SOME CONSIDERATIONS ON THE OPTIMALITY AND COVERAGE OF THE ITALIAN UNEMPLOYMENT INSURANCE SYSTEM

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Abstract

The paper aims at providing some simple guidelines for the evaluation of the Italian unemployment insurance system (UI). It provides background information on the theoretical literature and the actual institutional arrangement in some countries. Then, I evaluate two aspects of UI in Italy: the fraction of workers covered by ordinary unemployment benefits (OUB); and its efficiency in resolving the tension between insurance provision and incentives to work. I use the WHIP data to construct a sample of newly unemployed workers in 2002 and estimate eligibility based on their employment record. Next, assuming eligibility I evaluate efficiency using a standard principal-agent model of insurance provision – Pavoni (2007), Shavell and Weiss (1979). The analysis reveals that UI in Italy suffers mainly from a problem of coverage, rather than from poor design in the extent and timing of benefits. Using the WHIP data I evaluate two reforms aiming at extending coverage: the first removes the *enrollment* criterion – inscription to social security older than two years. The second eliminates reduced unemployment benefits (RUB), not playing an insurance role, and extends access to OUB by lowering the eligibility requirement from 52 to 26 weeks of contributions, the replacement rate reflecting weeks of contributions.

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1 Introduction

This paper aims at providing some simple guidelines for the evaluation of the Italian system of income subsidies related to the event of unemployment. The economic rational for unemployment insurance (henceforth UI) is that of insuring the worker against the risk of unemployment so to guarantee a smoother consumption path. The difficulty is that of preserving the incentives to work. I evaluate twwo aspects of the Italian UI system: its ability in providing coverage; and its efficiency in addressing the tension with work incentives. The paper also provides background information on the theoretical literature and the actual UI system in some countries.

The Italian system is segmented along several dimensions, such as the worker qualification, the industry and the size of the employer. I focus on two schemes: the first, is ordinary unemployment benefits (henceforth OUB) which is the main unemployment insurance tool. The second is reduced unemployment benefits (henceforth RUB): originating as an income supplement for seasonal workers employed in agriculture it has been extended to all employees so as to provide a subsidy to worker with discontinuous careers not having enough social security contributions to qualify for OUB – 52 full time equivalent weeks in the previous two years. However RUB is paid in January of the following year, regardless of the employment status of the worker at that time, therefore it does not play an insurance role. Both, OUB and RUB require the worker to have enrolled in social security at least two years before – the *enrollment* criterion.

The aim of the paper is that of providing some simple guidelines and tools for the evaluation of UI in Italy. As such, in the second and third section it provides an overview of the theoretical literature, and background information on the actual institutional arrangement in some European (Italy, France, Germany, Spain and Denmark) and extra-European countries (the U.S. and Chile). With regard to the academic literature I distinguish two strands of literature: the first evaluating the needs for government provided UI – assuming that there is no market for privately provided unemployment insurance; the second focusing on its optimal design.

In the fourth section I use the Work Histories Italian Panel (henceforth WHIP) and quantify the coverage of the system of income subsidies related to the event of unemployment. I construct a sample of private sector employees experiencing unemployment in 2002; based on employment records I evaluate their eligibility to either OUB or RUB. In particular I quantify the role played by the enrollment criterion in limiting access – enrollment in social security older than two years. It turns out that only 47% of workers in the sample can access OUB, while 18% can access RUB, which, however,

does not play an insurance role.

In the fifth section I turn the attention to the efficiency of OUB. I do not intend to assess whether the generosity of the scheme is appropriate; rather, I try to quantify the scope for efficiency gains which could be achieved by modifying the schedule of benefit payments to better address the tension between insurance provision and incentives to work. To this aim I use the standard principal agent model of Shavell and Weiss (1979): the unemployed worker is credit constrained so that consumption in each period equals benefits and based on the amount and timing of future benefits the worker chooses the effort in searching for a job today. The principle, who commits to a schedule of payments, does not observe the search effort. To this model I add a minimum bound as in Pavoni (2007) so to evaluate a reform introducing a minimum income level as well.

The model is calibrated according to the data mentioned above. Assuming eligibility, the quantitative analysis suggests that costs can be reduced by $5-10\%$ relative to current OUB. These gains are quantitatively significant, yet the number is derived under the assumption that the model is correctly specified. Instead, the main issue with the Italian UI system is that access is limited. In the sixth and final section I evaluate two possible reforms aiming at extending coverage. The first removes the enrollment criterion: coverage raises to 82%, with a 19% increase in costs in the benchmark scenario; however, most of the change is due to wider access to RUB, which does not play an insurance role. The second reform eliminates RUB while reducing the eligibility requirement for OUB from 52 to 26 weeks of contributions, adjusting the replacement rate to reflect contributions: coverage rises to 59% with a 4% cost increase, in the benchmark case. The combination of the two interventions raises coverage to 69% and it increases costs by 20%. The costs estimates are particularly sensitive to the take-up rate which is imputed to individuals becoming eligible after the reform. This observation hints to the importance of better understanding and quantifying take-up rates, but a proper analysis would require suitable data, as those used in Anastasia, Bertazzon, Disara, Emireni, and Rasera (2011) for Veneto.

2 Literature

The premise of the literature on unemployment insurance is that markets are incomplete and that the worker cannot insure against the risk of unemployment. Government intervention may increase welfare by providing such an insurance. The Government faces a standard moral hazard problem: if insurance is complete the worker does not have any incentive to work lead-

ing to opportunistic behavior – assuming that the planner cannot observe the worker's search behavior. I distinguish two strands of literature, the first analyzing the negative and positive effects of unemployment insurance in general equilibrium; the second considering instead the optimal timing of benefit payments.

In the first group, Hansen and İmrohoroğlu (1992) quantify the welfare benefits from unemployment insurance in a model where the worker may quit her job or she may turn down an offer and still receive benefits with a certain probability. Unemployment insurance decreases precautionary savings and increases welfare but this result is fragile relative to the introduction of moral hazard: if the probability of detecting opportunistic behavior is low, UI significantly decrease welfare for empirically plausible values of the replacement rate. Marimon and Zilibotti (1999) analyze a search and matching model with ex-ante heterogeneous workers and firms. Workers are risk neutral so unemployment benefits do not serve an insurance purpose, rather benefits constitute a subsidy to search and may raise output and welfare by improving the "quality" of matches – though unemployment rises.[1] Acemoglu and Shimer (1999, 2000) consider a model with risk averse workers, search frictions and fixed investments. The market adjusts to the absence of unemployment insurance by decreasing investments and providing low productivity and low wage jobs with a low unemployment risk. Unemployment insurance raises output and may improve welfare significantly even when accounting for moral hazard.[2] Finally, Landais, Michaillat, and Saez (2010) analyze the optimal level of unemployment insurance in a business cycle search and matching model where unemployment in recessions is due to "job rationing" (the wage is inelastic relative to movements in TFP). In recessions increasing the search effort does not decrease unemployment as much, due to rationing, while it decreases other workers probability of finding a job due to congestion externalities. Therefore the optimal replacement rate is countercyclical.

The second strand of literature attempts to devise the optimal contract addressing the trade-off between insurance provision and incentives to work. The fundamental intuition first highlighted in the seminal paper by Shavell and Weiss (1979) is that the planner may exploit the inter-temporal dimension to mitigate the tension between these two objectives: the planner sustains the consumption of the unemployed worker today, while providing the

[1] Also, in search and matching models unemployment insurance may resolve the inefficiencies due to search externalities. Marimon and Zilibotti (1999) assume that Hosios' condition holds.

[2] Moral hazard is modeled as the participation decision of agents differing in the value of leisure.

incentives to search for a job by threatening the worker of decreasing her consumption tomorrow, if she does not find a job (the planner has the ability to commit to a state contingent schedule of benefit payments and the worker cannot save so that consumption equals the amount of the benefit). Hopenhayn and Nicolini (1997) extend the set of instruments available to the planner with tax on future labor income which is used by the planner as an additional threat: under suitable regularity conditions the optimal contract is such that the tax increases with the duration of unemployment while unemployment benefits, though decreasing, decrease less rapidly. The two instruments allow the planner to better smooth consumption while preserving the incentives to search which increases the efficiency of the contract dramatically, relative to the case with one instrument. Pavoni and Violante (2007) further extend the set of instruments by considering a minimum income level and monitoring. Human capital and the prospects for re-employment decrease with unemployment duration and the optimal contract consist of a sequence of interventions: first, unemployment benefits and income tax, second, monitoring and finally social assistance. Shimer and Werning (2006, 2008) study the same problem as Hopenhayn and Nicolini (1997) but allow the worker to save – savings are unobserved. Under these circumstances the planner cannot exploit the inter-temporal margin and optimal benefits are constant – Shimer and Werning (2008). If agents are heterogeneous the schedule may increase or decrease depending on how the composition of the unemployment pool (conditional on unemployment duration) evolves (endogenously) – Shimer and Werning (2006). CHETTY (2008) observes that the change in the job finding probability at benefit expiration – Meyer (1990) – may in fact reflect liquidity constraints, not only moral hazard, and proposes a test to distinguish the two. Card, Chetty, and Weber (2007) estimate that liquidity constraints are important. Finally, Hopenhayn and Nicolini (2009) address the issue of repeated unemployment spells: unemployment insurance may induce opportunistic behavior in that it may induce workers to accept socially inefficient jobs, or to quit socially efficient jobs. The optimal contract is contingent on the entire worker's employment history as indexed by the life time value of worker which is promised to the worker by the planner: it increases while the worker is employed and it decreases when she is unemployed.

3 Unemployment insurance in practice

3.1 Italy

The Italian system of income subsidies related to the event of unemployment is segmented along several dimensions, depending for example on the industry and the employer class size. The most common unemployment insurance scheme is the ordinary unemployment benefit (henceforth OUB) covering salaried workers.[3] The worker must have been laid-off (voluntary quits are not covered), she must have worked for at least one year in the last two years and she must have been enrolled in social security for at least two years.[4] I refer to the latter as the *enrollment* criterion. The benefit equals 60% of the average gross salary received in the last three months for the first six months, and it equals 50% for the seventh and eighth month. Workers 50 years of age or older are entitled to an additional four months of benefits at 40% replacement rate. The benefit amount is subject to a cap.[5]. The contribution is paid by the employer and it amounts to 1.6% of the gross salary it pays to the worker.

Workers who do not qualify for OUB may be eligible for reduced unemployment benefits (henceforth RUB). The worker must satisfy the enrollment criterion and she must have worked for at least 78 days during the year.[6] The benefit is paid the ensuing year in January, regardless of the worker's employment status at that time. Therefore, the scheme does not play an insurance role – assuming that financial frictions do not allow the worker to discount the future claim. The replacement rate grows in the number of days worked: it equals 35% of the average gross daily salary for the first 120 days, and 40% for the remaining days up to 180 days. The amount of the benefit is subject to a cap.[7]

[3]Employees in agriculture and construction have access to different schemes, as do manufacturing or trade workers employed at firms with more than 15 or 50 employees, respectively.

[4]More precisely, eligibility requires 52 full time equivalent weeks of contributions – only salaried worker participate in social security. Also, the worker must have contributed at least one full time equivalent week prior to the two years preceding the onset of unemployment

[5]The cap in 2011 is 906.80 euros a month, or 1089.89 euros if the salary is above 1961.80 euros.

[6]All days within the beginning and ending date of the employment relation are counted, including holidays and regardless of hours worked – with the exception of employment contract involving fewer than 4 days a week.

[7]The cap equals 892.96 euros, monthly units, or 1073.25 euros if the salary is above 1961.80 euros.

3.2 UI in some other countries

I briefly review the UI system in some other countries: Denmark, France, Germany, Spain, Chile and the United States.

In Germany unemployment insurance is mandatory for all employees as well as apprentices and trainees. Instead, participation for self-employed workers is voluntary. The employee and the employer contribute to financing the scheme; each one pays 1.4% of earnings, up to 5000 euros (in terms of monthly earnings). Eligibility requires 12 months of work in the two previous years, the replacement rate is 60% (67% if the worker has children) and duration varies from 6 to 24 months depending on the worker's age and on months worked. Social assistance is means tested and conditinal on participation (the worker cannot reject more than a certain number of "suitable" offers, the parameters becoming less strict over the spell). The amount is paid until eligibility sussists and it varies depending on family status and the number of children (the range being 300-1000 euros); the worker may receive housing aid as well.

Differently than in Germany, the French system is segmented along several dimensions and self-employed workers and trainees do not have access to unemployment insurance. Eligibility requires 4 months of contributions in the last 28 months and benefit duration equals the number of months contributed up to 24 months. The replacement rate declines with income, from 75% to 57%, the cap on monthly earnings being approximately $11,000$. The employee and the employer both contribute to financing the scheme with 2.4% and 4% of the worker earnings, respectively. The firm must pay an additional fee if firing a worker over 50. The generosity of social assistance is comparable to that in Germany but duration is limited to 6 to 18 months.

As in France, in Spain self-employed workers and trainees do not have access to unemployment insurance. Eligibility requires 1 year of work in the 6 previous years, the replacement rate is 70% for the first 6 months and then drops to 60%. Duration ranges from 4 months to 2 years, with 6 years of contributions. The employee and the employeer contribute to financing the scheme, the tax rate depending on the type of contract, $1.55 - 1.6\%$ and $5.5 - 7.7\%$ respectively – the rate is higher for fixed term contracts. Social assistance is lower than in France and Germany, approximately 400 euros a month for up to one year and a half.

Chile unemployment insurance system is quite different: the employer and the employee both contribute towards an individual severance account and a solidarity severance fund – 2.4% (3% for fixed term contracts) and .6% respectively. Eligibility requires at least 1 year of contributions – six months for fixed term contracts. The replacement rate and duration increase depend-

ing on the amount of funds in the individual account. Duration ranges from 1 to 5 months and each month the benefit drops by 10 percentage point relative to that in the first month. The worker recevies two additional months of benefits if the unemployment rate is at least one percentage point higher than its 4 year average. If the individual account balance is insufficient, than the worker can access the solidarity severance fund. Thus, the system reflects the efficiency criteria highlighted in Hopenhayn and Nicolini (2009) and Landais et al. (2010). Self-employed worker and trainees are not eligible for unemployment insurance.

In Denmark unemployment insurance is managed by trade unions and participation is voluntary. A worker may choose a particular unemployment insurance fund regardless of her affiliation to that particular union. In addition to a variable premium which a participating worker pays, all workers pay 8% of their gross earnings to subsidize the unemployment insurance system. Eligibility requires membership in the unemployment insurance fund for the last 12 months, and 52 weeks of contributions in the 3 previous years – 34 weeks for part time workers. The replacement rate is 90% and duration is four years. Self-employed workers and trainees have access to unemployment insurance. Social assistance is managed at the local level.

Unemployment insurance in the United States is managed at the state level, eligibility criteria vary; the replacement rate is generally 60% and duration is 26 weeks; self-employed workers do not have access to unemployment insurance. The employer pays a fix federal tax, .8% of payroll, and a variable state tax, 0 to 10%, based on the firm's experience rating in laying off workers.

4 Eligibility

I first construct a sample of unemployed workers using the Work Histories Italian Panel (henceforth WHIP) and estimate eligibility to OUB and RUB. Next, assuming eligibility I evaluate the efficiency of OUB in resolving the tension between insurance provision and incentives to work, assuming that a worker can access unemployment insurance. I conclude that OUB are reasonably close to efficiency, in the sense that the savings from implementing the optimal scheme are approximately 8%, assuming that the model is correctly specified. Then, I evaluate the cost of two reforms that would expand access to unemployment insurance: removing the enrollment criterion, and lowering the threshold for OUB to 26 weeks adjusting the replacement rate to reflect contributions.

WHIP is constructed from social security archives containing information

on private employment, self-employment and social security benefits for all individuals who have worked in Italy over the period 1985-2004. Individuals born in four dates are selected resulting in a sampling rate of 1/90, or approximately $740,000$ individuals in each year.

I restrict the analysis to private employment. The registry does not include workers in agriculture mining and forestry and it covers the period 1985-2003. I focus on unemployment episodes initiated in 2002 so that a worker is observed for at least one year after loosing her job. For each employment relation ending in 2002 I check that the worker has no other employment relation and that she does not start a new one within a week (the first week of unemployment is not covered by OUB). Finally, I verify that the worker does not retire by the end of 2003. are not in the registry. I exclude workers in construction because they are covered by a different unemployment insurance and workers receiving mobility benefits.

This definition of unemployment is subject to two caveats. First, I do not observe whether the separation is initiated by the worker or by the firm; as mentioned above, workers quitting their job are not eligible for unemployment benefits. Using data for Veneto Anastasia et al. (2011) find that approximately 1/3 of separations are initiated by the employee in the period 2008-2010 (excluding farm workers and workers receiving mobility benefits). Second, the worker may be self-employed. I find that 11.25% of workers who are classified as becoming unemployed in 2002, do in fact appear in at least one of the two self-employment registries in either 2002 or 2003. Eligibility and, in the case of transitions to self-employment, duration may be overstated as a result. Finally, the worker may be not participating in the labor market, but the search effort is not actually monitored in Italy.

The first two columns of table 1 report descriptive statistics for the entire sample of employed workers in 2002 and for individuals becoming unemployed during 2002 – according to the definition above. Unemployment incidence is higher among young and female workers and in the south of Italy (see the definition in the table). Also workers experiencing unemployment have a significantly lower degree of labor market experience and a lower wage. Finally the incidence of unemployment is higher among blue than white collar employees and in the travel and leisure industry.

In 2002 the replacement rate was constant and equal to 40% and duration was 6 months. Figure 1 displays survival estimates for unemployment episodes involving workers in the 25-50 age segment who received OUB in that year. The hazard rises in the 6^{th} month (.125 monthly probability) and peaks in the 7^{th} month (.15 monthly probability); then, it gradually declines. The average monthly job finding probability between the 6^{th} and 12^{th} month is .088. The fraction of workers who is still unemployed at the beginning of

Table 1: WHIP, 2002: descriptive statistics

	sample[†]	new unemployed[△]	eligible for OUB	with OUB	eligible for RUB	with RUB	no enroll. criterion[◇]	contribut. $\geq 26, < 52$[♡]
age (years)	36.0	32.6	36.0	37.0	33.4	36.5	27.3	33.7
women (%)	38.8	42.4	35.9	45.3	51.9	56.3	45.3	50.2
north (%)[♠]	60.0	57.8	62.0	44.0	54.7	44.2	56.4	53.5
south	20.2	22.5	19.5	36.1	24.6	35.5	23.8	25.5
experience (years)	8.21	4.70	8.21	6.96	3.00	3.00	0.75	3.54
daily wage (euros)[□]	81.0	66.2	87.8	80.5	33.0	44.5	39.8	36.1
blue collar (%)[♣]	58.1	64.5	62.2	78.2	74.4	83.6	60.8	74.3
white collar	32.4	24.0	28.1	21.0	19.6	15.5	20.6	19.9
manufacturing (%)	45.4	33.1	42.5	34.1	22.0	16.7	29.0	24.2
trade	17.7	15.4	17.3	16.8	12.8	7.5	15.5	14.4
F.I.R.E.	16.4	21.2	17.0	11.9	23.6	11.8	26.3	21.9
travel/leisure	7.7	16.0	9.4	28.6	26.1	51.0	16.7	24.7
n. of individuals	119413	26418	12445	1312	4677	1026	4326	3280

[†] WHIP 2002: non-farm private employee, construction workers are excluded.

[△] Workers becoming unemployed and remaining unemployed for at least 7 days, workers receiving mobility benefits are excluded.

[♡] Workers not eligible for neither OUB nor RUB due to the enrollment criterion only.

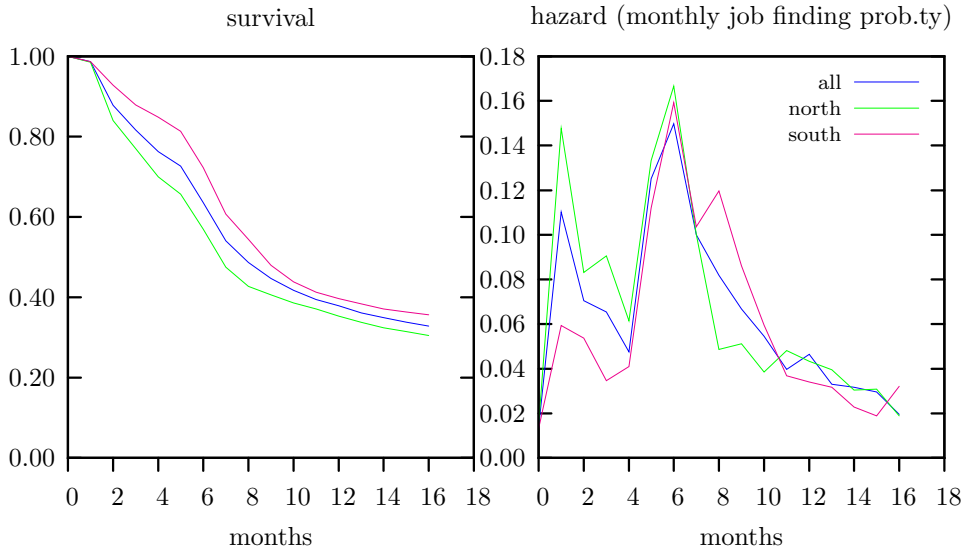
[◇] Workers having at least 26 weeks of contributions in the previous two years and satisfying the enrollment criterion.

[♠] north: Aosta Valley, Piedmont, Liguria, Lombardy, Emilia-Romagna, Veneto, Friuli-Venezia Giulia, Trentino. South: Abruzzo, Molise, Apulia, Campania, Calabria, Basilicata, Sicily, Sardinia.

[□] Gross compensation received be the employee in 2002 divided by the number of days worked (6 days week) within a particular employment relation.

[♣] Blue collar includes "apprendisti" and "operai" (apprentices and blues collar, respectively), white collar includes "impiegati" (and not middle and high managers).

Figure 1: Workers receiving OUB, duration analysis (WHIP 2002)



WHIP: non-farm private employee becoming unemployed in 2002 and receiving OUB, construction workers and workers receiving mobility benefits are excluded. Kaplan-Meyer estimate of the survival function (left panel) and life-table estimate of the unemployment hazard (right panel) for the whole sample and for the north and south separately (see table 1 for the definition), data grouped monthly.

the 7^{th} month is 63.5%, but geographic differences are important: the figure is 57.0% for the north and 72.2% for the south.

The spike in the unemployment hazard may be due to seasonal factors. In 2002 the duration of OUB was 9 months for workers age 50 or older; however, the sub-sample is too small to test whether the peak is located at the 9^{th} month for this age segment. Finally, it may be due to liquidity effects as well – Card et al. (2007). Using different data Rosolia and Sestito (2008) do not find evidence of liquidity and moral hazard effects for Italy in 2003.

Next I estimate eligibility to OUB and RUB. As mentioned, access to OUB requires 52 weeks of full time equivalent contributions in the two years preceding the onset of unemployment; access to RUB requires 78 days of work during the calendar year. In both cases the enrollment criterion must also be satisfied by the worker – enrollment in social security for at least two years. For each worker I record the first day of work in the employment registries 1985-2002, the weeks of contributions (available in the registry) in the two years prior to unemployment and the total number of days covered by any employment contract during 2002 (as an proxy for days worked).

Table 1 report descriptive statistics for workers who are estimated to be eligible for OUB or RUB – third and fifth column. I integrate information from the benefit registry and compute descriptive statistics for workers actually receiving OUB and RUB – fourth and sixth column. Workers who are eligible for OUB are older, they are prevalently men, have more labor market experience and have higher daily wages, relative to the average worker becoming unemployed in 2002. The pattern is reversed with regard to RUB. The take-up rate for OUB is 10.5% and that for RUB is 23.7%, female and workers in the south are more likely to request unemployment benefits, if they are unemployed.[8]

Summarizing, unemployed workers tend to be younger, have less labor market experience and earn lower wages. It may be argued that unemployment insurance is particularly important for individuals with these traits: the incidence of unemployment is higher, they may face tighter credit constraints and they may be less able to self-insure. However, these segments of the population are less likely to satisfy the requirements to access OUB. Instead they may access RUB which, however, is not as generous and does not play an insurance role as the benefit is paid in January of the following year.

5 Efficiency of ordinary unemployment benefits

I use a fairly standard principal-agent model of unemployment insurance provision and evaluate the cost effectiveness of ordinary unemployment benefits (OUB) assuming eligibility. The model is essentially as in Pavoni (2007), with two differences: the policy maker has only one instrument, unemployment benefits, and cannot set labor taxes based on the length of the unemployment spell. The worker choses not only whether to search, but also the intensity of the search effort.

The choice of this particular model is motivated by several considerations. First, I do not seek to assess whether the generosity of the current system is appropriate, which would require a general equilibrium framework allowing for non-participation, as well as externalities resulting from search frictions – Acemoglu and Shimer (1999, 2000), Hansen and İmrohoroğlu (1992), Marimon and Zilibotti (1999). Instead, I focus on the optimality of the timing of

[8]Anastasia et al. (2011) estimate a take-up rate of %50 using data for Veneto in 2009. That data is richer allowing to account for a finer set of criteria, for exemple whether the worker quits her job volontarely. According to their analysis 12% of workers experiencing a separation receive OUB.

benefits. Second, I depart from the recent literature which follows Hopenhayn and Nicolini (1997) in allowing the principal to use labor income taxes as an instrument, as may be politically difficult to implement; furthermore, Pavoni (2007) shows that the tax is nearly flat when the principle is constrained by a minimum bound. Third, the model does not account for borrowing – Shimer and Werning (2006, 2008). To the extent that borrowing constraints are less severe for high income individuals, the model is appropriate for low income workers only. However, low income workers are likely to benefit the most from unemployment insurance: they may be less able to self-insure and face a higher probability of becoming (and remaining) unemployed. Also, the existence of a cap to benefits – a common feature of actual UI systems – results in a flat schedule for high income workers, which is a property of the optimal scheme in models with borrowing. Fourth, the policy maker choses the replacement rate, therefore the model accounts for heterogeneity in labor income only. Shimer and Werning (2006) allow for heterogeneity in unobservable characteristics, including human capital depreciation. However, the policy maker may be able to better address this issue by targeting different workers with different components of the welfare system, e.g. active labor market policies, social assistance – Pavoni (2007). Finally the model does not account for repeated spells of unemployment, Hopenhayn and Nicolini (2009). An important concern with the current scheme is that many workers, particularly those with temporary contracts, do not satisfy the requirement of 52 weeks of full time equivalent contributions over the two previous years. The insight of Hopenhayn and Nicolini (2009) may prove important to design a more flexible system which accommodates the needs of such workers. This extension is left for future research.

5.1 The model

Time is discrete, the worker is infinitely lived and orders stochastic processes, $\{c_t, a_t\}_{t=s}^{\infty}$, according to the preferences:

$$E_s \sum_{t=s}^{\infty} \beta^t [u(c_t, \tau_t) - a_t]$$

c denotes consumption and a the search effort. The instantaneous utility function may vary with the employment state, $\tau \in \{e, u\}$, reflecting differences in the value of home production/leisure. Given the employment state, the instantaneous utility function satisfies standard regularity conditions: it is differentiable and strictly concave and it satisfies Inada conditions. The consumption good cannot be stored and the worker cannot borrow. Thus, if

she is unemployed, consumption equals unemployment benefits, $c_t = b_t$, and if she is employed consumption equals the wage, $c_t = w_t$. The probability of finding a job in $t+1$ is $p(a_t) : \Re_+ \to [0, 1)$, increasing and concave – $p(0) = 0$, $p' > 0$, $p'' < 0$ $\lim_{a\to+\infty} p'(a) = 0$. An employed worker remains employed forever.[9]

The planner cannot observe the search effort exerted by the worker; it commits to a schedule of benefits, $\{b_t\}_{t=0}^{\infty}$, and guarantees a minimum consumption level as in Pavoni (2007), $b_t \geq \bar{b}$ ($\bar{b}$ is a primitive). Faced with the schedule, the unemployed worker chooses the search effort, a_t. The problem of the planner is that of setting benefits as to minimize the expected discounted sum of payments, $E\sum_0^{\infty} \beta^t b_t$, while delivering the expected value V_0 to the unemployed worker.

Following the dynamic contract literature, the problem can be recast recursively – Phelan and Townsend (1991), Spear and Srivastava (1987): the contract specifies the action to be taken by the agent in the current period, (c, a), together with the value of unemployment in the next period, V^u. The planner faces two constraints: first, it must deliver in the current period the value that had been previously promised – the promise keeping constraint (1b). Second, it must ensure that incentives are such that the worker chooses the level of effort specified in the contract – the incentive compatibility constraint (1c). In addition the value of unemployment must not be lower than the minimum bound associated with the minimum consumption level, $\bar{b}$.

Let $C(V)$ denote the least cost of delivering the present value V. The optimal contract and the associated cost function are the solution to the dynamic problem with initial condition $V_0 < V^e$:

$$C(V) = \min_{b,a,V^u} b + \beta[1 - p(a)]C(V^u) \tag{1a}$$

$$s.t.$$

$$V \leq u(b, u) - a + \beta\left\{p(a)V^e + [1 - p(a)]V^u\right\} \tag{1b}$$

$$1 \geq \beta p'(a)(V^e - V^u) \tag{1c}$$

$$V^u \geq \bar{V} \tag{1d}$$

Employment is permanent, then the value associated with this state is simply:

$$V^e = \frac{u(w, e)}{1 - \beta}$$

[9] Allowing for an exogenous separation rate does not change the model qualitatively.

The level of the minimum bound and the search effort associated with the minimum consumption level, $(\bar{a}, \bar{V})$, are jointly defined:

$$\bar{V} = \frac{u(\bar{b}, u) - \bar{a} + \beta p(\bar{a}) V^e}{1 - \beta[1 - p(\bar{a})]}$$
$$1 \geq \beta p'(\bar{a})(V^e - \bar{V})$$

The promise keeping constraint, (1b), is binding. Suppose not, then benefits, b, can be decreased and the cost reduced, while not violating the incentive compatibility constraint, (1c). In addition, if $\lim_{a \to 0} p'(a) = +\infty$ the effort choice is interior, provided that $V^u < V^e$. I restrict attention to the bounded support $V^u \in [\bar{V}, V_0]$. In the interior of this interval the promise keeping and the incentive compatibility constraints hold with equality and (b, a) can be substituted for in the objective function:

$$b(V, V^u) \equiv u^{-1}\left(V + a(V^u) - \beta\left\{p(a(V^u))V^e + [1 - p(a(V^u))]V^u\right\}, u\right)$$
$$a(V^u) \equiv p'^{-1}\left(\frac{1}{\beta(V^e - V^u)}\right)$$

The term $b(V, V^u)$ is bounded, continuous and increasing in V; also, the constraint set is compact. Blackwell's sufficiency conditions hold and the contraction mapping theorem and its corollary imply that there exists one and only one solution in the space of bounded continuous function endowed with the sup-norm, and that it is increasing in V.[10]

A well known difficulty in further characterizing the solution is that (1b) and (1c) are non-linear; in fact (1b) defines a non convex set – Hopenhayn and Nicolini (1997), Phelan and Townsend (1991) – and, after substituting for (a, b), $b(V, V^u)$ is not convex. Standard arguments for convexity and differentiability of the value function require this property, which however is only sufficient[11] I assume differentiability. The envelope condition and the first order condition for the choice of the continuation value of unemployment are:

$$C'(V) = \frac{1}{u(b(V, V^u), u)} \tag{4a}$$
$$C'(V) = C'(V^u)\left\{1 + \frac{p'(a(V^u))^2}{-p''(a(V^u))[1 - p(a(V^u))](V^e - V^u)}\right\} \tag{4b}$$

[10] See Stokey, Lucas, and Prescott (1989), theorems 4.6 and 4.7 for a detailed derivation. Note that the probability of remaining unemployed enters the continuation value (1a), yet the argument is unaffected.

[11] See Stokey et al. (1989), theorems 4.8 and 4.11.

The second equation implies $C'(V) > C'(V^u)$, therefore, using the envelope condition, the optimal sequence of benefits is decreasing. The value of unemployment is decreasing as well, then the constraint $V^u \leq V_0$ never binds and the optimal contract solves the relaxed problem where the domain is unconstrained.

To find the optimal contract I take a constructive approach and solve the model backward, starting at the minimum bound. Let V^* be the value of unemployment such that if $V \in [\bar{V}, V^*]$ then $V^u = \bar{V}$:

$$u'(V^*, u)^{-1} = u'(\bar{V}, u)^{-1} \left\{ 1 + \frac{p'(\bar{a})^2}{-p''(\bar{a})[1 - p(\bar{a})](V^e - \bar{V})} \right\}$$

For any $V_n \in [\bar{V}, V^*]$ I know the continuation value, $V^u = \bar{V}$, and therefore the optimal benefit level, $b_n = b(V_n, \bar{V})$, and the derivative of the cost function, $C'(V_n) = u'(b_n, u)^{-1}$. Starting from these initial values I can apply iteratively the first order condition for the choice of the continuation value, (4b), the envelope condition, (4a), and the promise keeping constraint (1b), and recover $C'(V_{n-1})$, b_{n-1} and V_{n-1} in succession (V_{n-1} is the level of the value of unemployment for which V_n is the optimal choice).

5.2 Simulations

The typical choice in the literature is to assume an exponential form for the job finding probability and a logarithmic form for the within-period utility. I set $p(a) = [1 - exp(-\rho a)]^\alpha$ and $u(w, e) = log(w)$, $u(b, u) = log(b + l)$. The power transformation to the exponential form guarantees that the search effort is interior whenever $V^u < V^e$; the parameter l captures the value of leisure/home production in monetary units. I set $\alpha = .95$ so that the job finding probability function behaves similarly to that used in the literature, except when $V^e - V_0$ is small relative to $V^e - \bar{V}$. Without loss of generality I normalize the wage to 1 and I set $\beta = .95^{1/12} = .9957$ – the unit of time is one month. The remaining parameters are ρ, relating the search effort to the job finding probability, and the monetary value of leisure/home production l. I calibrate l to match the fraction of workers remaining unemployed at the end of the six month when benefits expire, and ρ to match the probability of finding a job within the following 6 months. The two estimates are .635 and .088 (monthly), respectively.

Table 2 displays for different parameter values the savings that can be achieved by implementing the optimal scheme relative to the cost of OUB. The benchmark case is $l = .6$ and $\bar{p} = .088$ – the number in parenthesis is the fraction of workers remaining unemployed at benefit expiration given the

OUB as it was in 2002, 40% replacement rate for six months. The optimal scheme is that minimizing the cost of delivering to a worker younger than 50 the same expected value as that of OUB in 2011 (60% replacement rate for six months and 50% for two additional months). Figure 2 plots the optimal schedule for some of the parameter combinations in table 2.

The schedule becomes steeper if either the job finding probability after the expiration of benefits, $\bar{p}$, or the home production parameter, l, increase. The principal can better exploit the inter-temporal margin when the elasticity of the job finding probability is higher (the higher the value of home production, the higher the elasticity, given a value for the job finding probability after the expiration of benefits). Then, the replacement rate in the first period must be higher, reducing the distance with the OUB schedule, and therefore the extent of savings. In the optimal scheme benefits are lower and drop faster (in the benchmark case the replacement rate drops from 46.7 to 26% in 8 months) but duration is longer – it is infinite with no minimum bound.

When introducing a minimum bound the optimal schedule becomes steeper because the minimum bound reduces the ability of the principal of moving the threat of a lower consumption level into the future. The minimum bound obviously reduces savings – in the benchmark case from 8.93 to 6.62%, when the minimum income equals 10% of the wage. The reduction in savings is quite small because given the value of $\bar{p}$ there are only a few workers exhausting benefits and requesting social assistance. Instead, savings decrease sharply when the value of home production is high, because the minimum income is high relative to the net value of working, $w-l$. Indeed, when $l = .7$ and $\bar{p} = .070$ and $\bar{b} = .15$ the value of unemployment with social assistance and no unemployment insurance is higher than with OUB ($\bar{V} > V_0$) – the missing number in the bottom-left corner in table 2. For higher values of l or $\bar{b}$ the worker drops from the labor market ($\bar{V} > V^e$). The model highlights the vulnerability of a minimum income scheme relative to heterogenity: if workers differ significantly in terms of the job opportunities and the value of home production, then social assistance may have negative effects on the participation of a large fraction of workers. Indeed, in countries with actual social assistance, such as Germany where it is paid indefinitely, eligibility requires participating in the labor market and accepting a suitable job offer. Also, social assistance is complemented with employment services provided by job centers.

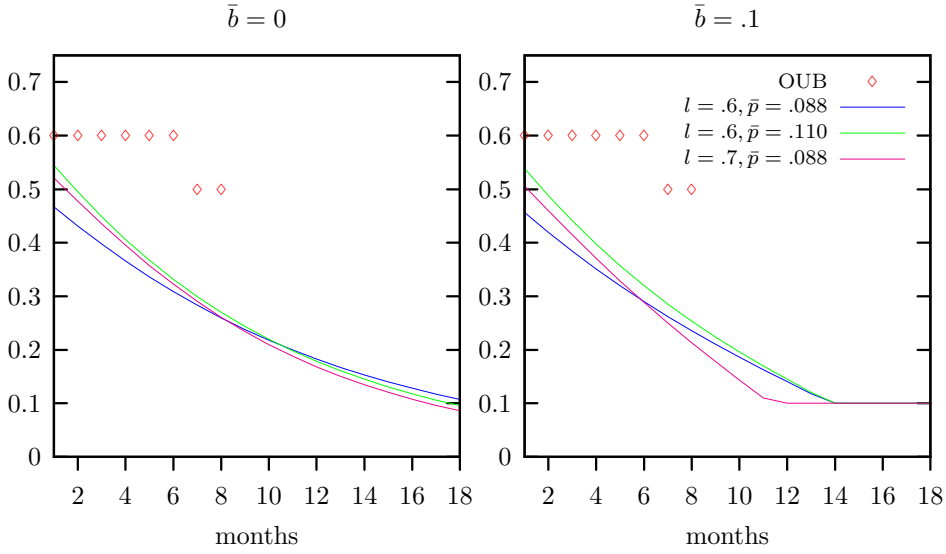
The model allows to evaluate the importance of other sources of heterogeneity. First, older workers face a lower job finding probability: selecting workers not receiving OUB, the fraction of those finding a job by the end of the 6 month is 49.4% for workers age 25-49 and 30% for workers 50 years

Table 2: Optimal UI: savings for different parameter values

			$\bar{p}$		
			.070	.088	.110
$\bar{b} = .00$		.5	13.93	11.48	9.03
			(69.16)	(62.87)	(55.96)
	l	.6	11.05	8.93	6.89
			(69.95)	(63.83)	(57.13)
		.7	8.66	6.85	5.25
			(71.33)	(65.53)	(59.21)
$\bar{b} = .10$		.5	11.09	10.12	8.35
	l	.6	6.45	6.62	5.68
		.7	−0.87	2.05	2.67
$\bar{b} = .15$		.5	−1.65	4.37	5.52
	l	.6	−16.19	−3.48	0.67
		.7		−25.93	−10.20

Savings relative to the expected cost of OUB as they currently are. $\bar{p}$ is the job finding monthly probability after the expiration of benefits, l is the monetary value of leisure/home production and $\bar{b}$ is the minimum income level or social assistance. The number in parenthesis is the probability that the worker is still unemployed at benefit expiration given the OUB schedule in 2002. According to the WHIP data for 2002, the fraction of workers age 25-50 remaining unemployed at the expiration of benefit is .635 and the monthly probability of finding a job in the next 6 months is .088 (see section 4).

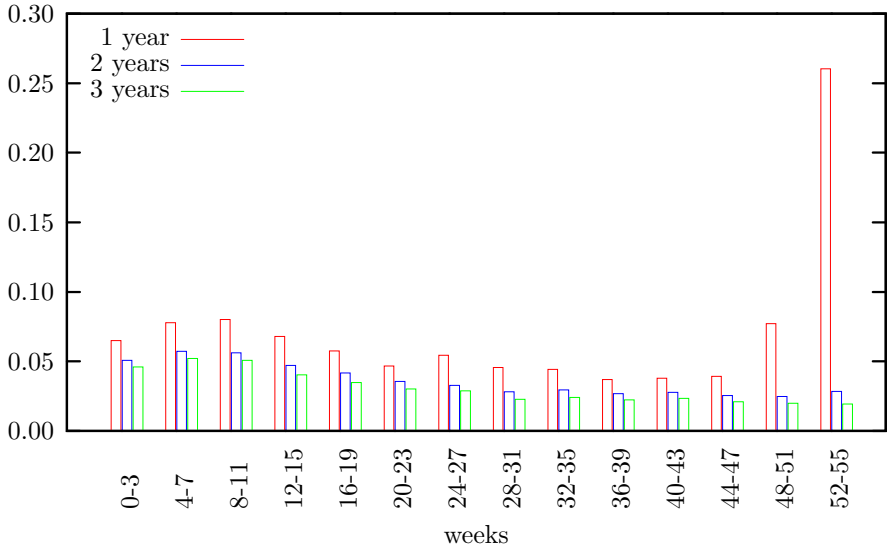
Figure 2: Optimal UI: schedule for different parameter values



see table 2.

of age or older – the figures are practically the same for the whole sample or selecting men only. OUB for Workers older than 50 is more generous, consistently with the model – they have access to an additional four months of benefits at 40% replacement. Second, regional differences may be important. Figure 1 displays the survival curve and the hazard function estimated separately for the north of Italy and for the south of Italy (see the definitions in table 1). In the south of Italy there are fewer job opportunities and the value of home production is probably higher relative to that of working, both due to lower wages and to the lack of public services (e.g. kindergartens). Possible calibrations for the north and the south of Italy correspond to the top-right and the bottom-left corner of table 2, respectively. A lower $\bar{p}$ and a higher l affect the schedule in opposite directions – compare the green and red curves in figure 2 – therefore a single scheme may be not too far from efficiency.

Figure 3: Weeks of contribution at time of unemployment



Weeks of social security contributions during the 1, 2 or 3 years prior to becoming unemployed. Private sector employment relations (excluding agriculture and construction and workers receiving mobility benefits) ending in unemployment in 2002, source WHIP.

6 Evaluation of two reforms extending eligibility

The previous section analyzes the efficiency of OUB assuming that the worker can access the insurance scheme. However, according to the analysis in section 4, the eligibility requirements limit the access to this scheme to approximately 50% of employees becoming unemployed in 2002. In this section we esitmate the cost associated with two reforms aiming at extending coverage: removing the enrollment criterion; or lowering the threshold for OUB from 52 to 26 weeks adjusting the replacement rate to reflect contributions, while eliminating RUB.

The exercise is relative to OUB and RUB as they are in 2002: 40% replacement rate for six months and 30% replacement rate up to a maximum of 180 days, respectivelly; the cap for OUB is 791 euros, or 951 euros if the montly salary is above 1711 euros, and that for RUB is 776 euros, or 933 euros if the monthly salary is above 1679 euros. I impute the cost for each employment spell (OUB) or employee (RUB) based on these institutional parameters, unemployment duration and finally his or her monthly income

in the previous job (OUB) or during the year (RUB), computed using data on compensation and days of employment.

Next, I impute take-up probabilities as predicted by a logit model based on observable characteristics. I include dummies for gender, for the geographical location of the employment relation (north, center or south, as defined in table 1), for the employment category (blue collar, white collar or manager, as defined in table 1) and for the type of benefit (OUB or RUB); also, I include a linear and a quadratic term for work experience (total full time equivalent years of contributions up to 2002), the daily wage and the maximum cost associated with unemployment – that where duration is such to exhaust benefits.

Column 7 in table 1 contains descriptive statistics for workers who have paid enough social security contributions or who have worked enough days to qualify for OUB or RUB, but who do not satisfy the enrollment criterion – first enrollment in social security dating back at least two years. Removing the enrollment criterion would allow 4326 of the 26418 workers becoming unemployed in 2002 to access either OUB or RUB. As one expects these workers are particularly young and they have little work experience (almost by definition). However, most of the increase in coverage is due to worker accessing RUB (3138 workers) rather than OUB (the remaining 1188 workers) and RUB is not an insurance scheme if workers cannot discount future claims, because the benefit is paid in January of the following year.

Figure 3 displays the histogram of the full time equivalent weeks of contributions in the previous 1, 2, or 3 years associated with each unemployment spell in the sample. Extending the horizon from two to three years would increase coverage by 6.8 percentage points, from 13775 to 15756 unemployment spells out of 29275 unemployment spells.

Instead, reducing the threshold for the weeks of contributions from 52 to 26 weeks would increase coverage to 17397 unemployment spells and, removing also the enrollment criterion, to 20363 unemployment spells. Column 8 in table 1 reports descriptive statistics for workers affected by such a reform (i.e. workers satisfying the enrollment criterion and with at least 26 full time equivalent weeks of contributions, but less than 52). According to estimates a worker becoming unemployed in 2002 is eligible for RUB in 5323 cases – 8819 in the absence of the enrollment criterion. Eliminating RUB while decreasing the threshold for OUB would leave without coverage the worker in 2003 of these episodes – 4246 in the absence of the enrollment criterion.

Finally, in table 3 I report estimates for the two reforms: removing the enrollment criterion (case A), or reducing the threshold to access OUB to 26 weeks, adjusting the replacement rate accordingly, and eliminating RUB (case B). The replacement rate is modified to reflect weeks of contributions:

Table 3: Cost of reforms in 2002 (% increase)

take-up new eligibles	estimated		50%	
unemployment duration	recorded	maximal	recorded	maximal
A♣:	19.0	21.7	44.8	54.9
B♢:	4.0	11.8	28.4	45.8
A+B:	19.6	32.8	71.0	107.1

♣ Removal of enrollment criterion, OUB and RUB coexist.

♢ Removal of RUB; OUB with at least 26 weeks of contributions in the two previous years and variable replacement rate: let $b_i = .40\%$ for $i = 1, 2, 3, 4, 5, 6$ and zero otherwise, as for OUB in 2002; the replacement rate in month i of unemployment is $\tilde{b_i} = \min(n/52, 1)b_i$, where n is weeks of contributions.

$\tilde{b}_i = min(n/52, 1)b_i$ where n is weeks of contributions and b_i is month i replacement rate of OUB in 2002.[12] I compute estimates based on different assumptions on the unemployment duration and the take-up probability for the workers becoming eligible as a result of the reform. First, benefits may raise duration, due to moral hazard or the presence of liquidity constraints; therefore, I also report estimates for the case where the worker is assumed to remain unemployed long enough as to exhaust benefits. Second, the take-up probability may be higher than estimated and I repeat the exercise assuming that workers becoming eligible request benefits with .5 probability.

According to the benchmark estimates removing the enrollment criterion would raise costs by 19.0%. Eliminating RUB and decreasing the threshold for OUB from 52 to 26 weeks (adjusting the replacement rate accordingly) is almost budget neutral, increasing costs by 4%. However estimates very significantly depending on the underlying assumptions, especiallly relative to the take-up rate. To this regard, it should be stressed that the analysis is subject to two important caveats: first, the approach is not behavioral and does not account for the increase in job separations which may result from a more generous unemployment insurance scheme. Second, I use data from 2002 and the result cannot be readdily extended to 2011, also because OUB and RUB have changed.

[12] Also, for spells with 26 to 52 weeks of contributions I impute the take up-probability computed for RUB (when available), which is higher than that for OUB, increasing the cost estimate.

7 Conclusions

In this paper I have evaluated the extent of coverage and the efficiency of the Italian system of income subsidies related to the event of unemployment (OUB and RUB) in resolving the tension between insurance provision and incentives to work. RUB does not play an insurance role because the benefit is paid in January of the following year, regardless of the employment status at that time. Coverage is quantified using WHIP data by constructing a sample of newly unemployed private sector employee in 2002, and exploiting information on their employment history. Efficiency is evaluated using a standard principal agent model of insurance provision – Shavell and Weiss (1979) – with the addition of a minimum income – Pavoni (2007) – to evaluate this aspect of a reform as well.

It emerges that the Italian suffers mainly from a lack of coverage: only 47% of workers in the sample can access the insurance tool, OUB. Under the assumptions that the model is correct, the optimal scheme allows to achieve a $5 - 10\%$ reduction of the cost per unemployment spell. I consider two reforms aiming at extending coverage. Removing the enrollment criterion – enrollment in social security older than two years – increases access to either OUB or RUB from 65 to 82% at an additional cost of 19%; however, the change is mainly due to an wider access to RUB, which does not play an insurance role. Removing RUB and extending access to OUB by reducing the eligibility requirement from 52 to 26 weeks of contributions raises the fraction of worker having access to OUB from 47 to 59% at an additional cost of 4%. The paper also provide some background information on the theoretical literature on UI and on actual UI systems in some European and extra-European countries.

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