Active Labour Market Programmes and Unemployment in a Dual Labour Market.[1)]

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September, 2003

Abstract

The paper presents a theoretical analysis of the macroeconomic effects of active labour market programmes in a dual labour-market framework. The paper uses the Shapiro-Stiglitz effciency-wage model. Active labour market programmes train unskilled labour and transfer them from a high-unemployment to a low-unemployment sector. Programmes have a direct labour-transfer effect which tends to reduce total unemployment. They also have effects on wages via expectations. The latter effects were to a very large extent neglected in earlier discussions of active labour-market policy. The model formally identifies and defines the effects on wages via expectations. The net signature of the latter effects depends on how programmes are targeted. In general, the net effect on unemployment is ambiguous. The model explains the conditions under which active labour market programmes reduce aggregate unemployment.

Keywords: Active labour market programme, unemployment, dual labor market, effciency wage

JEL classification: J31, J41, J64

1. Introduction

Recently, the interest in active labour market programmes (henceforth denoted ALMPs) as a means of improving the functioning of the labour market has been growing in Western Europe. The current high levels of persistent unemployment seem likely to have an important structural component that cannot be handled by demand policies only. ALMPs are often seen as a measure that can help reduce equilibrium unemployment by making labour markets more flexible (OECD, 1994; European Commission, 2000). They can be considered to have three different roles:(1) a job brokerage role; (2) a training/education role; and (3) a job creation role (OECD, 1993; Calmfors, 1994). Through these roles, ALMPs may influence the labour market in many different respects: resource allocation, income distribution and business cycle stabilisation. In their resource allocation aspects, ALMPs make it easier to match job-seekers with vacancies, while in their income distribution aspects, they secure incomes for the unemployed and provide employment for disabled workers. In their stabilising role, ALMPs are implemented in such a way

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1) I am grateful for many useful discussions and suggestions by Lars Calmfors, Ann-Sofie Kolm, Harald Lang, Torsten Persson and to participants in seminars/workshops at Stockholm University, Uppsala University and the Trade Union Institute for Economic Research.

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as to counter the fluctuations of the business cycle. In recent years, they have increasingly come to be considered as a way of preventing unemployed workers from exiting the labour force, so that the effective aggregate labour supply is maintained.

In this paper, I focus on the training/education role of ALMPs and investigate its impact in their reallocation aspects. ALMPs can serve to re-allocate labour from sectors with low to sectors with high productivity, which was the original motivation when these programmes were adopted in both Sweden and the US in the 1950s and 1960s. In Sweden, labour-market policies, such as labour-market training and mobility grants, were suggested by the economists Gosta Rehn and Rudolf Meidner in the 1950s (Fackföreningsrörelsen och den fulla sysselsättningen, 1951). The Rehn-Meidner model had a predominant influence on Swedish labourmarket policy, at least up to the end of the 1980s; an aspect of ALMPs which now once more seems to be receiving increasing international attention (European Commission, 2000).

When ALMPs train unskilled workers and increase the labour mobility from low-productivity sectors with high unemployment to high-productivity sectors with low unemployment, these programmes have a direct labour-placement effect which tends to reduce aggregate unemployment by reducing the mismatch in the labour market. Baily and Tobin (1977) used the Phillips curve and showed that a job creation scheme may reduce the NAIRU by substitution of low-wage for high-wage workers. Programmes may also have wage effects since any incentives to set wages, so that unemployment is held down, are affected. These effects were neglected in earlier discussions of active labour-market policy. Holmlund and Linden (1993) studied the e.ects of temporary public employment programmes (relief work), incorporating the Beveridge curve in a one-sector Nash wage-bargaining model. They analysed both a direct job placement effect and an effect on wage pressure, and concluded that the net effect on equilibrium unemployment depends on how programmes are targeted. Calmfors and Lang (1995) analysed the effects of ALMPs using a standard bargaining (union) model, arguing that ALMPs may raise the wage pressure and thus, reduce regular employment in a one-sector framework. Calmfors (1995a) sketched the effects of retraining programmes in a two-sector framework adopting the Blanchflower-Oswald (1994) notion of a non-linear wage curve. He pointed out that ALMPs encompassing both employed and unemployed workers may be a better policy than ALMPs targeting unemployed workers only.

Heckman et al. (1999) summarised the empirical studies on the effects of training programmes and concluded that they do not significantly reduce unemployment. Nickell and Layard (1999) analysed the way in which labour market institutions are related to unemployment in OECD countries. Their conclusion was that an increase in unemployment arising from generous unemployment benefits can be o.set by ALMPs. Calmfors et al. (2002) discussed the mechanism through which ALMPs affect (un)employment, and surveyed the empirical studies of the e.ects of ALMPs in Sweden. They concluded that ALMPs may reduce both open unemployment and regular employment.

This paper uses a two-sector general equilibrium model. I rely on the idea that wages and employment are determined by the intersection of an employment and a wage-setting schedule (Layard and Nickell, 1986; Johnson and Layard 1986; Layard et al., 1991). The Shapiro-Stiglitz (1984) efficiency-wage model is used to model wage setting. More exactly, I extend the one-sector framework of Calmfors and Lang (1995) to a two-sector framework along the lines sketched in Calmfors (1995a). I study the effects of transferring labour through ALMPs from a low-productivity, high-unemployment sector to a high-productivity, low-unemployment sector. Section 2 sets the scene for the subsequent analysis by focusing on a benchmark case where a one-shot transfer of labour that is not built into the expectations enters the wage-setting process. Sections 3 and 4 discuss the general case where such expectation effects occur, and in particular, I study the consequences of different ways of targeting ALMPs.

2. The benchmark case

I consider an economy consisting of two competitive sectors: a high-productivity sector with low sectoral unemployment (henceforth denoted the HP-sector) and a low-productivity sector with unskilled labour (henceforth denoted the LP-sector). There are two types of labour: skilled labour in the HP-sector and unskilled labour in the LP-sector. A worker can find himself in one of the following *four* states: (1) employment in the HP-sector; (2) employment in the LP-sector; (3) unemployment in the HP-sector; and (4) unemployment in the LP-sector.

I shall assume that labour-market policies train unskilled workers and transfer them from the LP-sector to the HP-sector. Otherwise, the two sectors are entirely separate. For simplicity, I assume that there is no private alternative for workers to upgrade their skills.[3] As a benchmark case, I first investigate the effects of a oneshot transfer of labour from the LP-sector to the HP-sector through ALMPs, which I label a *helicopter labour transfer policy*. I assume that skilled labour permanently maintains its productivity.

The Shapiro-Stiglitz efficiency-wage model is used to model wage setting. Firms in both sectors employ workers who decide whether to shirk or not. Some of the shirking workers are discovered and fired. In addition, workers leave for other reasons. Firms make up for layoffs and quits by hiring new workers from the unemployment pool. Thus, the cost for a worker of being fired is that she loses her job and goes through at least one period of unemployment until hired by another firm. Because firms set their wages to avoid shirking, wages are above the market-clearing level and therefore, involuntary unemployment exists.

2-1. The stocks of workers in the labour market

In my model, sector 1 is the HP-sector and sector 2 the LP-sector and I assume that the economy finds itself in a steady state. I postulate a stationary labour force which is normalised to unity. All stocks of labour are measured as shares of the labour force in the economy. Then, I let m_i, n_i, and u_i denote the labour force, employment and unemployment, respectively, in sector i (i = 1, 2). I have $n_i + u_i = m_i$ and $m_1 + m_2 = 1$.

It is convenient to introduce a parameter, h, to represent the helicopter labour transfer policy. h is a measure of the relative size of the two sectors. I let $m_1 = (1 + h)/2$ and $m_2 = (1 - h)/2$, where $-1 \leq h \leq 1$. When $h = 0$, the labour force in the two sectors is the same, i.e., half the labour force consists of skilled

3) If unskilled workers have another alternative for upgrading their skill, this alternative affects the utility of unskilled workers and the analysis becomes very complicated. However, the results remain qualitatively similar. Thus, I omit other possibilities for upgrading labour skills than ALMPs.

workers and the other half of unskilled workers. When $h = 1$, all workers are skilled, and when $h = -1$, all workers are unskilled. It then follows that

$$h = m_1 - m_2. \tag{1}$$

I denote the sectoral employment rates (employment in sector i as a fraction of the labour force in the sector) n'_i, i.e., $n'_i = n_i/m_i$ and I can also derive that

$$n_1 = \frac{1+h}{2} n'_1 , \tag{2}$$

$$n_2 = \frac{1+h}{2} n'_2 . \tag{3}$$

2-2. The wage-setting schedules

An individual's instantaneous utility function is $V_i\,(c, e)$, where c is income and e is effort. e can only take two values, zero and $\bar{e}$. e is zero if no effort is supplied on the job, i.e., for both shirking and unemployed workers, while $\bar{e}$ is the non-negative effort level of non-shirking workers. The utility function is assumed to be additively separable and workers to be risk neutral. The utility function can then be written as $V_i\,(c, e) = c - e$.

Let $\Omega^{n_j}_{i(t)}$ and $\Omega^{s_j}_{i(t)}$ denote the discounted values of being employed for nonshirking and shirking workers, respectively, at time t in the jth firm of sector i. $\Omega_{u_i(t)}$ is the discounted value of being unemployed in sector i at time t. It holds that

$$\Omega^{n_j}_{i(t)} = \frac{1}{1+r}[w^j_{i(t)} - \bar{e} + q\Omega_{u_i(t+1)} + (1-q)\Omega^{n_j}_{i(t+1)}] , \tag{4}$$

$$\Omega^{s_j}_{i(t)} = \frac{1}{1+r}[w^j_{i(t)} + (q+q')\Omega_{u_i(t+1)} + (1-q-q')\Omega^{s_j}_{i(t+1)}] , \tag{5}$$

where q is the exogenously given quit rate for workers and q' the exogenously given rate of being caught shirking. q and q' are assumed to be the same in both sectors.

The discounted value of being unemployed in sector i at time t can be expressed as

$$\Omega_{u_i(t)} = \frac{1}{1+r}[b + s_i\Omega_{i(t+1)} + (1-s_i)\Omega_{u_i(t+1)}] , \tag{6}$$

where b is the unemployment benefit and s_i the probability for an unemployed worker in sector i of finding a job.

Like Shapiro and Stiglitz (1984), I assume that firms determine wages for all future periods and that the economy finds itself in a steady state. Hence, I can drop the time subscripts and set $\Omega^{n_j}_{i(t)} = \Omega^{n_j}_{i(t+1)} = \Omega^{n_j}_i$, $\Omega^{s_j}_{i(t)} = \Omega^{s_j}_{i(t+1)} = \Omega^{s_j}_i$ and $\Omega_{u_i(t)} = \Omega_{u_i(t+1)} = \Omega_{u_i}$. I also assume a symmetric equilibrium, so that $w^j_{i(t)} = w_i$ for all j. Assuming that wages are set to avoid shirking, i.e., that $\Omega^{n_j}_i = \Omega^{s_j}_i = \Omega_i$, it can be derived from (4), (5) and (6) that

$$w_i = b + (q + q' + r + s_i)\frac{\bar{e}}{q'} . \tag{7}$$

2-3. The employment schedules

There are F identical firms in each sector. Each firm has a decreasing-returns-toscale Cobb-Douglas production function: $y_i^* = A_i(n_i^*)^{\alpha}$, where $0 < \alpha < 1$. y_i^* and n_i^* are output and employment in each firm in sector i. A_i represents productivity in sector i. I shall assume the productivity to be higher in sector 1 than in sector 2, i.e., that $A_1 > A_2$. Employment in each firm can be written $n_i^* = n_i/F$.

I assume the economy to be a small open one, so that product prices are given on the world market. Moreover, I normalise the relative price of the products to unity. A firm in each sector chooses n_i^*, so that the profit $\pi_i^* = y_i^* - w_i^* n_i^*$ is maximised. The first-order condition is $w_i^* = \alpha A_i(n_i/F)^{\alpha - 1}$. Taking (2), (3), and $n_i^* = n_i/F$ into account, the relations between sectoral wages and sectoral employment rates in both sectors can be written as:

$$w_1 = B_1\left(\frac{1+h}{2}\right)^{\alpha - 1}(n'_1)^{\alpha - 1}, \tag{8}$$

$$w_2 = B_2\left(\frac{1-h}{2}\right)^{\alpha - 1}(n'_2)^{\alpha - 1}, \tag{9}$$

where $B_i = \alpha A_i F^{1-\alpha} > 0$. From (8) and (9), it follows that $dw_i/dn'_i < 0$ and $d^2w_i/dn_i'^2 < 0$. Equations (8) and (9) thus define downward-sloping and convex labour-demand curves in each sector in the sectoral employment rate-wage plan. Labour-demand elasticity is constant and equal to $1/(1-\alpha)$.

2-4. The steady-state conditions

The various stocks and flows of labour are summarised in Figure 1. In each period, qn_i workers quit their present jobs in sector i (because wages are set so that no workers shirk and hence, no workers are fired). They cannot find a new job until they have been job seekers for at least one period. In a steady state, all stocks must be constant. Therefore, the condition for a steady state is

$$qn_i = s_i u_i.$$

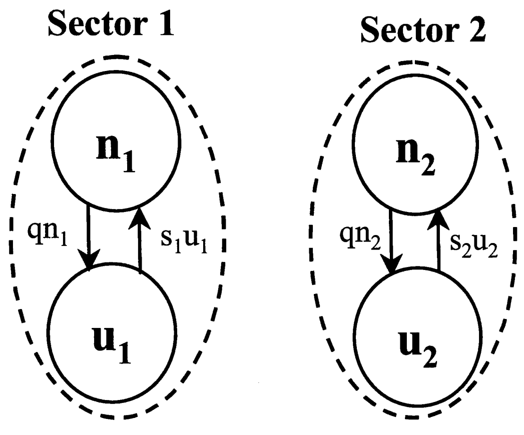

Figure 1: Labour market flows (Benchmark case)

Together with the earlier equations, the steady-state conditions give:

$$s_i = \frac{q}{1 - n'_i} n'_i \,. \tag{10}$$

Taking (10) into account, the wage-setting schedules become

$$w_i = C_1 + C_2 \frac{n'_i}{1 - n'_i}, \tag{11}$$

where $C_1 = b + (q + q' + r)\bar{e}/q' > 0$ and $C_2 = q\bar{e}/q' > 0$. The relationship between the wage and the sectoral employment rate is thus the same in both sectors. Since $dw_i/dn'_i > 0$ and $d^2w_i/dn_i'^2 > 0$, it follows that the wage-setting schedules are increasing and convex functions of the sectoral employment rates.

The four core equations, (8), (9) and (11) (note that (11) represents two equations), determine the four endogenous variables, w_1, w_2, n'_1 and n'_2. The other endogenous variables, n_1, n_2, are derived by substituting the equilibrium sectoral employment rates into (2) and (3). The exogenous variables are the labour-market policy variable, h, the unemployment benefit b, the productivity parameters A_1 and A_2, the other 'technical' parameters $\bar{e}$, q, q', r, α, and the 'scale' variable, F.

Figure 2 illustrates the general-equilibrium solution of the model in the sectoral employment rate-wage plan. The negatively sloped labour-demand curves (LD_1 and LD_2) are given by (8) and (9), while the wage-setting schedules (WS_1 and WS_2) are given by (11).[4] In this diagram, the equilibrium for sector 1 is E_1 and for sector 2, E_2.

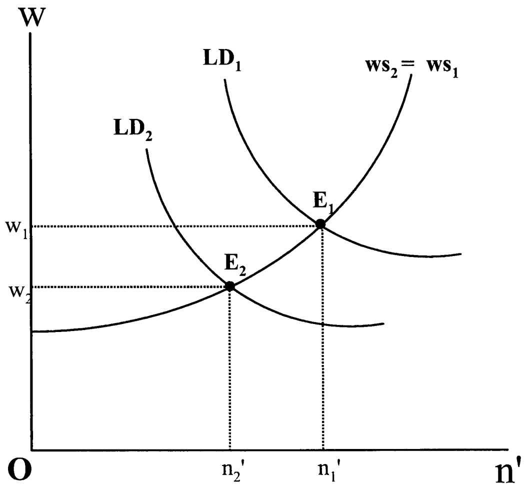

Figure 2: Labour market equilibrium (Benchmark case)

4) As can be seen from (11), the wage-setting schedules in both sectors are the same.

2-5. Comparative statics

I start from an initial equilibrium, where both the sectoral employment rate and the wage are higher in the HP-sector than in the LP-sector, i.e., $w_1 > w_2$ and $n'_1 > n'_2$ (see Figure 2). The aim is to investigate the case when labour is trained and transferred from the LP-sector to the HP-sector through ALMPs, a transfer represented by an increase in parameter h.

2-5-1. The effects on wages, sectoral employment rates, and sectoral employment

The effects on the sectoral employment rates are derived from (8), (9) and (11) as

$$\frac{dn'_1}{dh} = -\frac{(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-2}(n'_1)^{\alpha-1}}{2(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n'_1)^{\alpha-2} + \frac{2C_2}{(1-n'_1)^2}} < 0\,, \tag{12}$$

$$\frac{dn'_2}{dh} = \frac{(1-\alpha)B_2\left(\frac{1-h}{2}\right)^{\alpha-2}(n'_2)^{\alpha-1}}{2(1-\alpha)B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n'_2)^{\alpha-2} + \frac{2C_2}{(1-n'_2)^2}} > 0\,. \tag{13}$$

The terms in the numerators come from the shift in the employment schedules. As can be seen from (11), the wage-setting schedules are not affected by the helicopter labour transfer policy, which only affects wages and the sectoral employment rates in the two sectors through employment schedules. A transfer of labour through ALMPs shifts the employment schedule downwards in the HP-sector (because a larger labour force in the sector means that a given number of employed individuals is associated with a lower sectoral employment rate) and upwards in the LP-sector. This is illustrated in Figure 3. The equilibrium for the HP-sector moves from E_1 to E_1^* and for the LP-sector from E_2 to E_2^*. This '*helicopter effect*' reduces the wage and the sectoral employment rate in the HP-sector and increases the wage and the sectoral employment rate in the LP-sector. The wage reduction in the Hpsector means that employment will increase while the wage increase in the LP-sector means that employment will decrease. More precisely, from (2), (3), (12) and (13), the effects on employment are

$$\frac{dn_1}{dh} = \frac{1}{\frac{2(1-\alpha)}{C_2}B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n'_1)^{\alpha-3}(1-n'_1)^2 + \frac{2}{n'_1}} > 0, \tag{14}$$

$$\frac{dn_2}{dh} = -\frac{1}{\frac{2(1-\alpha)}{C_2}B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n'_2)^{\alpha-3}(1-n'_2)^2 + \frac{2}{n'_2}} < 0, \tag{15}$$

where $B_1 = [(1+h)/2]^{1-\alpha}(n'_1)^{1-\alpha}[C_1 + C_2 n'_1/(1-n'_1)]$ and $B_2 = [(1-h)/2]^{1-\alpha}(n'_2)^{1-\alpha}[C_1 + C_2 n'_2/(1-n'_2)]$.

2-5-2. The effects on aggregate employment

The effect of a transfer of workers through ALMPs on aggregate employment (n) is derived from (14) and (15) as

$$\frac{dn}{dh} = \frac{1}{\dfrac{2C_1(1-\alpha)(1-n'_1)^2}{C_2 n'^2_1} + \dfrac{2(1-\alpha)(1-n'_1)}{n'_1} + \dfrac{2}{n'_1}} - \frac{1}{\dfrac{2C_1(1-\alpha)(1-n'_2)^2}{C_2 n'^2_2} + \dfrac{2(1-\alpha)(1-n'_2)}{n'_2} + \dfrac{2}{n'_2}} . \tag{16}$$

If the sectoral employment rate in sector 1 is higher than that in sector 2, i.e., if $n'_1 > n'_2$, it holds that $0 < 1/n'_1 < 1/n'_2$ and $0 < (1 - n'_1)/n'_1 < (1 - n'_2)/n'_2$.

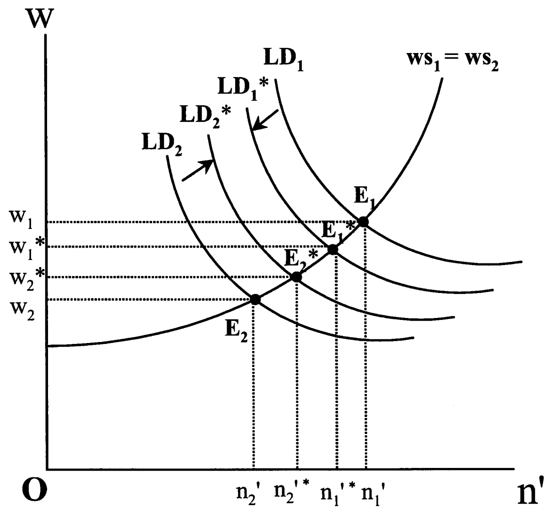

Figure 3: Helicopter effect of ALMPs

Therefore, if $n'_1 > n'_2$, aggregate employment is increased by the helicopter labour transfer policy. As long as the sectoral employment rate differentials are reduced by the policy, aggregate employment is increased by a labour transfer from the LP-sector to the HP-sector.

This positive effect on aggregate employment is due to the characteristics of the wage-setting and the labour demand schedules. Since the wage-setting schedules are upwards-sloping and convex, a given shift in the labour-demand curve has a larger impact on the wage, the higher the wage initially is. Since labour demand is constant-elastic, a given percentage change in the wage has a greater leverage on employment, the higher is initial employment. As a consequence, the increase in employment in the HP-sector is larger than the decrease in employment in the LP-sector.

When the sectoral employment rates are equalised by the policy, i.e., when $n'_1 = n'_2$, the helicopter labour transfer policy cannot increase aggregate employment any further, i.e., $dn/dh = 0$. Moreover, if the policy continues to transfer labour even after the sectoral employment rate has been equalised, this rate becomes higher in sector 2 than in sector 1, i.e., $n'_1 < n'_2$, which means that the policy decreases aggregate employment, i.e., $dn/dh < 0$. Therefore, aggregate employment is maximised when the helicopter labour transfer policy evens out the sectoral employment rate differentials, i.e., when $n'_1 = n'_2$.

The value of h which realises $n'_1 = n'_2$ can be derived from (16) as,

$$h^* = m_1 - m_2 = \frac{1 - \left(\frac{A_1}{A_2}\right)^{-\frac{1}{1-\alpha}}}{1 + \left(\frac{A_1}{A_2}\right)^{-\frac{1}{1-\alpha}}}.$$

Not very surprisingly, the "optimal" amount of labour that should be transferred from the LP-sector to the HP-sector, i.e., $m_1 - m_2$, depends positively on the productivity ratio, A_1/A_2. The more productive is sector 1 relative to sector 2, the larger are the benefits in terms of employment, of using ALMPs to upgrade the skills of unskilled workers.w

3. ALMPs targeting unemployed workers

In the benchmark case, I analysed the e.ects of a one-shot transfer of labour. No account was taken of the fact that the prospect of such a transfer might be built into expectations influencing wage setting. However, this must be the case if ALMPs are used to generate a continuous flow of labour from the LP-sector to the HP-sector.

As Calmfors and Lang (1995) and Calmfors (1995a) have pointed out, ALMPs may reduce regular employment because of an *accommodation effect*. The rational expectation that there is a certain probability of an unemployed worker being placed in a labour-market programme, thereby giving higher utility than open unemployment, may raise wages. I shall investigate the possibility of such an effect in my model by studying a case where only *unemployed* workers in the LP-sector are trained and transferred to the HP-sector, where both the wage and the sectoral employment rate are higher. This case corresponds to the standard type of active labour-market policy practiced in, for example, Sweden.

As a contrast, I shall also analyse ALMPs that instead target *employed* workers in the LP-sector and transfer them to the HP-sector. This type of labour-market policy can be considered as a general growth-oriented policy trying to raise the general level of competence of the labour force.

3-1. The wage-setting schedules

I still postulate a stationary labour force. But now, I assume that individuals leave the labour force ("die") at a rate a and that new individuals enter the labour force at the same rate. I normalise the value of "death" to zero. The discounted values of being employed for non-shirking and shirking workers, respectively, are then:

$$\Omega^{n_j}_{i(t)} = \frac{1}{1+r}\left[w^j_{i(t)} - \bar{e} + q\Omega_{u_i(t+1)} + (1-a-q)\Omega^{n_j}_{i(t+1)}\right], \tag{17}$$

$$\Omega^{s_j}_{i(t)} = \frac{1}{1+r}\left[w^j_{i(t)} + (q+q')\Omega_{u_i(t+1)} + (1-a-q-q')\Omega^{s_j}_{i(t+1)}\right]. \tag{18}$$

As before, since wages are set so as to avoid shirking and I assume a steady state, I can set $\Omega^{n_j}_{i(t)} = \Omega^{n_j}_{i(t+1)} = \Omega^{s_j}_{i(t)} = \Omega^{s_j}_{i(t+1)} = \Omega_i$ and $\Omega_{u_i(t)} = \Omega_{u_i(t+1)} = \Omega_{u_i}$.

An unemployed individual in sector i can find a regular job in the same sector with the endogenously determined probability, s_i. For a job seeker in the LP-sector, there is also the probability of being placed in ALMPs, in which case he/she is transferred to the HP-sector, and becomes a job seeker there in the next period. I denote this exogenous probability, x_u. The transformation of unskilled into skilled workers in ALMPs is assumed to be instantaneous. Thus, I need not care about any instantaneous utility effects of being in an ALMP, since this will only affect welfare by changing the future prospects of participants in the labour market. The probability of a job seeker in the HP-sector remaining a job seeker in this sector also in the next period is $1 - a - s_1$, while the probability of a job seeker in the LP-sector also being a job seeker in this sector in the next period is $1 - a - s_2 - x_u$. The discounted values of being unemployed in sector 1, Ω_{u_1}, and in sector 2, Ω_{u_2}, respectively, are now

$$\Omega_{u_1} = \frac{1}{1+r}[b + s_1\Omega_1 + (1 - a - s_1)\Omega_{u_1}], \tag{19}$$

$$\Omega_{u_2} = \frac{1}{1+r}[b + s_2\Omega_2 + x_u\Omega_{u_1} + (1 - a - s_2 - x_u)\Omega_{u_2}]. \tag{20}$$

Since the participants in ALMPs are instantaneously transferred to sector 1, Ω_{u_1} is also the expected present value of participation in an ALMP. I assume this value to be greater than or equal to the expected present value of being unemployed in the LP-sector, i.e., $\Omega_{u_1} \geq \Omega_{u_2}$. This is an incentive compatibility constraint. From (17) - (20) and the assumption of a steady state, I can derive that $\Omega_{u_1} - \Omega_{u_2} = [(s_1 - s_2)/(\alpha + r + x_u)](\bar{e}/q')$. Thus, the incentive compatibility constraint can be shown to be equivalent to the condition that $s_1 \geq s_2$[5].

Proceeding in the same way as in the benchmark case, I can derive the following two wage equations:

$$w_1 = b + (a + q + q' + r + s_1)\left(\frac{\bar{e}}{q'}\right), \tag{21}$$

$$w_2 = b + (a + q + q' + r + s_2)\left(\frac{\bar{e}}{q'}\right) + \frac{x_u(s_1 - s_2)}{a + r + x_u}\left(\frac{\bar{e}}{q'}\right). \tag{22}$$

Comparing (21) with (7), it is clear that the wage-setting schedule in the HP-sector is basically the same as that in the benchmark case. On the other hand, (22) shows the wage-setting schedule in the LP-sector to include a term corresponding to the benchmark case and a term arising from the chance of being placed in an ALMP. The second term captures the benefit of being moved to the HP-sector. This term tends to increase the wage in the LP-sector when the incentive compatibility constraint is satisfied, i.e., when $s_1 \geq s_2$ since ALMPs reduce the welfare loss of being unemployed in the LP-sector.

5) The above incentive compatibility constraint needs to be fulfilled only if participation in the training programme is *voluntary* and unemployed workers would continue to receive their unemployment benefits even if they turned down the offer to participate. In the case of Sweden, the refusal to participate in an ALMP would mean a loss of the benefit entitlement and in that case, the incentive compatibility constraint becomes much weaker.

3-2. The steady-state conditions

The model is summarised in Figure 4, which shows the various stocks and flows in the labour market. The new entrants, a, must pass through the pool of job seekers before they can find a job. A fraction x_a is assumed to enter the labour force with high skills and go into the HP-sector. A fraction $1 - x_a$ is assumed to enter with low skills and flow into the LP-sector. In each period, individuals leave the labour force at the rate a. The share of the total labour force passing through ALMPs in each period is l. Participants consist of unemployed workers from the LP-sector.

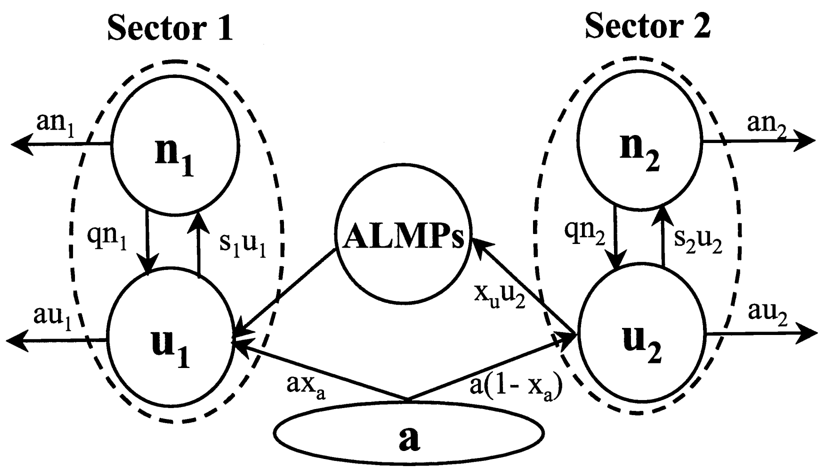

Figure 4: Labour market flows (ALMPs for the unemployed)

Since all stocks must be constant in a steady state, the conditions for such a steady state are

$$(a+q)n_i = s_i u_i, \tag{23}$$

$$l = x_u u_2, \tag{24}$$

$$(a+s_1)u_1 = l + qn_1 + x_a a, \tag{25}$$

$$(a+s_2+x_u)u_2 = qn_2 + (1-x_a)a. \tag{26}$$

Equation (23) is the condition for constant employment in sector i. TheLHS of (23) is the outflow from employment and the RHS of (23) the inflow into employment. Equation (24) gives the participation in ALMPs (the number of unemployed workers selected from the LP-sector). Equations (25) and (26) are the conditions for constant unemployment in the HP- and the LP-sector, respectively. The LHS of (25) and (26) are outflows fromunemployment and the RHS of these equations are the inflows into unemployment in the respective sectors.

Since $n'_i = n_i/m_i$ and $1 - n'_i = u_i/m_i$, it follows from (23) that the probabilities of getting a job in the two sectors are

$$s_i = (a+q)\frac{n'_i}{1-n'_i}. \tag{27}$$

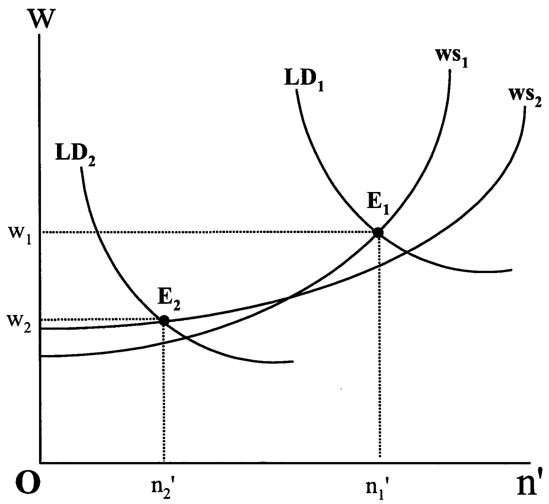

Figure 5: Labour market equilibrium (ALMPs for the unemployed)

Next, from D, (23), (24), (25) and (26), h satisfies

$$h = \frac{-2x_u n_2 + x_u + a(2x_a - 1)}{(a + x_u)}. \tag{28}$$

Substituting (27) into (21), the wage-setting schedule in the HP-sector becomes

$$w_1 = C_3 + C_4 \frac{n'_1}{1 - n'_1}, \tag{29}$$

where $C_3 = b + (a + q + q' + r)\bar{e}/q' > 0$ and $C_4 = (a + q)\bar{e}/q' > 0$.

Di.erentiating (29) w.r.t. n'_1 gives

$$\frac{dw_1}{dn'_1} = \frac{C_4}{(1 - n'_1)^2} > 0 \text{ and } \frac{d^2 w_1}{dn'^2_1} = \frac{2C_4}{(1 - n'_1)^3} > 0\,. \tag{30}$$

Hence, the wage-setting schedule in the HP-sector is upwards-sloping and convex.

Substituting (27) into (22), the wage-setting schedule in the LP-sector can be written as

$$w_2 = w_{2_B} + P_u, \tag{31}$$

where $w_{2_B} = (C_3 + C_4 n'_2)/(1 - n'_2)$ and

$$P_u = C_4 \frac{x_u}{a + r + x_u}\left(\frac{n'_2}{1 - n'_2} - \frac{n'_2}{1 - n'_2}\right)\left(\frac{\bar{e}}{q'}\right) \geq 0\,.$$

The wage in the LP-sector is equal to a term corresponding to the benchmark case (w_{2_B}) and a term arising due to the chance of being placed in an ALMP (P_u). P_u reflects the value of being moved to the HP-sector. It can easily be seen that $P_u \geq 0$ if the sectoral employment rate in the HP-sector is greater than or equal to that in the LP-sector, i.e., if $n'_1 \geq n'_2$ as assumed. The reason is that the chance of obtaining a job is then greater in the HP-sector than in the LP-sector, which tends to create a wage differential.

Differentiating (31) w.r.t. n'_2, I obtain

$$\frac{dw_2}{dn'_2} = \left(\frac{a+r}{a+r+x_u}\right)\left[\frac{C_4}{(1-n'_2)^2}\right] > 0 \text{ and } \frac{d^2 w_2}{dn'^2_2} = \left(\frac{a+r}{a+r+x_u}\right)\left[\frac{2C_4}{(1-n'_2)^3}\right] > 0 . \tag{32}$$

Hence, the wage-setting schedule in the LP-sector is also upwards-sloping and convex.

From (29), (30), (31) and (32), I can draw the wage-setting curves as in Figure 5 (WS_1 and WS_{2_u}). In this diagram, the equilibrium for sector 1 is E_1 and for sector 2, E_{2_u}. It can be seen that $w_1 = w_2$ when $n'_1 = n'_2$, but that the slope of the wage-setting curve is steeper in the HP- than in the LP-sector.

The four core equations, (8), (9), (29) and (31), determine the four endogenous variables, w_1, w_2, n'_1 and n'_2. The other endogenous variables, n'_1, n'_2, are derived by substituting the equilibrium sectoral employment rates into (2) and (3). The exogenous variables are the labour-market policy variable, x_u, the unemployment benefit b, the productivity parameters A_1 and A_2, the other 'technical' parameters a, $\bar{e}$, q, q', r, x_a, α and the 'scale' variable, F.

3-3. Comparative statics

In this section, I investigate the e.ects of a change in the probability of participation in ALMPs. As before, I start from an initial equilibrium where both the sectoral employment rate and the wage are higher in the HP-sector than in the LP-sector. This is equivalent to assuming that the chance of getting a job is greater in the Hpsector than in the LP-sector, i.e., that $s_1 > s_2$. The change in ALMPs is represented by a change in x_u.

3-3-1. The effects on wages, the sectoral employment rate, and sectoral employment

The effects on the sectoral employment rates are derived from (8), (9), (29) and (31) as

$$\frac{dn'_1}{dx_u} = -\frac{(1-\alpha)B_3\left(\frac{1+h}{2}\right)^{\alpha-2}(n'_1)^{\alpha-1}\frac{dh}{dx_u}}{2(1-\alpha)B_3\left(\frac{1+h}{2}\right)^{\alpha-1}(n'_1)^{\alpha-2} + \frac{2C_4}{(1-n'_1)^2}} , \tag{33}$$

$$\frac{dn'_2}{dx_u} = \frac{(1-\alpha)B_4\left(\frac{1-h}{2}\right)^{\alpha-2}(n'_2)^{\alpha-1}\frac{dh}{dx_u} - 2\left(\frac{\partial P_u}{\partial x_u} + \frac{\partial P_u}{\partial n'_1}\frac{\partial n'_1}{\partial x_u}\right)}{2(1-\alpha)B_4\left(\frac{1-h}{2}\right)^{\alpha-1}(n'_2)^{\alpha-2} + \frac{2C_4(a+r)}{(a+r+x_u)(1-n'_2)^2}} , \tag{34}$$

where

$$\frac{\partial P_u}{\partial x_u} = \frac{(a+q)(a+r)}{(a+r+x_u)^2}\left(\frac{n'_1}{1-n'_1} - \frac{n'_2}{1-n'_2}\right)\left(\frac{\bar{e}}{q'}\right) \geq 0 , \tag{35}$$

$$\frac{\partial P_u}{\partial n'_1}\frac{\partial n'_1}{\partial x_u} = \left[\frac{x_u C_4}{(a+r+x_u)(1-n'_1)^2}\right]\frac{\partial n'_1}{\partial x_u} . \tag{36}$$

From (2), (3), (33) and (34), the effects on employment are

$$\frac{dn_1}{dx_u} = \frac{\dfrac{dh}{dx_u}}{\dfrac{2(1-\alpha)}{C_4}B_3\dfrac{(1+h)^{\alpha-1}}{2}(n'_1)^{\alpha-3}(1-n'_1)^2+\dfrac{2}{n'_1}}, \tag{37}$$

$$\frac{dn_2}{dx_u} = -\frac{\dfrac{dh}{dx_u}+\left(\dfrac{a+r+x_u}{a+r}\right)\dfrac{(1-h)(1-n'_2)^2}{C_4n'_2}\left(\dfrac{\partial P_u}{\partial x_u}+\dfrac{\partial P_u}{\partial n'_1}\dfrac{\partial n'_1}{\partial x_u}\right)}{\left(\dfrac{a+r+x_u}{a+r}\right)\dfrac{2(1-\alpha)}{C_4}B_4\left(\dfrac{1-h}{2}\right)^{\alpha-1}(n'_2)^{\alpha-3}(1-n'_2)^2+\dfrac{2}{n'_2}}, \tag{38}$$

where $B_3 = [(1 + h)/2]^{1-\alpha}(n'_1)^{1-\alpha}[C_3 + C_4n'_1/(1 - n'_1)]$ and $B_4 = [(1 - h)/2]^{1-\alpha}(n'_2)^{1-\alpha}[C_3 + C_4n'_2/(1 - n'_2) + P_u]$.

Since $dh/dx_u > 0$[6], equation (33) shows the sectoral employment rate in the HP-sector to be decreased by the policy. Hence, the wage is reduced in this sector. Equations (37) show that there is a positive effect of an increase in x_u on employment in the HP-sector, due to the same helicopter effect as in the benchmark case.

I now turn to the effects on the wage, the sectoral employment rate and employment in the LP-sector. Equation (34) shows the effect on the sectoral employment rate in the LP-sector. The first term in the numerator comes from the shift of the employment schedule in the LP-sector. An expansion of ALMPs shifts the employment schedule upwards. This is the same helicopter effect as in the benchmark case, which tends to increase the wage and the sectoral employment rate in the LP-sector. Employment in this sector tends to fall due to the helicopter effect.

The second term, i.e., $\partial P_u/\partial x_u$, and the third term, i.e., $(\partial P_u/\partial n'_1)$ $(\partial n'_1/\partial x_u)$, in the numerator are due to the shift in the wage-setting schedule in the LP-sector. The second term is a direct effect of ALMPs. The welfare loss from being unemployed in the LP-sector is reduced because the probability of moving to the HP-sector, where the chance of getting a job is greater than in the LP-sector, is increased. This is an *accommodation effect*, which tends to raise the wage and reduce employment in the LP-sector. It also tends to shift the wage-setting schedule in the LP-sector upwards.

The third term is an indirect effect of ALMPs via the sectoral employment rate in the HP-sector. Taking (33) and $dh/dx_u > 0$ into account, this term tends to increase sectoral employment and reduce the wage in the LP-sector. For an individual worker who is transferred, the chance of getting a job in the HP-sector decreases, i.e., $\partial n'_1/\partial x_u < 0$, which means that labour-market tightness in the HP-sector becomes relatively smaller. This reduces the benefit of being transferred to the HP-sector and thus, increases the welfare loss for a worker of being fired, which gives employers in the LP-sector an incentive to reduce the wage. I shall label this a *wage-reducing relative labour-market tightness effect*, which tends to shift the wage-setting schedule downwards in the LP-sector.

To sum up, the helicopter effect and the wage-reducing relative labour-market tightness effect tend to increase the sectoral employment rate in the LP-sector, which the accommodation effect tends to decrease. The net impact on the sectoral employment rate in the LP-sector depends on the relative magnitude of these three effects and is in general ambiguous.

6) See the Appendix.

The effect on employment in the LP-sector can be seen from (38). For the same reason, the net effect on employment in this sector is also, in general, ambiguous, as in the case of the sectoral employment rate. But in an initial equilibrium, where there are no ALMPs, i.e., when $x_u = 0$, it follows from (36) that the relative labour-tightness effect is zero. The incentive for unskilled workers to shirk is unaffected by the deteriorated labour market conditions for skilled workers. Hence, in this case, the wage-setting schedule must shift upwards due to the accommodation effect. Employment must then decrease in the LP-sector, since both the wage-setting schedule and the labour-demand curve are shifted upwards. Both effects tend to raise the wage in the LP-sector and thus, reduce sectoral employment.

3-3-2. The effect on aggregate employment

The effect on aggregate employment (n) is derived from (37) and (38) as

$$\frac{dn}{dx_u} = \left[\frac{1}{\dfrac{2C_3(1-\alpha)(1-n'_1)^2}{C_4 n'^2_1} + \dfrac{2(1-\alpha)(1-n'_1)}{n'_1} + \dfrac{2}{n'_1}} - \frac{1}{\left(\dfrac{a+r+x_u}{a+r}\right)\left[\dfrac{2C_3(1-\alpha)(1-n'_2)^2}{C_4 n'^2_2} + \dfrac{2(1-\alpha)(1-n'_2)}{n'_2} + \dfrac{2(1-\alpha)(1-n'_2)^2}{C_4 n'^2_2} Pu\right] + \dfrac{2}{n'_2}}\right]\frac{dh}{dx_u}$$

$$-\Psi_u \frac{(a+r)}{(a+r+x_u)^2}\left(\frac{n'_1}{1-n'_1} - \frac{n'_2}{1-n'_2}\right)\left(\frac{\bar{e}}{q'}\right)$$

$$-\Psi_u \left(\frac{x_u C_4}{(a+r+x_u)(1-n'_1)^2}\right)\left(\frac{dn'_1}{dx_u}\right), \tag{39}$$

where

$$\Psi_u = \frac{1}{(1-\alpha)B_4\left(\dfrac{1-h}{2}\right)^{\alpha-2}(n'_2)^{\alpha-2} + \left(\dfrac{a+r}{a+r+x_u}\right)\dfrac{2C_4}{(1-h)(1-n'_2)^2}} > 0 .$$

The first term in the RHS represents the helicopter effect. If the sectoral employment rate is higher in the HP-sector than in the LP-sector, i.e., if $n'_1 > n'_2$, the helicopter effect tends to increase aggregate employment. The second term represents the accommodation effect and the third term the relative labour-market tightness effect. The accommodation effect tends to decrease aggregate employment, while the relative labour-tightness effect tends to increase it. Since the net effect on aggregate employment depends on the relative magnitude of these three e.ects, the net effect is, in general, ambiguous.

In an initial equilibrium, with no ALMPs, i.e., when $x_u = 0$, the relative-tightness effect is zero. The net effect on aggregate employment then depends on the relative magnitude of the helicopter and the accommodation effect, respectively. When $n'_1 = n'_2$, which implies that $s_1 = s_2$, the helicopter effect is still positive. Since the wage-setting schedule is flatter in the LP-sector than in the HP-sector, the decrease in the wage in the HP-sector is larger than the increase in the wage in the LPsector, when there is a shift in the employment schedules. Hence, the helicopter effect tends to increase aggregate employment, even if the sectoral employment rates are equalised. The accommodation effect is zero, because $s_1 = s_2$ implies that there is no gain from being transferred to the HP-sector. The relative labour-market tightness effect is positive. An increase in the probability of participating in ALMPs must thus, at this point, increase aggregate employment i.e., $dn/dx_u > 0$.

4. ALMPs targeting employed workers

Calmfors (1995a, 1996) has pointed out that ALMPs targeting employed workers could be more promising in terms of decreasing aggregate unemployment than ALMPs targeting unemployed workers, since the former have no accommodation effect that tends to decrease employment in the LP-sector. On the contrary, such ALMPs increase the value of employment and hence, ought to promote wage restraint.

Going outside the model, it is also conceivable that a general growth-oriented policy would focus on training employed rather than unemployed workers, since this may be considered more effective. Employed workers may originally have been hired because it was judged that on-the-job training would raise their productivity more than would be the case for other job candidates. ALMPs targeting employed workers represent a policy designed to increase the general competence in the economy.

In the following section, I shall investigate this possibility in my model, by considering a case where only *employed* workers in the LP-sector are transferred to the HP-sector.

4-1. The wage-setting schedules

Thus, I now assume that only employed workers in the LP-sector are admitted into ALMPs. A fraction, x_n, of unskilled employed workers is immediately placed in ALMPs. The present values of employment for non-shirking and shirking workers, respectively, in the HP-sector are the same as in the case of targeting the unemployed, i.e., (17) and (18). The present values of employment in the LP-sector are now

$$\Omega^{n_j}_{2(t)} = \frac{1}{1+r}\begin{bmatrix} w^j_{2(t)} - \bar{e} + x_n\Omega_{u_1(t+1)} + q\Omega_{u_2(t+1)} \\ +(1-a-q-x_n)\Omega^{n_j}_{2(t+1)} \end{bmatrix}, \tag{40}$$

$$\Omega^{s_j}_{2(t)} = \frac{1}{1+r}\begin{bmatrix} w^j_{2(t)} + x_n\Omega_{u_1(t+1)} + (q+q')\Omega_{u_2(t+1)} \\ +(1-a-q-q'-x_n)\Omega^{s_j}_{2(t+1)} \end{bmatrix}. \tag{41}$$

As before, the transformation of unskilled into skilled workers in ALMPs is instantaneous. Therefore, $\Omega_{u_1(t)}$ is the expected present value of participating in ALMPs at time t. As previously assumed, wages are set so as to avoid shirking and the economy is in a steady state. Thus, I can set $\Omega^{n_j}_{i(t)} = \Omega^{n_j}_{i(t+1)} = \Omega^{s_j}_{i(t)} = \Omega^{s_j}_{i(t+1)} = \Omega_i$ and $\Omega_{u_i(t)} = \Omega_{u_i(t+1)} = \Omega_{u_i}$.

An unemployed individual in sector i can find a regular job in the same sector with the endogenously determined probability s_i. Hence, the probability of a job seeker in sector i remaining a job seeker in this sector also in the next period is $1 - a - s_i$. The present values of being unemployed in sector i, Ω_{u_i}, are

$$\Omega_{u_i} = \frac{1}{1+r}[b + s_i\Omega_i + (1-a-s_i)\Omega_{u_i}]. \tag{42}$$

I once more impose an incentive compatibility constraint. If employed workers in the LP-sector are to participate in training programmes, it must hold that the expected present value of participation in an ALMP is greater than or equal to the expected present value of being employed in the LP-sector, i.e., $\Omega_{u_1} \geq \Omega_2$. From (17), (18), (40), (41) and (42) and the assumption of a steady state, I can derive that $\Omega_{u_1} - \Omega_2 = [(s_1 - a - r - s_2)/(a + r)](\bar{e}/q')$. Thus, the incentive compatibility constraint can be shown to be equivalent to the condition that $s_1 \geq a + r + s_2$. It is not enough that $s_1 \geq s_2$, rather s_1 must be sufficiently larger, so this is a stricter condition than $n_1 \geq n_2$. The explanation is that when setting wages, employers must compare the value for a worker of being employed in the LP-sector and the value of being unemployed (after having completed an ALMP) in the HP-sector. Therefore, the chance for an unemployed person of getting a job in the HP-sector must be "much" larger than the chance for an unemployed individual of getting a job in the LP-sector (as there is only a certain probability in each period of an employed worker turning into an unemployed job seeker), if there is to be a gain for an employed worker in the LP-sector from being transferred to the HP-sector.

I use (17), (18), (40), (41) and (42) to derive wage equations in the same way as before. The wage-setting schedule in the HP-sector turns out the same as (29). The wage-setting schedule in the LP-sector is

$$w_2 = b + (a + q + q' + r + s_2)\left(\frac{\bar{e}}{q'}\right) - \frac{x_n(s_1 - a - r - s_2)}{a + r}\left(\frac{\bar{e}}{q'}\right). \tag{43}$$

Similar to (31), the wage-setting schedule in the LP-sector is equal to a term corresponding to the benchmark case and a term reflecting the value of being moved to the HP-sector through ALMPs. The latter term tends to reduce the wage, since the chance of being placed in an ALMP when employed in this case represents an additional reward for not shirking. This means that there is less need for the employer to set a high wage to create an incentive not to shirk.

4-2. The steady-state conditions

The model is summarised in Figure 6. Participants in ALMPs now consist of unskilled employed workers. The steady-state conditions are

$$(a + q)n_1 = s_1 u_1, \tag{44}$$

$$(a + q + x_n)n_2 = s_2 u_2, \tag{45}$$

$$l = x_n n_2, \tag{46}$$

$$(a + s_1)u_1 = l + qn_1 + x_a a, \tag{47}$$

$$(a + s_2)u_2 = qn_2 + (1 - x_a)a. \tag{48}$$

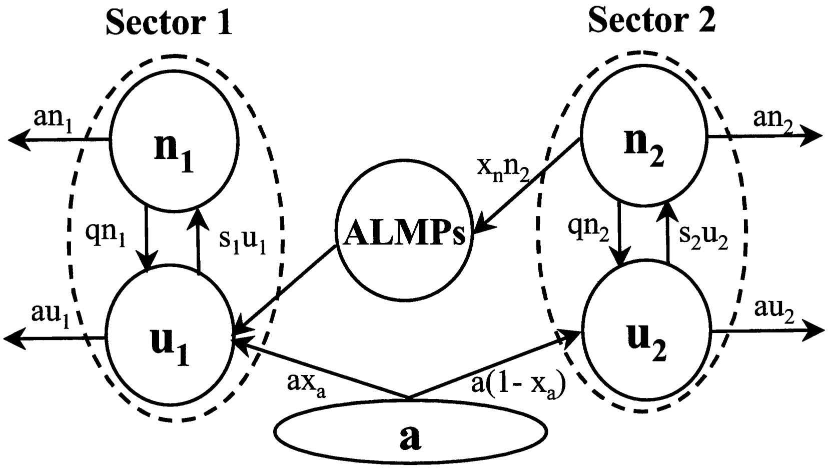

Figure 6: Labour market flows (ALMPs for the employed)

Equations (44) and (45) are the conditions for constant employment in the HP-sector and the LP-sector, respectively. The LHS in both equations are the outflows from employment and the RHS the inflows into employment. The term $x_n n_2$ in (45) and (46) gives the participation in ALMPs. Equations (47) and (48) are the conditions for constant unemployment in the HP-sector and the LP-sector, respectively. The LHS in (47) and (48) are outflows from unemployment and the RHS of these equations are inflows into unemployment.

Since $n'_i = n_i/m_i$ and $1 - n'_i = u_i/m_i$, it follows from (44) and (45) that the probabilities of getting a job in the two sectors are

$$s_1 = (a+q)\frac{n'_1}{1-n'_1}, \tag{49}$$

$$s_2 = (a+q+x_n)\frac{n'_2}{1-n'_2}. \tag{50}$$

From (1), (44), (45), (46), (47) and (48), h satisfies

$$h = \frac{2x_n n_2 + a(2x_a - 1)}{a}. \tag{51}$$

As I discussed in Section 4.1, the wage-setting schedule in the HP-sector is the same as when ALMPs targeted the unemployed and it is thus upward-sloping and convex. From (43) and (50), the wage-setting schedule in the LP-sector is

$$w_2 = w_{2_B} + P_n, \tag{52}$$

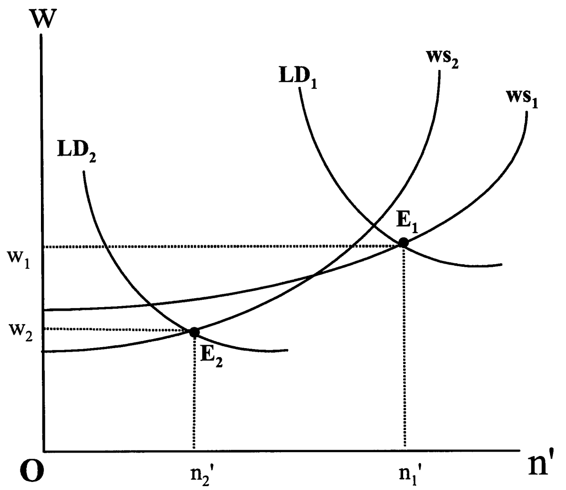

Figure 7: Labour market equilibrium (ALMPs for the employed)

where $w_{2_B} = C_3 + C_4 n'_2 / (1 - n'_2)$ and

$$P_n = \left[x_n - \left(\frac{x_n}{a+r}\right)s_1 + \left(\frac{a+r+x_n}{a+r}\right)s_2 - (a+q)\frac{n'_2}{1-n'_2}\right]\left(\frac{\bar{e}}{q'}\right). \tag{53}$$

The term w_{2_B} is the same as when ALMPs are targeted on unemployed workers. The term P_n reflects the value of being placed in ALMPs. The chance of being placed in ALMPs for employed workers (x_n) affects the term P_n via two channels. The first channel is a direct one, which is represented by the term x_n in the RHS of (53). It can easily be seen from (53) that $\partial P_n/\partial x_n \le 0$, since the incentive compatibility constraint, i.e. $s_1 \ge a + r + s_2$, is assumed to be fulfilled. The first channel tends to reduce the wage in the LP-sector. As I explained before, this is because the chance of being placed in an ALMP when employed represents an additional reward for not shirking, which means that there is less need for the employer to set a high wage to create an incentive not to shirk. The second channel is an indirect one, which affects P_n through the probability of finding a job in the LP-sector (s_2). As can be seen from (50), the chance of moving into the HP-sector when employed increases the probability for unemployed workers in the LP-sector of getting a job. This tends to raise the wage in the LP-sector, since a rise in s_2 reduces the welfare loss of being unemployed in the LP-sector, which tends to raise the wage.

Differentiating (52) w.r.t. n'_2 gives

$$\frac{dw_2}{dn'_2} = \left(\frac{a+r+x_n}{a+r}\right)\left(\frac{a+q+x_n}{a+q}\right)\left[\frac{C_4}{(1-n'_2)^2}\right] > 0, \tag{54}$$

$$\frac{d^2 w_2}{dn'^2_2} = \left(\frac{a+r+x_n}{a+r}\right)\left(\frac{a+q+x_n}{a+q}\right)\left[\frac{2C_4}{(1-n'_2)^3}\right] > 0. \tag{55}$$

Hence, the wage-setting schedule in the LP-sector is also upward-sloping and convex.

From (29), (30), (52), (54) and (55), I can draw the wage-setting curves as in Figure 7 (WS_1 and WS_{2_n}). In this diagram, the equilibrium for sector 1 is E_1 and for sector 2, E_{2_n}. It can be seen that

$w_1 = w_2$ when $n'_1 = n'_2$, but that the slope of the wage-setting curve is steeper in the LP-sector than in the HP-sector.

The four core equations, (8), (9), (29) and (52), determine the four endogenous variables, w_1, w_2, n'_1 and n'_2. The other endogenous variables, n_1, n_2, are derived by substituting the equilibrium sectoral employment rates into (2) and (3).

4-3. Comparative statics

I now examine the effect of a change in the chance of being placed in ALMPs for an employed worker, i.e., a change in x_n.

4-3-1. The effects on wages, the sectoral employment rate, and sectoral employment

The effect on the sectoral employment rates are derived from (8), (9), (29), and (52) as

$$\frac{dn'_1}{dx_n} = -\frac{(1-\alpha)B_3\left(\frac{1+h}{2}\right)^{\alpha-2}(n'_1)^{\alpha-1}\frac{dh}{dx_n}}{2(1-\alpha)B_3\left(\frac{1+h}{2}\right)^{\alpha-1}(n'_1)^{\alpha-2}+\frac{2C_4}{(1-n'_1)^2}}, \tag{56}$$

$$\frac{dn'_2}{dx_n} = -\frac{\frac{1-\alpha}{2}B_5\left(\frac{1-h}{2}\right)^{\alpha-2}(n'_2)^{\alpha-1}\frac{dh}{dx_n}-\left(\frac{\partial P_n}{\partial x_n}+\frac{\partial P_n}{\partial s_2}\frac{\partial s_2}{\partial x_n}+\frac{\partial P_n}{\partial n'_1}\frac{\partial n'_1}{\partial x_n}\right)}{(1-\alpha)B_5\left(\frac{1-h}{2}\right)^{\alpha-1}(n'_2)^{\alpha-2}+\left(\frac{a+r+x_n}{a+r}\right)\left(\frac{a+q+x_n}{a+q}\right)\frac{C_4}{(1-n'_1)^2}}, \tag{57}$$

where

$$\frac{\partial P_n}{\partial x_n} = -\left[\frac{(a+q)\left(\frac{n_1'}{1-n'_1}\right)-(a+q+x_n)\left(\frac{n'_2}{1-n'_2}\right)}{a+r}-1\right]\left(\frac{\bar{e}}{q'}\right) \le 0, \tag{58}$$

$$\frac{\partial P_n}{\partial s_2}\frac{\partial s_2}{\partial x_n} = -\left(\frac{a+r+x_n}{a+r}\right)\left(\frac{n'_2}{1-n'_2}\right)\left(\frac{\bar{e}}{q'}\right) > 0, \tag{59}$$

$$\frac{\partial P_n}{\partial n'_1}\frac{\partial n'_1}{\partial x_n} = -\left[\frac{x_n(a+q)}{(a+r)(1-n'_1)^2}\left(\frac{\bar{e}}{q'}\right)\right]\frac{dn'_1}{dx_n}. \tag{60}$$

From (2), (3), (56) and (57), the effects on employment are

$$\frac{dn_1}{dx_n} = \frac{\frac{dh}{dx_n}}{\frac{2(1-\alpha)}{C_4}B_3\left(\frac{1+h}{2}\right)^{\alpha-1}(n'_1)^{\alpha-3}(1-n'_1)^2+\frac{2}{n'_1}}, \tag{61}$$

$$\frac{dn_2}{dx_n} = -\frac{\dfrac{dh}{dx_n} + \left(\dfrac{a+r}{a+r+x_n}\right)\left(\dfrac{a+q}{a+q+x_n}\right)\dfrac{(1-h)(1-n'_2)^2}{C_4 n'_2}\left(\dfrac{\partial P_n}{\partial x_n} + \dfrac{\partial P_n}{\partial s_2}\dfrac{\partial s_2}{\partial x_n} + \dfrac{\partial P_n}{\partial n'_1}\dfrac{\partial n'_1}{\partial x_n}\right)}{\left(\dfrac{a+r}{a+r+x_n}\right)\left(\dfrac{a+q}{a+q+x_n}\right)\dfrac{2(1-\alpha)}{C_4}B_5\left(\dfrac{1-h}{2}\right)^{\alpha-1}(n'_2)^{\alpha-3}(1-n'_2)^2 + \dfrac{2}{n'_2}}, \tag{62}$$

where $B_3 = [(1+h)/2]^{1-\alpha}(n'_1)^{1-\alpha}[C_3 + C_4 n'_1/(1-n'_1)]$ and $B_5 = [(1-h)/2]^{1-\alpha}(n'_2)^{1-\alpha}[C_3 + C_4 n'_2/(1 - n'_2) + P_n]$.

Since $dh/dx_n > 0$[7] , the labour-demand schedule is shifted downwards in sector 1 and upwards in sector 2. Equation (56) shows the sectoral employment rate to be decreased and thus, the wage in the HP-sector is reduced by the policy. Hence, there is a positive effect on employment in the HP-sector, as shown by (61), which is the same helicopter effect seen before.

The impact on the sectoral employment rate in the LP-sector (n'_2) can be seen from (57). The first term in the numerator is due to the upward shift in the employment schedule in the LP-sector due to an expansion of ALMPs, the same helicopter effect as before. It tends to increase the wage and the sectoral employment rate in the LP-sector and employment in this sector thus tends to fall.

The terms in parentheses in the numerator, i.e., $\partial P_n/\partial x_n$, $(\partial P_n/\partial s_2)$ $(\partial s_2/\partial x_n)$, and $(\partial P_n/\partial n'_1)$ $(\partial n'_1/\partial x_n)$, come from the shift in the wage-setting schedule. The first term in parentheses is a direct effect of ALMPs and tends to shift the wage-setting schedule downwards. The wage in the LP-sector tends to fall, because its workers have a stronger incentive not to shirk in order to remain employed, if this gives them a chance of moving to the HP-sector. I shall label this effect a *promotion-wish effect*, which is the opposite of the earlier accommodation effect.

The second term in parentheses is an indirect effect of ALMPs through the probability of getting a job in the LP-sector (s_2). Since a rise in x_n implies that more employed workers in the LP-sector leave their jobs, the number of job slots in this sector increases in each period. Thus, the probability for the unemployed of getting a job in the LP-sector at a given sectoral employment rate tends to increase, which reduces the welfare loss of being unemployed in the LP-sector. Hence, employers need to pay a higher wage to discourage shirking. This is an *indirect accommodation effect*, which tends to raise the wage and reduce employment in the LP-sector. This effect only occurs when ALMPs target employed workers, since the probability of getting a job in the LP-sector is not affected by ALMPs, when targeting the unemployed.

The third term in parentheses is an indirect effect of ALMPs via the sectoral employment rate in the HP-sector (n'_1), as in the case of targeting the unemployed. As can be seen from (56), an increase in the probability of participating in ALMPs decreases the sectoral employment rate in the HP-sector. This means a reduction in the probability of getting a job in the HP-sector and weakens the incentive for employed workers in the LP-sector not to shirk in order to preserve the chance of being transferred. As a result, employers raise the wage in the LP-sector. ALMPs targeting employed workers in the LP-sector thus have a *wage-raising relative labourmarket tightness effect* as opposed to a wage-reducing e.ect when ALMPs target the unemployed.

7) See the Appendix.

To sum up, on the one hand, the helicopter effect and the promotion-wish effect tend to increase the sectoral employment rate in the LP-sector. On the other hand, the indirect accommodation effect and the wage-raising relative labour-market tightness effect tend to decrease the sectoral employment rate in the LP-sector. The net impact on the sectoral employment rate in the LP-sector depends on the relative magnitude of these four effects and is, in general, ambiguous. But in an initial equilibrium, with no ALMPs, i.e., when $x_n = 0$, it follows from (60) that the relative labour-tightness effect is zero. The incentive for unskilled workers to shirk is unaffected by the worsened labour market conditions for skilled workers. Moreover, if the sectoral employment rate (n'_i) is su.ciently larger in the HP-sector than in the LP-sector, the promotion-wish effect dominates the indirect accommodation effect, and the wage-setting curve may then shift downwards. If so, the initial impact of introducing ALMPs on the sectoral employment rate in this sector may be positive.

The e.ect on employment in the LP-sector can be seen from (62). For the same reason as in the case of the effect on the sectoral employment rate, the net effect on employment in this sector is also in general ambiguous.

4-3-2. The e.ects on aggregate employment

The effect on aggregate employment (n) is derived from (61) and (62) as

$$\frac{dn}{dx_n}=\left[\frac{1}{\frac{2C_3(1-\alpha)(1-n'_1)^2}{C_4 n'^2_1}+\frac{2(1-\alpha)(1-n'_1)}{n'_1}+\frac{2}{n'_1}} - \frac{1}{\left(\frac{a+r}{a+r+x_n}\right)\left(\frac{a+q}{a+q+x_n}\right)\left[\frac{2C_3(1-\alpha)(1-n'_2)^2}{C_4 n'^2_2}+\left(\frac{a+q+x_n}{a+q}\right)\frac{2(1-\alpha)(1-n'_2)}{n'_2}+\frac{2(1-\alpha)(1-n'_2)^2}{C_4 n'^2_2}Pn\right]+\frac{2}{n'_2}}\right]\frac{dh}{dx_n}$$

$$+\Psi_n\left[\left(\frac{a+q}{a+r}\right)\frac{n'_1}{1-n'_1}-\left(\frac{a+q+x_n}{a+r}\right)\frac{n'_2}{1-n'_2}-1\right]\left(\frac{\bar{e}}{q'}\right)$$

$$-\Psi_n\left(\frac{a+r+x_n}{a+r}\right)\left(\frac{n'_2}{1-n'_2}\right)\left(\frac{\bar{e}}{q'}\right)$$

$$+\Psi_n\left[\frac{x_n C_4}{(a+r)(1-n'_1)^2}\right]\frac{dn'_1}{dx_n}, \tag{63}$$

where

$$\Psi_n=\frac{1}{(1-\alpha)B_5\left(\frac{1-h}{2}\right)^{\alpha-2}(n'_2)^{\alpha-2}+\left(\frac{a+r+x_n}{a+r}\right)\left(\frac{a+q+x_n}{a+q}\right)\frac{2C_4}{(1-h)(1-n'_1)^2}}>0.$$

The first term represents the helicopter effect on aggregate employment. In the earlier cases, the helicopter effect increased aggregate employment when $n'_1 > n'_2$, but in this case, the assumption is not sufficient for this effect to increase employment. If the wage-setting schedule is much steeper in the LP-sector than in the HP-sector, i.e., if x_n is very large, the reduction in employment in the LP-sector is larger than the increase in employment in the HP-sector. The second term is the promotion-wish effect, which tends to increase aggregate employment. The third term represents the indirect accommodation effect, which tends to decrease aggregate employment. The fourth term is the relative labour-market tightness effect, which tends to decrease aggregate employment. Since these four effects work in different directions, the net effect of ALMPs on aggregate employment is, in general, ambiguous.

In an initial equilibrium, with no ALMPs, i.e., when $x_n = 0$, the helicopter effect tends to increase aggregate employment, since P_n is positive. The promotion-wish effect also tends to increase aggregate employment, while the indirect accommodation effect tends to decrease aggregate employment. The relative labour-market tightness effect, which tends to decrease aggregate employment, is zero. If the sectoral employment rate is sufficiently larger in the HP-sector than in the LP-sector, the promotion-wish effect will dominate the indirect accommodation e.ect. Thus, ALMPs targeting the employed will initially increase aggregate employment if n'_1 is sufficiently larger than n'_2.

As can be seen from (39) and (63), in general, it is difficult to evaluate whether targeting ALMPs at the employed has more favorable employment effects than targeting the unemployed, a result in contrast with the result in Calmfors (1995a). He concluded that ALMPs targeting employed workers is likely to be a better policy than ALMPs targeting unemployed workers. In my model, no such conclusion can be drawn.

5. Concluding remarks

Active labour market policies involving a one-shot transfer of labour from a lowproductivity, high unemployment sector to a high-productivity, low unemployment sector are analysed as a benchmark case. These policies have a direct labour transfer effect, a *helicopter effect*, which tends to increase employment in the HP-sector and decrease employment in the LP-sector. But the net effect of the one-shot labour transfer policy on aggregate employment is positive and is due to the characteristics of the wage-setting and labour-demand schedules. Since the wage-setting schedules are convex and the labour demand schedules are constant-elastic, the increase in employment in the HP-sector is greater than the decrease in employment in the LP-sector.

However, the analysis of a one-shot labour transfer policy does not tell how a labour market policy continuously transferring labour between sectors will work, because such a policy is bound to affect wage-setting via expectations. Therefore, I analyse continuous labour transfer policies through ALMPs as a general case. The expectation to be transferred through ALMPs affects the expected utility of labour in the LP-sector and thus, influences the wage in that sector. These effects may either offset or reinforce the direct labour-transfer effect in terms of aggregate employment, depending on how ALMPs are targeted. I analyse both ALMPs targeting unemployed workers and ALMPs targeting employed workers.

When ALMPs target unemployed workers, they will affect wage-setting schedules in two ways. First, there is an *accommodation effect* tending to raise the wage and reduce employment in the LP-sector since the welfare loss from being unemployed in the LP-sector is reduced, because the probability of moving to the HP-sector is increased by ALMPs. But there is also a *wage-reducing relative labour-market tightness effect*, which tends to reduce the wage and increase employment in the LP-sector, since the transfer of labour tends to increase the competition for jobs in the HP-sector (reduce the labour-market tightness) and thus, make it less attractive for an individual worker to be moved there. This reduces the incentive to set a high wage in the LP-sector, as it makes unemployment and the possibility to be transferred to the HP-sector through ALMPs less attractive. In an initial equilibrium, with no ALMPs, the incentive for unskilled workers to shirk is unaffected by the worsened labour market conditions for skilled workers. Since both the helicopter effect and the accommodation effect raise the wage in the LP-sector, employment initially decreases in that sector when ALMPs are introduced. The net effect on aggregate employment is, in general, ambiguous because the helicopter effect, the accommodation effect and the wage-reducing relative labour-market tightness effect work in different directions.

ALMPs targeting employed workers have three different effects on the wagesetting schedule in the LP-sector. First, there is a *promotion-wish effect* which tends to decrease the wage and increase employment in the LP-sector, since employed workers in the LP-sector have a stronger incentive not to shirk in order to remain employed if this gives them the chance of moving to the HP-sector. This effect works in the direction opposite to the accommodation effect when ALMPs target the unemployed, which tends to reduce wages in the LP-sector. Second, there is an *indirect accommodation effect* that tends to raise the wage and reduce employment in the LP-sector, since the probability of getting a job in the LP-sector is increased by ALMPs when employed workers in the sector leave their jobs in order to join ALMPs. This reduces the welfare loss of being unemployed in the LP-sector. Hence, employers need to pay a higher wage to discourage shirking. Third, there is a *wage-raising relative labour-market tightness effect* which tends to raise the wage and reduce employment in the LP-sector, since the reduction in the relative labourmarket tightness in the HP-sector due to ALMPs weakens the incentive for employed workers in the LP-sector not to shirk in order to preserve the chance of being moved to the HP-sector. As a result, employers have an incentive to raise the wage in the LP-sector. The relative labour-market tightness effect of targeting the employed thus works in the opposite direction to that when targeting the unemployed. In general, the net effect on aggregate employment is ambiguous, also when ALMPs target the employed. But in an initial equilibrium, with no ALMPs, the helicopter effect and the promotion-wish effect tend to reduce the wage. The indirect accommodation effect tends to increase the wage and the relative labour-market tightness effect is zero. If the sectoral employment rate is sufficiently larger in the HP-sector than in the LP-sector, the promotion-wish effect may dominate the indirect accommodation effect. Therefore, aggregate employment may be increased by introducing ALMPs targeting the employed, if the sectoral employment rate is sufficiently larger in the HP-sector than in the LP-sector.

For simplicity, the model has ignored some important issues in terms of upgrading labour skill. The first is that there is no explicit provision of ALMPs in the model and the transformation of unskilled into skilled workers is assumed to occur instantaneously. In reality, upgrading skill needs the time. If participants must stay in the provision of ALMPs for a while, instantaneous utility effects from being in an ALMP affect the wage for unskilled workers. Secondly, the model assumes that all participants in ALMPs complete training and become skilled workers. There is no risk of dropping out from programmes. The risk of dropping out from ALMPs changes the value of participating in ALMPs and influences the utility of unskilled workers. The third is that the costs of training has not been considered. If there are costs of participating in ALMPs, the value of being involved in programmes is decreased and thus the utility of unskilled workers is affected. All of these issues are likely to reduce the value of participating in ALMPs and thus the macroeconomic impact of ALMPs might be weaker. An analysis of more realistic setting about ALMPs along these lines are important agenda for future theoretical research and I believe that it would be worthwhile.

References

[1] Atkinson, A.B., 1995, Unemployment Compensation, Wage Dispersion and Endogenous Politicians, Mimeo

[2] Baily, M. and J. Tobin, 1977, Macroeconomic E.ects of Selective Public Employment and Wage Subsidies, *Brookings Papers on Economic Activity.*

[3] Blanchflower, D and A. Oswald, 1994, *The Wage Curve* (The MIT Press, Cambridge, MA).

[4] Björklund, A., P-A. Edin, B. Holmlund and E. Wadensjö, 1996, *Arbetsmarknaden* (SNS Forlag).

[5] Blanchard, O. J. and S. Fischer, 1989, *Lectures on Macroeconomics* (The MIT Press).

[6] Calmfors, L., 1994, Active Labour Market Policy and Unemployment - A Framework for the Analysis of Crucial Design Features, *OECD Economic Studies* 22.

[7] Calmfors, L., 1995a, Labour Market Policy and Unemployment, *European Economic Review* 39.

[8] Calmfors, L., 1995b,What CanWe Expect from Active Labour Market Policy?, *Konjunkturpolitik* 43.

[9] Calmfors, L., 1996, Den aktiva arbetsmarknadspolitiken och sysselsattingen - en teoretisk referensram, *Aktiv Arbetsmarknadspolitik* (Statens O.entliga Utredningar 1996:34).

[10] Calmfors, L., A. Forslund, andM. Hemstrom, 2002, Does Active Labour Market Policy Work? Lessons from the Swedish Experiences, *Swedish Economic Policy Review* 8.

[11] Calmfors, L. and H. Lang, 1995, Macroeconomic E.ects of Active Labour Market Programmes in a Union Wage-Setting, *Economic Journal* 105.

[12] Calmfors, L. and P. Skedinger, 1995, Does Active Labour Market Policy Increase Employment ? Theoretical Consideration and Some Empirical Evidence from Sweden, *Oxford Review of Economic Policy* 11.

[13] Carlin, W. and D. Soskice, 1990, *Macroeconomics and the Wage Bargain* (Oxford University Press).

[14] European Commission, 2000, *The EU Economy - 2000 Review*, European Economy.

[15] *Fackföreningsrörelsen och den fulla sysselsättningen*, 1951, LO, Stockholm.

[16] Hamermesh, D., 1993, *Labor Demand* (Princeton University Press).

[17] Heckman, J. J., R. J. LaLonde, and J. A. Smith, 1999, The Economics and Econometrics of Active Labour Market Programs, *Handbook of Labor Economics*, Ch. 31 (North-Holland).

[18] Holmlund, B. and Linden, J., 1993, Job matching, Temporary Public Employment, and Equilibrium Unemployment, *Journal of Public Economics* 51.

[19] Jackman, R., 1994, What Can Active Labour Market Policy Do?, *Swedish Economic Policy Review* 1.

[20] Johnson, G. E. and R. Layard, 1986, The Natural Rate of Unemployment Explanation and Policy, *Handbook of Labor Economics*, Ch. 16 (North-Holland).

[21] Layard, R. and S. Nickell, 1986, Unemployment in Britain, *Economica* 53.

[22] Layard, R., S. Nickell and R. Jackman, 1991, *Unemployment* (Oxford University Press).

[23] Lindbeck, A., 1993, *Unemployment and Macroeconomics* (The MIT Press).

[24] McConnell, C. R. and S. L. Brue, 1986, *Contemporary Labor Economics* (McGraw-Hill Inc.).

[25] Nickell S. and R. Layard, 1999, Labour Market Institutions and Economic Performance, *Handbook of Labor Economics*, Ch. 46 (North-Holland).

[26] OECD, 1990a, *Labour Market* Policies for the 1990s, Paris.

[27] OECD, 1990b, *Employment Outlook*, Paris.

[28] OECD, 1991, *Employment Outlook*, Paris.

[29] OECD, 1993, *Employment Outlook*, Paris.

[30] OECD, 1994, *Jobs Study - Evidence and Explanations Part II: The Adjustment Potential of the Labour Market*, Paris.

[31] Shapiro, E.M. and J. E. Stiglitz, 1984, Equilibrium Unemployment As a Worker Discipline Device, *American Economic Review* 74.

Appendix

A The effects on h

A-1 ALMPs targeting unemployed workers

From (28), (33), (35), (36) and (38), the effect on the measure of the relative size of the two sectors (h) is

$$\frac{dh}{dx_u} = \left(\frac{1}{H_1 + H_2}\right)\left(\frac{(1-h)(1-n'_2)}{a + x_u}\right)\left[\begin{array}{c} H_1 + \dfrac{x_u}{a + x_u} \\ + x_u\left(\dfrac{1-n'_2}{(a+q)n'_2}\right)\left(\dfrac{s_1 - s_2}{a + r + x_u}\right) \end{array}\right] > 0 \,,$$

where

$$H_1 = \frac{(a + r + x_u)(1-\alpha)B_4}{(a+r)C_4}\left(\frac{1-h}{2}\right)^{\alpha - 2}(n'_2)^{\alpha - 3}(1 - n'_2)^2 + \frac{1}{n'_2} - \frac{x_u}{a + x_u} > 0 \,,$$

$$H_2 = \frac{x_u^2\left(\dfrac{(1-h)}{(a + x_u)(a + r)}\right)(1-\alpha)B_3\left(\dfrac{1+h}{2}\right)^{\alpha - 2}(n'_1)^{\alpha - 2}}{2\left[(1-\alpha)B_3\left(\dfrac{1+h}{2}\right)^{\alpha - 1}(n'_1)^{\alpha - 2} + \dfrac{C_4}{(1-n'_1)^2}\right]} \geq 0 \,.$$

The above relationships show that an increase in x_u increases the skilled labour force in the HP-sector, and decreases the unskilled labour force in the LP-sector.

A-2 ALMPs targeting employed workers

The effect on the relative size of the two sectors, h, is derived from (51), (56), (58), (59), (60) and (62) as

$$\frac{dh}{dx_u} = \left(\frac{1}{H_3 + H_4}\right)\left(\frac{1-h}{a}\right)\left[\begin{array}{c} H_3 - \dfrac{x_n}{a} \\ + x_n\left(\dfrac{(1-n'_2)^2}{a + q + x_u}\right)\left(\dfrac{q + x_n}{a(1-n'_2)} + \dfrac{s_1 - a - r - s_2}{(a + r + x_n)n'_2}\right) \end{array}\right] > 0 \,,$$

where

$$H_3 = \frac{(a+r)(a+q)(1-\alpha)B_5}{(a + r + x_n)(a + q + x_n)C_4}\left(\frac{1-h}{2}\right)^{\alpha - 2}(n'_2)^{\alpha - 3}(1 - n'_2)^2 + \frac{1}{n'_2} + \frac{x_n}{a} > 0 \,,$$

$$H_4 = \frac{x_n^2\left(\dfrac{(a+q)(1-h)}{a(a + r + x_n)(a + q + x_n)}\right)(1-\alpha)B_3\left(\dfrac{1+h}{2}\right)^{\alpha - 2}(n'_1)^{\alpha - 2}}{2\left[(1-\alpha)B_3\left(\dfrac{1+h}{2}\right)^{\alpha - 1}(n'_1)^{\alpha - 2} + \dfrac{C_4}{(1-n'_1)^2}\right]} \geq 0 \,.$$

The above relationships show that an increase in x_n increases the skilled labour force in the HP-sector, and decreases the unskilled labour force in the LP-sector.