Institutions breaking the Law: The role of unemployment benefits and minimum wages in tax shifting

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Abstract

Institutions on the labor market may break the symmetry between employers' and employees' taxes (Dalton's Law). In the Pissarides (1990) search model of unemployment we show i) that a tax shift from employees to employers will lower unemployment when benefits are linked to gross wages and ii) that because of minimum wages such a tax shift may increase unemployment when the shift is targeted at the bottom of the labor market. We further consider the quantitative impact of a general tax shift and a tax shift targeted at the bottom of the labor market with MIMIC, the applied general equilibrium model for the Dutch labor market of CPB Netherlands Bureau for Economic Policy Analysis. The macro economic impact of general and targeted tax shifting is quite similar. Of unemployment benefits and minimum wages, only the former are found to play a major role.

1 Introduction

Dalton's Law states that the incidence of a tax is independent of the side on which it is levied (Dalton (1954)). Applied to the labor market, it implies that it is irrelevant for labor market outcomes whether taxes are paid by employees or employers. Hence, according to Dalton's Law, shifting taxes from employees to employers should not affect labor market outcomes. In this paper we show that institutional features prominent in European labor markets may break the symmetry between employers' and employees' taxes.

The outline of the paper is as follows. In section 2 we show that rules for the determination of social security benefits and minimum wages may break Dalton's Law in an extended Pissarides (1990) search model of unemployment.

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Next, in section 3 we demonstrate the importance of symmetry breaking quantitatively with MIMIC, the applied general equilibrium model for the Dutch labor market of CPB Netherlands Bureau for Economic Policy Analysis. The firm empirical basis and detailed modeling of the institutions related to the labor market makes MIMIC an ideal tool for numerical analyses of tax shifting. Section 4 gives some further considerations regarding tax shifting not present in the MIMIC model. Section 5 concludes.

2 Institutions breaking the Law in the Pissarides (1990) model

In the Pissarides (1990) search model of unemployment we first consider how linking benefits to gross wages implies that a tax shift from employees to employers lowers wage costs and unemployment. Next, we consider how linking gross minimum wages to average gross wages may increase wage costs and unemployment when we target the shift in taxes at the bottom of the labor market.

2.1 The role of linking benefits to gross wages

The analyses below considers employees' to employers' taxes in the Pissarides (1990) search model of unemployment when gross benefits are linked to gross wages. The next subsection considers the impact of minimum wages.

There is a continuum of workers with potential productivities ranging from $\underline{p}$ (>0) to $\overline{p}$. Denote the probability density function by $f(p)$. The mass of workers is normalized to 1. We consider how linking benefits to gross wages affects labor market outcomes in one segment of the labor market with productivity p_j.

Let u_j denote the unemployment rate, $1-u_j$ the employment rate and v_j the number of vacancies (normalized to the number of workers) in segment j. Frictions in the search process are captured by a so-called matching function $x(u_j, v_j)$ with x increasing in both its arguments. We assume that the matching function exhibits constant-returns-to-scale, which is typically not rejected by the data (see *e.g.* Petrongolo and Pissarides (2000)). Define labor market tightness by the ratio of vacancies to unemployment $\theta_j \equiv \frac{v_j}{u_j}$. The rate at which vacancies are filled is given by $q(\theta_j) \equiv \frac{x(u_j,v_j)}{v_j} = x(\frac{u_j}{v_j}, 1)$, with $q'(\theta_j) \leq 0$. The rate at which workers find employment is given by $\frac{x(u_j,v_j)}{u_j} = \theta_j q(\theta_j)$, with $(\theta_j q(\theta_j))' \geq 0$. When the ratio of vacancies to unemployment rises the vacancy duration rises and the unemployment duration falls. The rest of the model is concerned with the determination of the ratio of vacancies to unemployment.

Denote the interest rate by r, the gross wage by w_j, employers' taxes by $t_{f,j}$ (where the subscript f denotes 'firm').[1], and the separation rate by s_j. Denote the asset value of posting a vacancy by V_j. The asset value of a filled job, J_j, satisfies the Bellman equation

[1] For simplicity we assume that employers' and employees' taxes are independent of the gross wage, similar results obtain with taxes proportional to gross wages.

$$rJ_j = p_j - w_j - t_{f,j} + s_j(V_j - J_j). \tag{1}$$

Free entry by firms implies that firms enter until the value of a vacancy drops to zero, *i.e.* $V_j = 0$.

Next, consider worker utility. Unemployment benefits are denoted by b_j. Employed workers pay a constant income tax $t_{e,j}$ (where the subscript e denotes employees). Workers' asset values in employment, E_j, and unemployment, U_j, are given by

$$rE_j = w_j - t_{e,j} + s_j(U - E), \tag{2}$$

and

$$rU_j = b_j + \theta_j q(\theta_j)(E_j - U_j). \tag{3}$$

Now that we have both the asset values of firms and workers we can turn to wage determination.

Gross wages result from a Nash bargain between an individual firm and worker. Although the vacancy duration and unemployment duration depend on the resulting wage outcome, individual firms and workers take these durations as given.[2] For an invidiual job-worker pair i the Nash bargain solves

$$w_{i,j} = \arg\max_{w_i} (E_j(w_i) - U_j)^{\beta} (J_j(w_i) - V_j)^{1-\beta} \tag{4}$$

where β denotes the relative bargaining power of the worker, and unemployment benefits are not linked to individual wages. $E_j(w_i) - U_j$ denotes the surplus of the worker at w_i, and $J_j(w_i) - V_j$ denotes the surplus of the firm at w_i. We develop an expression of wages along the lines of Pissarides (1990, Chapter 1). Solving the maximization problem yields

$$E_j(w_i) - U_j = \beta \left(J_j(w_i) + E_j(w_i) - U_j \right), \tag{5}$$

where we use that in equilibrium $V_j = 0$. Substituting for $E_j(w_i)$ and $J_j(w_i)$ from (2) and (1) respectively (and using $V_j = 0$), gives

$$w_{i,j} = (1 - \beta)(rU_j + t_{e,j}) + \beta(p_j - t_{f,j}). \tag{6}$$

(6) implies that all workers receive the same wage.

To develop rU_j further we can make use of the free entry condition for firms. In equilibrium firms enter until they expect to earn zero profits. Denote the per period vacancy cost by c_j. The asset value of posting a vacancy V_j is given by

$$rV_j = -c_j + q(\theta_j)(J_j - V_j). \tag{7}$$

[2] As workers and firms do not take into account the externalities present in the matching process, equilibrium unemployment is unlikely to be efficient (see *e.g.* Pissarides (1990) Chapter 7).

But in equilibrium we have $V_j = 0$, so this condition gives us another condition for the asset value of a job J_j. In equilibrium $J_j = \frac{c_j}{q(\theta_j)}$. (5) implies $E_j - U_j = \frac{\beta}{1-\beta} J_j = \frac{\beta}{1-\beta} \frac{c_j}{q(\theta_j)}$. Substitution of this expression for $E_j - U_j$ in (3) gives

$$rU_j = b_j + \frac{\beta}{1-\beta} \theta_j c_j. \tag{8}$$

Now that we have rU_j we have gross wages as

$$w_j = (1-\beta)\left(b_j + t_{e,j}\right) + \beta\left(p_j + \theta_j c_j - t_{f,j}\right), \tag{9}$$

and hence wage costs $wc_j \equiv w_j + t_{f,j}$ are given by

$$wc_j = (1-\beta) b_j + \beta(p_j + \theta_j c_j) + (1-\beta)(t_{e,j} + t_{f,j}). \tag{10}$$

and net wages $wn_j \equiv w_j - t_{e,j}$ are given by

$$wn_j = (1-\beta) b_j + \beta(p_j + \theta_j c_j) - \beta(t_{e,j} + t_{f,j}). \tag{11}$$

In equilibrium, firms bear a share $(1-\beta)$ of employers' and employees' taxes and workers bear a share β of these taxes.

Equilibrium determination proceeds as follows. The government sets benefits b_j, and taxes $t_{f,j}$ and $t_{e,j}$. The wage bargain then determines wage costs wc_j for a given θ (repeated below for clarity)

$$wc_j = (1-\beta) b_j + \beta(p_j + \theta_j c_j) + (1-\beta)(t_{e,j} + t_{f,j}). \tag{12}$$

Free entry combined with the wage cost equation above determines θ and wage costs. Substitution of $V_j = 0$ and $J = \frac{c}{q(\theta_j)}$ into (1) gives

$$\frac{p_j - wc_j}{r + s_j} = \frac{c_j}{q(\theta_j)} \tag{13}$$

Given θ_j equilibrium unemployment can be found by the steady state condition $\theta_j q(\theta_j) u_j = s_j(1-u_j)$, or

$$u_j = \frac{s_j}{s_j + \theta_j q(\theta_j)}. \tag{14}$$

Which completes the determination of equilibrium.[3]

Now we consider what happens when we shift taxes from employees to employers. Suppose that the government maintains a balanced budget for each segment

$$t_{f,j} + t_{e,j} = \frac{u_j b_j}{1-u_j}. \tag{15}$$

[3]The interested reader may verify that when the separation rate is constant across segments, benefits are linked to gross wages and vacancy costs and taxes are proportional to productivity, the ratio of wage costs over productivity and the equilibrium unemployment rate are the same across segments.

Taking u_j and b_j as given for the moment, (15) implies that to maintain a balanced budget we have $dt_{f,j} = -dt_{e,j}$. When benefits are linked to wage costs (or net wages, which gives similar results), labor market outcomes in segment j remain unchanged. Indeed, let ϕ_{wc} denote the ratio between benefits and wage costs, we may then rewrite (12) as

$$wc_j = \frac{1}{1-(1-\beta)\phi_{wc}}(\beta(p_j + \theta_j c_j) + (1-\beta)(t_{e,j} + t_{f,j})). \tag{16}$$

The shift in taxes from employees to employers does not affect wage costs. With wage costs unaffected, labor market tightness remains unchanged, and so unemployment in segment j remains unchanged.

However, now consider what happens when benefits are linked to gross wages. Let ϕ_w denote the ratio between benefits and gross wages, we may then rewrite (12) as

$$wc_j = \frac{1}{1-(1-\beta)\phi_w}(\beta(p_j + \theta_j c_j) + (1-\beta)(t_{e,j} + t_{f,j}) - (1-\beta)t_{f,j}). \tag{17}$$

The shift in taxes lowers wage costs due to the term $-(1-\beta)t_{f,j}$, which reflects the drop in benefits which lowers the fallback position of workers in the wage bargain. Lower wage costs then imply higher labor market tightness via (13), noting that $q'(\theta_j) < 0$. It becomes profitable for more firms to enter the market. Higher labor market tightness implies lower unemployment via the steady state condition (14), noting that $(\theta_j q(\theta_j))' > 0$.

Indirect effects aggravate the initial effect on wage costs and unemployment. The fall in equilibrium unemployment and benefits implies that the sum of taxes can be lowered by (15). From (12) it is clear that this will further lower wage costs, increasing labor market tightness, further reducing unemployment *etc.*, until a new equilibrium is reached. So, via the linking of benefits to gross wages, a tax shift can affect labor market outcomes, breaking the symmetry between employers' and employees' taxes.[4]

Targeting is not really an issue when it comes to the effect of linking benefits to gross wages. Across-the-board tax shifting from employees to employers will lower equilibrium unemployment in all segments. A tax shift from employees to employers targeted at the bottom of the labor market will lower equilibrium unemployment at the bottom of the labor market. Other segments will only be affected when the government gives the savings on unemployment benefits back as an across-the-board reduction in tax rates.

2.2 The role of linking minimum wages to average wages

Minimum wage legislation is another institutional feature that may break the symmetry between employers' and employees' taxes. However, this only be-

[4] This way of lowering benefits relative to wages is known as the 'soft' decoupling of net benefits and wages in Dutch politics, as opposed to the 'hard' decoupling, *i.e.* reducing benefits directly.

comes a concern when the tax shift is targeted at the bottom of the labor market and minimum wages are linked to average wages. We consider these issues below.

Above we showed the role of linking benefits to gross wages, now we want to focus on the role played by minimum wages. To keep the analysis tractable we now let benefits be a fraction of productivity.

How do minimum wages affect the different labor market segments. Consider Figure 1 below. On the horizontal axis we plot productivity, the vertical axis gives wage costs and productivity. With benefits linked to productivity, vacancy costs proportional to productivity (or wage costs), and taxes proportional to productivity, wage costs become proportional to productivity (see (16)). The wc_{Nash} locus gives the relation between productivity and wage costs in the absence of minimum wages.

Now we introduce minimum wage legislation. Suppose the government sets a minimum wage w_{min} with corresponding employers' taxes $t_{f,min}$, define $wc_{min} \equiv w_{min} + t_{f,min}$. The labor market can then be partitioned in three productivity regions.

In the first region, running from 0 to wc_{min}, wage costs are higher than or equal to productivity. Suppose that the matching function $x(u_j, v_j)$ is given by $\gamma {u_j}^{\alpha} {v_j}^{1-\alpha}$, so that $q(\theta_j) \equiv \frac{x(u_j,v_j)}{v_j} = \gamma\left(\frac{u_j}{v_j}\right)^{\alpha}$. The free entry condition for firms (13) can then be rewritten as

$$\frac{v_j}{u_j} = \left(\frac{\gamma}{c_j}\frac{p_j - wc_j}{r+s}\right)^{\frac{1}{\alpha}}. \tag{18}$$

Hence, for $wc_{min} \geq p_j$, vacancies are zero. Hence, θ_j is zero and unemployment is 1 by the flow equilibrium condition (14).

In the second region, running from wc_{min} to p_c, productivity is sufficient to cover minimum wage costs, but minimum wage costs are higher than the wage costs that would result in the absence of minimum wages. Hence, the free entry condition (18) implies that less firms will enter the market, lowering vacancies relative to unemployment. From the flow equilibrium condition (14) we now see that this will imply a higher unemployment rate than would result in the absence of minimum wages.

The critical productivity p_c that separates the second from the third region is the productivity for which the minimum wage equals the wage that would result in the absence of minimum wages (*i.e.* the productivity level for which the minimum wage not longer binds). This productivity is implicitly defined by

$$wm_{min} = (1-\beta)b_c + (1-\beta)(p_c + \theta_c c_c) + (1-\beta)(t_{e,min} + t_{f,min}). \tag{19}$$

Higher minimum wage costs will increase the critical productivity level.

In the third region, running from p_c to $\overline{p}$, the minimum wage does not affect labor market outcomes, as the bargaining parties agree on wages above the minimum wage. So here equilibrium wage costs and unemployment are determined in the same way as in the previous subsection.

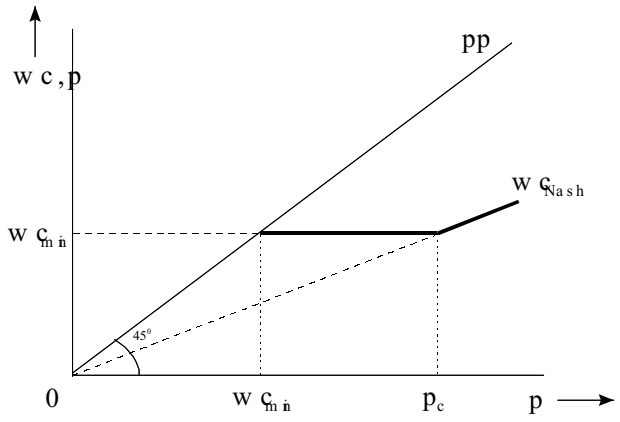

Figure 1: Labor costs in the presence of minimum wages

Suppose that a policy maker sets the minimum gross wage proportional to average gross wages. Do across-the-board and targeted tax shifts affect labor market outcomes?

We may discuss the impact of an across-the board tax shift informally. Suppose that taxes are proportional to productivity. A tax shift will then lower gross wages in all segments proportionally. Gross minimum wages will fall by the extent of the rise of employers' taxes at the minimum wage level. Minimum wage costs will not change. Hence, with benefits fixed, labor market outcomes are unaffected.

Now consider a shift in taxes at the bottom of the labor market only. For simplicity consider a marginal (and proportional) shift from employees to employers up to some productivity p somewhat above p_c. As only the bottom will see any changes in taxes average gross wages will hardly be affected. For ease of exposition assume that the average wage does not change at all. In this case minimum wage costs rise to the full extent of the rise in employers' taxes at the minimum wage level. We want to consider how this affects labor market outcomes, in particular average unemployment.

The average unemployment rate is given by

$$u = \int_{\underline{p}}^{wc_{min}} 1 f(p)dp + \int_{wc_{min}}^{p_c} u(p)f(p)dp + \int_{p_c}^{\overline{p}} u(p)f(p)dp. \tag{20}$$

Taking the derivative of (20) with respect to minimum wage costs we get

$$\begin{aligned} \frac{\partial u}{\partial wc_{min}} &= f(wc_{min})(1-u(wc_{min})) \\ &\quad + \int_{wc_{min}}^{p_c} \frac{\partial u(p)}{\partial wc_{min}} f(p)dp \\ &\quad + f(p_c)(u(p_c)-u(p_c)), \\ &= \int_{wc_{min}}^{p_c} \frac{\partial u(p)}{\partial wc_{min}} f(p)dp, \end{aligned} \tag{21}$$

where we note that $u(wc_{min}) = 1$. For productivities in the interval $< wc_{min}, p_c >$ wage costs rise. From (18) we know that this lowers labor market tightness and raises equilibrium unemployment in these segments. Although the steps above seem rather straightforward once we postulate that minimum wage costs rise to the full extent of employers' taxes at the minimum wage level, it is useful to note that the only first-order effect is on wages above the minimum wage level, not on the lower margin $p = wc_{min}$ as $u(wc_{min}) = 1$.

Summarizing, a tax shift targeted at the bottom of the labor market that affects average wages less than minimum wages will cause minimum wage costs to rise. This adversely affects equilibrium unemployment in segments with a productivity close to the minimum wage cost level.

2.3 Empirical relevance of channels

The previous section has identified two channels via which a shift from employees' taxes to employers' taxes may affect labor market outcomes. What can we say about the empirical relevance of these two channels?

First, the importance of the unemployment benefit mechanism depends upon the role of the replacement rate for wages, the impact of wages on (un)employment and the share of individuals on unemployment benefits. There is ample evidence that changes in the replacement rate affect wages. Furthermore, wages clearly affect (un)employment. However, not all unemployed workers receive unemployment benefits (which are linked to gross wages). A significant part of unemployed individuals receives welfare benefits. Welfare benefits are typically not linked to gross wages, but indexed to aggregate net wages. In the analysis above, net wages do not change (*ceteris paribus*). Hence, the reduction of unemployment benefits that has been derived above applies only to part of the unemployed.

Second, the importance of the minimum wage mechanism depends again on the role of wages for (un)employment, but also on the distribution of productivities. To be specific, the number of people that have productivity levels higher than wc_{min} and below p_c determines the importance of the tax shift for equilibrium unemployment as the minimum wage is binding only for these productivity levels. Empirical evidence available for the Netherlands indicates that a relatively small number of workers earn wages close to or at the minimum wage level, which limits the role played by the minimum wage in tax shifting (see *e.g.* Teulings *et al.* (1998)).

Summing up, empirical evidence suggests that although both channels are relevant, the unemployment benefits channel is likely to dominate the minimum wage channel. Hence, we would expect a tax shift from employees to employers to reduce unemployment.

3 Across-the-board and targeted tax shifting in MIMIC

After deriving some qualitative results in a highly stylized model of the labor market, we next turn to the quantitative effects of across-the-board and targeted tax shifting in MIMIC. MIMIC is the AGE model of CPB Netherlands Bureau for Economic Policy analysis with a focus on the labor market. We first briefly consider why MIMIC seems a particularly useful tool in calculating the effects of tax shifting (for a full description of the model and many other simulations see Graafland *et al.* (2001)). Subsequently we consider some simulation results on tax shifting.

3.1 Motivation for using the MIMIC model

The focus of MIMIC is on adequately modeling labor demand, labor supply, wage formation and the process by which vacant jobs are matched to job seekers. MIMIC is an applied general equilibrium model. Endogenous variables are determined by the profit maximizing behavior of firms and the utility maximizing behavior of workers, given technology and policy.

What makes MIMIC a particular useful for a quantitative analysis of tax shifting is:

a) MIMIC has a firm empirical basis (all structural parameters are estimated or taken from the literature). Of particular interest is the wage equation which has been estimated recently on long time series. Of particular interest is the influence of the replacement rate (benefits) and the bargaining power of employers and employees (the data suggest that each party bears 50 percent of both taxes, *ceteris paribus* that is for given benefit levels).

b) MIMIC distinguishes between different worker types. Of particular interest is the distinction between low-skilled and high-skilled labor when we want to analyze targeted tax shifting. Furthermore, each skill type has a productivity distribution calibrated on Dutch data per skill type. The effect of the minimum wage channel clearly depends on how many workers are affected in the lower segment of the wage distribution. In addition, the budgetary implications of targeted tax changes demand a detailed modeling of the wage distribution.

c) The detailed modeling of institutions related to the labor market. MIMIC distinguishes between individuals that receive benefits linked to gross individual wages (unemployment benefits, disability benefits) and individuals that receive benefits related to net average wages (welfare benefits). Furthermore, the model contains a detailed modeling of the tax system. This gives us realistic starting values for tax rates and tax bases.

3.2 Simulation results

In the rich institutional setup of MIMIC we consider the following shifts in taxes from employees to employers:

1) An increase in social security contributions by employers of 1 percent of gross hourly wages, combined with a decrease in employee income tax rates of 1 percent of gross hourly wages.

2) An increase in social security contributions by employers targeted at the bottom end of the wage distribution (the phase-in range is between 50 and 100 percent of gross hourly minimum wages, the phase-out range is between 150 and 200 percent of gross hourly minimum wages), combined with a reduction of income tax rates for employees (with a similar phase-in and phase-out range). The maximum tax shift equals 1300 euro between 100 and 150 percent of gross hourly minimum wages.

Both simulations imply an 'ex ante' tax shift of 2.4 billion euro, where 'ex ante' means without any changes in behavior. In both simulations the government changes the rate of general income taxation (for all inviduals, not just

workers but all individuals with income (unemployed, retired *etc.*)) to maintain a balanced budget. Furthermore, our analysis is essentially comparative statics, *i.e.* we compare equilibria. We do not consider the transition path of the initial equilibrium to the new equilibrium with the changed tax parameters. Hence, the results should be viewed as 'long-run'.

The simulation results are given in Table 1. In both simulations we see that the replacement rate drops. As a large part of benefits are linked to gross wages, and shifting taxes implies a fall in gross wages, net benefits drop relative to net wages. Indeed, employed workers are compensated by the drop in gross wages via the reduction in income taxes for employed workers. When we target the tax shift at the bottom of the labor market we observe a significant reduction of the replacement rate for unskilled workers.

The fall in the replacement rate moderates wage claims, which results in lower wage costs. When the tax shift is targeted at the bottom of the labor market, there is a significant drop in wage costs of the low-skilled. The drop in average labor costs is slightly lower for the tax shift targeted at the bottom of the labor market. The minimum wage channel seems to play a minor role relative to the unemployment benefits/replacement rate channel.

The change in production mirrors the change in wage costs, with the general tax shift being slightly more effective in raising output than the targeted tax shift. Indeed, whereas the employment effects are similar, productivity slightly rises with the general tax shift and slightly falls with the targeted tax shift. The reason for the difference in productivity effects is that the targeted tax shift achieves substitution of low-skilled labor for high-skilled labor and thus a fall in productivity at the macro level.

Labor supply is hardly affected (not reported in the table), which implies that the changes in unemployment reflect the changes in employment. Average unemployment falls slightly more under the general tax shift, whereas low-skilled unemployment falls much more when the tax shift is targeted at the bottom of the labor market.

Overall, we conclude that the unemployment benefit channel is by far the most important channel through which a tax shift effects labor market outcomes relative to the minimum wage channel. A tax shift from employees to employers lowers unemployment.

4 Further considerations in tax shifting

Above we showed that institutional features present in benefit and minimum wages determination imply that it does matter whether taxes are levied on employers and employees. A shift in taxes from employees to employers lowers unemployment and raises output. In this section we want to consider two further issues related to tax shifting: system costs and abuse.

In the model changes in the tax system are costless in terms of running the tax system. However, one can envisage that these costs are likely to rise with the number of tax instruments used. This would be an argument against tax

Table 1: Simulation outcomes: Tax shifting in MIMIC

Simulation[a]	general shift to employers	shift to employers at the bottom
Prices	Percentage changes	
Wage costs	-0.24	-0.22
- low-skilled	-0.22	-0.40
Volumes		
Production	0.21	0.19
Employment	0.20	0.20
- low-skilled	0.20	0.30
Ratios	Absolute changes	
Unemployment rate	-0.14	-0.13
- low-skilled	-0.16	-0.25
Replacement rate	-0.83	-0.80
- low-skilled	-0.80	-1.65

[a]In all simulations the government adjusts income tax rates to maintain a balanced budget. In all simulations the 'ex ante' shift in taxes from employees to employers is 2.4 billion euro.
[b]Shift in taxes for employees to employers of 1 percent of gross hourly wage rate.
[c]Shift in taxes for employees to employers. Phase-in between 50 and 100 percent of gross hourly minimum wages. Phase-out between 150 and 200 percent of gross hourly minimum wages. Maximum shift (between 100 and 150 percent of gross hourly minimum wages) equals 1300 euro.

schemes that tax both employer and employee.

Another issue is the potential abuse of targeted tax deductions by workers and/or firms. When firms receive a tax deduction for low wage workers they have an incentive to overstate the number of hours worked so as to understate the hourly wage for a given yearly wage income for the worker. The same incentive exists for the worker when the tax deduction is targeted at workers. It is unclear if abuse of the tax deductions in this accounting type of way is a real concern of actual programs. However, one may envisage that when the system gives a tax exemption to both the firm and the worker that both parties have an incentive to overstate the number of hours worked and understate the hourly wage. Hence, abuse is more likely to result. When abuse is a real concern it may then be sensible to have a tax exemption on only side of the market.

Both system costs and abuse considerations suggest that only one of the two parties involved should be taxed. Taxing workers may be more cost effective in terms of system costs if the tax system wants to account for worker-specific factors as well. On the other hand, taxing firms may enable the exploitation of scale effects.

5 Conclusions

Unemployment benefits and minimum wage legislation may break the symmetry between employees' and employers' taxes. A shift in taxes from employees to employers does not affect wage costs and net wages, *ceteris paribus*, however gross wages fall. A large part of benefits are linked to gross wages. As a result the replacement rate falls, lowering wage costs and thereby stimulating employment. However, minimum wages may limit the fall in unemployment when the tax shift is targeted at the bottom of the labor market. When minimum wages are linked to average wages, and average wages are hardly affected by the tax shift at the bottom, employers bear the full burden of the higher employers' taxes at the bottom of the labor market.

We subsequently argue that unemployment benefits determination is more likely to play an important role in the overall impact than minimum wages as only few workers work close to or at the minimum wage. Simulations with MIMIC, an AGE model for policy analysis on the Dutch labor market, confirm this intuition. A general shift in taxes from employees to employers of 1 percentage point lowers unemployment by .1 percentage points and raises aggregate production by .2 percent. The same budgetary 'ex ante' shift in taxes from employees to employers at the bottom of the labor market gives similar aggregate results, with a much larger impact on the bottom of the labor market.

Note that the reason for the non-neutrality of the analyzed tax shift is entirely institutional. This indicates that the same employment effects could be arrived at in another way, namely by simply cutting unemployment benefits. However, experience suggests the the political costs of this alternative route are considerably higher. From a political point of view, it can be argued then that the tax shift is a more efficient route to increase employment.

The linking of benefits to gross wages favors a tax shift from employers to employees in terms of production and unemployment. System costs and abuse further seem to favor using only one tax instrument. Targeting the tax deduction at workers seems the most cost effective, as it can be integrated in tax forms.

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