or because they just left the job search). Thus, the dataset allows us to differentiate between "unregistered" situations caused by the formalisation of an employment contract and other causes, for instance, situations where job seekers do not perform the (obligatory) renewal on time[7].

For the purposes of this paper, we selected a sample of job seekers according to the following criteria. First, only administrative situations of "registered" or "unregistered"[8] were considered. Second, and due to the size of the original database (which contains monthly data of the universe of job seekers over the period 2005-2009), we only consider the last observation for each individual. Third, we do not include unregistered situations derived from abandoning the job search ("unregistered due to not having renewed the inscription"). Additionally, for the subsample of individuals whose last administrative situation was that of "unregistered due to an employment contract" ("unregistered" hereafter), we combine the

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[7] These cases are excluded from the analysis.

[8] We exclude "temporary suspensions" which account for only 1% of the workers in the job seekers record. Temporary suspensions include unemployed individuals who have stopped the job search because they are attending training courses or have left the job search due to illness or for maternity or paternity leaves.

information on job seekers and contracts records. Finally, since each individual may have had various contracts, only the last contract observed for each individual has been taken into account.

After selecting individuals aged between 16 and 64 years old and excluding those whose requested occupation is "Armed Forces", our final sample consists of 973,602 individuals, of which 57.2% are in an "unregistered" situation. The remaining 42.8% – those in the "registered" situation – continue searching for a job.

Table 1 contains a descriptive analysis of the selected sample according to the characteristics of the job seekers. The last column provides what has been termed as the *Job Search Success Rate* (JSSR), that is, the percentage of job seekers who found a job. This rate can be considered a good indicator of success in the job matching process.

As can be observed, the percentage of women over the total sample is slightly higher than that of men. This difference becomes larger if we look at the unregistered situations, which translates into higher JSSR among females (60% versus 55% for males). With regard to age, the majority of the sample is aged 25-44 years old (around 60%). However, the highest JSSR values (above 70%) are observed among youths (16-24 years old). This figure drops as age rises, until reaching the 23% observed for the group comprising job seekers aged 55-64.

Job seekers with lower secondary education are the most representative group, accounting for almost 45% of the total sample. Individuals with upper secondary and tertiary education account for around 21% each. Finally, 13.2% of the sample corresponds to workers in the primary education or no schooling group. As expected, the JSSR increases with level of education, although the differences between those with upper secondary and tertiary education are slight.

The descriptive analysis also reveals the predominance of demand for low-skilled occupations[9]. More than 20% of job seekers state that they are searching for a job within the category of "Elementary occupations". These occupations are followed by job requests in the groups of "Service and sales workers" (16.9%) and "Craft and related trades workers" (15.4%). The lowest number of demands corresponds to occupations belonging to the groups of "Managers" and "Operators and assemblers". Regarding the JSSR associated to the different occupations, it ranges from 47% in the group of "Managers" to 63% in the groups of "Professionals" and "Service and sales workers".

Around half of the total sample have more than one year of experience in the requested occupation, 20% of job seekers report one year of experience, and almost 27% have no experience at all. The descriptive analysis shows that the JSSR reaches its highest value for job seekers with no experience in the requested occupation. Although this result seems to be contrary to what would be expected, it is important to underline that this variable does not reflect the total employment experience of the individual, but only refers to experience in the demanded occupation.

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[9] National Classification of Occupations (1994) provided by the National Statistics Institute of Spain (INE).

Table 1: Job seekers records: Descriptive statistics

	Total (N) (1)	%	Registered (2)	Unregistered (3)	JSSR (%) (3) / (1)
Total	973,602	100	416,280	557,322	57.2%
			42.8%	57.2%	
Gender					
Men	476,693	49.0%	51.4%	47.2%	55.1%
Women	496,909	51.0%	48.6%	52.8%	59.3%
Age					
16 to 19	41,268	4.2%	2.9%	5.3%	71.2%
20 to 24	129,415	13.3%	8.8%	16.6%	71.6%
25 to 34	342,554	35.2%	29.0%	39.8%	64.8%
35 to 44	233,510	24.0%	25.7%	22.7%	54.1%
45 to 54	141,904	14.6%	17.9%	12.1%	47.5%
55 to 64	84,951	8.7%	15.7%	3.5%	22.9%
Educational level					
Primary education and no schooling	128,996	13.2%	15.4%	11.6%	50.3%
Lower secondary education	431,826	44.4%	46.6%	42.6%	55.0%
Upper secondary education	206,856	21.2%	19.5%	22.6%	60.8%
Tertiary education	205,924	21.2%	18.5%	23.1%	62.6%
Demanded occupation					
1 Managers	16,727	1.7%	2.1%	1.4%	46.8%
2 Professionals	105,878	10.9%	9.4%	12.0%	63.2%
3 Technicians and associate professionals	102,472	10.5%	9.7%	11.1%	60.4%
4 Clerical support workers	148,904	15.3%	15.0%	15.5%	58.0%
5 Service and sales workers	164,905	16.9%	14.6%	18.7%	63.1%
6 Skilled agricultural, forestry and fishery workers	9,509	1.0%	1.1%	0.9%	51.8%
7 Craft and related trades workers	149,880	15.4%	18.4%	13.2%	48.9%
8 Plant and machine operators, and assemblers	57,398	5.9%	6.6%	5.4%	52.4%
9 Elementary occupations	217,929	22.4%	23.1%	21.9%	56.0%
Nationality					
Spanish	762,578	78.3%	78.6%	78.1%	57.1%
Foreign	211,024	21.7%	21.4%	21.9%	57.8%
Occupational experience					
None	261,914	26.9%	21.8%	30.7%	65.4%
One year or less	199,857	20.5%	17.8%	22.6%	63.0%
More than one year	511,831	52.6%	60.4%	46.7%	50.8%
Geographical area of job search					
Same region of residence (NUTS2)	887,304	91.1%	91.5%	90.9%	57.1%
Other regions and other countries	25,899	2.7%	2.3%	3.0%	63.7%
Restricted area	60,399	6.2%	6.2%	6.2%	56.9%
Average time registered as unemployed (days)	159	-	240	99	-

JSSR: Job search success rate; percentage of total job seekers who were in their last administrative situation as "unregistered".

The majority of job seekers (91%) undertake their job search within their region of residence, while only 2.7% are willing to work in another region and even abroad. A further 6.2% of job seekers place other types of geographical constraints on their search process. As

expected, the highest JSSR is found among individuals who are more flexible in terms of search preferences regarding employment location.

Finally, the longest job search durations (approximated by the number of months that individuals remain registered as job seekers) are observed among individuals who remained as "registered" (240 days). In contrast, the corresponding value among individuals in "unregistered" situations was slightly over three months (99 days).

3.2. Contracts records

In order to analyse the probability that a job seeker will find a job whose characteristics match with those of the demanded occupation, attention must be paid to workers in "unregistered" situations, who comprise a total of 557,322 individuals. These workers can be followed in the contracts record and may display consecutive contracts. In such cases, and due to the size of the database, we focus on the most recent contract on the condition that this was subsequent to the date where the job seeker switched to a situation of "unregistered". Nonetheless, additional information was extracted regarding the number of intermediate contracts and has been used as an indicator of job mobility.

For 41.9% of the subsample of job seekers who found a job throughout the period 2005-2009, that is, job seekers switching from "registered" to "unregistered" situations, no additional contract was registered over the abovementioned period (*one contract*), 27.7% had an additional contract to the last contract observed (*two contracts)*, and the remaining 30.4% registered various contacts (*three or more contracts*).[10]

Table 2 presents a descriptive analysis according to job characteristics. Looking at the total sample of job seekers with at least one contract (last column of Table 2), we find that

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[10] It is important to note the possibility of a slight bias since the period under analysis is not equivalent for all job seekers. While some job seekers were observed to be "unregistered" at the beginning of 2006 and can be followed in the contracts records in the subsequent four years, for those who were incorporated in the sample later, the reference period becomes shorter.

52.1% was employed on a temporary basis in their last job. Another 45.8% hold a permanent contract, and the remaining 2.2% corresponds to other types of contracts. The occupations registering the largest number of contracts are "Elementary occupations" (21.8%), "Service and sales workers" (20.8%), and "Clerical support workers" (19%). Finally, with respect to firm size, the majority of contracts (somewhat over 58%) were made in companies with less than 100 workers.

When we observe job seekers with one, two and three or more contracts separately, we find important differences related to the type of contract. Among those with one or two contracts, the share of temporary contracts is around 47%, while the share of permanent contracts increases from 48% to 51%. In contrast, when looking at job seekers who registered three or more contracts, the share of temporary contracts increases to almost 63%. Furthermore, for those with more than one contract, highly significant differences are apparent between the first and last contract with regard to the type of contract. In the case of those who registered two contracts, the incidence of temporality in the first contract is 81.4%, falling to 47.3% in the last contract. In the group of job seekers having more than two contracts, a similar phenomenon can be observed, with temporality falling from 85.3% to 62.6%.

With respect to occupation, we do not observe significant differences among the three previous groups of job seekers. Furthermore, within the group of individuals with three or more contracts, no differences were found between the occupations in the first and last jobs. Thus, job mobility does not appear to involve changes in the occupation, but it does involve changes in the type of contract; concretely, from temporary to permanent contracts.

Table 2. Contracts records: Descriptive statistics

	One contract	Two contracts	Three or more contracts	Total
N	233,313	154,640	169,369	557,322
	41.9%	27.7%	30.4%	100%
Total	100%	100%	100%	100%
Type of contract (last contract)				
Permanent contract	48.7%	51.4%	36.6%	45.8%
Temporary contract	47.6%	47.3%	62.6%	52.1%
Others	3.7%	1.3%	0.8%	2.2%
Type of contract (first contract)				
Permanent contract	-	15.9%	13.4%	28.9%
Temporary contract	-	81.4%	85.3%	68.4%
Others	-	2.6%	1.4%	2.7%
Occupation one-digit (last contract)				
1 Managers	1.6%	0.9%	0.5%	1.1%
2 Professionals	10.5%	8.9%	8.6%	9.5%
3 Technicians and associate professionals	12.3%	11.6%	11.0%	11.7%
4 Clerical support workers	19.1%	19.4%	18.4%	19.0%
5 Service and sales workers	20.6%	21.1%	20.9%	20.8%
6 Skilled agricultural, forestry and fishery workers	0.9%	0.5%	0.6%	0.7%
7 Craft and related trades workers	10.0%	10.4%	8.8%	9.8%
8 Plant and machine operators, and assemblers	5.4%	6.1%	5.5%	5.6%
9 Elementary occupations	19.5%	21.0%	25.7%	21.8%
Occupation one-digit (first contract)				
1 Managers	-	0.8%	0.4%	1.0%
2 Professionals	-	8.1%	6.7%	8.6%
3 Technicians and associate professionals	-	11.5%	9.5%	11.2%
4 Clerical support workers	-	19.7%	19.1%	19.2%
5 Service and sales workers	-	21.4%	21.6%	21.2%
6 Skilled agricultural, forestry and fishery workers	-	0.6%	0.5%	0.7%
7 Craft and related trades workers	-	10.4%	9.2%	9.9%
8 Plant and machine operators, and assemblers	-	6.0%	5.1%	5.5%
9 Elementary occupations	-	21.5%	27.9%	22.6%
Firm size (last contract)				
Less than 100 workers	60.4%	60.0%	53.4%	58.1%
100 or more workers	39.6%	40.0%	46.6%	41.9%

3.3. Analysis of occupational matching

In this section we provide a descriptive analysis of the occupational matching rate. Occupational matching occurs when the occupation demanded by the individual coincides with the occupation in the last contract observed. In both cases, we consider a 4-digit CNO-94

level of disaggregation. Obviously, this matching rate can only be analysed for the subsample of job seekers who were successful in the job search process (57.2% over the total sample).

Table 3 provides descriptive information about this occupational matching rate, which is found to be near 23% on average. The rate is slightly higher for women than for men, and increases with the age of the individual. With respect to the educational attainments of job seekers, the highest values of matching rates are found among individuals with no schooling or with only primary studies. The matching rate is, however, higher for job seekers with more years of experience in the demanded occupation, and those working in small firms. Finally, the data suggest that job mobility slightly reduces the matching rate, while no significant differences are found between temporary and permanent contracts.

It is interesting to observe the differences in the occupational matching rate among the major occupational groups (Figure 1). The occupational matching rate reaches its highest value within the group of "Service and Sales Workers" (above 34%, see Figure 1, Panel A). However, given that job vacancies are not equally distributed among the major occupational groups (see Section 3.2), a weighted occupational matching rate should be calculated by multiplying the standard rate by the corresponding JSSR in each occupation (Figure 1, Panel B). Attending to these weighted matching rates, the major group of "Service and sales workers" remains in the first position (21.7%). The group of "Professionals" – located in the fifth position in terms of standard matching rates – ranks second with a weighted matching rate of 13.1%, and is closely followed by the groups of "Elementary occupations" (12.5%) and "Technicians and associate professionals" (12.3%). In contrast, the lowest values of the weighted occupational matching rates are found among "Managers" (4.6%) and "Skilled agricultural, forestry and fishery workers" (6.3%).

Table 3: Occupational Matching Rate by personal and job characteristics

	N	4-digit Occupational Matching Rate, %
Total	557,322	22.8
Gender		
Men	262,820	20.8
Women	294,502	24.6
Age		
16 to 19	29,402	22.7
20 to 24	92,650	20.4
25 to 34	222,028	20.7
35 to 44	126,328	24.1
45 to 54	67,419	28.3
55 to 64	19,495	30.5
Educational level		
Primary education and no schooling	64,896	28.5
Lower secondary education	237,657	23.8
Upper secondary education	125,808	19.9
Tertiary education	128,961	20.8
Nationality		
Spanish	435,397	21.8
Foreign	121,925	26.2
Occupational experience		
None	171,171	15.3
One year or less	125,909	21.5
More than one year	260,242	28.4
Firm size		
Less than 100 workers	323,935	24.2
100 or more workers	233,387	20.8
Job mobility (additional contracts)		
No additional contracts	233,313	23.8
One additional contract	154,640	22.7
Two or more additional contracts	169,369	21.5
Type of contract		
Permanent contract	255,106	22.4
Temporary contract	290,229	23.3
Others	11,987	19.6

Figure 1: Occupational Matching Rate and Weighted Occupational Matching Rate

Weighted Occupational Matching Rate = Occupational Matching Rate x Job Search Success Rate
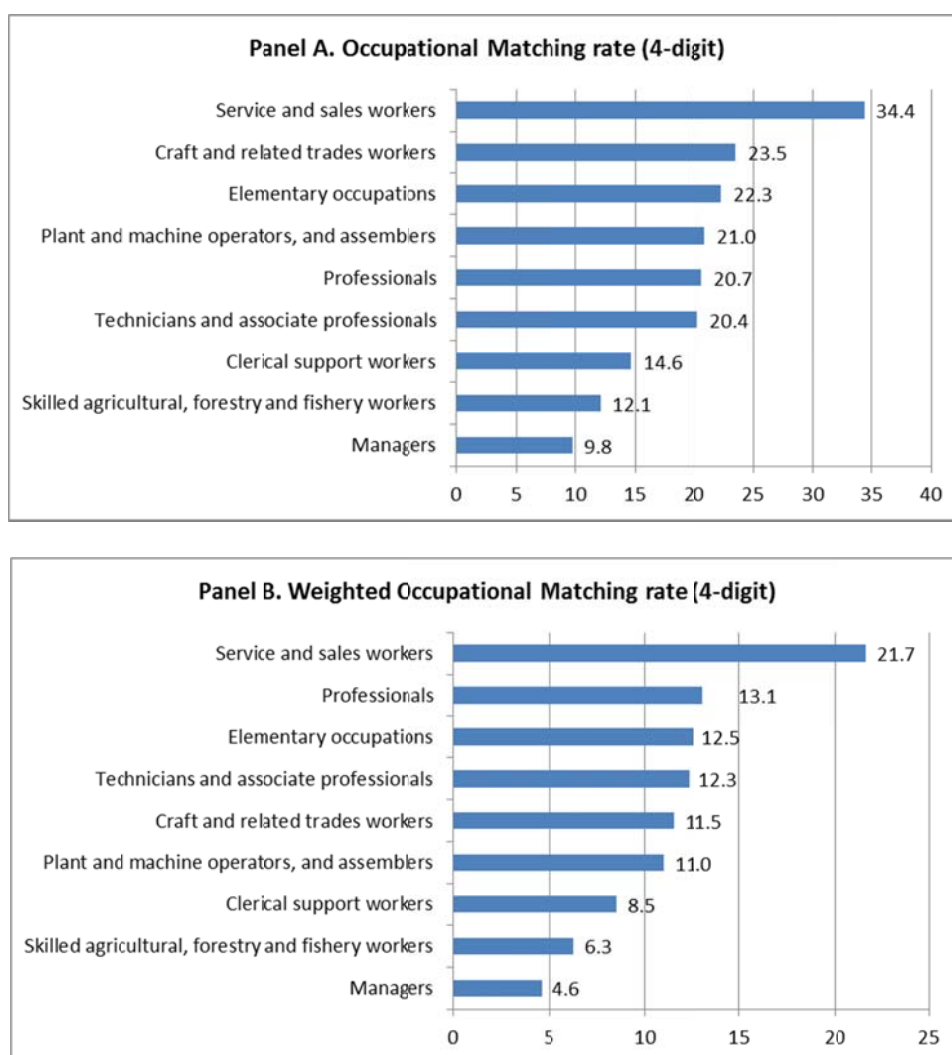
Table 4 shows the matching rate by sub-major occupational groups – 2-digit CNO-94 level of disaggregation – in those cases where the JSSR is above the average sample value (57.2%). The first and second columns contain the 4-digit occupational matching rate and the JSSR, respectively. The weighted occupational matching rate is presented in the last column.

Table 4: Occupational matching rate, Job search success rate and Weighted occupational matching rate (occupations with above average JSSRs)

Sub-major occupations (CNO-94)	4-digit Occupational matching rate, % (MR)	Job Search Success Rate, % (JSSR)	Weighted Occupational Matching Rate, % (MR*JSSR)
27 Health professionals (first stage university studies)	70.0	73.2	51.3
21 Health professionals (second and third stage university studies)	41.3	68.9	28.4
50 Cooks, waiters and bar tenders	39.3	63.5	25.0
32 Early childhood educators and Ship and aircraft controllers and technicians	33.5	73.0	24.4
31 Health associate professionals	33.3	66.1	22.0
53 Sales workers	33.3	65.2	21.7
51 Personal service workers	32.3	59.2	19.1
25 Social and cultural professionals	27.7	60.4	16.7
52 Protective services workers	24.8	65.6	16.3
Total	**22.8**	**57.2**	**13.0**
41 Librarians, archivists and curators	22.4	59.6	13.3
22 Teaching professionals with higher education	21.5	61.3	13.2
28 Teaching professionals	17.7	62.9	11.1
98 Transport and storage labourers	17.6	61.6	10.8
30 Science and engineering associate professionals	17.1	61.6	10.5
42 Office machine operators	17.0	57.8	9.8
20 Science and engineering professionals	16.7	61.3	10.3
35 Other associate professionals	16.6	62.9	10.5
26 Science and engineering associate professionals	16.3	62.2	10.2
23 Legal professionals	14.1	62.4	8.8
78 Food processing and related trades workers	13.6	60.8	8.3
46 Cashiers and ticket clerks	12.2	58.7	7.2
24 Business and administration professionals	10.1	63.9	6.4
29 Other associate professionals with higher education	9.9	63.9	6.3
45 Travel consultants and clerks	9.0	59.2	5.4
96 Construction labourers	6.4	60.1	3.8

"Health professionals" do not only exhibit the highest probability of getting a job (73.2%), but also the highest occupational matching rates (70%). However, when comparing professionals of this type with a first stage level of university education to those with second and third levels, the best results are clearly observed among the former, especially in terms of matching rates (70% in contrast to 41.3%). The distance between these two groups is also

latent when comparing the weighted occupational matching rates (51.3% in contrast to 28.4%).

The third position corresponds to the group of "Cooks, waiters and bartenders", followed by the groups "Early childhood educators and Ship and aircraft controllers and technicians", "Sales workers", "Health associate professionals" and "Personal service workers". Two other groups of occupations, "Social and cultural professionals" and "Protective services workers", also display rates of occupational matching above the average.

In short, the disaggregated results show that, except for the group of "Health professionals", occupational matching is not very high in the remaining groups (always below 30%). These low values, however, must not necessarily be considered labour market inefficiencies. This would be the case if the tasks performed by workers in the final occupation are of a similar skill level to those corresponding to the demanded occupation. As observed in Table 5, a high degree of 'versatility' between different professional profiles seems to be quite common among certain types of occupations.

Three types of indicators are shown in Table 5. Firstly, Rate 1 includes the occupational matching rate analysed thus far. Rates 2 and 3 focus on the group of job seekers who did not reach a perfect occupational match. In particular, Rate 2 represents the percentage of individuals employed in occupations within the same 1-digit occupational group. It is worth noting that certain types of occupations register low values of 4-digit occupational matching rates (Rate 1), and they also record low values of Rate 2. This occurs in the groups "Skilled agricultural, forestry and fishery workers", "Managers" and "Technicians and associate professionals". This could be explained by either a high level of professional versatility or by a mismatch between labour supply and demand at the sectoral level. In contrast, other occupational groups such as "Clerical support workers" and

"Professionals" display a slight 4-digit occupational matching rate (Rate 1), but high values for Rate 2.

Finally, Rate 3 shows the percentage of job seekers who are employed in occupations that completely differ from the demanded occupation. The highest values for this rate are found within the occupational group of "Managers".

Table 5: Occupational matching

Demanded occupation (major groups)	Rate 1 (%)	Rate 2 (%)	Rate 3 (%)	Total (%)
1 Managers	9.8	13.1	77.2	100
2 Professionals	20.7	24.8	54.5	100
3 Technicians and associate professionals	20.4	14.5	65.2	100
4 Clerical support workers	14.6	34.7	50.7	100
5 Service and sales workers	34.4	17.6	48.1	100
6 Skilled agricultural, forestry and fishery workers	12.1	2.1	85.8	100
7 Craft and related trades workers	23.5	22.5	54.0	100
8 Plant and machine operators, and assemblers	21.0	19.3	59.8	100
9 Elementary occupations	22.3	23.4	54.3	100
Total	**22.8**	**22.6**	**54.6**	**100**

When a 4-digit occupational matching rate failed to occur, we analyse the direction of the flows of job seekers. This is done in Table 6, which shows a matrix of occupational transitions from demanded to final occupations.

Occupational matching rates within the same 1-digit occupational group (Rate 2) are represented in the principal diagonal of the matrix. The remaining cells indicate the direction of the flows of job seekers whose requested occupation completely differs from the occupation observed in the contract. Obviously, demanded occupations with the highest values for Rate 3 – "Skilled agricultural, forestry and fishery workers", "Managers" and "Technicians and associate professionals" – register the most intensive flows towards occupations belonging to different 1-digit major groups.

More than 46% of job seekers who requested occupations within the major group of "Skilled agricultural, forestry and fishery workers" found a job belonging to the group of "Elementary occupations". The most common final occupations for workers demanding occupations within the group of "Technicians and associate professionals" are "Clerical support workers" (33.7%) and "Professionals" (21.7%). The flows from "Technicians and associate professionals" to "Professionals" constitute an example where occupational mismatch does not necessarily lead to labour market inefficiencies since the latter group involves higher-skilled occupations.

Origin occupations within the group of "Managers" show the most intensive flows of job seekers towards final occupations in the groups of "Technicians and associate professionals" (29%), "Professionals" (26.8%), and "Clerical support workers" (23.6%). These numbers suggest a clear occupational downgrading, especially in the latter case.

The occupations at the bottom of the skills distribution, "Elementary occupations", presented a value for Rate 3 above 50% (Table 5). Of these, we observe that the majority of job seekers' flows are directed towards occupations belonging to the groups "Service and sales workers" (40.8%) and "Clerical support workers" (19.8%), which involve, in most cases, occupational upgrading.

Table 6: Occupational transitions, percentages

	Occupation in the contract								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Demanded occupation									
1 Managers	**13.1**	26.8	29.0	23.6	10.2	0.1	1.9	3.1	5.4
2 Professionals	5.4	**24.8**	34.6	39.3	10.9	0.3	2.1	1.3	6.1
3 Technicians and associate professionals	2.7	21.7	**14.5**	33.7	18.0	0.5	6.1	4.9	12.3
4 Clerical support workers	1.4	10.5	26.2	**34.7**	31.9	0.6	2.7	4.0	22.7
5 Service and sales workers	0.4	6.0	14.2	32.3	**17.6**	0.8	4.1	4.3	37.7
6 Skilled agricultural, forestry and fishery workers	0.2	2.8	4.6	9.0	18.0	**2.1**	12.6	6.5	46.4
7 Craft and related trades workers	0.2	2.4	9.0	6.4	14.6	1.6	**22.5**	15.9	49.9
8 Plant and machine operators, and assemblers	0.4	2.2	8.7	9.3	14.9	1.1	20.3	**19.3**	43.2
9 Elementary occupations	0.4	4.5	8.4	19.8	40.8	2.0	14.8	9.3	**23.4**

4. Determinants of occupational matching: Econometric analysis

This section provides an econometric analysis of the determinants of occupational matching. If the initial conditions are exogenous, a standard probit model could be used. However, if the sample of individuals getting a job is not random, the estimation results from a standard probit model would lead to biased results. To control for the possibility of this sample selection bias, we follow Heckman (1979) and apply a probit model with sample selection.

Thus, the probability of a 4-digit occupational matching conditioned on being in an employment situation (administrative situation of "unregistered") is estimated as follows:

$$\Pr\left(y_{i2}=1 \mid y_{i1}=1\right)=\frac{\Phi_2\left(x_{i2}^{'}\beta_2, x_{i1}^{'}\beta_1, \rho\right)}{\Phi\left(x_{i1}^{'}\beta_1\right)} \tag{1}$$

where $y_{i2}=1$ if occupational matching is reached, and $y_{i1}=1$ if the job seeker is employed. The explanatory variables in the selection equation include gender, age, educational level, nationality, experience in the demanded occupation, job search duration (measured by time since last inscription in the employment office) and its square, type of contract, firm size and job mobility. Φ and Φ_2 represent the cumulative distribution functions of a standard and a bivariate normal distribution, respectively. β_1 and β_2 are the vectors of parameters to be estimated from the selection equation and the matching equation, respectively. Finally, ρ is the correlation coefficient of the two equations model.

If $\rho=0$, the conditional probability of occupational matching could be estimated using a standard probit model. However, if ρ is significantly different to zero, the probability of

occupational matching would be given by the expression (1) and require some exclusion restrictions to identify the model. In particular, we include a set of instruments which refer to the geographical area of the job search (within the region, outside the region or in a restricted geographical area) in the vector of explanatory variables, x_{i1}. These variables are assumed to affect employment probability (*a priori* higher flexibility in the job search process increases the arrival rate of job offers), while at the same time they do not exert a significant influence on the probability of occupational matching.

The model is estimated by maximum likelihood. The log-likelihood function is given by:

$$
\begin{aligned}
\ln L\left(\beta_1, \beta_2, \rho\right) = & \sum_{y_1=1, y_2=1} \ln \Phi_2\left(x_{i2}^{'}\beta_2, x_{i1}^{'}\beta_1, \rho\right) + \\
& \sum_{y_1=1, y_2=0} \ln \Phi_2\left(-x_{i2}^{'}\beta_2, x_{i1}^{'}\beta_1, -\rho\right) + \sum_{y_1=0} \ln \Phi\left(-x_{i1}^{'}\beta_1\right)
\end{aligned}
\tag{2}
$$

The estimation results are presented in Table 7. To better understand the results, marginal effects instead of coefficients are reported. For expositional purposes, we first describe the results of the selection equation (employment equation) and then move to the determinants of occupational matching.

Employment probabilities are found to be higher among females, youths, job seekers with tertiary education and those of Spanish nationality. Greater differences are observed among age groups. In particular, the results show that job seekers between the age of 55 and 64 register a probability of employment around 33 percentage points lower than the reference group (those between 16 and 19 years old). The probability of employment also increases with level of education. Taking job seekers with primary education as the reference category, having upper secondary or tertiary education increases the probability of finding a job by around 9 percentage points.

Experience in the demanded occupation is found to reduce the likelihood of employment. This effect is especially important among those with more than one year of experience, with a marginal effect, in absolute terms, of 0.064. As we explained in the descriptive analysis, this result might be explained by the fact that this variable refers to experience in the occupation instead of employment experience. To the extent that job seekers with more experience in a specific occupation are more specialised, they would be more selective in their job search process, thus reducing the arrival rate of job offers and consequently their chances of employment. In contrast, workers without experience in the occupation would be more willing to accept any type of job offer.

The time elapsed since inscription in the employment offices is also included as a determinant of employment probabilities. Although it does not exactly correspond with job search duration (i.e. it might be the case that individuals start their job search process without registering in the Public Employment Offices), it can be considered as a proxy variable. The estimation results reveal that the probability of employment increases with the time elapsed since inscription, but the effect becomes negative for longer durations. This non-linear effect could be associated to the human capital depreciation caused by long periods of unemployment.

The geographical area of the job search also matters in the success of the job search process. Concretely, taking as the reference category the region of residence – at Eurostat *NUTS* level 2 (Autonomous Communities) – the results show that job seekers who are willing to accept a job outside their region of residence have a higher probability of employment. In turn, those who place restrictions on the geographical area are slightly less likely to find a job.

Let us now switch to the determinants of occupational matching. In general, the results obtained from the econometric analysis are in line with those obtained in the descriptive analysis of Section 3.3. The first aspect to be underlined is that all the explanatory variables

are statistically significant. *Ceteris paribus*, women register higher occupational matching rates than men. This result is fundamentally related to the fact that the occupations most demanded by women also coincide with those which register a greater percentage of contracts.

With respect to age, the results show that the highest occupational matching rates are found among young job seekers. The most important differences are registered in the 25-34 age group, whose probability of occupational matching is, on average, 10 percentage points lower than that of those aged between 16 and 19.

The occupational matching rate seems to decrease with the educational level of job seekers. The worst outcomes are found for upper secondary education, which shows an almost 6-point lower probability of matching than for workers with primary education or no schooling. This negative effect is slightly smaller among job seekers with tertiary education, with a marginal effect of -0.042. However, this result should not be necessarily understood as a symptom of worse labour market outcomes among highly educated workers. 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 in the arrival 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.

Table 7. Estimation of occupational matching probability (Heckman model)

	Main equation: Probability of occupational matching			Selection equation: Probability of employment		
	Marginal effects (1)		Std. Err.	Marginal effects (1)		Std. Err.
Gender						
Male						
Female	0.070	***	(0.005)	0.044	***	(0.003)
Age						
16 to 19						
20 to 24	-0.056	***	(0.010)	0.009		(0.008)
25 to 34	-0.100	***	(0.009)	-0.037	***	(0.007)
35 to 44	-0.079	***	(0.014)	-0.114	***	(0.008)
45 to 54	-0.051	***	(0.019)	-0.156	***	(0.008)
55 to 64	-0.051	***	(0.044)	-0.331	***	(0.009)
Education						
Primary education and no schooling						
Lower secondary education	-0.028	***	(0.008)	0.042	***	(0.004)
Upper secondary education	-0.059	***	(0.014)	0.090	***	(0.005)
Tertiary education	-0.042	***	(0.014)	0.093	***	(0.005)
Nationality						
Foreign						
Spanish	-0.035	***	(0.006)	0.014	***	(0.004)
Occupational experience						
None						
One year or less	0.084	***	(0.007)	-0.029	***	(0.004)
More than one year	0.137	***	(0.012)	-0.064	***	(0.003)
Log Time registered as job seeker	0.021	***	(0.014)	0.103	***	(0.003)
(Log Time registered as job seeker)^2	-0.005	***	(0.003)	-0.021	***	(0.000)
Type of contract						
Permanent contract						
Temporary contract	0.009	***	(0.004)	-	-	-
Others	-0.005		(0.014)	-	-	-
Firm size						
Less than 100 workers				-	-	-
100 or more workers	-0.031	***	(0.004)	-	-	-
Job mobility (additional contracts)						
No additional contracts				-	-	-
One additional contract	-0.011	***	(0.005)	-	-	-
Two or more additional contracts	-0.022	***	(0.005)	-	-	-
Geographical area of job search						
Same region (Eurostat NUTS 2)	-	-	-			
Out of the region of residence	-	-	-	0.032	***	(0.008)
Restricted area	-	-	-	-0.011	***	(0.006)
Constant	-	***	(0.051)	-	***	(0.009)
N	973,602					
Log pseudolikelihood	-894,450.5					
Rho	0.186					
LR test (rho = 0): chi2(1) =	4.78					
Prob> chi2 =	0.029					

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

(1) Marginal effects are calculated for a representative individual: Spanish woman aged 25-34, with lower secondary education, with more than one year of occupational experience, working with a temporary contract in a firm with less than 100 workers, no additional contracts and looking for a job in the same region of residence. The rest of the variables are considered at their mean values.

Regarding the effect of nationality, it is worth mentioning that, despite registering greater employment probabilities, natives face lower occupational matching rates – with a difference of 3.5 percentage points with respect to non-natives.

It is also noticeable that although the chances of employment were found to be lower with previous experience in the demanded occupation, the probability of occupational matching clearly increases with more years of occupational experience. Specifically, and taking job seekers without any experience as the reference category, the probability of matching increases by almost 14 percentage points for those reporting more than one year of experience.

The time elapsed since inscription seems to improve the probability of occupational matching, but the effect is reversed for search processes that are long in duration.

The type of contract also exerts some influence on occupational matching rates. In particular, people employed on a temporary basis are more likely to achieve an exact occupational match than those with a permanent contract. Nevertheless, the difference is very slight – less than 1 percentage point. This result could be explained by a trade-off between job stability and occupational matching. If job stability dominates workers' preferences, workers might be willing to accept jobs on a permanent basis, even in occupations that do not fit their requirements.

Occupational matching appears to be greater in smaller companies. Workers employed in firms with 100 workers or more have a probability of occupational matching which is 3 percentage points lower than those employed in companies with less than 100 employees. Once more, this result can be driven by a trade-off in workers' preferences: employment opportunities offered by large firms – greater stability and possibilities of promotion, among others – versus occupational matching.

Finally, job mobility measured by the number of previous contracts negatively affects the probability of occupational matching. Specifically, and taking workers without previous contracts as the reference group, the probability of matching among those who report two or more additional previous contracts is over 2 percentage points lower. This result is in contrast with most findings in the literature which report that job mobility tends to improve the quality of the job matching process. However, we should keep in mind that our analysis comprises a very specific type of job seekers. In many aspects, the characteristics of these workers differ substantially from those workers who search for employment through other channels.

5. Conclusions

This article focuses on occupational matching rates to analyse the labour market performance of workers registered in Public Employment Offices. Compared to traditional studies based on educational matching between the educational attainments of workers and the educational requirements of jobs, a novel aspect of this study is the use of linked data from two administrative records: job seekers inscribed in Public Employment Offices and contracts records. The first includes information regarding job seekers and the characteristics of the job search process, while the second contains characteristics about the contracts formalised between workers and companies.

Occupational matching is defined by comparing the demanded occupation by the job seekers in their job requests with the occupation finally observed in the contract. The descriptive analysis shows that matching rates significantly differ between occupational groups. The highest values are observed among "Service and sales workers" and "Professionals". In contrast, "Managers", "Skilled agricultural workers" and "Clerical support workers" register the lowest levels of occupational matching.

A further 'versatility' analysis is done for situations in which an exact occupational match fails to be reached. In particular, we identify both upwards and downwards occupational transitions as well as flows among professional categories that, despite belonging to different occupational groups, display similar task/skill characteristics.

The econometric analysis, which is based on a probit model with sample selection, shows that the probability of occupational matching is significantly higher among women, foreign workers and youths. In addition, lower levels of education lead to higher occupational matching rates. This result can be associated to the higher arrival rates of job offers among highly educated workers, which provide them with a higher degree of professional versatility.

Furthermore, our results reveal that workers seem to be willing to sacrifice their initial professional targets when they have the chance to access more stable jobs by either getting a permanent contract or being employed in large companies.

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 for manoeuvre in the labour intermediation process. This might be the case of designing training programmes for the unemployed. Keeping in mind the abovementioned professional versatility phenomenon, labour market performance might be improved, for instance, with the inclusion 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.

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