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PAID BY EMPLOYERS AND EMPLOYEES

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On the Equivalence of Taxes Paid by Employers and Employees*

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Abstract

In this paper we study the employment effects of a budget neutral restructuring of taxes levied on employers and employees. We derive conditions for taxes levied on workers to have the same employment effects as taxes levied on firms under standard processes of wage determination.

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Introduction

Most countries finance their expenditures and the social security by a mix of taxes paid by workers and by employers. Generally the taxes are related to the wages received by employees. This raises the question of the equivalence of these taxes: do taxes levied on wages have the same impact on employment if they are paid by workers or by firms? Put in another way, does a switch between taxes paid by employers and taxes paid by employees affect employment? Clearly the answer is no in a perfectly competitive market: replacing an employer's tax by an employee's tax of equal magnitude has no effect on the net wage, the gross wage or the employment level (Symons and Robertson (1990)). Still empirical evidence suggests that the answer is yes (see e.g. Holm et al. (1994)), and union leaders would surely not be indifferent to an increase in the employees' taxation rate that would be compensated by a decrease in the employers' taxation rate. Therefore there is a need to depart from perfectly competitive markets to fit the facts[1]. This is what is done in a union framework by Rasmussen (1993) or Holm et al. (1995). However these models heavily rely on a non linear taxation to explain the non equivalence result. In this paper we show that even in the case of linear taxation, both taxes may not be equivalent and we extend the results to non-union frameworks.

We first derive conditions for the equivalence (Section 1). Then we check whether these conditions hold under different processes of wage determination. We show that they hold for perfectly competitive labor markets but not necessarily in the case of minimum wages (Section 2). Then we develop an efficiency wage model (Section 3), and a bargaining model (Section 4). We show in which circumstances the conditions hold in these models. This is followed by concluding remarks.

1 A General Condition for Equivalence

In this section we derive a condition for taxes levied on employers to have the same effect on employment as taxes levied on workers. For clarity we introduce the following terminology:

1. w is the market wage;

2. $w(1+t)$ is the gross wage and t is the tax rate for the employers;

[1] This departure from perfectly competitive markets is also needed to explain why a tax per head has a different employment impact than a tax on the wage bill (see e.g. Pisauro (1991), or Rasmussen (1997, 1998)).

3. $w(1-s)$ is the net wage and s is the tax rate for the workers.

We assume that there are n identical firms. The gross wage $w(1+t)$ guides their employment decisions. Each firm's labor demand is $L^D(w(1+t))$ which aggregates to $L^A = nL^D(w(1+t))$. Therefore if n is exogenous, a tax restructuring does not alter employment if and only if the market wage adjusts to keep the gross wage $w(1+t)$ constant.

On the other hand, the government's budget can be written as the difference between tax revenues and the unemployment cost, i.e.

$$g \equiv [w(1+t) - w(1-s)]\, L^A - b(L^S - L^A), \tag{1}$$

where b is the unemployment benefit and L^S is the labor supply which depends on the net wage $w(1-s)$. In this paper we consider the impact of tax restructuring on the government's revenues and budget.

First let us briefly focus on the government's *revenues*,

$$r \equiv [w(1+t) - w(1-s)]\, L^A \tag{2}$$

which depend only on the gross and net wages. We know that a restructuring of taxes does not alter employment if and only if $w(1+t)$ is constant. We can also establish that if the restructuring of taxes does not alter employment (i.e. $w(1+t)$ is constant), then it will not alter the tax *revenues* if and only if the net wage $w(1-s)$ is constant (see (2)). Therefore we have a first result that *a tax restructuring is irrelevant to employment and to government's revenues if and only if both net and gross wages remain constant.*

Suppose that the wage setting process can be expressed only in terms of the gross and net wages i.e.

$$G(w(1+t), w(1-s)) = 0. \tag{3}$$

Then, in the case of a revenue neutral tax restructuring, the net and gross wages are the solutions of the system made of this equality (3) and the constant revenues (2). It is therefore obvious that a revenue neutral tax restructuring will keep both the gross and net wages unchanged; so will be the employment level. This gives the following proposition:

Proposition 1 *If the wage setting process depends only on the net and gross wages (see expression (3)), then a* revenue *neutral restructuring of taxes levied on employers and employees is irrelevant to employment and does not alter the net and gross wages.*

We turn now to the case of *budget* neutral tax reforms (expression (1)) in which the unemployment cost ($b(L^S - L^A)$) matters. We assume that the unemployment benefit can be written as a function of the market wage and the worker's tax rate: $b = b(w, s)$. The following condition is critical to the remaining of the analysis:

$$wb_1 + (1 - s)b_2 = 0. \tag{4}$$

This states that the unemployment cost depends only on the net wage. If this condition is fulfilled the budget (1) depends only on gross and net wages as it was the case for the government's revenues. Therefore we can also state that *a tax restructuring is irrelevant to employment and to the government's budget if and only if both net and gross wages remain constant.*

Suppose that condition (4) is fulfilled and that the wage setting process satisfies (3). A *budget* neutral restructuring of taxes imposes that the net and gross wages are the solutions of the system made of the wage setting (3) and the constant budget (1). Such a budget neutral restructuring will thus have no impact on the gross and net wages. It will therefore not affect the employment level.

This yields the following proposition:

Proposition 2 *If the wage setting process satisfies (3) and the unemployment benefit satisfies condition (4) then, a* budget *neutral restructuring of taxes is irrelevant to employment.*

In general if (3) or (4) are not satisfied, it is possible to change the employment level with a budget neutral restructuring of taxes.

In the next sections, we check whether the most popular models of wage determination fulfill the conditions of this proposition. In particular we analyze how the net wage, the gross wage and the government's budget are affected by a change of taxes in these models.

2 Competitive Labor Market and Minimum Wages

In his Theorem of the Invariance of Tax Incidence, Dalton (1954) states that tax source should not matter in competitive markets. We give here a direct proof by applying our result. The demand and supply of labor are $L^A(w(1 + t))$ and $L^S(w(1 - s))$. When the labor market clears, we have

$$G \equiv L^A(w(1 + t)) - L^S(w(1 - s)) = 0. \tag{5}$$

Since the unemployment benefit is irrelevant in competitive markets and since this wage setting process depends only on the net and the gross wages, Proposition 2 yields the following corollary:

Corollary 1 *In a competitive labor market, a budget neutral restructuring of taxes levied on employers and employees is irrelevant to employment.*

While a restructuring of taxes from employers to employees is irrelevant to employment in competitive labor markets, the result could be different in non-competitive labor markets. The first obvious example is the case in which the *market wage* is constrained to the level of a *minimum wage* $w^{\min}$ that determines the employment level. The wage setting is $w = w^{\min}$. Clearly, the net and gross wages (resp. $w^{\min}(1-s)$ and $w^{\min}(1+t)$) will change when the government modifies taxes s and t. Intuitively, given a binding minimum wage, any employment policy that requires to reduce gross wages must reduce taxes on firms (t). To keep budget neutrality, this must occur at the expense of the workers (increase in s while $w^{\min}$ is unchanged). Therefore it is possible to design a revenue neutral restructuring of taxes that is relevant to employment.

In contrast, if the *net wage* is constrained by the minimum value $\tilde{w}^{\min}$, then $(1-s)w = \tilde{w}^{\min}$. Condition (3) is satisfied. Therefore, according to Proposition 2, a revenue neutral restructuring of taxes is irrelevant provided that condition (4) is fulfilled. In words, the employment level is unaltered because any decrease in the employer's tax rate is exactly offset by a corresponding increase in the market wage. The latter is necessary to compensate the rise in the worker's tax required by budget neutrality. This establishes the following Corollary of Proposition 2:

Corollary 2 *A budget neutral restructuring of taxes levied on employers and employees is not irrelevant to employment when the employment level is determined by a binding minimum value of the* market *wage. It is irrelevant to employment in the case of a binding minimum value of the* net *wage and when the employment benefit fulfills the condition (4).*

3 Efficiency Wage Models

In this section, we analyze the impact of restructuring taxes in efficiency wage models. Shapiro and Stiglitz (1984) propose an efficiency wage model based on the worker's shirking behavior. The main aspect of such model lies in the discipline effect of unemployment: the larger the unemployment rate,

the lower the worker's probability to find a new job when fired, the lower his incentive to shirk and the larger his effort. In the spirit of Rasmussen (1997) we build a simplified and generalized version of the Shapiro and Stiglitz model by assuming that the worker's effort e depends on the net wage $(1-s)w$ and some outside reference A:

$$e = e((1-s)w, A).$$

The outside reference A may depend on the net wage received in other firms ($\overline{w}(1-s)$), the net unemployment benefit b and the probability of being employed or unemployed[2]. The unemployment benefit can be related to $\overline{w}$ and s as $b = b(\overline{w}, s)$. The probability p of being employed depends on the labor supply and the labor demand which are themselves related to the net and gross wages in the economy, thus $p = p(\overline{w}(1-s), \overline{w}(1+t))$. In short,

$$\begin{aligned} A &= f(\overline{w}(1-s), b(\overline{w}, s), p(\overline{w}(1-s), \overline{w}(1+t))), \text{ or,} \\ A &= g(\overline{w}(1-s), \overline{w}(1+t), b(\overline{w}, s)). \end{aligned} \tag{6}$$

The firm maximizes its profit with respect to the offered wage and the employment level:

$$\max_{w,L} \Pi = \max_{w,L} F(L.e((1-s)w, A)) - w(1+t)L.$$

This amounts to finding the best wage w that minimizes the cost per unit of effort, which requires the following modified Solow condition:

$$\frac{w(1-s)\ e_1((1-s)w, A)}{e((1-s)w, A)} = 1. \tag{7}$$

By maximizing its profit with respect to L, the firm determines the optimal employment level $L^D((1+t)w)$. The effect of a revenue neutral restructuring of taxes will obviously depend on the way A influences the effort.

In the Shapiro and Stiglitz model, the equilibrium is symmetric: $\overline{w} = w$. Let us here focus on the determination of the unemployment benefit. If it fulfills the condition (4): $wb_1 + (1-s)b_2 = 0$ then A depends only on the net and gross wages (see (6)). So do e and e_1, and therefore (7). Hence Proposition 2 applies and a budget neutral restructuring of taxes levied on employers and employees is irrelevant to employment. This happens for example when the unemployment benefit is exogenous ($b(\overline{w}, s) =$ constant) or when the replacement ratio r (i.e. unemployment benefit / net wage) in the economy is a constant (i.e. $b(\overline{w}, s) = r(\overline{w}(1-s))$).

[2] See Layard et al. (1991) for a similar definition of the alternative revenue.

In contrast, if $b(\overline{w}, s)$ is not a constant and if it does not depend only on $\overline{w}(1-s)$ then Proposition 2 does not apply. For instance, this is the case when the unemployment benefit is taxed or when it is not directly related to the net wage. In such situations, a budget neutral restructuring of taxes levied on employers and employees is generally relevant to employment

The current argument gives to the following Corollary :

Corollary 3 *In the generalized Shapiro and Stiglitz model, a budget neutral restructuring of taxes levied on employers and employees is irrelevant to employment if the unemployment benefit $b(\overline{w}, s)$ satisfies the condition (4).*

This analysis can also be extended to the models of Solow (1979) and Akerlof and Yellen (1990). In the former, the effort does not depend on the alternative revenue[3]: $e = e((1-s)w)$. Hence, the equation (7) satisfies condition (3). Proposition 2 applies: the tax mix is irrelevant to employment provided that condition (4) is fulfilled. In the latter, the outside reference A is some "fair" net wage $(1-s)\overline{w}$ where $\overline{w}$ is exogenous. The effort is defined as $e = e((1-s)w/A) = e(w/\overline{w})$. Therefore the condition (7) does not depend on net and gross wages. In such a model, a budget neutral restructuring of taxes levied on employers and employees is relevant to employment.

4 Wage Bargaining Models

In this section, we analyze the employment incidence of a reform of taxes levied on employers and employees in the presence of unions. We use a wage bargaining model. The union utility is $U(L, w(1-s), A)$ where A is the outside reference defined in (6). Let us assume that the firm's profit is $\Pi(L, w(1+t))$ yielding a labor demand $L^D(w(1+t))$. By the envelop theorem, one has $d\Pi/dw = (1+t)\Pi_2$. The wage bargaining with the firm's right to manage is equivalent to the maximization of the Nash product :

$$\max_w U^\beta * \Pi^{1-\beta}$$

where β is the union bargaining power and the fall-back levels have been set to zero[4]. This yields the first order condition

[3]Qualitatively, this amounts to set the reference option A to a constant value.

[4]This simplifying assumption is generally made in this kind of literature. If the fall backs depend on the net and gross wages only, or if they are constant, then the remaining of the analysis holds. On the other hand, if they depend on w only, then one can show that the two taxes will not be equivalent.

$$\beta w(1+t)L^{D'}\frac{U_1}{U}+\beta w(1-s)\frac{U_2}{U}+(1-\beta)w(1+t)\frac{\Pi_2}{\Pi}=0. \qquad (8)$$

In a symmetric equilibrium, $\overline{w}=w$. If the unemployment benefit satisfies the condition (4), $A, U, U_1, U_2, \Pi, \Pi_2$ and (8) depend only on the net and gross wages. Proposition 2 applies and a budget neutral restructuring of taxes levied on employers and employees is irrelevant to employment.

We can summarize these results in the following Corollary :

Corollary 4 *In the wage bargaining model with the firm's right-to-manage, a budget neutral restructuring of taxes levied on employers and employees is irrelevant to employment if the unemployment benefit $b(\overline{w}, s)$ satisfies the condition (4).*

The following example illustrates what happens in the extreme monopoly union case in which the union determines the wage level ($\beta = 1$). Assume that the union utility is Stone Geary:

$$V = L\left(w(1-s)-A\right)^{\gamma} \ \ (\gamma < 1),$$

and the labor demand has a constant elasticity ($L^D = aw^{-\beta}$ with $a, \beta > 0$). In the monopoly union model, one can readily compute

$$w(1-s)=\frac{A}{1-\gamma/\beta}.$$

Suppose that the union reference option includes only the net unemployment benefit. If the unemployment benefit B is not taxed, then A is equal to B. The union then determines a wage that leaves the net wage unchanged: any increase in the taxation of workers is compensated by an increase in the market wage; therefore the gross wage moves proportionally to the tax increase. Any increase in the taxation on firms leaves the net wage and the market wage unchanged, increasing therefore the gross wage in the same proportion. Hence there is an equivalence between both taxes.

In contrast, if the unemployment benefit is taxed, A is equal to $B(1-s)$ and $w = B/\left(1-\gamma/\beta\right)$. Any increase in the taxation of workers decreases the net wage proportionally but leaves the market wage and the gross wage (and thus employment) unchanged. On the other hand, any decrease in the taxation of firms leaves the net wage and the market wage unchanged but decreases the gross wage proportionally, increasing by the same way the employment level. Hence it is better for employment to tax the workers.

Conclusion

In this paper we have studied the employment effects of a budget neutral restructuring of taxes levied on employers and employees. We have derived conditions for taxes levied on workers to have the same employment effects as taxes levied on firms. These conditions are fulfilled in perfectly competitive labor markets while they are not under a binding minimum value of the market wage. A key condition for equivalence in all models is that the unemployment benefit be related only to the net wage (which includes the case of a constant benefit). It is important to note that it is not the possibility to tax the unemployed that makes a restructuring of taxes relevant to employment. What is crucial is whether the *functional relationship* between the net unemployment benefit and the net wage is *broken or not*. For instance, it will be broken when the unemployment benefit is not taxed but indexed to the market wage or, in the alternative case, when the employment benefit is taxed and not indexed. It will nevertheless not be broken if the unemployment benefit is neither taxed nor indexed.

The results of the paper call for the following comments. First, when they are feasible, the employment increases go through a reduction in the gross wage. The neutrality of the government's budget imposes that the tax reduction on the firm be compensated by a tax increase on the workers and hence by a reduction in their net wage. A neutral restructuring of taxes will foster employment but at the expense of the net wage of workers. Whether the government should or should not reform the taxation system does not depend on the effects on employment only, it is also related to how the welfare of the workers, the unemployed and the capitalists enter the government welfare function. This analysis is beyond the scope of this paper.

Second, in the current paper, we have avoided the redistribution issues by assuming identical workers and linear taxes. There is a bunch of papers that discuss the effects of changing the tax progressivity (see Lockwood and Manning (1993), Holm et al. (1995), Rasmussen (1997, 1998), or Andersen and Rasmussen (1999)). This departure from simple linear taxes strengthens the non equivalence result.

Finally, we have reviewed models in which firms set the employment levels. This right-to-manage hypothesis is not appropriate when unions also bargain over the employment level (efficient contracts). In that situation, Proposition 1 does not hold. Further research in this direction is expected.

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