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# Measuring Unemployment by means of Official Data and Administrative Records: Empirical and Theoretical Perspectives\*

MARCO GUERRAZZI<sup>†</sup> and ILHAM KSEBI<sup>‡</sup>

June 8, 2018

## Abstract

This paper addresses the measurement of unemployment in the Italian regional context. Specifically, retrieving data from Tuscany, we compare the picture of unemployment that emerges by exploring official data and administrative records over the period after the burst of the Great Recession. Consistently with previous findings, we find that registered unemployment is higher, more persistent and more concentrated on women than its official measure. However, despite those heterogeneities, we show that the cyclical behaviour of registered job seekers is similar to the one of official job seekers. Moreover, we provide a way to reconcile the two measures of unemployment. Thereafter, we develop a model that provides a rationale for the coexistence of official and registered job seekers and we explore how it reacts to productivity shocks and its policy implications. Finally, we offer some insights about the desirability of an integrated use of these data.

**Keywords:** Unemployment; Official data; Administrative records; Unconstructive search; Claimants in employment.

**JEL Classification:** E24, J64.

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# 1 Introduction

From an empirical point of view, in Italy - like in many others developed countries - there are two alternative ways to measure unemployment. On the one hand, the official perspective recommends to retrieve data from the National Bureau of Statistics (ISTAT). Following guidelines defined at the international level by the International Labour Organization (ILO), ISTAT measures unemployment by asking every week to a representative sample of Italian families about their employment status and their labour market attitudes. Specifically, official unemployed people are those that at the time of the interview state: a) to be jobless; b) to have done concrete job search activities during the last four weeks; and c) to be willing to accept a job within two weeks (cf. Battistin et al. 2006). Making inference out of the sample of people that fulfill those requirements, ISTAT provides the ‘official’ number of job seekers and the harmonized rate of unemployment, i.e., the ratio between people actively looking for a job and the corresponding labour force, at the national, regional and provincial level.

On the other hand, Italian regional administrations handle public employment agencies (Centri per l’Impiego - CPIs) headquartered in each province where jobless individuals can decide - if they want to do it - to register their prompt willingness to work. Consequently, each CPI collects ‘administrative’ records on jobless people - sometimes called counting customers - that are looking for jobs all around its area of competence no matter their eligibility to claim unemployment benefits. Indeed, in Italy the number of registered unemployed does not coincide and is much wider than the claimant count, i.e., the number of people entitled to receive the job seeker allowance.

At least in principle, the two mentioned statistical sources should catch about the same phenomenon. However, the available empirical evidence reveals that the measure of unemployment provided by ISTAT is quite different from the one retrieved by provincial employment agencies. Specifically, unemployment recorded by CPIs is usually larger than the corresponding official figure (cf. Anastasia and Disarò, 2005; Guerrazzi, 2012). Moreover, the distance observed between the two measures of unemployment goes well beyond the sampling errors inexorably attached to harmonized unemployment (cf. Barbieri et al. 2000).<sup>1</sup>

The factors usually called in to explain the observed discrepancies between official and registered unemployment in Italy are twofold. On the one hand, inaccuracies in the updating process of provincial records of job seekers tend to inflate registered unemployment. For instance, it may happen that a worker who starts her own business remains for a while in the provincial registers or it is also possible to find the same person in the archives of two or more

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<sup>1</sup>Even if the observed distances are often smaller, the higher incidence of registered unemployment with respect to official - or harmonized - unemployment is a recurring feature that characterizes a number of developed countries such as Germany, Austria, France, Ireland, Finland and the Netherlands (cf. Melis and Lüdeke, 2006; Konle-Seidl and Lüdeke, 2017). By contrast, given the low willingness to register prevailing in rural areas, in China registered unemployment falls short what is perceived as the actual level of unemployment (cf. Knight and Xue, 2006; Wang and Sun, 2014).

CPIs. On the other hand, but in the same direction, provincial records have the tendency to include people that for official statistics are employed or out of the labour force; indeed, workers with minimal jobs as well as people whose job search intensity is unconstructive - or unfulfilling - often retain their position in the provincial files. The former group collects the so-called claimants in employment, the latter the economically inactive - or unconstructive - searchers. Concretely, claimants in employment are registered job seekers who have worked more than one hour in temporary or subsidized jobs during the week before the interview and therefore are classified as employed according to official criteria. Moreover, unconstructive searchers are registered job seekers whose registration is older than one month and since then they didn't perform any other concrete search activity. As we will show below, the presence of those two groups of individuals as well as the optionality of registration are able to affect the cyclical properties of registered unemployment.

Considering the distortions recalled above and stressing its administrative dependence, some authors questioned the usefulness of resorting to registered unemployment for the economic analysis of labour market trends (e.g. Fenwick and Denman, 1996). Nonetheless, some scholars argue in favour of an integration among official and administrative statistics on unemployment. For instance, trying to assess 'true' unemployment in Austria, Biffil (1997) maintains that official statistics may well underestimate the labour resources which may be activated by an improvement of economic conditions and the extent of poverty and social discontent. Moreover, exploring UK data where - like in the US and Australia - registered unemployment and the claimant count coincide, Thomas (1998) argues that a reconciliation of official and registered unemployment is necessary to understand the actual dynamics of the labour market. In addition, addressing the evidence of Baltic countries and Montenegro, Hazans (2008) claims that these two statistical sources are both necessary for a comprehensive analysis of the evolution of the employment situation in a given region.

Following the latter research line, in this paper we retrieve data from Tuscany and we compare the pictures of unemployment that emerges by using official data and administrative records over the decade 2008-2017, i.e., the years after the burst of the Great Recession. Consistently with the discrepancies recalled above, we find that registered unemployment is definitely higher, more persistent and more concentrated on women with respect to its official measure. However, despite those heterogeneities, we show that the stock of registered job seekers conveys a cyclical information about the labour market performance that goes in the same direction of the one indicated by official unemployment no matter the non-compulsory character of registration and the simultaneous presence of claimants in employment and unconstructive searchers. Moreover, exploring the corresponding age and gender distributions, we provide a straightforward way to reconcile registered unemployment to ILO unemployment.

Thereafter, we develop a search model in which individuals that fulfill the criteria of official unemployment may coexist with claimants in employment and unconstructive searchers and we explore how that theoretical framework reacts to productivity shocks and we assess its policy

implications. To the best of our knowledge, this paper is the first contribution that tries to address official and registered unemployment from an empirical and a theoretical perspective. In addition, we offer some critical insights about the desirability of an integrated use of these data.

The paper is arranged as follows. Section 2 reports evidence on official and registered unemployment by focusing on their cyclical properties and making an effort to reconcile the two series. Section 3 develops a search model with unconstructive searchers and claimants in employment. Section 4 offers some insight on how to amend and integrate official and administrative data on unemployment. Finally, section 5 concludes.

## 2 Official data versus administrative records

In this section we introduce some evidence on unemployment in Tuscany. Being placed in the central part of the country, Tuscany can be taken as a representative area between the relatively low-unemployment Italian regions of the North and high-unemployment regions of the South. Moreover, according to Barbieri et al. (2000), Tuscany is among the regions in which more than 80% of the individuals surveyed for the calculation of official job seekers are actually registered at the competent CPIs. That percentage of overlapping between official and registered job seekers places Tuscany among the Italian regions in which the updating problems and inconsistencies of provincial files mentioned in the introduction appear less severe.

The observation period covers with quarterly figures the years immediately after the burst of the Great Recession. Specifically, our observation window is opened in the last quarter of 2008 and is closed in the final quarter of 2017. Within this time span, Tuscany hosted - on average - about 6.7% of the national active population.<sup>2</sup>

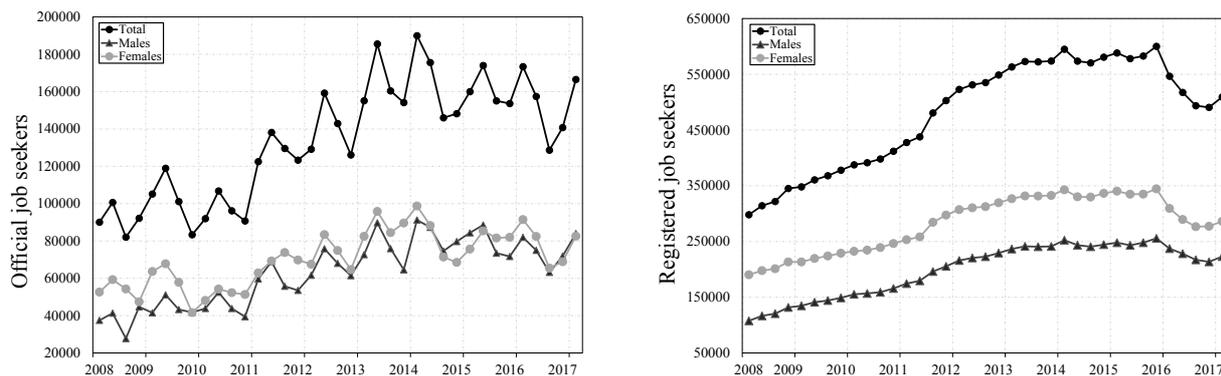
Available data on unemployment have some limitations that are worth making clear from the beginning. First, official figures on Italian regional unemployment do not allow to distinguish between long-term and short-term unemployment and are silent about the educational achievements on the involved individuals. Moreover, although theoretically possible, disclosed data on registered unemployment do not provide information to detect claimants in employment and unconstructive searchers. Consequently, aware of its variegated composition, we will treat registered unemployment as a unique series like the one of official unemployment.

### 2.1 Time series analysis

The time path of official (on the left) and registered (on the right) job seekers is illustrated in the two panels of figure 1.

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<sup>2</sup>Official (administrative) data can be retrieved by logging at the web page <http://dati.istat.it> (<http://www.regione.toscana.it/osservatorio-regionale-mercato-del-lavoro/consultazione-dati-sil>).



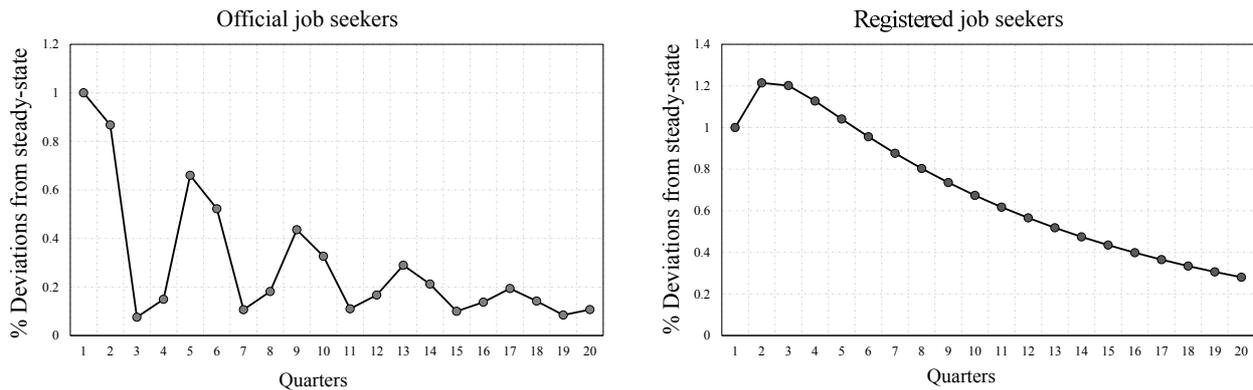
**Figure 1:** Official and registered job seekers

The two diagrams show some regularities that can be summarized as follows. First, all over the concerned period, both series mirror a sharp worsening of labour market prospects for Tuscan workers. Indeed, with the exception of the final part of the observation period, the number of official job seekers as well as the registered ones display a definite tendency to rise over time. In this regard, it is worth noting that from 2008 to 2014 the number of official and registered job seekers doubled their respective magnitudes. Second, the number of job seekers registered by Tuscan CPIs is much higher than the number of ILO job seekers estimated by ISTAT. Specifically, the number of registered job seekers is, on average, 3.64 times the figure of official job seekers.<sup>3</sup> Third, while the official measure of unemployment displays fluctuations around an increasing trend, the registered reference shows a steady rise with the exception of few quarters only. Obviously, this pattern suggests that registered unemployment is more persistent than official unemployment. In details, taking logs of the two series, the AR(1) coefficient is 0.822 for the official job seekers and 0.986 for the registered ones. Furthermore, the gender gap, i.e., the proportion of female among unemployed people, is higher and more stable for registered job seekers than for official job seekers. Concretely, the percentage of female is, on average, equal to 53.16% within official unemployment and 58.90% for registered unemployment.<sup>4</sup>

The different degree of persistence displayed by the two series raises the issue of how the stocks of official and registered job seekers may react to exogenous shocks (cf. Gil-Alana and Jiang, 2013). In that direction, the two diagrams in figure 2 plot the impulse response functions to a normalized one-unit shock in the standard deviation of each series taken in logs. Details on the required VAR estimations are available from the authors upon request.

<sup>3</sup>Taking the official figures of the labour force in Tuscany, the harmonized unemployment rate has been, on average, 7.88% over the period of analysis whereas the ratio between the stock of registered job seekers and the active population reached 28.51%. In calibrated models, high levels of the unemployment rate such as the one conveyed by registered job seekers are usually rationalized through the accounting of unconstructive searchers (e.g. Zanetti, 2007)

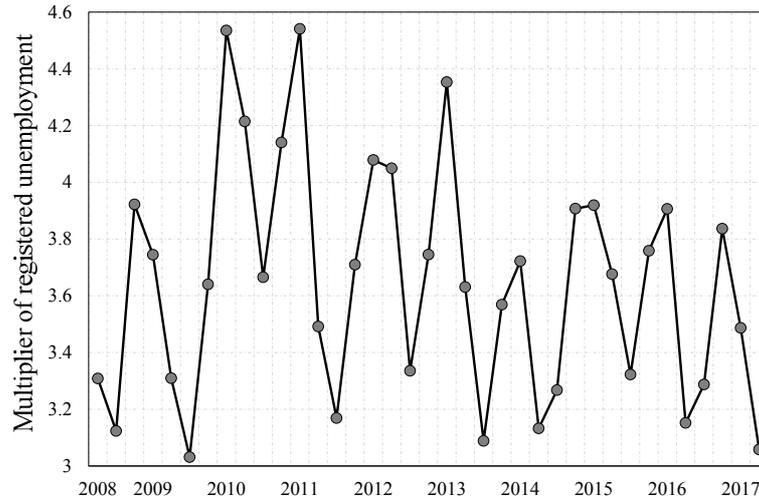
<sup>4</sup>Among registered job seekers we observe a quite continuous decrease in the percentage of female individuals. By contrast, among official job seekers the percentage of women is almost constant over time.



**Figure 2:** Impulse response functions of official and registered job seekers

Even if the two series display the properties of a mean-reversion process, the two panels of figure 2 highlight some important differences. Specifically, the diagram on the LHS shows that immediately after the shock official job seekers tend to come back to their equilibrium level by means of damped oscillations. However, after twenty quarters the series is still 0.10 percentage points above its steady-state. By contrast, the diagram on the RHS shows that registered job seekers overshoot for four quarters the initial value of the shock, then the series starts to converge slowly and monotonically to its equilibrium level. Indeed, after twenty quarters registered job seekers are 0.28 percentage points above their steady-state level. This finding corroborates the lower persistence of official unemployment conveyed by the different AR(1) coefficients and suggests - from a theoretical point of view - that ILO unemployment appears more consistent with the natural rate hypothesis, whereas registered unemployment seems to replicate the typical features stressed by the hysteresis approach (cf. Friedman, 1968; Blanchard and Summers, 1986).

Looking at the evolution of official and registered job seekers over time, an additional interesting feature of the data illustrated in figure 1 is that ratio between the latter and the former series displays a fluctuating path without any prominent trend which is mainly ascribable to the cyclical component of official unemployment. Specifically, as shown in figure 3, that multiplier - with few exceptions - has been quite stable all over the period. Indeed, it varied from a minimum values of 3.03 achieved in the first quarter of 2010 to a maximum of 4.54 tipped in the third quarter of 2011.

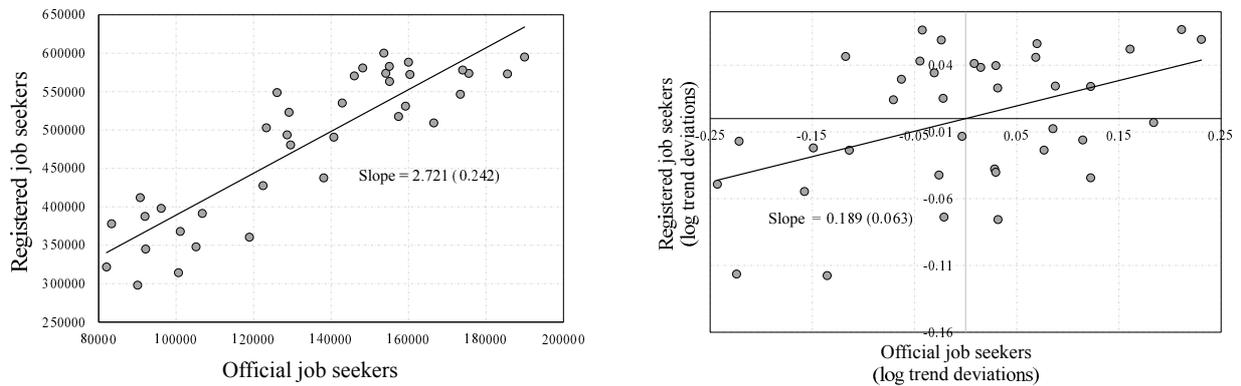


**Figure 3:** The multiplier of registered unemployment

In the next section, we will show that the magnitude of the multiplier illustrated in figure 3 may depend on the path of labour productivity as well as on the institutional framework that rules the functioning of the labour market.

## 2.2 Official and registered job seekers

While the higher incidence of females among unemployed individuals is a structural feature of Italian unemployment (cf. Bertola and Garibaldi, 2003), the other peculiarities of the two series illustrated in figure 1 deserve a deeper analysis. For this purpose, the two diagrams of figure 4 plot the results of a linear regression between the number of official and registered job seekers (on the left) and the corresponding logarithmic trend deviations (on the right).<sup>5</sup>



**Figure 4:** Official versus registered job seekers

<sup>5</sup>Here and in the remainder of the paper, trends are taken with the HP filter by setting the smoothing parameter at the conventional quarterly reference of 1,600.

The left-hand-side panel of figure 4 shows that there is a statistically significant positive relation between the number of official and registered job seekers. Indeed, the slope of the regression line between the two series - including the presence of a constant - is 2.72 with a standard error of 0.242 whereas the corresponding value of the  $R^2$  is equal to 78.22%.<sup>6</sup>

The strength of such a relation may rise the reasonable suspicion that those results may be the upshot of a spurious regression. Admittedly, the Great Recession can be considered as the confounding factor that pushed upward ILO and registered unemployment in a joint manner. However, the regression results in the RHS of figure 4 reveal the existence of a deeper relation between official and registered job seekers. Specifically, removing the upward trend from the two series, the positive link between the number of official and registered job seekers still survives although with a lower coefficient of determination. Indeed, the slope of the regression line between the two series becomes 0.189 with a standard error of 0.063 and a  $R^2$  of 20.15%.

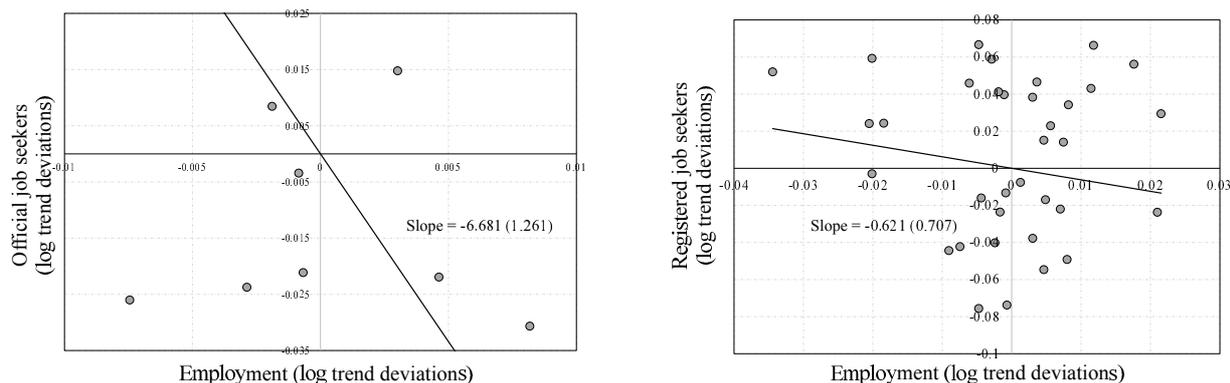
The interpretation for this result is twofold. On the one hand, registered unemployment conveys a cyclical information about the performance of the labour market that goes in the same direction on the one indicated by official unemployment. In other words, when ILO unemployment is above or below its trend the same holds for registered unemployment. On the other hand, the presence of unconstructive searchers among registered job seekers and the optionality of registration are likely to move official and registered unemployment in opposite directions by providing a rationale for the lower significance of the positive relation between the logarithmic trend deviations plotted in figure 4. For instance, when official job seekers registered to CPIs quit their search activities they may well remain and enlarge provincial archives but lose their position in the sample of officially unemployed persons. By contrast, it is also possible that lost-standing unconstructive searchers who have lost the benefits of registration begin some different searching activities that allow them to be surveyed as official job seekers. Furthermore, upward movements in ILO job seekers can happen without any movement in registered unemployment as the additional job seekers may decide to avoid registration.

### 2.3 Employment and official/registered job seekers

A confirmation of the cyclical signal conveyed by registered unemployment can be obtained by exploring how employment variations are affected by movements in official and registered job seekers (cf. Thomas, 1998). In this direction, the two panels of figure 5 plot the results of two distinct linear regressions: the former between the logarithmic trend deviations of employment and official job seekers (on the left), the latter between the logarithmic trend deviations of employment and registered job seekers (on the right). In both cases, the measure of employment is given by the harmonized one.

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<sup>6</sup>Qualitatively similar figures are found by Kyriacou et al. (2009) and Litra (2017), respectively in Cyprus and Romania where, however, registered unemployment falls short of official unemployment.

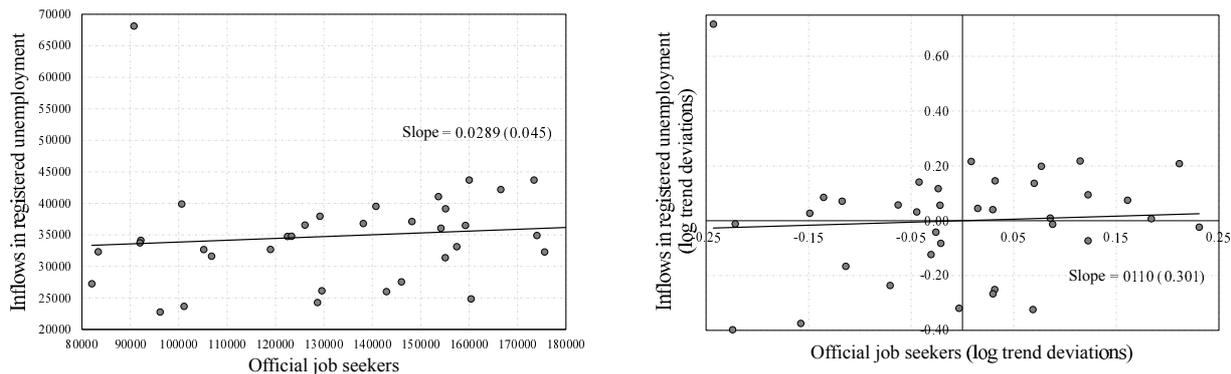


**Figure 5:** Employment versus official and registered job seekers

The two panels of figure 5 reveal that official and registered unemployment are both negatively correlated to employment. Specifically, the logarithmic trend deviations of official unemployment move in the opposite direction of the corresponding measure of employment in a significant manner whereas the coefficient that links the logarithmic trend deviations of registered unemployment to employment trend deviation is negative but not statistically significant. The missing significance of the anti-cyclical pattern of registered job seekers can be ascribed to the presence of claimants in employment within the former group as well as to the already mentioned optionality of registration. For instance, upward movements of registered job seekers can go together with a similar movement in ILO employment when those registered individuals obtain minimal jobs that allow to retain their positions in the provincial archives. Moreover, drops in official employment can happen without any enlargement of registered job seekers when the people who lose their job decide to postpone or avoid registration.

## 2.4 Official job seekers and inflows in registered unemployment

As we stated in the introduction, an issue with Italian registered unemployment is the updating of provincial archives of job seekers (cf. Oliveri, 2009). Consequently, some interesting information may be obtained by analyzing the relation between official unemployment and the inflows in registered unemployment that - by definition - are not affected by updating problems. For this purpose, the two diagrams of figure 6 plot the results of a linear regression between the number of official job seekers and the inflows of new job seekers in the provincial archives (on the left) and the corresponding logarithmic trend deviations (on the right).



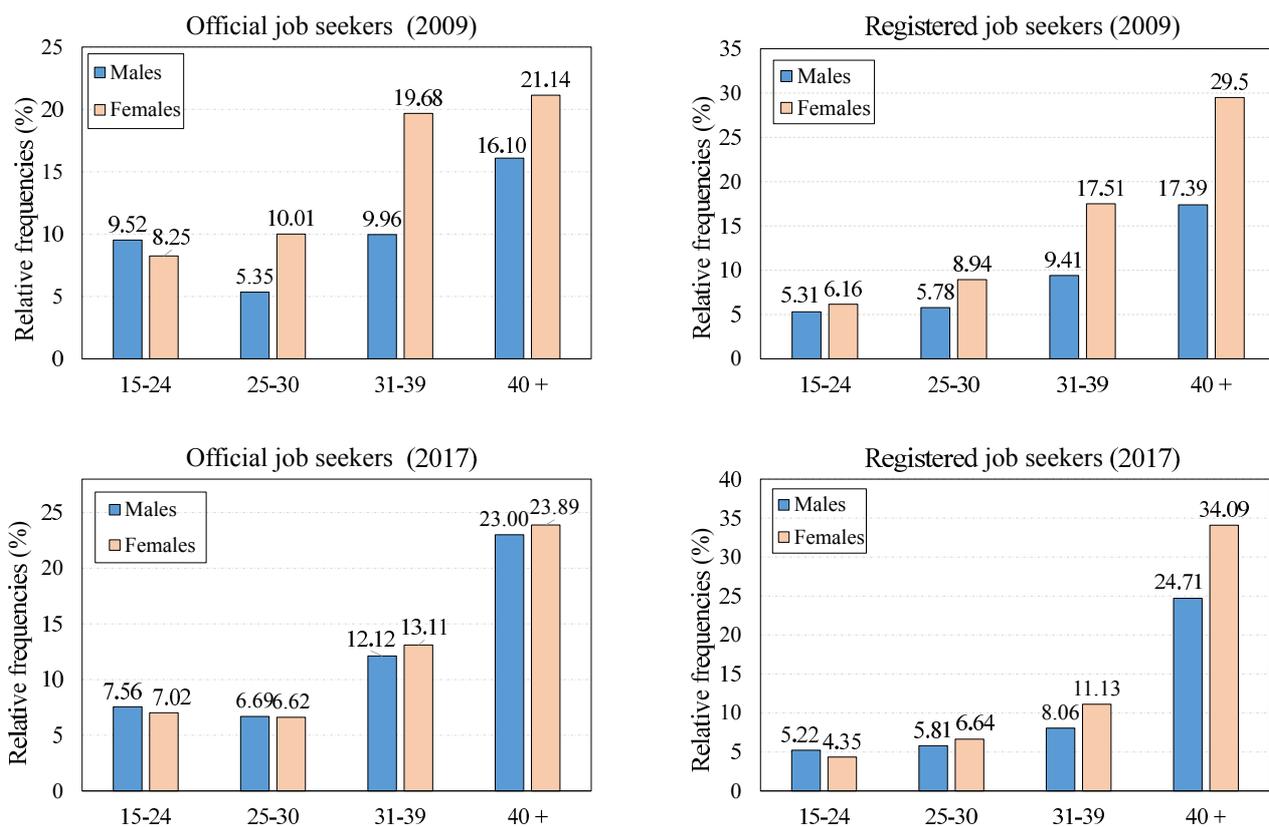
**Figure 6:** Official job seekers versus inflows in registered unemployment

The diagrams in figure 6 show that relation between official job seekers and the flow of new registrations is negligible. Indeed, in both cases, i.e., in the estimation in levels as well as in the one run on logarithmic trend deviations, the hypothesis of no correlation cannot be rejected. In other words, the inflows on registered unemployment are about the same no matter the level of ILO unemployment. This result, together with the ones in figures 4 and 5, reveals that the stock of registered job seekers retains a cyclical information that is missing from the inflows in registered unemployment.

## 2.5 Age and gender distributions

The different composition of official and registered job seekers becomes apparent when we consider age and gender distributions (cf. Konle-Seidl and Lüdeke, 2017). Unfortunately, existing data on that matter are not homogeneous in the sense that for official and registered job seekers are gathered in different age groups.<sup>7</sup> In order to overcome this problem, we assume a uniform distribution of individuals across each age group and we rearrange the categories of official job seekers consistently with the registered ones. In the four panels of figure 7, we plot the corresponding histograms for official (on the left) and registered job seekers (on the right) by having regard for the initial (above) and the final (below) calendar year of our empirical analysis.

<sup>7</sup>Official job seekers are gathered by ISTAT in the following age groups: 15 – 24, 25 – 34, 35 – 44, 45 – 54 and 55 and more.



**Figure 7:** Age and gender distribution of official unemployment and registered job seekers

The information conveyed by the four diagrams in figure 7 show that the two measures of unemployment display some common traits as well as some heterogeneities. First, starting from middle-aged individuals, the concentration of unemployment tends to increase no matter the series taken into account. However, the relative frequency of registered job seekers has a firm bias in the last age group. Second, the monotonicity of the path of official unemployment is broken by youth individuals, whose incidence is much higher with respect to registered unemployment. Third, considering the initial and the final years of observation, we see that both measures of unemployment become more concentrated on females and on individuals aged 40 years or more. Moreover, once again in both series, we observe severe drops among female individuals aged 31 – 39 years probably driven by a discouraging effect triggered by the crisis (cf. Addabbo et al., 2011).

The higher incidence of older individuals among registered job seekers corroborates the fact that within this group there are people whose search activity is carried out at low levels. Indeed, in the literature there exists some evidence according to which search intensity is negatively correlated with the age of the involved individuals (cf. Zacher, 2013; Cohen et al., 2011).

## 2.6 Reconciling data

Age and gender distributions can be used to make an attempt to reconciling official and registered unemployment (cf. Kyriacou et al., 2009). Specifically, distinguishing between male and female individuals, the figures of the age distributions of registered job seekers can be exploited to find out a set of weights that brings back registered unemployment to ILO unemployment for each gender and for each age group. This task can be done by estimating a series of constrained least-square models such as

$$\min_{\eta_{i,g}} \sum_{t=2008.4}^{2017.4} (U_{H,t} - \eta_{i,g} U_{R,i,t})^2 \quad g = \{\text{males, females}\}$$

s.to  
 $0 < \eta_{i,g} < 1$

where  $U_{R,t}$  ( $U_{H,t}$ ) are registered (official) job seekers at time  $t$ , whereas  $i$  is an index for the age groups indicated in figure 7.

The problem above reveals that for each gender and for each age group we are looking for a coefficient  $\eta_{i,g}$  constrained between 0 and 1 that minimizes the quadratic distance between official unemployed and a corresponding weighted measure of registered unemployment. It is well known that the solution of constrained-least-squares problems is usually very sensitive to the choice of upper and lower bounds for those coefficients (cf. Ping, 2015). However, taking different bounds for  $\eta_{i,g}$  such as the relative frequencies of official unemployment over the measure of the registered one leads only to minor differences in the results.<sup>8</sup>

The estimated values of  $\eta_{i,g}$  are shown in table 1 (standard errors in parenthesis).

Age group	Males	Females
15 – 24	0.5431 (***) (0.0126)	0.5100 (***) (0.0146)
25 – 30	0.2814 (***) (0.0043)	0.2631 (***) (0.0059)
31 – 39	0.3462 (***) (0.0070)	0.2928 (***) (0.0054)
40+	0.2579 (***) (0.0035)	0.1861 (***) (0.0032)

**Table 1:** Estimated weights for reconciling registered unemployment  
(\*\*\*) significant at 1%

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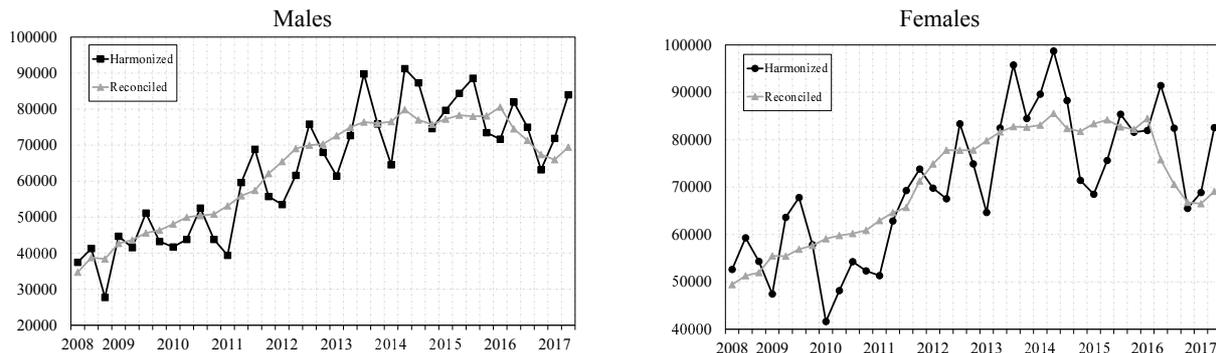
<sup>8</sup>Estimations are run with MAT LAB. Details are available from the authors upon request.

The coefficients collected in table 1 are very significant. Their importance rely on the fact that - everything else being equal -  $1 - \eta_{i,g}$  may provide an estimation of the incidence of claimants in employment and unconstructive job seekers in the series of registered job seekers. In details, considering the different age groups and the gender partition, the estimated values of  $\eta_{i,g}$  display remarkable divergencies. First, especially for females, the weight of claimants in employment and unconstructive job seekers appears particularly high for individuals aged 40 years or more. Usually, older women are more likely to be in very non-standard employment relationships than males and this can boost the presence of claimants in employment among those individuals. Generally speaking, the incidence of workers with minimal jobs is very sustained among older workers since they are more likely to possess outdated ICT skills or limited information with respect to younger individuals. Sometimes older workers obtain atypical work arrangements, such as working less than 10 hours a week, as a form of pre-retirement and this allows those workers to remain registered in the CPIs records (cf. Riso, 2010).

By contrast, the incidence of claimants in employment and unconstructive job seekers among young individuals is definitely lower. A rationale for that pattern can be found in the eligibility criteria of unemployment benefits that usually rule out people without former work experiences (cf. Crepaldi and Lodovici, 2014). Therefore, younger workers may be lead to declare themselves as unemployed fulfilling the criteria of official statistics, but - at the same time - they may have little incentives to register in the provincial files since they cannot claim unemployment benefits. Furthermore, even if the presence of unconstructive searchers should be negligible among the younger, the retrieved values of  $\eta_{i,g}$  may be the signal of a significant share of claimants in employment. Indeed, there is evidence that after the years of crisis atypical employment rose among young individuals, especially for women. In details, employment for people among 15 and 24 years old displayed a tendency to be concentrated in part-time work and the shadow economy (cf. Allmendinger et al. 2013; Riedmann and Fischer, 2014).

In addition, low values of  $\eta_{i,g}$  are found even for middle age groups, i.e., for individuals aged 25 – 30 and 31 – 39 years. Actually, people in those age groups tend to be involved in casual and seasonal work in the sectors of construction, tourism and education. In this regards, Law 160/1988 extended unemployment insurance to cover this type of workers by introducing ad hoc unemployment benefits with reduced requirements. Seasonal workers who are registered as unemployed enjoy regular support year after year and usually they do not search for alternatives. Being classified as unemployed workers not seeking a job, those workers are exempted from activation measures (cf. Galarneau, 2005).

The results in table 1 can be used to plot the reconciled series vis-à-vis official unemployment for both genders.



**Figure 8:** Reconciled series

The two panels of figure 8 track the official and the reconciled series obtained from the procedure described above. Interestingly, the two reconciled series follow a path similar to the corresponding trends of official unemployment. Consequently, given the figures of registered unemployment, the weights in table 1 can be used to forecast the expected value of official unemployment. However, there remains some small systematic differences which may be due - at least in part - to structural and procedural changes regarding the provision of unemployment benefits. Specifically, in the third quarter of 2010, 2011, 2013, 2014 and 2015, the reconciled series is comparatively higher than the official series. With the exception of 2009 for males and 2012 for females, this seems to be due to the presence of seasonal employment in the sectors of tourism and catering. As we said above, irrespective of whether or not they are seeking work during the winter months when they are temporarily out of their jobs, those individuals may decide to register in order to claim the job seekers allowance.

### 3 A theoretical model with unconstructive searchers and claimants in employment

Following the lines traced out by Coe and Snower (1997), in this section we develop a static search model in which official and registered unemployment may coexist in equilibrium. For this purpose, we assume that the economy is populated by  $L > 0$  risk-neutral individuals that inelastically supply their labour services. Among those individuals, a fraction  $\theta$ , with  $0 < \theta < 1$ , searches constructively for a job while the remaining  $1 - \theta$  are labeled as unconstructive searchers. The unconstructive searchers are not willing to work and if they are hired they produce no output. In other words, unconstructive searchers are merely pretending to search in order to qualify for registration and - in this way - gain the unemployment benefit which is assumed to be equal to  $b > 0$ .<sup>9</sup> Without loss of generality, such an unemployment benefit

<sup>9</sup>Among unconstructive searchers we may find individuals in rest unemployment, i.e., workers that have been fired in a given industry that are available to return to work in that industry, and that industry only (cf. Alvarez

is not necessarily equal to the job seekers allowance but it is assumed to be the proxy for the value of all the perquisites and entitlements recognized to registered job seekers.

In addition, let us denote  $N$  as the level of employment prevailing in the economy. Among these workers, a fraction  $\xi$ , with  $0 < \xi < 1$ , is assumed to be given by claimants in employment, i.e., workers with minimal jobs who retain the right to maintain their position in the administrative archives of job seekers. As it will become clear in a moment, these individuals are engaged in an on-the-job search process aimed at getting an upgrade from a minimal job to a full position which is assumed to provide a higher wage (cf. Krause and Lubik, 2006). For that reason, we will make the hypothesis that there are two types of firms in the economy, i.e., one that posts vacancies for minimal jobs ( $V_m$ ) and one that posts vacancies for full positions ( $V_f$ ). Consequently, the total number of vacancies available in the economy will be given by  $V_T = V_m + V_f$ .

### 3.1 Search for workers, jobs and upgrades

In the model economy, the rate at which workers arrive at a vacancy, the one at which vacancies arrive at a workers and the one at which job upgrades arrive at a claimant in employment are conveyed by Poisson processes. In details, the probability that a vacant full job is matched by a constructive searcher ( $\varepsilon_f$ ) and the probability that a vacant minimal job is matched by a claimant in employment ( $\varepsilon_m$ ) are assumed to be decreasing function of the respective measure of the labour market tightness. Specifically,

$$\varepsilon_f = \varepsilon_i \left( \frac{\theta L}{V_f} \right) \quad 0 \leq \varepsilon_f(\cdot) \leq 1 \quad (1)$$

$$\varepsilon_m = \varepsilon_m \left( \frac{\xi N}{V_m} \right) \quad 0 \leq \varepsilon_m(\cdot) \leq 1 \quad (2)$$

where  $\varepsilon'_i(\cdot) > 0$  for  $0 < \varepsilon_i(\cdot) < 1$ , with  $i = \{f, m\}$ .

Similarly, the probability that a constructively searching worker finds a job ( $\rho_f$ ) and the probability that a claimant in employment upgrades ( $\rho_m$ ) its position are given by

$$\rho_f = \rho_f \left( \frac{V_f}{\theta L} \right) \quad 0 \leq \rho_f(\cdot) \leq 1 \quad (3)$$

$$\rho_m = \rho_m \left( \frac{V_m}{\xi N} \right) \quad 0 \leq \rho_m(\cdot) \leq 1 \quad (4)$$

where  $\rho'_i(\cdot) > 0$  for  $0 < \rho_i(\cdot) < 1$ , with  $i = \{f, m\}$ .

Workers with full positions are given by constructive searchers who have found a job. Consequently, the expression in (3) conveys the following relation between  $N$  and  $L$ :

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and Shimer, 2011).

$$(1 - \xi) N = L \rho_f \left( \frac{V_f}{\theta L} \right) \theta \quad (5)$$

Obviously, eq. (5) implies that the official unemployment rate can be written as

$$u_H = 1 - \rho_f \left( \frac{V_f}{\theta L} \right) \theta \quad (6)$$

By contrast, assuming that all the official job seekers register themselves in the provincial archives and omitting sampling problems, the level of registered job seekers is given by the sum among official job seekers ( $L(1 - \rho_f(\cdot)\theta)$ ), unconstructive searchers ( $(1 - \theta)L$ ) and claimants in employment ( $\xi N$ ). Consequently, taking into account the expression in (5), the registered unemployment rate is given by

$$u_R = 2 - \theta \left( 1 - \left( \frac{\xi}{1 - \xi} - 1 \right) \rho_f \left( \frac{V_f}{\theta L} \right) \right) \quad (7)$$

The expressions in (6) and (7) reveal that whenever  $1 - (\xi/(1 - \xi))\rho_f(\cdot)$  is lower than  $1/\theta$  - a condition that is always fulfilled - the rate of registered unemployment is strictly higher than the official one. Intuitively, the registered unemployment rate is higher than the official one as long as there are unconstructive searchers ( $\theta < 1$ ) and claimants in employment ( $\xi > 0$ ). Moreover, while the official unemployment rate is constrained between 0 and 1, the same does not hold for the registered one. Obviously, this is due to the fact that the numerator of  $u_R$  may collect individuals that according to official criteria are classified as employed or out of the labour force (cf. Battistin et al. 2006).

The equations (6) and (7) allow also the derivation of the multiplier of registered unemployment, i.e., the ratio between registered and official job seekers. In details,

$$M(\theta, \xi) = 1 + \frac{1 - \theta \left( 1 - \frac{\xi}{1 - \xi} \rho_f \left( \frac{V_f}{\theta L} \right) \right)}{1 - \rho_f \left( \frac{V_f}{\theta L} \right) \theta} \quad (9)$$

Whenever  $1/\theta$  is higher than  $1 - (\xi/(1 - \xi))\rho_f(\cdot)$ , an hypothesis which is always verified according to the assumption set forth above, the multiplier of registered unemployment is higher than 1 as shown by figure 2. Obviously, this is the same condition under which  $u_R$  is higher than  $u_H$ . From an empirical point of view, the theoretical expression for  $M(\cdot)$  should be somehow related to the inverse of the  $\eta_{i,g}$  coefficients whose estimations are collected in table 1.

Eq. (9) reveals that  $M(\cdot)$  depends - inter alia - on  $\theta$  and  $\xi$ . The expression and sign of the respective derivatives are given by

$$\frac{\partial M(\theta, \xi)}{\partial \theta} = - \frac{1 + \rho_f \left( \frac{V_f}{\theta L} \right) (1 - e_{\rho_f}) \left( 1 - \theta + \frac{\xi}{1 - \xi} \left( 1 + \rho_f \left( \frac{V_f}{\theta L} \right) \theta \right) \right)}{\left( 1 - \rho_f \left( \frac{V_f}{\theta L} \right) \theta \right)^2} \quad (10)$$

$$\frac{\partial M(\theta, \xi)}{\partial \xi} = \frac{\theta \rho_f \left( \frac{V_f}{\theta L} \right)}{(1 - \xi)^2 \left( 1 - \rho_f \left( \frac{V_f}{\theta L} \right) \theta \right)} > 0 \quad (11)$$

where  $e_{\rho_f} \equiv \partial \rho_f(\cdot) / \partial (V_f / \theta L) (V_f / \theta L) / \rho_f(\cdot)$  is the elasticity of matching with respect to labour market tightness for full positions.

As long as  $e_{\rho_f}$  is lower than one, an hypothesis for which there is a robust circumstantial evidence abroad as well as in the Italian context (cf. Petrongolo and Pissarides, 2001; Cardullo and Guerrazzi, 2016), (10) shows that the multiplier of registered unemployment over official unemployment is a decreasing function of the fraction of constructive searchers. By contrast, according to (11),  $M(\cdot)$  is an increasing function of the share of claimants in employment.

### 3.2 Supply of vacancies

As we stated above, there are two types of firms that post different types of vacancies. On the one hand, a worker employed in a full position generates a real revenue equal to  $a > 0$  and receives a real wage equal  $w$ . Under the assumption that employers who supply a vacancy for a full position have to pay the fixed cost  $\kappa > 0$ , the expected profit for a firm that post full positions is given by

$$\pi_f = \varepsilon_f \left( \frac{\theta L}{V_f} \right) (a - w) - \kappa \quad (12)$$

On the other hand, minimal jobs are assumed to be a smaller-scale version of full positions. In other words, minimal jobs yield less to employers, are associated to lower wage payments and imply lower search cost.<sup>10</sup> The latter feature of minimal jobs is due to the fact that claimants in employment are usually directed to firms with the help of the CPI in which they registered. Consequently, the expected profit for a firm that post minimal jobs can be written as

$$\pi_m = \alpha \left( \varepsilon_m \left( \frac{\xi N}{V_m} \right) (a - w) - \kappa \right) \quad 0 < \alpha < 1 \quad (13)$$

Under free entry, both types of vacancies are supplied until the associated expected profit is driven to zero, i.e.,  $\pi_f = \pi_m = 0$ . Therefore, eq.s (12) and (13) imply that each type of vacancy is equal to

$$V_f = \frac{\theta L}{\varepsilon_f^{-1} \left( \frac{\kappa}{a-w} \right)} \quad (14)$$

$$V_m = \frac{\xi N}{\varepsilon_m^{-1} \left( \frac{\kappa}{a-w} \right)} \quad (15)$$

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<sup>10</sup>Implicitly, we are assuming that jobs are perfectly divisible at level of firms. Such an assumption is consistent with a production technology characterized by constant returns to scale.

Since  $\varepsilon_i$ , with  $i = \{f, m\}$ , are supposed to be increasing functions of their respective arguments, it follows that both types of vacancies are decreasing (increasing) functions of the real wage and search costs (individual worker's productivity).

### 3.3 Wage determination

The real wage  $w$  earned by workers is assumed to be the outcome of a Nash bargaining process. On the one hand, the fallback position of workers is given by the unemployment benefit  $b$  that also proxies the array of perquisites assigned to registered job seekers. On the other hand, the fallback position of employers is assumed to be given by marginal firing costs that, for the sake of simplicity, are proportional to the real wage according to the parameter  $\phi \in (0, 1)$  (cf. Coe and Snower, 1997). Consequently, under the assumption that the bargaining power of workers (employers) is given by  $\mu$  ( $1 - \mu$ ), the Nash maximandum can be written as:

$$\max_w (w - b)^\mu (a - (1 - \phi)w)^{1-\mu} \quad (16)$$

The expression in (16) implies that the bargained wage is equal to

$$w^* = \frac{a\mu + b(1 - \mu)(1 - \phi)}{1 - \phi} \quad (17)$$

Eq. (17) reveals that the wage earned by workers increases with the productivity of the individual employee, with the amount of firing costs and with the level of unemployment benefits. Moreover, as long as  $(a - (1 - \phi)b) / (1 - \phi) > 0$  - a condition that fits the hypothesis made above on the parameters' model -  $w$  is an increasing function of the bargaining power of workers.

### 3.4 Unconstructive searchers and claimants in employment

The equilibrium fraction of unconstructive searchers ( $1 - \theta^*$ ) and the one of claimants in employment ( $\xi^*$ ) are found by assessing two distinct non-arbitrage conditions according to which the expected value of the search activities carried out, respectively, by official job seekers and workers employed in minimal jobs must be equal to the value of payments received by the two categories of workers.

On the one hand, suppose that individuals are heterogeneous in terms of their search costs and  $s_f(\theta)$ , with  $s'_f(\cdot) > 0$  for all  $\theta \in (0, 1)$ , is a continuous function that conveys the cumulative distribution of constructive job search costs. Consequently, ordering job searchers in terms of their individual search costs from the lowest to highest,  $s_f(\theta)$  represents also the search cost of the marginal constructive searcher out of the proportion  $\theta$  of the labour force ordered in such a manner (cf. Coe and Snower, 1997). Thereafter, in equilibrium, the marginal searcher must be indifferent between constructive and unconstructive search, so that

$$\rho_f \left( \frac{V_f}{\theta^* L} \right) w^* + \left( 1 - \rho_f \left( \frac{V_f}{\theta^* L} \right) \right) b - s_f(\theta^*) = b \quad (18)$$

Solving eq. (18) for  $\theta$  by taking into account the results in (14) and (17), we find the equilibrium fraction of constructive job seekers:

$$\theta^* = s_f^{-1} \left( \frac{\mu (a - b(1 - \phi)) \rho_f(\varpi)}{1 - \phi} \right) \quad (19)$$

where  $\varpi_f \equiv 1/\varepsilon_f^{-1} (\kappa(1 - \phi) / ((1 - \phi)(a + b(1 - \mu)) - a\mu))$ . Obviously,  $1 - \theta^*$  is the equilibrium fraction of unconstructive job seekers that - by hypothesis - register themselves to CPIs.

In the other hand, but in a similar manner, claimants in employment must be indifferent between searching (constructively) for a full position and keeping their minimal job, so that

$$\rho_m \left( \frac{V_m}{\xi^* N} \right) w^* + \left( 1 - \rho_m \left( \frac{V_m}{\xi^* N} \right) \right) \alpha w^* - s_m(\xi^*) = \alpha w^* \quad (20)$$

where  $s_m(\xi)$ , with  $s'_m(\cdot) > 0$  for all  $\xi \in (0, 1)$ , is the cumulative distribution of on-the-job search costs, whereas  $\xi$  is the fraction of employed searchers ordered from lowest to highest in terms of their individual search costs.

Taking into account the results in (15) and (17), eq. (20) can be solved for  $\xi$  to find the fraction of claimants in employment:

$$\xi^* = s_m^{-1} \left( \frac{(1 - \alpha) \rho_m(\varpi_m) (a\mu + b(1 - \mu)(1 - \phi))}{1 - \phi} \right) \quad (21)$$

where  $\varpi_m \equiv 1/\varepsilon_m^{-1} (\kappa(1 - \phi) / ((1 - \phi)(a + b(1 - \mu)) - a\mu))$ .

### 3.5 Productivity shocks and policy implications

The expressions in (19) and (21) reveal that the fraction of unconstructive searchers and the one of claimants in employment depends on the different model's parameters. Consequently, it becomes possible to assess how productivity shocks and policy interventions aimed at modifying the underlying institutional setting of the labour market may affect the theoretical figures of official and registered unemployment.

First, aiming at exploring the effects triggered by a downturn or by an upturn on unconstructive searchers and claimants in employment, we begin by assessing how  $\theta^*$  and  $\xi^*$  are influenced by variations in labour productivity. Actually, in a supply-driven model like the one developed above, expansions (recessions) can be portrayed by increases (reductions) in the value of  $a$ . The respective derivatives are given by

$$\frac{\partial \theta^*}{\partial a} = \mu \frac{\partial s_f^{-1}(\cdot)}{\partial \theta^*} \left( \frac{\rho_f(\cdot)}{1 - \phi} + \frac{\kappa \rho'_f(\cdot) (a - b(1 - \phi)) (1 - \phi - \mu)}{(\Omega \varepsilon_f^{-1}(\cdot))^2} \right) \quad (22)$$

$$\frac{\partial \xi^*}{\partial a} = (1 - \alpha) \frac{\partial s_m^{-1}(\cdot)}{\partial \xi^*} \left( \frac{\mu \rho_m(\cdot)}{1 - \phi} + \frac{\kappa (a\mu + b(1 - \mu)(1 - \phi))(1 - \phi - \mu) \rho'_m(\cdot)}{(\Omega \varepsilon_m^{-1}(\cdot))^2} \right) \quad (23)$$

where  $\Omega \equiv (1 - \phi)(a + b(1 - \mu)) - a\mu$ .

The sign of (22) and (23) crucially depends on the term  $1 - \phi - \mu$ . Namely,  $\partial \theta^* / \partial a \geq 0$  and  $\partial \xi^* / \partial a \geq 0$  if and only if  $1 - \phi - \mu \geq 0$ . Interestingly, according to (12), (13) and (17), such a condition is satisfied when profits move in the same direction of labour productivity. Consequently, we can state that whenever there is a positive (negative) productivity shock the fraction of constrictive job seekers as well as the one of claimants in employment tend to increase (decrease). Comparing those results with the path of the multiplier illustrated in figure 3 and recalling the analytical results in (10) and (11), we notice that in the aftermath of the two major recessive impulses that hit the Italian economy the effects driven by variations of  $a$  on  $\theta^*$  dominated the ones on  $\xi^*$  by signaling a discouraging effect triggered by the adverse economic conditions. Actually, the peaks of the multiplier seem to be achieved at the two deeps of the recessions in 2009 and 2012.

From a policy point of view, an intriguing issue that our model allows to address is the way in which official and registered unemployment react to variations in the perquisites and entitlements recognized to job seekers and denoted by  $b$ . Specifically, deriving  $\theta^*$  and  $\xi^*$  with respect to that parameter leads to

$$\frac{\partial \theta^*}{\partial b} = \mu \frac{\partial s_f^{-1}(\cdot)}{\partial \theta^*} \left( \frac{\kappa (a - b(1 - \phi))(1 - \phi)(1 - \mu) \rho'_f(\cdot)}{(\Omega \varepsilon_f^{-1}(\cdot))^2} - \rho_f(\cdot) \right) \quad (24)$$

$$\frac{\partial \xi^*}{\partial b} = (1 - \alpha)(1 - \mu) \frac{\partial s_m^{-1}(\cdot)}{\partial \xi^*} \left( \frac{\kappa (1 - \phi)(a\mu + b(1 - \mu)(1 - \phi)) \rho'_m(\cdot)}{(\Omega \varepsilon_m^{-1}(\cdot))^2} + \rho_m(\cdot) \right) > 0 \quad (25)$$

On the one hand, according to (24) and increase in  $b$  has two counterbalancing effects on the fraction of constructive searchers: (i) a bargaining effect given the first term in brackets that leads to an increase in  $\theta^*$  and (ii) a moral hazard effect given by the second one that, on the contrary, leads to a reduction in  $\theta^*$ . Intuitively, the bargaining effect works through the positive relation between the negotiated wage and  $b$  conveyed by eq. (17). Consequently, the higher the wage, the higher the incentives to search in a constructive manner. The functioning of the moral hazard effect is more intuitive. Indeed, an increase (reduction) in the entitlements recognized to job seekers reduces (increases) the incentives to search constructively. Interestingly, when workers have complete market power ( $\mu = 1$ ), the bargaining effect disappears and we have only the moral hazard effect. Furthermore, when workers have no market power ( $\mu = 0$ ), unemployment benefits have no effect on  $\theta^*$ . On the other hand, (25) shows that the effect of  $b$  on the fraction of claimants in employment is definitely positive. As we recalled above, the wage equation in (17) provides a positive relationship between  $w^*$  and  $b$ . Thereafter, the higher the wage, the higher the incentives to look constructively for job upgrades.

Whenever the wage is assumed to be the outcome of negotiations between workers and firms, labour market deregulation is usually modeled as a reduction of the bargaining power of workers (cf. Blanchard and Giavazzi, 2003). The effect of variations in  $\mu$  on  $\theta^*$  and  $\xi^*$  are conveyed by

$$\frac{\partial \theta^*}{\partial \mu} = (a - b(1 - \phi)) \frac{\partial s_f^{-1}(\cdot)}{\partial \theta^*} \left( \rho_f(\cdot) + \frac{\mu((1 - \phi)b + a)\rho'_f(\cdot)}{(\Omega \varepsilon_f^{-1}(\cdot))^2} \right) > 0 \quad (26)$$

$$\frac{\partial \xi^*}{\partial \mu} = (1 - \alpha) \frac{\partial s_m^{-1}(\cdot)}{\partial \xi^*} \left( \frac{(a - b(1 - \phi))\rho_m(\cdot)}{1 - \phi} - \frac{\kappa(a\mu + b(1 - \mu)(1 - \phi))(a + b(1 - \phi))\rho'_m(\cdot)}{(\Omega \varepsilon_m^{-1}(\cdot))^2} \right) \quad (27)$$

According to eq. (26), the fraction of constructive searchers is positively affected by the bargaining power of workers. This result is driven by the fact that the equilibrium wage conveyed by eq. (17) is an increasing function of  $\mu$ . Therefore, the higher the wage, the higher the incentives to search constructively for a job. By contrast, as revealed by eq. (27), the effect of the bargaining power of workers on claimants in employment is not straightforward. In addition to the positive effect driven by  $\mu$  on  $w^*$ , there is also a counterbalancing negative effect due to the fact that when the wage increases firms have the incentive to post less vacancies, in this case for minimal jobs.

Looking at marginal firing costs born by employers, our model allows also to stress the way in which official and registered job seekers responds to variations in the parameter  $\phi$ . In details, deriving  $\theta^*$  and  $\xi^*$  with respect to  $\phi$  leads to

$$\frac{\partial \theta^*}{\partial \phi} = a\mu \frac{\partial s_f^{-1}(\cdot)}{\partial \theta^*} \left( \frac{\rho_f(\cdot)}{(1 - \phi)^2} - \frac{\kappa\mu(a - b(1 - \phi))\rho'_f(\cdot)}{(\Omega \varepsilon_f^{-1}(\cdot))^2} \right) \quad (28)$$

$$\frac{\partial \xi^*}{\partial \phi} = -\frac{1 - \alpha}{1 - \phi} \frac{\partial s_m^{-1}(\cdot)}{\partial \xi^*} \left( \frac{(a\mu + 2b(1 - \mu)(1 - \phi))\rho_m(\cdot)}{1 - \phi} + \frac{a\kappa\mu(a\mu + b(1 - \mu)(1 - \phi))\rho'_m(\cdot)}{(\Omega \varepsilon_m^{-1}(\cdot))^2} \right) < 0 \quad (29)$$

Eq. (28) shows that the effect of  $\phi$  on the fraction of constructive searchers is certainly positive. Recalling some results achieved in models with insiders and outsiders, higher firing costs allow employed workers to extract a higher share of the rent generated by the underlying employment relationship (cf. Lindbeck and Snower, 1989). Consequently, as conveyed by eq. (17), there is a positive link between  $\phi$  and  $w^*$ . We already know that a higher wage leads individuals to search constructively for jobs. By contrast, confirming a path that we have somehow see above, the incentives that drive employers to post minimal jobs go in the same direction of the incentives that drive claimants in employment to search for job upgrade. In fact, eq.(29) shows that  $\xi^*$  is negatively related to  $\phi$ . In other words, higher marginal firing costs leads employer to post lower vacancies for minimal jobs, and this reduce the willingness of workers to search for job upgrades.

Considering the bargaining power of workers and firing costs born by firms, the period covered by our empirical analysis encloses a wave of labour marker deregulation labeled as

Job Act (Law 183/2014 and D.Lgs 23/2015). Indeed, starting in 2014 the Italian government ratified some interventions aimed at increasing labour market flexibility and reducing firing costs. The main novelties of the Job Act are the availability of contracts with increasing protection instead of the traditional permanent contract and the abolition of the prohibition of firing workers without a cause (cf. Antonioli and Pini, 2014; Catalano and Pezzolla, 2017; Sestito and Viviano, 2016).

According to eq.s (26) – (29), our model does not have unambiguous predictions for the effects triggered by changes in  $\mu$  and  $\phi$ . However, the available empirical evidence illustrated in figures 1 and 3 shows a general reduction of unemployment together with mild values of the multiplier. Such a pattern may suggest that the positive effect triggered by lower firing cost on the fraction of constructive searchers offset the corresponding negative effect triggered on  $\theta^*$  by the reduction of  $\mu$ . Moreover, since a fraction of minimal jobs likely became full jobs for the availability of contracts with increasing protection, it appears reasonable to assume that the negative effect on  $\xi^*$  triggered by the reduction of  $\mu$  outweighed the corresponding positive effect as well as the positive effect triggered by the reduction of  $\phi$  on the percentage of claimants in employment.

Concerning the fixed cost of vacancy posting, it plays a role as well in influencing the fraction of constructive searchers and claimants in employment conveyed in the following expressions:

$$\frac{\partial \theta^*}{\partial \kappa} = - \frac{\partial s_f^{-1}(\cdot)}{\partial \theta^*} \frac{\mu (a - b(1 - \phi)) \rho'_f(\cdot)}{\Omega(\varepsilon_f^{-1}(\cdot))^2} < 0 \quad (30)$$

$$\frac{\partial \xi^*}{\partial \kappa} = - \frac{\partial s_m^{-1}(\cdot)}{\partial \xi^*} \frac{(1 - \alpha) (a\mu + b(1 - \mu)(1 - \phi)) \rho'_m(\cdot)}{\Omega(\varepsilon_m^{-1}(\cdot))^2} < 0 \quad (31)$$

Eq.s (30) and (31) straightforwardly suggest that the higher the value of  $\kappa$ , the lower the incentives to post vacancies, no matter the type. Therefore, the lower the incentives to search constructively for full jobs and job upgrades.

From a policy perspective, the parameter  $\kappa$  can be taken as a proxy of the recruitment efficiency of CPIs. Consequently, an increase (reduction) in matching efficiency of CPIs, i.e., a reduction (increase) of  $\kappa$  does not have an univocal effect on the multiplier of registered unemployment since it leads to a reduction (increase) of unconstructive searchers but an increase (decrease) in claimants in employment.

Finally, the fraction of claimants in employment also depends on the distance between full and minimum job conveyed by the parameter  $\alpha$ . The respective derivative can be written as follows:

$$\frac{\partial \xi^*}{\partial \alpha} = - \frac{\partial s_m^{-1}(\cdot)}{\partial \xi^*} (a\mu + b(1 - \mu)(1 - \phi)) \rho_m(\cdot) < 0 \quad (32)$$

Eq. (32) reveals that the lower the distance between minimal and full jobs, the lower the fraction of claimants in employment.

## 4 Official and registered unemployment: Why do we need both?

Unemployment statistics are essential in identifying policy targets in labour market, setting normative standards for actions, choosing among strategic options, assisting in making policy decisions and controlling their effectiveness. Official and registered unemployment seek to grasp the shortage of work, but they are derived in a different way. As we notice in section 2, this leads to marked divergences among them and some flaw can be detected in both statistics. On the one hand, official unemployment is measured via sample surveys so it is potentially subject to errors due to heterogeneities among people with different characteristics and mis-classification errors in the self-reported labour force status (cf. Feng and Hu, 2013). In addition, as argued by Summers (1982), ILO unemployment can be biased by sampling, seasonal-adjustment and sampling-variability errors. Even the quality of interviewers' work may be questioned in official statistics (cf. Hazans, 2008). On the other hand, registered data are affected by the national legislation that provides the eligibility criteria for registration and to claim unemployment benefits. These criteria define a sort of participation constraint that may be unrelated to employment hardship and ineffective in avoiding the moral hazard of potential applicants. In other words, jobless individuals who experience problems in submitting the required documents to the CPI are automatically ruled out from registered statistics. Conversely, people entitled to receive the benefits granted by registration can register themselves even if they are not actively seeking for jobs.

Likewise, both statistics are used in different ways. On the one side, official unemployment is mainly used for international comparisons, the analysis of long-term and medium-term trends in the labour market, the analysis of labour market position of different socio-demographic groups, the analysis of labour market flows, the analysis of job search activities and for the estimation of the size of the labour force. On the other side, registered unemployment is mainly used for the analysis of short-term trends, to forecast labour supply and labour demand in certain occupations and in certain municipalities, to calculate the seasonally-adjusted unemployment rate and to calibrate weights implemented to generalize the results of the labour force survey to the whole population. Therefore, it may be important to exploit both data to overcome the limitations outlined above and - at the same time - gather a wider idea about the unemployment situation in a given region.

The public discussion on Italian unemployment is often characterized by the debate on the reliability and the possible underestimation underlying official figures. In this regard, arguing in favour of a broader definition of unemployment, some scholars suggested to supplement the official measure of job seekers by taking into account the share of the labour force covered by social safety valves (e.g. Cingano et al. 2010; Olivieri and Paccagnella, 2012). By contrast, there is broad consensus on the view that provincial records on job seekers are heavily inflated

(cf. Anastasia and Disarò, 2005).

From the point of view of employment and income policies, the accurate determination of the number of people that need intervention is essential in order to calibrate the amount of resources to be allocated and, at a later stage, evaluating their effectiveness. In this direction, the possibilities of comparison allowed by official data are certainly indispensable. However, from a quantitative perspective and considering the always-mentioned reforms of social safety valves and the recent debate on the guaranteed minimum income, the possible under-reporting problems associated with the official labour market survey deserve to be taken in serious consideration (cf. Budlender, 2011). There are empirical studies developed with a number of methodologies that suggest a broader definition of unemployment with respect to the one implemented to retrieve official statistics (cf. Battistin et al. 2006; Brandolini et al. 2004). Such a definition would lead to include all the jobless individuals who declared a) to be immediately available to start a job and b) carried out some concrete search activities without any restriction for the period in which the latter has been actually performed. In this way, it is very likely that some registered job seekers not surveyed by ISTAT as unemployed would be fairly considered for retrieving the real magnitude of involuntary unemployed workers as well as the quantity of labour actually supplied in the economy under scrutiny.

In this view, administrative records on job seekers seem to constitute the proper reference to integrate and amend official figures on unemployment (cf. Chernyshev, 2001; Anastasia et al. 2015). For instance, aiming at amending the available measures of unemployment, Burchard and Le Grand (2002), propose a methodological approach to address the problem of the existence of voluntary unemployment. Obviously, people that voluntarily decide to be unemployed should not be considered for grasping the measure of actual employment hardship. The method implemented by Burchard and Le Grand (2002) is based on controlling for various constraints on people's decisions that can affect their employment situation. These constraints are introduced sequentially according to the extent to which they can be regarded beyond individual control. Such a procedure allows to estimate the predicted probability of being employed and when such a probability is above a certain threshold for a jobless individual, the individual herself should be considered as voluntary unemployed and not considered in unemployment statistics.

In the perspective of integration, Jones and Riddell (1999) suggest an empirical procedure to assess whether people out of the labour force such as registered unconstructive searchers may deserve to be considered as genuinely unemployed. As we noticed in section 2, in the Italian context this can be quantitatively important especially for non-young persons. Estimating the transition probabilities of a Markovian model in which different labour force states are taken into account, Jones and Riddell (1999) find that a significant share of non-searching individuals that desire to have a job is behaviourally similar to the individuals that fulfill the criteria of official unemployment. Consequently, such a share of individuals should be considered to evaluate the amount of under-utilization of labour in the economy and the extent of frictional

and structural mismatch.

Again on the way of integration, some attention should be paid also to registered claimants in employment that hold very precarious positions. For instance, Thomas (1998) argues that claimants in employment have a dynamic behaviour which is very close to official unemployment so that a fraction of them should be taken into account to evaluate the real extent of actual unemployment.

Furthermore, considering the possibilities of updating and the quantity of information that could be gathered by CPIs, administrative archives could be exploited to build longitudinal databases. Thereafter, those panels of data should be used to monitor the dynamics of unemployment and to evaluate the effectiveness of policy aimed at bringing people into employment. However, as argued by Trivellato (2003, 2006), more than an integration among official data and administrative records, the most sensible thing to do would be the creation of a national information system of labour - or a national labour accounting system - with the task to organize and process data coming from different statistical sources. Within the European context, Italian authorities had repeatedly committed themselves to ensure that all public administrations endowed with competencies in labor market issues should become able to develop statistical indicators for implementing and controlling active policy interventions. Unfortunately, these ambitious projects, announced several times, have not yet been realized.

## 5 Concluding remarks

This paper addresses some issues concerning the measurement of unemployment in the Italian regional context. Specifically, retrieving data from Tuscany, we compare the picture of unemployment that emerges by exploring official data released by ISTAT and administrative records collected by regional CPIs over the last ten years on a quarterly basis.

From an empirical point of view, consistently with previous findings, we find that registered unemployment is higher, more persistent and more concentrated on women than its official measure (cf. Barbieri et al. 2000; Anastasia and Disarò, 2005; Guerrazzi, 2012). However, despite those heterogeneities, we show that the stock of registered job seekers conveys a cyclical information about labour market performance that goes in the same direction of the one indicated by official unemployment. Specifically, we show that official and registered unemployed tend to move together along the cycle and are both negatively correlated to regional employment. By contrast, we give evidence that such a cyclical information is missing from the inflows into registered unemployment. Moreover, we provide an empirical procedure to reconcile registered unemployment to official unemployment that is fairly able to replicate the trend of the latter.

Thereafter, we develop a search model that provides a rationale for the coexistence of official and registered job seekers by deriving the analytical expression of the multiplier of registered unemployment, i.e., the ratio between registered and official job seekers. A comparative statics

analysis carried out within our theoretical framework allows to clarify some features of observed data such as the increase of the multiplier observed during the years of the recession as well as some of the (un)employment effects of the labour market deregulation triggered by the Job Act (cf. Antonioli and Pini, 2014; Catalano and Pezzolla, 2017; Sestito and Viviano, 2016).

Finally, we offer some insights on how to integrate and amend official and administrative data on unemployment. Specifically, we suggest the advisability to rule out voluntary unemployment, the need to consider a fraction of unconstructive searchers and claimant in employment as genuinely unemployed and the importance to build longitudinal data on jobless individuals (cf. Burchard and Le Grand, 2002; Jones and Riddell, 1999; Trivellato, 2003, 2006).

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قياس البطالة بإستعمال البيانات الرسمية والسجلات الإدارية:

**منظور تجريبي ونظري**

ماركو غويرازي و إلهام كسيبي

**ملخص:**

يتناول هذا البحث مشكلة قياس البطالة على المستوى الإقليمي في إيطاليا. في هذا الصدد، نقوم بدراسة إقليم توسكانا، عن طريق مقارنة مستويات البطالة المدرجة في البيانات الرسمية مع تلك المدرجة في السجلات الإدارية في فترة ما بعد الأزمة المالية في عام 2008. بالتوازي مع نتائج أبحاث سابقة في هذا الشأن، نجد أن مستوى البطالة في السجلات الإدارية مقارنة مع البيانات الرسمية أعلى و يحتوي على عدد أكبر من الإناث، بالإضافة إلى أنه يظهر ميلاً للتغير بشكل أبطأ. في طبيعة الحال، وبغض النظر عن غياب التجانس بين مقياسي البطالة في البيانات الرسمية و السجلات الإدارية، نوضح مدى تشابه السلوك الدوري بينهما. إضافة إلى ذلك، نقدم وسيلة للتوفيق بينهما. كخطوة لاحقة، نقوم بتطوير نموذج يوفر أسس منطقية لدمجهما، ونوضح كيفية تجاوبه مع الصدمات الإنتاجية والتعديلات في هيكله التأسيسي. وأخيراً، نقدم فهم معمق للمنفعة المكتسبة من الاستخدام المدمج لهذه البيانات.