

IS IT GOOD TO SUBSIDIZE BAD JOBS? A MACROECONOMIC ANALYSIS

Reto Foellmi and Tanja Zehnder, University of Zurich*

February 24, 2006

Abstract

We study the macroeconomic implications of subsidizing bad jobs in the context of a search-matching model. Bad jobs are modelled as part-time jobs. We show that subsidizing bad jobs reduces unemployment. However, the introduction of bad jobs triggers a crowding out of good jobs. Hence, the net effect on output is ambiguous. We then calibrate the model to data of European countries and show that the bad job subsidy has significant employment effects. Furthermore, in numerical simulations proportional subsidies turn out to be more effective in reducing unemployment than fixed subsidies.

JEL classification: J65, J68, H50, E60

Keywords: unemployment, search, active labor market programs, bad job subsidy

*University of Zurich, Institute for Empirical Research in Economics, Bluemlisalpstrasse 10, CH-8006 Zürich, Tel: +41 44 634 37 15, Fax: +41 44 634 49 07, e-mail: rfoellmi@iew.unizh.ch, tzehnder@iew.unizh.ch.

1 Introduction

Is it possible to reduce equilibrium unemployment by means of subsidizing bad jobs? This is an important question because employment subsidies are an important element of active labor market policies. Several microeconomic analyses have estimated the effects of employment subsidies on recipient outcomes. Eichler and Lechner (2002) attest a higher employment probability compared with non-participants due to subsidizing jobs in public institutions in (eastern) Germany. A higher employment probability on treated individuals was also found by van Ours (2004) for a program in the Slovak Republic and by Sianesi (2002) for Sweden. For Switzerland, Gerfin and Lechner (2002) and Lalive et al. (2002) attest a positive employment effect of a wage subsidy. The mentioned microeconomic studies are of first importance to estimate the success of the measure on the participants. But these microeconomic evaluation methods can only assess the partial effects on the treated individuals relative to the control group, whereas the macroeconomic effects of the labor market policy cannot be analyzed. The aim of this paper is therefore to study the effects of bad job subsidies on macroeconomic outcomes such as unemployment, structure of jobs and output.

We develop a simple extension of the standard on-the-job-search model Pissarides (1994) with two different types of jobs. There are two types of job in the economy: good and bad jobs. A good job is a full-time job and a bad job is a part-time job. Firms decide what type of job to create and then search for workers. We allow the government to subsidize bad jobs. The subsidy is modelled as a compensation payment to the bad job worker. The unemployed workers search for good and bad jobs. A worker in a bad job continues to search for a good job. We allow for the possibility that on-the-job search is more productive than off-the-job search. Hence accepting a bad job contains an option value because a bad job worker has *ceteris paribus* a higher probability to find a good job than an unemployed.¹

¹This set-up captures the empirical evidence documented by Gerfin and Lechner (2002) and Lalive et al. (2002) that participants in subsidized jobs have a higher job finding rate for good jobs than unemployed workers.

The model then is calibrated to labor market data of three continental European countries. The following three points are the main findings of our numerical analysis.

First, the introduction of bad jobs leads to a *crowding out* of good jobs. A firm will endogenously offer bad jobs because due to the subsidy wage costs are lower and because the more productive on-the-job-search presents an option value for the worker. The introduction of a subsidy for bad jobs leads to less claims for wages in the bad job sector. As a result, it becomes attractive to open bad job vacancies. This implies that firms have to wait longer to fill a good job vacancy hence less good jobs are created.

Second, *unemployment* will decrease. Subsidizing bad jobs increases the bargaining power of employer. This triggers the creation of more vacancies and thus total employment (good and bad job workers) increases.

Third, a subsidy has an a priori ambiguous impact on the *output* of the economy: output depends on the composition of jobs. Due to the subsidy employment in the bad job sector increases and unemployment decreases. This positive effect on output can be dominated if the number of employed worker in good job sector strongly decreases with subsidy. Each reduction in employment in good job sector reduces output one-to-one. Whereas an increase in bad job workers augments output only by the part-time factor. Hence the net effect on total output depends on the relative change of number of good and bad job workers and on the part-time factor. With means of simulations we show that for reasonable parameter values the net effect on output is negative.

The following literature is related to our paper. Holmlund and Linden (1993) examined whether it is possible to reduce equilibrium unemployment by means of temporary public employment programs. The main difference from our approach is that, disregarding from the different model structure, policy makers can vary the inflow in public employment programs. In our paper, however, we are interested in the policy of subsidizing jobs which are created by private firms. Hence in our examination decisions of firms affect the outflow from unemployment and not as in case of Holmlund and Linden a policy parameter. The issue addressed in this paper covers the impact of a subsidy on the structure of jobs and thus on output. Lise et al. (2005) analyze the general equilibrium

effects of income assistance policies. They find that the general equilibrium effects are substantial, in particular there are no net employment effects. Different from our paper, there is only one job type in their model. Boone and van Ours (2004) present a theoretical and empirical analysis of different types of active labor market policies. In the empirical section they found that subsidized jobs are not effective at all. In their theoretical model they differ low and high skill jobs too, but, unlike to our model, there is an exogenous probability that by learning-by doing the low productivity job turns into a high productivity job. Hence there is no decision of firms about what kind of job to post. Furthermore, they do not analyze the effects of subsidized employment on output and the structure of jobs.

This paper is organized as follows. Section 2 presents the model and section 3 studies the types of equilibria. Section 4 discusses several calibration exercises. In particular, we show the effects of an introduction of a subsidy. Further we compare effects of different designs of subsidies. Section 5 concludes.

2 The Model

2.1 The search for good and bad jobs

Individuals have an infinite horizon and enjoy utility out of consumption minus the disutility of work and time spent for search. For simplicity, no savings are possible. When a worker consumes c units and spends t units of time for work and/or search he enjoys a utility flow of $\frac{c^{1-\zeta}}{1-\zeta} - \gamma(t)$. The parameter ζ denotes relative risk aversion, and $\gamma(t)$ with $\gamma'(0) = 0$, $\gamma' \geq 0$, $\gamma'' > 0$ the disutility of work or search time. All workers are homogeneous in their productivity.

There are two types of jobs in this economy: "Good" jobs and "bad" jobs. They differ in their working time only: A good job is full-time a bad job is part-time. To guarantee that a good job is indeed good, the parameters are chosen such that a full-time worker would like to work even more. A fortiori this holds for a part-time workers, hence, he enjoys a lower utility level than a full-time worker.

Using the familiar Bellman approach, let V_g (V_b) denote the value of having

a good (bad) job and V_u the value of being unemployed. A full-time worker receives wage w , works z units of time and the job gets dissolved at rate δ such that he gets unemployed.

$$\rho V_g = \frac{w^{1-\zeta}}{1-\zeta} - \gamma(z) + \delta(V_u - V_g) \quad (1)$$

An unemployed worker receives an unemployment benefit of bw where $b \in (0, 1)$ is the replacement rate. The value of unemployment in equation (2) consists of four parts: the flow of utility during unemployment (utility of benefits minus search costs), the expected value change when a good job is found and the expected value change when a bad job is found. Each unemployed has to decide on his search intensity s_u . With more time devoted for search, the unemployed increases his probability of finding a good job, $\mu_g s_u$, and the probability of finding a bad job, $\mu_b s_u$. μ_g and μ_b are determined by the labor market conditions and are exogenous to the worker. Search is undirected, an increase in the search effort increases the probabilities to find both types of jobs proportionally.

$$\rho V_u = \max_{0 \leq s_u \leq 1} \left(\frac{(bw)^{1-\zeta}}{1-\zeta} - \gamma(s_u) + \mu_g s_u (V_g - V_u) + \mu_b s_u (V_b - V_u) \right). \quad (2)$$

The first order condition for search of an unemployed is then given by

$$\gamma'(s_u) = \mu_g (V_g - V_u) + \mu_b (V_b - V_u). \quad (3)$$

The value of employment in the bad job sector is given in equation (4). A worker who is matched with a bad job yields the wage \bar{w} and works κz units of time. The job destruction rate equals δ , the same as for good jobs. The government subsidizes bad jobs financed by a tax τ on overall wage payments. The subsidy is a fraction b of the difference between the wage in a good job and the wage in a bad job ($b(w - \bar{w})$). This proportional subsidy has one important advantage in comparison with a fix subsidy: Total income generated in a bad job is always higher than unemployment benefit. Hence job seekers are encouraged to accept bad job offers that pay less than their unemployment benefits. The income generated by this scheme is always larger than unemployment benefits which results in case of not accepting the bad job.²

² $bw < \bar{w} + b(w - \bar{w})$

$\Leftrightarrow 0 < \bar{w}(1 - b)$. This is satisfied for all $b \in (0, 1)$.

The bad-job worker may invest s_b units of time in job search. We allow for the possibility that on-the-job-search is more productive than off-the-job-search; hence, a bad job worker is matched at rate $a\mu_g s_b$ to a good job where $a \geq 1$ denotes the exogenous search productivity parameter. The case $a > 1$ captures a situation where a bad job seeker has a higher transition rate to a good job than an unemployed job seeker because bad job workers are closer to the labor market.³ The working time in a bad time equals κz . We get the Bellman equation

$$\rho V_b = \max_{0 \leq s_b \leq 1} \left(\frac{(\bar{w} + b(w - \bar{w}))^{1-\zeta}}{1-\zeta} - \gamma(s_b + \kappa z) + a\mu_g s_b (V_g - V_b) + \delta(V_u - V_b) \right). \quad (4)$$

and the corresponding first order condition of search effort

$$\gamma'(s_b + \kappa z) = a\mu_g (V_g - V_b). \quad (5)$$

To have an interesting problem we consider parameter constellations only where (5) holds with equality such that $s_b > 0$ holds.

The flows in Figure 1 require that jobless people have incentives to accept good and bad job offers and that bad job workers have an incentive to accept good job offers. The following proposition establishes the ranking of utilities.

Proposition 1 *In an equilibrium where (5) holds, employment in good job sector yields the highest utility, then being employed in bad job sector and finally being unemployed: $V_g > V_b > V_u$.*

Proof. From equation (9) we see if $J_{vb} \geq 0$ then $J_b > J_{vb}$. Thus from equation (13) we know that $J_b > J_{vb} \implies V_b > V_u$. Analogously $J_{vg} \geq 0$ implies $J_g > J_{vg}$. Thus from equation (12) $J_g > J_{vg} \implies V_g > \alpha V_u + (1-\alpha)V_b$ follows. If $V_b \geq V_g$ holds, the last expression cannot be satisfied. Hence in an equilibrium with $s_b > 0$ V_g must exceed V_b . ■

Figure 1

³Bad jobs can be seen as a program that is temporary employment with wage subsidy in firms that operate in competitive markets. There are two microeconomic analyses that estimate the effect of treatment on treated of this type of program in Switzerland (see, e.g., Gerfin and Lechner (2002), Lalive et al. (2002)). They attest a positive effect of temporary employment with wage subsidy on reducing the duration of unemployment.

2.2 Posting of good and/or bad jobs

The value of a vacancy for a good is denoted by J_{vg} and satisfies

$$\rho J_{vg} = -cy + \frac{m_g}{v_b + v_g}(J_g - J_{vg}) \quad (6)$$

where m_g denotes the number of good job matched and $v_b + v_g$ the stock of bad job and good job vacancies. The interest rate equals the discount rate ρ . Per unit of time, a cost of cy accrues to open a vacancy which is proportional to output y . A firm in the good job sector can either occupy a vacancy with an unemployed or with a bad job worker. If a vacancy is filled the firm enjoys a value gain of $J_g - J_{vg}$. We assume free entry in posting vacancies, hence $J_{vg} = 0$.

The flow value of an employed good job J_g then reads

$$\rho J_g = y - (1 + \tau)w + \delta(J_{vg} - J_g). \quad (7)$$

where δ is the exogenous separation rate. Firms have to pay a tax τw to finance unemployment benefits and subsidies for bad jobs. Using free-entry condition $J_{vg} = 0$ the value of a good job can be expressed as follows:

$$\frac{y - (1 + \tau)w}{\rho + \delta} = \frac{v_b + v_g}{m_g} \frac{cy}{\alpha + (1 - \alpha)a}. \quad (8)$$

Turning to firms in the bad job sector, the value of posting a bad job vacancy can be written as follows:

$$\rho J_{vb} = -c\kappa y + \frac{m_b}{v_b + v_g}(J_b - J_{vb}). \quad (9)$$

We again assume that the cost of opening a bad job vacancy is proportional to output κy (remember that agents work κz units of time in the bad job). Bad job vacancies are filled at rate $\frac{\mu_b}{v_b + v_g}$.

The flow profit from hiring a worker of a firm in the bad job sector is given as follows:

$$\rho J_b = \kappa y - (1 + \tau)\bar{w} + am_g s_b (J_{vb} - J_b) + \delta(J_{vb} - J_b). \quad (10)$$

The output of a bad job worker equals κy (the productivity per working hour is the same for both job types) and total labor costs of a bad job employer equal $(1 + \tau)\bar{w}$. There are two reason for termination of bad matches. One is, as in

the case of good matches, the exogenous separation process δ . The other reason is that workers in bad jobs will quit their job if a good job offer arrives. The probability of this termination reason is obviously equal to the job finding rate of the worker $am_g s_b$. Thus opening a bad job vacancy is both less profitable than opening a good job due to less work time and due to the higher job destruction rate. There is also free entry in the bad job sector which drives down the value of a bad job vacancy to zero. Hence, the value of a bad job can be expressed as follows⁴

$$\frac{\kappa y - (1 + \tau)\bar{w}}{\rho + \delta + am_g s_b} = \frac{v_b + v_g}{m_b} c\kappa y. \quad (11)$$

2.3 The matching-process on the labor market

Good job market The pool of good job seekers consists of unemployed job seekers and bad job workers. The number of contacts between good job offers and good job seekers is given by the following matching technology with constant returns to scale:

$$m_g = \underbrace{\frac{v_g}{v_g + v_b}}_{\equiv \psi} A(u_u s_u + e_b a s_b)^{1-\eta} (v_g + v_b)^\eta$$

where u_u is the number of unemployed workers and e_b the number of bad job workers. The parameter A denotes the productivity of matching. Each stock of job seekers is multiplied with its corresponding search intensity. The search intensity of unemployed is denoted by s_u , respectively by s_b for the bad job worker. The measure of the supply-side in the matching function is given by $u_u s_u + e_b a s_b$, the aggregate amount of searching hours in efficiency units. The other input of the matching technology is the total number of vacancies which is given by the sum of the masses of both kinds of vacancies $v_g + v_b$.

We assume that there is undirected search, hence job seekers cannot distinguish between good and bad jobs. They search for each kind of job with the same intensity. This implies that the matching technology process must be

⁴Note that we assumed that an interior solution, i.e., both good and bad jobs are created exists. The conditions for existence can only be stated when the matching process is specified.

Finally, no bad job vacancies are created if (11) does not hold even if the wage in the bad job is driven to zero, or formally if $(\rho + \delta + am_g s_b) c > \frac{m_b}{v_g}$ holds.

weighted by the share ψ of good job vacancies in total number of vacancies. Hence the number of contacts between good job offers and good job seekers is proportional to the fraction of good job vacancies.

Bad job market The number of contacts between bad job offers and unemployed is given as follows:

$$m_b = \frac{v_b}{\underbrace{v_g + v_b}_{\equiv 1 - \psi}} A(u_u s_u)^{1-\eta} (v_g + v_b)^\eta.$$

Only unemployed job seekers enter the matching function because employees in a bad job cannot improve their position by accepting new bad job offers. Hence, bad job workers do not cause congestion for the unemployed. The matching technology in this case is weighted by the share of bad job vacancies which is denoted by $1 - \psi$.

The rate at which a job seeker is matched with a firm in the good job sector (per efficiency unit of search effort) is given by

$$\mu_g = \frac{m_g}{u_u s_u + e_b a s_b} = \psi A \theta_g^\eta$$

where we define θ_g , the labor market tightness for good jobs, as the ratio of total vacancies to the effective resource of search: $\theta_g = (v_g + v_b) / (u_u s_u + e_b a s_b)$. Analogously, the labor market tightness for bad jobs as the ratio of total vacancies to unemployed job seekers is defined by $\theta_b = (v_g + v_b) / u_u s_u$. Hence, the rate at which an unemployed job seeker is matched with a firm in the bad job sector is given by

$$\mu_b = \frac{m_b}{u_u s_u} = (1 - \psi) A \theta_b^\eta.$$

Equivalently, we can express the probability that the firms' job vacancy is matched with a worker in term of the labor market tightness $\frac{\mu_g}{v_b + v_g}$

$$\frac{\mu_j}{v_b + v_g} = A \theta_j^{\eta-1} \text{ where } j \in \{g, b\}.$$

Finally we state the equations of motion for the stock of unemployed, u_u , and the bad job workers, e_b (the equation of motion for the stock of good job workers,

e_g , is redundant in steady state)

$$\begin{aligned} \dot{u}_u &= -(\psi A\theta_g^\eta + (1-\psi)A\theta_b^\eta) s_u u_u + \delta(e_g + e_b) \\ \dot{e}_b &= -\delta e_b - \psi a A\theta_g^\eta s_b e_b + (1-\psi)A\theta_b^\eta s_u u_u. \end{aligned}$$

The labor force is normalized to 1 and stays constant. The inflow in unemployment consists of agents who lost their good and bad jobs, respectively; $\delta(e_g + e_b)$. The stock of unemployed shrinks on the one hand because $\psi A\theta_g^\eta s_u u_u$ agents found good jobs and $(1-\psi)A\theta_b^\eta s_u u_u$ agents found bad jobs. The logic for inflows and outflows in the state of bad job employment is analogous. The inflow in bad job consists of unemployed $(1-\psi)A\theta_b^\eta s_u u_u$. The outflow consists on the one hand of bad job workers who found a good job $\psi a A\theta_g^\eta s_b e_b$ and of bad job workers who lost their job exogenously δe_b . In steady state the number of workers in each state must remain constant. We get

$$\begin{aligned} u_u &= \frac{\delta}{\psi A\theta_g^\eta s_u + (1-\psi)A\theta_b^\eta s_u + \delta} \\ e_b &= \frac{\delta(1-\psi)A\theta_b^\eta s_u}{(\delta + \psi a A\theta_g^\eta s_b)(\psi A\theta_g^\eta s_u + (1-\psi)A\theta_b^\eta s_u + \delta)} \\ e_g &= 1 - u_u - e_b. \end{aligned}$$

Figure 1 illustrates the flows between the three states, i.e., good job employment, bad job employment and unemployment.

2.4 Wage bargaining

In both good and bad jobs, workers and firms bargain over the wage. A worker and a firm split the joint surplus that their match generates. According to the standard literature we assume the wage is determined by a Nash bargaining. The wage rate of a good job w is then given by:

$$w = \arg \max_w (\alpha(V_g - V_u) + (1-\alpha)(V_g - V_b))^{1-\beta} (J_g - J_{vg})^\beta \quad (12)$$

with $0 < \beta < 1$ denoting the bargaining power of the job applicant. We assume that a firm in the good job sector owner cannot differ whether a job seeker is unemployed or an on-the-bad-job worker. This means that a bad job worker cannot believably prove her position. For this reason both possible fall back

positions of a good job seeker must be taken into account in the Nash bargaining solution. Both different positions are weighted with their relative resource of search ($\alpha = s_u u_u / (s_u u_u + s_b e_b)$). Note that the fall back position of a bad job worker is higher than that of an unemployed. Thus the higher the relative number of bad job workers the higher is the claim for wages.

The wage rate of a bad job \bar{w} which maximizes the Nash bargaining solution is given by where we assume that the bargaining power in both job sectors is the same:

$$\bar{w} = \arg \max_{\bar{w}} (V_b - V_u)^{1-\beta} (J_b - J_{vb})^\beta. \quad (13)$$

To solve for the wage levels in (12) and (13) we assume that the unemployment benefit level bw and the subsidy level in bad jobs $b(w - \bar{w})$ are defined on the economy wide average wage w . Thus an individual worker's choice of wage w neither affect the unemployment benefit level nor the on-the-bad-job subsidy level when he becomes unemployed or a bad job worker. That is, $\partial V_u / \partial w = 0$ and $\partial V_b / \partial w = 0$ in the Nash bargaining function. Using equations (1), (4), (2), (10), and (7), we get the following solutions for w

$$w = \frac{y}{1 + \tau} \left(1 - \frac{c}{A\theta_g^{\eta-1}} \frac{\rho + \delta}{\alpha + (1 - \alpha)a} \right) \quad (14)$$

and for \bar{w}

$$\bar{w} = \frac{\kappa y}{1 + \tau} \left(1 - \frac{c}{A\theta_b^{\eta-1}} (\rho + \delta + \psi a A \theta^\eta s_b) \right). \quad (15)$$

We interpret these two equations as the respective firm's labor demand schedule.

2.5 Government

To close the model we impose the balanced budget constraint of the government

$$\tau (we_g + \bar{w}e_b) = b (u_u + (w - \bar{w})e_b). \quad (16)$$

For a given policy parameter b , the six equations (3), (5), (8), (11), (14) and (15) give us a solution for the six unknowns w , \bar{w} , s_b , s_u , ψ , and θ .

3 Existence and uniqueness of equilibria

Before we turn to simulations it is important to ask which conditions are necessary such good and bad jobs coexist in equilibrium. As already mentioned we assume that the number of working hours in a good job - and thus even more in a bad job - is less than the individually optimal number of working hours. This and the fact of a higher job destruction rate of bad jobs lead to a higher expected joint return of the firm and the worker in good job matches. Thus without any subsidy of bad jobs there is no equilibrium where both kinds of jobs coexist and good jobs only will prevail in equilibrium.

If the government subsidizes wages in bad jobs it may be worthwhile to open bad job vacancies. Due to the subsidy bad job workers would claim a lower wage and thus incentives to open a bad job increase. However, if unemployed and bad-job workers have the same search productivity to find good jobs ($a = 1$), simulations show that an equilibrium with coexistence of both kinds of jobs does not exist. We need also different search productivities in order that it is worthwhile to open bad jobs. The higher the search productivity for bad job workers the higher is the effectiveness of their search efforts for good jobs. Thus, more productive search of bad-job workers increases the option value of a bad job. Hence bad job workers reduce their claims for wages. This increases incentives to open more bad job vacancies. By means of simulations we can show that in the ($a > 1$) case (and positive subsidy) an equilibrium with both kinds of jobs exists.

Possibility of multiple equilibria

Interestingly, the subsidy of bad jobs causes the possibility of multiple equilibria. The following mechanism gives rise to a possible multiplicity: The higher the subsidy rate the lower the demand for bad job wages. This leads to more incentives to open bad job vacancies. The higher the number of bad job vacancies the smaller is relatively the number of good job vacancies to total vacancies. Hence the vacancy mix changes in favor of bad jobs. Thus bad job workers will find a good job at a smaller rate per search unity. This reduces job destruction rate of bad jobs. This leads again to more incentives to open bad job vacancies.

4 Calibration

We turn to our question of primary interest. How does an introduction of a bad-job subsidy affect central labor market outcomes such as job structure, unemployment and output? To gain intuition about the robustness of the results we then discuss how the quantitative effects change when the level of part-time factor or the productivity of search for unemployed and bad jobs workers is varied. In a further step we analyze the interaction of active and passive labor market policies. Finally, we investigate the impact of the design of the subsidy for bad jobs. In our baseline calibration we use parameter values that are in line with the European labor market of 1985-1993.

To calibrate the model we have to parametrize the disutility of time $\gamma(i)$. We assume that it takes an isoelastic form $\gamma(i) = \frac{1-(1-i)^{1-\epsilon}}{1-\epsilon} - i$, where $0 < \epsilon < 1$. The parameters are set to values that reflect a quarterly time dimension. The chosen parameter values in our baseline model are given in Table 1.

Table 1

The value of the discount rate ρ is set to 0.025 which is 10.4% on an annual basis.⁵ The value of the replacement rate b corresponds to the average for France, Netherlands and West Germany. The search cost function parameter ϵ is set to 0.5. Simulations show that as long as this parameter is not too close to 0 or 1 results do not change substantial. The parameter η of the matching function is set to its usual value of 0.5 which implies that the stock of job seekers and vacancies have similar effect on the flow of filled vacancies.⁶ The bargaining parameter is set to $\beta = 0.2$. The job destruction rate is set to 1%. Ridder and van den Berg (2003) found that monthly flow into unemployment for NL, D and F is on average 0.33% which is approximately 1% per quarter.

Further, the output productivity y is set to one and the vacancy cost c is set to 3. This implies that in every period the costs of a vacancy are three times the value of production. Finally remember that the marginal wage tax τ adjust endogenously to satisfy the government budget constraint (16).

⁵This is quite common in these types of exercises. See for example Boone and van Ours (2005).

⁶Broersma and van Ours (1999) find that a value of $\eta = 0.5$ is a reasonable approximation.

4.1 Introduction of a subsidy for bad jobs

First of all we want to discuss the effects on labor market outcomes when a subsidy for bad job is introduced. How do the *structure of jobs*, the *unemployment rate* and the *output level* change when bad jobs are subsidized? As a basis serves a situation in which bad jobs are not subsidized such that no bad jobs exist. What are the changes of the labor market outcomes when a subsidy for bad jobs is introduced? As already mentioned, an equilibrium with coexistence of both kinds of jobs only exists with different transition rates for bad job workers and unemployed. Thus we set $a > 1$. Hence the search productivity for the pool of bad job workers is more productive than for the pool of unemployed job seekers. This is in line with the results of the microeconomic analyses. This positive "treatment effect" can be explained by the fact that the bad job worker is a part of the labor market and he has a higher contact probability with firms.

4.1.1 A numerical example

We compare a situation where no subsidy takes place and a situation where subsidies for bad jobs are introduced. Table 2 compares the labor market outcomes of the two situations.

Table 2

For the situation with no subsidy there are no bad jobs. The unemployment rate is 7.02%. This is in line with the average unemployment rate selected from Ridder and van den Berg (2003). The job finding rate of unemployed is about 13.24% which is in line with flow out of unemployment selected by Ridder and van den Berg (2003).

Let us consider the implication for the *structure of jobs* first. Bad jobs are created and in steady state there are 3.86% worker engaged in the bad job sector. There is a crowding out of good jobs with bad jobs. The crowding out is quite substantial: the share of open good vacancies on total open vacancies strongly decreases from 100% to 55.6%. The number of good job workers decreases from 92.98% to 90.82%. What is the intuition behind the results? The introduction of a subsidy for bad jobs makes it attractive to open bad job vacancies. However, there must arise a crowding out of good jobs by bad jobs. Some

unemployed agents are matched to bad jobs and therefore less unemployed are directly matched with good job vacancies. Hence unemployed occupy open good job vacancies at a lower rate. Hence, employment in good jobs must decrease. Note that despite the more productive search technology of bad job workers good job vacancies are occupied at a lower rate. The higher search productivity of bad job workers cannot offset the fact that - due to the detour of bad jobs - some workers are only matched indirectly to good jobs.

However, despite the decrease in good-job employment, the simulations show that the *unemployment rate* decreases from 7.02% to 5.32%. Intuitively, the bad-jobs subsidy increases the bargaining power of employers in equilibrium because wage claims decrease. As a result more vacancies will be advertised and total employment (being the sum of good and bad job workers) increases.

The decrease in good job vacancies also corresponds to the fact that in the new steady state wage costs of good jobs are higher. On the one hand (after-tax)-wages of good jobs decrease but on the other hand taxes increase and so do total wage costs. However, corresponding to the result that total employment increases, the total number of vacancies increases. There are more bad jobs created than good jobs destroyed.

A priori, the net effect on *output* is not clear. The change of the output depends on the structure of employment. Each reduction in employment in good job sector reduces output one-to-one whereas an increase in bad job workers augments output only by a factor κ . Hence the net effect on total output depends on the relative change of number of good and bad job workers and on the part-time factor κ . The effects of κ are analyzed in the next subsection. We found that the output always decreases when we compare a situation with subsidized bad jobs to a situation where there are good jobs only. In the present simulation, output decreases from 92.98% to 91.98%. That means that the new created number of bad jobs cannot compensate the output loss generated by the reduction of good jobs.

The introduction of a subsidy influences also the level of the tax rate. The expenditures of the unemployed insurance system decrease because there are less unemployed agents and payments for bad jobs workers are strictly lower than unemployment benefits: $bw > b(w - \bar{w})$. On the other hand, the decrease in good

jobs lowers revenues. The simulation shows that the latter effect dominates and taxes are higher in the new steady state.

To sum up, subsidizing bad jobs leads to more total employment. But this gain in employment comes at the cost of an crowding out of good jobs by bad jobs and, for realistic levels of the model's parameters, the output of the economy decreases. Hence, there is an trade-off between reducing unemployment and efficiency.

4.2 Change in the inferiority of bad jobs

Recall that two attributes determine the characteristics of the bad job. One element is the part-time factor. The higher the part-time factor the less inferior is the bad job compared to the good job. The other feature is the search productivity factor which determines the good job finding rate of bad job worker. A higher search productivity increases the option value of a bad job because search for good jobs is more effective as in the state of unemployment. In this section we want to analyze changes in the "badness" of bad jobs effects the structure of jobs, employment and output. We discuss the effect of the level of the part-time factor first and then we consider the effect of the level of the search productivity.

4.2.1 Effect of a higher part-time factor

A priori one could think that bad jobs are more likely to exist when the part-time factor is higher. In such a case the disadvantage of bad jobs is not large. However, the bad job contains an option value due to the higher search productivity of bad job workers. This increases the effectiveness of search for a good job. A higher part-time factor deteriorates this option value. Due to the higher work-time bad job workers have less time to search and thus they can less benefit from the higher effectiveness of search. As a consequence claims for bad job wages increases disproportionately. This means that wage for bad jobs increase more than the isolated effect of a higher part-time factor would induced. Thus the ratio of wage costs to productivity increases. Thus it becomes less attractive to open a bad job the higher the level of the part-time factor and the crowding

out of good jobs is smaller.

Table 3

Table 3 summarizes the simulation results when a the part-time factor changes. We consider steady state values for a part-time factor of 30% and 50%. With a part-time factor of 50% the crowding out of good jobs is smaller: the share of open good vacancies on total vacancies is 58.5% compared to 55.56% for the lower part-time factor. With a high part-time factor the unemployed' job finding rate for good jobs is higher than the correspond finding rate of bad job workers even though bad job workers have a higher search productivity. As indicated above, the reason is a locking-in effect as the workers have less time to search. Due to the higher work time search intensity of the bad job workers falls strongly: search intensity is 0.38 in case of a part-time factor of 50% whereas in case of a part-time factor of 30% search intensity is 0.53. Further, the output level does not change much but it is always lower than in the case of no subsidy.

Finally, because there are less bad jobs unemployment is higher if the part-time factor is higher. For a part-time factor of 30% unemployment is about 5.32% and for a part-time factor of 50% unemployment rate is 5.69%. Note that the unemployment is still less as in the economy without a subsidy for bad jobs (7.02%). These results suggest that subsidizing bad jobs is more effective in reducing unemployment when the productivity in bad jobs is low.

4.2.2 Effect of a higher search productivity for bad job workers

The higher the search productivity for bad job workers the higher is the effectiveness of their search efforts. This increases the option value of a bad job. Hence bad job workers reduce their claims for wages. This increases incentives to open more bad job vacancies which - on the other side - increases the crowding out of good jobs by bad jobs.

An increase in search productivity can reduce or increase search intensity of bad job workers. On the one hand bad job workers increase their search effort to take advantage of the improved search productivity (substitution effect) and on the other hand search effort can be reduced because the improved search

productivity increases the good job finding rate for a given level of search effort (income effect). Simulations show that the substitution effect dominates. The higher search intensity leads to a higher filling rate of good job vacancies.

4.3 Interaction of active and passive labor market policies

How interacts passive labor market policies, such as unemployment benefits, with active labor market policies such as subsidizing bad jobs? Put differently, should countries with generous unemployment benefits increasingly apply the policy of subsidizing bad jobs? To answer these questions we simulate the introduction of a bad job subsidy for different levels of the replacement rate.

Recall that the higher the replacement rate the higher is the subsidy in equilibrium. With higher subsidies it becomes more attractive to open bad job vacancies, the relative share of bad job vacancies will increase, and there is a larger crowding out of good jobs by bad jobs. This means that an introduction of a bad job subsidy leads on the one hand to big employment gains but to big output losses, on the other hand, if the replacement rate is high and the part-time factor in bad jobs is low.

In the simulations we vary the replacement rate from 56% to 80%. All other parameters are set as in the baseline. As we can see from Figure 2 the gains in employment increase with the level of the replacement rate. The crowding out of good jobs is higher the higher the replacement rate and hence the higher are the output losses.

As a result, countries with a generous passive labor market policy could reduce unemployment strongly due to subsidizing bad jobs. But they have to put up with output losses.

Figure 2

4.4 Comparison of different designs of the subsidy for bad jobs

Motivated from the policy design chosen in Switzerland, we discussed the impacts of a proportional subsidy which is equal to the replacement rate times the

difference between the wages in the two job sectors on structure of jobs, unemployment and output. Instead, what are the consequences on the mentioned variables if the subsidy of bad jobs would be a fixed amount (as it is the case in several European countries)? With a proportional subsidy the income in bad job sector composes of wage $\bar{w} + b(w - \bar{w})$. With a fixed subsidy the bad job worker receives a fixed amount S on top of his wage. Hence, the income in bad job equals $\bar{w} + S$.

One advantage of the proportional subsidy is that the worker's income in a bad job is always larger than the unemployment benefit *per constructionem*. Hence job seekers are encouraged to accept bad job offers that pay less wages than their unemployment benefits. In case of a fixed subsidy the government has to determine the level of the subsidy in order that the income in bad job state is higher than in unemployment state, which might turn out difficult in a realistic situation with several types of jobs. Instead, with a proportional subsidy the level of the subsidy is endogenous and depends on the level of the negotiated wage in bad job. Hence bad job workers can influence the level of the subsidy via their wage claims. In case of a fixed subsidy the level of the subsidy is independent of the negotiated wage. Thus incentives to claim low wages in bad job sector decreases. Hence wages in bad job sector will be higher in case of a fixed subsidy. This reduces incentives to announce bad jobs and leads to a less crowding out of good jobs with bad jobs. To compare the two different kinds of subsidies we set the level of the fixed subsidy equal to the subsidy which arises in case of paying a proportional subsidy: $S = b(w - \bar{w})$. Hence each bad job worker receives the same level of subsidy under both policy designs. The simulation results are given in Table 4.

Table 4

For a part-time factor of 30% that in the regime with a proportional subsidy the bad-job wage rate is lower (0.22) under proportional than under fixed subsidy (0.24). The number of bad job workers is higher with proportional subsidies (3.8% to 0.8%) which in turn implies there is less crowding out with a fixed subsidy. The share of open good vacancies on total open vacancies is lower with a proportional subsidy (55.6% to 89.7%). An introduction of a proportional sub-

sidy reduces unemployment more than an introduction of a fix subsidy (5.3% to 6.6%). But on the other hand output losses due to an introduction of a proportional subsidy are higher (91.98% to 92.84%). The system with a proportional subsidy needs a higher tax rate to keep the budget balanced (6.0% to 5.0%).

Hence a proportional subsidy is more effective in reducing unemployment because more bad jobs created. Consequently, it leads to more losses in output. However, when bad jobs are more productive the employment advantage still prevails but output losses are smaller.

5 Conclusion

We showed that an introduction of a subsidy for bad jobs is beneficial to increase employment because the subsidy leads to more vacancies. The higher the unemployment benefit the higher are the employment gains while subsidizing bad jobs. However, the introduction of a subsidy leads to a crowding out of good jobs by bad jobs. As a consequence of the change in the composition of jobs subsidizing bad jobs may have negative effects on output. Thus there is a trade off between reducing unemployment and efficiency. Furthermore, we examined the impact of the design of the subsidy. It turns out that employment gains are higher with a proportional subsidy than with a fixed subsidy.

6 References

Boone, Jan and van Ours, Jan (2004). "Effective Active Labor Market Policies", IZA Working Paper No. 1335.

Boone, Jan and van Ours, Jan (2005). "Modeling Financial Incentives to Get Unemployed Back to Work", *Journal of Institutional and Theoretical Economics*, forthcoming.

Broersma, Lourens and van Ours, Jan (1999). "Job Searchers, Job Matches and the Elasticity of Matching", *Labour Economics* 6, 77-93.

Eichler, Martin and Lechner, Michael (2002). "An Evaluation of Public Employment Programmes in the East German State of Sachsen-Anhalt", *Labour Economics* 9, 143-186.

Gerfin, Michael and Lechner, Michael (2002). "Microeconomic Evaluation of the Active Labor Market policy in Switzerland", *The Economic Journal* 112, 854-893.

Holmlund, Bertil and Linden, Johan (1993). "Job Matching, Temporary Public Employment, and Equilibrium Unemployment", *Journal of Public Economics* 51, 329-43.

Lalive, Rafael, van Ours, Jan, and Zweimüller, Josef (2002). "The Impact of Active Labor Market Programs on the Duration of Unemployment", IEW Working Paper No. 41, Universität Zürich.

Lise, Jeremy, Seitz, Shannon, and Smith, Jeffrey (2005). "Equilibrium Policy Experiments and the Evaluation of Social Programs", NBER Working Paper No. 10283.

Pissarides, Christopher (1994). "Search Unemployment with On-the-job Search", *Review of Economic Studies* 61, 457-475.

Ridder, Geert and van den Berg, Gerard (2003). "Measuring Labor Market Frictions: A Cross-Country Comparison", *Journal of the European Economic Association* 1, 224-244.

Sianesi, Barbara (2002). "Differential Effects of Swedish Active Labour Market Programmes for Unemployed Adults During the 1900s", IFAU Working Paper, No. 2002:5.

van Ours, Jan (2004). "The Locking-in Effect of Subsidized Jobs", *Journal of Comparative Economics* 32, 37-52.

Figure 1: Different employment states of the worker

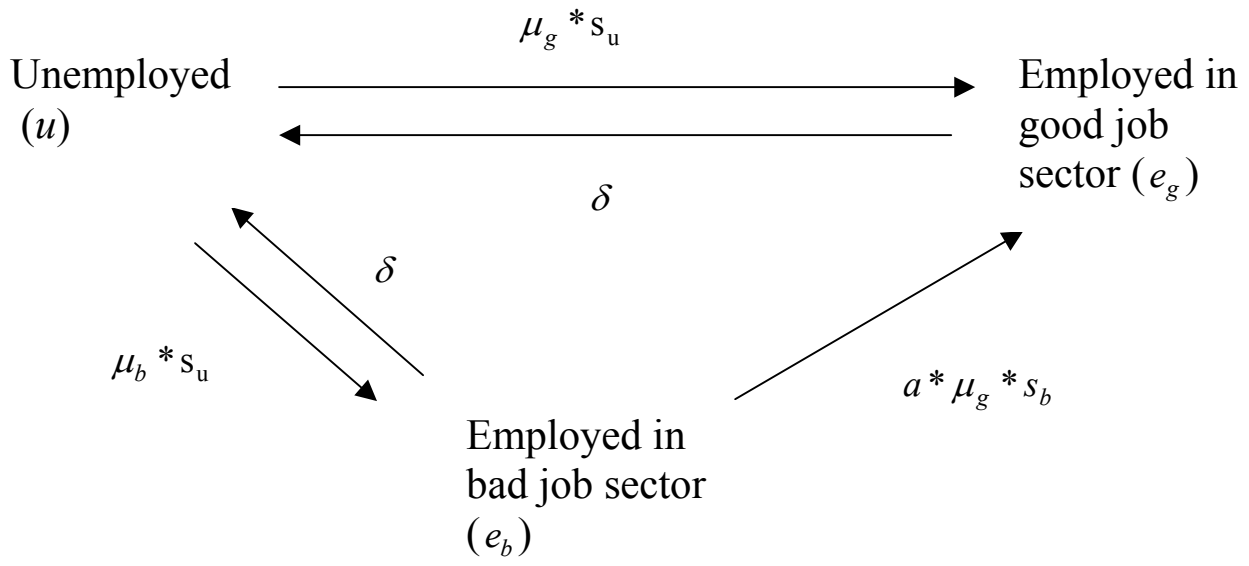


Figure 2: Variation of replacement rate

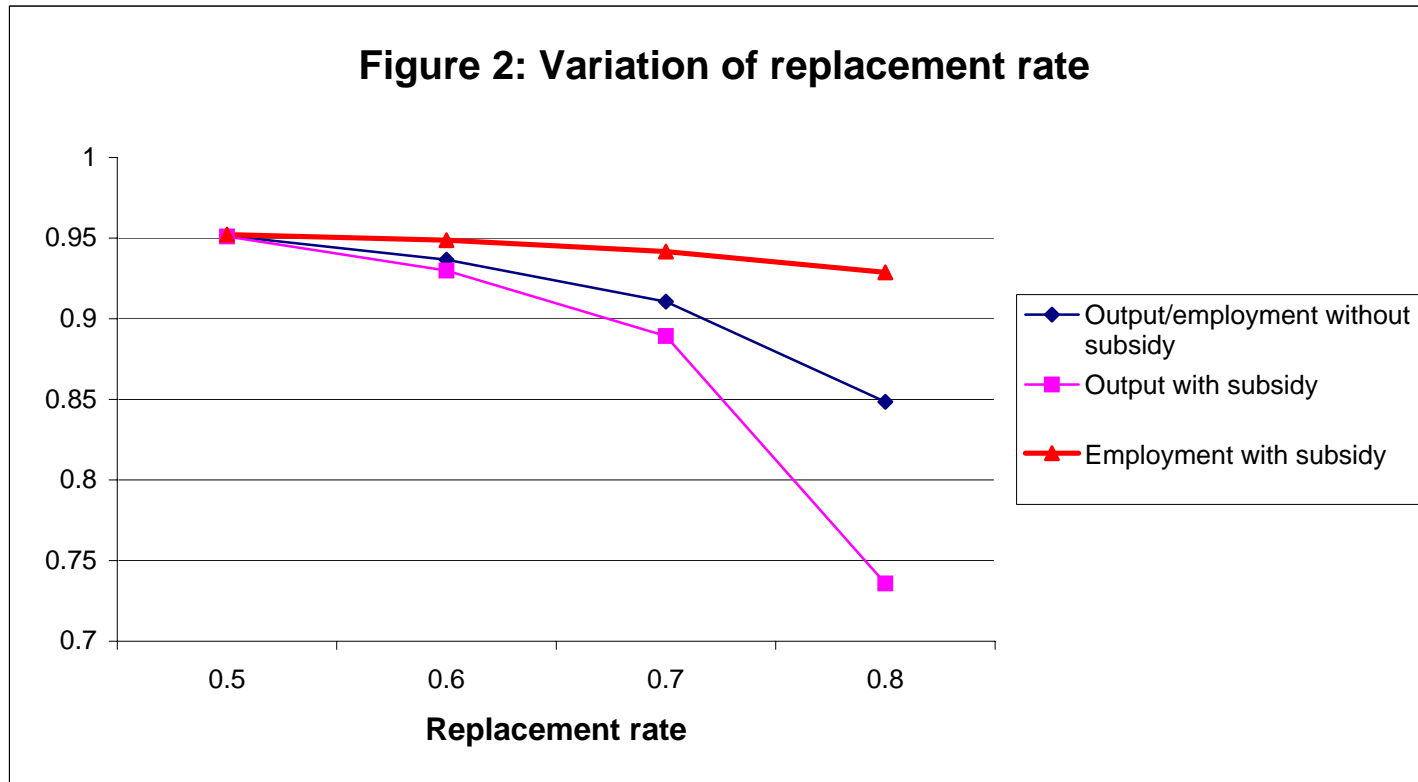


Table 1: Parameter values

Replacement rate:	$b=0.633$
Job destruction rate:	$\delta=0.01$
Production:	$y=1$
Vacancy costs:	$cy=3$
Discount rate:	$\rho=0.025$
Search cost function:	$\varepsilon=0.5$
Wage negotiations:	$\beta=0.2$
Matching function:	$\eta=0.5, A=0.75, a=1.66$
Work time in good job	$z=0.5$
Part-time factor:	$\kappa=0.3$
Risk aversion:	$\zeta=2$

Table 2: Introduction of a subsidy

	Without subsidy	With subsidy
Good job workers	92.98	90.82
Bad job workers		3.86
Unemployed	7.02	5.32
Share of good vacancies on total vacancies	100.00	55.65
Output	92.98	91.98
Tax rate	4.78	5.69
Open vacancies	0.30	0.55
Job finding rate of unemployed for bad jobs		8.87
Job finding rate of unemployed for good jobs	13.24	8.95
Job finding rate of bad job workers for good jobs		11.20
Search intensity of unemployed	0.71	0.70
Search intensity of bad job worker		0.53
Wage rate in good jobs	0.92	0.91
Wage rate in bad jobs		0.22
Wage costs/productivity (good job)	0.96	0.97
Wage costs/productivity (bad job)		0.78

Table 3: Variation of the part-time factor

	Part-time factor 0.3	Part-time factor 0.5
Good job workers	90.82	89.55
Bad job workers	3.86	4.76
Unemployed	5.32	5.69
Share of good vacancies on total vacancies	55.65	58.50
Output	91.98	91.93
Tax rate	5.69	5.80
Open vacancies	0.55	0.49
Job finding rate of unemployed for bad jobs	8.87	7.64
Job finding rate of unemployed for good jobs	8.95	8.92
Job finding rate of bad jobs workers for good jobs	11.20	8.13
Search intensity of unemployed	0.70	0.70
Search intensity of bad job worker	0.53	0.38
Wage rate in good jobs	0.91	0.91
Wage rate in bad jobs	0.22	0.40
Wage costs/productivity (good job)	0.97	0.97
Wage costs/productivity (bad job)	0.78	0.84

Table 4: Different types of subsidies

	Prop. Subsidy	Fixed Subsidy
Good job workers	90.82	92.60
Bad job workers	3.86	0.80
Unemployed	5.32	6.60
Share of good vacancies on total vacancies	55.65	89.74
Output	91.98	92.84
Tax rate	5.69	4.91
Open vacancies	0.55	0.34
Job finding rate of unemployed for bad jobs	8.87	1.94
Job finding rate of unemployed for good jobs	8.95	12.20
Job finding rate of bad jobs workers for good jobs	11.20	15.00
Search intensity of unemployed	0.70	0.71
Search intensity of bad job worker	0.53	0.52
Wage rate in good jobs	0.91	0.92
Wage rate in bad jobs	0.22	0.24
Wage costs/productivity (good job)	0.97	0.97
Wage costs/productivity (bad job)	0.78	0.26