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THE EFFECTS OF TAXES ON LABOUR IN A DYNAMIC EFFICIENCY WAGE MODEL*

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This paper studies the impact of wage and employment taxes in an intertemporal efficiency wage model. Cases with fixed, linear and quadratic adjustment costs associated with job creation are considered. In general, the model shows that an increase in the employment tax leads to an increase in unemployment, reducing job creation, and has ambiguous effect on wages; whereas an increase in the wage tax reduces wages and has ambiguous impact on unemployment and job creation.
JEL Classification Numbers: J41, H32.

1. Introduction

The literature on the incidence of taxation in labour markets with wage-setting agents generally finds that the specification of tax schedules influences wages and employment (e.g. Malcomson and Sator, 1987; Hoel, 1990; Delipalla and Sanfey, 2001). In particular, in efficiency wage models a growing interest has focused on the impact of wage tax and/or employment tax on wages and unemployment (e.g. Yellen, 1984; Shapiro and Stiglitz, 1984; Johnson and Layard, 1986). Pisauro's (1991) seminal contribution is the first systematic study to analyse the effect of taxes in a more general efficiency wage model of the moral hazard (or shirking) type.

In a short-run efficiency wage model, Pisauro (1991) has shown that both types of tax reduce employment and that the incidence of employment taxes leads to less wage restraint than payroll taxes (see also Carter, 1999). Rasmussen (1998) extends Pisauro's model to the long run by allowing for free entry and exit of firms. He shows that more extensive use of employment taxes instead of wage taxes, balancing the government budget,[1] increases the level of employment.[2]

This paper presents an intertemporal version of the Pisauro (1991) model. It studies the impact of wage and employment taxes in an intertemporal efficiency wage model developed along the lines of Hoon and Phelps (1992), Lin and Lai (1994) and Faria (2000).

The main feature of this intertemporal efficiency wage model lies in the assumption that firms face adjustment costs, derived from training costs, in hiring new workers. This is in sharp contrast with the usual vision, which sees the labour market as frictionless. In fact, when one considers the costs of changing the numbers of employees in the firm, that leads to disruptions to production, increasing search, training and other costs, such as

* I would like to thank, without implicating, Miguel Leon-Ledesma for useful comments.

[1] Chang and Lai (1999) analyse the balanced budget multiplier in a macroeconomic model with efficiency wages.

[2] See also Goerke (2000).

severance pay, it is easy to see that these costs can have important effects on job creation, and therefore can affect the long-run investment decisions of the firms.

The dynamic framework put forward in this paper allows us to investigate the effects of taxes on unemployment and wages; moreover, in contrast to previous studies, it allows us to assess the impact of taxes on job creation. It is shown that an increase in the employment tax leads to an increase in unemployment, reducing job creation, and has ambiguous effect on wages. An increase in the wage tax reduces wages and has ambiguous impact on unemployment and job creation.

2. The model

There is a large number of small (and identical) firms producing a single good whose price is normalized at unity. Firms are Nash competitors, each of which chooses wage and employment to maximize its profits, taking as given the wages and employment levels at other firms. In the symmetric equilibrium all firms pay the same wage.

The problem of the representative firm is the following:

$$\max \int_0^\infty \pi(y, w, n, \tau, h) e^{-rt} dt, \tag{1}$$

subject to

$$\dot{n} = h - qn, \tag{2}$$

where $\pi(\cdot)$ is a profit function which depends on the level of output y, real wage w, employment n, tax rate (wage and/or employment tax) τ and the number of hired workers h. The firm faces adjustment costs when it hires new workers. The number of workers employed by the firm varies according to equation (2). Employment grows with the number of hired workers, which stands for job creation, and decreases when they quit, where q is the quit rate. It is assumed that q is constant.

The production function of the representative firm is given by

$$y = f[ne(w, u, b, d)], \qquad f' > 0, f'' < 0,$$

where $e(\cdot)$ is the effort function derived from a representative worker problem, in which the worker chooses the level of effort to maximize his expected utility (see the details in Pisauro, 1991). In order to simplify matters it is assumed that b, the alternative income, is given exogenously as an unemployment benefit. Moreover, the detection rate d is also considered to be exogenous. Thus, without loss of generality, we can represent the effort function as in a typical moral hazard efficiency wage model, where a worker's effort is an increasing function of the real wage w, and of the level of unemployment u ($e_w > 0$, $e_{ww} < 0$; $e_u > 0$; $e_{uu} < 0$; $e_{wu} = 0$).

Two different types of taxation will be considered in order to solve the representative firm's problem: (i) an ad valorem or wage tax (τwn) and (ii) a specific or employment tax (τn).

2.1 The effect of a wage tax

In the presence of an ad valorem or wage tax, profits for the representative firm are

$$\pi = f(ne(w, u)) - w(1 + \tau)n - C(h), \tag{3}$$

where profits correspond to net revenue sales ($f(ne(w, u))$) minus the wage bill (wn), minus the wage tax (τwn), minus the adjustment (training) costs of new workers hired ($C(h)$).[3] By substituting (3) into (1), the Hamiltonian for the representative firm problem is

$$H = f(ne(w, u)) - w(1 + \tau)n - C(h) + \lambda(h - qn),$$

where λ is the shadow price of one extra worker employed in the firm. Using the Pontryagin maximum principle, the steady-state equilibrium is given by the following equations:

$$ef' - w(1 + \tau) = \lambda(r + q), \tag{4}$$

$$h = qn, \tag{5}$$

$$f'e_w = 1 + \tau, \tag{6}$$

$$\lambda = C'. \tag{7}$$

We can see that the system of (4)–(7) simultaneously determines the steady-state values of w, n, h and λ. One way to disentangle this system is by assuming very simple adjustment costs, such as (i) $C(h) = c$; (ii) $C(h) = ch$ and (iii) $C(h) = (\alpha/2)h^2$.[4] In the first case adjustment costs are fixed, while in cases (ii) and (iii) they are variable.[5] In case (ii) they increase linearly with the number of hired workers, and in case (iii) they are quadratic.

When adjustment costs are fixed as in case (i), $C(h) = c$, it implies $C' = 0$; then $\lambda = 0$, by (7). Using $\lambda = 0$ in (4) and substituting it into (6) gives the Solow condition, which determines the efficiency wage. We can see that this model with fixed adjustment costs is the same model analysed by Pisauro (1991) for the case of ad valorem tax.

When adjustment costs are linear, we have $C'(h) = c > 0$; therefore in the above system equation (7) determines the steady-state value of λ

$$\lambda = c \tag{7'}$$

Then, by introducing (7′) into (4) and considering (6), the equilibrium efficiency wage and level of employment can be determined:

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3 This formulation of training costs follows Faria (2000); see Hoon and Phelps (1992) for training costs with a scale variable.

4 In fact, we can generalize for all cases of increasing adjustment cost functions (e.g. cases (ii) and (iii)) by assuming $C(h) = (\beta/\delta)h^{\delta}$. It is easy to see that $\delta = 1$ when we have case (ii), and $\delta = 2$ when we have case (iii).

5 When variable adjustment costs are pervasive, employment changes may occur slowly (see e.g. Fair, 1985), while in the case where fixed adjustment costs are important, the employment can switch suddenly in a discontinuous way (see e.g. Nickell (1984)).

$$ef' - w(1 + \tau) = c(r + q), \tag{4'}$$

$$f'e_w = 1 + \tau. \tag{6'}$$

Finally, given λ, w and n, equation (5) determines the steady-state value of job creation, h.

It is worth noticing that from (4′) and (6′) we have

$$\frac{c(r + q)}{(1 + \tau)e} e_w + e_w \frac{w}{e} = 1. \tag{8}$$

As

$$\frac{c(r + q)}{(1 + \tau)e} e_w > 0,$$

the effort–wage elasticity is less than unity: $e_w(w/e) < 1$; that is, the Solow condition does not hold.

As there are I identical firms, the individual firm production function $f(en)$ generates, as a result of the assumption of efficient allocation of labour among firms, an aggregate production function, $F(eN) = If(en)$. Denoting by $F(\cdot)$ the aggregate production function, by L the labour force and by $N = In = (1 - u)L$ the level of aggregate employment, it follows that $F(eN) = F(e(1 - u)L)$. In addition, notice that $F'(eN) = f'(en)$. The market equilibrium conditions for determining the efficiency wage and the level of unemployment follow from (8) and (4′):

$$e_w(w, u)[c(r + q) + w(1 + \tau)] = e(w, u)(1 + \tau) \quad \text{(MCL)} \tag{9}$$

$$e(w, u)F'[(1 - u)Le(w, u)] - w(1 + \tau) = c(r + q) \quad \text{(LD)} \tag{10}$$

Condition (9) gives the level of w that minimizes the cost of labour for any level of u, and it is labelled MCL (minimum cost of labour schedule) by Pisauro (1991). Implicit differentiation with respect to w and u shows that this schedule is downward-sloping:[6]

$$\left.\frac{dw}{du}\right|_{\text{MCL}} = \frac{e_u(1 + \tau)}{e_{ww}[w(1 + \tau) + c(r + q)]} < 0. \tag{11}$$

Moreover, bearing in mind that $e_w(w/e) < 1 \Rightarrow e - e_w w > 0$, the impact of an increase in the wage tax shifts the MCL schedule downwards:

$$\left.\frac{dw}{d\tau}\right|_{\text{MCL}} = \frac{e - e_w w}{e_{ww}[w(1 + \tau) + c(r + q)]} < 0. \tag{12}$$

[6] The signs of the functions and their derivatives are the same as in Pisauro (1991), except for the ones corrected by Carter (1999).

Condition (10) is simply the labour demand (LD) schedule that is given by combinations of w and u consistent with equalization between marginal cost and marginal product. Implicit differentiation of (10) shows that this schedule is upward-sloping:

$$\left.\frac{dw}{du}\right|_{\mathrm{LD}} = \frac{eLF''[e-(1-u)e_u] - e_u F'}{e_w[F' + eF''(1-u)L] - (1+\tau)} > 0. \tag{13}$$

It is easy to see that an increase in the wage tax shifts this schedule downwards:

$$\left.\frac{dw}{d\tau}\right|_{\mathrm{LD}} = \frac{w}{e_w[F' + eF''(1-u)L] - (1+\tau)} < 0. \tag{14}$$

Therefore, in this dynamic model with linear adjustment costs, an increase in the ad valorem tax decreases wages.[7]

The effect of the wage tax on unemployment, however, is less clear. It can increase or decrease the unemployment rate depending on which schedule shifts more than the other. The expression for the effect of ad valorem or wage tax on unemployment is

$$\frac{du}{d\tau} = \frac{[w(1+\tau)+c(r+q)]we_{ww} - (e-e_w w)\{e_w[F' + eF''(1-u)L] - (1+\tau)\}}{e_u(1+\tau)\{e_w[F' + eF''(1-u)L] - (1+\tau)\} + [w(1+\tau)+c(r+q)]e_{ww}[e_u F' + eF''(1-u)Le_u - e^2F''L]} \gtreqless 0.$$

As the denominator is negative, the analysis of this expression indicates that the wage tax can reduce unemployment if

$$[w(1+\tau)+c(r+q)]we_{ww} > (e-e_w w)\{e_w[F' + eF''(1-u)L] - (1+\tau)\}. \tag{$*$}$$

The impact of the wage tax on wages and unemployment is illustrated in Figure 1. It is clear from the figure that an increase in the wage tax leads to a fall in wages. However, notice that when the wage tax increases it can decrease the unemployment rate from u to u', when the labour demand shifts from LD to LD′ (the situation described by the inequality (*) above), or it can increase the unemployment from u to u'', when the labour demand shifts from LD to LD″, offsetting the shift of the minimum cost of labour schedule from MCL to MCL′.[8]

To study the impact of an ad valorem tax on job creation, we must rewrite equation (5) in aggregate terms:

$$H = q(1-u)L, \tag{5′}$$

[7] The expression for the effect of the ad valorem or wage tax on the net real wage is

$$\frac{dw}{d\tau} = \frac{(e-e_w w)\{eLF''[-e+(1-u)e_u] + e_u F'\} + e_u(1+\tau)w}{e_u(1+\tau)\{e_w[F' + eF''(1-u)L] - (1+\tau)\} + [w(1+\tau)+c(r+q)]e_{ww}[e_u F' + eF''(1-u)Le_u - e^2F''L]}.$$

[8] It is easy to see that the equilibrium is stable. Assume in Figure 1 that the equilibrium is given by point (u, w) and the relevant locus are given by MCL and LD. For any point above u, there is an excess labour demand which increases employment, thereby decreasing the unemployment rate to point u. In the same vein, for any point below u the MCL locus is greater than LD, which leads to an increase in unemployment until it reaches point u.

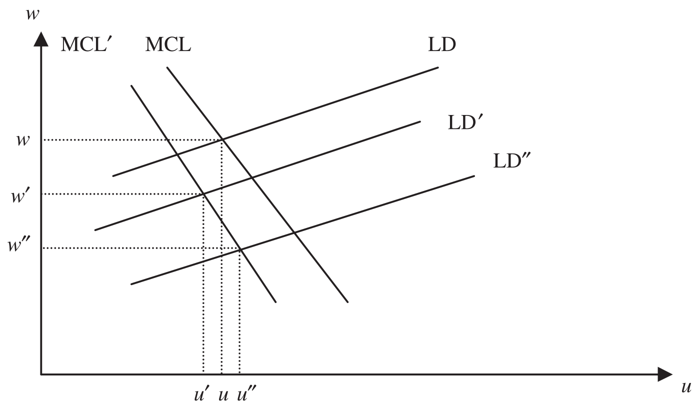

FIGURE 1. The effects of a wage (ad valorem) tax: lower wages, higher or lower unemployment

where $H = Ih$ is the aggregate job creation. It is clear that an increase in the unemployment rate (u) leads to a reduction in job creation, given a fixed quit rate [$dH/du = -qL < 0$]. As a result, the effect of the wage tax on job creation is also ambiguous, since it depends on the impact of this tax on the unemployment rate, which can be positive or negative, as seen above.

When we take into account the case of quadratic adjustment costs, we have $C'(h) = \alpha h$, so (7) becomes

$$\lambda = \alpha h. \tag{7″}$$

Using (5) in (7″) and substituting it into (4) yields

$$ef' - w(1 + \tau) = \alpha qn(r + q). \tag{4″}$$

From (4″) and (6), we obtain

$$\frac{\alpha qn(r + q)}{(1 + \tau)e} e_w + e_w \frac{w}{e} = 1. \tag{8′}$$

We can see that, as in the former case, the effort–wage elasticity is less than one; that is, the Solow condition does not hold here, either. The important implication is that with linear or quadratic costs the equilibrium efficiency wage is higher than the one given in the case of fixed adjustment costs. This is not a surprising result, since, when turnover costs are taken into account, the effort–wage elasticity is expected to be less than one (see Akerlof and Yellen (1986).

With quadratic adjustment costs, (8′) and (6) determine the equilibrium efficiency wage and level of employment; then, by (5), the number of new workers hired is defined. Finally, (7″) gives the optimal value of λ.

The market equilibrium conditions are given using (8′) and (4″):

$$e_w(w, u)[q(1 - u)LI^{-1}\alpha(r + q) + w(1 + \tau)] = e(w, u)(1 + \tau) \quad \text{(MCL)} \tag{9′}$$

$$e(w, u)F'[(1 - u)Le(w, u)] - w(1 + \tau) = \alpha q(1 - u)LI^{-1}(r + q) \quad \text{(LD)} \tag{10′}$$

By contrasting (9′) with (9), we can see the role of the properties of the adjustment cost functions. The quadratic adjustment costs make the MCL (given by (9′)) depend on the number of employed workers, while the linear adjustment costs make the MCL (given by (9)) independent of the number of workers.

The slope of (9′) and the wage tax effect on the MCL are, respectively,

$$\left.\frac{dw}{du}\right|_{\mathrm{MCL}} = \frac{e_w qLI^{-1}\alpha(r+q) + e_u(1+\tau)}{e_{ww}[w(1+\tau) + q(1-u)LI^{-1}\alpha(r+q)]} < 0, \tag{11'}$$

$$\left.\frac{dw}{d\tau}\right|_{\mathrm{MCL}} = \frac{e - e_w w}{e_{ww}[w(1+\tau) + q(1-u)LI^{-1}\alpha(r+q)]} < 0. \tag{12'}$$

In the same vein, by analysing the labour demand schedule described by (10′), its slope and the wage tax effect are given by

$$\left.\frac{dw}{du}\right|_{\mathrm{LD}} = \frac{eLF''[e - (1-u)e_u] - e_u F' - qLI^{-1}\alpha(r+q)}{e_w[F' + eF''(1-u)L] - (1+\tau)} > 0, \tag{13'}$$

$$\left.\frac{dw}{d\tau}\right|_{\mathrm{LD}} = \frac{w}{e_w[F' + eF''(1-u)L] - (1+\tau)} < 0. \tag{14'}$$

As the signs of (11′)–(14′) are the same as in the case of linear adjustment costs, we obtain, as a consequence, the same qualitative results. That is, when quadratic adjustment costs are taken into account, an increase in the ad valorem tax decreases wages, and has ambiguous impact on unemployment and job creation.

2.2 The effect of an employment tax

In the presence of an employment or specific tax, profits for the representative firm are

$$\pi = f(ne(w, u)) - (w+\tau)n - C(h). \tag{15}$$

Following the same steps as in the previous section, the Hamiltonian for the representative firm is

$$H = f(ne(w, u)) - (w+\tau)n - C(h) + \lambda(h - qn),$$

where λ is the shadow price of one extra worker employed in the firm. The steady-state optimality conditions are

$$ef' - (w+\tau) = \lambda(r+q), \tag{16}$$

$$h = qn, \tag{17}$$

$$f' e_w = 1, \tag{18}$$

$$\lambda = C'. \tag{19}$$

The system (16)–(19) is simultaneous. As before, in order to solve this system we consider three different types of adjustment cost. In the case of fixed adjustment costs (i), $C(h) = c$, it is implied by (19) that $C' = 0 = \lambda$. As in the previous section, case (i) is the same as the case analysed by Pisauro (1991) for employment tax. This shows that the Pisauro model can be seen as a particular case of the present model in which adjustment costs relating to job creation are fixed.

For the remaining types of adjustment cost, we have in the case of linear adjustment costs that (ii) $C'(h) = c > 0$, which implies $\lambda = c$ by (19). For the case of quadratic adjustment costs we have (iii) $C'(h) = \alpha h > 0$, which implies $\lambda = \alpha qn$ by (19) and (17).

Let us first consider the linear adjustment costs case, where we have $C'(h) = c > 0$, which implies $\lambda = c$ by (19). By substituting this into (16) it yields

$$ef' - (w + \tau) = c(r + q). \tag{16$'$}$$

Moreover, it follows from (16′) and (18) that

$$e_w[w + \tau + c(r + q)] = e. \tag{20}$$

Equation (20), together with (16′), is used to determine the market equilibrium conditions (following the same steps as in the previous section):

$$e_w(w, u)[w + \tau + c(r + q)] = e(w, u) \quad \text{(MCL)} \tag{21}$$

$$e(w, u)F'[(1 - u)Le(w, u)] = (w + \tau) + c(r + q) \quad \text{(LD)} \tag{22}$$

We can see that the slope of MCL, given by (21), is negative and the slope of LD, given by (22), is positive. From (21) it follows that an increase in the employment tax shifts the MCL schedule upwards:

$$\left.\frac{dw}{d\tau}\right|_{\text{MCL}} = \frac{-e_u}{e_{ww}[w + \tau + c(r + q)]} > 0. \tag{23}$$

The reason for (23) lies in the fact that the employment tax is a fixed cost of employing a worker; when this fixed cost rises, firms want better workers and to obtain this they will pay their employees more.

From (22), a higher employment tax shifts the LD schedule downwards:

$$\left.\frac{dw}{d\tau}\right|_{\text{LD}} = \frac{1}{e_w[F' + eF''(1 - u)L] - 1} < 0. \tag{24}$$

Given that a raise in the employment tax shifts the MCL schedule up and the LD schedule down, it follows that an increase in the employment tax increases unemployment

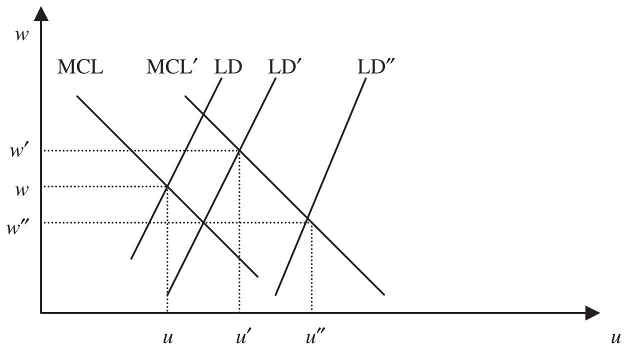

FIGURE 2. The effects of an employment (specific) tax: higher unemployment, higher or lower wage

unambiguously.[9] However, the impact of the employment tax on wages remains ambiguous. It can increase or decrease wages depending on which schedule shifts more. This is illustrated in Figure 2. When the labour demand schedule shifts from LD to LD′ and the shift is offset by that in the minimum cost of labour schedule from MCL to MCL′, the employment tax will lead to an increase in the wage. However, when the LD shift offsets the shift in the MCL, the wage will fall.

Finally, from the aggregate version of (17) we have $Ih = qIn \Rightarrow H = q(1-u)L$. One can see that an increase in the unemployment rate (u) leads to a fall in the aggregate job creation ($dH/du = -qL < 0$). Therefore, it is clear that an increase in the employment tax, by increasing the unemployment rate, will generate less job creation.

In order to analyse the quadratic adjustment costs case, corresponding to case (iii), we follow the same steps as the above linear adjustment costs case. Recall that with quadratic adjustment costs we have $C'(h) = \alpha h > 0$, which by (19) and (17) implies $\lambda = \alpha qn$. Substituting $\lambda = \alpha qn$ into (16) yields

$$ef' - (w + \tau) = \alpha qn(r + q). \tag{16″}$$

Additionally, it follows from (16″) and (18) that

$$e_w[w + \tau + \alpha qn(r + q)] = e. \tag{20′}$$

Equations (20′) and (16″) are used to determine the following market equilibrium conditions:

$$e_w(w, u)[w + \tau + q(1-u)LI^{-1}\alpha(r + q)] = e(w, u) \quad \text{(MCL)} \tag{21′}$$

$$e(w, u)F'((1-u)Le(w, u)) = (w + \tau) + q(1-u)LI^{-1}\alpha(r + q) \quad \text{(LD)} \tag{22′}$$

[9] The expression for the effect of employment tax on unemployment is

$$\frac{du}{d\tau} = \frac{[w + \tau + c(r+q)]e_{ww} + e_w[eLF''(1-u)e_w + e_wF' - 1]}{e_u\{e_w[F' + eF''(1-u)L] - 1\} + [w + \tau + c(r+q)]e_{ww}[e_uF' + eF''(1-u)Le_u - e^2F''L]} > 0.$$

From (21′) and (22′) it follows that the slope of MCL is negative and the slope of LD is positive:

$$\left.\frac{dw}{du}\right|_{\text{MCL}} = \frac{e_w qLI^{-1}\alpha(r+q) + e_u}{e_{ww}[w+\tau+q(1-u)LI^{-1}\alpha(r+q)]} < 0, \tag{25}$$

$$\left.\frac{dw}{du}\right|_{\text{LD}} = \frac{eLF''[e-(1-u)e_u] - e_u F' - qLI^{-1}\alpha(r+q)}{e_w[F' + eF''(1-u)L] - 1} > 0. \tag{26}$$

By the same token, from (21′) and (22′) it follows that an increase in the employment tax shifts the MCL schedule upwards, while it shifts the LD schedule downwards:

$$\left.\frac{dw}{d\tau}\right|_{\text{MCL}} = \frac{-e_w}{e_{ww}[w+\tau+q(1-u)LI^{-1}\alpha(r+q)]} > 0, \tag{23′}$$

$$\left.\frac{dw}{d\tau}\right|_{\text{LD}} = \frac{1}{e_w[F' + eF''(1-u)L] - 1} < 0. \tag{24′}$$

Therefore, with quadratic adjustment costs the employment tax has the same qualitative effects as in the case of linear adjustment costs; that is, an increase in the employment tax increases unemployment, has an ambiguous impact on wages, and generates less job creation.

2.3 Comments

The model shows that wage and employment taxes have quite different impacts on unemployment. As seen above, the wage tax can have a negative impact on unemployment when the variation in the labour demand is offset by a variation in the minimum cost of labour schedule for a given tax increase. In contrast, the employment tax always increases unemployment. This is due to the fact that it punishes firms for increasing employment, no matter what the wage bill is. In contrast, the wage tax punishes firms for increasing the wage bill. This difference between the tax systems implies that firms that can manage to increase employment without raising their payrolls (say, by hiring more low-skilled workers with lower wages[10]) are likely to pay lower taxes under a wage tax regime than under a regime with an employment tax.

In Pisauro's (1991) paper, both taxes increase unemployment. The present results contrast with his, which is hardly surprising, since my framework allows for the analysis of the long-run equilibrium while the Pisauro model is a static short-run equilibrium model.

[10] This has important implications for countries with a high degree of low-skilled unemployment, such as European countries. This may also suggest that a shift in the tax burden from those with low wages to those with high wages may reduce unemployment; see Roed and Strom (2002). Rasmussen (2002), however, shows that long-run adjustment in the number of firms to changes in profits may imply that an increase in tax progression has adverse employment effects when all the budgetary effects of the tax reform are taken into account.

In the present dynamic setup I focus on firms' intertemporal decisions where they face adjustment (training) costs associated with job creation. These results also contrast with that of Rasmussen (1998). Rasmussen extends Pisauro's model to the long run by allowing for the free entry and exit of firms and considers whether changes in the composition of labour taxes, balancing the government budget, would affect unemployment in the long run. However in Rasmussen (1998) firms maximize profits at each point on time and face no adjustment costs. Rasmussen shows that more extensive use of employment taxes instead of wage taxes increases the level of employment when the same net tax revenue is generated.[11]

3. Concluding remarks

This paper considers wage and employment taxes in an intertemporal efficiency wage model in which job creation is taken into account. I showed that the Pisauro (1991) model corresponds to the case in which adjustment costs related to new jobs are fixed. The present model shows that an increase in the employment tax leads to an increase in unemployment, reducing job creation, and has ambiguous effect on wages, while an increase in the wage tax reduces wages and has ambiguous impact on unemployment and job creation.

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[11] A related issue on taxation is whether its burden affects workers or firms. Goerke (2002) shows that a revenue-neutral substitution of a linear income tax paid by employees for a payroll tax paid by firms increases unemployment; see also Picard and Toulemonde (2001).

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