Shadow Activity and Unemployment in a Depressed Labor Market*

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Abstract

This paper studies the border between shadow employment and unemployment, and argues that the two macroeconomic phenomena are two faces of the same coin, in the sense that any policy aimed at reducing the former will increase the latter. Theoretically, it proposes and solves a matching model of the labor market, where shadow employment emerges in equilibrium as the endogenous response of firms and workers who fell overburdened by taxes and regulations. While the model we propose neatly rationalize the labor market trade off implied by "shadow reducing policies", it suggests that economies with low unemployment turnover should be characterized also by low turnover along the shadow margins. Empirically, the paper uses matched records across LFSs (Labor Force Survey) to assess whether turnover over shadow employment is more stagnant in the high unemployment region of the Italian Mezzogiorno. Since existing estimates of shadow employment are silent on labor market flows and on the relation between shadow activity and main labor market aggregates, we perform original empirical work on the border between employment, unemployment and inactivity, and we find that Italian shadow employment has longer duration in regions with lower unemployment turnover.

- Key Words: Unemployment, Matching, Shadow Activity.
- JEL classification: J30

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1 Introduction

Modern information technologies and improvements in tax collection make it relatively easy to detect and repress shadow activity. However, this is not done and governments' statements of "tolerance zero" vis-á-vis the informal sector do not seem to be taken too seriously by firms and workers who continue to go underground. Indeed, the informal sector is still flourishing. Available estimates of the size of the informal sector in European countries range from a low 10 to 12 per cent of GDP in the Nordics, UK and Switzerland to peaks of 20 to 30 per cent in Southern Europe and Ireland.

Why is the informal sector so much tolerated? A possible explanation is that Governments fear that the repression of shadow activity may simply rise unemployment, with undesirable political consequences. Starting from this simple observation, the paper studies the border between shadow employment and unemployment, and argues that the two macroeconomic phenomena are two faces of the same coin, in the sense that any policy aimed at reducing the former will increase the latter. Theoretically, it proposes and solves a matching model of the labor market, where shadow employment emerges in equilibrium as the endogenous response of firms and workers who fell overburdened by taxes and regulations. While the model we propose neatly rationalize the labor market trade off implied by "shadow reducing policies", it suggests that economies with low unemployment turnover should be characterized also by low turnover along the shadow margins. Empirically, the paper uses Italian regional data to assess whether turnover over shadow employment is more stagnant in the high unemployment region of the Italian Mezzogiorno. Since existing estimates of shadow employment are silent on labor market flows, we perform original empirical work on the border between employment, unemployment and inactivity, and we find that Italian shadow employment has longer duration in regions with lower unemployment turnover.

Available theories of the informal sector – recently reviewed by Schneider and Enste (2000) – do not seem to capture the labor market trade-off involved by the repression of shadow activity. This is because such theories take a partial equilibrium approach, focus almost entirely on labour demand, and do not work with "equilibrium unemployment" models. In this paper we provide a framework enabling to capture pros and cons of measures aimed at repressing shadow activity. More precisely, we propose and solve an equilibrium model of the labour market which sheds fresh light on the effects of the repression of the shadow economy on job creation, job destruction, and on the endogenous decision to go idle. Contrary to much literature on this issue, the size of the informal sector is not given, and the decision to go idle is made by firms and workers through a jointly efficient choice.

In the model there are two different configurations under which shadow employment arises. Under the first configuration, shadow employment is more productive than open unemployment, and shadow activity generates positive value added. Under the second configuration, shadow employment is still privately efficient, but it represents only a temporary device to buy time until workers find a job in the formal sector. The second configuration is clearly the least desirable from an efficiency standpoint, and particularly so when shadow employment is longlasting, since it ends up keeping human resources attached to unproductive jobs. Further, the latter configuration generates multiple equilibria and "shadow

traps", since an equilibrium with low unemployment/low shadow activity coexists with a high unemployment/ high shadow activity equilibrium.

The main implication of the model is that shadow employment and unemployment are two sides of the same coin. In other words, any unemployment reducing policy will endogenously reduce shadow employment, while it is very difficult to reduce shadow employment without increasing unemployment. This result seems to hold even when a "fiscal externality" is operating, and Governments can use the resources obtained from repressing the shadow economy to reduce taxes on the official economy, with a potential spillover on job creation. Under some conditions, our theory shows that policies aimed at repressing the shadow economy may completely back-fire, and end-up increasing, rather than reducing, the fiscal burden on formal employment. Paradoxically, an increase in government's control of the legal status of the private sector may induce an increase in tax, an increase in unemployment, and an increase in shadow employment.

The link between shadow activity and unemployment appears to be supported by existing empirical evidence, and by the simultaneous rise in unemployment and shadow activity observed in Europe over the last decades. Further, it appears that also within Italian regions, regional unemployment and shadow employment are closely correlated. To take the model as close as possible to the data and to obtain estimates of turnover along shadow employment, we look in some details at the characteristics of shadow employment in the Italian Mezzogiorno. In order to do so, we need measures of the informal sector encompassing not only (self-reported) Labour Force Survey (LFS) employment, but also unemployment and inactivity, since there are many indications that shadow employment involves individuals classified as non-employed according to standard LFS definitions. While our empirical results suggest that a significant component of the informal sector lies outside LFS employment, we find that shadow employment is rather stagnant in the Italian Mezzogiorno, as it involves significantly lower outflows to unemployment or to formal employment than in the rest of Italy. This result is broadly consistent with our theoretical perspective, and with the empirical predictions of the model.

The paper proceeds as follows. Section 2 presents few empirical regularities on shadow employment. Section 3 presents and solves the model, and the various equilibrium configurations. Section 4 discusses the relevance of our theoretical model, and summarizes the main empirical implications. Section 5 looks at the evidence linked to the Italian regions, and performs empirical work on the borders between employment, unemployment, inactivity and shadow employment. It presents also estimates of labor market flows over the shadow margin. Section 6 briefly summarizes and concludes.

2 Few Facts about Shadow Economies

The most common definition of the shadow economy is "all economic activities which contribute to the officially calculated (or observed) gross national product but are currently unregistered" [Feige, 1989; Feige 1994; Lubell 1991 and Schneider 1994] and a variety of methods are being used to measure it. Estimates of the shadow economy either draw from direct inferences, that is surveys trying to elicit involvement of respondents in unregistered

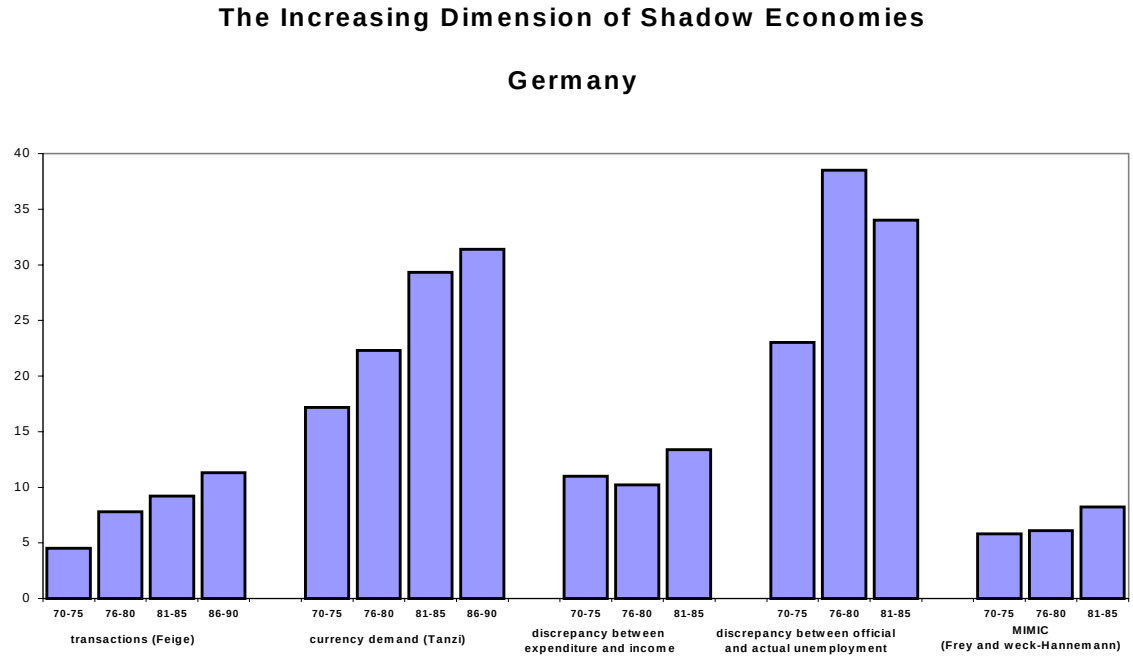

Figure 1: Size of Shadow Economy in Germany

activities, or from indirect methods, which basically draw on the inconsistencies between different statistical sources in order to gauge the size of the underground economy. Among the latter methods, discrepancies between national income and expenditure statistics or between physical (mainly electricity consumption) indicators of economic activity and official GDP statistics are most frequently used. Analogously, employment in the shadow economy is measured by comparing employment data reported by enterprises with employment self-reported by households, which is supposed to capture also activities that are not registered by employers.

All the above methods have pros and cons, and the wide variance of estimates being provided is an indication of the limitations of these techniques. Yet, there are two findings which are confirmed by all studies we are aware of.

The first of these *facts* is a tendency to the rise of the shadow economy in European countries. Figures 1-3 reproduce rates of change in the size of shadow activity in all countries for which different estimates, *based on the same methodology,* are available. As shown by the Figure, all measures are on the rise. Similar results can be obtained by focusing on shadow employment in European countries (Table 1). According to the estimates reproduced in Schneider (2000), in the European area the number of persons working in the unofficial economy doubled within the two decades from 1978 to 1998. The explanation being provided for this upward trend in the shadow economy is generally in the heavy tax, social security and administrative burdens imposed on official activity. Overstrict regulations in the labour

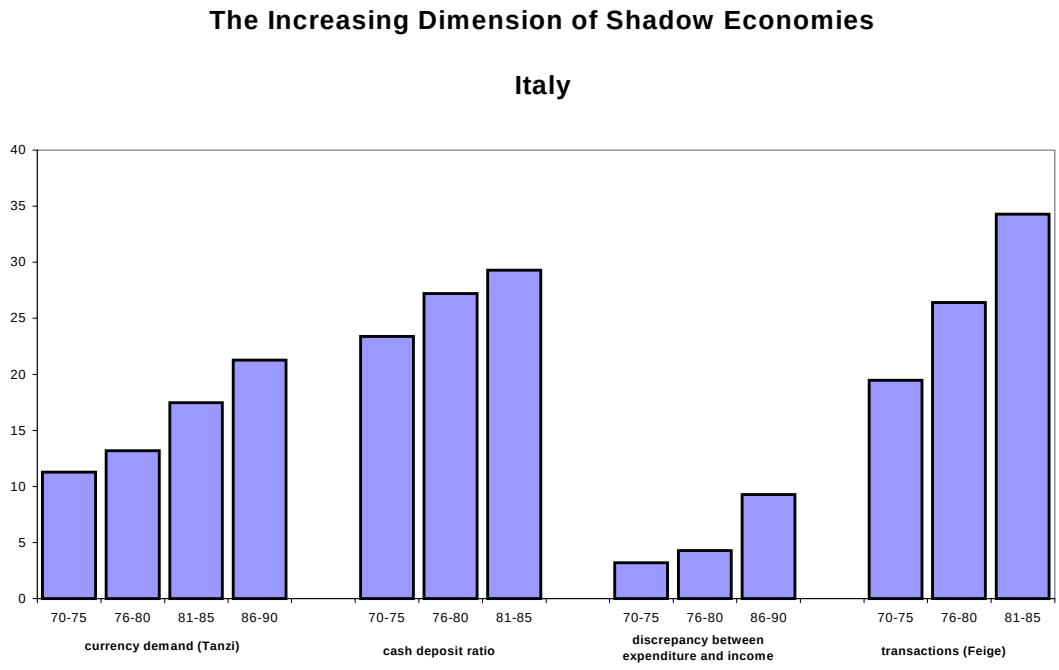

Figure 2: Size of Shadow Economy in Germany

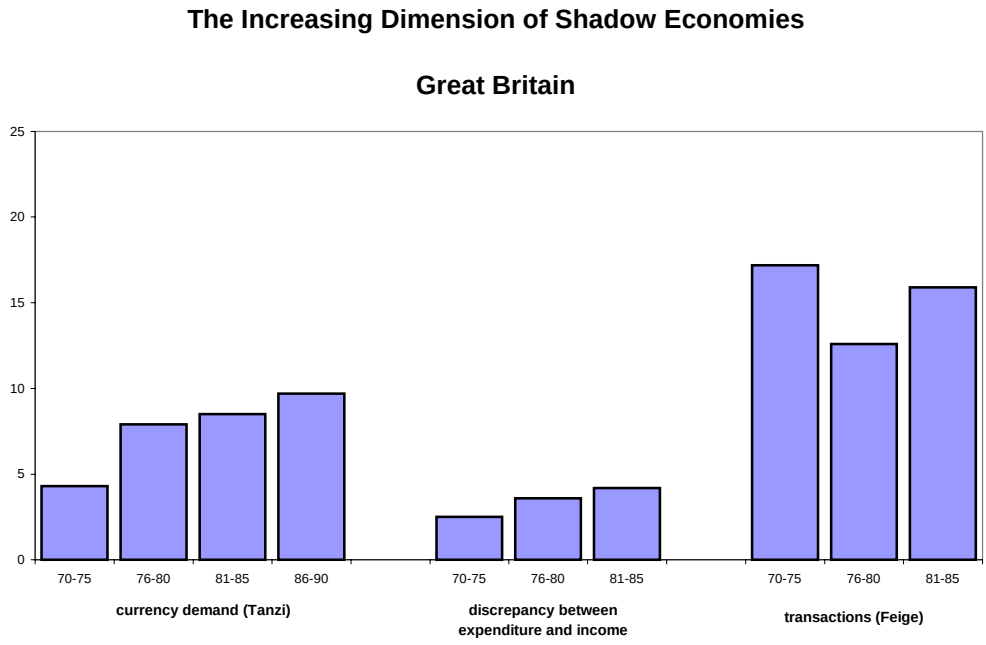

Figure 3: Size of Shadow Economy in Great Britain

market area, e.g., high costs involved by dismissals also bear the brunt of blame for the rise in shadow employment. Yet, the strictness of employment security provisions has been partly relaxed in many European countries in the course of the last decade and, more broadly, a greater degree of labour market flexibility has been allowed at least at the margin, via the introduction of new contractual types, e.g., fixed-term contracts and temporary work agency.

The second fact suggests significant within-country variation in the incidence of the shadow economy. Depressed regions, that is, areas with low productivity and high unemployment, typically display significantly larger shares of unregistered activities and employment than the country averages. The case of the Italian Mezzogiorno, which is further characterized below, is particularly striking in this respect. Available estimates suggest that the shadow rate, that is the proportion of employment that is irregular, may be as high as 30-35 per cent in the South, around 20 per cent in the Centre and at one-digit level in the North-West and the North-East, the latter macro-region being the one with the lowest level of shadow activity. Differences are marked not only in agriculture, but also within industry, with the South displaying an incidence of shadow employment that is twice as high than in the rest of the country. Significantly, there is no tendency over time to the narrowing of the regional differentials in the incidence of the shadow economy: in 1995 the South to Centre-North gap was roughly the same as 10 years earlier[1].

The persistence of wide regional differentials in the incidence of shadow employment suggests that many traditional explanations of the rise in shadow activity, based on the over-regulation of the labour market and on heavy tax and social security burdens, are likely to miss an important dimension. As in the case of the Italian Mezzogiorno, the regions displaying the largest shadow rates often benefit from tax deductions, which should, ceteris paribus, reduce pressures to go idle. Thus, the fact that shadow rates vary so much across regions sharing a similar regulatory environment points to variable enforcement of the rule of law as an important determinant of the documented rise in the volumes of shadow activity. Put another way, not only better regulations, but also tighter enforcement of the rule of law could bring down significantly the shadow sector. The obvious question is then: why are regulations so poorly enforced in some regions? Why are Governments finding it so hard to repress illegal employment? Do they really want to do it?

Two approaches are useful in an attempt to answer this battery of questions. The first route amounts to developing a theoretical model framing the labor market trade-off involved by the repression of irregular employment. The second route, following the insights of our theoretical analysis, involves an empirical assessment of the relation between shadow employment and the extent of labour slack, and the flows between shadow employment and the other labour market aggregates.

This is the task set out for the next two Sections.

[1]See Calzaroni and Pascarella for details on the estimates of shadow employment in Italian macro-regions.

Table 1: Estimates of the size of the shadow economy in some european countries

Countries	Years	Participants	Size as a share of GDP
Austria	1990-91	9,6	5,47
	1997-98	16	8,93
Denmark	1980	8,3	8,6
	1986	13	na
	1991	14,3	11,2
	1994	15,4	17,6
	1998	22,5	18,4
France	1975-82	3.0-6.0	6,9
	1997-98	6.0-12.0	14,7
Germany	1974-82	8.8-12.0	10,6
	1997-98	22	14,7
Italy	1979	20.0-35.0	16,7
	1997-98	11.5-32.3	23,1
Sweden	1978	13.0-14.0	13
	1997	19,8	19,8
Source: Schneider and Enste (2000)			

3 A Model of Shadow Employment.

The model developed in this section aims at capturing the stock-flow relationship between shadow economic activity and unemployment. Two things should be stressed at the outset regarding the type of shadow employment that the model is meant to capture.

First, our notion of shadow or illegal employment is one of tax evasion, rather than crime. Jobs are not declared in order to avoid paying taxes and job destruction costs. Rather than dealing with crime and unemployment [see Burdett, Lagos and Wright, 2000], we try to complement the literature on tax evasion, which has so far overlooked the effects of tax evasion and shadow employment on unemployment.

Second, in the terminology of policy makers, we are framing "marginal shadow employment', that is, employment in low productivity jobs, rather than "development shadow employment', i.e., new jobs which have the potential to become highly productive after some gestation period. In other words, "infant industry" arguments cannot be applied to justify tolerance vis-á-vis the informal sector. We are looking for deeper and empirically more relevant ("development shadow employment" is, in any event, deemed to involve a small fraction of unregistered employment) explanations for the weak and regionally diversified repression of shadow employment.

Overall, the closest statistical approximation to our notion of shadow activity is the definition of "underground or shadow economy" as provided in the 1993 System of National Accounts [SNA, 1993]. The latter defines the "shadow sector" as the set of legal activities unknown to the public administration because of tax evasion, unwilligness to pay social security contributions, non-application of contractual wage minima or hours of work and health at work standards. In particular, we focus on the "economic shadow sector", that is, the range of activities for which there is a deliberate choice of unreporting in order to reduce production costs rather than simply negligence on the part of employers in filling statistical questionnaires. The SNA "shadow economy" is distinguished from the informal sector (activities having a low level of organization, and based on informal work relationships,

e.g., within the family) and the "illegal sector", involving either the production of goods which are banned or carried out by individuals who are not legally authorized to do so.

In the model, all job start-ups are on the technological frontier. Every now and then, such jobs become obsolete, and turn into low-productivity jobs. Firms have to pay taxes (production taxes) in either good and bad times and destruction costs upon firing. In addition, firms have an option of entering into shadow activity, which implies not paying production taxes and destruction costs. Nevertheless, there are some risks involved with shadow activity, since jobs can be monitored. If found cheating, the job is immediately destroyed and a large penalty is imposed. There is on the job search, and workers in shadow jobs always look for formal jobs, as the latter pay higher wages. This is an important property of our model, as multiple equilibria are, to a large extent, related to the fact that it is possible to work in unproductive jobs and seek better jobs at the same time (Saint-Paul, 1995). In the model of next section wages are exogenously set in high productive as well as in low productive jobs, while the appendix solves the full model with endogenous wages, and shows that the results do carry through.

3.1 Assumption-General Set up

- We propose a matching model with on the job search. Firms are one job and the technology is irreversible; time is continuous.
- Good jobs produces y_g, bad jobs produce y_b. Naturally $y_g > y_b$.
- In legal activity there is a production tax τ to be paid. The tax is paid to a third party outside the firm worker pair.
- Good jobs turn bad, or obsolete, at rate λ. Obsolete jobs never return good.
- Any job (good or bad) dies at rate δ.
- All new jobs are good jobs (it can be relaxed), and are on the technological frontier.
- Upon job destruction (when δ strikes and when λ strikes, if it is optimal to do so) there is a destruction tax F. Destruction taxes are not paid if the worker quits.
- Firms are monitored at an exogenously determined Poisson process with arrival rate equal to ρ. If found complying with the regulation, nothing happens to the match. If found cheating and engaged in shadow activity (basically not paying taxes τ), the job is destroyed and a large penalty is imposed $\phi\tau$,where $\phi > 1$;
- Wages in legal activity are exogenously set at w (which can be thought of as a fraction of y). In shadow activity and in bad legal activity firms pay reservation wages, which we set equal to w_r. In the appendix we solve the model with endogenous wages;
- Labour supply is fixed and inelastic, and normalized to 1 for simplicity.

- **Matching Technology with On-the-Job Search** The number of contacts between searching firms and job seekers is given by the matching technology

$$x = x(v, u + n_e),$$

where x is the total number of matches in a given instant, v is the number of vacancies, u is the unemployment rate, and n_e is a measure of employed job seekers (in our model $n_e = n_s$, where n_s is a measure of shadow employment; more about this later). With constant returns to matching, the instant probability that a vacant job meets a job seekers is given by[2]

$$\frac{x(v, u + n_e)}{v} = x(1, \frac{u + n_e}{v}) = q(\theta); \qquad \theta \equiv \frac{v}{u + n_e}$$

with $q'(\theta) < 0$. In the matching literature (Pissarides, 2000) θ, the ratio of vacant firms to job seekers, is typically referred to as market tightness from the firms standpoint. The total number of contacts between unemployed job seekers and vacant jobs is

$$\frac{u}{u + n_e} x(v, u + n_e) = \frac{v}{u + n_e} \frac{x(v, u + n_e)}{v} = u\alpha(\theta); \qquad \alpha(\theta) = \theta q(\theta)$$

with $\alpha'(\theta) > 0$. Finally, the total number of contacts between employed job seekers and vacant firms is

$$\frac{n_e}{u + n_e} x(v, u + n_e) = n_e \alpha(\theta)$$

3.2 Bellman Equations with Exogenous Wages

Let's assume that good jobs choose legal activity (this assumption should be confirmed in equilibrium). The value function of a god job, J_g, reads

$$(r + \delta)J_g = y_g - \tau - w + \lambda[Max(\widetilde{J}_{b,} J_{b,} - F) - J_g] - \delta F, \tag{1}$$

where the productivity shock λ is associated with a permanent fall in productivity to a level y_b. Conditional upon λ striking, there are different possible outcomes, depending on whether it is optimal to continue into legal activity (J_b is the highest), continuing into shadow activity ($\widetilde{J}_b$ is the highest), or paying the destruction tax ($-F$ is the highest). Let's first write the value functions $\widetilde{J}_{b,}$ and J_b where the superscript $\tilde{}$ indicates shadow activity. J_b, the value of a legal bad job, reads

$$(r + \delta + \alpha(\theta))J_b = y_b - w_r - \tau - \delta F, \tag{2}$$

where, by virtue of the matching technology, $\alpha(\theta)$ is the instant probability that a worker in a bad firm finds a good vacant job. From the firm stand point, on the job search works like

[2]This matching technology is similar to the one used by Garibaldi (1999) and Pissarides (2000).

an increase in the discount rate, since it reduces the average duration of employment. The value of bad shadow job reads

$$[r+\delta+\alpha(\theta)]\widetilde{J}_b = y_b - w_r + \rho[-\phi\tau - \widetilde{J}_b]. \tag{3}$$

The present discounted value of a shadow job has two interesting features. First, in equation (3) firms do not pay production taxes, but have to pay the large penalty $\phi\tau$ if ρ strikes. Second, firms do not pay the destruction tax F if δ strikes. Since we want to study shadow employment, we will work with a set of parameters such that

$$\widetilde{J}_b > J_b \tag{4}$$

which, by virtue of equations (2) and (3), implies

$$\left(\frac{y_b - w_r - \rho\phi\tau}{r+\delta+\rho+\alpha(\theta)}\right) > \left(\frac{y_b - w_r - \tau - \delta F}{(r+\delta+\alpha(\theta))}\right).$$

Simplifying, we obtain a fundamental condition for the existence of legal activity. Equation 4 implies that

$$TE = \frac{(\tau + \delta F - \rho\phi\tau)}{\rho} > J_b, \tag{5}$$

where TE, which is equivalent to the present discounted value of tax evasion, is greater than the value of bad legal activity. An illegal job yields an expected flow of profits from tax evasion equals to $(\tau + \delta F - \rho\phi\tau)$. Since jobs are monitored at rate ρ, an illegal firm is likely to enjoy its evasion for a duration of $1/\rho$. This result can be easily summarized in the following remark.

Remark 1 ***Enforcement of Legal Activity***. *It is always possible to have parameters of enforcement (ρ and ϕ) sufficiently large so as to prevent the emergence of a shadow sector.*

Indeed in partial equilibrium, when $\alpha(\theta)$ is a parameter, it is always possible to set ρ and ϕ arbitrarily large so that the condition of equation (5) is violated, and shadow activity is never optimal.

Firms come into the market by posting vacancies. Since we assume that firms have the option to freely choose the technology, profit maximization trivially implies that all vacancies will be good. If V is the present discounted value of a vacancy, its expression reads simply

$$rV = -c + q(\theta)[J_g - V],$$

where c is the flow cost of vacancy posting and $q(\theta)$ is the instantaneous probability of filling in a vacancy. Free entry on the job implies $V = 0$, so that market tightness θ is determined by

$$J_g = \frac{c}{q(\theta)}. \tag{6}$$

Thus, the general equilibrium value of θ, making use of equations (1), and (3), together with condition 5 reads

$$\frac{c}{q(\theta)} = \left(\frac{y_g - w - \tau - \delta F}{r+\delta+\lambda}\right) + \lambda[Max(\widetilde{J}_b, -F)]. \tag{7}$$

3.3 Steady State Stocks and Equilibrium

There is a fixed labor supply of mass 1. Under the equilibrium configurations discussed below, shadow employment n_s is a measure of on the job search, and there are no legal bad jobs. If we indicate with n_o official employment in good jobs, the mass of workers is divided as

$$1 = u + n_s + n_o. \tag{8}$$

Since jobs enter into unofficial activity at rate λ, and leave it at rate $\alpha(\theta)+\delta+\rho$, the balance condition for shadow jobs is

$$\lambda n_o = (\delta + \alpha(\theta) + \rho)n_s. \tag{9}$$

The balance condition for official jobs is

$$\alpha(\theta)(u + n_s) = (\delta + \lambda)n_o \tag{10}$$

Finally, unemployment is constant if

$$\alpha(\theta)u = \delta(n_s + n_o) + \rho n_s, \tag{11}$$

where ρn_s is the flow of shadow jobs monitored and destroyed. Equations (9), (10) and (11) form a rank-deficient system in u, n_s and n_o, which, together with the summing up condition (8) yield the following equilibrium stocks[3]

$$u = \frac{\rho(\delta + \lambda) + \delta[\delta + \lambda + \alpha(\theta)]}{[\delta + \lambda + \alpha(\theta)][\rho + \alpha(\theta) + \delta]} \tag{12}$$

$$n_s = \frac{\lambda\alpha(\theta)}{[\delta + \lambda + \alpha(\theta)][\rho + \alpha(\theta) + \delta]} \tag{13}$$

$$n_o = \frac{\alpha(\theta)}{[\delta + \lambda + \alpha(\theta)]}. \tag{14}$$

Equations (12) (13) and (14) show that the size of official jobs n_o is not directly affected by ρ, even though it is indirectly affected through θ. The proportion of shadow jobs in total employment or *shadow rate* is simply defined as

$$s(\theta) = \frac{n_s}{n_o + n_s} = \frac{\lambda}{\delta + \lambda + \alpha(\theta) + \rho}. \tag{15}$$

[3]Making use of equation 8 to eliminate n_o from equations 10 11, one obtains a system of two equations

$$\alpha(\theta)u = \delta(1 - u) + \rho n_s$$
$$\alpha(\theta)(u + n_s) = (\delta + \lambda)(1 - u - n_s)$$

which simplify to

$$u(\alpha(\theta) + \delta + \lambda) + n_s(\alpha(\theta) + \delta + \lambda) = \delta + \lambda$$
$$u(\alpha(\theta) + \delta) - n_s\rho = \delta$$

This is an important variable in the policy context.

Note that as $\rho \longrightarrow \infty$ unemployment is $u(\rho = \infty) = \frac{(\delta+\lambda)}{\delta+\lambda+\alpha(\theta)}$; and $n_s(\rho = \infty) = 0$, while when $\rho = 0$ we have $u(\rho = 0) = \frac{\delta}{\delta+\alpha(\theta)}$

We are now in a position define the equilibrium.

Definition 2 ***Equilibrium with shadow activity***. *An equilibrium with shadow activity is a n-ple* $(\theta, u, n_s n_o)$ *satisfying*

- *the condition for shadow activity* (equation 5);
- *the free entry condition on the part of firms* (equation 6);
- *a set of balance flow conditions (equations* 12, 13 and 14).

We will characterize two different equilibria with shadow activity. The first one is the **shadow equilibrium.** This corresponds to a situation in which

$$\widetilde{J}_b > 0 > -F.$$

Thus in the shadow equilibrium shadow jobs have positive values, and emerge in equilibrium as a reaction of firms who feel overburdened by the state and choose the "*exit option*" (Hirschman, 1970). The second one is the **shadow trap**

$$-F < \widetilde{J}_b < 0,$$

which corresponds to a situation in which shadow jobs do not have positive present discounted value in equilibrium, but exist as a way for firms to avoid destruction taxes. In this case, firms use the shadow activity as a device to buy time until workers find a good job and quit.

3.4 Shadow Equilibrium

In the shadow equilibrium $\widetilde{J}_b > 0 > -F$, so that equation (7) becomes

$$\frac{c}{q(\theta)} = \left(\frac{y_g - w - \tau - \delta F}{r + \delta + \lambda}\right) + \lambda \left(\frac{y_b - b - \rho\phi\tau}{r + \delta + \rho + \alpha(\theta)}\right). \tag{16}$$

Equation (16) is a non linear equation that can be uniquely solved for θ. Once θ is obtained, the stocks can be uniquely obtained from equations (12), (14) and (13). The equilibrium can be described by Figure 2 in a (w, θ) space. For given wages, equation (16) is a sort of labor demand, and is downward sloping. Wages are exogenous in this version of the model, hence they are just a horizontal line. As established by the following propositions, when the fine increases and monitoring becomes more intense, θ falls and unemployment raises.

Proposition 3 ***SHADOW Rate, Unemployment and Market Tightness***. *Changes in policy parameters* (ϕ , τ *and* F; *with the exception of* ρ) *that increase market tightness (i.e.*θ) *reduce the shadow rate and equilibrium unemployment.*

To proof this, it is simply necessary to differentiate equation 16 with respect to ϕ (or τ and F) to obtain

$$-\frac{cq'(\theta)}{q(\theta)}\frac{\partial\theta}{\partial\phi} = -\lambda\frac{\rho\tau(r+\delta+\rho+\alpha(\theta))+\alpha'(\theta))[p_b-b-\rho\phi\tau]\frac{\partial\theta}{\partial\phi}}{[r+\delta+\rho+\alpha(\theta)]^2},$$

which, after a small simplification, immediately shows that $\frac{\partial\theta}{\partial\phi} < 0$. The derivative with respect to τ and F are similar and are not reported. From the definition of shadow rate and the value of equilibrium unemployment (12), it immediately follows that both variables monotonically fall with θ. In other words, unemployment and shadow activity are two different sides of the same coin. From this result, it immediately follows an interesting remark.

Remark 4 *A SHADOW Paradox. Increasing the fine associated with marginal activity increases the shadow rate. In equilibrium, the shadow rate increases with the penalty rate, ϕ.*

The intuition behind this result is as follows. An increase in the penalty rate induces firms to create fewer jobs, with a reduction in θ. Since with lower θ workers in shadow activity have lower probability of finding a good job, the duration of shadow jobs increases, inducing an increase in the proportion of shadow jobs, as illustrated by equation (15). The equilibrium effects of changes in the monitoring intensity rate ρ is more complicate, since ρ has ambiguous effects on the shadow rate. By virtue of equation (15), ρ has a direct impact on the shadow rate, but it has also an indirect effect through θ. Further, an increase in ρ unambiguously increases unemployment. The relationship between θ and ρ can be easily obtained by differentiating equation 16 with respect to ρ

$$-\frac{cq'(\theta)}{q(\theta)}\frac{\partial\theta}{\partial\rho} = -\lambda\frac{\phi\tau(r+\delta+\rho+\alpha(\theta))+[1+\alpha'(\theta)][p_b-b-\rho\phi\tau]\frac{\partial\theta}{\partial\rho}}{[r+\delta+\rho+\alpha(\theta)]^2},$$

which shows that $\frac{\partial\theta}{\partial\rho} < 0$.

Thus, in order to reduce the proportion of shadow employment it is necessary to increase θ. In the model this is obtained via a reduction of taxes and a reduction of the destruction tax. In addition, lower "centralized" wages and higher productivity reduce the shadow rate.

3.4.1 Fiscal Externality And Multiple Equilibria

The results of the previous section suggest that increasing monitoring intensity yields adverse equilibrium effects on unemployment and job creation, on top of the obvious direct effect on job destruction. Thus, one may want to ask why (in the context of the model) a policy maker may find it desirable to increase ρ. To address this issue we need to consider the possibility that an increase in tax compliance (induced by higher ρ) generates spillover effects on the aggregate resources available for fiscal spending which, in turn, may allow for a reduction in the tax rate. In other words, we need to consider the possibility that taxes are endogenously determined and depend on the size of fiscal spending as well as on the size of the good

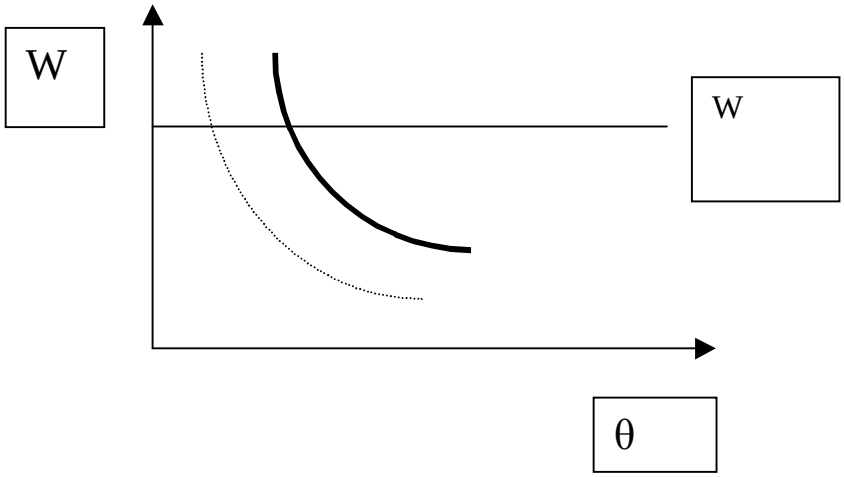

Figure 4: Effects of Monitoring ρ and Penalty Fine ϕ on Market Tightness

legal jobs, that is on the tax base. In what follows we assume that taxes τ, levied on official employment, are used to finance unemployment subsidies b. In the most general specification we consider the possibility that unemployment benefits are paid not only to unemployed workers, but also to workers employed in the shadow sector. The equilibrium level of taxes, τ^*, will then be the solution of the following balance budget constraint

$$\tau^* n_o = b(u + n_s),$$

where n_o, n_s and u are the equilibrium stocks level described by equations 12, 14 and 13.[4] Solving for τ^* it is clear that

$$\tau^* = \frac{b[1 - n_o(\theta)]}{n_o(\theta)} \tag{17}$$

is the equilibrium level of taxes. While the model is now solved by a system of 5 equations in 5 unknowns, the general equilibrium can be studied in a diagram in (θ, τ) space, as illustrated in figure 5. The first equation is simply the equilibrium condition (16), which yields a negative relationship between market tightness and taxes. Clearly, the larger the tax rate, the lower market tightness, since firms create fewer jobs in response to higher taxes. The second equilibrium relationship is equation (17), which encodes the positive relationship between legal employment n_o and market tightness θ. Since higher market tightness implies a larger tax base, equation (17) forms a second negative relationship between θ and τ, and the model displays multiple equilibria, since a good equilibrium with *low taxes-high job creation*

[4]The budget constraint can also be written as

$$\tau^* n_o + \rho n_s \phi \tau^* = b(u + n_s)$$

where $\rho n_s \phi \tau^*$ are the resource made available from succesful monitoring.

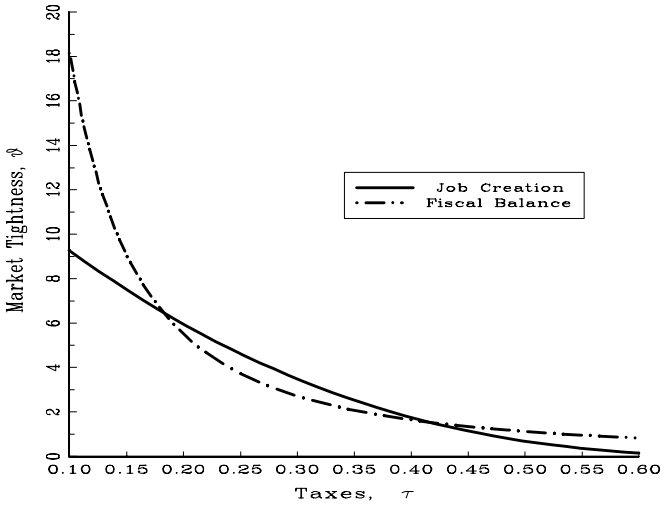

Figure 5: Taxes, and Market Tightness with Fiscal Externalities

coexists with a bad equilibrium with *high taxes and low job creation.* The two equilibria are described in Figure 5.

Using the model described in figure 5, we can study the effects of a change in the monitoring intensity ρ. In partial equilibrium, an increase in ρ reduces market tightness, and shifts down the curve labelled job creation. Since ρ does not directly enter equation 17, the fiscal balance condition does not shift. It is obvious that the general equilibrium effects of the increase in monitoring depend on which equilibrium the economy starts from. In the low unemployment (low θ) equilibrium, an increase in ρ yields a reduction in taxes, while the opposite holds in the "bad equilibrium".

Tables 2-4 simulate the results of changes in monitoring intensity in the equilibrium with exogenous taxes, as well as in the equilibrium with endogenous tax rates solved in this section. In the "good equilibrium" of the model with endogenous taxes larger monitoring intensity increases θ, causing an overall increase in the number of good jobs in the economy and a reduction in taxes, and may thus increase the aggregate value added produced by the economy, despite the increase in unemployment and shadow employment. This case represents a potential rationale for repressing shadow employment.

Table 2: Baseline Parameter Values

Variables	Notation	Value
Matching Elasticity [a]	η	0.35
Unemployed Income	b	0.50
Discount Rate	r	0.03
Idiosyncratic Shock Rate	λ	0.20
Separation Rate	δ	0.10
Workers' Surplus Share	β	0.30
High Productivity	y_g	2.00
Low Productivity	y_b	1.00
Search Costs	c	0.20
Monitoring Intensity	ρ	0.50
Penalty rate	ϕ	4.00
Production tax	τ	0.25
Destruction tax	F	2.00

(a), Matching function is log-linear; η is the elasticity; $x_0 = 0.7$ is the scale parameter
Source: Authors' calculation

Table 3: Changes in Monitoring Intensity; No fiscal externality

Constant tax rate; No fiscal externality						
ρ	τ	θ	u	n_s	n_o	$s(\theta, \rho)$
0.00	0.25	5.40	14.32	19.08	66.60	22.27
0.13	0.25	5.01	18.00	16.48	65.52	20.10
0.25	0.25	4.71	20.99	14.39	64.62	18.22
0.38	0.25	4.49	23.41	12.71	63.88	16.59
0.50	0.25	4.30	25.41	11.33	63.26	15.19

u is the unemployment rate; n_s is shadow employment
Source: Authors' calculation

3.5 Shadow traps

In the model there is an additional equilibrium configuration: the **shadow trap**. Firms that turn bad choose illegal activity rather than paying the firing tax, and wait for workers to find a job. This can lead to multiple equilibria even with exogenous taxes. A good equilibrium in which many jobs come into the market, and firms that enter illegal activity have the worker find another job immediately. But there can also be a bad equilibrium (the shadow trap), where few jobs come to the market and firms that enter the shadow economy stay in that state for a long time, since workers do not find another job easily. The condition for a

Table 4: Changes in Monitoring Intensity with fiscal externality

Endogenous tax; Fiscal externality						
ρ	τ	θ	u	n_s	n_o	$s(\theta, \rho)$
0.00	0.25	5.34	14.41	19.15	66.45	22.37
0.13	0.21	6.09	16.01	15.67	68.33	18.65
0.25	0.19	6.41	17.41	13.55	69.04	16.41
0.38	0.17	6.59	18.57	12.01	69.42	14.75
0.50	0.17	6.70	19.53	10.81	69.65	13.44

u is the unemployment rate; n_s is shadow employment
Source: Authors' calculation

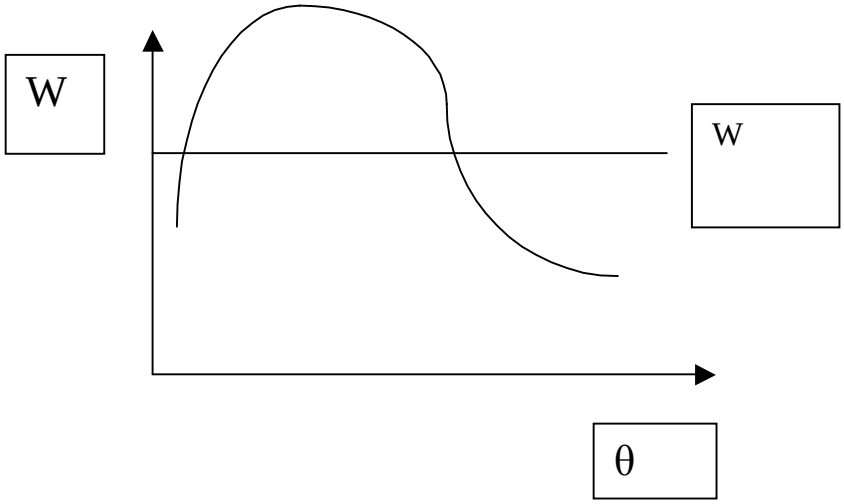

Figure 6: A Shadow Trap

shadow trap is $0 > \widetilde{J}_b > -F$, which implies that

$$\frac{c}{q(\theta)} = \left(\frac{p_g - w - \tau - \delta F}{r + \delta + \lambda}\right) + \lambda \left(\frac{p_b - b - \rho\phi\tau}{r + \delta + \rho + \alpha(\theta)}\right)$$

the labor demand conditions can be upward and downward sloping. The upward sloping part comes from the effect of θ on $\widetilde{J}_b$. Higher θ increases the *negative* value of a shadow job and makes turnover faster. In the shadow trap, described in figure 6, unemployment and shadow employment are higher than in the good equilibrium. In this case, a substantial reduction in destruction taxes F would be highly desirable, since it may enable the economy to exit from the shadow trap. Further, such policy would result in lower unemployment and lower shadow activity. Conversely, an increase in monitoring intensity ρ and in the fine ϕ would have similar effects to those investigated in section 3.4.

4 Empirical and Policy Implications of the Model

Our theoretical perspective has proposed a simple model of the labor market in which the unemployment rate and the size of the shadow economy are endogenously determined, closely interrelated, and depend on the general state of the market. Shadow activity emerges in equilibrium as the endogenous response of low productivity matches who feel overburdened by taxes and employment protection regulation (the cost of job destruction), and rationally choose the risks linked to shadow employment.

The main policy implication of the theory is then quite simple: *in order to reduce shadow employment it is necessary to reduce unemployment. A reduction of unemployment is also a sufficient condition for a decline in shadow employment.* In this context, the model confirms the traditional wisdom on labour market reforms, and suggests that any policy that

fosters job creation and enhances aggregate productivity will induce a reduction in shadow employment. In addition, if the exogenous wages assumed in the model of section 3 are centrally determined and appear too "high" in some regions, there is a clear case for having an endogenously determined wage, obtained via decentralized, firm-level, bargaining.[5] Furthermore, policies that increase labor mobility, making the matching process more efficient, ease workers' transition from shadow employment onto legal employment, inducing a fall in unemployment. Finally, reductions of red tape destruction costs (modeled in the form of destruction taxes) are also likely to reduce unemployment.

What about specific policies (e.g. an increase in the penalty rate associated to shadow activity), supposedly aimed at discouraging the emergence of shadow activity? Our simple theory suggests that a very cautious approach in this area is warranted, since an increase in the penalty rate may be perceived by newly created firms as a reduction in benefits stemming from the "shadow option", and may therefore completely backfire: in equilibrium higher penalty fees reduce job creation, and increase the average duration of shadow activity. The link between shadow activity and unemployment is at the heart of the policy dilemma faced by policy makers who would like to fight shadow employment, but realize that a more aggressive approach against shadow activity may ultimately fail, and results only in a more depressed labor market.

Our model has also analyzed the effects of changes in the monitoring intensity, which is technically defined as the rate at which firms' fiscal position is monitored. In the baseline model that we proposed, higher monitoring intensity has very similar effects to changes in the penalty rate, since it induces an increase in unemployment and in the shadow rate, the proportion of employment which is shadow. To investigate further the effects of changes in monitoring intensity, we have also studied the implication of such a policy when the tax rate levied on official employment is endogenously determined, since a binding (and static) public budget constraint requires that fiscal spending for unemployment benefits be financed entirely from taxes levied on official jobs. While in this case the effects of larger monitoring intensity continues to have negative effects on unemployment, it is possible to have situations in which a tougher approach on shadow employment may indeed be desirable, since it induces a reduction in the tax rate and an increase in the number of high productivity jobs. Nevertheless, the economy with endogenous taxes displays multiple equilibria, and a "good equilibrium" with low taxes/low unemployment/low shadow activity coexists with a "bad equilibrium" with high taxes/high unemployment/high shadow activity. Further, our analysis suggests that only in the good equilibrium an increase in monitoring intensity is likely to be efficient. Indeed, if the economy is stuck in the bad equilibrium, a tightening of controls on shadow activity results in an increase in taxes.

While our model shows that the emergence of the shadow sector is a joint (private) efficient decision by workers and firms, there is a particular type of policies, namely those aimed at making the unemployment benefit system earning and work–history-related, which are likely to increase the tension between the firm's and the worker's interest in the decision to "go shadow". Indeed, if unemployment benefits were to be collected only by workers

[5] In the model solved in the appendix, such effect would be obtained through a reduction in the bargaining sahre β.

with official employment history, the workers' incentive to enter the shadow sector would be obviously reduced, and would have to be compensated in terms of higher current wages. The firm, in turn, would perceive such a policy as an increase in the costs associated to underground activity, and would tend to stay in the official sector.[6]

Our theoretical approach on shadow employment, consistently with most of the matching literature, suggests that labor market phenomena are better understood if looked through their flows, rather than their stocks, since the latter tend to be very persistent, and hide the understanding of labor market dynamics. Further, our model is built on the assumption that flows to and from inactivity should not be very different from flows to and from unemployment, since both shadow employment and open unemployment are labor market states in which workers actively search for high productivity jobs. Indeed, our formal specification of the matching process assumes that shadow employment and unemployment enter the matching function in a complementary fashion. What ultimately matter for aggregate job formation is the sum of the two states. Thus, a testable prediction of our theory is that *economies with low unemployment turnover* (that is low flows in and out of unemployment) *should be characterized also by low turnover over the shadow margin* (that is low flows in and out of shadow employment). Note that this prediction is not shared by labor market theories in which the secondary informal sector is modeled as a frictionless market, and shadow employment plays the role of an adjustment buffer. In such "dual" models, flows along the shadow margin tend to be very similar to those of competitive and very flexible markets, even though the unemployment pool is stagnant. In some cases the turnover of the "flexible" margins" is increasing in the stagnancy of unemployment pools. Hence, one obtains empirical predictions which are the polar case of those of our model.

5 Empirical Assessment and the Case of Italian Mezzogiorno

5.1 Unemployment and Shadow Activity

A key implication of the model above is that unemployment and shadow employment are two sides of the same coin. This may rationalize why Governments allow for variable enforcement of the rule of law depending on the amount of labour slack: the larger the slack the loser law enforcement. The empirical counterpart of this property of the model is that we should generally[7] observe a positive relation between the dynamics of unemployment and the shadow rate.

Empirical evidence discussed in section 2 is broadly consistent with this prediction of the model: the documented upward trend in the size of the shadow economy in Europe

[6] Boeri (2000) studies the effects of similar policies in the context of transition economies.

[7] Only when Governments try to repress shadow employment without tackling the structural factor behind unemployment, shadow employment and unemployment will move in opposite directions. The issue is that shadow employment can be brought down to zero by improving the enforcement of the rule of law while unemployment cannot.

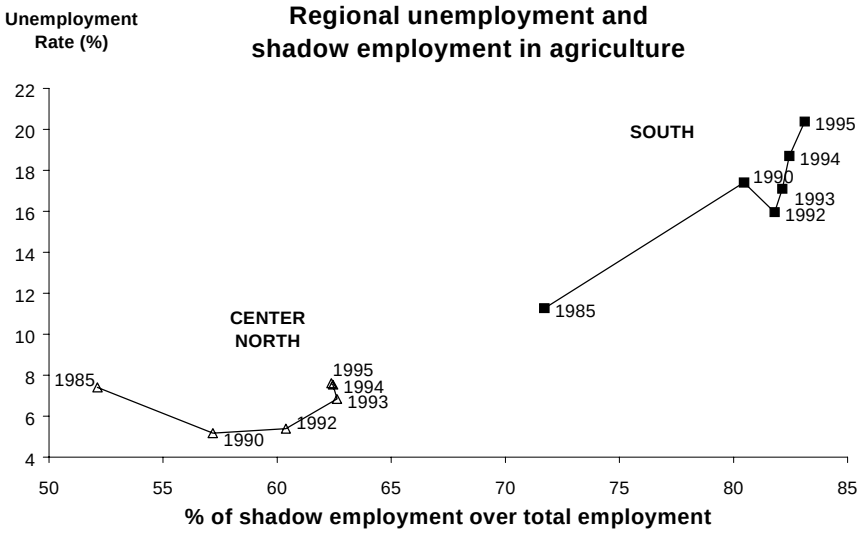

Figure 7: Unemployment and Shadow Employment in Agriculture

has been paralleled by the rise of unemployment. Further indications as to the relevance of this empirical prediction of the model can be obtained by looking at relation between unemployment and the shadow rates across Italian regions.

The Italian statistical office (Istat) provides estimates of the number of irregular jobs ("posizioni lavorative irregolari", including multiple job holding) by sector and macro-regions. Such estimates are mainly based on the comparison of data reported by enterprises (mainly within the enterprise Census) with those collected in the context of surveys or censuses having as statistical unit the household. The rationale behind this procedure is that enterprises report only "regular" jobs, while individuals provide information on all kind of jobs, regardless of their position in terms of fiscal compliance.[8]

Figures 7 and 8 display the shadow rate (the share of "irregular" jobs in the total number of positions estimated by Istat) and the unemployment rate in the Centre-North and in the South of Italy for all years in which both series were available. The shadow rate in agriculture and industry is tabulated separately in order to control for compositional effects on the volume of shadow activity (shadow employment is larger in agriculture and agricultural employment, either regular and irregular is declining everywhere). The two figures are consistent with a positive relationship between unemployment and the shadow rate: in the years where unemployment is on the rise, shadow employment would also seem to be increasing, at least as a proportion of the total number of jobs in the economy. Needless to say, the relationship holds also cross-sectionally insofar as shadow employment is higher in

[8]Estimates are then complemented with information on specific sectors (e.g., agriculture of services to households) and segments of the population (e.g., foreigners) in which the shadow sector is more developed and which are not covered by standard household-based surveys (for instance, non-resident foreign workers are not captured by the Labour Force Survey which covers only the resident population).

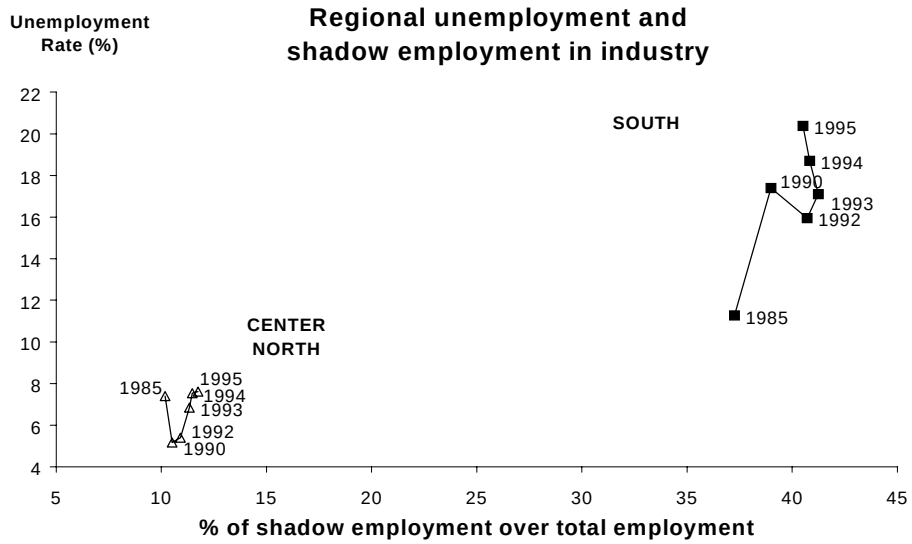

Figure 8: Unemployment and Shadow Employment in Industry

the high-unemployment Southern regions.

The positive correlation between unemployment and the shadow rate in our model comes the fact that both variables depend negatively on market tightness and on the duration of unemployment. Several estimates of shadow employment provided at Istat (e.g., summarized in Calzaroni, 2000) point to a negative relationship between the dynamics of official and unreported employment, which is perfectly in line with our theoretical perspective.

5.2 Flows Over Shadow Employment

Since our empirical interest is linked to the estimates of labor market flows over the shadow margin, we have to look into the empirical borders between unemployment and shadow activity. This border, albeit well defined in our theoretical framework, is very difficult to assess in reality, and requires some substantial empirical work.

Labor market flows are traditionally estimated from Labor Force Surveys (LFS), through a simple procedure that matches individual labor market states across different labor force surveys. Thus, to calculate flows over shadow employment, it may seem natural to link labor market statistics from LFS with existing estimates of shadow employment. However, such statistical analysis is far from obvious, since it requires a subtle assessment of the relationship between shadow employment and LFS statistics. Thus, in the remainder of this section, we try to reconcile shadow employment within the LFSs aggregates, and present an estimate of the flows to and from shadow employment.

Shadow Activity in LFSs. Where is shadow employment recorded? Let's begin from the Istat definition of shadow employment. A serious shortfall with Istat estimates of

shadow employment is that they are not necessarily consistent with the standard definitions of the main labour market aggregates, since we do not know whether Istat shadow employment is a component of LFS employment, inactivity or the unemployment. Technically, the Istat methodology outlined above (i.e. the comparisons between household-based and enterprise-based statistical sources) would imply that shadow employment is, for the most, encoded by the employment measures provided by the LFS. However, not all the Istat-estimated shadow employment comes from discrepancies between household and enterprise statements (there are also ad-hoc surveys of the foreign population and of specific sectors in which the incidence of shadow employment is notoriously marked). In addition, there are reasons to believe that LFS employment (and more broadly, household-based employment measures) offers a limited coverage of shadow employment, which appear to be present also among individuals who are classified either as unemployed or inactive (Meldolesi and Aniello, 1998). For instance, insofar as individuals involved in shadow activities cooperate with their employers in the decision to go idle (in our model the decision to go shadow is, after all, a jointly efficient one) they may well decide not to declare to be working.

In the next two sub-sections we provide evidence pointing to a significant incidence of shadow employment among LFS inactive and unemployed individuals, and we attempt to make the estimates of shadow employment consistent with a re-definition of the main labour market aggregates.

Shadow Employment and LFS Inactivity Aggregate data on asymmetries between labour market conditions in the Centre-North and in the South of Italy point to a presence of irregular forms of employment also among individuals classified by the LFS as inactive.

As indicated by Figure 9, over the 1990s, North-South unemployment differentials have not widened whilst the gaps in inactivity rates across the two macro-regions increased. Put another way, the North-South differential in employment rates (the fraction of the population in working age, classified as employed in the LFS) increased by almost 4 percentage points in the last decade of the XXth Century because of an increasing gap in labour force participation rates rather than larger differences in the incidence of unemployment across the two macro-regions.

What lies behind the increasing North-South gap in employment to population ratios? Two main factors would seem to have been operating. On the one hand, the gap in the fraction of males employed according to the LFS has markedly increased (Figure 10). On the other hand, gaps in employment rates among women have also risen (Figure 11), due to diverging developments in the two parts of Italy (declining employment rates in the South, increasing in the North). Significantly, the North-South LFS-employment gap has increased mainly among prime-aged individuals, either males or females. Overall, non-employment in the South is mainly a problem of inactivity among prime-aged individuals. In the North-East of Italy the employment-to-population ratio for males aged 30 to 44 is almost 100 per cent while in the South more than 10 per cent of the men in this age group are inactive.

What do prime-aged individuals do in the South? Are they really statistically inactive, that is, not working and not seeking jobs? Is this status transitory or stable? Since stocks may not be very informative in this respect, Table 4 looks at actual labour market transitions

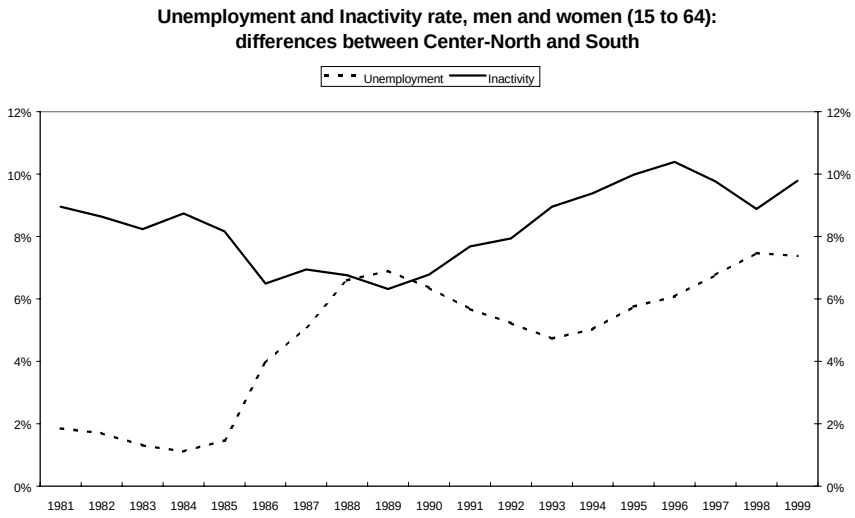

Figure 9: Unemployment and Inactivity Rate in Centre-North and South

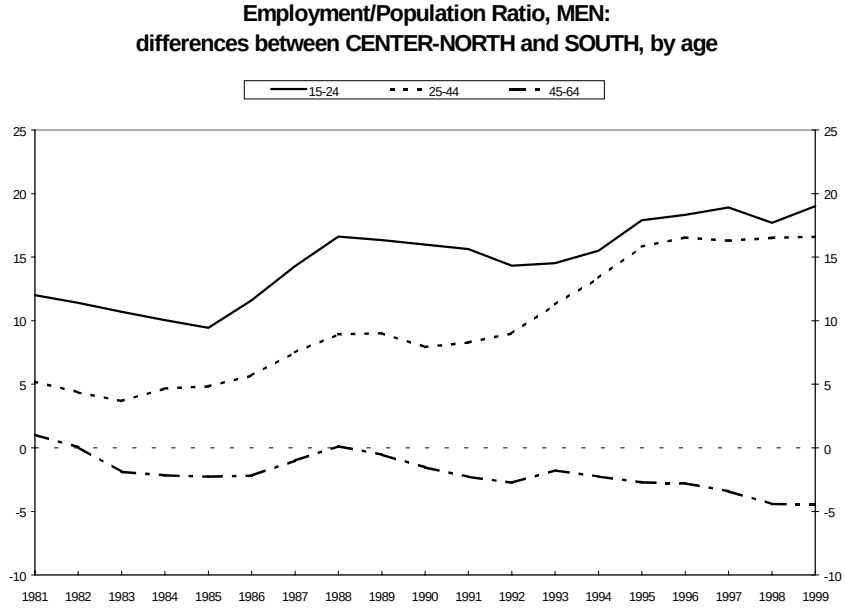

Figure 10: Employment Population Rate: North-Centre and South

Figure 11: Employment-Population Ratio, Women

of prime-aged individuals, notably males aged 30- to 45, matching records across different LFS waves. In particular, the table reports the average yearly transition probabilities (gross flows across employment, unemployment and inactivity as a proportion of the population of origin) as estimated in three different time periods (April 93 to April 94, April 94 to April 95 and April 95 to April 96).

Our interest is mainly in the flows from inactivity to employment and vice versa. The number of those moving *directly* (without intervening unemployment spells) from inactivity to employment points to either statistical errors or to discrepancies between economic and statistical definitions of inactivity, insofar as such individuals are not supposed to be willing to alter their labour market conditions. In other words, the relative size of OLF-E and E-OLF flows is an indication that something is problematic with the LFS definition of inactivity, and that it may be an indication of shadow activities. This is consistent with evidence collected in the context of a joint Istat-Fondazione Curella survey. The latter suggests that about 25 % of the shadow sector is non-employed, according to the LFS definitions.

A problem with our methodology is that matched records across LFS waves do not allow us to trace continuous labour market histories. We have, indeed, information on the labour market status only at the two survey dates and the limited retrospective information provided by the LFS questionnaire is of little help in this context[9]. However, this problem should upward bias the measurement of OLF-E flows especially in buoyant labour markets, where many flows from unemployment to jobs occur in between any two survey dates. Thus, if anything, we may be overestimating OLF-E flows in the North.

[9]Questions are asked about the time elapsed since the interruption of the last employment spell or the duration of job search for those being unemployed. Ideally, we would need to have retrospective questions allowing to disentangle between inactivity and unemployment.

Perhaps surprisingly, Table 5 points to significantly larger OLF-E and E-OLF flows in the South, than in the other macro-regions. In particular, the average 1993-6 E-OLF probability is 1.6 in the South compared with .0.5-0.7 in the other macro-regions. Analogously, the average OLF-E probability is about 22 per cent in Southern regions compared with 17 to 21 per cent in the other regions. Furthermore, transition probabilities are more stable when compared with those in the North (as revealed by the coefficient of variation displayed, in brackets, at the bottom of each coefficient). Thus, the impression is that we are dealing with a structural turnover from employment and unemployment to another labour market status, rather than simply a cyclical drive to inactivity. Finally, standard test of homogeneity of transition probabilities across the four macro-regions[10] point to rejection of the hypothesis that OLF-E and E-OLF probabilities are not significantly different one of another in the four macro areas.

Shadow Employment and LFS Unemployment While the previous analysis suggests that inactivity rates, as measured by the LFS, may include shadow employment, we have been silent on the accuracy of unemployment statistics in LFS definitions. Some indications as to the likely presence of shadow employment among LFS unemployment may come from the analysis of the reservation wage stated by individuals (the lowest wages at which individuals would take up job offers) classified as job seekers. The LFS questionnaire contains indeed a question on the lowest pay the interviewee is willing to accept when offered a job. The average reservation wage in the various quarters turns out to be between one-half and one-third of the actual average wage. Moreover, the question is formulated in such a way as to find out whether or not the job seeker had in mind posts outside the place of residence (likely to involve therefore some compensation or premium for the costs of mobility) or involving reduced working time, e.g., part-time jobs. Hence, by checking all these factors, it is possible to get some comparable information about the reservation wage of individuals. Indications as to the reliability of such data come by matching observations on the same individual over time and comparing reservation wages stated when still searching a job with the actual accepted wages, when this information is available.

According to job search theory, the optimal stopping rule of a rational job seeker is to continue searching until receiving an offer which lies above a given threshold, capturing the opportunity costs of employment, that is the reservation utility of the workers. If we believe that individuals are rational in their job search efforts, then the stated reservation wage of workers should coincide with their reservation utility.

Previous studies (e.g., Faini, Galli and Rossi, 1998; Boeri and Pagani, 1999) pointed to reservation wages of unemployed individuals resident in the Southern regions significantly higher than those observed in the Centre-North. In other words, these studies suggest that job seekers in the Mezzogiorno are somewhat more "choosy" than their Northern counter-

[10]These tests are based on likelihood ratio statistics. For each region, a transition matrix is estimated. The unrestricted model consists of the region-specific transition matrices. Let there be R regions. Then twice the difference in the log likelihoods associated with the unrestricted and restricted models is distributed as a χ^2 random variable with $(R-1)(S)(S-1)$,where S denotes the number of rows of the matrix, under the null of homogeneity of the transition matrix.

parts, in spite of the worse labour market conditions that they face. There are three possible explanations for this fact. The first is that sample selection inflates Southern reservation wages by increasing the duration of unemployment of those who have higher wage aspirations. For instance, well-educated individuals are more represented in the Southern than in the Northern unemployment pool because employment opportunities are comparatively less favorable for this category in the Mezzogiorno. The second explanation has to do with the type of jobs being pursued. In the Mezzogiorno there is almost a double rate of public to private jobs than in the North. Boeri and Pagani (1999) suggest that individuals seeking for public sector jobs may have, ceteris paribus, higher (entry) wage aspirations than individuals seeking for private jobs. This is because the tenure profile of wages for civil servants is significantly flatter than in the private sector. Put another way, if one is looking for a public job, then she will try to get a relatively high wage to start with as she will have reasonably to keep the same wage for the rest of her life. *The third explanation for the relatively high reservation wages observed in the South is in the presence of shadow activities carried out by individuals classified as unemployed. This would bias their reservation wages upwards as such individuals have a higher opportunity cost in accepting formal job offers than genuinely unemployed types.*

In order to disentangle this third source of asymmetry in stated reservation wages from the other two, we estimated a battery of reservation wage equations in the various macro-regions and for the years in which we had access to individual LFS data. In particular, in the basic specification, we run the following ("augmented" Mincer-type) earning equation:

$$\log(w_i^*) = a + D_r + X_i\beta + u_i$$

where w_i^* denotes the reservation wage of individual i, D_r are intercepts allowed to vary across macro-regions and the vector X_i summarizes the personal characteristics of individuals, while u_i is the error term. In particular, in our basic specification X included a gender dummy, linear and quadratic terms for age, education dummies, as well as variables capturing the relationship between the individual and the head of the household. Dummies capturing receipt of unemployment benefits and the type of job being pursued (part-time or full-time, within the residence area or reachable within daily commuting and, as suggested by Boeri and Pagani, 1999, public or private[11]) are also included. The other specifications summarized in Table 6 [12] include unemployment rates at the district level (capturing local labour market conditions) and a Heckman-correction term. The latter aims at capturing effects of self-selection which may be overlooked by an imperfect measurement of personal characteristics of individuals.

Regression results consistently indicate larger reservation utilities in the South than elsewhere, even when controlling for local labour market conditions and including a selection

[11] As in Boeri (1999) we disentangle search for public and private jobs by looking at the job search activities carried out by individuals. Those seeking only for public jobs are those who declare to have been seeking only via public competitions ("concorsi pubblici").

[12] We also carried out separate regressions for males and females as well as for prima-aged individuals. Results are available upon request. They are, in event, in line with those displayed in the main text.

term[13]. The Southern dummy is always positive and significant at conventional levels. The sign of the estimated coefficients is broadly in line with that of actual wage equations – suggesting that individuals are wage aspiration in line with labour demand – and consistent with a-priori expectations. In particular, the coefficients for gender, age, education, and family terms as well as the private/public jobs are "reasonably" signed.

Overall, ceteris paribus, the fact of being living in the South, yields about a 10 percent increase in wage aspirations. We interpret these results as indications of the fact that some fraction of LFS unemployment in the South may indeed be involved in shadow activities, which increase the opportunity cost of accepting formal job offers. Significantly, the Southern dummies – as the available estimates of shadow employment – are increasing over time, but this latter remark should be taken with the grain of salt as we have only three observations.

Flows Over the Shadow Margin The above evidence suggests that shadow employment encompasses at least a portion of LFS inactivity and unemployment. Based on available data, it is difficult to assess how large are "shadow unemployment" and "shadow inactivity".[14] Nevertheless, we can provide some rough estimates of the flows between shadow employment and the traditional labour market aggregates, net of the presence of shadow activity. This is useful to assess other predictions of the model and to draw from our analysis implications which may be relevant for policy-making.

Our empirical work suggests that shadow employment spreads across the three labour market aggregates captured by the LFS. Thus, in order to estimate flows from and to shadow employment we need to disentangle "genuine" unemployment and inactivity from hidden shadow employment. We also need to disentangle shadow employment from employment which is not shadow at all.

Let us start with shadow inactivity. According to the standard definitions, inactivity also includes individuals who are "available" for work, but not actively seeking jobs. Such inactive, but available, individuals account for a minor fraction of inactivity (generally less than 5 per cent in all macro-regions) but are overrepresent among prime-aged males and, most importantly, in OLF-E flows. In particular, OLF-E probabilities are 2 to 4 times larger among individuals declaring to be available for work than for the remaining inactive individuals. Furthermore, almost one fifth of the flows from employment to inactivity are to the subset of individuals who are available for work. Thus, at a first approximation, we decide to include in shadow inactivity all those who declare to be available for work.

Concerning shadow unemployment, the reservation wage estimates discussed in the previous section give some hints as to empirical strategies enabling to disentangle shadow from genuine unemployment. In particular, we may include in shadow unemployment only those individuals who, after controlling for personal characteristics, display the highest reservation

[13] Our results are also robust to outlier detection, which may be another way to explain the high reservation wages observed in the South. Hypothetical bias, which may be more serious in regions where jobseekers are rarely confronted with job offers, may induce individuals to state "unreasonable" reservation wage values.

[14] Some inferences on how shadow employment is distributed among the three labour market aggregates measured by the LFS could come by using our inferences in conjuction with the individual data used at ISTAT to estimate overall shadow employment, but unfortunately we have no access to such data.

wages, that is, the observations with the largest regression residuals in the reservation wage equation. The key issue is, in this context, how to define the threshold level of the residuals discriminating between unemployment and shadow unemployment. Any choice made in this context is forcefully arbitrary. We chose to define the threshold level of the residuals on the basis of the magnitude of the regional dummies and of the standard deviation of residuals[15]. According to our estimates, about 45 per cent of Southern unemployment is shadow, compared with about 30 per cent in the Centre and 25 per cent in the North-West.

Finally, the borderline between shadow and open employment was defined based on the presence of on-the-job search. Consistently with our theoretical model, we identified shadow employment in individuals working in the reference week and declaring to be seeking better employment opportunities. This procedure leads to underestimating the actual magnitude of shadow employment because only a rather minor fraction of the employed declare to be seeking jobs in the context of Labour Force Surveys. Indeed, the shadow rate (the fraction of employed involved in shadow activities) estimated on the basis of our criterion is significantly lower than the rate estimated by Istat (e.g., in the South 9 per cent compared with 33 per cent). The relevant statistics[16] is, however, the shadow employment to the working population ratio: according to our estimates this was 10 per cent in the South in 1993 and has steadily increased attaining almost 13 per cent by the end of 1996.

Tables 7-9 show the transition matrices that can be obtained by tracing flows of individuals across the *shadow segment* (encompassing shadow employment, unemployment and inactivity) and the remaining labour market states. Southern regions consistently display the lowest levels of mobility across labour market states even when the shadow sector is taken into account. This can be seen by looking at the scalar indexes of mobility for transition matrixes displayed at the bottom of each matrix[17]. Moreover, the stayer coefficient (the

[15]The rationale behind our procedure is as follows. Suppose that the residuals from regressions omitting regional dummies is the weighted sum of two (normally distributed and independent) random variables, X_1 and X_2, whose means we will denote as μ_1 and μ_2 (where $\mu_1 < \mu_2$) respectively. In other words:

$$u = \alpha X_1 + (1-\alpha)X_2$$

where (1-α) denotes the fraction of employment being shadow in each region. It follows that $u \sim N(\alpha\mu_1 + (1-\alpha)\mu_2, \alpha^2\sigma_1^2 + (1-\alpha)^2\sigma_2^2)$. Take unemployment in the North-East (the region with the lowest mean of the residuals) as the numeraire, that is, assume that in this region $\alpha = 1$. Clearly for the regional dummies to be significant at 95 per confidence levels, it must be that $\mu_2 > \mu_1 + \frac{1}{2}(\sigma_1 + \sigma_2)$.Take for simplicity the case where $\sigma_1 = \sigma_2$.Upon some manipulations, it is then possible to show that for any macro-region displaying a statistically significant dummy variable,

$$\hat{\alpha} = \frac{\hat{D}_r}{2\,\hat{\sigma}_1}$$

Thus we defined in each region the threshold level of the residuals as the $\hat{\alpha}$-th percentile of each distribution.

[16]It should be stressed that, contrary to Istat, we attribute shadow employment also to LFS unemployment and inactivity. This partly explains the discrepancy between our estimates and those by Istat.

[17]The index is defined as follows

$$I = \frac{(s - tr(M))}{s-1}$$

proportion of those not changing labour market status within a year) for the shadow segment is higher in the South than in the other regions. Overall, the impression given by our admittedly rough estimates of the flows between the shadow segment and the other labour market aggregates *is that shadow employment has longer duration just in those regions where a low turnover of the unemployment pool is also observed.* Put another way, shadow employment would seem to be very much in line with our model, that is, a condition which shares similar properties to unemployment – notably, which is as sclerotic as unemployment – rather than a competitive fringe, supposedly subject to the highest turnover rates especially in labour markets where a low mobility in the "official" segment of the economy is observed. In a nutshell, in the Italian Mezzogiorno a large fraction of employment is shadow and stagnant at the same time.

where s indicates the number of states of the matrix M. As shown by [**?**], when matrices have a maximal diagonal – that is, stayer coefficients are larger than any individual mover coefficient — this index satisfies a number of desirable properties. In particular, the index is bounded between 0 and 1, is monotonically increasing in mobility, attaches value zero only to identity matrices, and is equal to one for matrices with identical rows (hence probabilities of moving independent of the state originally occupied). All the computed matrices had maximal diagonal, hence in our case the index satisfies the four properties listed above.

6 Final Remarks

The main message delivered by the theoretical model developed in this paper and our empirical findings is that shadow employment shares the same properties as unemployment and that policies most likely to succeed in reducing shadow employment are just those that may contribute to unemployment reductions.

How to judge, on the basis of these findings, the current debate in Italy on policies coping with shadow employment? Can we say that it is much ado about nothing?

The proposals which have been developed are fairly sophisticated and imaginative (e.g., Meldolesi, 2000) and cannot be readily dismissed on the basis of theoretical arguments which are still lacking robust empirical support. However, we have reasons to believe that the policy debate would turn out to be more productive if it were to address unemployment and the size of the shadow sector in the South as two closely interrelated phenomena. The policy debate would also benefit if it were to take into account the risks involved by a muscular approach to the problem, that is one focused on the use of the repression apparatus. Such an approach may simply not work and there are good reasons why it is not applied not only in Italy, but also in many other OECD countries which have a more efficient policy enforcement mechanism, than ours. There are many instances, perhaps too many, in which a tough policy on shadow employment would seem to be unwarranted according to our model.

Would these policy implications change were we to consider also the so-called "development shadow employment", that is, shadow employment associated to native firms, who are able to emerge in equilibrium only if they can operate in the "underground sector"? While it is certainly possible to extend the model and our empirical approach in order to encompass this type of shadow employment, we believe that our insights would go through also in such a context. Not only the policy dilemma faced by policy makers would continue to apply, but it would probably be even stronger, since the costs associated with destroying this type of underground sector are larger, as they are likely to undermine the emergence of future high productivity jobs.

Ongoing discussions on policies to reduce shadow employment also envisage improvements of the external environment in which firms operate. According to this paper, such policies would be certainly welcome, since they belong to the set of unemployment reducing policies. This means, after all, that there was no need to put on the forefront shadow employment in order to justify policies which should be adopted anyway.

Finally, there is a set of policies which has the potential of contributing to reducing shadow employment by corrupting the jointly efficient character of the decision to go shadow on the part of the firm *and* the worker. Such policies are those that condition access to social insurance, e.g. insurance against job loss, only to persons with a previous formal working record and which actually enforce work-test in order to prevent holders of jobs in the shadow segment to draw non-employment benefits. Surprisingly enough, such policies are not even mentioned in the policy debate on shadow employment in Italy. This is perhaps because they would require a reform of the unemployment benefit system which is far, certainly too far, on the policy agenda.

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7 APPENDIX The Model with Endogenous Wages

7.1 Belmman Equations

We now explicitly introduce the workers' decision in the shadow employment relationship and we endogenously derive wages. The model will allow to test the robustness of the propositions derived in the previous section, and will allow us to examine issues linked to the fiscal externality.

Let's begin by writing the value function of a good job for worker. W_g reads

$$(r+\delta)W_g = w_g + \lambda[Max(W_b, \widetilde{W_b}, U) - W_g] + \delta U,$$

where $U, W_b, \widetilde{W_b}$, are respectively the asset value of unemployment, legal jobs and shadow bad jobs while w_g is the endogenous wage, to be determined by Nash Bargaining. In turn, the asset value of a bad legal job reads

$$(r+\delta)W_b = w_b + \alpha(\theta)[W_g - W_b] + \delta U$$

where at rate $\alpha(\theta)$ workers find a good job. The asset value of a shadow job is

$$(r+\delta+\rho)\widetilde{W_b} = \widetilde{w_b} + \alpha(\theta)[W_g - \widetilde{W_b}] + (\delta+\rho)U$$

where the worker transit into unemployment at rate $\delta+\rho$, since the firm is monitored with intensity ρ. The value of unemployment is

$$rU = b + \alpha(\theta)[W_g - U.]$$

The firm asset equations are similar to hose derived above, but with wages to be determined endogenously. Namely

$$(r+\delta)J_g = p - \tau - w_g + \lambda[Max(\widetilde{J}_{b,}J_{b,} - F) - J_g] - \delta F,$$

is the value of a good job. The values of a bad legal job is

$$(r+\delta)J_b = p_b - w_b - \tau - \delta F$$

while the value of shadow job reads

$$[r+\delta+\rho+\alpha(\theta)]\widetilde{J}_b = p_b - \widetilde{w_b} - \rho\phi\tau.$$

Wages are set so as to split the total surplus from the job. In what follow, we indicate with $S_g = J_g + W_g - U + F$ the total surplus from a good jobs. Workers get a fraction β of the total surplus in all jobs, so that

$$\begin{aligned}(1-\beta)[W_g - U]. &= \beta(J_g - F).\\ (1-\beta)[W_b - U]. &= \beta(J_b - F)\\ (1-\beta)[\widetilde{W_b} - U]. &= \beta\widetilde{J}_b.\end{aligned}$$

This implies that workers accept a shadow job as long $\widetilde{W_b} > W_b$, while the firm wants to enter into shadow activity when $\widetilde{J}_b > (J_b - F)$. By virtue of the above rule, this is equivalent to having $\widetilde{S}_b > S_b$. so that in our model, there is agrement over the creation of a shadow job, and shadow activity is jointly efficient decision.

7.2 Deriving Wages

In what follow we assume that $\widetilde{W_b} > W_b$ and we derive the equilibrium wage under the assumption that matches switch to shadow activity when λ strikes. This assumption must then be verified in equilibrium. Summing up the Belmman equation describing a shadow job, one obtains

$$(r+\delta+\rho)(\widetilde{J_b}+\widetilde{W_b}-U) = p_b - b + \alpha(\theta)[W_g - \widetilde{W_b}] - \alpha(\theta)[W_g - U] - \alpha(\theta)\widetilde{J_b}$$

which can be written as

$$\widetilde{S_b} = \frac{p - b - \rho\phi\tau}{r+\delta+\rho+\alpha(\theta)}$$

while the surplus of a good job reads

$$(r+\delta+\lambda)(J_g + W_g - U) = p_g - \tau - b - \delta F + \lambda\widetilde{S_b} - \alpha(\theta)[W_g - U]$$

To get the wage in the good one writes $(r+\delta+\lambda)J_g$ and $(r+\delta+\lambda)(W_g - U)$ with the wage rule and the free entry condition $S_g = (1-\beta)J_g = \frac{c}{q(\theta)}$to obtain

$$(1-\beta)[w_g - b + \lambda\beta\widetilde{S_b} - \frac{\theta\beta c}{1-\beta}] = \beta[p_g - w_g - \tau - \delta F + \lambda(1-\beta)\widetilde{S_b}]$$

which simplifies to

$$w_g = (1-\beta)b + \beta[p_g + c\theta]$$

This is a standard wage. Thus, wages in good job increase with productivity, with the share β and with market tightness.

To calculate $\widetilde{w_b}$ one writes $(r+\delta+\rho+\alpha(\theta))(\widetilde{W_b} - U)$ and $(r+\delta+\rho+\alpha(\theta))\widetilde{J_b}$ with the sharing rule to obtain

$$\widetilde{w_b} = (1-\beta)b + \beta(p_b - \rho\phi\tau)$$

This is fairly deep (in terms of search theory) With on the job search the wage does not depend on market tightness θ and wages are lower than what they would be without on the job search. This is because the surplus is lower. Further, a viable shadow economy requires $\widetilde{w_b} > b$ or

$$(p_b - \rho\phi\tau) > b$$

So that an increase in benefit may indeed reduce shadow employment. The equilibrium can now be described with the help of a diagram in (w_g and θ), where the equation describing θ is simply

$$\frac{c}{q(\theta)} = \left(\frac{p_g - w_g - \tau - \delta F}{r+\delta+\lambda}\right) + \lambda(1-\beta)\left(\frac{p - b - \rho\phi\tau}{r+\delta+\rho+\alpha(\theta)}\right)$$

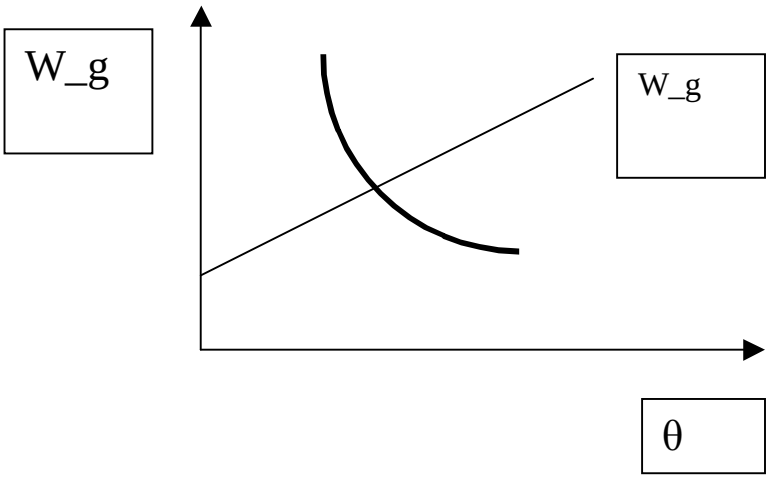

Figure 12: Equilibrium with endogenous wages

Table 5: Transition Probabilities in LFSs

NORTH WEST	E	U	OLF
E	98.45	0.92	0.63
s.d.	0.44	0.22	0.22
	(0.004)	(0.240)	(0.340)
U	40.18	44.56	15.41
s.d.	4.46	3.62	5.3
	(0.110)	(0.080)	(0.343)
OLF	19.3	9.4	71.3
s.d.	5.9	4.84	2.28
	(0.303)	(0.514)	(0.031)
NORTH EAST	E	U	OLF
E	98.7	0.77	0.53
s.d.	0.13	0.29	0.27
	(0.001)	(0.378)	(0.500)
U	46.82	36.19	16.99
s.d.	11.82	14.66	2.87
	(0.252)	(0.405)	(0.168)
OLF	17.1	10	72.9
s.d.	6.4	4.82	3.81
	(0.372)	(0.482)	(0.052)
CENTER	E	U	OLF
E	98.5	0.75	0.76
s.d.	0.22	0.29	0.07
	(0.002)	(0.388)	(0.094)
U	31.8	46.69	18.47
s.d.	0.52	6.96	7.46
	(0.016)	(0.139)	(0.404)
OLF	21.02	15.8	63.18
s.d.	5.9	3.42	5.48
	(0.280)	(0.216)	(0.086)
SOUTH	E	U	OLF
E	95.8	2.65	1.57
s.d.	0.72	0.35	0.4
	(0.007)	(0.130)	(0.254)
U	29.05	53.83	17.12
s.d.	0.27	1.82	1.7
	(0.009)	(0.033)	(0.099)
OLF	22.39	20.33	57.28
s.d.	3.6	2.9	4.99
	(0.159)	(0.142)	(0.087)

Averages 4-93/4-94; 4-94/4-95; 4-95/4-96
s.d. are standard deviations.
Coefficient of Variation in parenthesis
Source: Authors' calculation

Table 6: Reservation Wages of the Unemployed; 1995

	coeff	sig	st. err.		coeff	sig	st. er.		coeff	sig	st. er.
gender (M=1)	0,0593	**	0,0127		0,0585	**	0,0234				
age	0,0200	***	0,0030		0,0196	***	0,0030		0,0274	***	0,0056
age^2	-0,0003	***	0,0000		-0,0002	***	0,0000		-0,0003	***	0,0001
level of education:											
primary or lower	-0,1370	**	0,0272		-0,1385	***	0,0271		-0,1265	***	0,0445
tertiary	-0,2023	**	0,0274		-0,2053	***	0,0274		-0,2108	***	0,0446
type of job being seeked:											
in the private sector	-0,0432	**	0,0183		-0,0435	**	0,0182		-0,0269		0,0308
part-time	-0,2300	**	0,0153		-0,2298	***	0,0153		-0,2237	***	0,0247
within comm. distance	-0,0123	**	0,0106		-0,0135		0,0106		-0,0134		0,0108
labour market status											
first-time jobseeker	0,0039	**	0,0127		-0,0010		0,0127		0,0005		0,0129
un. benefit recipient	0,0489	**	0,0223		0,0517	**	0,0222		0,0483	**	0,0216
relation vis-a-vis household											
husband/wife	-0,0894	**	0,0196		-0,0887	***	0,0195		-0,0589	*	0,0335
son/daughter	-0,0694	**	0,0195		-0,0691	***	0,0195		-0,0574	*	0,0318
relative	-0,0854	**	0,0295		-0,0836	***	0,0295		-0,1093	**	0,0495
nr of family members	0,0021	***	0,0044		0,0013		0,0044		0,0060		0,0074
local conditions											
un. rate (district-level)					0,4793	***	0,1075				
dummy North-West	0,0358	***	0,0199		0,0319		0,0199		0,1136	***	0,0416
dummy Center	0,0435	**	0,0199		0,0269		0,0202		0,0340		0,0325
dummy South	0,1115	**	0,0182		0,0460	**	0,0234		0,0744	**	0,0321
constant	13,9764	*	0,0731		13,9493	***	0,0732		13,8686	***	0,1247
Mills lambda									-1,7710	***	0,6008
R2	0,1242				0,1276						
n	5112				5112				5112		

Estimates of Mincer-type reservation wage eqations
Source: Authors' calculation

Table 7: Transition Matrix April 93-April 94

SOUTH	employed	shadow emp.	shadow unem.	shadow in.	unemployed	inactive
employed	91,01	2,67	0,61	0,54	0,72	4,45
shadow employed	42,28	42,73	3,75	1,5	6,3	3,45
shadow unemployed	14,14	5,66	42,42	5,66	20,57	11,57
shadow inactive	3,7	1,4	2,81	51,15	3,57	37,37
unemployed	11,11	6,82	15,79	7,99	47,37	10,92
inactive	2,51	0,32	0,66	3,94	0,72	91,85
Mobility Index	0,47					
Stayer coeff. Shadow	49,25					
NORTH-WEST	employed	shadow emp.	shadow unem.	shadow in.	unemployed	inactive
employed	92,3	1,65	0,29	0,53	0,59	4,65
shadow employed	50,69	37,15	2,78	0,69	4,51	4,17
shadow unemployed	23,95	7,04	21,13	7,04	21,13	19,72
shadow inactive	6,98	0,87	0,87	45,06	1,16	45,06
unemployed	28,22	7,43	6,93	6,44	37,62	13,37
inactive	2,57	0,29	0,27	2,92	0,68	93,27
Mobility Index	0,55					
Stayer coeff. Shadow	40,92					

South and North West; males and females in working age.
Source: Authors' calculation

Table 8: Transition Matrix April 94-April 95

SOUTH	employed	shadow emp.	shadow unem.	shadow in.	unemployed	inactive
employed	92,37	1,84	0,51	0,47	0,6	4,2
shadow employed	41,8	44,26	4,92	1,23	5,12	2,66
shadow unemployed	12,94	5,58	44,42	4,82	21,57	10,66
shadow inactive	5,14	1,13	3,26	52,7	1,76	36,01
unemployed	14,69	7,65	13,88	5,63	49,09	9,05
inactive	2	0,21	0,4	3,63	0,67	92,96
Mobility Index	0,45					
Stayer coeff. Shadow	51,56					
NORTH-WEST	employed	shadow emp.	shadow unem.	shadow in.	unemployed	inactive
employed	93	1,25	0,15	0,56	0,56	4,49
shadow employed	56,28	36,84	1,62	0,4	3,24	1,62
shadow unemployed	24	6,67	26,67	6,67	25,33	10,67
shadow inactive	2,93	0,29	0,88	41,94	2,35	51,61
unemployed	30,15	8,04	4,52	5,03	38,19	14,07
inactive	2,24	0,27	0,14	2,39	0,65	94,31
Mobility Index	0,54					
Stayer coeff. Shadow	39,44					
South and North West; males and females in working age.						
Source: Authors' calculation						

Table 9: Transition Matrix April 95-April 96

SOUTH	employed	shadow emp.	shadow unem.	shadow in.	unemployed	inactive
employed	92,2	1,92	0,69	0,6	0,76	3,83
shadow employed	36,99	46,15	5,73	2,29	6,71	2,13
shadow unemployed	18,88	10,97	36,48	5,87	16,84	10,97
shadow inactive	4,57	0,81	2,33	55,82	3,32	33,15
unemployed	15,37	8,25	12,62	5,83	51,78	6,15
inactive	1,83	0,2	0,67	3,94	0,77	92,59
Mobility Index	0,45					
Stayer coeff. Shadow	53,22					
NORTH-WEST	employed	shadow emp.	shadow unem.	shadow in.	unemployed	inactive
employed	93,54	1,58	0,21	0,44	0,44	3,79
shadow employed	51,04	40,95	1,48	1,19	3,86	1,48
shadow unemployed	34,78	4,35	33,7	3,26	14,13	9,78
shadow inactive	7,17	0,97	0,58	44,57	2,91	43,8
unemployed	26,64	9,81	4,67	9,81	40,19	8,88
inactive	2,71	0,23	0,2	2,56	0,52	93,78
Mobility Index	0,51					
Stayer coeff. Shadow	43,32					
South and North West; males and females in working age.						
Source: Authors' calculation						