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Active Labour Market Programmes and Unemployment in a Dual Labour Market*

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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 efficiency-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 sign of the latter effects depend 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, efficiency wage

JEL classification: J31, J41, J64

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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 to reduce equilibrium unemployment by making labour markets more flexible (OECD, 1994).

ALMPs are usually defined as measures to improve the functioning of the labour market that are targeted on the unemployed and then primarily on unskilled workers. ALMPs can be seen to have three different roles: (1) a job brokerage role; (2) a training/educational 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 its resource allocation aspects, ALMPs make it easier to match job-seekers with vacancies. In its income distribution aspects, ALMPs secure incomes for the unemployed and provide employment for disabled workers. In its stabilising role, ALMPs are implemented in such a way as to counter the fluctuations of the business cycle. In recent years, ALMPs have more and more come to be seen as a way of preventing unemployed workers from dropping out of the labour force, so that the effective aggregate labour supply is maintained (Layard et al., 1991).

In this paper, I focus on the training/education role of ALMPs and investigate the impact of ALMPs in its re-allocation aspects. ALMPs can serve to re-allocate labour from sectors with low productivity to sectors with high productivity. This was the original motivation when ALMPs 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 Gösta Rehn and Rudolf Meidner in the 1950s (*Fackföreningsrörelsen och den fulla sysselsättningen*, 1951). The Rehn-Meidner model had a dominating influence on Swedish labour-market policy at least up to the end of the 1980s. This aspect of ALMPs seems now again to be receiving increasing attention internationally (Jackman 1994; OECD 1994).

When ALMPs train unskilled workers and increase labour mobility from low-productivity sectors with high unemployment to high-productivity sectors with low unemployment, ALMPs have a direct labour-placement effect which tends to reduce aggregate unemployment. However, they may also have wage effects because the 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 Lindén (1993) studied the effects 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. They argued that ALMPs may raise 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 targeted only on unemployed workers.

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 schedule and a wage-setting schedule (Layard & Nickell, 1986; Johnson & 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 there is a one-shot transfer of labour that is not built into the expectations that enter into the wage-setting process. Sections 3 and 4 discuss the general case where such expectations effects occur. There, I especially study the consequences of different ways of targeting ALMPs.

2. The benchmark case

2.1. The model

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

I shall assume that labour-market policies train unskilled workers and transfer them from the low-productivity to the high-productivity sector. Otherwise, the two sectors are entirely separated from each other. As a benchmark case, I first investigate the effects of a one-shot transfer of labour from the low-productivity to the high-productivity sector through ALMPs. I label this a *helicopter labour transfer policy*. I assume that skilled labour maintains its productivity permanently.

The Shapiro-Stiglitz efficiency-wage model is used to model wage setting. Firms in both sectors employ workers who decide whether or not to shirk. 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 to a worker of being fired is to lose the job and go through at least one period of unemployment until he/she is hired by another firm. Because firms set their wages to avoid shirking, wages are above the market-clearing level. Therefore involuntary unemployment exists.

2.1.1. The stocks of workers in the labour market

There are M individuals in the exogenously given labour force in the economy. Aggregate employment is N. I let M_i,N_i and U_i denote the labour force, employment and unemployment, respectively, in sector i $(i = 1, 2)$. Measuring in terms of the aggregate labour force, M, I have $n_1+n_2 = n$ and $n_1+u_1+n_2+u_2 = m_1+m_2 = 1$, where $n_i = N_i/M$, $n = N/M$, $u_i = U_i/M$ and $m_i = M_i/M$. I shall refer to n_i and u_i as employment and unemployment in sector i, respectively.

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

$$h = m_1 - m_2. \tag{2.1}$$

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

$$n_1 = \frac{1+h}{2} n_1^{'}, \qquad (2.2)$$

$$n_2 = \frac{1-h}{2} n_2^{'}. \qquad (2.3)$$

2.1.2. The wage-setting schedules

An individual's instantaneous utility function is $V_i(c, e)$, where c is the income and e is the effort. e can take only two values, zero and $\overline{e}$. e is zero if no effort is supplied on the job, i.e., for both shirking and unemployed workers. $\overline{e}$ 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 $-_i^{n_j}(t)$ and $-_i^{s_j}(t)$ denote the discounted values of being employed for non-shirking workers and shirking workers, respectively, at time t in the jth firm of sector i. $-_{u_i}(t)$ is the discounted value of being unemployed in sector i at time t. It holds that

$$-_i^{n_j}(t) = \frac{1}{1+r}\left[w_i^j(t) - \overline{e} + q -_{u_i}(t+1) + (1-q) -_i^{n_j}(t+1)\right], \qquad (2.4)$$

$$-_i^{s_j}(t) = \frac{1}{1+r}\left[w_i^j(t) + \overline{q} -_{u_i}(t+1) + (1-\overline{q}) -_i^{s_j}(t+1)\right], \qquad (2.5)$$

where q is the same exogenously given quit rate for non-shirking workers in both sectors and $\overline{q}$ is the same exogenously given quit rate for shirkers in both sectors. I assume that $\overline{q} > q$, because shirkers, in addition to voluntary separations, face the probability of being caught shirking, in which case they are fired.

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

$$-_{u_i}(t) = \frac{1}{1+r}\left[b + s_i -_i(t+1) + (1-s_i) -_{u_i}(t+1)\right], \qquad (2.6)$$

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

Like Shapiro & Stiglitz I assume that firms determine wages for all future periods and that the economy finds itself in a steady state. Hence I can drop time subscripts and set $-_i^{n_j}(t) = -_i^{n_j}(t+1) = -_i^{n_j}$, $-_i^{s_j}(t) = -_i^{s_j}(t+1) = -_i^{s_j}$

and $- _{u_i}(t) = - _{u_i}(t+1) = - _{u_i}$. I also assume a symmetric equilibrium, so that $w_i^j(t) = w_i$ for all j. Assuming that wages are set to avoid shirking, i.e., that $- _i^{n_j} = - _i^{s_j} = - _i$, it can be derived from (2.4), (2.5) and (2.6) that

$$w_i = b + \left(1 + \frac{q + r + s_i}{\overline{q} - q}\right)\overline{e}. \tag{2.7}$$

2.1.3. The employment schedules

There are F identical firms in each sector. Each firm has a decreasing-returns-to-scale Cobb-Douglas production function: $Y_i^j = f\left(N_i^j\right) = A_i\left(N_i^j\right)^{\alpha}$, where $0 < \alpha < 1$, $f'\left(N_i^j\right) > 0$ and $f''(N_i^j) < 0$. N_i^j is the number of workers in the jth firm in sector i and A_i represents the productivity in sector i. I shall assume that the productivity is higher in sector 1 than in sector 2, i.e., that $A_1 > A_2$. Because all firms within each sector are identical, it follows that $N_i^1 = N_i^2 = \cdots = N_i^j = \cdots = N_i^F$. Total employment in sector i is thus $FN_i^j = n_i M$ and employment in each firm can be written $N_i^j = n_i M/F$.

I assume that the economy is a small open one, so that the prices of the products are given in the world market. Moreover, I normalise the relative price of the products to unity. A firm in each sector chooses N_i^j so that the profit $\Pi_i^j = Y_i^j - w_i N_i^j$ is maximised. The first-order condition is $w_i^j = f'(N_i^j) = \alpha A_i \left(n_i M/F\right)^{\alpha-1}$. Because all firms within each sector are identical, wages and employment are the same in each firm within the sector. Taking (2.2) and (2.3) into account, the relations between the sectoral wages and the sectoral employment rates can be written:

$$w_1 = B_1\left(\frac{1+h}{2}\right)^{\alpha-1}\left(n_1'\right)^{\alpha-1}, \tag{2.8}$$

$$w_2 = B_2\left(\frac{1-h}{2}\right)^{\alpha-1}\left(n_2'\right)^{\alpha-1}, \tag{2.9}$$

where $B_i = \alpha A_i F^{2-\alpha} M^{\alpha-1} > 0$. From (2.8) and (2.9), it follows that $dw_i/dn_i' < 0$ and $d^2 w_i/dn_i'^2 < 0$. Equations (2.8) and (2.9) thus define downward-sloping and convex labour-demand curves in each sector in the sectoral employment rate-wage plan. The labour-demand elasticity is constant and equal to $1/\left(1-\alpha\right)$.

2.1.4. The steady-state conditions

The various stocks and flows of labour are summarised in Figure 1. 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 have to be constant. Therefore, the condition for a steady state is

$$qn_i = s_i u_i.$$

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

$$s_i = \frac{q}{1 - n'_i} n'_i. \tag{2.10}$$

Taking (2.10) into account, the wage-setting schedules become

$$w_i = C_1 + C_2 \frac{n'_i}{1 - n'_i}, \tag{2.11}$$

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

The four core equations, (2.8), (2.9) and (2.11) (note that (2.11) 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 (2.2) and (2.3). 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 $\overline{e}$, q, $\overline{q}$, r, α, and the 'scale' variables F and M.

I can illustrate the general-equilibrium solution of the model by the intersection of wage-setting schedules and labour demand curves as in Figure 2. The wage-setting schedules are given by (2.11). The negative sloped labour demand curves are given by (2.8) and (2.9). In this diagram, the equilibrium for the high-productivity sector is E_1 and for the low-productivity sector E_2.

2.1.5. Comparative statics

I start from an initial equilibrium, in which both the sectoral employment rate and the wage are higher in the high-productivity sector than in the low-productivity sector, i.e., $w_1 > w_2$ and $n_1' > n_2'$ (see Figure 2). I shall investigate the case when labour is trained and transferred from the low-productivity to the high-productivity sector through ALMPs. The labour transfer from the low-productivity to the high-productivity sector is represented by an increase in the parameter h.

The effects on wages, sectoral employment rates and sectoral employment The effects on the sectoral employment rates are derived from (2.8), (2.9) and (2.11) as

$$\frac{dn_1'}{dh} = -\frac{(1-\alpha)\,B_1\left(\frac{1+h}{2}\right)^{\alpha-2}(n_1')^{\alpha-1}}{2\,(1-\alpha)\,B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n_1')^{\alpha-2}+\frac{2C_2}{\left(1-n_1'\right)^2}} < 0 \tag{2.12}$$

$$\frac{dn_2'}{dh} = \frac{(1-\alpha)\,B_2\left(\frac{1-h}{2}\right)^{\alpha-2}(n_2')^{\alpha-1}}{2\,(1-\alpha)\,B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n_2')^{\alpha-2}+\frac{2C_2}{\left(1-n_2'\right)^2}} > 0. \tag{2.13}$$

The terms in the numerators come from the shift of the employment schedules. As can be seen from (2.11), the wage-setting schedules are not affected by the helicopter labour transfer policy. The policy affects wages and the sectoral employment rates in the two sectors only through the employment schedules. A transfer of labour through ALMPs shifts the employment schedule downwards in the high-productivity sector (because a larger labour force in the sector means that a given number of employed persons is associated with a lower sectoral employment rate) and upwards in the low-productivity sector. This is illustrated in Figure 3. The equilibrium for the high-productivity sector moves from E_1 to E_1^* and for the low-productivity sector from E_2 to E_2^*. This '*helicopter effect*' reduces the wage and the sectoral employment rate in the high-productivity sector and increases the wage and the sectoral employment rate in the low-productivity sector. The wage reduction in the high-productivity sector means that employment will increase there. The wage increase in the low-productivity sector means that employment will decrease there. More precisely, from (2.2), (2.3), (2.12) and (2.13), the effects on employment are

$$\begin{aligned}\frac{dn_1}{dh} &= \frac{1}{2}n_1' + \frac{1+h}{2}\frac{dn_1'}{dh} \\ &= \frac{1}{\frac{2(1-\alpha)}{C_2}B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n_1')^{\alpha-3}(1-n_1')^2+\frac{2}{n_1'}} > 0\end{aligned} \tag{2.14}$$

$$\begin{aligned}\frac{dn_2}{dh} &= -\frac{1}{2}n_2' + \frac{1-h}{2}\frac{dn_2'}{dh} \\ &= -\frac{1}{\frac{2(1-\alpha)}{C_2}B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n_2')^{\alpha-3}(1-n_2')^2 + \frac{2}{n_2'}} < 0, \end{aligned} \tag{2.15}$$

where $B_1 = [(1+h)/2]^{1-\alpha}(n_1')^{1-\alpha}[C_1 + C_2 n_1'/(1-n_1')]$ and $B_2 = [(1-h)/2]^{1-\alpha}$ $(n_2')^{1-\alpha}[C_1 + C_2 n_2'/(1-n_2')]$.

The effects on aggregate employment The effect of a transfer of workers through ALMPs on aggregate employment (n) is derived from (2.14) and (2.15) as

$$\begin{aligned}\frac{dn}{dh} &= \frac{dn_1}{dh} + \frac{dn_2}{dh} = \frac{1}{\frac{2C_1(1-\alpha)\left(1-n_1'\right)^2}{C_2 n_1'^2} + \frac{2(1-\alpha)\left(1-n_1'\right)}{n_1'} + \frac{2}{n_1'}} \\ &\quad - \frac{1}{\frac{2C_1(1-\alpha)\left(1-n_2'\right)^2}{C_2 n_2'^2} + \frac{2(1-\alpha)\left(1-n_2'\right)}{n_2'} + \frac{2}{n_2'}}. \end{aligned} \tag{2.16}$$

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 $0 < (1-n_1')/n_1' < (1-n_2')/n_2'$. 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 labour transfer from the low-productivity sector to the high-productivity sector.

This positive effect on aggregate employment comes from the characteristics of the wage-setting and the labour demand schedules. Since the wage-setting schedules are upwards-sloping and convex, a given shift of the labour-demand curve gives a larger impact on the wage, the higher the initial wage. Because labour demand is constant-elastic, a given percentage change of the wage has a greater leverage on employment, the higher is initial employment. As a consequence, the increase in employment in the high-productivity sector is larger than the decrease in employment in the low-productivity 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 more, i.e., $dn/dh = 0$. Moreover, if the policy continues to transfer labour even after the sectoral employment rate is equalised, the sectoral employment rate in sector 2 becomes higher than that in sector 1, i.e., $n_1' < n_2'$. This 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 (2.16) 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 low-productivity to the high-productivity 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 the unskilled workers.

3. Standard ALMPs

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

As Calmfors & 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 that an unemployed worker may be placed in a labour-market programme, giving higher utility than open unemployment, may raise wages. I shall investigate the possibility of such an effect in my model by looking at a case when only *unemployed* workers in the low-productivity sector are trained and transferred to the high-productivity 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* insiders in the low-productivity sector and transfer them to the high-productivity sector. This type of labour-market policy can be thought of as a general growth-oriented policy trying to raise the general competence level of the labour force.

3.1. The wage-setting schedules

I still postulate a stationary labour force. But I now assume that individuals leave the labour force 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 workers and shirking workers, respectively, then are:

$$
\begin{aligned}
-_i^{n_j}(t) &= \frac{1}{1+r}\left[w_i^j(t) - \overline{e} + q -_{ui}(t+1) + (1-a-q) -_i^{n_j}(t+1)\right], \quad (3.1)\\
-_i^{s_j}(t) &= \frac{1}{1+r}\left[w_i^j(t) + \overline{q} -_{u_i}(t+1) + (1-a-\overline{q}) -_i^{s_j}(t+1)\right]. \quad (3.2)
\end{aligned}
$$

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

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 low-productivity sector, there also exists the probability of being placed in ALMPs, in which case he/she is transferred to the high-productivity 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 occur instantaneously. This way I need not care about any instantaneous utility effects from being in an ALMP. This will affect welfare only by changing the future prospects of participants in the labour market. The probability that a job seeker in the high-productivity sector remains a job seeker in this sector also in the next period is $1 - a - s_1$. The probability that a job seeker in the low-productivity sector is also 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, $-_{u_1}$, and in sector 2, $-_{u_2}$, respectively, now are

$$
\begin{aligned}
-_{u_1} &= \frac{1}{1+r}\left[b + s_1 -_1 + (1-a-s_1) -_{u_1}\right], \quad (3.3)\\
-_{u_2} &= \frac{1}{1+r}\left[b + s_2 -_2 + x_u -_{u_1} + (1-a-s_2-x_u) -_{u_2}\right]. \quad (3.4)
\end{aligned}
$$

Because the participants in ALMPs are instantaneously transferred to sector 1, $-_{u_1}$ is also the expected present value of participation in an ALMP. I assume that the expected present value of participation in an ALMP is greater than or equal to the expected present value of being unemployed in the low-productivity sector, i.e., $-_{u_1} \geq -_{u_2}$. This is an incentive compatibility constraint. From (3.1)

- (3.4) and the assumption of a steady state, I can derive that - $_{u_1}$ $-$ - $_{u_2}$ $=$ $[(s_1 - s_2) / (a + r + x_u)] [\overline{e} / (\overline{q} - q)]$. Thus the incentive compatibility constraint can be shown to be equivalent to the condition that $s_1 \geq s_2$[1].

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

$$w_1 = b + \left(1 + \frac{a + q + r + s_1}{\overline{q} - q}\right) \overline{e}, \tag{3.5}$$

$$w_2 = b + \left(1 + \frac{a + q + r + s_2}{\overline{q} - q}\right) \overline{e} + \frac{x_u (s_1 - s_2)}{a + r + x_u} \left(\frac{\overline{e}}{\overline{q} - q}\right). \tag{3.6}$$

Comparing (3.5) with (2.7), it is clear that the wage-setting schedule in the high-productivity sector is basically the same as in the benchmark case. On the other hand, (3.6) shows that the wage-setting schedule in the low-productivity sector includes a term corresponding to the benchmark case and a term arising because of the chance of being placed in an ALMP. The second term captures the benefit of being moved to the high-productivity sector. This term tends to increase the wage in the low-productivity sector when the incentive compatibility constraint is satisfied, i.e., when $s_1 \geq s_2$. The reason is that ALMPs reduce the welfare loss of being unemployed in the low-productivity sector.

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, have to pass through the pool of job seekers before they can find a job. A fraction x_a of them is assumed to enter the labour force with high skills and go into the high-productivity sector. A fraction $1 - x_a$ is assumed to enter with low skills and flow into the low-productivity sector. Each period, individuals leave the labour force at a rate a. The share of the total labour force passing through ALMPs in each period is l. Participants consist of unemployed workers from the low-productivity sector. Since all stocks have to be constant in a steady state, the conditions for a steady state are

$$(a + q) n_i = s_i u_i, \tag{3.7}$$

[1] 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 also if they turn down the offer to participate. In the case of Sweden, refusal to participate in an ALMP would mean a loss of the benefit entitlement. In that case, the incentive compatibility constraint becomes much weaker.

$$
\begin{aligned}
l &= x_u u_2, && (3.8)\\
(a+s_1)u_1 &= l+qn_1+x_a a, && (3.9)\\
(a+s_2+x_u)u_2 &= qn_2+(1-x_a)a. && (3.10)
\end{aligned}
$$

Equation (3.7) is the condition for constant employment in sector i. The LHS of (3.7) is the outflow from employment and the RHS of (3.7) is the inflow into employment. Equation (3.8) gives the participation in ALMPs (the number of unemployed worker selected from the low-productivity sector). Equations (3.9) and (3.10) are the conditions for constant unemployment in the high-productivity and the low-productivity sector, respectively. The LHS of (3.9) and (3.10) are outflows from unemployment and the RHS of these equations are the inflows into unemployment in the respective sectors.

From (2.2), (2.3) and (3.7), the probabilities to get a job in the two sectors are

$$s_i = (a+q)\frac{n_i'}{1-n_i'}. \quad (3.11)$$

Next, from (2.1), (3.7), (3.8), (3.9) and (3.10), h satisfies

$$h = \frac{-2x_u n_2 + x_u + a\,(2x_a - 1)}{(a+x_u)}. \quad (3.12)$$

By substituting (3.11) into (3.5), the wage-setting schedule in the high-productivity sector becomes

$$w_1 = C_3 + C_4\frac{n_1'}{1-n_1'}, \quad (3.13)$$

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

Differentiating (3.13) w.r.t. n_1' gives

$$\frac{dw_1}{dn_1'} = \frac{C_4}{(1-n_1')^2} > 0 \text{ and } \frac{d^2w_1}{dn_1'^2} = \frac{2C_4}{(1-n_1')^3} > 0. \quad (3.14)$$

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

By substituting (3.11) into (3.6), the wage-setting schedule in the low-productivity sector can be written as

$$w_2 = w_{2B} + P_u, \quad (3.15)$$

where $w_{2B} = C_3 + C_4 n_2'/(1-n_2')$ and $P_u = C_4 x_u\,[n_1'/(1-n_1') - n_2'/(1-n_2')]\,/\,(a+r+x_u)$. The wage in the low-productivity sector is equal to a term corresponding to the benchmark case (w_{2B}) and a term arising because of the chance of being placed in an ALMP (P_u). P_u reflects the value of being moved to the high-productivity sector. It can easily be seen that $P_u \geq 0$ if the sectoral employment rate in the high-productivity sector is greater than or equal to that in the low-productivity sector, i.e., if $n'_1 \geq n'_2$ as I assume. The reason is that the chance of getting a job is then greater in the high-productivity sector than in the low-productivity sector, which tends to create a wage differential.

By differentiating (3.15) w.r.t. n'_2, I obtain

$$\frac{dw_2}{dn'_2} = \left(\frac{a+r}{a+r+x_u}\right)\left[\frac{C_4}{(1-n'_2)^2}\right] > 0 \text{ and } \frac{d^2w_2}{dn'^2_2} = \left(\frac{a+r}{a+r+x_u}\right)\left[\frac{2C_4}{(1-n'_2)^3}\right] > 0. \tag{3.16}$$

Hence the wage-setting schedule in the low-productivity sector is also upwards-sloping and convex.

From (3.13), (3.14), (3.15) and (3.16), I can draw the wage-setting curves as in Figure 5. 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 high-productivity sector than in the low-productivity sector.

The four core equations, (2.8), (2.9), (3.13) and (3.15), 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 (2.2) and (2.3). 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, $\overline{e}$, q, $\overline{q}$, r, x_a, α and the 'scale' variables F and M.

3.3. Comparative statics

In this section, I investigate the effects of a change in the probability to participate in ALMPs. I start from an initial equilibrium as before, in which both the sectoral employment rate and the wage are higher in the high-productivity sector than in the low-productivity sector. This is equivalent to assuming that the chance of getting a job is greater in the high-productivity sector than in the low-productivity 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 (2.8), (2.9), (3.13) and (3.15) as

$$\frac{dn_1'}{dx_u} = -\frac{(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-2}(n_1')^{\alpha-1}\frac{dh}{dx_u}}{2(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n_1')^{\alpha-2}+\frac{2C_4}{\left(1-n_1'\right)^2}} \tag{3.17}$$

$$\frac{dn_2'}{dx_u} = \frac{\frac{1-\alpha}{2}B_2\left(\frac{1-h}{2}\right)^{\alpha-2}(n_2')^{\alpha-1}\frac{dh}{dx_u}-\left(\frac{\partial P_u}{\partial x_u}+\frac{\partial P_u}{\partial n_1'}\frac{\partial n_1'}{\partial x_u}\right)}{(1-\alpha)B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n_2')^{\alpha-2}+\frac{C_4(a+r)}{(a+r+x_u)\left(1-n_2'\right)^2}}, \tag{3.18}$$

where

$$\frac{\partial P_u}{\partial x_u} = \frac{(s_1-s_2)(a+r)}{(a+r+x_u)^2}\left(\frac{\overline{e}}{\overline{q}-q}\right)>0 \tag{3.19}$$

$$\frac{\partial P_u}{\partial n_1'}\frac{\partial n_1'}{\partial x_u} = \left[\frac{x_uC_4}{(a+r+x_u)(1-n_1')^2}\right]\frac{\partial n_1'}{\partial x_u}. \tag{3.20}$$

From (2.2), (2.3), (3.17) and (3.18), the effects on employment are

$$\frac{dn_1}{dx_u} = \frac{\frac{dh}{dx_u}}{\frac{2(1-\alpha)}{C_4}B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n_1')^{\alpha-3}(1-n_1')^2+\frac{2}{n_1'}} \tag{3.21}$$

$$\frac{dn_2}{dx_u} = -\frac{\frac{dh}{dx_u}+\left(\frac{a+r+x_u}{a+r}\right)\frac{(1-h)\left(1-n_2'\right)^2}{C_4n_2'}\left(\frac{\partial P_u}{\partial x_u}+\frac{\partial P_u}{\partial n_1'}\frac{\partial n_1'}{\partial x_u}\right)}{\left(\frac{a+r+x_u}{a+r}\right)\frac{2(1-\alpha)}{C_4}B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n_2')^{\alpha-3}(1-n_2')^2+\frac{2}{n_2'}}, \tag{3.22}$$

where $B_1 = [(1+h)/2]^{1-\alpha}(n_1')^{1-\alpha}[C_3+C_4n_1'/(1-n_1')]$ and $B_2 = [(1-h)/2]^{1-\alpha}$ $(n_2')^{1-\alpha}[C_3+C_4n_2'/(1-n_2')+P_u]$.

The effect on the measure of the relative size of the two sectors (h) is derived from (3.12), (3.17), (3.19), (3.20) and (3.22) as

$$\begin{aligned}\frac{dh}{dx_u} &= \frac{2a(1-n_2-x_a)}{(a+x_u)^2}-\frac{2x_u}{a+x_u}\frac{dn_2}{dx_u}\\ &= \left(\frac{2}{a+x_u}\right)\left(\frac{1}{H_1+H_2}\right)\left[\begin{array}{c}\frac{a(1-n_2-x_a)[H_1(a+x_u)+2x_u]}{(a+x_u)^2}\\ +\frac{x_u(s_1-s_2)(1-h)\left(1-n_2'\right)^2}{(a+q)(a+r+x_u)n_2'}\end{array}\right]>0,\end{aligned} \tag{3.23}$$

where

$$H_1 = 2\left[\begin{array}{c}\left(\frac{a+r+x_u}{a+r}\right)\frac{(1-\alpha)}{C_4}B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n_2')^{\alpha-3}(1-n_2')^2 \\ +\left(\frac{1}{n_2'}-\frac{x_u}{a+x_u}\right)\end{array}\right] > 0$$

$$H_2 = \frac{\frac{x_u^2}{(a+x_u)}\left(\frac{1-h}{a+r}\right)(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-2}(n_1')^{\alpha-2}}{(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n_1')^{\alpha-2}+\frac{C_4}{(1-n_1')^2}} > 0.$$

Equation (3.23) shows that an increase in x_u increases the skilled labour force and decreases the unskilled labour force. Equations (3.17) and (3.23) show that the sectoral employment rate in the high-productivity sector is decreased by the policy. Hence the wage is reduced in this sector. Equations (3.21) and (3.23) show that there is a positive effect of an increase in x_u on employment in the high-productivity sector. This is because of the same helicopter effect as in the benchmark case (see Figure 6).

I turn now to the effects on the wage, the sectoral employment rate and employment in the low-productivity sector. Equation (3.18) shows the effect on the sectoral employment rate in the low-productivity sector. The first term in the numerator comes from the shift of the employment schedule in the low-productivity 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 low-productivity sector (see Figure 6). Employment in this sector tends to fall by 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 come from the shift of the wage-setting schedule in the low-productivity sector. The second term is a direct effect of ALMPs. The welfare loss from being unemployed in the low-productivity sector is reduced because the probability of moving to the high-productivity sector, where the chance of getting a job is greater than in the low-productivity sector, is increased. This is an *accommodation effect*, which tends to raise the wage and reduce employment in the low-productivity sector. This accommodation effect tends to shift the wage-setting schedule in the low-productivity sector upwards.

The third term is an indirect effect of ALMPs via the sectoral employment rate in the high-productivity sector. Taking (3.17) and (3.23) into account, this term tends to increase the sectoral employment and reduce the wage in the low-productivity sector. For an individual worker that is transferred, the chance to get a job in the high-productivity sector becomes smaller, i.e., $\partial n_1'/\partial x_u < 0$.

This means that labour-market tightness in the high-productivity sector becomes relatively smaller. This reduces the benefit of being transferred to the high-productivity sector and thus increases the welfare loss for a worker of being fired. This gives employers in the low-productivity sector an incentive to reduce the wage. I shall label this a *wage-reducing relative labour-market tightness effect.* It tends to shift the wage-setting schedule downwards in the low-productivity sector.

The helicopter effect, the accommodation effect and the relative labour-market tightness effect thus work in different directions. The net impact on the sectoral employment rate in the low-productivity sector depends on the relative magnitude of these three effects.

The effect on employment in the low-productivity sector can be seen from (3.22). From the same reason as the effect on the sectoral employment rate, the net effect on employment in this sector is also in general ambiguous. But in an initial equilibrium, where there are no ALMPs, i.e., when $x_u = 0$, it follows from (3.20) 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. Hence, the wage-setting schedule must in this case shift upwards due to the accommodation effect. Employment must then decrease in the low-productivity sector. The reason is that both the wage-setting schedule and the labour-demand curve in Figure 6 are shifted upwards. Both effects tends to raise the wage in the low-productivity sector and thus to reduce sectoral employment.

3.3.2. The effects on aggregate employment

The effect on aggregate employment (n) is derived from (3.21) and (3.22) as

$$
\begin{aligned}
\frac{dn}{dx_u} &= \frac{dn_1}{dx_u} + \frac{dn_2}{dx_u} \\
&= \left[\frac{1}{\frac{2C_3(1-\alpha)\left(1-n_1'\right)^2}{C_4 n_1'^2} + \frac{2(1-\alpha)\left(1-n_1'\right)}{n_1'} + \frac{2}{n_1'}} - \frac{1}{\left(\frac{a+r+x_u}{a+r}\right)\left[\frac{2C_3(1-\alpha)\left(1-n_2'\right)^2}{C_4 n_2'^2} + \frac{2(1-\alpha)\left(1-n_2'\right)}{n_2'} + \frac{2(1-\alpha)\left(1-n_2'\right)^2}{C_4 n_2'^2} P_u\right] + \frac{2}{n_2'}} \right] \frac{dh}{dx_u} \\
&\quad - \frac{\frac{(s_1-s_2)(a+r)}{(a+r+x_u)^2}\left(\frac{\overline{e}}{\overline{q}-q}\right)}{(1-\alpha)\, B_2 \left(\frac{1-h}{2}\right)^{\alpha-2} (n_2')^{\alpha-2} + \left(\frac{a++r}{a+r+x_u}\right)\frac{2C_4}{(1-h)\left(1-n_2'\right)^2}}
\end{aligned}
$$

$$-\frac{\left[\frac{x_u C_4}{(a+r+x_u)\left(1-n_1'\right)^2}\right]\frac{dn_1'}{dx_u}}{(1-\alpha)\,B_2\left(\frac{1-h}{2}\right)^{\alpha-2}(n_2')^{\alpha-2}+\left(\frac{a++r}{a+r+x_u}\right)\frac{2C_4}{(1-h)\left(1-n_2'\right)^2}}.$$

The first term represents the helicopter effect. If the sectoral employment rate is higher in the high-productivity sector than in the low-productivity 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 and the relative labour-tightness effect tends to increase it. Because the net effect on aggregate employment depends on the relative magnitude of these three effects, the net effect is in general ambiguous.

In an initial equilibrium, where there are 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 effect and the accommodation effect. When $n_1' = n_2'$, which implies that $s_1 = s_2$, the helicopter effect in this case is still positive. Because the wage-setting schedule is flatter in the low-productivity sector than in the high-productivity sector, the decrease of the wage in the high-productivity sector is larger than the increase in the wage in the low-productivity sector when the employment schedules shift. 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 of being transferred to the high-productivity sector. The relative labour-market tightness effect is positive. An increase of the probability to participate in ALMPs must thus at this point increase aggregate employment i.e., $dn/dx_u > 0$.

4. ALMPs targeted on insiders

Calmfors (1995a, 1996) has pointed out that ALMPs that are targeted on insiders could be more promising in terms of decreasing aggregate unemployment than ALMPs targeted on outsiders. The reason is that ALMPs targeted on insiders have no accommodation effect that tends to decrease employment in the low-productivity sector. On the contrary, such ALMPs increase the value of employment and ought hence to promote wage restraint.

Going outside the model, it is also conceivable that a general growth-oriented policy would focus on training insiders rather than outsiders, because it may be believed that this is more effective. Employed workers may have been hired originally because it was judged that on-the-job training would raise their productivity more than would be the case for other job candidates. One can think of ALMPs that are targeted on insiders as a policy designed to increase competence in general in the economy.

In the following section, I shall investigate this possibility in my model by looking at a case where only *employed* workers in the low-productivity sector are transferred to the high-productivity sector.

4.1. The wage-setting schedules

I thus now assume that only employed workers in the low-productivity 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 high-productivity sector are the same as in the case with targeting on the unemployed, i.e., (3.1) and (3.2). The present values of employment in the low-productivity sector are now

$$\begin{aligned} -^{nj}_{2}(t) &= \frac{1}{1+r}\Big[w_2^j(t) - \bar{e} + x_n -_{u_1}(t+1) + q -_{u_2}(t+1) \\ &\quad + (1-a-q-x_n) -^{nj}_{2}(t+1)\Big], \qquad (4.1) \\ -^{sj}_{2}(t) &= \frac{1}{1+r}\Big[w_2^j(t) + x_n -_{u_1}(t+1) + \bar{q} -_{u_2}(t+1) \\ &\quad + (1-a-\bar{q}-x_n) -^{sj}_{2}(t+1)\Big]. \qquad (4.2) \end{aligned}$$

As before, the transformation of unskilled into skilled workers in ALMPs occurs instantaneously. Therefore $-_{u_1}(t)$ is the expected present value of participation in ALMPs at time t. As assumed before, wages are set so as to avoid shirking and the economy is in a steady state. Thus I can set $-^{nj}_{i}(t) = -^{nj}_{i}(t+1) = -^{sj}_{i}(t) = -^{sj}_{i}(t+1) = -_{i}$ and $-_{u_i}(t) = -_{u_i}(t+1) = -_{u_i}$.

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 that a job seeker in sector i remains 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, $-_{u_i}$, is

$$-_{u_i} = \frac{1}{1+r}\left[b + s_i -_{i} + (1-a-s_i) -_{u_i}\right]. \qquad (4.3)$$

I again impose an incentive compatibility constraint. If employed worker in the low-productivity 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 low-productivity sector, i.e., $-_{u_1} \geq -_2$. From (3.1), (3.2), (4.1), (4.2) and (4.3) and the assumption of a steady state, I can derive that $-_{u_1} - -_2 = [(s_1 - a - r - s_2) / (a + r)] [\bar{e} / (\bar{q} - q)]$. 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 $s_1 \geq s_2$, but s_1 must be sufficiently larger. So this is a stricter condition than $n_1 \geq n_2$. The explanation is that employers when setting wages have to compare the value for a worker of being employed in the low-productivity sector and the value of being unemployed (after having completed an ALMP) in the high-productivity sector. Therefore, the chance for an unemployed to get a job in the high-productivity sector must be "much" larger than the chance for an unemployed to get a job in the low-productivity sector (as there is only a certain probability each period that an employed worker will turn into an unemployed job seeker), if there is to be a gain for an employed worker in the low-productivity sector to be transferred to the high-productivity sector.

I use (3.1), (3.2), (4.1), (4.2) and (4.3) to derive wage equations in the same way as before. The wage-setting schedule in the high-productivity sector turns out the same as (3.13). The wage-setting schedule in the low-productivity sector is

$$w_2 = b + \left(1 + \frac{a + q + r + s_2}{\bar{q} - q}\right) \bar{e} - \frac{x_n (s_1 - a - r - s_2)}{a + r} \left(\frac{\bar{e}}{\bar{q} - q}\right). \qquad (4.4)$$

Similar to (3.15), the wage-setting schedule in the low-productivity sector is equal to a term corresponding to the benchmark case and a term reflecting the value of being moved to the high-productivity sector through ALMPs. The latter term tends to reduce the wage. The reason is that the chance of being placed in an ALMP when employed represents in this case an extra reward from 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 7. Participants in ALMPs now consist of unskilled employed workers. The steady-state conditions are

$$(a + q)n_1 = s_1 u_1, \qquad (4.5)$$
$$(a + q + x_n)n_2 = s_2 u_2, \qquad (4.6)$$

$$
\begin{aligned}
l &= x_n n_2, & (4.7)\\
(a+s_1)u_1 &= l + qn_1 + x_a a, & (4.8)\\
(a+s_2)u_2 &= qn_2 + (1-x_a)a. & (4.9)
\end{aligned}
$$

Equations (4.5) and (4.6) are the conditions for constant employment in the high-productivity sector and in the low-productivity sector, respectively. The LHS in both equations are the outflows from employment and the RHS are the inflows into employment. The term $x_n n_2$ in (4.6) and (4.7) gives participation in ALMPs. Equations (4.8) and (4.9) are the conditions for constant unemployment in the high-productivity sector and in the low-productivity sector, respectively. The LHS in (4.8) and (4.9) are outflows from unemployment and the RHS of these equations are inflows into unemployment.

From (2.2), (2.3), (4.5) and (4.6) the probabilities to get a job in the two sectors are

$$
\begin{aligned}
s_1 &= (a+q)\frac{n_1'}{1-n_1'}, & (4.10)\\
s_2 &= (a+q+x_n)\frac{n_2'}{1-n_2'}. & (4.11)
\end{aligned}
$$

From (2.1), (4.5), (4.6), (4.7), (4.8) and (4.9), h satisfies

$$
h = \frac{2x_n n_2 + a\left(2x_a - 1\right)}{a}. \qquad (4.12)
$$

As I discussed in section 4.1., the wage-setting schedule in the high-productivity is the same as when ALMPs were targeted on the unemployed. It is thus upwards-sloping and convex. By substituting (4.10) and (4.11) into (4.8), the wage-setting schedule in the low-productivity sector is

$$
w_2 = w_{2B} + P_n, \qquad (4.13)
$$

where $w_{2B} = C_3 + C_4 n_2' \left(1 - n_2'\right)$ and $P_n = x_n \left[\left(a + r - (a+q)\, n_1' / \left(1 - n_1'\right) - (a+q+x_n)\, n_2' / \left(1 - n_2'\right)\right) / (a+r)\right] \left[\overline{e} / \left(\overline{q} - q\right)\right]$. The term w_{2B} is a term corresponding to the benchmark case and the term P_n reflects the value of being placed in ALMPs.

Differentiating the above equation w.r.t. n_2' gives

$$
\begin{aligned}
\frac{dw_2}{dn_2'} &= \left(\frac{a+r+x_n}{a+r}\right)\left(\frac{a+q+x_n}{a+q}\right)\left[\frac{C_4}{\left(1-n_2'\right)^2}\right] > 0, & (4.14)\\
\frac{d^2 w_2}{dn_2'^2} &= \left(\frac{a+r+x_n}{a+r}\right)\left(\frac{a+q+x_n}{a+q}\right)\left[\frac{2C_4}{\left(1-n_2'\right)^3}\right] > 0. & (4.15)
\end{aligned}
$$

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

From (3.13), (3.14), (4.13), (4.14) and (4.15), I can draw the wage-setting curves as in Figure 8. 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 low-productivity sector than in the high-productivity sector.

The four core equations, (2.8), (2.9), (3.13) and (4.13), 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 (2.2) and (2.3).

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 (2.8), (2.9) and (3.13)and (4.13) as

$$\frac{dn_1'}{dx_n} = -\frac{(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-2}(n_1')^{\alpha-1}\frac{dh}{dx_n}}{2(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n_1')^{\alpha-2}+\frac{2C_4}{(1-n_1')^2}} \tag{4.16}$$

$$\frac{dn_2'}{dx_n} = \frac{\frac{1-\alpha}{2}B_2\left(\frac{1-h}{2}\right)^{\alpha-2}(n_2')^{\alpha-1}\frac{dh}{dx_n}-\left(\frac{\partial P_n}{\partial x_n}+\frac{\partial P_n}{\partial n_1'}\frac{\partial n_1'}{\partial x_n}\right)}{(1-\alpha)B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n_2')^{\alpha-2}+\left(\frac{a+r+x_n}{a+r}\right)\left(\frac{a+q+x_n}{a+q}\right)\frac{C_4}{(1-n_1')^2}}, \tag{4.17}$$

where

$$\frac{\partial P_n}{\partial x_n} = -\left(\frac{s_1-a-r-s_2}{a+r}\right)\left(\frac{\overline{e}}{\overline{q}-q}\right)<0 \tag{4.18}$$

$$\frac{\partial P_n}{\partial n_1'}\frac{\partial n_1'}{\partial x_n} = -\left[\frac{x_nC_4}{(a+r)(1-n_1')^2}\right]\frac{dn_1'}{dx_n}. \tag{4.19}$$

From (2.2), (2.3), (4.16) and (4.17), the effects on employment are

$$\frac{dn_1}{dx_n} = \frac{\frac{dh}{dx_n}}{\frac{2(1-\alpha)}{C_4}B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n_1')^{\alpha-3}(1-n_1')^2+\frac{2}{n_1'}} \tag{4.20}$$

$$\frac{dn_2}{dx_n} = -\frac{\frac{dh}{dx_n}+\left(\frac{a+r}{a+r+x_n}\right)\left(\frac{a+q}{a+q+x_n}\right)\frac{(1-h)\left(1-n_2'\right)^2}{C_4 n_2'}\left(\frac{\partial P_n}{\partial x_n}+\frac{\partial P_n}{\partial n_1'}\frac{\partial n_1'}{\partial x_n}\right)}{\left(\frac{a+r}{a+r+x_n}\right)\left(\frac{a+q}{a+q+x_n}\right)\frac{2(1-\alpha)}{C_4}B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n_2')^{\alpha-3}(1-n_2')^2+\frac{2}{n_2'}} \tag{4.21}$$

where $B_1 = [(1+h)/2]^{1-\alpha}(n_1')^{1-\alpha}[C_3 + C_4 n_1'/(1-n_1')]$ and $B_2 = [(1-h)/2]^{1-\alpha}$ $(n_2')^{1-\alpha}[C_3 + C_4 n_2'/(1-n_2') + P_n]$.

The effect on the relative size of the two sectors, h, is derived from (4.12), (4.16) (4.18), (4.19) and (4.21) as

$$\begin{aligned}\frac{dh}{dx_n} &= \frac{2}{a}\left(n_2 + x_n\frac{dn_2}{dx_n}\right)\\ &= \left(\frac{2}{a}\right)\left(\frac{1}{H_3+H_4}\right)\left[\begin{array}{c}\left(\frac{a+r}{a+r+x_n}\right)\left(\frac{a+q}{a+q+x_n}\right)\left(\frac{2(1-\alpha)B_2}{C_4}\right)\left(\frac{1-h}{2}\right)^{\alpha-1}(n_2')^{\alpha-3}(1-n_2')^2\\ +\frac{2}{n_2'}+\frac{(s_1-a-r-s_2)(1-h)\left(1-n_2'\right)^2}{(a+r+x_n)(a+q+x_n)n_2'}\end{array}\right] > 0,\end{aligned} \tag{4.22}$$

where

$$\begin{aligned}H_3 &= 2\left[\begin{array}{c}\left(\frac{a+r}{a+r+x_n}\right)\left(\frac{a+q}{a+q+x_n}\right)\frac{(1-\alpha)}{C_4}B_2\left(\frac{1-h}{2}\right)^{\alpha-1}(n_2')^{\alpha-3}(1-n_2')^2\\ +\frac{1}{n_2'}+\frac{x_n}{a}\end{array}\right] > 0\\ H_4 &= \frac{\frac{x_n^2}{a}\left(\frac{1-h}{a+r+x_n}\right)\left(\frac{a+q}{a+q+x_n}\right)(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-2}(n_1')^{\alpha-2}}{(1-\alpha)B_1\left(\frac{1+h}{2}\right)^{\alpha-1}(n_1')^{\alpha-2}+\frac{C_4}{\left(1-n_1'\right)^2}} > 0.\end{aligned}$$

Equation (4.22) shows that an increase in x_n increases the skilled labour force and decreases the unskilled labour force. As can be seen from (4.16) and (4.22), the sectoral employment rate is decreased and thus the wage reduced in the high-productivity sector by the policy. Hence, there is a positive effect on employment in the high-productivity sector, as shown by (4.20) and (4.22). This is the same helicopter effect as before.

The impact on the sectoral employment rate in the low-productivity sector can be seen from (4.17). The first term in the numerator comes from the upwards shift of the employment schedule in the low-productivity sector by an expansion of ALMPs. This is the same helicopter effect as before. It tends to increases the wage and the sectoral employment rate in the low-productivity sector (see Figure 9). Employment in this sector thus tends to fall by this effect.

The second term, i.e., $\partial P_n/\partial x_n$, and the third term, i.e., $(\partial P_n/\partial n_1') (\partial n_1'/\partial x_n)$, in the numerator come from the shift of the wage-setting schedule. The second term is a direct effect of ALMPs. It tends to shift the wage-setting schedule downwards. The wage in the low-productivity sector tends to fall, because workers there have a stronger incentive not to shirk in order to stay employed if this gives them a chance to move to the high-productivity sector. I shall label this effect a *promotion-wish effect*.

The third term is an indirect effect of ALMPs via the sectoral employment rate in the high-productivity sector. As can be seen from (4.16), an increase in the probability to participate in ALMPs decreases the sectoral employment rate in the high-productivity sector. This means a reduction in the probability to get a job in the high-productivity sector and weakens the incentive for employed workers in the low-productivity sector not to shirk in order to preserve the chance of being transferred. As a result, employers raise the wage in the low-productivity sector. ALMPs targeted on employed workers in the low-productivity sector thus has a *wage-raising relative labour-market tightness effect*.

The helicopter effect, the promotion-wish effect and the wage-raising relative labour-market tightness effect thus work in different directions. The net effect on the wage-setting schedule in the low-productivity sector is in general ambiguous. But in an initial equilibrium, where there are no ALMPs, i.e., when $x_n = 0$, it follows from (4.19) that the relative labour-tightness effect is zero. The wage-setting schedule must in this case shift downwards due to the promotion-wish effect. Since the helicopter effect tends to increase the sectoral employment rate in the low-productivity sector, the initial impact of introducing ALMPs on the sectoral employment rate in this sector is positive.

The effect on employment in the low-productivity sector can be seen from (4.21). From the same reason as the effect on the sectoral employment rate, the net effect on employment in this sector is also in general ambiguous.

4.3.2. The effects on aggregate employment

The effect on aggregate employment (n) is derived from (4.20) and (4.21) as

$$\frac{dn}{dx_n} = \left[-\frac{\frac{1}{\frac{2C_3(1-\alpha)\left(1-n_1'\right)^2}{C_4 n_1'^2}+\frac{2(1-\alpha)\left(1-n_1'\right)}{n_1'}+\frac{2}{n_1'}}}{\left(\frac{a+r}{a+r+x_n}\right)\left(\frac{a+q}{a+q+x_n}\right)\left[\frac{2C_3(1-\alpha)\left(1-n_2'\right)^2}{C_4 n_2'^2}+\frac{2(1-\alpha)\left(1-n_2'\right)}{n_2'}+\frac{2(1-\alpha)\left(1-n_2'\right)^2}{C_4 n_2'^2}P_n\right]+\frac{2}{n_2'}} \right] \frac{dh}{dx_n}$$

$$+\frac{\frac{s_1-a-r-s_2}{a+r}\left(\frac{\overline{e}}{\overline{q}-q}\right)}{(1-\alpha)\,B_2\left(\frac{1-h}{2}\right)^{\alpha-2}(n_2')^{\alpha-2}+\left(\frac{a+r+x_n}{a+r}\right)\left(\frac{a+q+x_n}{a+q}\right)\frac{2C_4}{(1-h)\left(1-n_1'\right)^2}}$$

$$+\frac{\left[\frac{x_n C_4}{(a+r)\left(1-n_1'\right)^2}\right]\frac{dn_1'}{dx_n}}{(1-\alpha)\,B_2\left(\frac{1-h}{2}\right)^{\alpha-2}(n_2')^{\alpha-2}+\left(\frac{a+r+x_n}{a+r}\right)\left(\frac{a+q+x_n}{a+q}\right)\frac{2C_4}{(1-h)\left(1-n_1'\right)^2}}.$$

The first term represents the helicopter effect on aggregate employment. The helicopter effect in the earlier cases increased aggregate employment when $n_1' > n_2'$. However, this assumption is not sufficient in this case for the helicopter effect to increase employment. If the wage-setting schedule is much steeper in the low-productivity than in the high-productivity sector, i.e., if x_n is very large, the reduction of employment in the low-productivity sector is larger than the increase of employment in the high-productivity sector.

The second term is the promotion-wish effect, which tends to increase aggregate employment. The third term is the relative labour-market tightness effect, which tends to decrease aggregate employment. Since these three effects work in different directions, the net effect of ALMPs on aggregate employment is in general unclear.

In an initial equilibrium, where there are no ALMPs, i.e., when $x_n = 0$, the helicopter effect tends to increase aggregate employment since P_n is zero. The promotion-wish effect also tends to increase aggregate employment. The relative labour-market tightness effect which tends to decrease aggregate employment is zero. Thus ALMPs targeted on the employed initially increase aggregate employment.

5. Concluding remarks

Active labour market policies involving a one-shot transfer of labour from a low-productivity, high unemployment sector to a high-productivity, low unemployment sector is analysed as a benchmark case. This policy has a direct labour transfer effect, *a helicopter effect*, which tends to increase employment in the high-productivity sector and to decrease employment in the low-productivity sector. But the net effect of the one-shot labour transfer policy on aggregate employment is positive. This positive effect on aggregate employment comes from the characteristics of the wage-setting and the labour-demand schedules. Because the wage-setting schedules are convex and the labour demand schedules are constant-elastic, the increase in employment in the high-productivity sector is greater than the decrease in employment in the low-productivity 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 low-productivity sector and thus influences the wage in the sector. These effects either offset or reinforce the direct labour-transfer effect in terms of aggregate employment depending on how ALMPs are targeted. I analyse both ALMPs targeted on outsiders and ALMPs targeted on insiders.

When ALMPs are targeted on outsiders, they will affect wage-setting in two ways. First, there is an *accommodation effect* that tends to raise the wage and reduce employment in the low-productivity sector. The reason is that the welfare loss from being unemployed in the low-productivity sector is reduced, because the probability of moving to the high-productivity 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 low-productivity sector. This is because the transfer of labour tends to increase the competition for jobs in the high-productivity sector (reduce 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 low-productivity sector. In an initial equilibrium, where there are 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 low-productivity sector, employment initially decreases there 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 targeted on insiders also have two different effects on the wage in the low-productivity sector. On the one hand, there is a *promotion-wish effect* which tends to decrease the wage and to increase employment in the low-productivity sector. This is because employed workers in the low-productivity sector have a stronger incentive not to shirk in order to stay employed if this gives them a chance to move to the high-productivity sector. This tends to reduce wages in the low-productivity sector. On the other hand, there is a *wage-raising relative labour-market tightness effect* which tends to raise the wage and reduce employment in the low-productivity sector. The reason is that the reduction of the relative labour-market tightness in the high-productivity sector by ALMPs weakens the incentive for employed workers in the low-productivity sector not to shirk in order to preserve the chance of being moved to the high-productivity sector. As a result, employers raise the wage in the low-productivity sector. Together with the helicopter effect, the net effect on aggregate employment is also in general ambiguous. But in an initial equilibrium, where there are no ALMPs, both the helicopter effect and the promotion-wish effect tend to raise the wage and the relative labour-market tightness effect is zero. Therefore, aggregate employment is increased by introducing ALMPs targeted on insiders.

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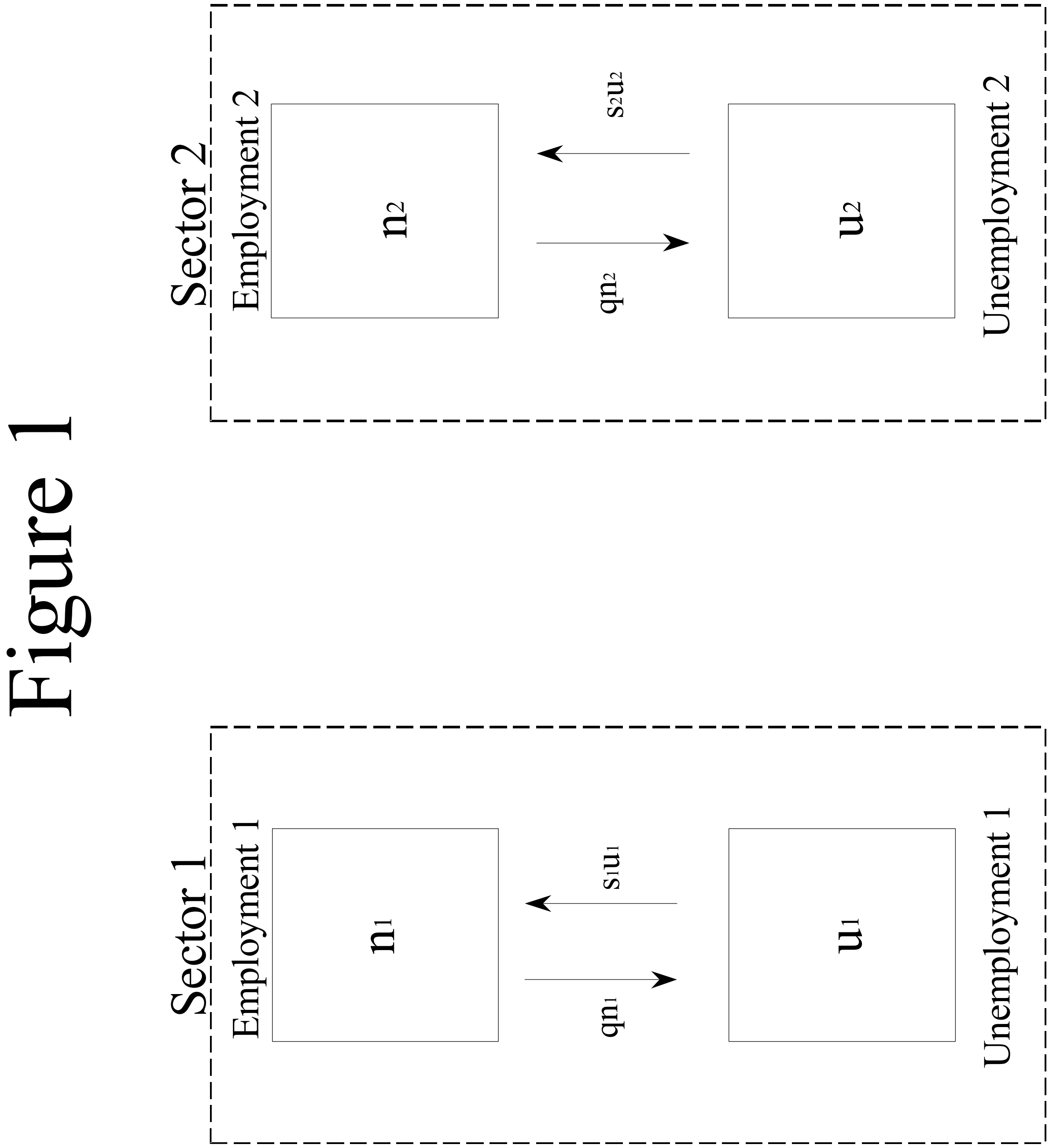
Figure 1
Sector 1
Employment 1
n1
qn1
s1u1
u1
Unemployment 1
Sector 2
Employment 2
n2
qn2
s2u2
u2
Unemployment 2

Figure 5.1:

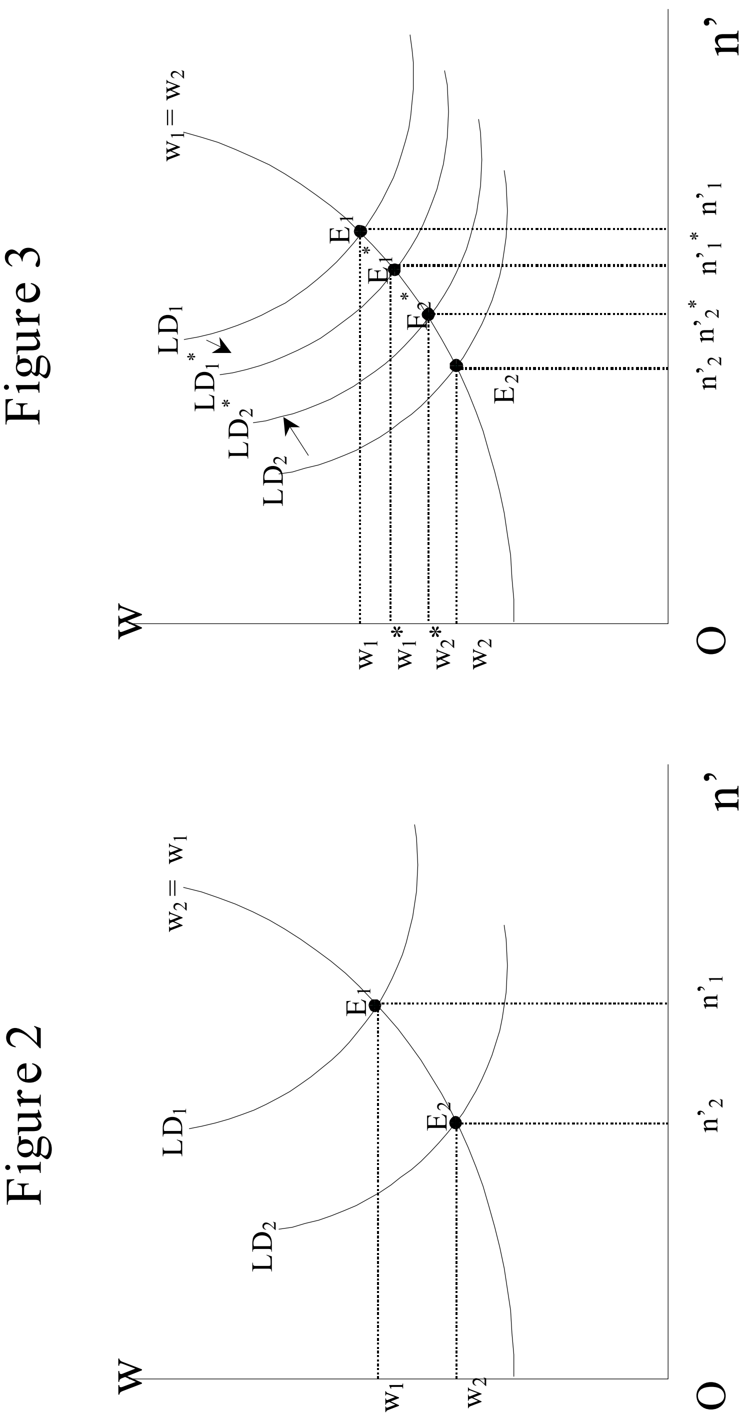

Figure 2
W
O
n'
LD1
LD2
E1
E2
w2 = w1
w1
w2
n'1
n'2
Figure 3
W
O
n'
LD1
LD1*
LD2*
LD2
E1
E1*
E2*
E2
w1 = w2
w1
w1*
w2*
w2
n'2 n'2* n'1* n'1

Figure 5.2:

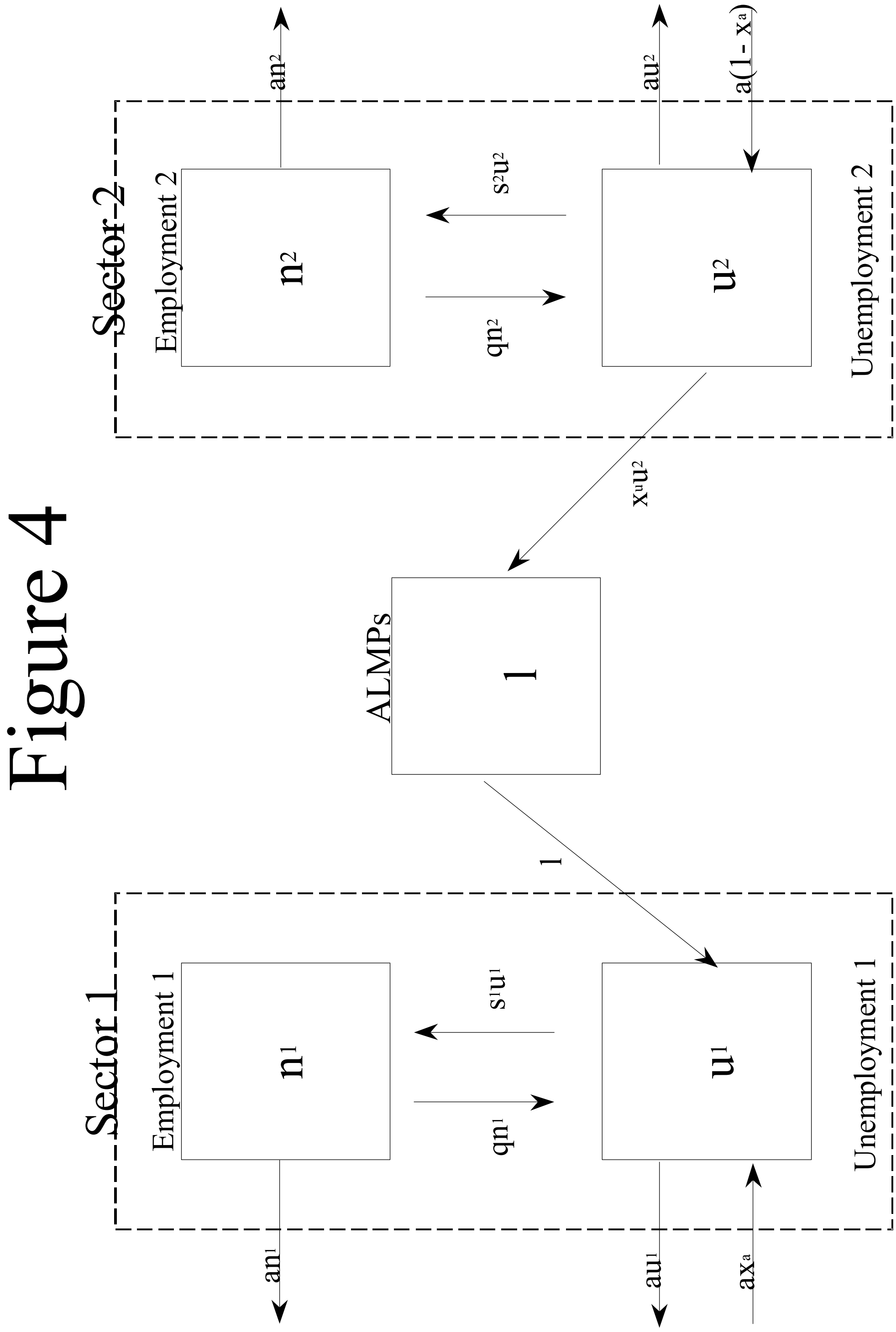
Figure 4
Sector 2
Employment 2
n2
Unemployment 2
u2
an2
au2
a(1- xa)
s2u2
qn2
xuu2
ALMPs
l
l
Sector 1
Employment 1
n1
Unemployment 1
u1
s1u1
qn1
an1
au1
axa

Figure 5.3:

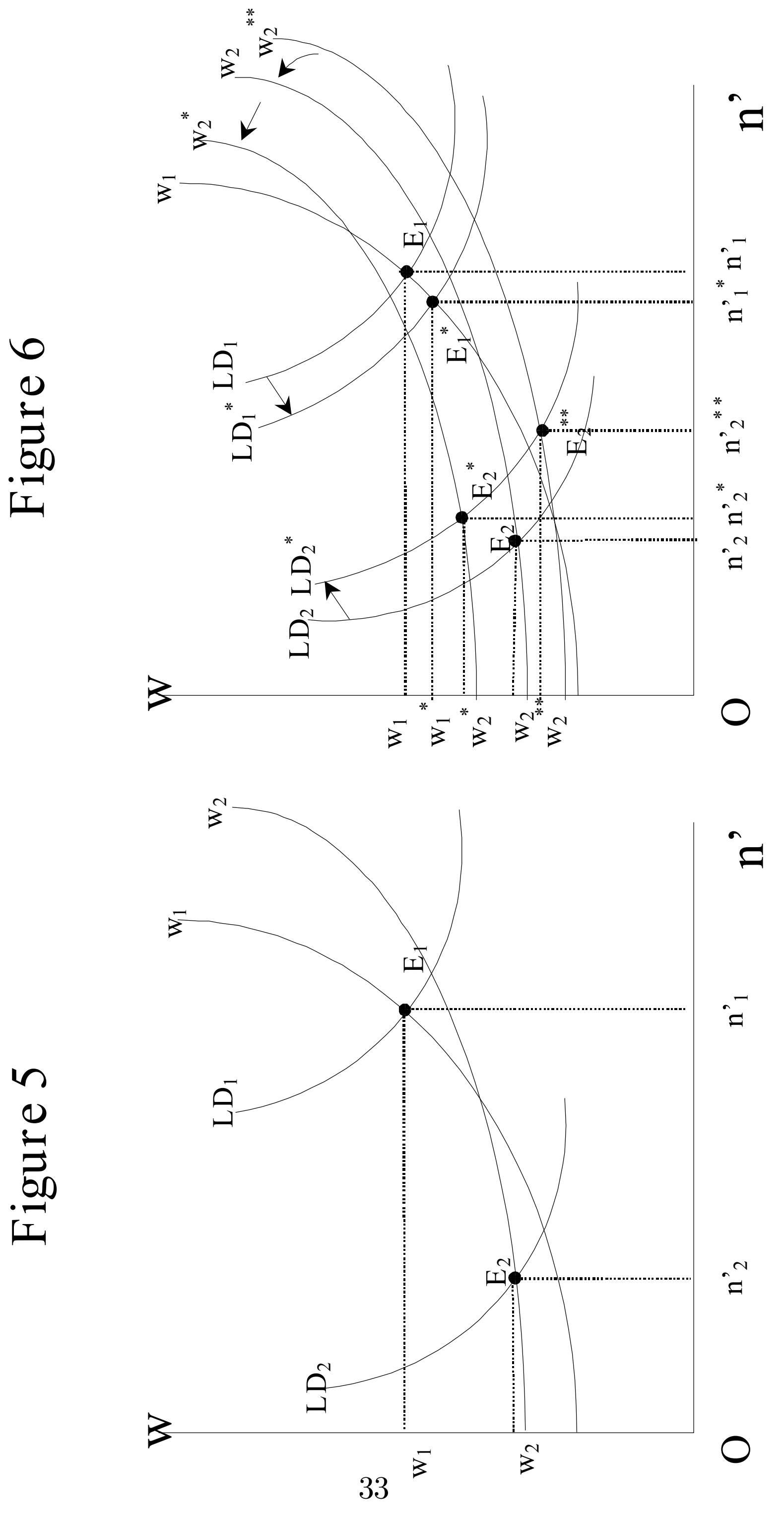

Figure 5.4:

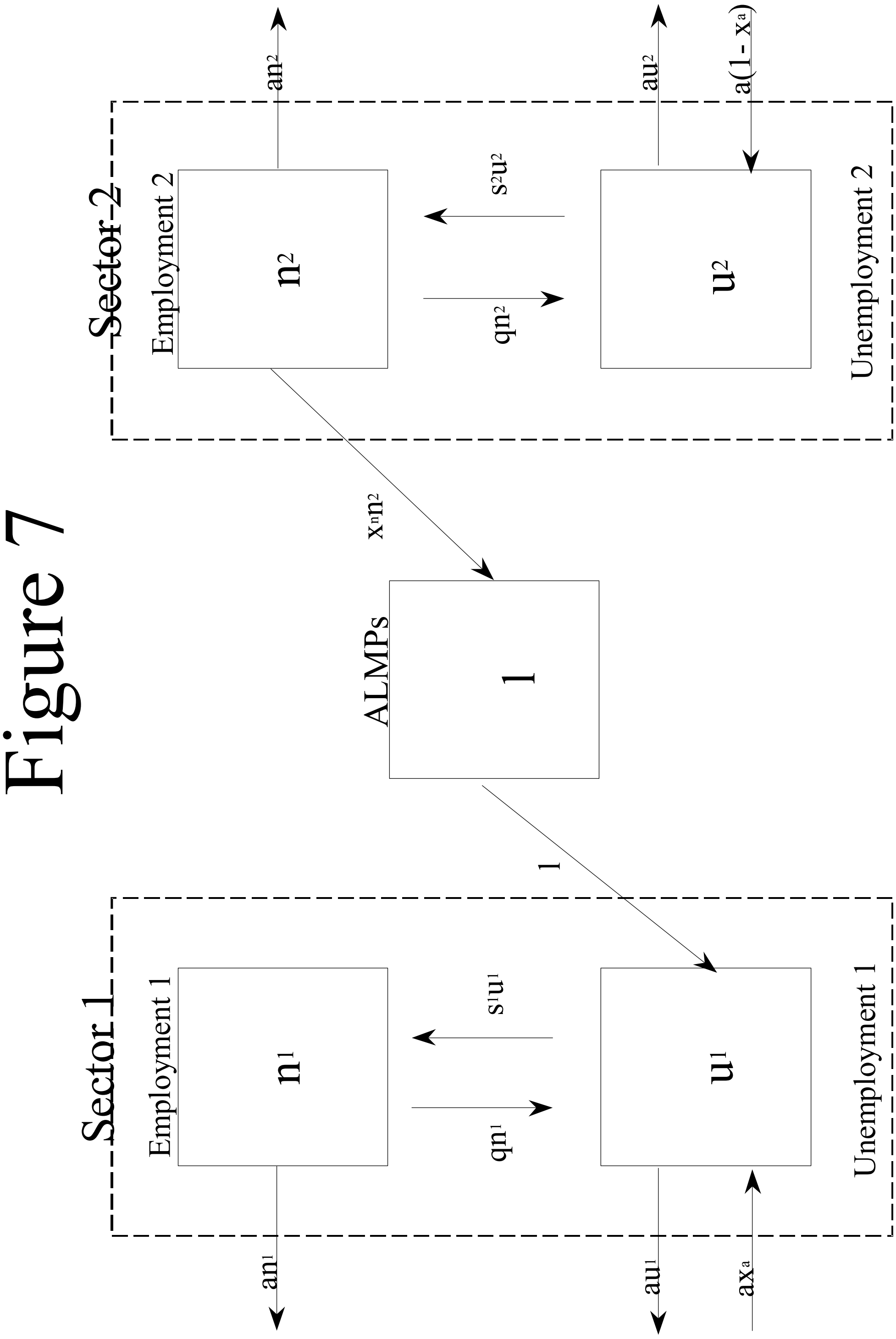
Figure 7
Sector 2
Employment 2
n2
an2
qn2
s2u2
u2
Unemployment 2
au2
a(1- xa)
xnn2
ALMPs
l
l
Sector 1
Employment 1
n1
an1
qn1
s1u1
u1
Unemployment 1
au1
axa

Figure 5.5:

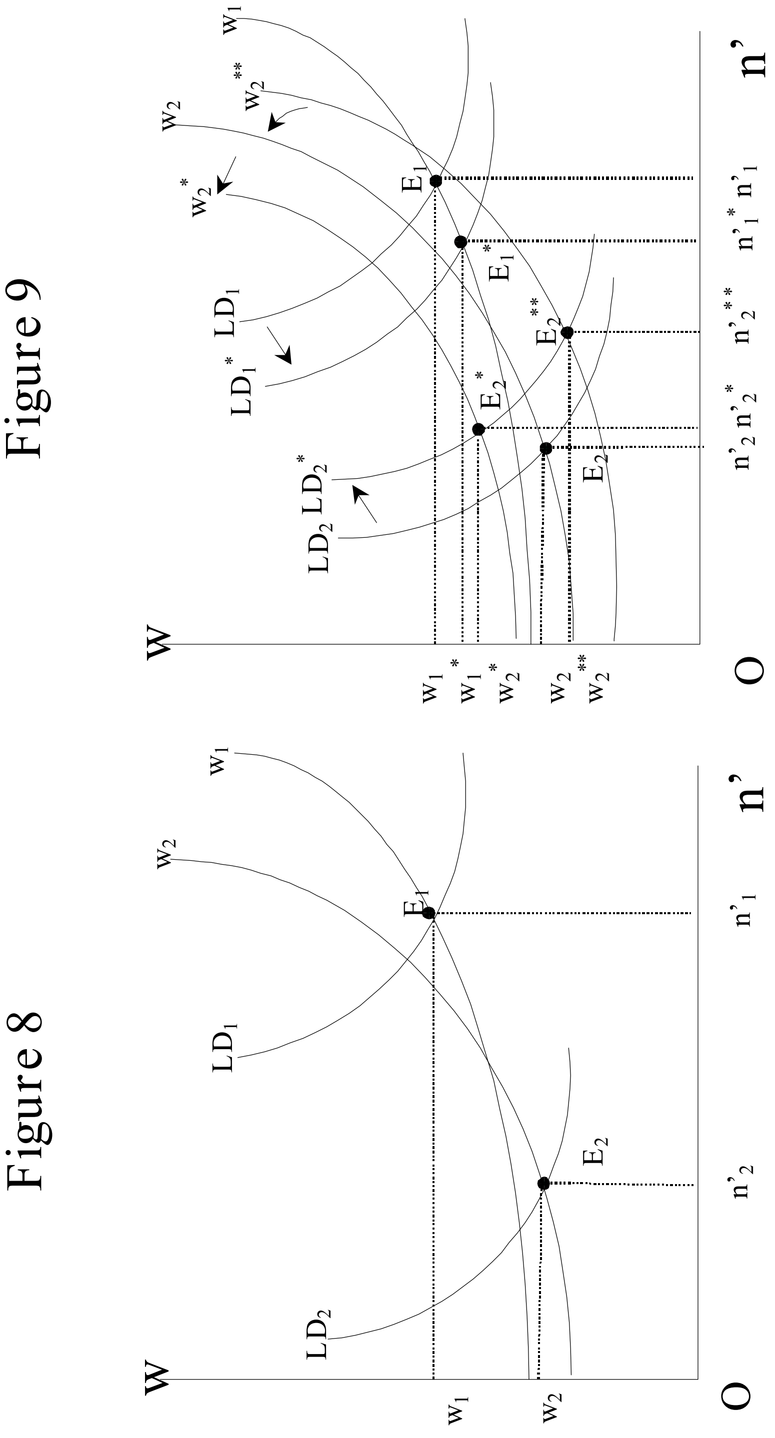

Figure 5.6: