Non-regular Employment and Labour Costs

Yoshihiko Fukushima*

The Okuma School of Public Management
Waseda University

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Abstract

The paper presents a theoretical analysis of macroeconomic effects of the payroll tax. Workers pay the income tax and the fee for the social security. Firms also bear the payroll tax and the social security contribution for employed workers. However, in Japan, firms do not have to pay for the payroll tax and the social security contribution for non-regular workers. The labour cost of non-regular workers is much smaller than that of regular workers. This is the main reason why firms have increased non-regular employment since 1990s. The paper examines the macroeconomic effects when the deference in the labour costs between regular workers and non-regular workers becomes smaller. More precisely, the case when the government decreases the payroll tax for regular employment and the case when government introduces the payroll tax for non-regular employment are investigated.

Keywords: payroll tax, non-regular employment, regular employment,

JEL classification: H24, H25, J31, J64, J68

*The Okuma School of Public Management, Waseda University, 1–6-1 Nishi-Waseda, Shinjuku-ku, Tokyo, Japan Phone: +81-3-3207-0096; Fax: +81-3-3207-3186; E-mail: flipfuku@waseda.jp

1 Introduction

Japan has experienced a sharp rise in non-regular employment. The share of non-regular workers has been increasing from 20% in 1990 to 34% in 2007(Ministry of Health, Labour and Welfare, 2006, 2007). Firms are achieving employment flexibility through increased hiring of non-regular workers, i.e. part-time workers, temporary staffs, contract workers etc. These workers are boosting their share of employment. From the macroeconomic point of view, a rise in the share of non-regular workers makes the Japanese labour market more flexible. However, for workers, a rise in the share of non-regular employment implies that employment situation becomes less stable.

The main reason why firms increase non-regular employment is that the labour costs of non-regular workers are relatively inexpensive. The average hourly wage of part-time employees, who account for three-quarters of non-regular workers, is only 40% of that of regular workers. In addition to the hourly wage, non-regular workers are not paid the bonus that firms pay to regular workers. Firms do not have to bear the social security contribution for non-regular workers such as pension insurance, medical care insurance, and employment insurance. Moreover, in general, non-regular workers are not eligible for a paid holiday and a maternity leave. Namely, compared with regular workers, non-regular workers are less expensive labour for firms. However, if the share of non-regular workers who are not well paid is continuously increased, this will bring about serious problems for the Japanese economy/society in the future. An increase in non-regular workers will incur both a shortage of labour and a decline in labor productivity. As a result, international competitiveness inevitably will fall and economic growth will stop in the long-run. Moreover a decrease in regular workers will have negative impacts on the social welfare system and the risk of a collapse of the social welfare system will increase.

There are also serious equity problems, given that the difference in productivity between regular and non-regular workers is much smaller than the wage gap. The equity concern is magnified by the lack of movement between the two segments of the workforce, trapping a significant portion of the labour force in a low-wage category from which it is difficult to escape. The main obstacle between the two segments comes from the difference in the labour costs. The paper investigates the macroeconomic effects when the labour costs between regular workers and non-regular workers become smaller. More precisely, the paper analyses the general equilibrium effects of the payroll taxes that firms don't have to pay for non-regular employment in Japan. I investigate the following two cases: (1) the case when the government decreases the payroll tax for regular employment; and (2) the case when the government introduces the payroll tax for non-regular employment.

Fitoussi(2000) surveys the macroeconomic effects of payroll tax reductions for low paid workers. He shows the relationships among the payroll tax, the minimum wage, and the employment subsidy. He concludes that a rise in the wage subsidy reduces the burden of the payroll tax for firms and also increases low-paid employment.

Goerke(2000, 2002) used an efficiency wage model to study the macroeconomic effects when the payroll tax is replaced the income tax. He shows that a shift from payroll to income taxes will reduce unemployment if the tax level is held constant at the initial wage.

This paper uses a two-sector general equilibrium model. I rely on the idea that wages and employment are determined by the intersection of an employment and a wage-setting schedule (Layard et al., 1991; Calmfors, 1994; Fukushima, 1998, 2001, 2003). I study the macroeconomic effects of a change in the payroll tax. The next section of the paper sets the basic model. In Section 3, first, I shall investigate the effects of a change in the payroll tax in the regular job sector when the payroll tax is not levied in the non-regular job sector. Second, the case when the government introduces the payroll tax in the non-regular job sector is analysed. Section 4 concludes.

2 The model

I consider an economy consisting of two competitive sectors: a high-productivity sector with regular employment (sector 1) and a low-productivity sector with non-regular employment (sector 2). A worker can find himself in one of the following four states: (1) regular employment; (2) non-regular employment; (3) unemployment in the regular job sector; and (4) unemployment in the non-regular job sector.

I shall assume that payroll taxes are levied on the wage bill. Wages and employ-

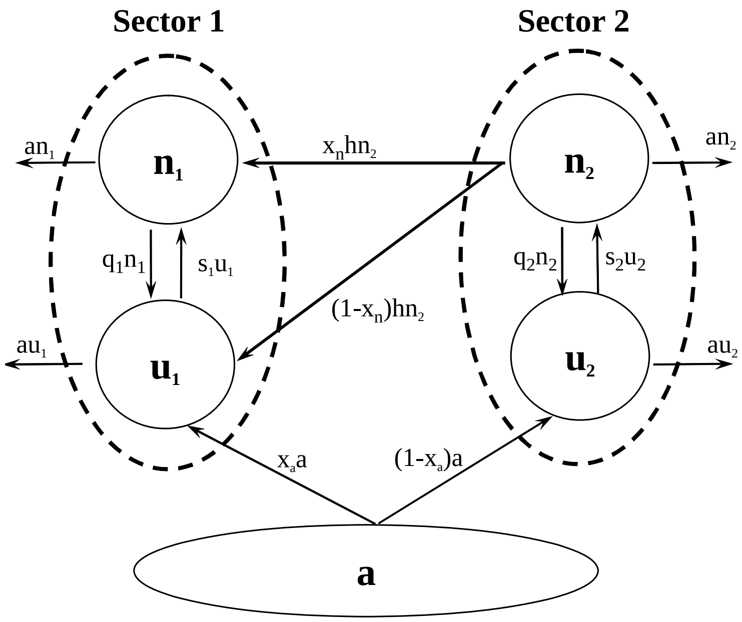

Figure 1: Labour market flows

ment are determined by the intersection of an employment schedule and a wage-setting schedule. A Nash bargaining model of the same type as in Manning (1993) is used to define a wage-setting relationship in sector 1. The wage in sector 2 is given by a legislated minimum wage.

2.1 Labour market flows and stocks

The various stocks and flows of labour are summarised in Figure 1. I assume that the economy finds itself in a steady state and thus, that all stocks are constant. Moreover, I postulate a stationary total labour force, which is normalised to unity.

Individuals leave the labour market at a constant rate a, which is exactly the same rate as the rate of entry into the labour market. A fraction x_a of new entrants is assumed to enter the unemployment pool in sector 1 and search for a regular job. A fraction $1-x_a$ of new entrants is assumed to search for a non-regular job in sector 2.

The share of unemployed workers in sector 2 is u_2. They find a job with the probability s_2. The steady state condition for unemployment in sector 2 is

$$(a+s_2)\,u_2 = q_2 n_2 + (1-x_a)\,a, \tag{1}$$

where q_2 is the exogenously given quit rate from non-regular employment. The LHS is the outflow from unemployment and the RHS is the inflow into non-regular unemployment.

The steady state condition for non-regular employment (n_2) is

$$(a + h + q_2)\, n_2 = s_2 u_2, \tag{2}$$

where h is the exogenously given transfer rate from sector 2 to sector 1. I assume that only non-regular employed worker can move from the non-regular job sector (sector 2) to the regular job sector (sector 1). The LHS is the outflow from non-regular employment and the RHS is the inflow into non-regular employment from the non-regular unemployment pool.

The steady state condition for unemployment in sector 1 (u_1) is

$$(a + s_1)u_1 = q_1 n_1 + (1 - x_n)\, h n_2 + x_a a, \tag{3}$$

where q_1 is the exogenously given quit rate from regular employment and s_1 the endogenously determined probability of getting a job in sector 1. A fraction x_n of workers who moves from sector 2 to sector 1 finds a regular job and a fraction $1 - x_n$ becomes a search a job seeker in sector 1. The LHS is the outflow from unemployment in sector 1 and the RHS the inflow into regular employment.

The condition for constant adult employment (n_1) is

$$(a + q_1)n_1 = s_1 u_1 + x_n h n_2. \tag{4}$$

The LHS is the outflows from regular employment and the RHS the inflows into regular employment.

I let m_i denote the total labour force in sector i, i.e. $m_i = n_i + u_i$. From (1) - (4), the labour force in both sectors can be expressed:

$$m_1 = x_a + \frac{1}{a} h n_2, \tag{5}$$

$$m_2 = 1 - x_a - \frac{1}{a} h n_2. \tag{6}$$

As can be seen from (5) and (6), m_1 and m_2 depend on the labour flow from non-regular employment to sector 1, i.e. hn_2. Workers who have a non-regular job can move from the non-regular sector to the regular sector in this model. Namely, the total labour force in both sectors depends on non-regular employment (n_2). Differentiating (5) and (6) w.r.t. n_2 gives $dm_1/dn_2 = h/a > 0$ and $dm_2/dn_2 = -h/a < 0$. A rise in non-regular employment (n_2) increases the total labour force in sector 1 and decreases the total labour force in sector 2. A rise in n_2 implies an increase in job seekers in the regular job sector.

2.2 Determination of wages and employment

The employment schedules are derived from the ordinary profit-maximising behaviour of firms. F identical firms in sector i produce a homogenous good through a decreasing-return-to-scale technology: $y_i^* = A_i \left(n_i^*\right)^{\alpha}$, where $0 < \alpha < 1$, y_i^* and n_i^* are the output and employment in each firm of sector i, respectively. A_i represents productivity in sector i, where $A_1 > A_2$. The relative price of the products is assumed to be given by the international market, and is normalised to unity. Each firm in sector 1 maximises its profit, $\pi_i^* = y_i^* - \left(1 + \tau_{p_i}\right) w_i^* n_i^*$, where w_i^* is the real wage in each firm in sector i and τ_{p_i} is the payroll tax rate. The first-order condition gives $w_i^* = \left(1 + \tau_{p_i}\right)^{-1} \alpha A_i \left(n_i^*\right)^{\alpha-1}$. 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:

$$w_i = B_i \left(\frac{1}{1 + \tau_{p_i}} \right) n_i^{\alpha - 1}, \tag{7}$$

where $B_i = \alpha A_i F^{1-\alpha} > 0$. Since $dw_i/dn_i < 0$ and $d^2 w_i/dn_i^2 < 0$, the labour-demand curves in both sectors are downward-sloping and convex (see the LD_i-schedule in Figure 2). The labour-demand elasticity is constant and equal to $1/\left(1 - \alpha\right)$. Moreover, as can be seen from (7), a rise in the payroll tax decreases the labour demand.

I now turn to the wage-setting schedule in sector 1. I shall assume there to be firm-specific unions so that one union is associated with each firm in sector 1. Like in Manning (1991, 1993), each union attempts to maximise the union utility function (z^*):

$$z_{(t)}^* = n_{1(t)}^* \left[\Omega_{n_1(t)}^* - \Omega_{u_1(t)} \right],$$

where $\Omega_{n_1}^*$ is the discounted value of employment in each firm of sector 1, Ω_{u_1} is the discounted value of unemployment in sector 1, and t is a time subscript. Ω_{u_1} also represents the expected value of the alternative to workers losing their jobs, since all workers who lose their jobs enter the unemployment pool in the same sector. Thus

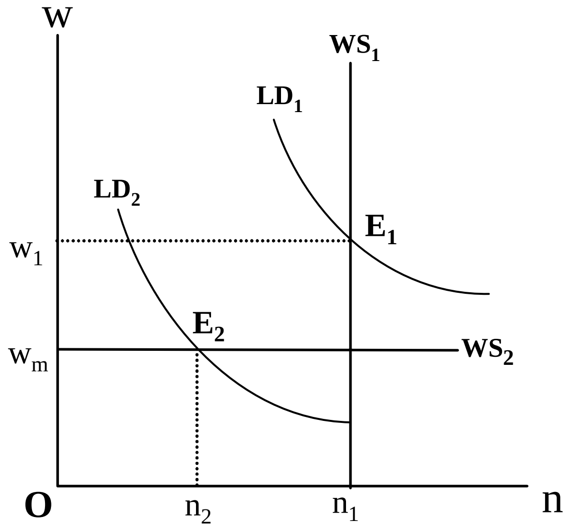

Figure 2: Labour market equilibrium

the bracket in the RHS represents the rent from employment. The union maximises the total rent for employed workers.

Workers are assumed to be risk neutral, so that an individual's instantaneous utility function, V, can be written as $V(I) = I$, where I is the after-tax income. I normalise the value of leaving the labour market to zero. Thus, the value of employment in each firm in sector 1 is

$$\Omega^*_{n_1(t)} = \frac{1}{1+r}\left[(1-\tau_e)\, w^*_{1(t)} + q_1\Omega_{u_1(t+1)} + (1-a-q_1)\,\Omega^*_{n_1(t+1)}\right], \tag{8}$$

where τ_e is an income tax rate. The probability of an employed individual in sector 1 also being employed in this sector in the next period is $1-a-q_1$, which is assumed to be positive.

The value of being unemployed in sector 1 is

$$\Omega_{u_1(t)} = \frac{1}{1+r}\left[b_{u_1(t)} + s_1\Omega_{n_1(t+1)} + (1-a-s_1)\,\Omega_{u_1(t+1)}\right], \tag{9}$$

where b_{u_i} is the unemployment benefit in sector i. The probability of a job seeker in sector 1 remaining a job seeker in this sector also in the next period is $1-a-s_1$, and this probability is assumed to positive.

The wage, $w^*_{1(t)}$, is set so as to maximise a Nash bargain where the fall-back position of both the union and the firm is zero, i.e.

$$\max_{w^*_{1(t)}} \Psi = \left[z^*_{(t)}\right]^{\beta} \left[\pi^*_{1(t)}\right]^{1-\beta},$$

where β is the bargaining power of the union. Like Manning (1993), I assume wages to be determined for one period only. Hence, the current wage, $w^*_{1(t)}$, will not affect the values of future employment in the firm and future unemployment, i.e. $\Omega^*_{n1(t+1)}$ and $\Omega_{u_1(t+1)}$. As I shall be analysing a steady state, I can drop all time subscripts. Since $w^*_{1(t)} = w_1$ in a symmetric equilibrium, the first-order condition gives

$$w_1 = \left(\frac{1}{1-\tau_e}\right)\left[\frac{(1+r)\,\mu}{(1+r)\,\mu - (a+r+q_1+s_1)}\right] b_{u_1}, \tag{10}$$

where $\mu = \eta_{_N} + [(1-\beta)/\beta]\,\eta_\pi$. $\eta_{_N}$ and η_π are the elasticities of employment and profits, respectively, w.r.t. the wage in each firm, i.e. $\eta_{_N} = 1/(1-\alpha)$ and $\eta_\pi = \alpha/(1-\alpha)$. Hence, parameter μ can be treated as exogenous. I assume the replacement ratio to be constant and the same in both sectors, i.e., $b_{u_i}/w_i = \rho$. Taking (4) and (5) into account, the wage-setting relationship in sector 1 can be expressed as

$$n_1 = \left[\frac{\mu\,(1+r)\left(1-\frac{1}{1-\tau_e}\rho\right) - (a+r+q_1)}{\mu\,(1+r)\left(1-\frac{1}{1-\tau_e}\rho\right) - r}\right] m_1 + x_n h n_2. \tag{11}$$

Equation (11) implies that the wage-setting schedule in sector 1 is vertical for the given m_1 and n_2 in the wage-employment plan (see the WS_1-schedule in Figure 2). Employment is a function of the total labour force in the sector and non-regular employment.

The wage in sector 2 (w_2) is assumed to be given at the same legislated minimum wage level for all future periods, i.e.

$$w_2 = w_m, \tag{12}$$

where w_m is the legislated minimum wage (see the horizontal WS_2-schedule in Figure 2)[1].

[1] It seems to be a stylised fact that employment varies less for regular employment than for non-regular (Labour Economic White Paper, 2007). A simple way of capturing this stylised fact is to assume a vertical wage-setting schedule for workers in regular jobs and a horizontal wage-setting schedule for workers in non-regular jobs.

2.3 The present values of various states

The present values of being employed and unemployed in sector 1 are explicitly derived from (8) and (9) as

$$\Omega_{n_1} = w_1 \left[\frac{(1-\tau_e)(a+r+s_1) + q_1 \rho}{(a+r)(a+r+q_1+s_1)} \right], \tag{13}$$

$$\Omega_{u_1} = w_1 \left[\frac{(1-\tau_e) s_1 + (a+r+q_1) \rho}{(a+r)(a+r+q_1+s_1)} \right]. \tag{14}$$

The present value of being employed in sector 2 ($\Omega_{n_2(t)}$) is expressed as

$$\Omega_{n_2(t)} = \frac{1}{1+r} \left[\begin{array}{c} (1-\tau_e) w_m + x_n h \Omega_{n_1(t+1)} + (1-x_n) h \Omega_{u_1(t+1)} + q_2 \Omega_{u_2(t+1)} \\ +(1-a-h-q_2)\Omega_{n_2(t+1)} \end{array} \right], \tag{15}$$

where $\Omega_{u_2(t)}$ is the discounted value of being unemployed in sector 2 at time t. The probability of an employed individual in sector 2 being employed in this sector in the next period is $1-a-h-q_2$, which is assumed to be positive.

A employed worker in sector 2 can find a job with probability s_2. The probability of an unemployed worker in sector 2 remaining a job seeker in the next period is $1-a-s_2$, which is assumed to be positive. The value of being unemployed in sector 2 at time t ($\Omega_{u_2(t)}$) can be written as

$$\Omega_{u_2(t)} = \frac{1}{1+r} \left[s_2 \Omega_{n_2(t+1)} + (1-a-s_2) \Omega_{u_2(t+1)} \right]. \tag{16}$$

It follows from (14), (16), (17) and the assumption of a steady state that

$$\Omega_{n_2} = \frac{a+r+s_2}{(a+r+s_2)(a+r+h) + (a+r) q_2} \left[\begin{array}{c} (1-\tau_e) w_m \\ +h w_1 \frac{(1-\tau_e)[s_1-(a+r)x_n] + [a+r+q_1-(a+r)x_n]\rho}{(a+r)(a+r+q_1+s_1)} \end{array} \right], \tag{17}$$

$$\Omega_{u_2} = \frac{s_2}{(a+r+s_2)(a+r+h) + (a+r) q_2} \left[\begin{array}{c} (1-\tau_e) w_m \\ +h w_1 \frac{(1-\tau_e)[s_1-(a+r)x_n] + [a+r+q_1-(a+r)x_n]\rho}{(a+r)(a+r+q_1+s_1)} \end{array} \right]. \tag{18}$$

2.4 The budget constraint

The government decides the payroll tax rate (τ_{p_i}). The income tax rate (τ_e) is determined by the balanced budget requirement. It is assumed that payroll taxes are levied on employers and employed workers pay the income tax. For simplicity, I assume that the total expenditure is fixed as E. The income tax rate (τ_e) is determined in order to satisfy the following relationship.

$$\tau_{p_1} n_1 w_1 + \tau_{p_2} n_2 w_m + \tau_e (n_1 w_1 + n_2 w_m) = E. \tag{19}$$

The LHS in (19) is the revenue and RHS is the expenditure.

2.5 Equilibrium

There are 15 exogenous variables: the labour market policy variable, i.e. the payroll tax rates τ_{p_i}; the transfer rate from the non-regular job sector. to the regular job sector h; the probability to find a regular job for transferred workers from the non-regular job sector to the regular job sector x_n, the replacement ratio, ρ; the productivity parameters, A_i; the other 'technical' parameters; a, q_1, q_2, r, α, β; and the 'scale' variable, F.

There are 12 endogenous variables in the model: n_1, n_2, u_1, u_2, m_1, m_2, s_1, s_2, w_1, w_2, b_{u_1} and τ_e, which are all simultaneously determined. The core variables, w_1, w_2, n_1 and n_2, are determined by (7), (11), (12)[2]. The other variables, i.e. u_1, u_2, m_1, m_2, s_1 and s_2, are given by (1), (2), (3), (4), (5) and (6). The unemployment benefits, i.e. b_{u_1} is given by the assumption of a constant replacement ratio. The income tax rate, τ_e, is provided by (19).

Figure 2 illustrates the general-equilibrium solution of the model. Wages are measured along the vertical axis and employment along the horizontal axis. The negatively sloped labour-demand curves in the two sectors are given by (7). The vertical wage-setting schedule in sector 1 for the given m_1 is derived from (11). The horizontal wage-setting relation in sector 2 is given by (12). In this diagram, the equilibrium for sector 1 is E_1 and E_2 for sector 2. As can be seen from (7), (11) and (12), on the one hand, the equilibrium in sector 1 depends on the payroll tax rate(τ_{p_1}) and the income tax (τ_e). On the other hand, the equilibrium in sector 2 depends on the payroll tax (τ_{p_2}) only.

[2]Note that (7) represents two equations.

3 Comparative statics

I shall examine the effects of a change in the payroll tax (τ_{p_i}), which is the labour market policy parameter decided by the government. First, I shall investigate the effects of a change in the payroll tax in the regular job sector (sector 1) when the payroll tax is not levied in the non-regular job (sector 2), i.e., the effect of a change in τ_{p_1} when $\tau_{p_2} = 0$. Second, I shall investigate the case when the government introduces the payroll tax in the non-regular job sector.

3.1 Effects of a change in τ_{p_1}

As can be seen from (7), (11) and (12), a change in τ_{p_1} has no impact on the wage, employment, unemployment in sector 2, i.e., $dw_m/d\tau_{p_1} = 0$, $dn_2/d\tau_{p_1} = 0$, and $du_2/d\tau_{p_1} = 0$. Moreover, it follows from (5) and (6) that $dm_1/d\tau_{p_1} = (h/a)\left(dn_2/d\tau_{p_1}\right) = 0$ and $dm_2/d\tau_{p_1} = -(h/a)\left(dn_2/d\tau_{p_1}\right) = 0$. Namely, the total labour force in both sectors are not influenced by a change in τ_{p_1}. The effect on regular employment is derived from (7) (11) and (19) as

$$\frac{dn_1}{d\tau_{p_1}} = \frac{\left[n_1 - \left(\frac{1}{n_1}\right)\left(\frac{\tau_{p_1}}{1+\tau_{p_1}}\right)\right]\theta w_1}{n_1 w_1 + n_2 w_m - \tau_e \alpha w_1 \theta} > 0, \tag{20}$$

where $\theta = \left[\mu\rho\left(1+r\right)\left(a+q_1\right)m_1\right]\left[\mu\left(1+r\right)\left(1 - \frac{1}{1-\tau_e}\rho\right) - r\right]^{-2}\left(1-\tau_e\right)^{-2} > 0$. A rise in the payroll tax in sector 1 increases regular employment. The reason is the following. A rise in the payroll tax increases the tax revenue and this implies a decrease in the income tax rate (τ_e) under the assumption that the tax expenditure is fixed and constant. As can be seen from (7), on the one hand, a rise in τ_{p_1} shifts the labour demand schedule downwards in sector 1 and this tends to decrease the labour demand for regular jobs. On the other hand, a fall in the income tax rate shifts the wage-setting schedule in sector 1 rightwards and this tends to increase regular employment. The effect via τ_{p_1} and the effect via τ_e work in opposite directions. However, (20) shows that the net effect on regular employment is positive. This is illustrated in Figure 3. A rise in τ_{p_1} shifts the demand schedule in sector 1 (LD_1) downwards and the wage-setting schedule in sector 1 rightwards. The equilibrium for sector 1 moves from E_1 to E_1^*. The wage for regular jobs is decreased and thus regular employment increases. This is different from many earlier studies. Many

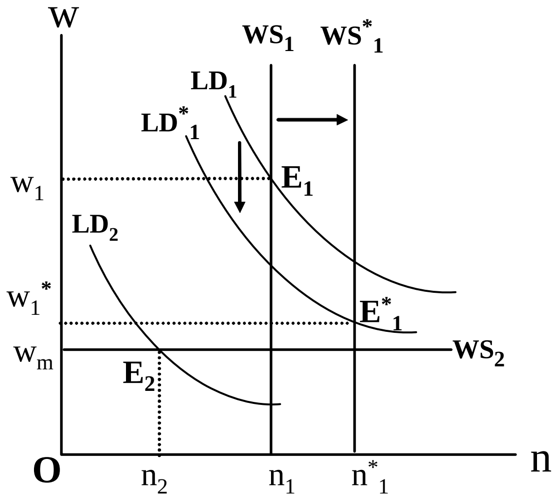

Figure 3: The effects of an increase in τ_{p_1}

earlier studies pointed out that a rise in the payroll tax may decrease employment because a rise in the payroll tax implies an increase in the total labour cost for employers. However, this is not the case in my model. The reason is that a rise in τ_{p_1} induces a fall in the income tax rate and this positive impact on employment is much greater than the negative effects via τ_{p_1}. As a result, employment tends to be increased by a rise in τ_{p_1}.

It follows from (20) and $dm_1/d\tau_{p_1} = 0$ that the effect on unemployment in sector 1 can be written as

$$\frac{du_1}{d\tau_{p_1}} = \frac{dm_1}{d\tau_{p_1}} - \frac{dn_1}{d\tau_{p_1}} < 0.$$

This shows that unemployment in sector 1 is decreased by a rise in τ_{p_1}. Since a change in τ_{p_1} has no impact on unemployment in sector 2, aggregate unemployment is decreased by an increase in τ_{p_1}.

To sum up, a rise in τ_{p_1} increases regular employment and decreases aggregate unemployment. However, a change in τ_{p_1} has no impact on the non-regular job sector.

3.2 Effects of an introduction of τ_{p_2}

As can be seen from (7) and (12), an introduction of τ_{p_2} affects non-regular employment via the labour demand schedule in sector 2.

The effect of an introduction of τ_{p_2} on non-regular employment is derived from (7) and (12) as

$$\left.\frac{dn_2}{d\tau_{p2}}\right|_{\tau_{p_2}=0} = -\frac{n_2}{1-\alpha} < 0. \tag{21}$$

An introduction of the payroll tax in the non-regular job sector decreases non-regular employment. This is illustrated in Figure 4. An introduction of τ_{p_2} shifts the demand curve in sector 2 (LD_2) downwards. The equilibrium for sector 2 moves from E_2 to E_2^*. Non-regular employment is decreased from n_2 to n_2^*.

It follows from (5), (6) and (21) that the effects on the total labour force in both sectors are

$$\left.\frac{dm_1}{d\tau_{p2}}\right|_{\tau_{p_2}=0} = \left(\frac{h}{a}\right)\left.\frac{dn_2}{d\tau_{p2}}\right|_{\tau_{p_2}=0} < 0, \tag{22}$$

$$\left.\frac{dm_2}{d\tau_{p2}}\right|_{\tau_{p_2}=0} = -\left(\frac{h}{a}\right)\left.\frac{dn_2}{d\tau_{p2}}\right|_{\tau_{p_2}=0} > 0. \tag{23}$$

An introduction of τ_{p_2} decreases the total labour force in the regular job sector and increases the total labour force in the non-regular job sector. As can be seen from Figure 1, a fall in non-regular employment implies a decrease in the labour flow from sector 2 to sector 1. Thus the total labour force in sector 1 decreases.

It follows from (21) and (23) that the effect on unemployment in sector 2 is

$$\left.\frac{du_2}{d\tau_{p2}}\right|_{\tau_{p_2}=0} = \left.\frac{dm_2}{d\tau_{p2}}\right|_{\tau_{p_2}=0} - \left.\frac{dn_2}{d\tau_{p2}}\right|_{\tau_{p_2}=0} > 0.$$

This shows that an introduction of the payroll tax in the non-regular job sector increases unemployment in the sector.

The effect on regular employment is derived from (7) (11), (19), and (22) as

$$\left.\frac{dn_1}{d\tau_{p2}}\right|_{\tau_{p_2}=0} = \frac{n_2 w_m\left(\frac{1-\tau_e-\alpha}{1-\alpha}\right)\theta}{n_1 w_1 + n_2 w_m - \left(\frac{\tau_{p_1}}{1-\tau_e}\right)\alpha w_1 \theta} - \left[1 + \frac{\alpha}{h} - \frac{a+q_1}{\mu(1+r)\left(1-\frac{1}{1-\tau_e}\rho\right) - r}\right] \lesseqgtr 0. \tag{24}$$

The first term in the RHS represents the positive effect on regular employment via the income tax (τ_e). An introduction of the payroll tax in the non-regular job

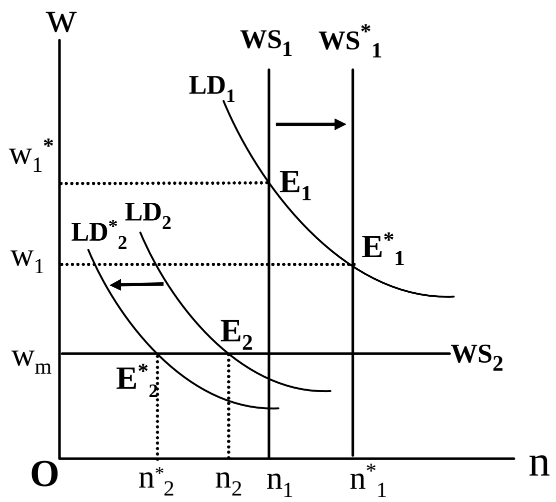

Figure 4: The effects of an introduction of τ_{p_2}

sector increases the tax revenue. Since the tax expenditure is assumed to be fixed and constant, the income tax tends to decrease. This effect shifts the wage-setting schedule rightwards and the regular employment tends to increase. The second term in the RHS is the negative effect on regular employment via the labour flow from sector 2 to sector 1. As can be seen from (7), an introduction of the payroll tax in sector 2 tends to decrease the labour demand in the sector. Since the wage in the sector is assumed to be given by the legislated minimum wage, non-regular employment is decreased by an introduction of τ_{p_2}. A fall in non-regular employment implies a decrease in the labour flow into sector 1 and this tends to shifts the wage-setting schedule in sector 1 leftwards. The second term tends to decrease regular employment. These two effects work in the opposite direction. In general, the net effect is ambiguous.

Figure 3 illustrates the case that the effect via the first term dominates the effect via the second term, i.e., the wage-setting schedule in sector 1 (WS_1) is shifted rightwards. An introduction of τ_{p_2} shifts the demand curve in sector 2 (LD_2) downwards. The equilibrium for sector 2 moves from E_2 to E_2^*. Non-regular employment is decreased from n_2 to n_2^*.

If the wage-setting schedule in sector 1 (WS_1) is shifted leftwards, an introduction of τ_{p_2} induces a decrease both in regular employment and non-regular employment.

Namely, an introduction of τ_{p_2} decreases aggregate employment in the economy.

4 Concluding remarks

This paper has analysed the general equilibrium effects of the payroll taxes. First, I investigate the case when the government changes the payroll tax that is levied only in the regular job sector. Second, I analyse the case when the government introduces the payroll tax in the non-regular job sector.

When the government raises the payroll tax in regular job sector, the income tax is decreased because the tax expenditure is assumed to be fixed and constant in the model. On the one hand, a rise in the payroll tax shifts the labour demand schedule downwards in the sector and this tends to decrease the labour demand for regular jobs. On the other hand, a fall in the income tax rate shifts the wage-setting schedule in the regular job sector rightwards and this tends to increase regular employment. The net effect on regular employment is positive. Namely, a rise in the payroll tax in the regular job sector increases regular employment. Since a change in the payroll tax in the regular job sector has no impact on the non-regular job sector in the model, an increase in regular employment implies a decrease in aggregate unemployment. If the wage in the non-regular job sector depends on the income tax, a fall in the income tax increases non regular employment. This implies an increase in the labour flow into the regular job sector and thus the regular job sector becomes more competitive. As a result, regular employment increases further.

When the government introduces the payroll tax in the non-regular job sector, non-regular employment deceases because a rise in the payroll tax implies a rise in the labour costs for non-regular jobs. A fall in non-regular employment decreases the labour flow into the regular job sector and thus the regular job sector becomes less competitive. This tends to raise the wage and decrease employment there. However, an introduction of the payroll tax in the non-regular job sector decreases the income tax. This tends to increase regular employment. The net effect on regular employment is ambiguous because these two effects work in the opposite directions. If regular jobs and non-regular jobs are substitutes, an introduction in the payroll tax for non-regular jobs implies that the labour costs for regular jobs becomes relatively cheaper. As a result, regular employment may increase and non-regular employment may decrease in the economy.

References

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

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

[3] Calmfors, L., 1996, Den aktiva arbetsmarknadspolitiken och sysselsättingen - en teoretisk referensram, *Aktiv Arbetsmarknadspolitik* (Statens Offentliga Utredningar 1996:34).

[4] Fitoussi, J.-P., 2000, Payroll Tax Reduction for the Low Paid, *OECD Economic Studies* 31, Paris.

[5] Fukushima, Y., 1998, Active Labour Market Programmes and Unemployment in a Dual Labour Market, *Research Papers in Economics* 1998:2, Stockholm University.

[6] Fukushima, Y., 2001, Active Labour Market Programmes, Education and Unemployment, Research Papers in Economics 2001:11, Stockholm University.

[7] Fukushima, Y., 2003, Essays on Employment Policies, Dissertations in Economics 2003:1, Stockholm University.

[8] Goerke, L. , 2000, Labour Taxation, Efficiency Wages and the Long Run, *Bulletin of Economic Research* 52.

[9] Goerke, L. , 2002, Statutory and Economic Incidence of Labour Taxes, *Applied Economics Letters* 9.

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

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

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

[13] Lindbeck, A., 1995, *The Swedish Experiment* (SNS Förlag).

[14] Manning, A. 1991, The Determinants of Wage Pressure: Some Implications of a Dynamic Model, *Economica* 58.

[15] Manning, A. 1993, Wage Bargaining and the Phillips Curve: The Identification and Specification of Aggregate Wage Equations, *Economic Journal* 103.

[16] Ministry of Health, Labour and Welfare, 2005, *White paper on Labour Economy*, Tokyo, Japan.

[17] Ministry of Health, Labour and Welfare, 2006, *White paper on Labour Economy*, Tokyo, Japan.

[18] Ministry of Health, Labour and Welfare, 2007, *White paper on Labour Economy*, Tokyo, Japan.

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

[20] OECD, 2004, *Employment Outlook*, Paris.

[21] OECD, 2005, *Employment Outlook*, Paris.

[22] OECD, 2006, *Employment Outlook*, Paris.

[23] Orszag, J. M. and D. Snower, 1999, Youth Unemployment and Government Policy, *Journal of Population Economics* 12.