Stick, Carrot and Skill Acquisition

Trine Filges & Birthe Larsen

Labour Market Policy
Working Paper 3:2002

Working Paper
Socialforskningsinstituttet
The Danish National Institute of Social Research

Stick, Carrot and Skill Acquisition

Trine Filges and Birthe Larsen

Labour Market Policy
Working Paper 3:2002

Stick, Carrot and Skill Acquisition*

Trine Filges† and Birthe Larsen‡

January 28, 2002

Abstract

This paper examines the macroeconomic effects of youth unemployment programmes in the form of vocational training (YUPs), developing a two sector general equilibrium model featuring matching frictions and worker-firm wage bargaining for skilled workers. Unskilled sector wages are indexed to skilled sector wages. Workers differ with respect to ability, having importance for the young worker's skill decision. Furthermore, a young worker may be offered vocational training through YUPs. The total number of skilled workers is therefore determined by these two channels and the interaction between them. We focus on the impact of of YUPs on skill division, unemployment distribution workers and aggregate unemployment.

Keywords: Skill acquisition, search, unemployment

JEL classifications: J18 J38 J68

1. Introduction

During the last decade of the former century, a huge amount of both theoretical and empirical papers emerged on the impact of Active Labour Market Policy on unemployment (see Heckman et al, 1999 for a survey). Beside the likely positive impacts, potential negative effects were shown, like a positive wage effect, supporting the mixed empirical evidence.

This paper examines another potential effect of Active Labour Market Policy. We consider training programmes offering vocational training to non-educated young workers. A number of European countries have introduced such programmes. The programmes should in theory be perfect substitutes for ordinary vocational training offered by the firms. The idea behind the programmes is that unemployment among low skilled workers is higher than unemployment among skilled workers. Consequently, increasing the number of skilled workers by offering them vocational training should decrease the total unemployment rate. However, the programmes may crowd out *ordinary* vocational training, thereby reducing a potential negative impact on the unemployment rate.[1]

*We want to thank participants at the EALE conference, Jyväskyla, Finland, 2001 and at an EPRU seminar, University of Copenhagen.

†Centre for Research in Social Integration and Marginalization and the Danish National Institute of Social Research, Herluf Trolles Gade 11, DK-1052 Copenhagen K, E-mail address: tif@sfi.dk, Phone: +45 3348 0926, Fax: +45 3348 0833

‡ Centre for Research in Social Integration and Marginalization and Copenhagen Business School, Department of Economics, Solbjerg Plads 3, DK-2000 Copenhagen F. E-mail address: bl.eco@cbs.dk

[1]A note of caution: the ordinary vocational training in some countries involve some public provided training too.

Evaluating the impact of programmes providing training, requires a more thorough analysis of what influences young peoples' choice of working or going to school. We set up a theoretical search model of young peoples' choice between school and work. According to the human capital investment theory, the decision of whether to enter the labour market immediately or to acquire further education post compulsory school, is a matter of whether the costs exceeds the benefits of further education, or the reverse.

Furthermore, we keep alternative wages for programme participants fixed in the sense that they are not determined by bargaining and hence a change in the worker's fall back position has no impact on wages and thereby unemployment. As this paper presents an analysis primarily about the group of young unemployed people who have not (yet) received any kind of education beyond compulsory school, it may be reasonably to assume that the minimum wage plays an important role when deciding to acquire education or search for a job. If the minimum wage is high, the opportunity cost of education is high and young people are more likely to search for a job than to acquire education.

Nickell and Van Ours (2000) analyses the Dutch and British cases. We now describe what have happened in Denmark. Denmark has experienced a larger fall in unemployment during the same period than England and the Netherlands. We therefore give a short description of the policy implemented in Denmark in the nineties, even though some of the same elements may be found in the policy conducted in other countries.

Since 1994 the Danish unemployment rate declined. The Danish youth unemployment rate has declined since 1993 and more dramatically than the overall unemployment rate. From 1994 to 1998 the overall unemployment rate decreased with 46 percent, from 12.3 to 6.6 percent. In comparison, the youth unemployment rate decreased with 62 percent, from 11.1 to 4.2 percent. Until 1993, the youth unemployment rate where higher than the total unemployment rate, but since 1993 the ordering was reversed. The gab between youth and the total unemployment rates has increased since then. In 1994 a labour market reform was implemented in Denmark. This reform aimed at increasing the number and the speed with which the long-term unemployed (with more than 6 months of unemployment) were activated. In 1996 a reform directed towards the unemployed, low-educated youth was implemented, the Youth Unemployment Programme (YUP), involving both a carrot and a stick. The aim of this reform was to improve the employment possibilities for unemployed, low-educated youth by motivating them to undertake an education. Young *insured* persons, less than 25 years, without any formal education beyond secondary school, who have been unemployed for minimum 6 months during the last 9 months, are given an offer of 18 months specially designed vocational education. This is the carrot. This offer contains an incentive to undertake ordinary education or to find a job since unemployment benefits are cut by 50 percent while in the special education programme. This is the stick. Refusal to participate in the special education programmes is followed by a sanction, it will result in a total loss of unemployment benefits. We disregard this sanction effect, as it is empirically unimportant, see the discussion below.

Jensen et. Al. (1999) study the immediate effect of the implementation of the YUP on the transition rate out of unemployment. They examine the time young individuals spend unemployed, and the states they enter after unemployment. The main result of their analysis is that the transition rate from unemployment to schooling significantly increases due to the YUP. The increase is mainly due to a direct programme effect, including both enrollment for the specially designed and ordinary vocational training. The effect of YUP on the transition

rate from unemployment to schooling is to a smaller extent due to a sanction effect. They do not find any significant effects on the transition from unemployment to employment.

From this analysis, emerge one basic question. Could the decrease in unemployment and, in particular, the decrease in youth unemployment, be due to the implementation of specific designed YUPs, that is, programmes involving a carrot and a stick? In answering this question, we have to take into account the possibility of a complete elimination of any effect of YUPs if the increased fraction of skilled workers through active labour market programmes is fully counteracted by a decrease in the number of workers acquiring skills through ordinary vocational training.

We concentrate on ordinary vocational training, as this should be a perfect substitute for the YUPs, we here consider. If an individual chooses to search for a job instead of enroll in an education programme, he or she might end up unemployed, receiving unemployment benefits. We assume that being unemployed, the unskilled individual has a probability of being placed in a programme (according to the YUPs described above). The group of young people who have undertaken either specially designed or ordinary vocational training search for jobs as skilled workers. However, in order to capture the possibility of the firms not acknowledging the (potential) resulting skill acquisition of the programme participant but rather still consider him or her as being unskilled after the ended training, we include a section on this issue.

The decision of whether to undertake ordinary vocational training or search for a job is based on maximization of the lifetime utility. Lifetime utility depends upon a number of variables. The income while attending school or working influences the decision. The employment prospects also influences the schooling decision. Research shows that higher unemployment rates imply that a larger fraction of the young people undertake an education, see for example Fredriksson (1999), Belzil and Hansen (1999) and Riphan (1999). This result is in accordance with the human capital investment theory. Among other things, the cost of education is the income lost while spending time on education. When unemployment is high, the opportunity cost of education is low. When weighting the future expected utility against the present (dis) utility of either go to school or work, the expected employment level specific to one's education level is also highly relevant. Besides the straight economic incentives, we incorporate an individual factor in the utility functions, measuring 'ability' and/or social background.

The paper is organised as follows. In Section 2 we set up the model. Section 3 is concerned with the impact on unemployment, the training decision and sector division and total unemployment from a higher rate of being offered programme participation. Section 4 provides an evaluation and Section 5 considers the case where the programmes do not result in any skills provision for the workers. The last section concludes.

2. The Model

When a young person enters the labour force, this new worker has several possibilities. However, in order to focus on the impact of youth labour market programmes, we simplify these possibilities such that the worker only has one decision. The worker decides whether he or she wants to remain unskilled or obtain ordinary vocational training. The vocational trained worker is a skilled worker. We assume that some workers are more able to acquire skills through vocational training, whereby obtaining skills is less costly for those individuals. Hence, workers are heterogeneous. We assume that workers are uniformly distributed between zero and one, $\mu \in (0, 1)$,

where a higher μ corresponds to a higher ability to obtain skills. The costs of acquiring skills through ordinary vocational training are $c(\mu)$, where $c'(\mu) < 0$.

The unskilled worker having decided to remain unskilled applies for a job in the sector providing unskilled jobs and the unskilled worker having decided to apply for vocational training applies for such a training job.[2] Wages for unskilled workers are indexed to skilled sector wages.

After a period of unemployment, unskilled workers are offered participation in active labour market programmes providing vocational training, whereby the worker becomes a skilled worker.

2.1. Matching

Let $u_j, j = n, s$ be the rate of unemployment and $v_j, j = n, s$ is the vacancy rate for unskilled and skilled workers, respectively. The matching functions are given by:

$$x_j = x\left(u_j, v_j\right), \ j = n, s.$$

The matching function satisfies the same properties as a neoclassical production function and is homogenous of degree one. The labour force is normalised to unity. The worker's transition rates into the two sectors can be expressed as $f_j = \frac{x_j}{u_j} = x\left(\theta_j\right), \ j = n, s$ where $\theta_j, \ j = n, s$ is labour market tightness for the two sectors. The transition rate facing firms is given by $q_j = \frac{x_j}{v_j} = x\left(\frac{1}{\theta_j}\right), \ j = n, s.$

2.2. The unskilled worker

For an unskilled worker, let U_n, P_n, and E_n denote the expected present values of being openly unemployed, programme participant and employed.

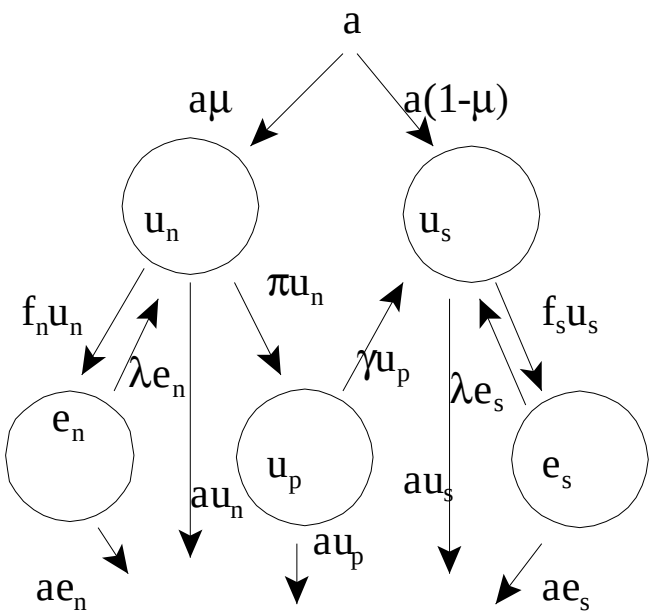
An unskilled worker, who has decided not to acquire skills faces asset equations of the form:

$$\begin{aligned} rU_n &= bw_n - t + f_n\left(E_n - U_n\right) + \pi\left(P_n - U_n\right) - aU_n, && (2.1)\\ rP_n &= gbw_n - t + \gamma\left(U_s - P_n\right) - c\left(\mu\right) - aP_n, && (2.2)\\ rE_n^i &= w_n^i - t + \lambda\left(U_n - E_n^i\right) - aE_n, && (2.3) \end{aligned}$$

where r is the subjective rate of time preference assumed to be identical for firm and worker. E_n^i denotes the value of match i and w_n^i is the associated wage. The parameter π is the probability of being offered programme participation, in which case the worker receives a fraction, g, of the unemployment insurance received as openly unemployed, bw_n, where $0 < b < 1, 0 < g \leqq 1$ and w_n is the expected wage for unskilled workers. Whenever the unskilled worker is offered programme participation, the worker has some ability costs associated with this form of skill acquisition, $c\left(\mu\right)$.We let λ denote the separation rate from ordinary employment. The parameter t is a lump sum tax rate. Refusal to participate in a programme results in a total loss of unemployment insurance, and hence we assume all workers agree to participate. We implicitly assume that the value of receiving unemployment assistance is smaller than the value of programme participation. We do acknowledge that this may not be the case, however, in order to keep focus on the skill acquisition decision this is an appropriate assumption. The parameter a is the rate by which the worker exists the labour market. This is then compensated for by an inflow of a workers into the labour market per unit of time.

[2] The market for training jobs is not explicit in the model.

Transition rates into ordinary employment depend on labour market tightness for unskilled workers, $f_n(\theta_n)$. At the rate γ, the programme ceases, corresponding to the worker being a skilled worker. The programme participant does not search for a job. Figure 1 illustrates labour market flows, where e_n is employment in the unskilled sector and e_s is employment in the skilled sector.



Labour Market Flows

The wage is indexed to the skilled sector wage, $w_n = \phi w_s$, $\phi < 1$. Wages are lower for unskilled workers than for skilled workers. Higher skilled sector wages result in higher unskilled sector wages.[3] As unemployment benefits are indexed to wages, skilled unemployment is not dependent on worker productivity as labour market tightness for skilled workers is not dependent on productivity. Hence, without minimum wages, the relation between labour market tightness and thereby unemployment will be indeterminate. In order to ensure than unskilled workers accept job offers we need that $rE_n^i > rU_n$, where a sufficient condition is that $\phi > r + a$.

Let J_n^i denote the present value of a filled job from match i and V_n denotes the present

[3] This may at first glans seem not to be an appropriate assumption for Denmark where there is no minimum wage for unskilled workers. However, the unskilled sector wage is often negotiated by the union and in that way related to skilled sector wages. Hence this is a simplifying assumption for Denmark and an appropriate assumption for many European Countries.

value of a vacant unskilled job. Labour productivity for an unskilled worker is y_n. The cost of holding a vacancy open is $k_n = \rho y_n$. That is, we let hiring costs be proportional to marginal productivity. The firm's transition rate from having a vacant to having a filled job is q_n. The flow values of having a filled and a vacant job are then determined by

$$\begin{aligned} rJ_n^i &= y_n - w_n^i + \lambda\left(V_n - J_n^i\right) - aJ_n^i, \quad (2.4) \\ rV_n &= q_n\left(J_n^i - V_n\right) - \rho y_n. \quad (2.5) \end{aligned}$$

We assume free entry, whereby in equilibrium $V_n = 0$. From equation (2.4) and (2.5) we obtain an equation to determine labour market tightness, once wages are determined:

$$\frac{\rho y_n}{q_n}\left(r_a + \lambda\right) = y_n - w_n, \quad (2.6)$$

where $r_a = r + a$.

2.3. The skilled worker

For a skilled worker, let U_s and E_s denote the expected present values of being openly unemployed and employed, respectively. The arbitrage equations facing the skilled worker are:

$$\begin{aligned} rU_s &= bw_s - t + f_s\left(E_s - U_s\right) - aU_s, \quad (2.7) \\ rE_s^i &= w_s^i - t - \lambda\left(E_s^i - U_s\right) - aE_s. \quad (2.8) \end{aligned}$$

We disregard active labour market programmes for skilled workers as the particular programmes we consider, are offered to unskilled workers only. Skilled employed workers receive the wage, w_s and skilled unemployed workers receive bw_s. Skilled workers have the probability $f_s\left(\theta_s\right)$ of obtaining a job.

Skilled workers have the marginal productivity y_s and firms employing skilled workers have the probability q_s of filling a vacancy. The value of having a filled job, J_s, and an unfilled job, V_s, solve the equations:

$$\begin{aligned} rJ_s^i &= y_s - w_s^i + \lambda\left(V_s - J_s^i\right) - aJ_s^j, \quad (2.9) \\ rV_s &= q_s\left(J_s - V_s\right) - \rho y_s, \quad (2.10) \end{aligned}$$

where $k_s = \rho y_s$ is the hiring cost for skilled sector firms.

2.3.1. Wages for Skilled Workers

Wages, w_s, are determined by Nash Bargaining with the worker's bargaining power equal to $\frac{1}{2}$. The first order condition yields:

$$E_s - U_s = J_s - V_s.$$

Substituting from equations (2.7)-(2.10) and noting that free entry implies $V_s = 0$ we have

$$w_s = \frac{y_s\left(1 + \rho\theta_s\right)}{2 - b}. \quad (2.11)$$

The skilled sector wage increase with worker bargaining power, worker productivity, unemployment insurance and labour market tightness. The latter effect stems from the saved hiring costs when the match is formed. Skilled sector wages do not depend on the rate at which unskilled workers are offered programme participation, π.

Wages are higher in the skilled sector than in the unskilled sector, $w_s > w_n$, as $\phi < 1$. An increase in ϕ therefore corresponds to a reduction in wage dispersion.

2.3.2. Labour Market Tigthness in the Unskilled Sector

We substitute for wages and hiring costs in equation (2.6) which gives an equation in labour market tightness for unskilled workers, θ_n:

$$\frac{\rho}{q_n}(r_a + \lambda) = 1 - \phi \frac{y_s}{y_n} \frac{(1 + \rho\theta_s)}{2 - b}. \tag{2.12}$$

Labour market tightness in the unskilled sector is a function of parameters and labour market tightness in the skilled sector. The parameter π does not appear as unskilled sector wages are related to skilled sector wages. Hence, there is no direct impact on labour market tightness from more programme participation.

Note that for given skilled sector wages, higher unskilled sector wages, that is, a higher ϕ, results in lower labour market tightness in the unskilled sector.

2.3.3. Labour Market Tightness in the Skilled Sector

Labour Market tightness is determined by using the equations (2.9),(2.10) the free entry condition and the wage equation, (2.11). We obtain an equation in labour market tightness for skilled workers, θ_s:

$$\frac{\rho}{q_s}(r_a + \lambda) = 1 - \frac{1 + \rho\theta_s}{2 - b}. \tag{2.13}$$

Using (2.12) and (2.13) we obtain a relationship between q_n and q_s :

$$\rho\left(\frac{1}{q_n} - \frac{1}{q_s}\right)(r_a + \lambda) = \frac{(1 + \rho\theta_s)}{2 - b} \frac{y_s}{y_n} \left(\frac{y_n}{y_s} - \phi\right) \tag{2.14}$$

From equation (2.14) we can deduce that if the relative marginal productivity, $\frac{y_n}{y_s}$, is higher than the relative wage in the unskilled sector, $\phi = \frac{w_n}{w_s}$, then the transition rate of firms in the unskilled sector is lower than the transition rate of firms in the skilled sector, in other words it is easier for an unskilled worker to find a job than it is for a skilled worker. Formally, equation (2.14) implies:

$$\frac{y_n}{y_s} \gtreqless \phi = \frac{w_n}{w_s} \Rightarrow \frac{1}{q_n} \gtreqless \frac{1}{q_s} \Rightarrow f_n \gtreqless f_s. \tag{2.15}$$

Note that if we had bargained wages for the two sectors, and no interaction in-between the two sectors, then labour market tightness would be independent of productivity and therefore equal for the two sectors. It follows that unemployment would be the same for the two sectors. The reason it that hiring costs and unemployment insurance are related to productivity.

2.4. Training decision and Sector Division

When deciding on training, the worker is comparing the values of unemployment as a skilled worker to the value of unemployment as an unskilled worker. While obtaining vocational training, the worker is receiving a wage. We assume that an unskilled worker deciding to obtain ordinary vocational training can do that immediately, without any searching period and that the worker deciding to acquire skills, actually do obtain the training and becomes a skilled worker.[4]

The marginal worker, $\hat{\mu}$, will then be indifferent between acquiring skills and remaining unskilled, implying the value of unemployment as a skilled worker deducted training costs is equal to the value of unemployment as an unskilled worker:

$$U_s - U_n(\hat{\mu}) = \frac{c(\hat{\mu})}{r_a},$$

where $\frac{c(\mu)}{r_a}$ is the value of skill acquisition per training period and noting that rU_n is also a function of μ. For existence of a nontrivial solution, $\hat{\mu} > 0$, we need that at $\mu = 1, U_s > U_n$ and then as μ decreases, $c(\mu)$ increases and U_n increases. Hence, $U_n > U_s$ for $\mu < \hat{\mu}$ and the reverse.

Substituting from the equations (2.1) to (2.3) and (2.7) and (2.8) we obtain an equation determining the fraction of workers acquiring skills through ordinary vocational training:

$$r_a w_s \left(\frac{b(r_a + \lambda) + f_s}{(r_a + \lambda + f_s)} \psi_s - \psi_n \phi \right) = c(\hat{\mu}), \tag{2.16}$$

where $\Psi_s = \frac{((r_a+\lambda+f_n)(r_a+\gamma)+\pi(r_a+\lambda))}{(r_a(r_a+\lambda+f_n)(r_a+\gamma)+\pi(r_a+\lambda)\gamma)}$ and $\Psi_n = \frac{((b(r_a+\lambda)+f_n)(r_a+\gamma)+\pi(r_a+\lambda)gb)}{(r_a(r_a+\lambda+f_n)(r_a+\gamma)+\pi(r_a+\lambda)\gamma)}$. When the wage difference between the skilled and the unskilled sector is large, ϕ small, this will tend to increase the number of people acquiring ordinary vocational training.

Workers with $\mu \leqq \hat{\mu}$, choose not to acquire skills, whereas workers with $\mu > \hat{\mu}$ acquire skills. There is a continuous flow of a workers into the labour force and a continuous flow of a workers out of the labour force. The labour force is normalised to one. The sector division, without any active labour market programmes providing vocational training would therefore be $\hat{\mu}$ unskilled workers and $(1 - \hat{\mu})$ skilled workers. However, in order to obtain the equilibrium number of skilled and unskilled workers, we have to take into account the number of workers obtaining skills through active labour market programmes, γu_p. Hence, $\hat{\mu} - \frac{\gamma}{a} u_p$ and $1 - \hat{\mu} + \frac{\gamma}{a} u_p$ resolve the unskilled and skilled labour forces, respectively.

We observe that a nontrivital solution exists if the following condition is satisfied:

$$\frac{b(r_a + \lambda) + f_s}{(r_a + \lambda + f_s)} \psi_s - \psi_n \phi > 0.$$

The condition is always satisfied. Thus, a positive number of workers will acquire ordinary vocational training.

[4] This is, of course, a simplification. However, in order to focus on whether increased programme participation implies lower unemployment or not, we wish to avoid unnecessarily complications of the model.

2.5. Unemployment

Unemployment has to be separated into different groups. Unskilled workers may be openly unemployed or programme participants. There is a continuous flow of a workers into the labour force and a continuous flow of a workers out of the labour force.

In equilibrium inflows are equal to outflows. The equilibrium flows characterizing the labour market for workers are then:

$$\begin{aligned} \lambda e_n + \hat{\mu} a &= (a + \pi + f_n)\, u_n, \\ u_n f_n &= e_n\,(a + \lambda)\,, \\ \pi u_n &= (\gamma + a)\, u_p, \\ f_s u_s &= (a + \lambda)\, e_s, \\ a\,(1 - \hat{\mu}) + \gamma u_p + \lambda e_s &= (f_s + a)\, u_s, \end{aligned}$$

where e_n (e_s) is the number of unskilled (skilled) employed workers. u_n (u_s) is the rate of unskilled (skilled) unemployed workers searching for unskilled jobs. The first equation characterizes equilibrium unemployment for openly unemployed unskilled workers. The second equation gives equilibrium unemployment for programme participants, u_p. Furthermore, we have that $e_s + u_s + u_n + u_p + e_n = 1$, where the pool of skilled workers is $s = u_s + e_s$ and the pool of unskilled workers is $1 - s = u_n + u_p + e_n$.

Solving for unemployment we obtain:

$$u_n = \frac{a + \lambda}{f_n + (a + \lambda)\left(1 + \frac{\pi}{a}\right)} \hat{\mu}, \tag{2.17}$$

$$u_p = \frac{\pi}{a + \gamma} \frac{a + \lambda}{f_n + (a + \lambda)\left(1 + \frac{\pi}{a}\right)} \hat{\mu}, \tag{2.18}$$

$$u_s = s \frac{a + \lambda}{f_s + a + \lambda}, \tag{2.19}$$

where

$$s = 1 - \hat{\mu} + \frac{\gamma}{a} u_p.$$

Total unemployment is:

$$u = u_n + u_p + u_s.$$

Total openly unemployment is given by:

$$u_o = u_n + u_s.$$

This paper will be concerned with openly unemployment, which we denote unemployment from now on, for simplicity. This is, the right measure for unemployment, as programme participation is a transitory state before skills are obtained and the workers become skilled workers. The relevant unemployment *rate* to consider is therefore:

$$u_{TOT} = \frac{u_n + u_s}{u_n + e_n + u_s + e_s} = \frac{u_n + u_s}{1 - u_p}, \tag{2.20}$$

where we consider the total number of unemployed workers, who actively search for a job relatively to the actual labour force. The actual labour force is those workers searching for a job and those who have a job.

The unemployment rate for skilled workers, $\frac{u_s}{e_s+u_s}$ is lower than unemployment for unskilled workers, $\frac{u_n}{e_n+u_n}$, if

$$\frac{u_n}{e_n+u_n} = \frac{a+\lambda}{a+\lambda+f_n} > \frac{a+\lambda}{f_s+a+\lambda} = \frac{u_s}{e_s+u_s}, \tag{2.21}$$

which is true if

$$f_s > f_n.$$

A higher employment probability in the skilled sector tends to decrease unemployment in this sector relatively to the unemployment rate in the unskilled sector. A higher employment probability in the unskilled sector tends to decrease unemployment for unskilled workers relatively to unemployment for skilled workers. However, empirically we observe that the unemployment rate for unskilled workers is higher than the unemployment rate for skilled workers. This requires that skilled workers' transition rate is higher than unskilled workers' transition rate, $f_s > f_n$ and thereby that labour market tightness is higher in the skilled sector than in the unskilled sector. As seen from equation (2.15) this in turn requires that the relative marginal productivity is lower than the relative wage of the unskilled sector, i.e. it requires: $\frac{y_n}{y_s} < \phi = \frac{w_n}{w_s}$. We assume this to be the case, as a relatively high unemployment rate for unskilled workers is the most realistic set up.[5]

3. Comparative Statics

The aim of this section is to evaluate what happens to unemployment, training, sector division and total unemployment, when the probability of getting an offer for programme participation increases. The idea is that more people should obtain skills and as the unemployment rate for skilled workers is lower than the unemployment rate for unskilled workers, total unemployment should fall. However, as the YUPs may 'crowd out' ordinary vocational training, the number of skilled workers may actually decrease and thereby cause an increase in unemployment. The government budget constraint is:

$$bw_n u_n + bw_s u_s + gbw_n u_p = bw_s \left(\phi u_n \left(1 + g\frac{\pi}{a+\gamma} \right) + u_s \right) = t.$$

As shown below, u_n may increase or decrease with π through a direct impact and an impact on $\hat{\mu}$, depending positively on $\hat{\mu}$. The variable u_s depends on π through an impact on s. The expenditure side may increase or decrease with π. The government budget constraint is always fulfilled through adjustments of the lump sum tax, t, paid by all workers.

As noted above, wages and labour market tightness are not affected as higher π has no impact on skilled sector wages and thereby unskilled sector wages.

[5] Furthermore, if this was not the case, there would be no scope for fighting the problem of unemployment by introduction educational programmes.

3.1. Unemployment

By inspection of equation (2.19) and (2.17) together with (2.21) we observe that the unemployment rate for skilled workers, $\frac{u_s}{e_s+u_s}$ and the unemployment rate for unskilled workers, $\frac{u_n}{e_n+u_n}$ are both unaffected by an increase in π.

Corollary 1. *Unemployment rates for skilled workers and unskilled workers are unaffected by more people being offered programme participation.*

The total number of unskilled unemployed workers may decrease due to more people being offered programme participation. But the relevant number to consider, the *rate* of unskilled unemployment is not affected. This is so as the rate of being offered programme participation, π, has no impact on labour market tightness for unskilled workers. Labour market tightness for unskilled workers depend on skilled sector wages, which are not dependent upon π. Therefore labour market tigthness in the skilled sector is independent on π and the unemployment *rate* for skilled workers does not depend on the rate of being offered programme participation.

Intuitively this must be true. Moving into a transitory state of programme participation, and hence withdrawing from the labour force, should not affect the unemployment rate for unskilled workers. Furthermore, increasing the number of skilled workers through programme participation does not in the present set up, in equilibrium, have any impact on unemployment for skilled workers.[6]

3.2. Training Decision and Sector Division

The subsection is concerned with the impact on sector division from more workers being programme participants, that is, resulting from an increase in π.

Proposition 2. *When the rate of being offered programme participation increases, that is, π increases, the number of people acquiring ordinary vocational training increases (decreases), $\frac{d\hat{\mu}}{d\pi} < 0$ ($\frac{d\hat{\mu}}{d\pi} > 0$), under the sufficient condition that $\frac{r_a(1-gb\phi)}{1-b\phi} > \gamma$ ($\gamma > \frac{r_a(1-gb\phi)}{1-\phi}$).*

Proof. Differentiating equation (2.16) with respect to π we obtain

$$w_s r_a \left(r_a+\lambda\right) \frac{\left(\frac{\left(r_a+\lambda\right)b+f_s}{\left(r+\lambda+f_s\right)}\left(1-\gamma\psi_s\right)-\left(gb-\psi_n\gamma\right)\phi\right)}{c'(\hat{\mu})D} = \frac{d\hat{\mu}}{d\pi}, \tag{3.1}$$

where $D = \left(r_a\left(r_a+\lambda+f_n\right)\left(r_a+\gamma\right)+\pi\left(r_a+\lambda\right)\gamma\right)$.

We can show that a sufficient condition for $\frac{d\hat{\mu}}{d\pi} < 0$ is that $\frac{r_a(1-gb\phi)}{1-b\phi} > \gamma$. If the condition, $\gamma > \frac{r_a(1-gb\phi)}{1-\phi}$, holds, then less people are acquiring vocational training, $\frac{d\hat{\mu}}{d\pi} > 0$. ■

The value attached to the payoff in the skilled sector is unaffected by the frequency of being offered programme participation. However, when the frequency of being offered programme participation increases, the value attached to the payoff in the unskilled sector may decrease or increase. Note that $\frac{d\hat{\mu}}{d\pi}$ is unambiguously negative for $r_a > \gamma$. If the rate by which a programme ceases and the worker becomes a skilled worker, γ, is relatively large, then the value

[6] A companion paper, Filges and Larsen 2001, show in a set up where unemployed skilled workers search for jobs in both the skilled and the unskilled sector, that the number of skilled workers matters for the unemployment rate of skilled workers.

attached to the payoff in the unskilled sector increases and fewer workers are acquiring ordinary vocational training. Hence the larger the carrot-effect, i.e. the faster the unskilled finish the education programme and become skilled workers, the more likely it is that programmes crowd out ordinary education. The relative compensation while in programme, g, measures the stick-effect. The smaller the stick, that is the larger is g, the more likely it is that programmes crowd out ordinary education.

Note that a decrease in the number of people acquiring ordinary vocational training requires that the value of programme participation is larger than the value of unskilled unemployment, such that unskilled workers are better off when π increases.

The effect of an increased frequency of being offered programme participation on the relative number of skilled workers may be positive or negative. The relative number of skilled workers is given by:

$$s = \frac{\gamma}{a} u_p + 1 - \hat{\mu}. \tag{3.2}$$

If a higher frequency of being offered programme participation crowd in the number of people acquiring ordinary education, $\frac{d\hat{\mu}}{d\pi} < 0$, this has a direct positive effect on the relative number of skilled workers. There is further an indirect effect through the equilibrium pool of programme participants. The equilibrium pool of programme participants is given by:

$$u_p = \frac{\pi}{(a+\gamma)} u_n.$$

There is a direct positive effect on the equilibrium pool of programme participants and thereby on the relative number of skilled workers. Furthermore, there is an indirect crowding in or crowding out effect. If a higher frequency of being offered programme participation crowd out the number of people acquiring ordinary education, $\frac{d\hat{\mu}}{d\pi} > 0$, this has a positive impact on the equilibrium pool of unskilled unemployed workers, $\frac{du_n}{d\hat{\mu}} \frac{d\hat{\mu}}{d\pi} > 0$, and thereby on the relative number of skilled workers. Hence, the effect on the number of people acquiring ordinary education has two opposite effects on the relative number of skilled workers. The following proposition summarizes the effect.

Proposition 3. *When the rate of being offered programme participation, π, increases, the equilibrium pool of skilled workers, $s = \frac{\gamma}{a} u_p + 1 - \hat{\mu}$ increases (decreases) if $\frac{d\hat{\mu}}{d\pi} \frac{\pi}{\hat{\mu}} < (>) \left(1 - \frac{(1-s)}{\hat{\mu}}\right) \left(1 - \frac{u_p}{1-s}\right)$.*

Proof. The equilibrium pool of skilled workers, $s = 1 - \hat{\mu} + \frac{\gamma}{a} u_p$ changes according to:

$$\frac{\partial s}{\partial \pi} = -\frac{\partial \hat{\mu}}{\partial \pi} + \frac{\gamma}{a} \frac{\partial u_p}{\partial \pi} = \frac{1-s}{\pi} \left(-\frac{d\hat{\mu}}{d\pi} \frac{\pi}{\hat{\mu}} + \left(1 - \frac{(1-s)}{\hat{\mu}}\right) \left(1 - \frac{u_p}{1-s}\right) \right)$$

Hence, $\frac{\partial s}{\partial \pi} > 0$ iff $\frac{d\hat{\mu}}{d\pi} \frac{\pi}{\hat{\mu}} < \left(1 - \frac{(1-s)}{\hat{\mu}}\right) \left(1 - \frac{u_p}{1-s}\right)$. ■

This result says that if a higher frequency of being offered programme participation crowd in the number of people acquiring ordinary education, $\frac{d\hat{\mu}}{d\pi} < 0$, the relative number of skilled workers unambiguously increases. However, even if a higher frequency of being offered programme participation crowd out the number of people acquiring ordinary education, $\frac{d\hat{\mu}}{d\pi} > 0$, the relative number of skilled workers increases if the fall in the number of people acquiring ordinary education is not too high.

3.3. Total Unemployment

In this section we examine what happens to total unemployment when the rate at which a worker is offered programme participation increases. The aim of the specially designed active labour market programmes is to decrease unemployment, through an increase in the relative number of skilled workers. According to equation (2.21) the unemployment rate of skilled workers is lower than the unemployment rate of unskilled workers if the transition rate into skilled employment is higher than the transition rate into unskilled employment. Empirically, we observe that the unemployment rate for unskilled workers is higher than the unemployment rate for skilled workers, accordingly we assume that the inequality $f_s > f_n$ is fulfilled, see condition (2.15).

The total unemployment rate we consider, is a weighted average of the unemployment rates of skilled and unskilled workers respectively. The unemployment rates of skilled and unskilled workers are not affected by an increase in the rate of being offered programme participation. However, if the relative number of people acquiring education, ordinary and through the special programmes, increases, the total unemployment rate unambiguously decreases. Even if the relative number of skilled workers decreases, the total unemployment rate may decrease, as the effect of reducing the number of unskilled unemployed workers through programme participation is higher than the temporary reduction of the labour force. The following proposition summarizes the result.

Proposition 4. *The total unemployment rate, $u_{TOT} = \frac{u_s+u_n}{1-u_p}$, decreases with the rate of being offered programme participation, a higher π, under the sufficient condition that $\frac{ds}{d\pi} \geq 0$. From proposition (2) we know that a sufficient condition for $\frac{\partial s}{\partial \pi} \geq 0$ is that $\frac{\partial \hat{\mu}}{\partial \pi}\frac{\pi}{\hat{\mu}} \leqslant \left(1-\frac{(1-s)}{\hat{\mu}}\right)\left(1-\frac{u_p}{1-s}\right)$. If the relative number of skilled people decreases, $\frac{ds}{d\pi} < 0$, the total unemployment rate may still decrease if the fall in s is not too high, i.e. if $-u_p < \frac{\partial s}{\partial \pi}\frac{\pi}{s}$.*

Proof. Total unemployment changes with π according to:

$$\frac{\partial u_{TOT}}{\partial \pi} = \frac{\frac{\partial u_n}{\partial \pi} + \frac{\partial u_s}{\partial \pi} + u_{TOT}\frac{\partial u_p}{\partial \pi}}{(1-u_p)}. \tag{3.3}$$

The first term in the numerator has two parts:

$$\begin{aligned}\frac{\partial u_n}{\partial \pi} &= \frac{u_n}{\mu}\left(\frac{\partial \mu}{\partial \pi} - \frac{u_n}{a}\right) = \\ &\quad -\frac{u_n}{1-s}\left(\frac{\partial s}{\partial \pi} + \frac{u_n}{a+\gamma}\right).\end{aligned}$$

A sufficient condition for a negative sign is that $\frac{\partial s}{\partial \pi} \geq 0$, where from proposition (2) we know that a sufficient condition for $\frac{\partial s}{\partial \pi} \geq 0$ is that $\frac{\partial \hat{\mu}}{\partial \pi}\frac{\pi}{\hat{\mu}} \leqslant \left(1-\frac{(1-s)}{\hat{\mu}}\right)\left(1-\frac{u_p}{1-s}\right)$.

The second term of the numerator of equation (3.3) is equal to

$$\frac{\partial u_s}{\partial \pi} = \frac{\partial s}{\partial \pi}\frac{u_s}{s},$$

which is positive if the number of people acquiring skills increases.

Finally, the last term is equal to:

$$\frac{\partial u_p}{\partial \pi} = \frac{u_n}{(a+\gamma)\,\hat{\mu}}\left(\frac{\partial \hat{\mu}}{\partial \pi}\pi + e_n + u_n\right) = \frac{u_n}{(a+\gamma)\,(1-s)}\left(-\frac{\partial s}{\partial \pi}\pi + e_n + u_n\right).$$

A decrease in the relative number of skilled workers is a sufficient condition for an increase in the equilibrium pool of programme participants.

The total derivative may be reduced to

$$\frac{\partial u_{TOT}}{\partial \pi} = \frac{\left(u_{TOT} - \frac{u_s}{s}\right)\frac{1}{\pi}\left(\frac{\partial \hat{\mu}}{\partial \pi}\frac{\pi}{\hat{\mu}} - \left(1 - \frac{(1-s)}{\hat{\mu}}\right)\left(1 - \frac{u_p}{1-s}\right)\right)}{(1-u_p)} = -\frac{\left(u_{TOT} - \frac{u_s}{s}\right)\frac{s}{\pi}\left(\frac{\partial s}{\partial \pi}\frac{\pi}{s} + u_p\right)}{(1-u_p)\,(1-s)},$$

We have that $u_{TOT} - \frac{u_s}{s} > 0$ as $\frac{u_n}{e_n+u_n} > \frac{u_s}{e_s+u_s}$. Hence, $\frac{\partial s}{\partial \pi} \geq 0$ is a sufficient condition that total unemployment falls, where from proposition (2) we know that a sufficient condition for $\frac{\partial s}{\partial \pi} \geq 0$ is that $\frac{\partial \hat{\mu}}{\partial \pi}\frac{\pi}{\hat{\mu}} \leqslant \left(1 - \frac{(1-s)}{\hat{\mu}}\right)\left(1 - \frac{u_p}{1-s}\right)$. Even if the relative number of skilled people decreases, $\frac{ds}{d\pi} < 0$, the total unemployment rate decreases if the fall in s is not too high, i.e. if $-u_p < \frac{\partial s}{\partial \pi}\frac{\pi}{s}$. ■

The first term of the numerator of equation (3.3) has two parts. If the relative number of skilled workers increases (decreases), this tends to decrease (increase) unemployment. Furthermore, a higher rate of being offered programme participation directly reduces the number of unemployed unskilled workers. If the relative number of skilled workers do not decrease, the number of unemployed unskilled workers decreases.

The second term in the numerator of equation (3.3) captures the impact on the number of unemployed skilled workers. If the number of skilled workers increases, then this will increase the number of unemployed skilled workers. The last term in the numerator of equation (3.3) corresponds to the change in the labour force due to more people being offered programme participation. If the equilibrium pool of programme participants increases, the labour force is reduced and therefore tends to increase the unemployment rate. A higher rate of being offered programme participation directly increases the number of programme participants. If, however, the YUPs do not totally crowd out ordinary education, i.e. if the relative number of skilled workers increase, $\frac{\partial s}{\partial \pi} > 0$, this tends to decrease the number of programme participants. Hence, in the case preferred: the number of skilled workers increases, the total effect on the number of programme participants is ambiguous.

The total effect of a higher rate of being offered programme participation on the total unemployment rate, is unambiguously negative if the relative number of skilled workers do not decrease, i.e. if $\frac{ds}{d\pi} \geq 0$. Even if the relative number of skilled people decreases, $\frac{ds}{d\pi} < 0$, the total unemployment rate may still decrease, if the fall in s is not too high, i.e. if $-u_p < \frac{\partial s}{\partial \pi}\frac{\pi}{s}$. This condition corresponds to a condition on the magnitude of crowding out of ordinary education implied by a higher rate of being offered programme participation.

In the case where the number of workers acquiring ordinary skills increases, that is, a higher rate of being offered programme participation crowds in ordinary education, this unambiguously

implies that the number of skilled workers increases and total unemployment falls. On the other hand, even if a higher rate of being offered programme participation crowds out ordinary education to an extent implying that the relative number of skilled workers decreases, $\frac{ds}{d\pi} < 0$, total unemployment decreases if the marginal effect on ordinary skill acquisition is not too high, i.e. if $\frac{\partial \hat{\mu}}{\partial \pi} \frac{\pi}{\hat{\mu}} < \left(1 - \frac{(1-s)}{\hat{\mu}}\right)\left(1 - \frac{u_p}{1-s}\right)$.

4. Evaluation

Following our empirical results and the theoretical model, can we then say that youth active labour market programmes aiming at increasing the fraction of skilled workers and thereby reducing unemployment, have been a success in Denmark and/or could be a success in other countries?

Our theoretical analysis suggest that if the sufficient condition $\frac{r_a(1-gb\phi)}{1-b\phi} > \gamma$ holds, then the active labour programmes evaluated including a carrot, obtaining skills and a stick, reducing unemployment insurance, should be effective in increasing the fraction of skilled workers in the economy and lowering unemployment. Reversely, if $\gamma > \frac{r_a(1-bg\phi)}{1-\phi}$, then fewer workers are acquiring ordinary vocational training, tending to decrease the fraction of skilled workers in the economy and tending to increase total unemployment.

Two things to note. Firstly, the stick part is important. If $g = 1$ it is more likely that fewer people are acquiring ordinary vocational training, because participating in the government provided programmes offers a transition into the skilled labour force for workers without involving any direct costs. Secondly, the carrot part, the rate at which unskilled workers finish the special education programme and become skilled workers is important. If γ is high the analysis shows that the youth active labour market programmes tend to crowd out ordinary education. If the marginal effect on the number of people acquiring ordinary education is high, the youth active labour market programme's aim of increasing the relative number of skilled workers may fail. However, the effect of reducing the number of unskilled unemployed workers through a higher programme participation rate still has a negative effect on the total unemployment rate, even if this lock in effect temporarily reduces the labour force.

Turning towards some specific numbers,[7] we have the following. For highly skilled workers in Denmark b is, in general, $b = 0.645$ (1999)[8] and as the youth programmes in question involved a reduction of the benefits by one half, we have $g = 0.5$. An interest rate of $r_a = r + a = 0.02 + 0.001 = 0.021$ (per quarter) then gives the conditions: $\frac{\partial \hat{\mu}}{\partial \pi} < 0$ if $0.021\frac{1-0.3225\phi}{1-0.645\phi} > \gamma$ and $\frac{\partial \hat{\mu}}{\partial \pi} > 0$ if $\gamma > 0.021\frac{1-0.3225\phi}{1-\phi}$. Hence, if the difference between skilled and unskilled wages is not too high, ϕ is high, the first condition may be satisfied for relatively low values of γ. We need that $\phi \geq b$, that is, minimum wages are higher than unemployment insurance. For example, in Denmark in 1999 the value of the parameter ϕ was $\phi = 0.653$. This gives the condition $\frac{\partial \hat{\mu}}{\partial \pi} < 0$ if $\gamma < 0.029$ and $\frac{\partial \hat{\mu}}{\partial \pi} > 0$ if $\gamma > 0.048$. Hence, γ should not be too high for a higher programme participation to result in crowding in of ordinary education. Comparing the value of γ to the separation rate from an ordinary job, the duration of the programme, $\frac{1}{\gamma}$, should be smaller than the duration of an ordinary job, $\frac{1}{\lambda}$. This corresponds to $\lambda < \gamma$. Usually we assume that λ is

[7] All numbers are from The danish employer organisation.

[8] Here we should note that there is an upward limit on b in Denmark, which is probably reached by many skilled workers. Hence, b is above 0.645 for unskilled workers. However, we assume b_n and b_s to be equal for simplicity and symmetry.

around 0.06. In this case, a reasonable value of γ,that is, $\gamma > 0.06$, then implies that $\frac{\partial \hat{\mu}}{\partial \pi} > 0$, less workers are acquiring ordinary vocational training.

We could have an increase in the fraction of workers obtaining skills and a reduction in unemployment even if the number of people acquiring ordinary vocational training decreases. To see this, we run simulations. Hiring costs are $\rho = 0.667$ and $y_n = 1$. Then as $\phi = 0.653$, we need that $y_s > \frac{1}{0.653} = 1.5314$ to obtain the realistic case where $f_s > f_n$ and hence $\frac{u_s}{u_s+e_s} > \frac{u_n}{u_n+e_n}$. The fraction of skilled workers to unskilled workers is around $s = 0.4$. We choose parameter values and functional forms matching a total unemployment rate of $u_{TOT} = 12$ percent (Denmark in 1994). For $y_s = 1.553$, a Cobb Douglas mathching function with exponent equal to a half and $c(\mu) = 2(1-\mu)$ we have $\frac{u_s}{u_s+e_s} = 0.096$ and $\frac{u_n}{u_n+e_n} = 0.137$. With $\gamma = 0.16$, a change in π from $\pi = 0.0018$ to $\pi = 0.0028$ results in a lower $\hat{\mu}$ but an increase in s to $s = 0.46$ and hence a reduction in unemployment to $u_{TOT} = 0.118$. Simulations obtained from higher values of γ and then correspodently lower values of π results in even higher values of s. Reducing γ does not change the qualitative impact either.

However, the assumption that all workers attending an active labour market programme resulting in the acquisition of skills, is a simplifying assumption which need not hold. Many workers may initiate participation but find an unskilled job or give up the specially designed educational programme before graduating. Furthermore, firms may not acknowledge that the government trained worker has the same qualifications as an ordinary trained worker. This last issue we turn to in the next section.

5. What if the training part doesn't work

Until now we have assumed that the training provided by the government through Active Labour Market programmes has the same quality as the ordinary vocational training (which may include some elements of public funding too, of course). However, it may the case that the government provided training is not acknowledged by skilled sector firms as having the same quality as the ordinary vocational training mainly provided by firms. We have considered the one extreme where the two forms of training are perfect substitutes. In this section, we consider the other extreme case which captures that skilled sector firms are not interested in employing a government trained worker. Another interpretation could be that no programme participants finishes the total training programme. Hence, programme participants end up returning to the unemployment pool as unskilled workers instead of transferring to a state as skilled sector unemployed workers. The carrot is missing, only the stick is at work. We have that $s = 1 - \hat{\mu}$, the number of people acquiring ordinary skills is equal to the number of skilled workers.

What happens in this case is quite straight forward. The description of the model is basically the same, except from that equation (2.2) is modified to:

$$rP_n = gbw_n + \gamma(U_n - P_n) - c(\mu) - aP_n, \tag{2'}$$

The training equation, equation (2.16), becomes:

$$w_s\left(\frac{(r_a+\lambda_s)b + f_s}{(r+\lambda_s+f_s)}\psi'_s - \psi'_n\phi\right) = c(\hat{\mu}),$$

where $\psi'_s = \frac{(r_a+\lambda+f_n)(r+\gamma)+\pi(r_a+\lambda)}{(r_a+\lambda+f_n)(r_a+\gamma)}$ and $\psi'_n = \frac{((r_a+\lambda)b+f_n)(r+\gamma)+\pi(r_a+\lambda)gb}{(r_a+\lambda+f_n)(r_a+\gamma)}$.

Existence is easily shown. It is immediately observed that a higher π implies that $\hat{\mu}$ decreases as the value of being an unskilled unemployed worker decreases with π :

$$\frac{\partial \hat{\mu}}{\partial \pi} < 0.$$

When the probability of being offered programme participation increases, the unskilled worker is worse of as only the stick remains, inducing more workers to acquire skills. Note, however, that even if $g = 1$ (or slightly above) we still have a positive impact on skill acquisition. This is the case as the programme participation reduces the value of unskilled unemployment as there is no possibility to search for a job while programme participant. Hence, if g is less than one it just amplifies the negative impact on the value of unskilled unemployment.

Concerning unemployment, we have the following equations:

$$\begin{aligned} u_n &= \frac{(a+\lambda)\,\hat{\mu}}{(f_n + a + \lambda) + \pi \frac{a+\lambda}{\gamma + a}}, \\ u_p &= \frac{\pi}{(\gamma + a)} u_n, \\ u_s &= \frac{a+\lambda}{f_s + a + \lambda} s, \end{aligned}$$

where $s = 1 - \hat{\mu}$ and total unemployment is still given by equation (2.20). The proposition concerning unemployment is modified to:

Proposition 1. *When Active Labour Market Programmes do not imply a transition into the skilled labour force, the total unemployment rate decreases with the rate of being offered programme participation,* $\frac{\partial u_{TOT}}{\partial \pi} < 0$.

Proof. Differentiating total unemployment with respect to π we have the following:

$$\frac{\partial u_{TOT}}{\partial \pi} = \frac{\left(u_{TOT} - \frac{u_s}{s}\right)\left(\frac{\partial \hat{\mu}}{\partial \pi}\frac{\pi}{\hat{\mu}} - u_p \frac{(1-\hat{\mu})}{\hat{\mu}}\right)}{(1 - u_p)} < 0,$$

as $u_{TOT} > \frac{u_s}{s}$. ■

Hence, whenever the training programmes do not work, that is, they are not perfect substitutes for ordinary vocational training,[9] then the stick effect implies crowding in, that is, more workers are acquiring ordinary skills, resulting in a reduction in unemployment.

6. Conclusion

This paper has evaluated the impact of specially designed active labour market programmes aiming at providing the worker with vocational training in order for him or her to become a skilled worker. As the unemployment rate is higher for unskilled than for skilled workers, more programme participants should increase the fraction of skilled workers and thereby reduce the rate of unemployment. For example, Denmark has offered such youth educational programmes

[9] The programmes, of course, may have some effect anyhow, like the working getting used to getting up in the morning or the worker regains some lost skills. See for example Larsen 2001 for a paper on this last issue.

to young unskilled workers including a carrot and a stick, the carrot being skill acquisition and the stick being a reduction in unemployment insurance.

However, including an endogenous skill choice decision we have taken into account that a higher rate of being offered programme participation may reduce the number of people acquiring skills. If remaining an unskilled worker searching for a job and having the possibility of being offered programme participation is associated with a higher value than obtaining ordinary vocational training, the number of workers obtaining ordinary vocational training may decrease. In this case, an aggregate reduction in the number of skilled workers may be the result and unemployment could increase.

We have shown that if the time spend in programmes is long, then programmes do not crowd out ordinary education. But even if programmes crowd out ordinary education, the fraction of skilled workers may increase and unemployment is reduced. We cannot tell whether this has been the reason behind the reduction in the Danish unemployment rate. To answer this question, further empirical tests are needed. In general, if the programmes should be successful in any economy, the stick part of the programme is important; unemployment insurance should be reduced to some extent while the worker is a programme participant. Simple simulations suggests that the programmes have crowded out ordinary vocational training but that this has happened jointly with an increase in the fraction of skilled workers in the economy, hence leading to a reduction in total unemployment.

Furthermore, we have evaluated the impact of the programmes when they have no effect on the worker's skill level. In this case, only the stick part is effective and unambiguously inducing more workers to acquire ordinary education.

However, comparing the two cases, the case with and the case without the carrot part effectively working, is not straightforward. When the carrot part is effective, we may see a reduction in the number of workers acquiring ordinary skills but at the same time there is a direct increase in the number of skilled workers through the government provided programmes. When the carrot is not effective, the number of workers acquiring ordinary education is increased but there is no direct increase in the number of skilled workers through the government provided programmes.

References

[1]Belzil, C. and J. Hansen (1997). Estimating the Returns to Education from a Non-Stationary Dynamic Programming Model, *CLS Working Paper*, **97-06**.

[2]Dansk arbejdsgiverforening (The danish employer organisation). Arbejdsmarkedsrapport 2000. (the report is in danish).

[3]Filges, T. and B. Larsen (2001). The Impact of Youth Unemployment Policy. WP, Copenhagen.

[4]Fredriksson, P. (1997). Economic Incentives and the Demand for Higher Education, *Scandinavian Journal of Economics*, **99(1):** 129-142**.**

[5]Heckman, J.J., Ro.J. Lalonde and J.A. Smith. The economics and econometrics of active labour market programs. In Handbook of Labor Economics, ch. 31: 1865-2097.

[6]Jensen, P., M.S. Nielsen and M. Rosholm (1999). The Effects of benefits, Incentives, and Sanctions on Youth Unemployment, *CLS Working Paper*, **99-05**.

[7]Larsen, B. (2001). Minimum Wages, technological progress and loss of skill. *European Economic Review,* **vol. 45**: 1521-1544.

[8]Nichell, S. and J. Van ours (2000). Falling Unemployment, in Economic Policy 30, pp. 137-180.

[9]Pissarides, C. A., 1990, Equilibrium Unemployment Theory, Blackwell

[10]Riphan, R.T. (1999). Residental Location and Youth Unemployment: The Economic Geography of School-to-work Transitions, *IZA Discussion Paper*, **No. 99**.