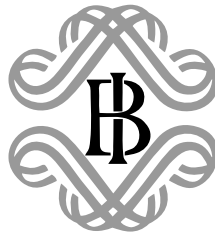# BANCA D'ITALIA

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with an application to Italy and Spain

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AN EMPIRICAL MICRO MATCHING MODEL WITH AN APPLICATION TO ITALY AND SPAIN

by Franco Peracchi[*] and Eliana Viviano [**]

Abstract

A large literature investigates the role of frictions in explaining labour market dynamics. Their presence is often summarized by an aggregate matching function relating the number of job matches to total unemployment and total vacancies. Most empirical specifications, however, are only reduced forms with no micro-foundation. Further, for many countries, empirical research on the matching function cannot be carried out because data on vacancies are simply not available. This paper looks at a job match as a transition from non-employment to employment. This transition is decomposed into two parts, one determined by the matching technology and one by individual search intensity. We show how the micro-founded model of Pissarides (1979) can be identified using only microdata on labour market transitions. This enables us to obtain a measure of market tightness even without information on the demand side of the market. The method is then applied to estimating the Italian and Spanish matching functions using data from the quarterly labour force surveys.

JEL classification: J60, J63, J64.
Keywords: Matching function, market tightness, labour market transitions, search intensity.

Contents

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1. Introduction[1]

Labour markets are characterized by flows of workers moving from one condition to another. For example, individuals change their working status by moving from inactivity to participation, from unemployment to employment, and from employment to retirement. Given the large social losses implied by unemployment, it is hardly surprising that the most studied labour market movement is from unemployment into employment.

A transition from unemployment to employment occurs when a job seeker and a vacancy meet through a decentralized process which can be affected by a variety of frictions (heterogeneity in required and offered skills, different location of workers and firms, information imperfections, congestion, etc.). As a consequence of these frictions, not all vacancies may be filled, even in the presence of unemployed workers. Frictions are then the main source of equilibrium unemployment. It is now common to model the presence of frictions with an aggregate matching function (see for example Pissarides, 2000, and Petrongolo & Pissarides, 2001). By analogy with the aggregate production function, this is a relationship that takes the stock of job seekers and vacancies as inputs, and gives the total number of job matches as output.

The standard approach to estimating the matching function relies on aggregate time-series data on flows into employment, under the assumption of long-term stability of the matching process. Data availability and definitional problems crucially affect the quality of the inference. While reliable data on labour market flows and unemployment exist for many countries, data on vacancies are in general not available, except for a few countries where vacancy registration is required by law (Israel for example, see Yashiv, 2000) or surveys on vacancies are conducted on a regular basis. Instead, different proxies for vacancies are often used, with effects on the interpretation of the corresponding results and the possibility to carry out international comparisons.

The standard approach to estimating the matching function is also affected by a number of problems regarding the definition of the other input to the matching function, namely the stock

of job seekers. In practice, there is no obvious way of defining the set of individuals who are "at risk" to be matched with a vacancy. A natural choice consists of those unemployed at a given point in time. However, evidence from many countries shows that a sizeable share of movements into employment consists of people recorded as out of the labour force (see, for example, Clark & Summers, 1979, and Jones & Riddell, 1999). This observation has led to empirical specifications that include those out of the labour force as inputs (Broesma & van Ours, 1999, and Mumford & Smith, 1999). Unfortunately, because of the lack of micro-foundation of the resulting matching functions, these models do not help to clarify the nature of the matching process for the different types of non-employment.

In this paper, we look at a job match as a transition from non-employment (unemployment or out of the labour force) to employment. For simplicity, we do not consider how vacancies are created, nor job-to-job movements. We first show how the micro-founded urn-ball matching model proposed by Pissarides (1979) can be estimated using only micro-data on labour market transitions, such as those generally collected by standard labour force surveys. This enables us to derive a measure of market tightness even with very limited information on the demand side of the market. Although our empirical results strongly depend upon the assumptions about the matching technology, the proposed method can be considered a useful tool for empirical analyses of the matching function when no data on vacancies are available or their quality is poor. It can also be useful when good data on vacancies are available, because it allows one to compare the findings of a standard (reduced form) aggregate model with the micro evidence.

Second, in addition to estimating the transition probability into employment, we also estimate the probability of a non-employed person deciding to look for a job. This probability, which can be interpreted as a measure of search intensity, allows us to distinguish between different types of non-employed people.

We then apply the proposed method to estimate the Italian and Spanish matching functions using micro-data from the national labour force surveys. Because of the very similar design of the two surveys, we can get comparable information on the matching process.

The remainder of this paper is organized as follows. Section 2 presents our estimation method. Section 3 describes the data. Section 4 presents some descriptive statistics and the results of our modeling exercise. Finally, Section 5 concludes.

2. Modeling labour market dynamics

Section 2.1 summarizes the main features of the empirical approach commonly used to study the matching function. Section 2.2 presents our method, which exploits the link between individual transitions and the aggregate matching function. This allows us to derive the main features of the matching function using data on individual labour market movements. Finally, Section 2.3 analyzes the link between individual search intensity and hazard rates.

2.1 Matching functions

An aggregate matching function is a relationship

$$M = M(V, S) \tag{1}$$

between, on the one hand, the total number of matches M and, on the other hand, the total number of vacancies V and of job seekers S. A matching function $M(\cdot)$ is typically assumed increasing in both arguments and concave.

Under the further assumption of constant returns to scale, we have that $M/S = M(\theta, 1) = m(\theta)$, where $\theta = V/S$ is a measure of market tightness. In order to estimate model (1), one needs to specify a functional form for the matching function and collect data on M, V and S.

The elasticities η_V and η_S of M with respect to V and S measure the positive externalities (thick-market effect) caused, respectively, by firms on job seekers and by job seekers on firms. On the other hand, $\eta_V - 1$ and $\eta_S - 1$ measure the negative externalities (congestion) caused, respectively, by firms on each other and by job seekers on each other. The interpretability of model parameters in terms of elasticities partly explains the success of the log-linear (Cobb-Douglas) specification $M = \alpha V^\beta S^\gamma$. This specification is convenient but, like other commonly adopted functional forms, lacks micro-foundation. This implies that it is often unclear how to interpret the estimates obtained and how to relate them to observed labour market dynamics (Coles & Smith 1996). It is also difficult to explain the effects of individual or aggregate variables on the matching process and, as a consequence, these variables enter the matching function simply as shift variables.

The interpretation and robustness of the estimated elasticities also depend on the way in which the variables M, V and S are defined and measured. Consider first the stock of vacancies

V. In order to get good estimates of the matching technology, good data on vacancies are needed. When they are not available, as often happens, proxies for vacancies are typically used, such as help-wanted indices derived from newspaper advertisements, or the number of vacancies registered at job centres, often adjusted in some way (see, for example, Storer, 1993, Coles & Smith, 1996, and Berman, 1997). These data sources, however, need not correspond to total vacancies available at a given time, because firms could adopt other methods to advertise their vacant positions, such as the Internet, private employment agencies or informal networks.

When data on vacancies are proxied by some downward biased index, the associated coefficient is also likely to be estimated with bias. The sign and magnitude of this bias is determined by two sources of distortion. The first is the standard attenuation bias due to measurement errors. The second can be of any sign, and depends on the correlation between the adopted vacancy index and the measurement error (see Broesma & van Ours, 1999, for an example). Because of these two potentially offsetting effects, the direction of the bias is undetermined and the estimated elasticity to vacancy should be interpreted with caution. This is especially true with international comparisons, where the proxies used may be different across countries.

Consider now the problem of identifying the pool of job seekers *S*. Early studies adopt very simple models where *S* corresponds to total unemployment and, consequently, *M* is equal to the outflow from unemployment into employment (see, for example, Pissarides, 1986, and Layard *et al.*, 1991). Most of these studies find that the matching process satisfies the hypothesis of constant returns to scale. They also find that a plausible range for the elasticity to unemployment is between .5 and .7. A range for the elasticity to vacancies is instead between .3 and .5, suggesting that the supply side of the market has a greater influence on the matching process (see Petrongolo & Pissarides, 2001, for a review).

Several empirical studies show that a large part of hirings that occur in a given period consist of people recorded as inactive at the beginning of the period (see, for example, Clark & Summers, 1979, and Jones & Riddell, 1999). Therefore, recent literature on the matching function expresses total labour availability *S* as a function $S = g(U, O)$ of the stock *U* of unemployed and the stock *O* of people out of the labour force. The resulting matching function takes the form $M = M(V, g(U, O))$, where *M* is now the total flow from non-employment into employment. In the simplest case, $g(U, O)$ is just the sum of the unemployed and people out of the labour force. In other cases, *g* is

modeled as a more complex function of *U* and *O* (for example, Broesma & van Ours, 1999, propose a Cobb-Douglas specification). In these studies, the estimated elasticity to *S* is generally lower than .5, confirming how relevant is the definition of the inputs for the analysis of job match elasticities (see also Blanchard & Diamond, 1989). The general problem of lack of micro-foundation of standard empirical matching models gets even worse when the pool of job seekers *S* is represented by a (non-microfounded) function like $g(U,O)$. An aggregate function for *S* is neither useful to interpret the labour supply behavior of the different groups of non-employed people (men versus women, younger versus older people, etc.), nor to evaluate how they may influence the matching rate.

In the next two sections, the problem of measuring the two inputs to the matching function will be addressed using a micro model for transition probabilities.

2.2   A micro-founded hazard model

At the micro level, a job match implies a transition from non-employment to employment. Let *h* be the (discrete-time) hazard that a non-employed person finds a job between time *t* and time $t+1$. It follows from (1) that $h = M/S$. In the special case of constant returns to scale, $h = m(\theta)$.

In order estimate this hazard rate, we need to specify a functional form for *h*. As for the matching function, we can choose any function whose values are comprised between 0 and 1. However, we can go a step forward in the study of the matching process and adopt a micro-founded matching function. Consider the basic urn-ball micro matching model proposed by Pissarides (1979). In this model, time is partitioned into a number of intervals of fixed length ("application rounds") during which job seekers apply for a job and firms select from among them the people needed to cover their vacancies.[2] Assume that, in each application round, job seekers can send just one application for a vacant job. A job seeker knows where vacancies are located, but not if other seekers are applying for the same job. As a result, a vacancy may receive several applications, or no application at all. In this simple model, frictions are entirely due to the failure of workers' coordination. Also assume that, when a firm receives more than one application, it selects a worker at random. Applicants who are not selected return to the pool of job seekers. Under this set of

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[2]   In this paper, we adopt the standard assumption that an application round lasts for one quarter. This assumption is implicitly made by all those studies where the matching function is estimated on quarterly data (see for example Storer, 1994, and Castillo *et al.*, 1998).

assumptions, one obtains the following micro-founded constant-returns-to-scale matching function (see Pissarides, 1979, and Petrongolo & Pissarides, 2001)

$$(2) \qquad M = V(1 - e^{-1/\theta})$$

where $\theta = V/S$ is market tightness. The resulting employment hazard is

$$h = \frac{M}{S} = \theta(1 - e^{-1/\theta}).$$

The market tightness parameter θ can easily be estimated by maximum likelihood using micro-data on individual transitions. Given a random sample of n people who are non-employed at time t, the individual contribution to the sample likelihood is

$$(3) \qquad \ell_i = \begin{cases} \theta(1 - e^{-1/\theta}), & \textit{if the person finds employment at } t+1, \\ 1 - \theta(1 - e^{-1/\theta}), & \textit{otherwise.} \end{cases}$$

Notice that θ can be estimated even in the absence of data on vacancies. Thus, model (2) not only gives a micro-founded hazard rate, but also allows us to estimate a measure of market tightness compatible with the observed transitions, even when the lack of data on vacancies prevents direct estimation of the matching function.

2.3 Introducing search intensity

The model presented in the previous section is a simple two-state model where non-employed people find employment with probability h. However, not all the non-employed search for employment at a given time. A simple way of describing the labour supply behavior of non-employed people is through search intensity. Search intensity is a measure of the effort applied in job search, under the assumption that a higher intensity implies a higher probability of finding a job. We shall assume that each non-employed person is characterized by a search intensity level s which depends on individual preferences, search costs and the expected return of searching. In what follows, without loss of generality, we normalize s to be between 0 (does not want to search) and 1 (active job seekers).

Petrongolo and Pissarides (2001) propose a simple way to introduce search intensity into the urn-ball model presented in the previous section. In their framework, job seekers simply choose

the total number of application rounds in which they want to participate. Search intensity, defined as the individual probability of participating in a given application round, can then be measured by the fraction of application rounds in which a job seeker decides to participate. Within this framework, the transition probability from non-employment to employment can be decomposed into two parts: (i) the probability s of participating in an application round, and (ii) the probability $\theta(1 - e^{-1/\theta})$ that, conditional on participating in an application round, a person finds employment, where now $\theta = V/[\sigma(U + O)]$ and σ is mean search intensity in the population.

The individual contribution to the sample likelihood is now

$$
(4) \qquad \ell_i = \begin{cases} 1 - s, & \textit{if the person does not participate}, \\ s\theta(1 - e^{-1/\theta}), & \textit{if the search is succesful}, \\ s[1 - \theta(1 - e^{-1/\theta})], & \textit{if the search is not succesful}. \end{cases}
$$

After suitably parameterizing s, and possibly θ, as functions of observables, ML estimates of the model parameters may again be obtained from micro-data on transitions.

3. Data

This section summarizes the main features of the data we use. We first describe the Italian and Spanish quarterly labour force surveys (LFS) (Section 3.1), and then present some descriptive statistics (Section 3.2).

3.1 The Italian and Spanish labour force surveys

The Italian and Spanish LFSs share a lot of common features, both in their design and the nature of the information collected. Therefore, even if the two surveys are not fully harmonized, it is possible to compare individual labour market status and many aspects of job search behavior.

Both surveys are rotating quarterly sample surveys. In Italy, the rotation scheme is 2–2–2, that is, people are interviewed for two consecutive quarters, remain out of the sample for two quarters, and are interviewed again for two more quarters. Thus, each quarter sample consists of four rotation groups, in any two-quarter period there are two overlapping rotation groups and, for any rotation group, the second pair of interviews occurs one year later in the same quarters as the

first pair. In Spain, instead, each quarter sample consists of six rotation groups, each rotation group is interviewed for six consecutive waves and, in any two-quarter period, there are five overlapping rotation groups, one exits the sample and is replaced by a new one.

The Spanish LFS (*Encuesta de Poblacion Activa*) is conducted by the Spanish National Statistical Office (INE), that regularly produces two types of files, cross-sectional and longitudinal. Cross-sectional files contain detailed information about individuals, households and the place of residence (municipality and region). In the longitudinal files, information about households and their place of residence is omitted. This information can be easily added by matching the longitudinal and the cross-sectional files using the individual identifiers and the other variables common to both files. This matching procedure leads to a 100 per cent match rate.

Unlike Spain, longitudinal files of the Italian LFS (*Rilevazione Trimestrale delle Forze di Lavoro*) are not produced on a regular basis. This paper uses a preliminary version of the October 1999–October 2000 quarterly matched data, available thanks to a joint research project of the Italian National Statistical Institute (ISTAT) and the Bank of Italy. In the Italian LFS, linkage of individual records is problematic because of the lack of a unique personal identifier and reporting errors in the household identifier (Paggiaro & Torelli, 1999). The procedure adopted by ISTAT matches individuals on the basis of time invariant information (gender, date of birth, etc.) and information which varies monotonically (e.g. educational attainments). Sample attrition and matching errors do not allow for a perfect match between consecutive surveys and on average about 6 per cent of the original sample is lost each quarter. As for the Spanish case, where the loss of units is entirely due to sample attrition (Jiménez-Martín & Peracchi, 2002), this loss of information does not seems to affect the estimates of transition probabilities (Viviano, 2002).

Following most of the empirical literature on the matching function, we focus on quarter-to-quarter transitions. Our estimates are based on the surveys conducted between October 1999 and October 2000. For each country, we pool in a single dataset the four quarterly waves conducted in 2000 (October 1999–January 2000, January 2000–April 2000, April 2000–July 2000, and July 2000–October 2000). The final samples, consisting only of working-age individuals (aged 16–64), amount to more than 200,000 observations in each country.[3]

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[3] The rotation scheme of the Italian LFS implies that each individual is interviewed only twice during the period October 1999–October 2000. Thus, the Italian pooled dataset contains transitions of different individuals. This is not

3.2 Some descriptive statistics

Italy and Spain are characterized by high and unevenly distributed unemployment, concentrated among women and younger people (see Table 1).[4] Differences by gender are stronger in Spain than in Italy, whereas the opposite is true for differences by age group. In year 2000, the Italian unemployment rate was 8.4 per cent for men, 14.9 per cent for women, 31.1 per cent for younger workers (aged less than 25 years), and 8.4 per cent for the rest of the working-age population. In Spain, it was 10 per cent for men, 20.6 per cent for women, 25.5 per cent for younger workers and 12.2 per cent for the rest of the working-age population (respectively 5.6 percentage points lower and 3.8 percentage points higher than the corresponding Italian rates).

In both countries, labour market conditions differ considerably across regions. In Italy, the unemployment rate in 2000 was around 4 per cent in the North-Eastern regions,[5] but close to 24 per cent in the Southern regions.[6] In Spain, it was below 5 per cent in Navarra and Balears, but around 25 per cent in the Southern regions.[7]

Panels a) and b) of Figures 1 and 2 show the age profile of the quarterly flow into employment by gender for Italy and Spain respectively. The flow is expressed as a percentage of the non-employed population, and therefore corresponds to the exit rate $M/(U+O)$ from non-employment. The rate is further decomposed in order to separately identify those who move from unemployment from those who move from out of the labour force. Data have been smoothed using a simple centered moving average of the age-specific rates. In Spain, exit rates from non-employment initially increase with age, reach a peak around 35 for men and 26 for women, and then decrease. The Italian data reveal a similar pattern, but with a weaker relationship between age and the female

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true for the Spanish pooled dataset, where a sizeable part of the pooled sample (around 42 per cent) is observed for all the 5 waves taking place between October 1999 and October 2000, 29 per cent is observed 4 times, 21 per cent is observed 3 times, and 9 per cent is observed 2 times.

[4] We do not consider the effects of the new European Commission Regulation 1897/2000 regarding the definition of unemployment. The new definition is more restrictive than the usual ILO definition, because people merely registered at employment offices are now considered non-active job seekers. As a consequence, these people are excluded from the unemployment pool. So far, Spain is the only country of the European Union that has adopted this regulation (see Garrido & Toharia, 2003, for a discussion).

[5] Trentino A.A., Veneto, Friuli V.G., and Emilia R.

[6] Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicily and Sardinia.

[7] Andalusia, Canarias, Extremadura, Murcia and Ceuta y Melilla.

exit rate from non-employment.

As in many other countries (see, for example, Clark & Summers, 1979, Burda & Wyplosz, 1994, and Jones & Riddell, 1999) in both Italy and Spain a sizeable part of the quarterly flow into employment consists of people initially recorded as being out of the labour force. In Spain, this flow is particularly important for women older than 35 years of age. In Italy, it amounts on average to nearly half the total flow for men and about 70 per cent of that for women. Thus, in both countries, the study of the matching process must also take into account movements from out of the labour force.

In general, an observed transition from inactivity to employment masks two transitions, one from inactivity to job seeking and one from job seeking to employment. These transitions are not observed because we only know an individual's working condition at fixed points in time one quarter apart from each other. However, our estimates of the number of matches M and the number of job seekers S must somehow take them into account. In this paper, we measure M by the number of people who are without a job at time t and find employment before time $t+1$. Similarly, we measure S by the sum of those who look for and find employment (i.e. M) and those who look for but do not find employment (i.e. those who are unemployed at $t+1$).

According to the ILO definition, people without a job are recorded as unemployed if they have undertaken at least one search action during the 30 days preceding the reference period. However, because we are considering job matches that take place during a quarter, consistency between flow and stock data requires that we include in the pool of job seekers those recorded as inactive at time $t+1$ because their last search action occurred 2 or 3 months before time $t+1$. The Italian and Spanish data provide a measure of this larger stock of job seekers. In fact, unlike other labour force surveys, the Italian data report for non-employed people the number of months that have passed since the last search action. It is therefore easy to identify those who made at least one search step during the previous 2–3 months. On average, they amount to nearly 20 per cent of total unemployment. The Spanish LFS does not allow us to derive such a measure, but only to identify those who have not undertaken any search step during the previous 30 days because they are waiting for the results of previous efforts. On average, they represent around 2 per cent of total unemployment.

Panels c) and d) of Figures 1 and 2 show the ratio $S/(U+O)$, which is a direct estimate

of search intensity. They also show the ratio M/S, which is a direct estimate of the probability of finding employment during a quarter. According to these non-parametric estimates, average male search intensity in Spain increases with age up to 28–30 and then decreases. At its peak, search intensity is around 70 per cent. In Spain, women aged 26 have the largest probability of participating in an application round and, at this peak, search intensity is around 50 per cent. Compared with Spain, the age profile of search intensity of Italian men is older. Moreover, at the peak, search intensity is almost 10 percentage points lower than in Spain. Search intensity for Italian women is even lower and equals 30 per cent at the peak. Thus, the Italian labour market is characterized by a higher share of non-employed people who decide to stay out of the labour market.

In both countries, the estimated hazard rate h is around 30 per cent on average (around 35 per cent for men and 25 per cent for women). In Spain, the age profile of h decreases by age, especially for men. In Italy, it is instead U-shaped, the minimum being reached between 22 and 28 years of age. This is a peculiar feature of the Italian labour market, where people with secondary education, who amount to around 60 per cent of the total population of this age group, tend to search more intensively but have fewer job opportunities than other groups in the population (see Viviano, 2002). In both countries, older people have less probability of participating in an application round but a relatively higher probability of finding employment.

4. Results

The literature on the matching function typically assumes that the labour market is segmented, for example by skills, regions or travel-to-work-areas (see, for example, Coles & Smith, 1996). As a consequence, market tightness θ and search intensity s need not be the same for different labour market segments. In this paper, we allow both θ and s to be functions of regional labour market characteristics and socio-demographic characteristics of a person (gender, age, educational attainment). Because θ can only take non-negative values and s must lie between 0 and 1, the following specifications are adopted

$$\theta_i = \theta(X_i) = \exp(\beta^\top X_i) \tag{5}$$

and

(6)
$$s_i = s(Z_i) = \frac{\exp(\gamma^\top Z_i)}{1 + \exp(\gamma^\top Z_i)},$$

where β and γ are vectors of unknown parameters and X_i and Z_i, with $X_i \neq Z_i$, are vectors containing personal characteristics and regional labour market characteristics. For parsimony, both X_i and Z_i only contain the main effects and exclude interactions between personal characteristics and regional labour market characteristics.

More precisely, the vector X_i contains three indices of regional labour market conditions. The first is the fraction of workers who worked more hours than usual during the reference period. The second is the average number of extra hours worked during the reference week. The third is the regional separation rate at time t, that is, the number of people moving from employment to non-employment between time t and time $t + 1$ divided by total employment at time t. The first two variables capture the effects of labour demand shock, while the third reflects structural labour market characteristics.[8] Under the assumption that urban agglomeration may affect frictions (see, for example, Coles & Smith, 1996), X_i further includes a dummy variable equal to 1 if the region of residence contains a big city (one with more than 1,000,000 inhabitants). To take into account possible seasonal effects and unobserved regional characteristics, the vector X_i also contains seasonal dummies and area dummies (different in the two countries). Finally, X_i contains a set of dummies for gender (female dummy), age (four age groups: 16–24, 25–34, 35–44 and 45+) and educational attainment of a person (three levels: primary, secondary and tertiary education following the ISCED classification).

In addition to the dummies for gender, age and educational attainment, the vector Z_i contains the position of a person within the household (single and living alone, household-head, spouse of the head, other household member), self-reported work status (job seeker, student, other condition), past work experience, and a set of dummies for the type of non-employment status (ILO unemployed, job seeker but not in the 4 weeks before the survey, not job seeker) and the search method used. It also includes labour market characteristics, as described by the regional separation rate and the dummy for a large city in the region of residence.[9]

The model parameters β and γ have been estimated by maximizing the sample log-likelihood

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[8] In the two countries the separation rate depends on the characteristics of employment in a given segment. For example, in both countries the separation rate is highly correlated with the fraction of temporary workers.

$L(\beta, \gamma) = \sum_i \ln \ell_i(\beta, \gamma)$, where ℓ_i is of the form (4), with θ and s specified as in (5) and (6).[10] After selecting non-employed persons aged between 16 and 64, the Italian and Spanish samples consist of 116,853 and 165,798 observations respectively. Because of the rotation scheme, a large part of the Spanish sample consists of repeated observations of the same person. So, for Spain, estimated standard errors are derived from the "sandwich" estimate of the asymptotic variance matrix, under the assumption that observations on the outcome variable are independent between persons but not within.

Table 2 reports estimates of the β and γ coefficients associated, respectively, with market tightness and search intensity. The baseline case is a man aged 25–34, not at school, with secondary education, living with his parents in the Southern part of Italy (Area 4), [11] or Spain (Area 5),[12] not in a big city, with past work experience, who actively looked for a job during the previous four weeks by sending applications and *résumés*. Regional separation rates, fraction of overtime workers and average extra hours worked are all expressed as deviations from the country-specific means. For both countries our estimates indicate significant differences in market tightness between men and women and across age groups, educational levels and geographical areas. In Italy, market tightness is higher for people with tertiary education, while in Spain it is higher for people with primary education only. In both countries, market tightness is negatively related to the separation rate, the fraction of overtime workers and the average extra hours worked during the reference week. Finally, the matching rate is lower in regions with a big city, as found also by Coles & Smith (1996) for England and Wales.

Search intensity is higher for men, for people aged 25-34 and for people with higher educational attainment. As expected, search intensity is also affected by household background variables, labour market conditions at time t and the type of search methods used, with similar impact

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[9]   Under the assumption that individuals are unable to adjust immediately to aggregate shocks, the current value of variables which are highly correlated with the business cycle, such as the fraction of workers who worked more hours than usual during the reference period and the average number of extra hours worked during the reference week, should not help predict search intensity.

[10]   The sample log-likelihood has been maximized using the Newton-Raphson optimization method provided by the `ml` command in Stata 7.0, with numerical first and second derivatives, and with starting values of the parameters set equal to zero. For both countries, convergence is always achieved after 5 iterations.

[11]   Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicily, and Sardinia.

[12]   Andalusia, Canarias, Extremadura, Murcia, and Ceuta y Melilla.

on both Italian and Spanish job seekers.

Table 3 reports average predicted search intensity and market tightness. For each individual in the sample, predicted values are computed by keeping household background variables, previous labour market condition, and regional labour market characteristics at their average, but allowing gender, age group, educational attainment and region of residence to vary across individuals. Predicted values are then averaged over gender, age group, educational attainment and geographical area.[13] [14]

We do so in order to isolate the "pure" effect of variation across this second set of variables. The table also provides the average value of a number of features of the matching process, namely the hazard rate, the search duration (the inverse of the hazard rate), the vacancy duration (the inverse of the probability V/M that a vacancy is filled), the elasticity to unemployment η_U, and the elasticity to vacancy η_V. These indicators make it possible for us to interpret labour market dynamics underlying the unemployment rates of the two countries. For example, a higher intensity implies that a relatively larger share of the population looks for a job. Thus, it can increase the unemployment rate. However, when search intensity is associated with fairly high market tightness, the final effect on the unemployment rate can be of any sign.

In Italy, average estimated search intensity is equal to 28.6 per cent, that is, 28.6 per cent of the non-employed population carries out some search action during each quarter (see Table 3). Average search intensity is higher for men, for people aged 25–34, and for more educated persons. It also varies considerably by geographical area, and is higher in the Southern part of the country (Area 4).[15] In Italy, average market tightness is equal to 44.5 per cent, that is, about 45 vacancies are available for every 100 job seekers. Large differences can be found by gender and age group, with older people facing a tighter market than younger workers (64.0 versus 35.5 per cent). Market tightness is slightly greater for people with lower educational attainment than for people with

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[13] Averages are weighted using the probability weights provided by each survey.

[14] In what follows Area 1 consists of Piedmont, Lombardy, Liguria in Italy, and Cantabria, La Rioja, Navarra, Pais Vasco in Spain. Area 2 consists of Trentino A.A., Veneto, Friuli V.G., Emilia R. in Italy, and Aragon, Catalunia, Comunidad Valenciana, Balears in Spain. Area 3 consists of Tuscany, Umbria, Marche, Lazio in Italy, and Asturias, Galicia in Spain. Area 4 consists of Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicily and Sardinia in Italy, and Castilla La Mancha, Castilla y Leon, Madrid in Spain. Area 5 consists of Andalusia, Canarias, Extremadura, Murcia, Ceuta y Melilla in Spain.

[15] Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicily and Sardinia.

secondary education (44.5 versus 39.5). There are striking differences across regions, however. In the North-Eastern part of the country (Area 2), estimated market tightness is equal to 82.5 per cent, almost twice the national average.

Thus, our results suggest that differences in the male and female unemployment rates cannot be imputed to search intensity, which is higher for men than for women, but to differences in market tightness, which is more than 10 percentage points higher for men. Our estimates suggest also that Italian youth unemployment is not due to lower search intensity, which is close to the national average for this group, but to the fact that market tightness is 6 percentage points lower than the average. Finally, the high unemployment rate of the Southern regions is due not only to lower market tightness (20.8 per cent), but also to higher search intensity (8 percentage points higher than the average).

In Spain, average estimated search intensity is equal to 35.3 per cent, a value that is considerably higher than in Italy. As in Italy, search intensity is above average for men, more educated people and in the Southern regions (Area 5).[16] In Spain, however, market tightness is lower than in Italy (28.6 versus 44.5 per cent) and differences among socio-demographic groups are smaller. Market tightness is higher for men than for women (33.7 versus 23.5 per cent), while the differences across educational levels are relatively small. Unlike Italy, market tightness decreases with age, being highest among people aged 16–24 (37.3 per cent) and lowest among people aged 45+ (23 per cent). This partly explains why the Spanish youth unemployment rate is lower than the Italian one. In the Eastern regions of Spain (Area 2), θ is only 8 percentage points higher than the national average, while for the other regions the differences are negligible. Finally, as in Italy, in the Southern regions (Area 5), the high unemployment rate is a combination of a larger pool of applying job seekers and a lower market tightness.

In both countries, and for almost all the segments of the labour market that we consider, the job creation rate is quite low compared to the pool of applying job seekers. On average, the matching technology is characterized by a low elasticity to unemployment. The estimated values are .230 for Italy and .113 for Spain, close to the estimates of Burda and Wyplosz (1994). Because of higher market tightness, average search duration is lower in Italy than in Spain (3.4 quarters versus 3.9 quarters). Vacancy duration, on the other hand, is about one quarter in both countries.

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[16] Andalusia, Canarias, Extremadura, Murcia, and Ceuta y Melilla.

Our estimates suggest that, both in Italy and Spain, labour market dynamics are mainly driven by the demand side of the market. This result does not hold for all geographical areas, however. In the North-Eastern part of Italy (Area 2), where θ is 82 per cent, search duration is equal to only 1.8 quarters, while the elasticity to unemployment is around .488. Therefore, at least in Italy, notable supply effects can be found at the regional level.

5. Conclusions

This paper proposes a simple method for estimating relevant features of a macro matching function from data on individual labour market transitions. This method has two main advantages. First, it enables us to derive a measure of market tightness even when data on vacancies are not available or their quality is poor. Second, it gives us a way of modelling and estimating the probability that a non-employed person will enter the labour market at a given time. Given the particular specification of the matching function, we can decompose individual transition probabilities into two parts, one influenced by individual search intensity, and one determined by the characteristics of the matching technology.

Because of the high degree of harmonization of European labour force surveys, the proposed estimation method can be applied to obtain comparable information on matching technology in several European countries. As an illustration this paper focuses on Italy and Spain. In both countries unemployment is a very persistent phenomenon, unevenly distributed between men and women, among age groups, and across regions.

Our results suggest that, both in Italy and Spain, the process of job creation is not heavily influenced by the supply side of the market. Unlike the findings of macro models for other European countries, the average elasticity to unemployment is quite low, and the matching rate appears to be driven mainly by the vacancy creation process.

Some sizeable supply effect can be found in Italy at the regional level. In the North-Eastern part of the country, the estimated elasticity to unemployment is near .50, not far from the elasticities generally estimated for many other low-unemployment countries.

Tables and Figures

Table 1: Labour force participation rates, employment rates and unemployment rates in 2000.

	Men	Women	Aged ≤ 24	Aged > 24	Total
Labour force participation rates					
Italy	67.0	46.2	37.7	64.4	59.7
Spain	78.4	51.5	46.8	69.4	64.8
Employment rates					
Italy	73.2	39.2	27.4	59.1	53.1
Spain	70.6	40.9	34.9	61.1	55.6
Unemployment rates					
Italy	8.4	14.9	31.1	8.4	10.9
Spain	10.0	20.6	25.5	12.2	14.2

Table 2: Market tightness and search intensity: Estimated coefficients and *p*-values (for simplicity, the coefficients for the seasonal dummies are not reported).

	Market tightness				Search intensity			
	Italy		Spain		Italy		Spain	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Constant	-1.92	.00	-1.22	.00	2.17	.00	2.56	.00
Women	-.28	.00	-.36	.00	-.13	.00	-.12	.00
Age 16-24	.07	.05	.23	.00	-.13	.00	-.05	.11
Age 35-44	.34	.00	-.16	.00	-.13	.00	-.30	.00
Age 45+	.66	.00	-.24	.00	-.96	.00	-1.15	.00
Tertiary education	.22	.00	.01	.66	.24	.00	.50	.00
Primary education	.12	.00	.09	.00	-.20	.00	-.13	.00
Single living alone					.03	.69	-.07	.30
Household head					.08	.08	-.40	.00
Spouse of head					-.48	.00	-.69	.00
Student					-1.36	.00	-.67	.00
Other					-1.91	.00	-1.42	.00
No past experiences					-.25	.00	-.82	.00
Unemployed: Asked friends					.56	.00	.29	.00
Unemployed: Public recruitment					.06	.31	.07	.45
Unemployed: Public employment office					.12	.01	.89	.00
Unemployed: Set up in self-employment					-.10	.70	0.00	1.00
Not searching at time *t*, but before					-1.52	.00	-1.25	.00
Not searching at time *t*					-2.67	.00	-3.13	.00
Area 1	.84	.00	-.04	.38	-.01	.75	.01	.78
Area 2	1.23	.00	.35	.00	.07	.09	.10	.01
Area 3	.55	.00	-.18	.00	.06	.09	.10	.02
Area 4			.03	.51			-.03	.41
Region with a big city	-.45	.00	-.06	.16	-.02	.39	-.08	.03
Separation rate	-1.71	.19	-1.45	.15	2.87	.00	1.28	.16
Fraction of overtime workers	-2.18	.13	-19.43	.00				
Average extra hours worked	-.04	.13	.02	.07				

Table 3: Matching technology estimates.

	Search intensity (%)	Market tightness (%)	Hazard rate (%)	Search duration (quarters)	Vacancy duration (quarters)	Elasticity to S (%)	Elasticity to V (%)
Italy	28.6	44.5	36.0	3.39	1.16	23.0	77.0
Men	35.0	50.4	39.3	3.01	1.19	26.9	73.1
Women	22.3	38.5	32.7	3.76	1.11	19.0	81.0
Age 16-24	27.3	35.5	31.1	3.88	1.09	17.0	83.0
Age 25-34	41.4	32.7	29.2	4.16	1.08	15.0	85.0
Age 35-44	41.2	45.8	37.4	3.11	1.16	24.3	75.7
Age 45+	4.6	64.0	46.3	2.40	1.29	35.6	64.4
Tertiary ed.	41.6	49.4	38.7	3.07	1.19	26.1	73.9
Secondary ed.	24.0	39.5	33.1	3.73	1.12	19.6	80.4
Primary ed.	20.3	44.5	36.1	3.36	1.15	23.1	76.9
Area 1	23.5	42.4	37.3	2.82	1.12	23.6	76.4
Area 2	24.3	82.5	56.2	1.82	1.43	48.8	51.2
Area 3	30.1	32.1	30.0	3.57	1.06	14.4	85.6
Area 4	36.7	20.8	20.4	5.33	1.01	5.0	95.0
Spain	35.3	28.6	27.3	3.93	1.04	11.3	88.7
Men	44.3	33.7	31.5	3.30	1.06	15.9	84.1
Women	26.4	23.5	23.0	4.56	1.02	6.7	93.3
Age 16-24	22.3	37.3	34.2	3.03	1.08	19.3	80.7
Age 25-34	58.1	29.3	28.0	3.73	1.04	11.8	88.2
Age 35-44	50.6	24.9	24.2	4.32	1.02	7.8	92.2
Age 45+	10.3	23.0	22.6	4.65	1.02	6.3	93.7
Tertiary ed.	46.4	28.2	26.9	3.97	1.04	10.9	89.1
Secondary ed.	31.0	27.0	25.9	4.13	1.03	9.9	90.1
Primary ed.	28.7	30.7	28.9	3.68	1.05	13.2	86.8
Area 1	41.4	27.0	26.0	4.06	1.03	9.8	90.2
Area 2	35.3	36.7	33.7	3.11	1.08	18.8	81.2
Area 3	35.4	24.1	23.5	4.50	1.02	7.3	92.7
Area 4	28.0	28.0	26.9	3.93	1.03	10.7	89.3
Area 5	36.6	27.1	26.1	4.05	1.03	9.9	90.1

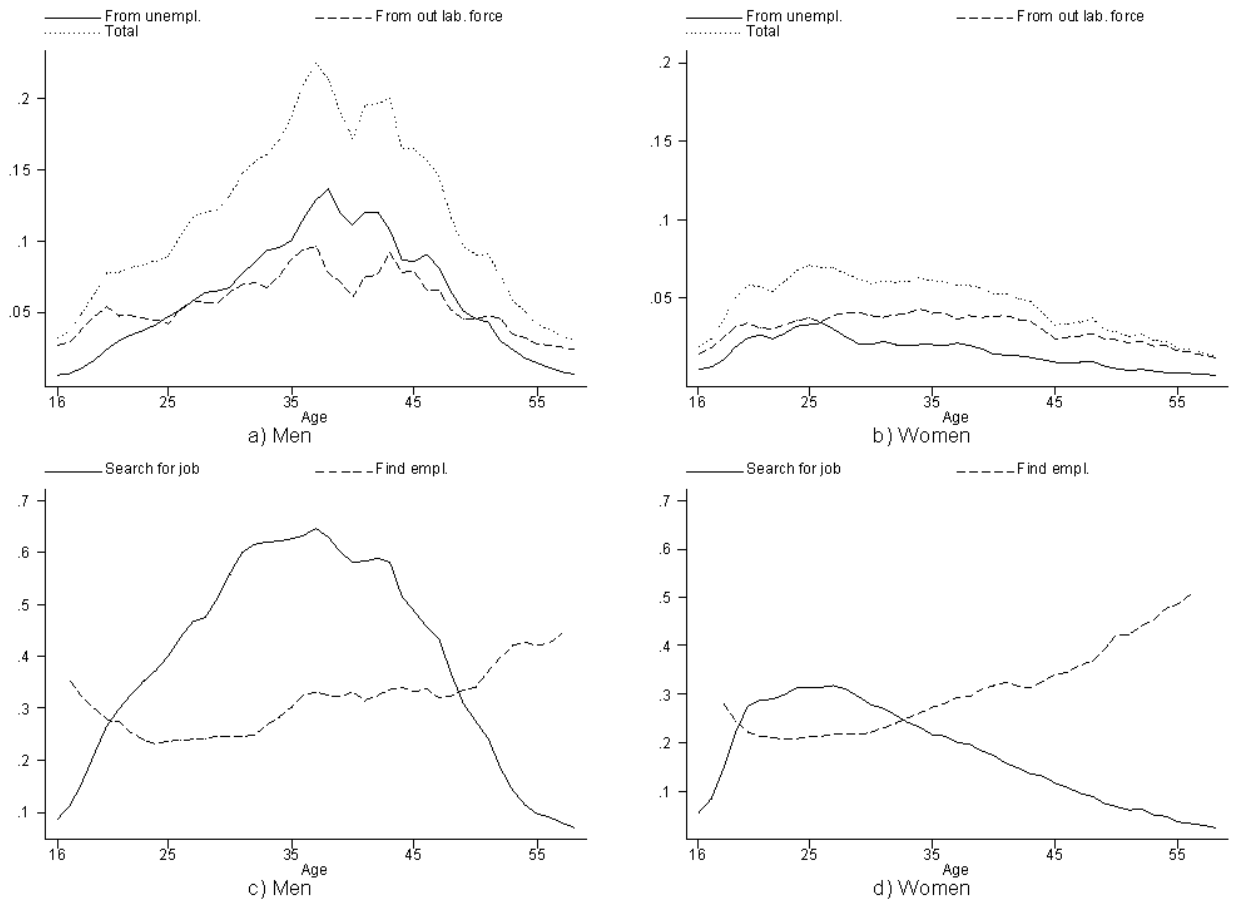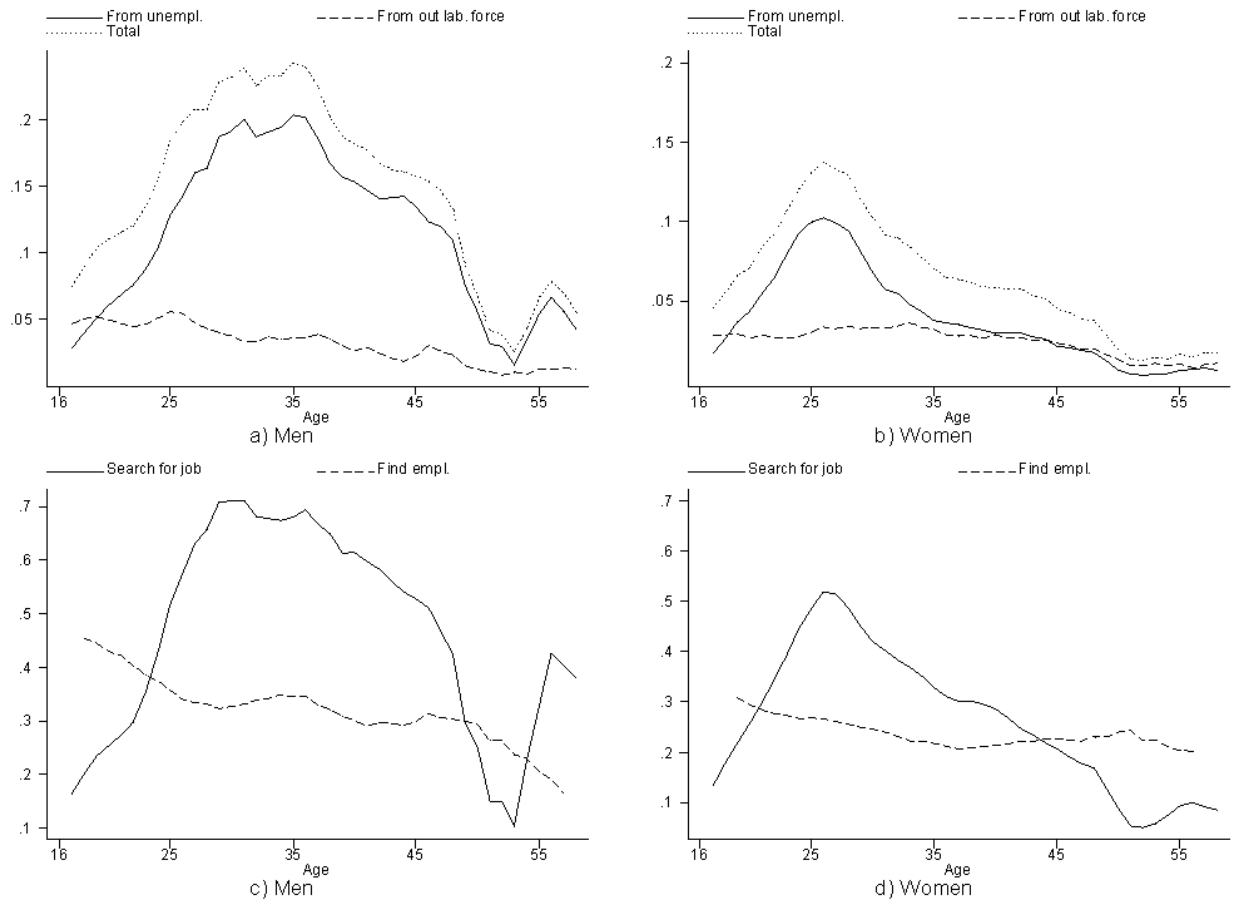Figure 1: Flow into employment, search intensity and hazard of exit into employment. Italy.

a) Men

b) Women

c) Men

d) Women

Figure 2: Flow into employment, search intensity and hazard of exit into employment. Spain.

a) Men

b) Women

c) Men

d) Women

References

Anderson P.M., and S.M. Burgess (2000), "Empirical Matching Functions: Estimation and Interpretation Using State-Level Data", *Review of Economics and Statistics*, 82, 93–102.

Bentolila S., and J.J. Dolado (1991), "Mismatch and Internal Migration in Spain, 1962–1986", in F. Padoa Schioppa Kostoris (ed.) *Mismatch and Labor Mobility*, Cambridge University Press, Cambridge.

Berg van den G., and G. Ridder (1998), "An Empirical Equilibrium Search Model of the Labor Market", *Econometrica*, 66, 1183–1221.

Berman E. (1997), "Help Wanted, Job Needed: Estimates of a Matching Function from Employment Service Data", *Journal of Labor Economics*, 15, 251–291.

Blanchard O. J., and P. Diamond (1989), "The Beveridge Curve", *Brooking Papers on Economic Activity*, 1, 1–76.

Brandolini A., and P. Cipollone (2001), "Evidence on Mismatch in Italy", Bank of Italy, mimeo.

Broersma L., and J.C. van Ours (1999), "Job Searchers, Job Matches and the Elasticity of Matching", *Labour Economics*, 6, 77–93.

Burda M.C., and C. Wyplosz (1994), "Gross Worker Flows in Europe", *European Economic Review*, 38, 1287–1315.

Castillo S., J.F. Jimeno and O. Licandro (1998), "Employment Segmentation, Labor Mobility and Mismatch: Spain, 1987-1993", FEDEA Working paper No. 98–04.

Clark K.B., and L. Summers (1979), "Labor Market Dynamics and Unemployment: A Reconsideration", *Brooking Papers on Economic Activity*, 1, 14–70.

Cohen D., A. Lefranc and G. Saint-Paul (1997), "French Unemployment: A Transatlantic Perspective", *Economic Policy*, 25, 267–285.

Coles M.G., and E. Smith (1996), "Cross Section Estimation of a Matching Function: Evidence from England and Wales", *Economica*, 63, 589-98.

Garrido L., and L. Toharia (2003), "What Does It Takes To Be (Counted As) Unemployed? The Case of Spain", University of Alcalá, mimeo.

Jiménez-Martín S., and F. Peracchi (2002), "Sample Attrition and Labour Force Dynamics: Evidence from the Spanish Labor Force Survey", *Spanish Economic Review*, 4, 79–102.

Jones S.R.G., and W.C. Riddell (1999), "The Measurement of Unemployment: An Empirical Approach", *Econometrica*, 67, 147–162.

Lagos R.A. (2000), "An Alternative Approach to Market Frictions: An Application to the Market

for Taxicab Rides ", *Journal of Political Economy*, 108, 851–871.

Layard R., S.J. Nickel, and R.A. Jackman (1991), *Unemployment, Macroeconomic Performance and the Labor Market*, Oxford University Press, Oxford.

Mortensen D.T. (1986), "Job Search and Labor Market Analysis", in O. Ashenfelter and R. Layard (eds.), *Handbook of Labour Economics*, North-Holland, Amsterdam.

Mumford K., and P.N. Smith (1999), "The hiring function Reconsidered: On Closing the Circle", *Oxford Bulletin of Economics and Statistics*, 61, 343–364.

Paggiaro A., and N. Torelli (1999), "Una procedura per l'abbinamento di record nella Rilevazione trimestrale delle forze di lavoro", in *Documentazione tecnica del file standard panel della Rilevazione trimestrale delle forze di lavoro*, Istat, Rome.

Petrongolo B., and C.A. Pissarides (2001), "Looking Into the black Box: A Survey Of The Matching Function", *Journal of Economic Literature*, 39, 390–431.

Pissarides C.A. (1979), "Job Matching with State Employment Agencies and Random Search", *Economic Journal*, 89, 818–833.

Pissarides C.A. (1986), "Unemployment and Vacancies in Britain", *Economic Policy*, 3, 499-559.

Pissarides C.A. (1988), "The Search Equilibrium Approach to Fluctuation in Employment", *American Economic Review*, 78, 363-369.

Pissarides C.A. (2000), *Equilibrium Unemployment Theory*, MIT Press, Cambridge (MA).

Saint-Paul G. (2000), "Flexibility vs. Rigidity: Does Spain Have the Worst of Both Worlds?", IZA Discussion Paper No. 144.

Storer P. (1994), "Unemployment Dynamics and Labor Market Tightness: An Empirical Evaluation of Matching Function Models", *Journal of Applied Econometrics*, 9, 389–419.

Viviano E. (2002),"Un'analisi critica delle definizioni di disoccupazione e partecipazione in Italia", Bank of Italy, Tema di Discussione No. 450.

Yashiv E. (2000),"The Determinants of Equilibrium Unemployment", *American Economic Review*, 90, 1297–1322.

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R. CESARI and F. PANETTA, *Style, fees and performance of Italian equity funds*, Journal of Banking and Finance, Vol. 26 (1), **TD No. 325 (January 1998)**.

L. GAMBACORTA, *Asymmetric bank lending channels and ECB monetary policy*, Economic Modelling, Vol. 20 (1), pp. 25-46, **TD No. 340 (October 1998)**.

C. GIANNINI, *"Enemy of none but a common friend of all"? An international perspective on the lender-of-last-resort function*, Essay in International Finance, Vol. 214, Princeton, N. J., Princeton University Press, **TD No. 341 (December 1998)**.

A. ZAGHINI, *Fiscal adjustments and economic performing: A comparative study*, Applied Economics, Vol. 33 (5), pp. 613-624, **TD No. 355 (June 1999)**.

F. ALTISSIMO, S. SIVIERO and D. TERLIZZESE, *How deep are the deep parameters?,* Annales d'Economie et de Statistique,.(67/68), pp. 207-226, **TD No. 354 (June 1999)**.

F. FORNARI, C. MONTICELLI, M. PERICOLI and M. TIVEGNA, *The impact of news on the exchange rate of the lira and long-term interest rates,* Economic Modelling, Vol. 19 (4), pp. 611-639, **TD No. 358 (October 1999)**.

D. FOCARELLI, F. PANETTA and C. SALLEO, *Why do banks merge?,* Journal of Money, Credit and Banking, Vol. 34 (4), pp. 1047-1066, **TD No. 361 (December 1999)**.

D. J. MARCHETTI, *Markup and the business cycle: Evidence from Italian manufacturing branches,* Open Economies Review, Vol. 13 (1), pp. 87-103, **TD No. 362 (December 1999)**.

F. BUSETTI, *Testing for stochastic trends in series with structural breaks*, Journal of Forecasting, Vol. 21 (2), pp. 81-105, **TD No. 385 (October 2000)**.

F. LIPPI, *Revisiting the Case for a Populist Central Banker,* European Economic Review*,* Vol. 46 (3), pp. 601-612, **TD No. 386 (October 2000)**.

F. PANETTA, *The stability of the relation between the stock market and macroeconomic forces*, Economic Notes, Vol. 31 (3), **TD No. 393 (February 2001)**.

G. GRANDE and L. VENTURA, *Labor income and risky assets under market incompleteness: Evidence from Italian data,* Journal of Banking and Finance, Vol. 26 (2-3), pp. 597-620, **TD No. 399 (March 2001)**.

A. BRANDOLINI, P. CIPOLLONE and P. SESTITO, *Earnings dispersion, low pay and household poverty in Italy, 1977-1998,* in D. Cohen, T. Piketty and G. Saint-Paul (eds.), The Economics of Rising Inequalities, pp. 225-264, Oxford, Oxford University Press, **TD No. 427 (November 2001)**.

L. CANNARI and G. D'ALESSIO, *La distribuzione del reddito e della ricchezza nelle regioni italiane*, Rivista Economica del Mezzogiorno (Trimestrale della SVIMEZ), Vol. XVI (4), pp. 809-847, Il Mulino, **TD No. 482 (June 2003)**.

2003

F. SCHIVARDI, *Reallocation and learning over the business cycle,* European Economic Review, , Vol. 47 (1), pp. 95-111, **TD No. 345 (December 1998)**.

P. CASELLI, P. PAGANO and F. SCHIVARDI, *Uncertainty and slowdown of capital accumulation in Europe*, Applied Economics, Vol. 35 (1), pp. 79-89, **TD No. 372 (March 2000).**

P. ANGELINI and N. CETORELLI*, The effect of regulatory reform on competition in the banking industry,* Federal Reserve Bank of Chicago, Journal of Money, Credit and Banking, Vol. 35, pp. 663-684, **TD No. 380 (October 2000)**.

P. PAGANO and G. FERRAGUTO, Endogenous growth with intertemporally dependent preferences, Contribution to Macroeconomics, Vol. 3 (1), pp. 1-38, **TD No. 382 (October 2000).**

P. PAGANO and F. SCHIVARDI, *Firm size distribution and growth,* Scandinavian Journal of Economics, Vol. 105 (2), pp. 255-274, **TD No. 394 (February 2001)**.

M. PERICOLI and M. SBRACIA, *A Primer on Financial Contagion,* Journal of Economic Surveys, Vol. 17 (4), pp. 571-608, **TD No. 407 (June 2001)**.

M. SBRACIA and A. ZAGHINI, *The role of the banking system in the international transmission of shocks,* World Economy, Vol. 26 (5), pp. 727-754, **TD No. 409 (June 2001)**.

E. GAIOTTI and A. GENERALE, *Does monetary policy have asymmetric effects? A look at the investment decisions of Italian firms,* Giornale degli Economisti e Annali di Economia, Vol. 61 (1), pp. 29-59, **TD No. 429 (December 2001)**.

L. GAMBACORTA, *The Italian banking system and monetary policy transmission: evidence from bank level data*, in: I. Angeloni, A. Kashyap and B. Mojon (eds.), Monetary Policy Transmission in the Euro Area, Cambridge, Cambridge University Press, **TD No. 430 (December 2001).**

M. EHRMANN, L. GAMBACORTA, J. MARTÍNEZ PAGÉS, P. SEVESTRE and A. WORMS, *Financial systems and the role of banks in monetary policy transmission in the euro area,* in: I. Angeloni, A. Kashyap and B. Mojon (eds.), Monetary Policy Transmission in the Euro Area, Cambridge, Cambridge University Press, **TD No. 432 (December 2001)**.

F. SPADAFORA, *Financial crises, moral hazard and the speciality of the international market: further evidence from the pricing of syndicated bank loans to emerging markets*, Emerging Markets Review, Vol. 4 (2), pp. 167-198, **TD No. 438 (March 2002)**.

D. FOCARELLI and F. PANETTA, *Are mergers beneficial to consumers? Evidence from the market for bank deposits*, American Economic Review, Vol. 93 (4), pp. 1152-1172, **TD No. 448 (July 2002)**.

E.VIVIANO, *Un'analisi critica delle definizioni di disoccupazione e partecipazione in Italia,* Politica Economica, Vol. 19 (1), pp. 161-190, **TD No. 450 (July 2002)**.

M. PAGNINI, *Misura e Determinanti dell'Agglomerazione Spaziale nei Comparti Industriali in Italia*, Rivista di Politica Economica, Vol. 3 (4), pp. 149-196, **TD No. 452 (October 2002)**.

F. BUSETTI and A. M. ROBERT TAYLOR, *Testing against stochastic trend and seasonality in the presence of unattended breaks and unit roots*, Journal of Econometrics, Vol. 117 (1), pp. 21-53, **TD No. 470 (February 2003)**.

2004

F. LIPPI, *Strategic monetary policy with non-atomistic wage-setters,* Review of Economic Studies, Vol. 70 (4), pp. 909-919, **TD No. 374 (June 2000)**.

P. CHIADES and L. GAMBACORTA, *The Bernanke and Blinder model in an open economy: The Italian case,* German Economic Review, Vol. 5 (1), pp. 1-34, **TD No. 388 (December 2000)**.

M. BUGAMELLI and P. PAGANO, *Barriers to Investment in ICT*, Applied Economics, Vol. 36 (20), pp. 2275-2286, **TD No. 420 (October 2001)**.

A. BAFFIGI, R. GOLINELLI and G. PARIGI, *Bridge models to forecast the euro area GDP*, International Journal of Forecasting, Vol. 20 (3), pp. 447-460,**TD No. 456 (December 2002)**.

D. AMEL, C. BARNES, F. PANETTA and C. SALLEO, *Consolidation and Efficiency in the Financial Sector: A Review of the International Evidence*, Journal of Banking and Finance, Vol. 28 (10), pp. 2493-2519, **TD No. 464 (December 2002).**

M. PAIELLA, *Heterogeneity in financial market participation: appraising its implications for the C-CAPM*, Review of Finance, Vol. 8, pp. 1-36, **TD No. 473 (June 2003)**.

E. BARUCCI, C. IMPENNA and R. RENÒ, *Monetary integration, markets and regulation*, Research in Banking and Finance, (4), pp. 319-360, **TD NO. 475 (June 2003)**.

E. BONACCORSI DI PATTI and G. DELL'ARICCIA, *Bank competition and firm creation*, Journal of Money Credit and Banking, Vol. 36 (2), pp. 225-251, **TD No. 481 (June 2003)**.

R. GOLINELLI and G. PARIGI, *Consumer sentiment and economic activity: a cross country comparison*, Journal of Business Cycle Measurement and Analysis, Vol. 1 (2), pp. 147-172, **TD No. 484**

(September 2003).

L. GAMBACORTA and P. E. MISTRULLI, *Does bank capital affect lending behavior?*, Journal of Financial Intermediation, Vol. 13 (4), pp. 436-457, **TD NO. 486 (September 2003)**.

F. SPADAFORA, *Il pilastro privato del sistema previdenziale: il caso del Regno Unito,* Rivista Economia Pubblica, (5), pp. 75-114, **TD No. 503 (June 2004)**.

FORTHCOMING

A. F. POZZOLO, *Research and development regional spillovers, and the localisation of economic activities*, The Manchester School, **TD No. 331 (March 1998)**.

L. DEDOLA and F. LIPPI, *The Monetary Transmission Mechanism: Evidence from the industry Data of Five OECD Countries*, European Economic Review, **TD No. 389 (December 2000)**.

D. J. MARCHETTI and F. NUCCI, *Price Stickiness and the Contractionary Effects of Technology Shocks*, European Economic Review, **TD No. 392 (February 2001)**.

G. CORSETTI, M. PERICOLI and M. SBRACIA, *Correlation analysis of financial contagion: what one should know before running a test*, Journal of International Money and Finance, **TD No. 408 (June 2001)**.

D. FOCARELLI, *Bootstrap bias-correction procedure in estimating long-run relationships from dynamic panels, with an application to money demand in the euro area,* Economic Modelling, **TD No. 440 (March 2002)**.

G. DE BLASIO and S. DI ADDARIO, *Do Workers Benefit from Industrial Agglomeration?,* Journal of Regional Science, **TD No. 453 (October 2002)**.

F. CINGANO and F. SCHIVARDI, *Identifying the sources of local productivity growth,* Journal of the European Economic Association, **TD NO. 474 (June 2003)**.

G. ARDIZZI, *Cost efficiency in the retail payment networks:first evidence from the Italian credit card system,* Rivista di Politica Economica, **TD NO. 480 (June 2003)**.

G. DE BLASIO, *Does Trade Credit Substitute Bank Credit? Evidence from Firm-level Data,* Economic Notes, **TD NO. 498 (June 2004)**.

C. BENTIVOGLI and F. QUINTILIANI, *Tecnologia e dinamica dei vantaggi comparati: un confronto fra quattro regioni italiane*, in C. Conigliani (a cura di), *Tra sviluppo e stagnazione: l'economia dell'Emilia-Romagna*, Bologna, Il Mulino, **TD NO. 522 (October 2004)**.