



An empirical approach on labour segmentation. Applications with individual duration data



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ABSTRACT

This article proposes empirical tools to account for the role of heterogeneities in the labour matching process, and shows an application to the Andalusian labour market which relies on individual data. The central idea of the paper is that the labour market is segmented, and this segmentation can be treated empirically by grouping workers, jobs and matches into labour groups according to their characteristics. In a segmented labour market the probability that a match occurs in a particular job group affects the probability that a match occurs in a particular worker group or vice versa. We propose two empirical measures related to this idea: propensity to match, and segmentation in worker and job groups. The usefulness of this empirical framework is shown by its application to different labour market analyses. Firstly, we use a clustering methodology, based on a similarity measure, to obtain a better overview of the structure of the labour market. Secondly, we propose a measure of mobility based on our similarity measure, and estimate a regression model that relates mobility to worker and job characteristics and to the economic cycle. Finally, these tools are included in an unemployment duration model. The proposed methodology may be useful in labour intermediation by helping seekers to follow a 'roadmap' of successful paths.

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1. Introduction

In the labour market, workers seeking jobs and vacant jobs offered by employers are heterogeneous in aspects as skills, geographical location, gender, age, payment, working time, attitude, taste, and many others. These heterogeneities lead to the concept of mismatch: "Mismatch is an empirical concept that measures the degree of heterogeneity in the labour market across a number of dimensions, usually restricted to skills, industrial sector, and location. Large differences in the skills possessed by workers and those required by firms would lengthen the time that it takes to match a given group of workers to a given group of firms, as agents search for a good match among the heterogeneous group. Industrial sector matters in matching because of industry-specific skills that may not be picked up by generally available measures of skills. Finally, location influences matching because of imperfect labour mobility." (Petrongolo and Pissarides, 2001, 399–400).

The main objective of this paper is to propose, from an empirical perspective, new variables to control for heterogeneities and segmentation in the labour matching process. We begin by dividing the workers, the jobs and the (worker–job) matches into highly detailed groups

according to their characteristics (location and skills in our application). Ideally, the detailed division should allow us to consider the groups obtained as homogeneous or almost homogeneous, and the large size of the database should enable data in each group to be sufficiently numerous as to be statistically representative. Based on this segmentation scheme, we propose new empirical variables such as the 'propensity to match' between a worker group and a job group, the degree of 'segmentation' of a particular (worker or job) group, and the 'similarity' in the matching between any two (worker or job) groups. To show the usefulness of these variables, we make use of them in an application to the Andalusian labour market,¹ which relies on a database of individual data of considerable size. These data allow us to perform different types of analysis: clustering, mobility and duration.

The nature of our data, with information on vacancies, unemployed workers and job placements, links up our work directly with the theoretical concept of matching function. This function is intended to represent heterogeneities, frictions, and information imperfections and to capture the implications of the costly trading process without the need to make the heterogeneities and other features that give rise to it explicit. Instead of representing frictions more specifically

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¹ This application to Andalusia is also interesting because it is the most populated Spanish region and persistently one of the European regions with the highest unemployment rate. In this region the main problems of the Spanish labour market – Bentolila et al. (2012) – are exacerbated.

according to their origin and their type, we lump them all together into an aggregate function. Therefore, the matching function does not assume that workers and jobs are homogeneous²; it simply omits to make the heterogeneities explicit. Without heterogeneities (zero mismatch), the matching function would not exist and jobs and workers would match instantaneously (Petrongolo and Pissarides, 2001, 400; Pissarides, 2000, 3–4, 22; Pissarides, 2008; Shimer, 2007, 1077).³

Considerable work has been carried out in an effort to open the ‘black box’ of the matching process and to render the heterogeneities inside the matching function explicit. Island, urn-ball, taxicab, queuing, stock-flow (or marketplace) and mismatch models, have all explored different types of frictions, extending the search theory of the labour market to allow for worker and firm heterogeneity and for micro-foundations of the matching process.⁴ As a rule, the labour market, or workers and jobs, are divided into parts (local labour markets, locations, islands, queues, worker–job pairs acceptable or unacceptable to match productively, stock (old)-flow (new) workers and jobs), which are then treated as if each part were homogeneous.

Our work is not meant to extend or evaluate theoretical models of labour matching, but instead it tries to handle empirically important elements involved in these models – heterogeneities and segmentation. The heterogeneities of workers and jobs cause the segmentation of the labour market⁵; that is, features such as skills, location, age, gender, etc., make certain jobs only suitable for certain workers.⁶ We begin our analysis by considering that in a segmented labour market the probability that a match occurs in a particular job group affects the probability that a match occurs in a particular worker group or vice versa (for instance, the municipality, group of occupation or sector of economic activity of a job affects the probability that it matches with a worker corresponding to a particular municipality, occupation or sector of activity). We propose a measure of the degree of segmentation of each group and another measure of the propensity to match between workers and jobs depending on the groups to which they belong. As might be expected, our data show a very high degree of segmentation for the vast majority of groups.

Since highly detailed division results in a very large number of groups, which may be difficult to interpret, we use a clustering⁷ methodology, based on a similarity measure, to obtain a better overview of the structure of the labour market and to obtain a smaller number of clusters (‘groupings of groups’). Cluster analysis enables, as far as possible, subjective or ‘a priori’ grouping criteria to be avoided: in our case, this would be the case, for example, if, for locations, municipalities were grouped in provinces and regions, or if, for skills, classifications with fewer digits for occupations or sectors were used. Instead, we

² Several authors seem to state this. For example Yashiv, 2007, 1872: “In the basic model all workers and jobs are assumed homogeneous ...” and Brown et al., 2009, 4: “In many conventional search models that use a matching function, workers and jobs are treated as if each group were homogeneous and randomly matched”.

³ There exists an extensive literature that surveys search and matching theories applied to labour economics and the matching function; see, for example, Devine and Kiefer (1991), Mortensen and Pissarides (1999), Pissarides (2000), Petrongolo and Pissarides (2001), Rogerson et al. (2005), and Yashiv (2007).

⁴ See, for example, Phelps (1970), Lucas and Prescott (1974) and Mortensen (2009) about island models, Petrongolo and Pissarides (2001) about urn-ball models, Lagos (2000) on the taxicab model, Gautier (2002) and Sattinger (2010) on queuing, Coles and Smith (1998) and Ebrahimi and Shimer (2010) about stock-flow models, and Shimer (2007) on mismatch models.

⁵ In labour economics, the concept of market segmentation has also been used in a more restrictive sense than ours. This applies to the theory of dual labour markets – see for example Reich et al. (1973) – or to the branch of endogenous segmentation – Moreno-Galbés (2009).

⁶ Álvarez de Toledo et al. (2008, 2011) test, with macroeconomic and individual data from the Spanish public employment agencies respectively, the plausibility of the stock-flow model (Coles and Smith, 1998) for the Spanish economy. In essence, they conclude that there exists clear evidence of this type of labour market segmentation, based primarily on skills and location. More specifically, the results point to an extreme case of that scheme: a queue of workers.

⁷ About cluster analysis see, for example, Cotterman and Peracchi (1992), who propose an application to an industrial classification, and the survey of Jain et al. (1999).

look for a measure of similarity adapted, in the most objective possible way, to the purpose of our research. In the context of the search and matching theories applied to labour economics, we consider that worker (job) groups are more similar the more they resemble in the way they match with job (worker) groups. Using this concept of similarity, we will show in which way the worker–job clusters with high propensity to match that are formed may be considered as labour market clusters. We present results obtained by applying this methodology to our data.⁸

Mobility and unemployment duration are essential concepts in the search models that make the heterogeneities explicit by dividing the labour market into parts and specifying how workers (and jobs) move from one to another part.⁹ We propose an empirical measure of mobility directly related to our similarity measure, and then we estimate a multiple regression model that relates mobility in each worker–job match primarily to worker characteristics, and additionally to job characteristics and to the economic cycle. We use the results of the regression to estimate the ‘a priori’ workers’ willingness to move. Our analysis ends up showing that the new empirical framework developed in this work can enhance the estimation of unemployment duration models in this field.¹⁰

The rest of the paper is organised as follows. Section 2 analyses the concept of labour market segmentation and proposes some related empirical measures: propensity to match and segmentation in worker and job groups. Section 3 develops the clustering methodology and shows the structure of the labour market obtained by applying this methodology. Section 4 proposes a measure of mobility and estimates a regression model that relates this measure to worker and job characteristics and to the economic cycle. The results are used to estimate the willingness of workers to move. Section 5 estimates an unemployment duration model making use of the tools obtained in the previous sections. Finally, Section 6 draws conclusions and suggests a number of possible applications of our methodology to active labour market policies.

2. Labour market segmentation

At any period t in time, each worker seeking for a job is assigned to one of the n worker groups W_{it} ($i = 1, 2, \dots, n$), each vacant job is assigned to one of the m job groups J_{jt} ($j = 1, 2, \dots, m$), and each of the matches formed with both, worker and job, is assigned to one of the $n \times m$ joint groups S_{ijt} . Each group is defined by the corresponding set of characteristics $\bar{W}_i, \bar{J}_j, \bar{S}_{ij}$ plus the t period (\bar{S}_{ij} includes the characteristics of the worker \bar{W}_i and the characteristics of the job \bar{J}_j that are matched).¹¹ In period t , the number of matches in each joint group, M_{ijt} , shows ‘who matches with whom’.¹²

The total number of matches, $M_t = \sum_{i=1}^n \sum_{j=1}^m M_{ijt}$, is the sum of matches

⁸ More detailed results on local labour markets in Andalusia can be found in Álvarez de Toledo et al. (2013).

⁹ Mobility has been studied from different perspectives in empirical literature: ‘job’ mobility – Topel and Ward (1992), Shimer (2007) and Barnichon and Figura (2011), ‘interregional’ mobility – Greenwood (1985), Pissarides and Wadsworth (1989), Faini et al. (1997), Ahn et al. (1999) and Arellano and Bover (2002), ‘occupational’ mobility – Miller (1984), McCall (1990), Neal (1995), Castillo et al. (1998), Kambourov and Manovskii (2009) and Lalé (2012), and ‘sectoral’ mobility – Lilien (1982), Abraham and Katz (1986), Jovanovic and Moffitt (1990), Iglesias-Fernández and Llorente-Heras (2007) and Bachmann and Burda (2010).

¹⁰ There exists an extensive literature on unemployment duration and hazard rates. We can highlight the works of Lancaster (1979), Devine and Kiefer (1991), van den Berg and van Ours (1996), Machin and Manning (1999), Yashiv (2007), Shimer (2007, 2008), Kuo and Smith (2009) and Rogerson and Shimer (2011). For the Spanish economy, see for instance Alba-Ramírez (1994), Ahn et al. (1999), Carrasco (1999), Bover et al. (2002), Güell and Hu (2006), Güell and Petrongolo (2007), Carrasco and García-Pérez (2008) and Álvarez de Toledo et al. (2011).

¹¹ Barnichon and Figura (2011) formally use a similar type of labour market segmentation.

¹² Similarly, in two-sided matching games, a match production function governs who matches with whom. See, for example, Fox (2008).

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