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Macroeconomic Shock and Labour Market Programmes

Yoshihiko Fukushima*

Faculty of Political Science and Economics, Waseda University, 1--6-1 Nishi-Waseda, Shinjuku-ku, Tokyo, 169-8050 Japan

Abstract

The paper presents a theoretical analysis of macroeconomic effects of employment subsidy programmes and training/education programmes when the economy faces a macroeconomic shock. Wages and employment are determined by the intersection of demand curves and wage-setting schedules. The wage curve is derived from the Shapiro-Stiglitz efficiency-wage model. Employment subsidy programmes decrease the risk of being unemployed and tend to keep the welfare of workers. Training programmes upgrade labour skill and tend to transfer labour from a low-productivity to a high-productivity sector. Both programmes tend to increase the welfare of workers. However, the macroeconomic impacts of these two programmes on wages and labour productivity are different. The paper investigates and compares the macroeconomic influences of subsidised employment programmes and training/education programmes in a dual labour-market framework.

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1. Introduction

The expenditure for employment subsidy programmes in Japan has increased dramatically since the collapse of the venerable American investment bank, Lehman Brothers, in 2008. The expenditure for employment maintenance programmes in 2008 was 6.8 billion yen, but it became 654 billion yen in 2009 and...
3250 billion yen in 2010. Those programmes covered 1.8 million workers per month in 2009 and 0.85 million workers per month in 2010 (Ministry of Health, Labour and Welfare, 2011). These numbers correspond to 2.8% and 1.3% of total labour force in each year, respectively. Because of the employment maintenance programmes, a lot of workers avoid the risk of being unemployed. The employment maintenance programmes are good for employers, too. If firms can keep workers as stand-by workers instead of firing them when the economy is in a recession, firms can be back in business quickly with low costs when the economy recovers.

It is also good to society that workers stay as stand-by workers because social costs associated with unemployment is likely to be much larger than the total expenditure for employment subsidy programmes. However, from another point of view, employment subsidy programmes protect and maintain firms and industries that are no longer competitive. No OECD countries except Japan have used employment subsidy programmes as key labour market policies after Lehman shock in 2008. Most of the OECD countries have emphasised on training/education programmes and recruitment incentive programmes instead of employment maintenance programmes. This paper examines the macroeconomic effects of subsidised employment programmes and training/education programmes in a dual labour-market framework.

When ALMPs train unskilled workers and increase labour mobility from unskilled sectors with high unemployment to skilled sectors with low unemployment, ALMPs have a direct labour-placement effect which tends to decrease aggregate unemployment by reducing mismatch in the labour market. Baily and Tobin (1977) used the Phillips curve and showed that job creation scheme may reduce the NAIRU by substitutions of low-wage for high-wage workers. Programmes may also have wage effects via expectations, which were neglected in earlier discussions. Calmfors and Lang (1995) analysed the effects of ALMPs using a standard bargaining one-sector model. They argued that ALMPs may raise wage pressure and thus reduce regular employment. Calmfors (1995) 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 to both employed and unemployed workers may be a better policy than to target only on the unemployed.

Heckman et al. (1999) summarised the empirical studies on impacts of training programmes and concluded that such programmes does not significantly reduce unemployment. Calmfors et al. (2002) discussed the mechanism through which ALMPs affect (un)employment and surveyed the empirical studies of the effects of ALMPs in Sweden. They concluded that ALMPs may reduce both open unemployment and regular employment.

Gustman and Stenmeier (1988) studied the effect of training subsidies and wage subsidies on youth employment in a two-sector general equilibrium model. Labour was assumed to be heterogeneous in terms of ability. They concluded that both youth and aggregate employment may be increased by training subsidies for young workers. Wage subsidies for youth may have a positive impact on youth employment and an effect on aggregate employment is ambiguous. Orszag and Snower (1999) used an overlapping generation model to study hiring subsidies for unemployed workers. They analysed the interaction between deadweight (hiring rate in the absence of hiring subsidies), and displacement (the effect of hiring subsidies on the separation rate), and hiring effectiveness (the effect of hiring subsidies on the hiring rate) in a dynamic framework. An optimal employment subsidy scheme was found to lead to a reduction in aggregate unemployment.

This paper uses a two-sector general equilibrium model. I rely on the idea that wages and employment are determined by the intersection of a labour-demand schedule and a wage-setting schedule (Layard et al., 1991; Calmfors, 1994; Fukushima, 1998, 2001). The Shapiro-Stiglitz (1984) efficiency-wage model is used to model wage setting.

I study the effects of subsidised employment programmes and training/education programmes. Moreover, I shall compare the outcomes of employment subsidy programmes and outcomes of training/education programmes when the economy faces a macroeconomic shock. Section 2 sets the basic model. In Sections 3 I
demonstrate how training/education programmes and employment subsidy programmes affects wages, employment in each sector and aggregate employment. Section 4 concludes.

2. The model

I consider an economy made up by two sectors: a HP-sector (sector 1) and a LP-sector (sector 2). There are two types of labour: skilled labour in the HP-sector and unskilled labour in the LP-sector. I shall assume that labour-market policies train unskilled workers and transfer them from the LP-sector to the HP-sector. Otherwise, the two sectors are entirely separated from each other. Skilled labour is assumed to maintain its productivity permanently and thus training in ALMPs has no value for skilled workers. For simplicity, I assume that there is no private alternative for workers to upgrade their skills.

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. Labour Market Flows and Stocks

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

The various stocks and flows of labour are summarised in Figure 1. Since the economy is assumed to be in a steady state, all stocks are constant. One the one hand, each period employed workers in sector $i$ quit their present jobs at a given rate $q$ (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. On the other hand, unemployed workers in sector $i$ find their jobs at an endogenous determined rate $s_i$. In a steady state, all stocks have to be constant. Therefore, the condition for a steady state is $qn_i = s_i u_i$. Thus the steady-state conditions give $s_i = q(n_i/u_i)$.

![Figure 1: Labour Market Flows and Stocks](image)

It is convenient to introduce a parameter, $h$, to represent the labour transfer policy via training and education. $h$ 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 $h = 1$ ($h = -1$), all workers are skilled (unskilled). It follows that $h = m_1 - m_2$.

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

$$n_1 = \frac{1+h}{2} n_1', \quad (1)$$

$$n_2 = \frac{1-h}{2} n_2'. \quad (2)$$

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

$$s_i = \frac{n_i'}{1-n_i'} q. \quad (3)$$

### 2.2. Determination of wages and employment

The labour-demand curves are derived from the ordinary profit-maximising behaviour of firms. There are $F$ identical firms in each sector. $F$ identical firms produce a homogenous good through a decreasing-return-to-scale technology: $y_i^* = A_i n_i'^a$, where $0 < \alpha < 1$ and $0 < A_i < 1$. $y_i^*$ and $n_i^*$ are the output and employment in each firm in each sector. $A_i$ represents productivity in sector $i$. I shall assume the productivity to be higher in sector 1 than in sector 2, i.e., that $0 < A_2 < A_1 < 1$. Employment in each firm can be written $n_i' = n_i / F$. The relative price of the products is assumed to be given by the international market, and is normalised to unity. Each firm in both sectors maximises its profit.

Each firm’s profit in sector 1 can be expressed as $\pi_1^* = y_1^* - w_1^* n_1$, where $w_1^*$ is the real wage in each firm in sector 1. The first-order condition gives $w_1^* = A_1 F^{1-a} n_1'^{a-1}$. Since $n_1^* = n_1 / F$, and $w_1^* = w_1$ in a symmetrical equilibrium, the aggregate labour-demand schedule in sector 1 can be written:

$$w_1 = A_1 F^{1-a} n_1'^{a-1}. \quad (4)$$

I assume that the government pays the wage subsidy to firms in sector 2. Thus each firm in sector 2 maximises its profit, $\pi_2^* = y_2^* - (1-s) w_2^* n_2$, where $s$ is the wage subsidy to each firm in sector 2. The first-order condition gives $w_2^* = (1-s)^{-1} A_2 F^{1-a} n_2'^{a-1}$. Since $n_2^* = n_2 / F$, and $w_2^* = w_2$ in a symmetrical equilibrium, the aggregate labour-demand schedule in sector 2 can be expressed as

$$w_2 = \left( \frac{1}{1-s} \right) A_2 F^{1-a} n_2'^{a-1}. \quad (5)$$

It follows from (4) and (5) that $\partial w_1 / \partial n_1 < 0$ and $\partial^2 w_1 / \partial n_1^2 < 0$. Thus the labour-demand curves in both sectors are downward-sloping and convex (see the LD1-schedule and LD2-schedule in Figure 2). The labour-demand elasticity is constant and equal to $1 / (1 - \alpha)$.

Taking (1) and (2) into account, the relations between the sectoral wages and the sectoral employment rates can be written:

$$w_1 = A_1 F^{1-a} \left( \frac{1+h}{2} \right)^{a-1} n_1'^{a-1}, \quad (6)$$
It follows (6) and (7) that $dw_i/dn_i < 0$ and $d^2w_i/dn_i^2 < 0$. Equations (6) and Equation (7) 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 $1/(1-\alpha)$ (see the LD1-schedule and LD2-schedule in Figure 2).

![Figure 2: Labour market equilibrium](image)

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

Let $\Omega_{i(t)}^{n_j}$ and $\Omega_{i(t)}^{s_j}$ denote the discounted values of being employed for non-shirkers and shirkers, respectively, at time $t$ in the $j$th firm of sector $i$. $\Omega_{u_i(t)}$ is the discounted value of being unemployed in sector $i$ at time $t$. It holds that

$$\Omega_{i(t)}^{n_j} = \frac{1}{1+r}\left[w_{i(t)}^j - \bar{e} + q\Omega_{u_i(t+1)} + (1-q)\Omega_{i(t+1)}^{n_j}\right],$$

$$\Omega_{i(t)}^{s_j} = \frac{1}{1+r}\left[w_{i(t)}^j + (q+\bar{q})\Omega_{u_i(t+1)} + (1-q-\bar{q})\Omega_{i(t+1)}^{s_j}\right],$$

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

where $r$ is the rate of time preference assumed to be identical for all individuals. $w_{i(t)}^j$ is the wage at $t$ in $j$th firm of sector $i$ and $b$ is the unemployment benefit. $q$ is the exogenously given quit rate for workers and $\bar{q}$ is the exogenously given rate of being caught shirking. $s_i$ is the probability for an unemployed worker in sector $i$ to find a job.

Like Shapiro & Stiglitz (1984) I assume that firms determine wages for all future periods and that the economy finds itself in a steady state. Hence I can drop time subscripts and set $\Omega_{i(t)}^{n_j} = \Omega_{i(t)}^{n_j} = \Omega_{i(t+1)}^{n_j} = \Omega_{i(t+1)}^{n_j} = \Omega_{i}^{n_j}$, $\Omega_{u_i}^{n_j}=\Omega_{u_i+1}^{n_j}=\Omega_{u_i}^{n_j}$ and $\Omega_{u_i}^{s_j}=\Omega_{u_i(t+1)}^{s_j}=\Omega_{u_i(t+1)}^{s_j}$. I also assume a symmetric equilibrium, so that $w_{i(t)}^j = w_i$ for all $j$. Assuming that wages are set to avoid shirking, i.e., that $\Omega_{i}^{n_j} = \Omega_{i}^{s_j} = \Omega_{i}$, it can be derived from (8) - (10) that $w_i = b + (a + q + \bar{q} + r + s_i)(\bar{e}/\bar{q})$.

Taking (3) into account, the wage-setting schedules become
where \( C_1 = b + (q + \bar{q} + r)\bar{e}/\bar{q} > 0 \) and \( C_2 = q\bar{e}/\bar{q} > 0 \). The relationship between the wage and the sectoral employment rate is thus the same in both sectors. Since \( dw_1/dn_1 > 0 \) and \( d^2w_1/dn_1^2 > 0 \), it follows that the wage-setting schedules are increasing and convex function of the sectoral employment rates. (see the WS-schedule in Figure 2).

2.3. Equilibrium

The four core equations, (6) (7), and (11) (note that (11) represents two equations), determine the four endogenous variables, \( w_1, w_2, n'_1, \) and \( n'_2 \). The other endogenous variables, \( n_1 \) and \( n_2 \) are derived by substituting the equilibrium sectoral employment rates into (1) and (2). The labour market policy variables are the training and education programmes parameter, \( h \), and the employment subsidy programmes parameter, \( s \). The other exogenous variables are the unemployment benefit \( b \), the productivity parameters \( A_i \), the other 'technical' parameters \( \bar{e}, q, \bar{q}, r, \alpha, \) and the 'scale' variable \( F \).

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 schedule (WS) is given by (11). The negative sloped labour-demand curves (LD\(_1\) and LD\(_2\)) are given by (6) and (7). In this diagram, the equilibrium for the HP-sector is \( E_1 \) and for the LP-sector \( E_2 \).

3. Comparative statics

I start from an initial equilibrium, in which both the sectoral employment rate and the wage are higher in the HP-sector than in the LP-sector, i.e., \( w_1 > w_2 \) and \( n'_1 > n'_2 \), (see Figure 2). I shall examine macroeconomic effects of the employment subsidy policies, and the training/education programmes when the economy faces a macroeconomic shock. More precisely, I shall investigate the effects of changes in \( h \) and \( s \), which are the labour market policy parameters decided by the government.

3.1. Training/education programmes

In this section, I shall investigate the case when labour is trained and transferred from the LP-sector to the HP-sector through ALMPs. The labour transfer is represented by an increase in the parameter \( h \).

The effects on the sectoral employment rates are derived from (6) (7), and (11) as

\[
\frac{dn'_1}{dh} = \frac{a(1-\alpha)A_2F^{1-\alpha}a(1+h)^{a-2}n'_1^{a-1}}{2a(1-\alpha)A_1F^{1-\alpha}a(1+h)^{a-2}n'_1^{a-2}+2C_2(1-n'_1)^2} < 0 \tag{12}
\]

\[
\frac{dn'_2}{dh} = \frac{(1-h)a(1-\alpha)A_2F^{1-\alpha}a(1+h)^{a-2}n'_2^{a-1}}{2(1-h)a(1-\alpha)A_2F^{1-\alpha}a(1+h)^{a-2}n'_2^{a-2}+2C_2(1-n'_2)^2} < 0 \tag{13}
\]

The terms in the numerators come from the shift of the employment schedules. As can be seen from (11), the wage-setting schedules are not affected by the labour transfer policy through training and education programmes. The policy affects wages and the sectoral employment rates in the two sectors only through the
employment schedules. A transfer of labour through training and education programmes shifts the employment schedule downwards in the HP-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 LP-sector. This is illustrated in Figure 3. The equilibrium for the HP-sector moves from $E_1$ to $E_1^*$ and for the LP-sector from $E_2$ to $E_2^*$. This labour transfer policy reduces the wage and the sectoral employment rate in the HP-sector and increases the wage and the sectoral employment rate in the LP-sector. The wage reduction in the HP-sector means that employment will increase there. The wage increase in the LP-sector decrease employment there. More precisely, from (1), (2), (12) and (13), the effects on employment are

$$\frac{dn_1}{dh} = \frac{1}{c_2 a(1-a)A_1 F^{1-a}(\frac{1-h}{2})^{a-1} n_1'^{-a-3}(1-n_1'^2)^2 + \frac{2}{n_1'}} > 0, \quad (14)$$

$$\frac{dn_2}{dh} = \frac{1}{(1-h/c_2) a(1-a)A_2 F^{1-a}(\frac{1-h}{2})^{a-1} n_2'^{-a-3}(1-n_2'^2)^2 + \frac{2}{n_2'}} < 0 \quad (15)$$

It follows from (14) and (15) that the effect of a transfer of workers through training and education programmes on aggregate employment ($n = n_1 + n_2$) is

$$\frac{dn}{dh} = \frac{1}{c_2 a(1-a)A_1 F^{1-a}(\frac{1-h}{2})^{a-1} n_1'^{-a-3}(1-n_1'^2)^2 + \frac{2}{n_1'}} - \frac{1}{(1-h/c_2) a(1-a)A_2 F^{1-a}(\frac{1-h}{2})^{a-1} n_2'^{-a-3}(1-n_2'^2)^2 + \frac{2}{n_2'}} \quad (16)$$

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 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 LP-sector to the HP-sector.

Figure 3: Effects of Training/Education Programmes

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 HP-sector is larger than the decrease in employment in the LP-sector.

When the sectoral employment rates are equalised by the policy, i.e., when $n_1' = n_2'$, the 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., \( \frac{dn}{dh} < 0 \). Therefore, aggregate employment is maximised when the helicopter labour transfer policy evens out the sectoral employment rate differentials, i.e., when \( n'_1 = n'_2 \).

The value of \( h \) which realises \( n'_1 = n'_2 \) can be derived from (16) as, \( h = m_1 - m_2 = (1 - (A_1 / A_2) - (\alpha - 1))/((1 + (A_1 / A_2) - (\alpha - 1)) \). Not very surprisingly, the "optimal" amount of labour that should be transferred from the LP-sector to the HP-sector, i.e., \( m_1 - m_2 \), depends positively on the productivity ratio \( A_1 / A_2 \). The more productive is sector 1 relative to sector 2, the larger are the benefits in terms of employment of using ALMPs to upgrade the skills of the unskilled workers.

3.2. Employment subsidy programmes

In this section, I shall investigate the case when the government changes the level of employment subsidy to LP-sector. An increase in the wage subsidy is represented by an increase in the parameter, \( s \).

As can be seen from (6), (7), and (11), the wage-setting schedules in both sectors are not affected by a change in \( s \). A change in \( s \) directly affects employment in the LP-sector through the labour-demand curve. However, a change in \( s \) has no impact on the wage and employment in the HP-sector. The effects on the sectoral employment rates in the LP-sector are derived from (7) and (11) as

\[
\frac{dn'_1}{ds} = \frac{\left( a - 1 \right) A_2 F^{1-a} \left( \frac{1-h}{2} \right)^{\frac{a-1}{2}} n'_1^{\frac{1}{2}} - \frac{2}{1-n'_2} \left( a - 1 \right) A_2 F^{1-a} \left( \frac{1-h}{2} \right)^{\frac{a-1}{2}} n'_2^{\frac{1}{2}}}{\left( a - 1 \right) A_2 F^{1-a} \left( \frac{1-h}{2} \right)^{\frac{a-1}{2}} n'_1^{\frac{1}{2}} - \frac{2}{1-n'_2} \left( a - 1 \right) A_2 F^{1-a} \left( \frac{1-h}{2} \right)^{\frac{a-1}{2}} n'_2^{\frac{1}{2}}} > 0. \tag{17}
\]

The term in the numerator comes from the shift of the employment schedule. An increase in the wage subsidy implies that firms hire workers with lower wages. As a result, labour demand in the LP-sector tends to increase. This is illustrated in Figure 4. A rise in \( s \) shifts the demand curve in sector 2 (LD\(_2\)) rightwards. The equilibrium for the HP-sector remains \( E_1 \), but the equilibrium for the LP-sector moves from \( E_2 \) to \( E_2^* \).

![Figure 4: Effects of Employment Subsidy Programmes](image)

The effect on employment in the LP-sector is derived from (2) and (17) as

\[
\frac{dn'_2}{ds} = \frac{\left( 1-h \right) \frac{1}{2} \left( a - 1 \right) A_2 F^{1-a} \left( \frac{1-h}{2} \right)^{\frac{a-1}{2}} n'_2^{\frac{1}{2}} - \frac{2}{1-n'_2} \left( a - 1 \right) A_2 F^{1-a} \left( \frac{1-h}{2} \right)^{\frac{a-1}{2}} n'_2^{\frac{1}{2}}}{\left( 1-h \right) \frac{1}{2} \left( a - 1 \right) A_2 F^{1-a} \left( \frac{1-h}{2} \right)^{\frac{a-1}{2}} n'_2^{\frac{1}{2}} - \frac{2}{1-n'_2} \left( a - 1 \right) A_2 F^{1-a} \left( \frac{1-h}{2} \right)^{\frac{a-1}{2}} n'_2^{\frac{1}{2}}} > 0.
\]
A rise in the wage subsidy increases both the wage and employment in the LP-sector. This is because the wage subsidy enables firms to employ young workers with lower wages and thus firms increase youth employment.

Since a change in $s$ affects the LP-sector only, the effect on aggregate employment ($n = n_1 + n_2$) is the same effect as on employment in the LP-sector. Namely, the impact on aggregate employment is \( dn/ds = dn_2/ds > 0 \). Even if the sectoral employment rate in sector 2 becomes higher than that in sector 1, i.e., \( n_1' < n_2' \), the employment subsidy programmes can increase aggregate employment until unemployment in the LP-sector disappear.

### 3.3. Training/education programmes and employment subsidy programmes

In this section, I shall compare the outcomes of training/education programmes and outcomes of employment subsidy programmes when the economy faces a macroeconomic shock. The macroeconomic shock is assumed to be a fall in the productivity in the LP-sector, i.e., a fall in \( s \). As can be seen from \( (5) \) and \( (7) \), a decrease in \( A_2 \) brings about a reduction in the wage. Both programmes are assumed to be implemented to maintain the wage at the same level as before the macroeconomic shock occurs.

To maintain the wage in the LP-sector by employment subsidy programmes implies that \( s \) must be increased to satisfy the condition that \( dw_2/dA_2 = 0 \). Total differentiating \( (7) \) gives \( dw_2 = (1/(1 - s))F1 - \alpha(1 - h)/2 \alpha - 1n2'\alpha - 1A21/(1 - s)ds + da2 \). By rearranging the above equation, I obtain

\[
\frac{ds}{dA_2} = -\frac{1-s}{A_2} < 0. \tag{18}
\]

If government changes \( s \) to satisfy \( (18) \) when the productivity in the LP-sector decreased by the macroeconomic shock, the wage is the same level even after the macroeconomic shock occurs. Namely, \( s \) must increase to keep the wage constant in the LP-sector when \( A_2 \) falls. As I discussed in section 3.2, a change in \( s \) has no impact on the HP-sector. Thus if government changes \( s \) to satisfy \( (18) \), the economy stays in the same initial equilibrium.

In order to maintain the wage in the LP-sector by the training/education programmes, labour must be transferred from the LP-sector to the HP-sector. This is because the wage tends to rise when the labour market is tight. Total differentiating \( (7) \) gives \( dw_2 = (1 - s)F1 - \alpha(1 - h)/2 \alpha - 1n2'\alpha - 1A21/(1 - s)ds + da2 \). Taking into account the condition that \( dA2dA2 = 0 \), rearranging the above equation gives, \( dh/dA_2 = -(1 - h)/(1 - \alpha)A_2^{-1} < 0 \). If government changes \( h \) to satisfy this relationship, the wage is the same level even after the macroeconomic shock occurs. Namely, \( h \) must increase to keep the wage constant in the LP-sector when \( A_2 \) falls. A rise in \( h \) implies the total number of workers in the LP-sector decreases and the total number of workers in the HP-sector increases. Then the wage tends to decrease in HP-sector and thus employment increase there. Since a decrease in employment in the LP-sector is smaller than an increase in employment in HP-sector, aggregate employment is increased. Moreover, the share of skilled workers increases and thus the labour productivity in the economy becomes higher.

To sum up, the outcomes of training/education programmes and the outcomes of employment subsidy programmes are different when both programmes are implemented to keep the wage in the LP-sector constant in time of the macroeconomic shock. In case of the employment subsidy programmes, there is no impact on the economy and thus no effect on aggregate employment. In case of the training/education programmes, total unskilled labour decreases and total skilled labour increases. Since a fall in unskilled employment is smaller than an increment of skilled employment, aggregate employment is increased by this policy. Moreover, differently from the employment subsidy programmes, the training/education programmes tend to increase the labour productivity in the economy.
4. Concluding remarks

This paper has analysed the general equilibrium effects of employment subsidy programmes and training/education programmes in a dual labour market framework. Both employment subsidy programmes and training/education programmes tend to increase aggregate employment. However, impacts on each sector are different. On the one hand, employment subsidy programmes only affect the targeted unskilled sector. The programmes tend to increase both the wage and employment there. But the programmes have no influence on the skilled sector. On the other hand, training/education programmes influence both unskilled and skilled sectors. The programmes tend to increase the wage in unskilled sector and thus decrease employment there. The wage in skilled sector tends to decrease and employment in the sector tends to increase. An increment of employment in skilled sector is greater than a fall in unskilled employment and thus aggregate employment tends to increase.

The outcomes of training/education programmes and the employment subsidy programmes are different when both programmes are implemented to keep the wage in the unskilled sector constant in time of the macroeconomic shock. In case of employment subsidy programmes, there is no impact on the economy and thus no effect on aggregate employment. In case of the training and education programmes, the total unskilled labour decreases and that of skilled labour increases. Since a fall in unskilled employment is smaller than an increment of skilled employment, aggregate employment is increased by this policy. Moreover, differently from employment subsidy programmes, training/education programmes tend to increase the labour productivity in the economy.

Namely, employment subsidy programmes are the status quo and not forward-looking policies. However, training and education programmes are proactive policies and may have positive long-term influence on economic growth.

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