Optimal Size and Intensity of Job Search Assistance Programs

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Abstract

This paper derives the welfare optimal size and intensity of job search assistance programs in a general equilibrium model where the labor market is affected by search frictions. Both instruments have a priori ambiguous fiscal implications: their direct employment stimulating effects broaden the base of the labor income tax and increase revenues, while also incurring direct costs. The net impact on taxes then not only affects taxpayers' disposable income, but also fundamentally influences the program's general equilibrium feedback on all workers. In the optimum, both instruments trade off the fiscal and general equilibrium implications against the program's direct positive effects on participants. Considering the welfare implications of introducing a small program, job finding rates of its participants must be sufficiently improved to warrant program introduction. A generous unemployment insurance system may also contribute to positive welfare implications, as the fiscal gains due to the programs' direct employment stimulation are then higher.

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1 Introduction

Over the last decades, active labor market programs have been part of most industrialized countries' policies to bring the unemployed back into work. A considerable share of the unemployed are assigned to participate in these programs, and total public expenditures amount to more than 1% of GDP in some OECD countries (OECD, 2006). The most commonly used policies are job search assistance programs, which shall improve the job search skills of the unemployed rather than their productivity in a given occupation. Examples of such measures include training of how to apply for a job, practicing job interviews, but also counselling and direct referrals to potentially suitable jobs by the public employment service. These activities typically require no long-term instruction and are therefore relatively cheap compared to other activation measures. However, due to their high prevalence, their costs for taxpayers nevertheless reach up to about 0.3% of GDP (OECD, 2006).

Microeconometric evaluations of existing programs indicate that, in contrast to other activation measures, job search assistance appears to be effective for a broad range of participants (see the surveys in Fay, 1996; Heckman, LaLonde, and Smith, 1999; Martin and Grubb, 2001; Kluve and Schmidt, 2002). This means that participants have a higher transition rate to employment than if they had not attended the program. However, due to their considerable size, job search assistance programs must be expected to affect also the labour market situation of non-participants. These effects are captured in macroeconometric evaluation studies, which typically analyze the impact of activation measures on the aggregate unemployment or employment rates. Although the evidence is still scarce, most existing studies suggest that the macroeconomic implications are often significant (see for example Calmfors and Skedinger, 1995; Blundell, Costa Dias, Meghir, and Van Reenen, 2004; Boone and Van Ours, 2004, and the references therein).

A number of theoretical papers more systematically characterize how job search assistance programs influence the macroeconomic equilibrium. Calmfors and Lang (1995) study the implications on wages and employment when the program is targeted at the long-term versus the short-term unemployed. Distinguishing between high- and low-skilled workers, Van der Linden (2005) analyzes the effects of a program expansion among the low-skilled by step-wise endogenization of variables. Both studies stress that general equilibrium reactions substantially influence a program's implications on aggregate employment. Repercussions can even be so severe that the employment rate falls in consequence of a job search assistance program. This possible outcome is also explicitly taken up by Saint-Paul (1998), who identifies the conditions under which unskilled workers will vote for a labor markt program that actually raises unemployment. In a nutshell, by characterizing the implications of job search assistance programs in a general equilibrium setting, these papers highlight the different channels through which workers' employment prospects are affected by these policies.

However, when it comes to judging the overall effects and desirability of a policy, the evaluation criterion that should ultimately be considered is social welfare rather than employment. The above studies provide only to a reduced extent information about this measure: Saint-Paul (1998) discusses utility effects for employed low-skilled workers, but does not capture the welfare consequences for other groups in the economy. Van der Linden (2005), on the other hand, shows a simulation of aggregate welfare as a function of program size, but does not, in his theoretical analysis, integrate the different effects to a social welfare measure. This issue is taken up in this paper.

The aim of this paper is to characterize the effects of job search assistance programs on social welfare and to perform a normative analysis of such a policy. We concentrate on the two most important characteristics: the size of a program, i.e. the number of jobseekers attending, and its intensity, which is measured as the total services provided to each participant. The optimality criteria for both characteristics are derived in a general equilibrium framework where the labor market is affected by search frictions and wages are bargained between firms and workers. Workers are ex ante homogeneous, and assignment to the job search assistance program is undertaken by the government. We find that both instruments should optimally trade off their direct beneficial impact on program participants against the fiscal implications for taxpayers and the general equilibrium effects affecting all workers in the economy. The fiscal implications consist of two parts: first, program enlargement or intensification of course has direct costs, as more instruction and counselling have to be financed. Secondly, the direct employment enhancing effect on participants also changes the government budget. On the one hand, it widens the base of the labor income tax, thus providing more revenues. On the other hand, it cuts down to the same extent the number of individuals living on unemployment insurance compensation and thus saves benefit expenditures. This sum of taxes and benefits is generally denoted as the participation tax of the unemployment insurance system and can reach considerable levels, especially in European countries with traditionally generous welfare states (see Immervoll, Kleven, Kreiner, and Saez, 2007). The general equilibrium implications affecting all workers in the same way have several components, including changes in wages and ensuing repercussions on search efforts because the returns to job search are altered. It turns out, however, that these effects are also fundamentally related to the change in the wage tax that results from the direct fiscal implications. We find that as the direct effect of the program on participants' utility is positive, the marginal impact on the fiscal budget of both instruments is negative in the optimum, requiring an increase in the wage tax.

These results let us put into context the OECD (2005) recommendations on the evaluation of program assignment. It is argued that programs should be assigned if the additional government income in the form of the participation tax exceeds program costs. Our analysis makes clear that in this evaluation, it is important to consider the marginal costs of the program, instead of the average costs per participant. Further, given that indeed the program has positive direct effects on expected utility of its participants, stopping assignment when the marginal net fiscal gains are zero results in a too small program size from a welfare perspective.

Our analysis also provides insights on the question whether a job search assistance program should be introduced in the first place. Program introduction is more likely to improve social welfare if the program is able to significantly increase a worker's effectiveness in job search activity and if the costs incurred by the first participant are not too high. Further, the presence of a very generous welfare state implies a high participation tax and therefore significant savings for the public budget if the program raises the employment rate among attendants, thus making the program also more beneficial.

Our paper connects to several strands of the literature. A few recent papers study the optimal sequence of different active and passive labor market policies for the unemployed (see Pavoni and Violante, 2007; Wunsch, 2007; Spinnewijn, 2008). However, by focusing on individual jobseekers only, these papers do not consider the feedback effects on other agents in the economy, which should be taken into account when designing potentially large programs. As discussed above, the general equilibrium studies of Calmfors and Lang (1995) and Van der Linden (2005) focus mainly on a positive analysis of program effects on employment and thus stop short of deducing normative implications. A notable exception, albeit focusing on a different measure of active labor market policy, is Fredriksson (1999), who studies the optimal number of participants in public employment programs.

The influence of the participation tax on both program introduction decisions and optimal program design also highlights the importance of interactions between different elements of active and passive labor market policies, which has already received some attention in the literature. For instance, in Keuschnigg and Ribi (2008) the participation tax of the unemployment insurance system is shown to play also a significant role in the determination of optimal wage subsidies (as a means for redistribution). Other studies emphasizing the interactions between active and passive policies include Van der Linden (2006), Cardullo and Van der Linden (2006), Coe and Snower (1997) in a general equilibrium context, and the individual-based contributions of Pavoni and Violante (2007), Wunsch (2007) and Spinnewijn (2008).

The paper proceeds as follows. Section 2 introduces the model, and Section 3 discusses the comparative static effects of changes in the government instruments. Section 4 then derives optimal progam size and intensity, and Section 5 concludes. The Appendix provides some more technical calculations.

2 A Simple Model

The analytical framework is based on a one-period model of a labor market affected by frictions. This set-up provides a situation where individuals' job search efforts are only partially successful and there might be a role for a policy that addresses this issue. To focus on the main mechanisms at work, the model is kept simple in other respects.

The economy contains a mass one of ex ante homogeneous workers. In the beginning, all individuals are unemployed and have to exert positive search effort to be able to find a job. Given their search effort, they can then with a certain probability secure a suitable job, paying a net wage $w - t$. Otherwise, individuals end up unemployed and receive unemployment insurance benefits b from the state.

To enhance matching in the labor market and stimulate employment, the government runs an active labor market program that provides job search assistance to the unemployed.[1] The assignment of unemployed workers to the program is undertaken by the government, and for the designated individuals participation is mandatory. This is also very common in practice, where it is mostly at the discretion of the public employment service to place the unemployed into different programs. The share of program participants in the whole population, i.e. the *size* of the program, is denoted by ϕ. For participants, the labor market program leads to an increase in their search effectiveness. Given a level of search effort s_P, their actual search effectiveness then amounts to δs_P with $\delta > 1$.[2] The factor δ is thus interpreted as a measure of the *intensity* of the program. The two defining characteristics ϕ and δ of the job search assistance program are both policy instruments of the government.

The number of suitable job matches M that are formed in the economy depends on the number of vacancies V set up by firms and on the effective number of jobseekers

$$S = \phi \cdot \delta s_P + (1 - \phi) \cdot s_N, \tag{1}$$

where effective search intensities of the two groups (participants versus non-participants) are multiplied with the relative weight of the respective group in the population. In accordance with the literature, we assume the matching function to be increasing and linear homogeneous in the arguments S and V, or specifically, $M(S, V) = m_0 S^\alpha V^{1-\alpha}$. In what follows, it will be convenient to use the concept of labor market tightness θ, reflecting the ratio of vacancies to the effective number of jobseekers:

$$\theta \equiv \frac{V}{S}.$$

[1] We assume that there are no privately run labor market programs in this economy, which is a common assumption in the theoretical literature. In reality, the policy discussion clearly centers on publicly funded programs, and many unemployed workers might also be cash constrained to attend programs for which they would have to pay themselves. Further, some measures of job search assistance programs also contain monitoring elements, and can therefore be provided only by the public authority.

[2] The index P stands for program participants, the index N denotes non-participants.

In this static model, the employment rate e in the economy is given by the ratio of successful matches that are formed relative to initial jobseekers, who have mass one: $e = m_0 S \theta^{1-\alpha}$. From the point of view of a single individual, the probability p of finding a job depends on whether he has participated in the job search assistance program. If he has not taken part in the program, his search effectiveness s_N implies a probability of finding a job of

$$p_N = \frac{s_N M}{S} = s_N m_0 \theta^{1-\alpha}. \tag{2}$$

Analogously, a person who has participated in the program has an effective search intensity of δs_P, leading to a job finding probability of

$$p_P = \frac{\delta s_P M}{S} = \delta s_P m_0 \theta^{1-\alpha}. \tag{3}$$

Job search probabilities for the two groups and the aggregate employment rate thus increase in labor market tightness. Finally, a firm can fill a vacancy with probability $q = m_0 \theta^{-\alpha}$, which is decreasing in market tightness.

2.1 Job Search Decision

Individuals determine their job search effort to maximize expected utility. Job search incurs effort costs $\varphi(s)$, which is an increasing and convex function of s. It is assumed that both groups of jobseekers have the same effort cost function. Individuals who have not participated in the labor market program know that they have a probability p_N of finding a job. In this case, they earn a gross wage w, but have to pay a labor income tax of t. If they end up unemployed (with probability $1 - p_N$), they receive unemployment insurance benefits of b. Their indirect expected utility is thus

$$EU_N = \max_{s_N} p_N u(w - t) + (1 - p_N) u(b) - \varphi(s_N), \tag{4}$$

where u is a standard concave utility function. Optimal job search effort s_N is determined by the condition

$$m_0 \theta^{1-\alpha} \left[u(w - t) - u(b) \right] = \varphi'(s_N). \tag{5}$$

The left-hand side shows the marginal benefit of increased search effort: as a higher search effort raises the probability of finding a job, see (2), it becomes more likely that the individual can move out of unemployment and thus realize the utility differential $u(w-t)-u(b)$. It is clear that to uphold positive search incentives, this utility differential must be positive. This will be ensured by wage bargaining. The right-hand side shows the marginal effort cost associated with higher search effort.

For a jobseeker who has participated in the job search assistance program, the probability of finding a job is given by p_P in (3), and expected utility is

$$EU_P = \max_{s_P} p_P u(w-t) + (1-p_P)u(b) - \varphi(s_P). \tag{6}$$

We thus assume that the time spent in the program does not directly affect a person's cost to exert search effort. This seems reasonable given that job search assistance does not require a very high time input by participants. There can therefore also not occur a lock-in effect in our model, which is often found to be important for more intensive program types (cf. Lechner, Miquel, and Wunsch, 2006). Optimal job search effort s_P follows from the condition

$$\delta m_0 \theta^{1-\alpha} \left[u(w-t) - u(b)\right] = \varphi'(s_P). \tag{7}$$

Due to program participation, the marginal increase in the job-finding probability is $\delta m_0 \theta^{1-\alpha}$, which is higher than in the case of a non-participant if the program is effective ($\delta > 1$). The convexity of the search cost function then implies that program participants exert higher search effort than non-participants. Comparing (2) and (3), it follows that the probability of finding a job is higher for participants for two reasons: first, they exert higher search effort, and second, their search effort is more effective due to the multiplier δ. We can also show that despite higher effort costs, participants end up with higher expected utility than non-partipants, $EU_P > EU_N$ (see Appendix). The labor market program thus creates inequality between participants and non-participants.

2.2 Firms

All firms in the economy produce the same numeraire good. Each firm can only create one vacancy, which costs k units of the numeraire. With probability q, it then finds a suitable worker to fill the post and produce y units of output, and pays the worker a gross wage of w. If it fails to find a worker, its output is zero. A firm's expected profits are therefore $E(\pi) = q(y - w) - k$. With free entry, firms enter the economy until expected profits are driven down to zero:

$$q(y - w) = k. \tag{8}$$

The wage is determined by Nash bargaining. Once a successful worker-firm match has been created, both actors know that they can share a rent. Breaking up the relationship would leave both with their outside option, which is zero for the firm and $u(b)$ for the worker as we have assumed one shot matching. With $\gamma \in (0, 1)$ denoting the worker's bargaining power, the wage is determined by

$$w = \arg\max \left[u(w - t) - u(b)\right]^{\gamma} \left[y - w\right]^{1-\gamma}$$

or implicitly by the first order condition

$$\gamma u'(w - t)[y - w] = (1 - \gamma)[u(w - t) - u(b)]. \tag{9}$$

2.3 Equilibrium

The labor market and the government's budget constraint jointly determine equilibrium in the economy. There are V vacancies posted by all firms together, and workers' search behavior implies an effective number of jobseekers S. Labor market equilibrium requires that both labor supply and labor demand are equal to the number of matches formed with the given vacancies and jobseekers:

$$e = M(S, V) = qV. \tag{10}$$

Aggregate employment is given by the total mass of program participants and non-participants that were able to secure a suitable job, and is thus a weighted sum of the respective job-finding probabilities: $e = \phi p_P + (1 - \phi)p_N$.

The government has two categories of expenditures: first, it pays out unemployment insurance benefits to the unemployed, which requires outlays of $(1 - e)b$. Second, it bears the costs of the job search assistance program. These costs are denoted by $G(\delta, \phi)$ and increase both with program intensity and program size, $G_\delta > 0$ and $G_\phi > 0$. The government's sole source of revenues is the labor income tax, leading to income et. A balanced budget requires

$$(1 - e)b + G(\delta, \phi) = et. \tag{11}$$

The variables b, ϕ and δ are the government's policy instruments. Via unemployment insurance benefits, it provides social insurance for those who are not successful on the job market. As the labor market is affected by frictions, investing in labor market programs increases employment probabilities of the share of participants ϕ by raising their search effectiveness via δ.

2.4 Market Clearing

Walras' Law implies that the market for the numeraire good must clear when budget constraints are fulfilled and the labor market is in equilibrium, $e = qV$. Individuals spend all disposable income on the numeraire good, leading to private consumption $C \equiv e(w-t) + (1-e)b$. Using (11) to eliminate the tax rate and the free entry condition (8) yields the GDP identity

$$qyV = C + G + Vk.$$

Total production qyV of the numeraire good is thus used for private consumption C, public investment G in the labor market program, and for capital input Vk to create vacancies.

3 Policy Changes and Employment Effects

In this section, we analyze how changes in the size and intensity of the job search assistance program affect the employment probabilities of the two groups of workers and aggregate employment in the economy. To isolate these effects and their general equilibrium implications, we first derive the comparative statics of the model.

3.1 Comparative Statics

Starting out from an equilibrium in the economy, this section determines how changes in the government's policy instruments b, ϕ and δ affect equilibrium values of the endogenous variables. Unless otherwise indicated, the hat notation designates changes in variables relative to their pre-change equilibrium values.

The gross wage w is determined by the bargaining condition (9). In log-linearizing this equation, we apply the approximations $u_B \approx u_E-(w-t-b)u'_E$ and $u'_B \approx (1+\rho\chi)u'_E$, where

$\rho \equiv -cu''(c)/u'(c)$ is the coefficient of relative risk aversion of workers and $\chi \equiv \frac{w-t-b}{w-t}$ captures the relative income difference between the employed and the unemployed state. Indexed utilities stand for consumption utility in the employed ($u_E \equiv u(w-t)$) and the unemployed ($u_B \equiv u(b)$) states. The change in the wage is then given by

$$\hat{w} = \omega\left(\hat{b} + \hat{t}\right), \quad \omega \equiv \frac{(1-\gamma)(1+\rho\chi)}{1+(1-\gamma)\rho\chi}, \quad 0 < \omega < 1, \tag{12}$$

where $\hat{b} \equiv db/w$, and $\hat{t} \equiv dt/w$. A rise in the unemployment benefit b improves the outside option of workers. For a given wage level, this reduces the income difference between the two employment states. Via wage bargaining, a part of this reduction is shifted to firms, leading to a higher gross wage. Analogously, an increase in the tax t reduces the net wage and is also partially shifted to firms. Log-linearizing the optimality condition for job search effort (5) (use again the approximations for u_B and u'_B) yields the change in search effort of non-participants,

$$\hat{s}_N = \sigma_{\varphi,s}\left(1-\alpha\right)\hat{\theta} + \frac{\sigma_{\varphi,s}}{1-t^*}\left[\hat{w} - \hat{t} - (1+\rho\chi)\hat{b}\right], \tag{13}$$

with $\sigma_{\varphi,s} \equiv \varphi'(s)/(\varphi''(s)s) > 0$ determining the magnitude of the reaction of search effort in response to a change in the marginal return to searching. The term $t^* \equiv \frac{t+b}{w}$ captures the participation tax. This consists of the total fiscal transfers a worker has to give up when moving from joblessness into employment, i.e. the unemployment insurance benefit he loses plus the tax he additionally has to pay when earning a wage. Equation (13) shows that as a higher labor market tightness and a greater income difference in the two employment states (expression in brackets) increase the return to job search, they stimulate the search intensity of non-participants. For program participants, the change in search effort follows from differentiating (7):

$$\hat{s}_P = \sigma_{\varphi,s}\hat{\delta} + \sigma_{\varphi,s}(1-\alpha)\hat{\theta} + \frac{\sigma_{\varphi,s}}{1-t^*}\left[\hat{w} - \hat{t} - (1+\rho\chi)\hat{b}\right]. \tag{14}$$

In addition to the general equilibrium effects that also affect job search of non-participants, workers who attend the labor market program also raise their search effort in a direct reaction to an increase in program intensity δ. As a higher δ makes a given level of job search more effective, thus translating into a higher employment probability, it raises the return to searching and consequently stimulates this activity. The effective number of jobseekers S, defined in (1), finally changes by

$$S\hat{S} = (\delta s_P - s_N)(1-\phi)\hat{\phi} + \phi s_P \delta\hat{\delta} + \phi\delta s_P \hat{s}_P + (1-\phi)s_N\hat{s}_N, \tag{15}$$

where the relative change in program size is defined as $\hat{\phi} = d\phi/(1-\phi)$. Increases in program size and intensity directly raise S as they expand the number of workers who can benefit from the program and make search effort more effective, respectively. Indirect effects come about because of the changes in search efforts within the two groups, as indicated in (13) and (14).

The number of firms in the economy and thus, for a given S, also labor market tightness are determined by the zero profit condition (8). Using the matching function to express the probability of filling a vacancy, $q = m_0\theta^{-\alpha}$, implies

$$\hat{\theta} = -\frac{w\hat{w}}{\alpha(y-w)}. \tag{16}$$

A higher gross wage reduces the firms' rent of a successful job match. To rebalance the zero profit condition, the probability of filling a vacancy must therefore rise, implying a reduction in labor market tightness.

By the definition of the matching function, an equilibrium on the labor market is ensured, and changes in employment, $\hat{e} = \hat{S} + (1-\alpha)\hat{\theta}$, equate changes in labor demand, $\hat{q} + \hat{V}$. Last, the tax rate t is endogenously determined to balance the government budget constraint (11), and differentiating yields

$$\hat{t} = \frac{1-e}{e}\hat{b} - t^*\hat{e} + \frac{G_\delta\delta}{ew}\hat{\delta} + \frac{G_\phi(1-\phi)}{ew}\hat{\phi}. \tag{17}$$

For a given unemployment rate, higher benefit payments b raise expenditures, and must be financed by higher taxes on labor income. Similarly, when increased size or intensity make the labor market program more costly, this must also be covered by higher taxes. A higher employment rate, on the other hand, reduces the number of benefit recipients and, at the same time, increases the number of taxpayers. Thus, for each additionally employed, revenues in proportion to the participation tax t^* are added to the state's budget, allowing for a corresponding reduction in the labor income tax. Inserting for the change in employment, and using equations (12)-(16) lets us write the change in the tax as a function of changes in the policy parameters only:

$$\begin{aligned}
\hat{t} &= \left(\frac{1-e}{e} + t^*\left(\sigma_{\varphi,s}+1\right)\frac{(1-\alpha)w\omega}{\alpha(y-w)} + \frac{t^*\sigma_{\varphi,s}}{1-t^*}(1+\rho\chi-\omega)\right)\frac{\hat{b}}{\Psi} \\
&\quad + \left(\frac{G_\phi}{ew} - t^*\frac{\delta s_P - s_N}{S}\right)\frac{(1-\phi)\hat{\phi}}{\Psi} + \left(\frac{G_\delta}{ew} - t^*\left(1+\sigma_{\varphi,s}\right)\frac{\phi s_P}{S}\right)\frac{\delta\hat{\delta}}{\Psi}, \\
\Psi &\equiv 1 - t^*\left(\sigma_{\varphi,s}+1\right)\frac{(1-\alpha)w\omega}{\alpha(y-w)} - \frac{t^*\sigma_{\varphi,s}}{1-t^*}(1-\omega).
\end{aligned} \tag{18}$$

For stability reasons, it is required that $\Psi > 0$. This term captures the behavioral responses of jobseekers and firms to an increase in the tax that lead to a reduction in employment. The ensuing erosion of the tax base implies that the tax must be raised by a greater amount to generate a certain level of revenues than would be required in the absence of any endogenous behavioral response.

An increase in the unemployment insurance benefit b has an unambiguously positive effect on the tax t. An increase in the size ϕ of the job search assistance program has two counteracting effects on the tax: on the one hand, program expansion has a direct marginal cost $G_\phi > 0$, which must be covered by higher taxes. On the other hand, as more workers benefit from higher search effectiveness, substituting δs_P for s_N in their probability to find a job, this has a direct positive impact on the employment rate. As discussed above, this leads to fiscal savings in proportion to the participation tax t^*, which implies the labor income tax can be reduced. The total effect of a change in ϕ on t is ambiguous.

A rise in program intensity δ has analogous effects on the tax as a change in ϕ. The increase in program costs $G_\delta > 0$ puts an additional burden on the public budget. A more intensive program, however, raises search effectiveness of participants both directly and indirectly by stimulating search effort. As a result, program participants face a higher probability of finding a suitable job, which boosts overall employment. This has again the positive implications for the fiscal budget discussed above. The aggregate effect of an increase in δ on the public finances and thus on the tax rate that must balance the budget is again ambiguous.

3.2 Employment Effects of Changes in Size and Intensity

Having fully determined the comparative statics of the model, we can now isolate the effects of changes in program size and intensity on search behavior and employment probabilities for the different groups. This lets us relate our results more clearly to existing studies of macroeconomic effects of job search assistance programs, in particular to Van der Linden (2005). In this section, we keep unemployment insurance benefits constant. For ease of exposition, we abbreviate the effects on the tax in (18) by

$$\begin{aligned} \hat{t} &= \lambda \cdot \frac{\delta\hat{\delta}}{\Psi} + \xi \cdot \frac{(1-\phi)\hat{\phi}}{\Psi}, \\ \lambda &\equiv \frac{G_\delta}{ew} - t^* \left(1+\sigma_{\varphi,s}\right) \frac{\phi s_P}{S}, \quad \xi \equiv \frac{G_\phi}{ew} - t^* \frac{\delta s_P - s_N}{S}. \end{aligned} \tag{19}$$

The term λ thus captures the net direct tax effect of an increase in program intensity δ we discussed just above, while ξ summarizes the net direct tax effect of a rise in program size ϕ. Inserting this and equations (16) and (12) into (14) shows that in reaction to changes in δ and ϕ, program participants alter their search effort according to

$$\begin{aligned} \hat{s}_P &= \sigma_{\varphi,s}\hat{\delta} - \psi_s \lambda \frac{\delta\hat{\delta}}{\Psi} - \psi_s \xi \frac{(1-\phi)\hat{\phi}}{\Psi}, \\ \psi_s &\equiv \sigma_{\varphi,s} \frac{(1-\alpha)w\omega}{\alpha(y-w)} + \sigma_{\varphi,s} \frac{1-\omega}{1-t^*} > 0. \end{aligned} \tag{20}$$

Of course, the direct effect of a higher program intensity δ exerts the same influence on search effort as already identified above. The term ψ_s summarizes the general equilibrium effects that feed back on participants' job search efforts. They consist of an adjustment in labor market tightness, which directly influences matching probabilities, and a change in the consumption utility difference that can be gained when securing a job. Aggregate indirect effects of a change in δ are thus a negative multiple of λ. As long as a rise in δ has a negative net impact on the tax t ($\lambda < 0$), the equilibrium implications for search effort are also positive. However, direct and indirect effects become counteracting when $\lambda > 0$, and if the required tax increase is sufficiently high (implying $\lambda \frac{\psi_s \delta}{\Psi} > \sigma_{\varphi,s}$), a rise in program intensity might even reduce the job search effort of participants.

In the case of program size ϕ, search effort of participants only changes in response to the equilibrium feedback of the implied change in the tax on labor market tightness and the consumption utility differential, which is in negative proportion to ξ. Thus, when additional jobseekers enter a program, search activities of those already attending might rise or fall, depending on the sign of ξ.

Differentiating (3), the change in participants' probability to find a suitable job is given by $\hat{p}_P = \hat{\delta} + \hat{s}_P + (1-\alpha)\hat{\theta}$, or, upon inserting (20) and (16) (and using equations (12) and (19)),

$$\begin{aligned} \hat{p}_P &= (\sigma_{\varphi,s}+1)\,\hat{\delta} - \psi_p \lambda \frac{\delta\hat{\delta}}{\Psi} - \psi_p \xi \frac{(1-\phi)\hat{\phi}}{\Psi}, \\ \psi_p &\equiv \psi_s + \frac{(1-\alpha)w\omega}{\alpha(y-w)} > 0. \end{aligned}$$

As a higher program intensity directly increases search effectiveness and also search effort, the direct effect on the employment probability is positive. The indirect effects working on search effort (see (20)) are now complemented by the additional impact of a change in market tightness, which directly influences the matching probability. These aggregate indirect effects are summarized in ψ_p and are again a negative multiple of λ, or, in the case of a change in program size, of ξ.

For workers not assigned to participate in the job search assistance program, there are no direct effects of changes in δ and ϕ on either search effort or the probability to find a job. The respective equilibrium adjustments are given by

$$\hat{s}_N = -\psi_s \lambda \frac{\delta\hat{\delta}}{\Psi} - \psi_s \xi \frac{(1-\phi)\hat{\phi}}{\Psi} \qquad \text{and} \qquad \hat{p}_N = -\psi_p \lambda \frac{\delta\hat{\delta}}{\Psi} - \psi_p \xi \frac{(1-\phi)\hat{\phi}}{\Psi},$$

and are thus the same as the equilibrium feedback effects for program participants. Finally, we can derive the impact on aggregate employment by inserting (15) and (16) into $\hat{e} = \hat{S} + (1-\alpha)\hat{\theta}$ and using (19) and the changes in search efforts $\hat{s}_P$ and $\hat{s}_N$ from above:

$$\hat{e} = (1+\sigma_{\varphi,s})\,\frac{\phi s_P}{S}\delta\hat{\delta} - \psi_p \lambda \frac{\delta\hat{\delta}}{\Psi} + \frac{\delta s_P - s_N}{S}(1-\phi)\hat{\phi} - \psi_p \xi \frac{(1-\phi)\hat{\phi}}{\Psi}. \tag{21}$$

On the one hand, an increase in program intensity has a positive direct effect on employment within the group of participants. They benefit from higher effectiveness of their job search effort, and raise their effort in response. Both effects translate into a higher employment probability for this group. On the other hand, the fiscal consequences of a rise in δ and their implications for the equilibrium wage and labor market tightness affect all individuals in the same way, leading to an employment change that is proportional to λ. Aggregate employment effects might thus be positive as long as the fiscal consequences do not require too high an increase in the tax rate.

When the number of program participants is raised, this also has a positive direct effect on employment. As we have seen in Section 2.1, individuals who have attended the program always exert higher search effort than those who have not. And because search effort of participants is made even more effective by the multiplication with δ, their probability of finding a job is higher than that of non-participants. Thus, increasing the share of the population entering the program directly increases the employment rate by the respective differential. The effects on the public budget and thus on the tax rate again lead to general equilibrium adjustments of the search efforts and market tightness, which affect all workers in the same way. Depending on whether the fiscal gains of program expansion exceed the fiscal costs or not, the indirect equilibrium effects might be positive or negative. When the necessary increase in the tax rate turns out to be too high, aggregate employment might even be reduced when more jobseekers enter the program.

These results confirm the findings of Van der Linden (2005), who shows in simulations how the positive direct employment effects of an expansion of a job search assistance programs can be more than compensated when all general equilibrium implications are considered. Our discussion, however, provides further insights into the theoretical conditions that must be satisfied for such an outcome to occur, as it relates the change in employment fully to the fundamental changes in program characteristics ϕ and δ.

4 Optimal Program Size and Intensity

Having seen how changes in the size and the intensity of a job search assistance program affect employment probabilities of both participants and non-participants, we now analyze how these instruments should be set optimally. Social welfare W is defined as aggregate welfare of all individuals, $W = \phi EU_P + (1-\phi)EU_N$, and, because population size is normalized to one, corresponds to the expected utility of a person before program assignment has taken place. Differentiation shows that social welfare is, on the one hand, affected by changes in the expected utility of the different groups of workers, and, on the other hand, by a changing composition of program participants versus non-participants in the population:

$$dW = \phi dEU_P + (1-\phi)dEU_N + [EU_P - EU_N](1-\phi)\hat{\phi}. \qquad (22)$$

In order to derive social welfare effects and the optimality criteria for the program characteristics, it is first necessary to analyze how these instruments affect expected utility of the different groups, which we do in the next subsection. To be able to discuss also the effects of passive labor market policy on welfare, we again allow for changes in unemployment insurance benefits b. In Subsections 4.2 and 4.3, we then turn to the determination of optimal program size and intensity, respectively.

4.1 Welfare Effects of Changes in Policy Instruments

In the Appendix we show that the change in program participants' expected utility (6) can be written as

$$\frac{dEU_P}{u'_E} = p_P (w - t - b)\,\hat{\delta} + \Gamma p_P (1-\alpha)\hat{\theta} + (1-p_P) w\,(1+\rho\chi)\,\hat{b} - p_P w \hat{t}, \qquad (23)$$

$$\Gamma \equiv \frac{(y-w)(\gamma-\alpha)}{(1-\gamma)(1-\alpha)}.$$

The division by marginal utility u'_E implies changes in income equivalent units. The first term on the right captures the direct impact of a higher employment probability due to a more intensive program. As participants become more likely to find a job and realize the income differential between the two employment states, their expected utility increases. The second term relates to efficiency effects of a change in labor market tightness. When workers' bargaining power γ is high relative to the elasticity of the matching function with respect to jobseekers S, $\gamma > \alpha$ in Γ, the bargained gross wage is too high from an efficiency perspective. Consequently, too few firms enter the economy, resulting in inefficiently high unemployment. Because a tighter labor market raises employment, an increase in θ then improves efficiency in the model. As already shown by Hosios (1990), when $\gamma = \alpha$, bargaining is efficient and a change in θ has no direct implications ($\Gamma = 0$) on expected utility. The third term shows the impact of a change in unemployment insurance benefits on participants' consumption utility. Due to risk aversion, higher benefits imply a higher than one-to-one gain in income equivalent units. Similarly, when the tax rate increases, utility in the employed state is correspondingly reduced, as captured in the last term in (23).

Analogously, we can derive the change in non-participants' expected utility as

$$\frac{dEU_N}{u'_E} = \Gamma p_N(1-\alpha)\hat{\theta} + (1-p_N)w(1+\rho\chi)\hat{b} - p_N w\hat{t}. \tag{24}$$

Utility responds in the same manner to changes in θ, t and b as in the case of program participants. The only difference to equation (23) is that program intensity does not directly affect workers' employment prospects, and thus expected utility, here. Dividing equation (22) by marginal utility u'_E in the employed state and inserting the results from (23) and (24), using the equality $\phi p_P + (1-\phi)p_N = e$ and finally substituting for $\hat{t}$ from (17) yields the change in social welfare

$$\begin{aligned} \frac{dW}{u'_E} &= \phi p_P(w-t-b)\hat{\delta} + \frac{EU_P - EU_N}{u'_E}(1-\phi)\hat{\phi} - G_\delta \delta\hat{\delta} \\ &\quad -G_\phi(1-\phi)\hat{\phi} + (1-e)\,w\rho\chi\hat{b} + \Gamma e(1-\alpha)\hat{\theta} + ewt^*\hat{e}. \end{aligned} \tag{25}$$

In this exposition, we see the direct effects of changes in the policy instruments and their implied impacts on efficiency. Higher program intensity stimulates employment probabilities of participants (as in (23)), and a larger program size lets more individuals attain expected utility EU_P instead of EU_N. We know from the discussion in Subsection 2.1 that this difference is positive. However, program costs G rise in both program characteristics, which reduces resources available for taxpayers. The second term on the second line of (25) shows the gains from insurance that arise when the unemployed receive a higher transfer. This gain increases with the risk aversion parameter ρ and the income difference in the two employment states, as captured in χ. The next expression corresponds again to the possible inefficiency of wage bargaining and the ensuing implications that arise from a change in market tightness, as discussed below equation (23). The last term in (25) reflects the excess burden of the welfare state. From the workers' point of view, the participation tax t^* constitutes the fiscal cost of the transition from unemployment to employment and thus negatively affects employment decisions. An increase in employment e reduces this excess burden and raises social welfare.

4.2 Optimal Program Size

Using (25), social welfare changes with the size of the job search assistance program according to (remember that $d\phi = (1-\phi)\hat{\phi}$)

$$\frac{dW}{u'_E \cdot d\phi} = \frac{EU_P - EU_N}{u'_E} - G_\phi + \Gamma e(1-\alpha)\frac{\hat{\theta}}{d\phi} + ewt^* \frac{\hat{e}}{d\phi}.$$

Inserting for the effect on the employment rate from (21) shows that the direct fiscal implications of program enlargement stem from increased revenues in the form of the participation tax from those workers who are additionally employed because of their program attendance, minus the direct marginal program costs. These two effects can be summarized again by using ξ: $ewt^* \frac{\delta s_P - s_N}{S} - G_\phi = -ew\xi$. Further summarizing $ew + ewt^* \frac{\psi_P}{\Psi} = \frac{ew}{\Psi}$ and using (16) and (19) finally yields

$$\frac{dW}{u'_E \cdot d\phi} = \frac{EU_P - EU_N}{u'_E} - ew\frac{\xi}{\Psi} - \Gamma e \frac{(1-\alpha)w\omega}{\alpha(y-w)} \frac{\xi}{\Psi}. \tag{26}$$

Apart from the fact that a higher number of participants means that more workers can enjoy expected utility EU_P instead of EU_N, all direct and indirect implications of an increase in ϕ are proportional to the fiscal net effect ξ. The second term on the right contains the total employment effects, net of the marginal program costs, and is a negative function of ξ. The third term captures again the efficiency effect due to the change in labor market tightness, and is in negative proportion to ξ for $\gamma > \alpha$ and in positive proportion for $\gamma < \alpha$. However, inserting for Γ and ω shows that the second and third terms taken together are always a negative multiple of ξ.

If $\xi = \frac{G_\phi}{ew} - t^* \frac{\delta s_P - s_N}{S}$ is sufficiently high, the derivative of social welfare in (26) is negative at $\phi = 0$, i.e. when no worker participates in the program. It is then optimal not to introduce a job search assistance program in the first place. Several factors make such a situation possible. First, if participants' chances to find suitable employment are only slightly higher than the chances of non-participants, this implies that both $\delta s_P - s_N$ in ξ and the difference in expected utilities $EU_P - EU_N$ are low. A program thus has to be sufficiently effective to justify its implementation. The second possibility arises when marginal program costs G_ϕ are very high already for the first participant. It is then unlikely that the welfare gains outweigh these costs.

The third factor influencing the welfare effects of a program introduction is the generosity of the welfare state itself. The increase in employment due to the direct effect of the labor market program on participants generates a fiscal gain in proportion to the participation tax t^*. This tax measure increases in unemployment insurance benefits and labor income taxes. A generous welfare state thus leads to a high participation tax and consequently boosts the fiscal gains associated with an expansion in employment due to the job search assistance program. It also follows from this argument that for countries with already expansive welfare states in place it is comparatively cheaper to run additional active labor market programs if the increase in employment is similar to that in less generous economies. This might partly explain the fact that countries like Finland, Denmark or Sweden, which all have generous unemployment insurance systems, at the same time spend considerable amounts on active labor market policy (cf. OECD, 2006).

It is also conceivable that all workers in the economy optimally participate in the program. Formally, this requires the derivative of social welfare in (26) to be positive at the maximal size $\phi = 1$. In this case, the effectiveness of the program relative to the marginal costs of program expansion would have to be high even when already many workers attend the program.

If the derivative of social welfare in (26) is positive at $\phi = 0$ and negative at $\phi = 1$, the optimal size of the job search assistance program is determined by the condition

$$\frac{EU_P - EU_N}{u'_E} = \left(ew + \Gamma e \frac{(1-\alpha) w \omega}{\alpha (y - w)} \right) \frac{\xi}{\Psi}.$$

As the term on the left-hand side is positive (see Subsection 2.1), and inserting for Γ shows that the sum in brackets is also greater than zero, the net direct tax effect ξ of a higher program size must be positive in the optimum. The marginal program costs should thus be higher than expected public savings from the direct increase in the employment probability of the marginal attendant. From a distributional perspective, the search assistance program creates inequality between the groups of participants and non-participants, and the gain in expected utility that the marginal participant can obtain compensates for the consequences of a marginal increase in the required tax level and ensuing equilibrium effects. These include negative general equilibrium effects on employment and, if wage bargaining leads to inefficiently high unemployment ($\gamma > \alpha$), reduced labor market tightness further removes the equilibrium from the first-best.

This optimality condition can be compared to the recommendations for program assignment made in OECD (2005, Chapter 5). It is argued there that programs should be chosen according to the fiscal savings they generate in the form of the participation tax, which should exceed their costs. Our optimality condition for program size makes clear that when placement officers decide on assigning a jobseeker to a particular program that is already in place, they should make sure to consider the marginal program costs that follow from an additional participant. Depending on the size of the fixed costs of a program, these can be higher or lower than the average costs, which are for instance normally reported in cost-benefit analyses (cf. Dolton and O'Neill, 2002; Van Reenen, 2004). Further, this decision rule ignores that the job search assistance program has direct benefits for its participants, as they achieve a higher expected utility than non-participants. Restricting the number of attendants when the net fiscal effects are zero therefore leads to a too small program size.

4.3 Optimal Program Intensity

Now turning to the analysis of optimal program intensity, the derivative of social welfare with respect to δ follows from inserting the changes in the employment rate (21) and in market tightness (following from (16), (12) and (19)) into (25) and summarizing as above:

$$\frac{dW}{u'_E \cdot d\delta} = \phi s_P m_0 \theta^{1-\alpha}(w-t-b) - ew\frac{\lambda}{\Psi} - \Gamma e \frac{(1-\alpha)w\omega}{\alpha(y-w)}\frac{\lambda}{\Psi}. \tag{27}$$

Analogous to the case of program size, the second term on the right captures both the direct fiscal consequences of a change in program intensity for taxpayers and the general equilibrium implications that affect employment. Both effects are proportional to $\lambda = \frac{G_\delta}{ew} - t^* \left(1+\sigma_{\varphi,s}\right) \frac{\phi s_P}{S}$, as is the impact on efficiency due to a change in labor market tightness (third term). Inserting for Γ and ω shows that the two terms taken together are a negative multiple of λ.

A more intensive labor market program has always a positive direct impact on the probability to find a suitable occupation for its participants. They are thus more likely to gain the consumption utility differential between the two employment states, which is approximated by the income difference $w-t-b>0$. However, in spite of this positive direct effect, very high marginal program costs G_δ that lead to $\frac{dW}{u'_E \cdot d\delta} < 0$ will prevent the implementation of an effective job search assistance program. It is then optimal to set both program size and intensity to zero.

In contrast, if program costs are rather small initially, the optimal program intensity is determined by the condition

$$\phi s_P m_0 \theta^{1-\alpha}(w - t - b) = \left(ew + \Gamma e \frac{(1-\alpha)w\omega}{\alpha(y-w)} \right) \frac{\lambda}{\Psi}.$$

As both the left-hand side and the term in brackets are positive, optimality requires that the net fiscal effect λ is also positive. The marginal gains of a more intense program, consisting of the direct increase in employment prospects and, consequently, expected utility of participants, then offset the marginal costs in the form of an increase in the labor income tax and ensuing general equilibrium effects. The equilibrium feedback on aggregate employment is thus negative at the margin, which, if the labor market exhibits inefficiently high unemployment ($\gamma > \alpha$), further adds to this inefficiency and constitutes an additional marginal cost of the policy.

Finally, comparing the effects of program size and intensity on social welfare in (26) and (27) makes clear that both characteristics affect social welfare through the same equilibrium channels. Thus, in the event that both instruments optimally take interior values, they must jointly satisfy the simple condition

$$\frac{EU_P - EU_N}{u'_E \cdot \phi s_P m_0 \theta^{1-\alpha}(w - t - b)} = \frac{\xi}{\lambda}.$$

The left-hand side shows the ratio of the direct marginal effects of an increase in program size and in program intensity, while the right-hand side shows the ratio of the corresponding direct marginal effects on the tax rate. Thus, if the gain in expected utility of program participants due to an intensification of the program is higher than the gain in expected utility for the marginal participant if the program is expanded, it is also optimal to accept a greater rise in the required tax on labor income in the case of program intensification.

5 Conclusion

Job search assistance programs aim at improving the job search skills of the unemployed and are generally found to be among the most effective active labor market policies for a broad range of participants. Being also relatively inexpensive compared to other activation measures, in many countries a large share of insured jobseekers are assigned to attend these programs. It follows from this that in addition to the direct implications of programs on their participants, their macroeconomic effects must also be expected to be significant, and it is all the more important to design these programs in a way that is beneficial for social welfare.

This paper thus develops the optimal rule for determining the two most important characteristics of such a program, i.e. its size and intensity. It is found that both characteristics have positive direct effects on their participants (or the marginal participants in the case of program size). These effects follow from the direct stimulation of attendants' employment probability, which is generally the focus of the microeconometric evaluation literature. In the optimum, these positive direct effects are traded off against the program's net fiscal implications, which must be borne by taxpayers, and against the general equilibrium effects that concern all workers in the economy. These general equilibrium effects consist of the reactions of wages, job search efforts and ultimately employment, and we show that they are also fundamentally related to the marginal net fiscal impact of changes in program size and intensity. For both instruments, the net tax effect consists of a positive component in the form of direct program costs and of a negative component of an enlarged tax base due to the direct employment stimulation of the policy. We find that in the optimum, the net tax effects of both instruments should be positive at the margin. The required increase in the labor income tax implies that the marginal general equilibrium feedback on employment is negative and thus counteracts the positive direct employment stimulating effects of the program on its participants.

In addition, we find that the implementation of a job search assistance program can increase social welfare only if it sufficiently increases the job finding rates of participants and is not too costly already for small numbers of participants. Further, if the welfare state is very generous, a program is also more likely to improve welfare, as the fiscal gains from the participation tax paid by the additionally employed are then higher.

A remaining question is how the optimal design of job search assistance would react to the presence of other active labor market policies. Although some existing studies have already provided insights into the interactions of different programs (cf. Coe and Snower, 1997; Cardullo and Van der Linden, 2006), this has not been done in the context of a normative analysis.

Appendix

Proof of $EU_P > EU_N$ for $\delta > 1$:

Here, we show that $EU_P > EU_N$ for $\delta > 1$. Using the optimality conditions (5) and (7) for job search efforts, the difference between indirect expected utilities of program participants (4) and of non-participants (6) can be written as (remember that $p_P = \delta s_P m_0 \theta^{1-\alpha}$ and $p_N = s_N m_0 \theta^{1-\alpha}$):

$$\begin{aligned} EU_P - EU_N &= p_P\left(u(w-t) - u(b)\right) - \varphi(s_P) - \left[p_N\left(u(w-t) - u(b)\right) - \varphi(s_N)\right] \\ &= s_P\varphi'(s_P) - \varphi(s_P) - [s_N\varphi'(s_N) - \varphi(s_N)]. \end{aligned}$$

Further, we know that $s_P > s_N$ for $\delta > 1$. It is therefore sufficient to show that the function $\mu(s) = s\varphi'(s) - \varphi(s)$ is monotonically increasing. The derivative of this function is $\mu'(s) = s\varphi''(s)$. As we have assumed that the search cost function is strictly convex, $\varphi''(s) > 0$, it follows that $\mu'(s) > 0$.

Derivation of equation (23):

Differentiating equation (6) and applying the optimality condition for job search (7) yields

$$dEU_P = p_P\left[u_E - u_B\right](\hat{p}_P - \hat{s}_P) + p_P w u'_E(\hat{w} - \hat{t}) + (1 - p_P) w u'_B \hat{b}.$$

Using the approximations for u_B and u'_B stated above, dividing by u'_E and substituting $\hat{p}_P = \hat{\delta} + \hat{s}_P + (1-\alpha)\hat{\theta}$ leads to

$$\frac{dEU_P}{u'_E} = p_P\left(w - t - b\right)\left(\hat{\delta} + (1-\alpha)\hat{\theta}\right) + p_P w(\hat{w} - \hat{t}) + (1 - p_P)w\left(1 + \rho\chi\right)\hat{b}$$

Finally, inserting from (16), substituting from the wage bargaining condition (9) and rearranging yields equation (23). Derivation of equation (24) starts out from equations (4) and (5) and then follows exactly the same steps.

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