Fighting unemployment without worsening poverty: Basic income versus reductions of social security contributions.[1]

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Abstract

Reductions of social security contributions (RSSC) and a basic income (BI) (or the related Negative Income Tax) are considered in a dynamic general equilibrium framework with imperfect competition on the labour market (the 'wage-setting/price-setting' model). The cases with homogeneous and heterogeneous workers are considered. It turns out that both policies have a long-run effect on the unemployment rate if they are appropriately designed. With two types of skills, this proposition holds if relative wages are rigid and if the supply of skills is not perfectly elastic. A welfare analysis shows that introducing appropriately framed RSSC or BI can be a Pareto improvement.

Keywords: basic income; taxation; payroll taxes; social insurance; wage bargaining; equilibrium unemployment.

JEL classification : H2, H3, J32, J38, J58

1. Introduction

At least four types of policies have been advocated to fight unemployment without worsening poverty: Reductions of social security contributions (RSSC), an unconditional basic income, the negative income tax and the earned income tax credit (EITC). The reader is referred to Van Parijs (1998) for an insightful introduction to these policies. Drèze (1993) and Drèze and Gollier (1993) look for institutions that achieve both production efficiency and risk-sharing between workers and employers. According to their analysis, minimum wage legislation should put a floor on earnings and employers social insurance contributions (ESIC) should be adjusted in order to bring labour costs down to a level compatible with full employment. The proposal of Drèze and Malinvaud *et al* (1994) to exempt minimum wages from ESIC has to some extent been implemented in some Member States, such as France and Belgium.[3] Yet, several authors (e.g. Nickell and Bell, 1997) have questioned this policy. According to them, most of the effect is on take home pay and not on unemployment. Moreover, the acquisition of skill would be slowed down.

A first aim of this paper is to clarify the debate about the effects of RSSC in fully unionised economies. Since the critique of Nickell and Bell is based on the so-called 'wage-setting/price-setting' model (henceforth, WS-PS), the present paper adopts the same approach, first with homogeneous workers and later with two types of workers. For simplicity, ignoring RSSC, taxation is linear. With a single type of labour, a dynamic general equilibrium analysis shows that in the long run RSSC affects unemployment if and only if they introduce some non linearity in the tax schedule.[4] For, under appropriate conditions, the WS curve is vertical in a steady state. Therefore, proportional taxes are in the long run absorbed entirely by workers and have no influence on unemployment. Because the proposal of Drèze and Malinvaud *et al* (1994) is an exemption, the elasticity of the wage cost with respect to the bargained (gross) wage is higher than one. This non linearity in the tax schedule has a favourable effect on the steady-state unemployment rate. With two skills and a fixed supply, the paper shows how a proportional cut in payroll taxes on the low-skilled affects the long-run equilibrium unemployment rate if the low-skilled wage presents some rigidity (as it does in Continental Europe at least). If skill-specific labour supply is endogenous but not perfectly elastic in the long run, cutting payroll taxes on the low-skilled workers has an effect on their unemployment rate. It is even a major policy response to tackle the well-documented skilled-biased technical progress without worsening poverty.

A basic income is an unconditional allowance handed out to (almost) every adult citizen. It has also been called 'universal income', 'social dividend' (Lange, 1936, and Meade ,1989) or 'participation income' (Atkinson, 1995a). With the analytical tools used in this paper, the negative income tax and the basic income are strictly equivalent. For Drèze (1993) and Drèze and Sneessens (1997), a basic income could be an alternative to RSSC *if* it was associated with some deregulation of the labour market. A second objective of this paper is therefore to analyse how a basic income performs in the WS-PS setting and how it compares with RSSC. To contrast with the claim of Drèze and Sneessens, it is here assumed that unions keep their bargaining power when the basic income is implemented. Furthermore, if the basic income is lower than pre-existing unemployment benefits, the latter do not disappear. They are simply reduced in such a way that the net income of the unemployed remains unchanged at given wages.

The analysis considers first only one type of labour. With a constant marginal tax rate, the introduction of a basic income generates a non linear tax schedule. The latter becomes progressive in the sense that the elasticity of the net income of an employed worker with respect to the bargained (gross) wage is negatively related to the basic income level. This has a favourable effect on equilibrium unemployment. So, the basic income and an exemption of payroll taxes influence the unemployment rate in a very similar way. However, the basic income also affects unemployment through a second channel. Unemployment benefits raise the reservation wage of job seekers and this effect is typically amplified by collective bargaining. Allowing workers to keep (part of) their unemployment allowance if they are hired influences wage-setting and eventually unemployment. If at given wages the basic income favours in-work income without increasing the revenue of the unemployed, equilibrium unemployment shrinks. The opposite is true if the basic income favours both in-work and out-of-work incomes of risk-averse agents. In both cases however, the equilibrium level of *net wages* decreases. If, in equilibrium, both the unemployment benefits and the basic income are proportional to net earnings, the decrease in net wages can have a negative effect of the instantaneous income of those currently unemployed. Even if an increase in the basic income-net wage ratio can improve the inter-temporal utilities of the unemployed and the employed, the instantaneous effect on the income of the unemployed is a matter of concern. The paper deals with this issue.

With two types of workers, it is shown that a basic income and a RSSC on low-skilled workers influence the unemployment rates in different ways. As long as low-skill wages are rigid and skill-specific labour supply is not perfectly elastic in the long run, introducing a basic income has a favourable effect on the unemployment rate of the low-skilled.

Increasing the income of the 'inactive' population through a fully unconditional income could have a direct positive effect on the welfare of the labour force. The model ignores this possibility. Under this assumption, the analysis points to a conflict of interest between the 'active' and the 'inactive' population. The increase in the tax rate needed to keep a balanced budget has a detrimental effect on the well-being of the labour force. To avoid this conflict of interest, the paper put more emphasis on the limit case where the inactive population becomes ineligible to the basic income. So doing, the institutional setting becomes close to an EITC. This holds true if the basic income (that one could call an "active citizen's income") does not influence the income of the unemployed (at given wages). Still at least one difference remains. Compared to the EITC implemented in the US, the stylised policy considered here is lump sum (no phasing-in, nor phasing-out).

This paper is linked to various strands in the literature. It is evidently not possible to review all the contributions here. What follows is a selective and very condensed survey of the literature. First, the link between progressive taxation, wage setting and unemployment has now been extensively analysed, often in a static framework. Papers like Lockwood and Manning (1993) or Holmlund and Kolm (1995) found some empirical support for the claim that, loosely speaking, progressive taxes induce wage moderation and boost employment (see also the tax-based income policy of Layard, Nickell and Jackman, 1991). Yet, the analysis should be extended to deal with tax evasion or with inter-temporal issues such as investment in skills (see e.g. Andersen and Rasmussen, 1997). Tax evasion is not introduced below but the supply of skills will be endogenous in Section 3. Second, there is a growing and closely

connected literature about the effects of the structure of labour taxation in unionised economies. This literature identifies reasons why it can matter whether labour taxation is levied on firms or workers (see e.g. Rasmussen, 1994, Koskela and Schöb, 1999, Picard and Toulemonde 1999). Tax credits and non linear RSSC are examples considered in this literature. Third, several papers have used an efficiency wage set-up to analyse the effects of the replacement of unemployment insurance schemes by a basic income (see Bowles, 1992, Atkinson, 1995a and also Groot, 1997). In a bargaining framework, the partial-equilibrium and static analysis of Kesenne (1993) should also be mentioned. Fourth, earlier papers have already introduced a lump-sum allowance or tax subsidy in static versions of the WS-PS model (see Holmlund and Kolm, 1995, and Pissarides, 1998). Both present static models and only the first one disaggregates the labour force. These papers conclude that these lump-sum policies have favourable effects on unemployment.[5] Given their effects on wages, these papers call for a welfare analysis, which is done in this article. Finally, one should recall that it has been argued that social insurance contributions (SIC) should not be considered as taxes. SIC entitle those who pay them to deferred benefits such as retirement benefits or compensation for workplace injuries (see e.g. Gruber, 1997). However, the present paper adopts the usual assumption according to which wage-setters take SIC as if they were taxes.

The paper is organised as follows. Section 2 develops a dynamic general equilibrium model of a unionised economy with one type of skill. Section 2 also presents simulation results about the long-run properties of this model. Section 3 distinguishes two types of workers. Section 4 concludes the paper.

2. Homogeneous unionised workers and equilibrium unemployment

2.1 The model

This section develops a dynamic general equilibrium model of a small unionised economy facing an exogenous interest rate r.[6] The model draws upon Cahuc and Zylberberg (1999). There are three goods, namely homogeneous labour (L), capital (K) and a produced and consumed good. The market for the produced good is perfectly competitive. Its price is taken as the numeraire. The setting is deterministic with, in each period t, n identical firms,[7] endowed with a decreasing returns-to-scale Cobb-Douglas technology $(A_t L_t)^{\alpha} K_t^{\theta-\alpha}$, $A_t > 0, 0 < \alpha < 1, \alpha < \theta < 1$,[8] N risk averse workers and M inactive individuals (whose role is here simply to increase the budgetary cost of a basic income if the latter is not restricted to the labour force). n, N and M are given.[9] Wage bargaining over the (gross) wage w_t is decentralised and involves a firm-specific union and the firm owner. Wages are only set for the current period. The firm owner decides on employment L_t and on the level of investment (the 'right-to-manage' assumption). Firms and workers are infinitely lived agents with perfect foresight. In a given period t, the sequence of decisions is as follows:

- Each firm decides upon its current investment level which will increase its capital stock in $t+1$. Therefore, the capital stock is predetermined in t.
- If the decentralised bargaining leads to an agreement, the firm determines labour demand for the current period as a function of the real wage cost $(1+\tau_t)w_t - E_t$. τ_t is the constant marginal ESIC rate ($\tau_t \geq 0$) and E_t is an ESIC exemption ($E_t \geq 0$).[10] Employment is fixed

by labor demand, production occurs and the employees receive each a net real wage $(1-s_t)w_t$ at the end of the period. In this expression, s_t is the constant marginal tax on earnings formally incident on workers.[11] Without an agreement, workers immediately leave the firm and start searching a job. They are immediately rehired in another firm with an endogenous probability a_t. In such a case, nothing is produced during the current period. Yet, the firm will have the opportunity to bargain and to hire workers (without hiring costs) in *t+1*.

- At the end of the period, an exogenous fraction *q* of the employees leaves the firm and enters unemployment. They will be hired in *t+1* with probability a_{t+1}. Moreover, the marginal tax rates are adjusted to keep the budget of the State in equilibrium.

Due to space limitation, the exposition only focuses on the main features of the model. For a more detailed exposition, see Cahuc and Zylberberg (1999) and Van der Linden (1999a, 1999b).[12]

Firms

When it determines its labor demand and the level of investment, each firm takes as given the sequence of real wage costs $\{(1+\tau_t)w_t - E_t, t \geq 0\}$, the (constant) interest rate r and the (constant) depreciation rate δ. In period *t*, given the initial capital stock K_t, each firm chooses its investment level I_t, such that $K_{t+1} = (1-\delta)K_t + I_t$. Along an equilibrium path, there is a collective agreement in each period. So, at time $t = 0$, given K_0, the firm maximizes the following objective function :

$$\underset{\{L_t, K_{t+1}\}_{t\geq 0}}{Max} \sum_{t=0}^{\infty} \left[\frac{1}{1+r}\right]^t \left[\left(A_t L_t\right)^{\alpha} K_t^{\theta-\alpha} - \left((1+\tau_t)w_t - E_t\right)L_t - \left(K_{t+1} - (1-\delta)K_t\right)\right] \quad (1)$$

The first-order conditions of this problem can be written as :

$$L_t = \frac{K^{\frac{\theta-\alpha}{1-\alpha}}}{A_t}\left(\frac{(1+\tau_t)w_t - E_t}{\alpha A_t}\right)^{\frac{1}{\alpha-1}}, \quad (2)$$

$$K_{t+1}^{\frac{1-\theta}{1-\alpha}} = \frac{\theta-\alpha}{r+\delta}\left(\frac{(1+\tau_{t+1})w_{t+1} - E_{t+1}}{\alpha A_{t+1}}\right)^{\frac{\alpha}{\alpha-1}} \quad (3)$$

Let $\pi_t(K_t)$ be current optimal profits net of investment. The optimal discounted profits at time *t* are denoted by $\Pi_t(K_t)$. If $\beta = \frac{1}{1+r}$ is the discount factor, it is easily seen that :

$$\pi_t(K_t) = (1-\alpha)K_t^{\frac{\theta-\alpha}{1-\alpha}}\left(\frac{(1+\tau_t)w_t - E_t}{A_t}\right)^{\frac{\alpha}{\alpha-1}}, \quad (4)$$

$$\Pi_t(K_t) = \pi_t(K_t) - I_t + \beta\Pi_{t+1}(K_{t+1}) \quad (5)$$

Workers

Each of the *N* workers supply zero or one unit of labour. The instantaneous utility is a function of real net income R_t: $v(R_t)$, $v'>0$, $v'\leq 0$. It is later assumed that $v(R_t)$ is iso-elastic:

$$v(R_t) = \frac{R_t^{\lambda}}{\lambda},\ \lambda \leq 1,\ \lambda \neq 0. \tag{6}$$

Let V_e^t (respectively, V_g^t, V_u^t) denote the intertemporal discounted utility of a worker employed at time *t* in a given firm (respectively, a redundant worker, an unemployed). If B_t denotes the real level of the basic income, V_e^t verifies the following recursive relationship :

$$V_e^t = v(R_{et}) + \beta\left\{q\left[a_{t+1}\overline{V_e^{t+1}} + (1-a_{t+1})V_u^t\right] + (1-q)V_e^{t+1}\right\}, \tag{7}$$

where R_{et} denotes the instantaneous real net income of a currently employed worker ($R_{et} = (1-s_t)w_t + B_t$) and $\overline{V_e^{t+1}}$ is the intertemporal discounted utility of a job on average in the economy in period *t+1*. $\overline{V_e^{t+1}}$ is of the same form as (7) with only one difference : The average net real wage in the economy, $\overline{w_t}$, replaces w_t. $\overline{V_e^{t+1}}$ and V_u^{t+1} actually are (perfectly) anticipated utilities. The intertemporal discounted utility of being unemployed at time *t* is such that :

$$V_u^t = v\left(R_{ut}\right) + \beta\left\{a_{t+1}\overline{V_e^{t+1}} + (1-a_{t+1})V_u^{t+1}\right\}, \tag{8}$$

where R_{ut} is the instantaneous real income of those currently unemployed. If Z_t is the current level of unemployment benefits, then $R_{ut} = max[Z_t, B_t]$. Given the above assumptions, the outside option of the workers, V_g^t, is given by:

$$V_g^t = a_t\overline{V_e^t} + (1-a_t)V_u^t. \tag{9}$$

Collective bargaining at the firm level

Following Manning (1993), let us assume the following flexible union's objective $L_t^{\psi}\left(V_e^t - V_g^t\right)$, where ψ is a nonnegative parameter representing union's preferences for employment relative to an inter-temporal rent for currently occupied workers. The firm owner and the firm-specific union bargain over the real gross wage for the current period during which the capital stock is given. When they bargain, they also take the tax parameters (s_t, τ_t), the level of exemption (E_t) and the income in case of unemployment (R_{ut}) as given. Assume that the current real (gross) wage w_t is set to maximise a Nash product. Without an agreement, nothing is produced but future profits and, hence, investment are not affected. Therefore, the firm's component in the Nash product, i.e. the difference between intertemporal discounted profits in case of an agreement, Π_t, and in the absence of an agreement, $-I_t + \beta\Pi_{t+1}$, is simply π_t. Ignoring constant and predetermined terms, from (2) and (4), the Nash program can be conveniently written as:

$$\underset{w_t}{Max}\left((1+\tau_t)w_t - E_t\right)^{\frac{\alpha(1-\gamma)+\psi\gamma}{\alpha-1}}\left(V_e^t - V_g^t\right)^{\gamma}, \tag{10}$$

where γ is the so-called bargaining power of the union ($0 \le \gamma \le 1$). The first-order condition of this problem can be written in the following way:

$$\frac{V_e^t - V_g^t}{\left[B_t + (1-s_t)w_t\right]v'(B_t + (1-s_t)w_t)} = \mu\,\zeta_t, \qquad \mu = \frac{\gamma(1-\alpha)}{\alpha(1-\gamma)+\psi\gamma} \ge 0, \zeta_t = \frac{\eta_t^e}{\eta_t^f} > 0. \tag{11}$$

On the left-hand side of condition (11), one finds the difference in inter-temporal utilities between an employed and a redundant worker (the "rent") scaled by the current net income of an employed worker (if $v' = 1$ and a function of it otherwise). This "scaled rent" is increasing with the time-invariant parameter μ. The latter is positively related to γ and negatively related to ψ and to the absolute value of the elasticity of labour demand, $\frac{1}{1-\alpha}$. To satisfy the second-order condition, it is assumed that $\mu < 1$.[13] Let us now turn to the second parameter, ζ_t. The latter is the ratio of two elasticities which in general are functions of w_t. The numerator is simply the elasticity of the real net income R_{et} with respect to the real gross wage w_t (also called the "coefficient of residual income progression"): $\eta_t^e = \frac{(1-s_t)w_t}{(1-s_t)w_t + B_t} < 1$. Imagine that η_t^e diminishes (say, because the basic income level B_t increases). Then a 1 percentage point of increase in the gross wage has a lower relative effect on the net income of the employed. Yet, it has unchanged negative effects on employment and profits. Therefore, the bargained "scaled rent" is reduced. The denominator of ζ_t is the elasticity of the real wage cost with respect to the real gross wage: $\eta_t^f = \frac{(1+\tau_t)w_t}{(1+\tau_t)w_t - E_t} > 1$. Imagine that η_t^f increases (say, because the exemption E_t is higher). Then a 1 percentage point of increase in the gross wage raises the wage cost relatively more. This is detrimental to employment and profits but does not change the relationship between the real gross wage and real net income. Therefore, the bargained "scaled rent" is reduced. So, ζ_t summarises the degree of non linearity of the tax schedule. As in Lockwood and Manning (1993) and chapter 8 of Cahuc and Zylberberg (1996), ζ_t captures the role of progressive taxation on wage bargaining. Finally, since ζ_t is positive, it should be noticed that the "rent" is definitely positive if $\gamma > 0$.

Symmetric equilibrium

In a symmetric equilibrium, since firms, workers and unions are identical, $V_e^t = \overline{V_e^t}$ and $w_t = \overline{w_t}$. Then (9) implies that:

$$V_e^t - V_g^t = (1-a_t)\left(V_e^t - V_u^t\right). \tag{12}$$

The exit rate from unemployment, a_t, can be rewritten as a function of the current and previous unemployment rate (hence, a_t is endogenous). For the current unemployment level is made of those who where unemployed at the beginning of this period and who are not currently hired. After division by the size of the labour force, N, this definition can be written as:

$$u_t = (1-a_t)(u_{t-1} + q(1-u_{t-1})), \tag{13}$$

where u_t is the unemployment rate in period *t*. Combining (7), (8), (11), (12) and (13) yields an equation that implicitly defines the current real gross wage as a function of: (i) the current and anticipated levels of the marginal rate of taxes formally incident on the employees (*s)*; (ii) the current and anticipated progressivity of the tax system (ζ); (iii) the current and anticipated levels of allowances (*B* and R_u); (iv) the previous and current unemployment rate *u*; (v) the characteristics of the union and the technology (captured by μ); (vi) the exogenous separation rate *q*. This equation can be written in the following way:

$$\frac{v(R_{et})-v(R_{ut})}{\mu\zeta_t R_{et} v'(R_{et})}+\beta(1-q)\frac{\zeta_{t+1}R_{e,t+1}v'(R_{e,t+1})}{\zeta_t R_{et} v'(R_{et})}=\frac{q+(1-q)u_{t-1}}{u_t}. \tag{14}$$

The dynamic properties of a similar model have been analysed by Van der Linden (1999b). Let us henceforth focus on a steady state. The second term on the left-hand side of (14) is then simply equal to $\beta(1-q)$. Furthermore, the right-hand side of (14) becomes equal to $\frac{q}{u_t}+1-q$. So, in a steady state, equation (14) can be written in the following way:

$$\frac{v((1-s_t)w_t+B_t)-v(R_{ut})}{\mu\zeta_t[(1-s_t)w_t+B_t]v'((1-s_t)w_t+B_t)}-(1-\beta)(1-q)=\frac{q}{u_t}. \tag{15}$$

For sufficiently risk averse workers, this *wage-setting curve* ('WS') is an implicit decreasing relationship between the real (gross) wage w_t and the unemployment rate u_t. The *price-setting curve* ('PS') is here simply an aggregate labour demand curve (immediately derived from (2) and (3)). This 'PS' curve is upward sloping in a (w_t, u_t) space:

$$N(1-u_t)=\frac{n}{A_t}\left(\frac{\theta-\alpha}{r+\delta}\right)^{\frac{\theta-\alpha}{1-\alpha}}\left(\frac{(1+\tau_t)w_t-E_t}{\alpha A_t}\right)^{-\frac{1+\alpha-\theta}{1-\theta}}. \tag{16}$$

If B_t and Z_t are fixed (in real terms), the model (15) - (16) is such that balanced growth (A_t increases at a constant rate) reduces the unemployment rate. Such a tendency is historically not observed and, hence, sounds unplausible. Therefore, it is standard in this literature to assume that unemployment benefits are indexed to wages. This assumption then leads to a vertical 'WS' curve : The equilibrium unemployment rate is fixed by the wage-setting behaviour and shifts in labour demand only affects the real (gross) wage rate. To see this and to simplify the following analysis, let us from now on make use of assumption (6). In addition, let the real level of (untaxed) unemployment benefits and basic income be proportional to the real net earnings:[14]

$$\frac{Z_t}{(1-s_t)w_t}=z,\quad 0<z<1 \text{ and } \frac{B_t}{(1-s_t)w_t}=b,\quad 0\le b<1. \tag{17}$$

From (17), the real net instantaneous income of the unemployed is now $R_{ut}=Max(z,b)(1-s_t)w_t$. When $0<b<z$, the basic income is said to be 'partial'. The income of the unemployed is here the sum of the basic income and an unemployment benefit reduced by the amount of the basic income. So, there is a switch in the type of benefit received but the

cash amount is unchanged *at given wages*. The opposite case ($b \geq z$) is the so-called 'full basic income'. Now, the unemployment benefits disappear and are replaced by a basic income which is at least equivalent *at given wages.* To keep the analysis as simple as possible, let the ESIC exemption, E_t, be proportional to the wage cost:

$$\frac{E_t}{(1+\tau_t)w_t} = e, \quad 0 \leq e < 1. \tag{18}$$

Henceforth, *z, b* and *e* will be considered as 'policy parameters'. From (17) and (18), it is easily checked that the two elasticities η_t^e and η_t^f become time-invariant:

$$\eta^e = \frac{1}{1+b}, \eta^f = \frac{1}{1-e} \Rightarrow \zeta = \frac{1-e}{1+b}. \tag{19}$$

Then, the steady-state unemployment rate, *u*, is determined by the 'WS' curve (15). The latter becomes:

$$u = \frac{q}{\frac{1}{\mu\lambda\zeta}\left(1-\left[\frac{Max(z,b)}{1+b}\right]^{\lambda}\right)-(1-\beta)(1-q)} \tag{20}$$

The higher *q* and μ, the higher the equilibrium unemployment rate. With more relative risk averse workers, the equilibrium unemployment rate is lower, too. These are rather intuitive results. As far as the policy parameters are concerned, the message delivered by equation (20) can be decomposed in two parts. First, introducing a basic income or an ESIC exemption has an influence on the equilibrium unemployment rate because taxation is now progressive (namely, ζ becomes lower than one). Let us call this the 'progressivity effect'. [15] As far as this mechanism is concerned, the two policies are strictly equivalent provided that they generate the same level of ζ. By the way, as is well-known in this literature, linear taxes have no effect on the unemployment rate in steady state (namely, neither *s* nor τ play a role in (20)). Their value only affects net income (through equation (16)). So, as *z, b* or *e* changes, at least one of the marginal tax rates *s* or τ will have to adjust to keep the public budget balanced. This adjustment is borne by employees with no effect on the allocation of labour. Taking (17) and (18) into account, the steady-state 'PS' curve (16) can be written as:

$$w = \frac{C}{(1-e)(1+\tau)(1-u)^{\kappa}}, \quad \kappa = \frac{1-\theta}{1+\alpha-\theta} > 0, \tag{21}$$

where *C* is a positive constant easily derived from (16). From (21), the real net income of an employed worker, $R_e = (1+b)(1-s)w$, is immediately computed.

Second, the basic income influences the unemployment rate through the ratio between income in case of unemployment and income in-work (the 'replacement ratio'). From (11), it is intuitively clear that the unions try to generate a "rent" for the occupied workers. This "rent" is measured in comparison with the outside option (the intertemporal utility of a redundant worker). Equation (12) establishes a clear link between this "rent" ($V_e^t - V_g^t$) and the

difference in utility between an employed and an unemployed worker ($V_e^t - V_u^t$). Due to the simplifying assumptions (6) and (17), what matters in steady state is simply the replacement ratio $\frac{Max(z,b)}{1+b}$. By assumption (17), real unemployment benefits are indexed to net earnings, not to the net income of an employed worker. Therefore, the partial basic income favors in-work net income (for a given *z*, as *b* increases, the replacement ratio $\frac{z}{1+b}$ decreases). This has a favourable effect on wage formation and eventually on unemployment. The opposite holds in the case of the full basic income. For then, the replacement ratio is $\frac{b}{1+b}$ which increases with *b*. This second mechanism, which could be called the 'replacement ratio effect', is specific to the basic income.

To sum up, an exemption of ESIC, captured by the policy parameter *e*, has a favourable effect on unemployment through the 'progressivity effect' (see Panel b of Figure 1). A partial basic income has a favourable effect too but now through both mechanisms (see Panel a of Figure 1). A full basic income has a favourable effect on unemployment through the 'progressivity effect'. On the other hand, it has a detrimental effect on unemployment through the 'replacement ratio effect'. It is easily seen that the two effects cancel out if workers are risk neutral. If they are risk averse, it can be checked that a marginal increase in the full basic income-net earnings ratio *b* raises the equilibrium unemployment rate.[16] These conclusions rely upon the way bargaining is modeled. If a collective agreement is not reached, the workers have been assumed to immediately leave the firm and start searching a job. This implies that the fall-back position of a union member is his outside option. In a setting where the lack of an agreement leads to a strike, the income during this period would be positively influenced by an unconditional basic income. Without an offsetting effect on the level of strike payments or other changes in the bargaining set-up, this would introduce a wage-push effect detrimental to employment.

Welfare and profits

From (7) and (8), the inter-temporal levels of utility can be written as follows in a steady state:

$$V_e = \frac{\left[1-\beta(1-a)\right]v(R_e) + \beta q(1-a)v(R_u)}{(1-\beta)\left(1-\beta(1-a)(1-q)\right)}, \tag{22}$$

$$V_u = \frac{\beta a\, v(R_e) + \left[1-\beta\left(1-q(1-a)\right)\right]v(R_u)}{(1-\beta)\left(1-\beta(1-a)(1-q)\right)} < V_e, \tag{23}$$

$$V_0 = \frac{v(B)}{1-\beta},$$

where V_0 stands for the inter-temporal utility of the inactive population. In (22) and (23), *a* is derived from (13) expressed in a steady state and from (20). From (6) and (17), it is easily checked that (22) and (23) are proportional to w^{λ}/λ, with *w* defined by (21). It can be verified that a lower unemployment rate (i.e. an improvement in the exit rate from unemployment, *a*) increases V_e and V_u at given wages.[17] In that way, an increase in the partial

basic income-net wage ratio, *b*, has a favourable effect on V_e and V_u. So does an increase in *e*. However, the effect on wages should also be taken into account. From (21) and Panel a of Figure 1, an increase in the partial basic income-net wage ratio also lowers *w*. This has a detrimental effect on V_e and V_u. On the contrary, Panel b of the same figure illustrates that an increase in *e* has an ambiguous effect on *w*.

Given (2) to (4) and (21), steady-state optimal inter-temporal profits Π can be written as:

$$\Pi = \left(\frac{\theta-\alpha}{r+\delta}\right)^{\frac{1-\alpha}{1-\theta}} \frac{1}{1-\beta}\left[\frac{C}{\alpha A(1-u)^{\kappa}}\right]^{-\frac{\alpha}{1-\theta}}\left[\left(\frac{1-\alpha}{\theta-\alpha}\right)r+\left(\frac{1-\theta}{\theta-\alpha}\right)\delta\right], \tag{24}$$

which is negatively related to the unemployment rate.

The budget constraint of the State
Up to now, the budget of the State (including the unemployment insurance system) has been ignored and it has been implicitly assumed that profits are untaxed. Under a balanced budget constraint, the marginal tax rates, *s* and τ, have to vary with the level of parameters *e* and *b*. Put another way, if, as it turns out, a reduction of social security contributions or a basic income increases net public expenses, this can only be financed through additional taxes on income from salaried employment.[18] This obviously has negative effects on the inter-temporal level of utility within the labour force.

To write the budget constraint of the State, an additional parameter has to be introduced. The inactive population and the *n* firm-owners are eligible to the basic income if the latter is truely unconditional. More generally, there could exist more restrictive criteria (see e.g. the 'participation income' of Atkinson, 1995b). So, let ν be the ratio between the eligible inactive population (extended to firm-owners) and the workforce ($\nu \leq [(M+n)/N]$). Given the focus of this paper on the unemployment insurance mechanism, let us ignore the other components of the Welfare State. Under assumptions (17) and (18) and after division by the size of the labour force and by the real gross wage rate, the balanced budget can then be written as:

$$(s+\tau)(1-u) = (1-s)\max(z,b)u + b(1-s)(1-u+\nu) + (1+\tau)e(1-u). \tag{25}$$

2.2 A numerical illustration

The analytical properties of the model are clear-cut as far as the steady-state unemployment rate is concerned. On the contrary, due to their effects on the real gross wage and on tax rates, it is unclear whether the introduction of an ESIC exemption or a basic income will raise the utility level of the various types of agents. For this very reason and to provide order of magnitudes of the various effects, this subsection develops a numerical analysis based on plausible values of the parameters.

Since wages are by assumption determined for one period, let such a period last a year. The example considered in this section is built upon the following assumptions: $\alpha = 0.7$, $\theta = 0.9$, $\gamma = 0.6$, $\psi = 0$, hence $\mu = 0.64$, $\lambda = -1$, $r = 0.05$, $\nu = 0$, $q = 0.2$, $\delta = 0.08$ and $z = 0.4$. In other words, the bargaining is modelled as the maximisation of an asymmetric Nash product and

the unions do not value the level of employment.[19] Relative risk aversion is put to 2. In this example, the basic income does not accrue to people out of the labour force. This 'active citizen's income' is handed out to the employed and the unemployed only (more on this below). The value of the separation rate q is in accordance with the results of Burda and Wyplosz (1994). $z = 0.4$ is an hypothesis that could be supported by the results provided in OECD (1996). The budget constraint (25) defines one of the marginal tax rates as a function of the other, the unemployment rate and the policy parameters. It is here assumed that $s/\tau = 1$ (this hypothesis is not at odds with the unweighted average of mean SIC and tax rates in Europe around 1991; see Table 8.6 in Drèze and Sneessens, 1997).

The upper part (respectively, lower part) of Table 1 considers the introduction of a basic income (respectively, an ESIC exemption). The unemployment rate is displayed in column 1, the marginal tax rates in column 2, the instantaneous real net earnings in column 3, the instantaneous real net income of those currently unemployed in column 4, the real wage cost in column 5. The inter-temporal discounted utility levels of the employed (respectively, the unemployed) are presented in column 6 (respectively, 7) and the inter-temporal discounted profits are provided in the last column. Most of the results are normalised to 1 in the benchmark case. The latter occurs when the policy parameters b and e are equal to zero.

The values of the parameters are such that the equilibrium unemployment rate amounts to nearly 9% in the benchmark situation (a value that is close to the average unemployment rate in the EU during the nineties). As expected, when a basic income is introduced the steady-state unemployment rate shrinks. When the basic income-net wage ratio equals say 20%, the unemployment rate is now close to 5.5%. This effect on unemployment is important. When b becomes higher than z, the increase in the replacement ratio more than compensates the tax progressivity effect. Therefore, the unemployment rate starts increasing. Hence, if z is taken as given, the policy-maker who only focuses on the level of unemployment should opt for the solution $b = z$. Then the reservation wage effect of unemployment benefits completely disappear. However, the marginal tax rates s and τ have to be raised in order to compensate an increase in net public outlays. Ignoring all other public expenses, s and τ are close to 2% in the benchmark situation. As can be seen from column 2, the marginal tax rates sharply increase with b. For instance, when $b = 0.2$, s and τ amount to 10%. This evolution of the tax rates has several implications on earnings and income levels. As expected, real net earnings decrease with b. Yet, the reduction turns out to be very important. It is explained by the adjustment of the real gross wage w (see Panel a in Figure 1) and by the increase in the tax rate incident on workers. However, the instantaneous income of the employed is not much affected because the increase in b actually more than compensates the drop in earnings. Things are obviously different for those currently unemployed. For, by assumption (17), the level of unemployment benefits is proportional to net earnings. In an inter-temporal perspective, the active population benefits from an increase in b. The same holds for inter-temporal profits as long as $b \leq z$. In this example, if an inter-temporal viewpoint is adopted, the introduction of a partial basic income is a Pareto-improving reform. There is no claim that this is a general result but it is found to hold if the discount rate r is not too high. It is intuitively clear that a higher r means that the improved probability of being hired is more heavily discounted by those currently unemployed, who suffer from the drop in the absolute level of their unemployment benefits.[20] This is a matter of concern for those who agree that the income level of the unemployed should not decrease in the short run. Since the instantaneous net income of those currently employed turns out to be fairly stable in this example, an

alternative to (17) would be to index the level of unemployment benefits to this net income (instead to net wages). This alternative will be considered later in Table 2.

Consider now what is happening when an increasing part of the wage cost is reduced by an exemption of ESIC. At the outset, it is useful to notice that comparing what happens for equal values of *e* and *b* is misleading. From (17) and (18), it should be obvious that the level of the exemption *E* is larger than the one of the basic income *B* when *e* is taken equal to *b*.[21] Keeping this remark in mind, the lower part of Table 1 shows one main difference. Net earnings are now fairly stable when *e* rises. The theoretical analysis led to the conclusion that for a given τ, an increase in *e* would have an ambiguous effect on the real gross wage *w* (see also panel b of Figure 1). Unreported results indicate that *w* actually increases in this example (taking the adjustment of τ into account). This tendency is therefore roughly compensated by rising taxes incident on workers (*s*). Most of the other effects of an exemption are qualitatively similar to what is observed with the basic income. As the exemption-wage cost ratio *e* increases, the unemployment rate decreases and the marginal tax rates and the inter-temporal indicators V_e, V_u and Π increase. Furthermore, the wage cost is fairly stable. So, in this example, the exemption approximately compensates the increase in w and τ.

If the (inter-temporal) Paretian criterion is adopted, Table 1 indicates that increasing *e* is an improvement compared to the benchmark situation. However, it seems as if *e* could be increased further beyond 0.5. And indeed unreported numerical results indicate that V_e, V_u and Π monotonically increase with *e*. This occurs although the marginal tax rates become huge. This is counter-intuitive. It is felt that we here reach a shortcoming of the theoretical setting. Returning to the criticism of Andersen and Rasmussen (1997), one should expect that high marginal tax rates will have adverse effects on the acquisition of skill or the supply of effort. Section 3 will attempt to take investment in human capital into account.

Meanwhile, the model with homogeneous workers can still be used to throw light on the consequences of unconditionality (parameter ν). Furthermore, it is worth to come back to an alternative design of basic income schemes. Starting with the former issue, it should be recalled that Table 1 is based on a very restrictive view about basic income schemes. By assumption, the distinction between the active and the inactive population is clear-cut and only the active people are eligible to the basic income. A more unconditional scheme can easily be introduced through parameter ν. Yet, it should be recognised that this approach does not recognise that these more unconditional schemes can give an incentive to develop 'informal activities' that influence aggregate welfare.[22] In addition, within the limits of the current paper, the number of inactive is exogenous. Van der Linden (1999a) relaxes this assumption. In the interest of space, the results about the effects of ν are not reported, but merely summarised. Remember that the higher ν, the more taxes are to be collected. This does not affect the equilibrium unemployment rate but well, and negatively, net earnings and the intertemporal utilities. Let $\nu = 0.125$, meaning that, on average in the EU, about one-quarter of the inactive population aged 15-64 would be eligible for a basic income. Then the intertemporal utility of the unemployment diminishes as *b* increases. When $\nu = 0.25$, this prospect is shared by the employed. Although the model needs to be extended, this points to a conflict of interest between the active and the inactive population.

We saw above that the introduction of an 'active citizen's income' has gloomy effects on the absolute level of instantaneous income for those currently unemployed. To avoid this implication, one could imagine an alternative to assumption (17), namely that:

$$\frac{Z_t}{B_t + (1 - s_t)w_t} = z, \quad 0 < z < 1, \quad \text{with } B_t \text{ still equal to } b(1 - s_t)w_t. \tag{26}$$

In a steady state equilibrium, this amounts to redefining the net income of the unemployed, R_u, as $max[z(1+b), b](1-s)w$. Since this raises the replacement ratio, one should expect less favourable effects on the unemployment rate and an improvement of the instantaneous income position of the unemployed. The implication for their inter-temporal utility is therefore less clear. Table 2 summarises the relevant information. Case 'A' refers to assumption (17) and case 'B' to assumption (26). In both cases, $\nu = 0$. In case B, the instantaneous income of the unemployed remains nearly unchanged, still the inter-temporal indicators (V_e, V_u and Π) and the unemployment rate are improving compared to the benchmark situation. If case B is compared to A for the same value of b, the decrease in the unemployment rate is much lower under assumption B but those currently unemployed are better-off while those currently employed and the entrepreneurs are worse-off.

To compare the performances of the exemption to those of the two basic income assumptions (cases A and B), one needs to define comparable values for b and e. One pragmatic approach could be to fix an increase in marginal tax rates that the policy-maker would find acceptable. Assume that an increase of ten percentage points would be an upper-bound. Then, it can be checked that one should compare $e = 0.1$ (see Table 1) to b equal to 0.12 in case A and 0.11 in case B. Unreported results for the two latter values of b indicate that the exemption and the 'active citizen's income' under case B have very similar properties (except obviously for net earnings). An 'active citizen's income' under case A turns out to be a more powerful tool to fight unemployment and to increase both the inter-temporal utility of those currently employed and inter-temporal profits. Yet, the instantaneous income of those currently unemployed is then ten percentage points lower while in an inter-temporal perspective the difference is rather small for this group.

In sum, this simulation exercise has shown that the introduction of an active citizen's income or an exemption in ESIC can be a Pareto-improvement in a unionised economy. This is true when inter-temporal utility and profit levels are used. However, if the unemployment benefit is proportional to net earnings, the income position of the unemployed deteriorates in the short-run when a partial active citizen's income is introduced. Yet, the level of the active citizen's income can be defined in a different way to avoid this effect without loosing the Paretian property. Then, an exemption and an active citizen's income have rather similar properties. This analysis has also highlighted a plausible conflict of interest between the active and the inactive people if the latter are eligible to a basic income.

3 Heterogeneous unionised workers and equilibrium unemployment

This section also uses the WS-PS model but now two types of workers are distinguished (low-skilled, with subscript *l*, and high-skilled, with subscript *h*). Nickell and Bell (1997) summarise the rather pessimistic view on the effect of cutting payroll taxes on the less-skilled:

1st claim: If there are no barriers to acquisition of training, shifts in the demand for unskilled relative to skilled workers may have little long-run impact on relative unemployment rates because changes in unemployment rates and wages will tend to be offset by 'migration' from the unskilled to the skilled.

2nd claim: In the long run, if wages are flexible, payroll taxes are borne by labour. So labour costs and employment are unaffected although take-home pay will change. (p. 321)

As Gregg and Manning (1997) explain, these results heavily rely on a set of additional assumptions introduced in the WS-PS model by Layard, Nickell and Jackman (1991). First, it is assumed that the two skill groups are separable on the supply side, which means that the wage rate of a given skill group is only influenced by its own unemployment rate. Second, the supply of skills is perfectly elastic in the long run. Gregg and Manning (1997) give reasons why these hypotheses are fragile. So, in this section, I follow the viewpoint of Gregg and Manning (1997) and relax these assumptions. The model of this section also draws upon chapter 9 of Cahuc and Zylberberg (1996). The effect of (nonlinear) taxation in a unionised economy with two types of workers has been analysed by Holmlund and Kolm (1995). Their approach is however embedded in the one of Layard, Nickell and Jackman (1991). Moreover, their purpose is not to compare exemption of ESIC and basic income schemes. Recently, Lehmann (1999) has looked at the effect of a basic income in an equilibrium matching model that distinguishes two types of skill.

At the outset, it should be recognised that developing a rigorous and fully-fledged general equilibrium model of a unionised two-skills economy turns out to be quite a challenge in its own right. Due to space limitation, the model is only sketched. As in the above mentioned papers, the focus is on the long run effects. In a first stage, labour supply is fixed. This will allow to discuss the second claim. In order to adress the first claim, the hypothesis of exogenous labour supply is relaxed in a second stage. Due to space limitation, as far as the basic income is concerned, this section only considers the partial scheme.

3.1 A model with exogenous labour supply

Consider a decreasing returns-to-scale Cobb-Douglas technology $L_t^{\alpha}K_t^{\theta-\alpha}, 0<\alpha<\theta<1$. And let L_t be a C.E.S. function of the two types of workers :

$$L_t = G_t\left[\left(A_{ht}L_{ht}\right)^{\frac{\sigma-1}{\sigma}} + \left(A_{lt}L_{lt}\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}, G_t, A_{lt}, A_{ht}, \sigma > 0. \qquad (27)$$

The firm produces a homogeneous good and sell it on a competitive market at a price normalised to 1. When it determines labor demand and the investment level, each firm takes

as given the sequence of real wage costs, the (constant) interest rate r and the (constant) depreciation rate δ. In any period t, given the initial capital stock K_t, each firm chooses its investment level I_t such that $K_{t+1} = (1-\delta)K_t + I_t$. Along an equilibrium path, there is a collective agreement in each period. So, at time t = 0, given K_0, the firm maximises the following objective function :

$$\underset{\{L_t, K_{t+1}\}_{t\geq 0}}{Max} \sum_{t=0}^{\infty} \left[L_t^{\alpha} K_t^{\theta-\alpha} - w_t^f L_t - \left(K_{t+1} - (1-\delta)K_t \right) \right] \tag{28}$$

$$\text{with } w_t^f L_t = w_{ht}(1+\tau_{ht})L_{ht} + w_{lt}(1+\tau_{lt})L_{lt} \tag{29}$$

In the latter expression, w_{jt} denotes the real (gross) wage of skill j and $\tau_{jt} \geq 0$ the skill-specific ESIC rate, (j = h,l). The first-order conditions of this problem are :

$$L_t = K_t^{\frac{\theta-\alpha}{1-\alpha}} \left(\frac{w_t^f}{\alpha} \right)^{\frac{1}{\alpha-1}} \tag{30}$$

$$K_{t+1}^{\frac{1-\theta}{1-\alpha}} = \frac{\theta-\alpha}{r+\delta} \left(\frac{w_{t+1}^f}{\alpha} \right)^{\frac{\alpha}{\alpha-1}} . \tag{31}$$

Combining these two conditions yields the 'PS' curve:

$$L_t = \left[\frac{\theta-\alpha}{r+\delta} \right]^{\frac{\theta-\alpha}{1-\theta}} \left[\frac{w_t^f}{\alpha} \right]^{-\frac{1+\alpha-\theta}{1-\theta}} . \tag{32}$$

Conditional on this optimal level of L_t, the minimisation of the wage bill solves the following problem :

$$\underset{\{L_{ht}, L_{lt}\}}{Min} \; w_{ht}(1+\tau_{ht})L_{ht} + w_{lt}(1+\tau_{lt})L_{lt} \tag{33}$$

$$\text{subject to } G_t \left[\left(A_{ht} L_{ht} \right)^{\frac{\sigma-1}{\sigma}} + \left(A_{lt} L_{lt} \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \geq L_t \tag{34}$$

The first-order conditions of this problem can be summarised as follows :

$$\frac{L_{ht}}{L_{lt}} = \left(\frac{(1+\tau_{ht})w_{ht}}{(1+\tau_{lt})w_{lt}} \right)^{-\sigma} \left(\frac{A_{ht}}{A_{lt}} \right)^{\sigma-1} . \tag{35}$$

From (27), (29) and (35), it can be checked that w_t^f is a C.E.S. function of the two wage costs :

$$w_t^f = \frac{1}{G_t} \left[\left(\frac{(1+\tau_{ht})w_{ht}}{A_{ht}} \right)^{1-\sigma} + \left(\frac{(1+\tau_{lt})w_{lt}}{A_{lt}} \right)^{1-\sigma} \right]^{\frac{1}{1-\sigma}} . \tag{36}$$

Assume that the current income of an employed worker is $B_t + (1 - s_{jt})\, w_{jt}$, $j = h,l$, where $s_{jt} \geq 0$ and $B_t \geq 0$ are respectively the constant tax rate on earnings (SIC paid by employees and the income tax) and the real level of the basic income. There is assumed to be a union negotiating on behalf of the high-skilled workers. Leaving aside the bumping down or ladder effect,[23] in a steady state, there should be a relationship such as (20) defining the high-skilled unemployment rate.[24] Let us write this relationship in a compact way as:

$$B_t + (1 - s_{ht})\, w_{ht} = Z_{ht}\, I_h(u_{ht}), \quad I_h'(.) < 0, \tag{37}$$

where Z_{ht} is the unemployment benefit paid to a high-skilled worker and u_{ht} is the corresponding unemployment rate. As in the previous section, let us assume that in a steady state the level of unemployment benefits is indexed on net earnings. Assume also that the real level of the basic income is proportional to the net wage of high-skill workers. It will turn out later that the basic income is actually indexed on the wages of both types of workers. So,

$$Z_{ht} = z_h(1 - s_{ht})w_{ht}, \quad 0 < z_h < 1 \quad \text{and} \quad B_t = b(1 - s_{ht})w_{ht}, \quad 0 \leq b < 1. \tag{38}$$

This implies that the unemployment rate of the high-skilled is fixed by wage setting. For, combining (37) and (38) yields :

$$u_{ht} = \Omega_h\left(\frac{z_h}{1+b}\right), \ \Omega_h'(.) > 0. \tag{39}$$

So, as far as high-skilled workers are concerned, we are in the setting of Layard *et al* (1991).[25]

A first departure from their perspective will be to assume that, even in the long run, the real (gross) wage of the low-skilled presents a form of rigidity. The assumption that the reservation wage of the low-skilled depends on the wage of the high-skilled could do the trick. As a shortcut, let there simply be a strict proportionality between gross wages :

$$w_{lt} = \omega w_{ht}, \quad 0 < \omega < 1. \tag{40}$$

In Continental Europe, this assumption is not broadly in accordance with historical trends (see Table 3.1 in OECD, 1996, Table 8.3 in Drèze and Sneessens, 1997 and Gottschalk and Smeeding, 1997). Given (40), expression (35) can be rewritten as an equation defining the unemployment rate of the low-skill workers :

$$1 - u_{lt} = (1 - u_{ht})\frac{N_{ht}}{N_{lt}}\left(\frac{A_{ht}}{A_{lt}}\right)^{1-\sigma}\left(\frac{1+\tau_{ht}}{\omega(1+\tau_{lt})}\right)^{\sigma}. \tag{41}$$

In this expression, L_{jt} has been replaced by $N_{jt}(1-u_{jt})$, $j = l, h$, where N_{jt} designates the (exogenous) level of skill-j labour supply. Skilled-biased technical progress is defined as an exogenous change in the production function that increases the ratio L_{ht}/L_{lt} at the current wage cost level. Given (35), if $\sigma > 1$ (respectively, $\sigma < 1$), this occurs if A_{ht}/A_{lt} has an upward (respectively, downward) trend. According to Nickell and Bell (1997) and Gregg and Manning (1997), $\sigma > 1$ is a very plausible assumption. On the other hand, Manacorda and

Petrongolo (1999) cannot reject the hypothesis that σ = 1. Henceforth, the maintained assumption is nevertheless σ>1.

Equation (41) allows a comparison of the effects of a partial basic income and a cut in payroll taxes on the low-skill workers when labour supply is exogenous. Because wages are rigid at the low end of the labour market, cutting payroll taxes on the low-skilled has in the long run a favourable effect on their unemployment rate and no effect on the unemployment rate of the high-skilled workers.[26] The effectiveness of this policy depends on the magnitude of the elasticity of substitution σ. The partial basic income acts through a different channel. In the long run, it lowers the unemployment rate of the high-skilled workers and since the optimal mix of workers is governed by (35), the employment ratio is adjusted in such a way that the unemployment rate of the low-skilled improves as well.

Finally, the aggregate WS-PS equations determine the high-skill real wage rate w_{ht}. Equality (36) and assumption (40) imply that w_t^f is now simply :

$$w_t^f = \frac{w_{ht}}{G_t}\left[\left(\frac{(1+\tau_{ht})}{A_{ht}}\right)^{1-\sigma} + \left(\frac{(1+\tau_{lt})\omega}{A_{lt}}\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}} \qquad (42)$$

Let us rewrite the aggregate employment level L_t as $N_t(1-u_t)$ with $N_t=N_{ht} + N_{lt}$ and $u_t = s_{ht}u_{ht} + s_{lt}u_{lt}$ ($s_{jt} = N_{jt}/N_t$). Given (42), the 'PS' curve (32) is now an upward-sloping relationship between w_{ht} and the aggregate unemployment rate u_t. By assumptions (38) and (40), the aggregate 'WS' curve is vertical. Combining (39) and (41) yields the following vertical 'WS' curve :

$$u_t = s_{ht}\Omega_h\left(\frac{z_h}{1+b}\right) + s_{lt}\left\{1-\left[1-\Omega_h\left(\frac{z_h}{1+b}\right)\right]\frac{N_{ht}}{N_{lt}}\left(\frac{A_{ht}}{A_{lt}}\right)^{1-\sigma}\left(\frac{1+\tau_{ht}}{\omega(1+\tau_{lt})}\right)^{\sigma}\right\} \qquad (43)$$

As expected, neutral technical progress (G_t) does note influence the level of aggregate unemployment but well the real wage level. Yet, skilled-biased technical progress affects the aggregate unemployment rate and the PS curve and, hence, wages. To sum up, if the supply of skills is exogenous, the plausible assumption of rigid relative (gross) wages implies that a reduction of social security contributions on the low-skilled and a basic income have a long-run favourable effect on the low-skill unemployment rate. This conclusion is not in contradiction with the second reported claim of Nickell and Bell (1997) that relies upon the (at least in Continental Europe) counterfactual assumption of relative wage flexibility.

3.2 A model where labour supply is endogenous

The rate at which low-skill workers become trained and enter the high-skill group will not be treated in a structural way. As in Layard *et al* (1991) and Gregg and manning (1997), the rate at which low-skill workers 'migrate' will be a reduced form of plausible (endogenous) current indicators.[27] In Layard *et al* (1991), skill-specific labour supply is perfectly elastic in the long run. This happens because the second partial derivative of the following 'migration' function, *H*, is by assumption zero :

$$\frac{d}{dt}\left(\frac{N_{ht}}{N_{lt}}\right) = H\left(\Re, \frac{N_{ht}}{N_{lt}}\right),\ H_1 \geq 0,\ H_2 \leq 0, \tag{44}$$

where $\Re$ is a measure of net returns in case of migration, to be defined below. For Layard *et al* (1991, ch. 6), since the partial derivative $H_2 = 0$, there is one and only one level of $\Re$ such that N_{ht}/N_{lt} is constant in the long run and any level of N_{ht}/N_{lt} can be observed for this equilibrium value of $\Re$. This is a restrictive assumption (see Gregg and Manning, 1997). Therefore, a second departure from the Layard *et al* (1991) approach will be to consider expression (44) with $H_2 < 0$. Therefore, in the long run, when N_{ht}/N_{lt} reaches a steady state, there is an upward sloping relationship between N_{ht}/N_{lt} and $\Re$. Following Gregg and Manning (1997), this assumption is more plausible than the one of Layard *et al* (1991). One interpretation could be that the group of low-skill workers is actually heterogeneous as far as the cost of acquiring skill is concerned. Then, to increase the steady state N_{ht}/N_{lt} ratio, a higher net return $\Re$ is needed in order to compensate the cost of 'migration'. An ad hoc, yet plausible, specification for $\Re$ could be :

$$\Re = \Re\left(\frac{1-u_{ht}}{1-u_{lt}}, \frac{(1-s_{ht})w_{ht}}{(1-s_{lt})w_{lt}}\right), \quad \Re_1 \geq 0,\ \Re_2 \geq 0. \tag{45}$$

For it makes sense to assume that the incentive to acquire a high-skill level increases with the relative employment rate and the high to low-skilled net earnings ratio. In the long run, when 'migration' vanishes, (44) and (45) lead to :

$$H\left[\Re\left(\frac{1-u_{ht}}{1-u_{lt}}, \frac{(1-s_{ht})w_{ht}}{(1-s_{lt})w_{lt}}\right), \frac{N_{ht}}{N_{lt}}\right] = 0. \tag{46}$$

It is convenient to assume an explicit form for (46) and more specifically a homogeneous function of degree one. So, in the long run, let

$$\frac{N_{ht}}{N_{lt}} = D\left(\frac{1-u_{ht}}{1-u_{lt}}\right)^{\rho}\left(\frac{(1-s_{ht})w_{ht}}{(1-s_{lt})w_{lt}}\right)^{1-\rho},\ 0 \leq \rho \leq 1, \tag{47}$$

where D is a positive parameter. Still adopting a long-run perspective, we can now substitute (47) into (41). Remembering (40), this leads to the following long-run expression for u_{lt} when skill-specific labour supply is endogenous:

$$(1-u_{lt})^{1+\rho} = D(1-u_{ht})^{1+\rho}\left(\frac{1-s_{ht}}{1-s_{lt}}\right)^{1-\rho}\left(\frac{A_{ht}}{A_{lt}}\right)^{1-\sigma}\left(\frac{1+\tau_{ht}}{1+\tau_{lt}}\right)^{\sigma}\omega^{\rho-1-\sigma}, \tag{48}$$

with u_{ht} still defined by (39).[28] Expression (48) deserves the following comments. First, in the long-run, skilled-biased technical progress requires an adjustment of ω (the indicator of real wage rigidity) and/or of the tax/allowance rates in order to stabilise the unemployment rate of the less-skilled. Put differently, the acquisition of skills is not a sufficient answer. Acting on

wage-push factors *(z_h, ω)* is one available strategy that reduces the income of the low-skilled and/or the unemployed. Restructuring taxation on labour is an alternative that does no have these direct effects (yet, as we saw in Section 2, one should care about indirect effects through wage formation and adjustments in taxes). Clearly, without one type of adjustment or another, the unemployment rate among the less-skilled workers would in the long run tend to 1. This result is at odds with the first claim of Nickell and Bell (1997). It heavily relies on assumption (44) with $H_2 < 0$. Second, as far as this restructuring is concerned, it does matter which side of the market is taxed. Cutting payroll taxes on the low-skilled workers (i.e. lowering τ_{lt}) has still the effect emphasised in the previous subsection. Changing taxes formally incident on workers influences the labour supply mix (through an impact on the acquisition of skills). As equation (48) shows, there is no reason to expect that these two approaches have the same effect on the unemployment rate of the low-skilled. By the way, it is worth noticing that reducing the tax rate formally incident on low-skilled workers, s_{lt}, has an unfavourable effect on their unemployment rate since this lowers the net return of acquiring skills. The opposite is true if s_{ht} is reduced. Loosely speaking, this illustrates that 'more progressive taxes' can have negative effects when the acquisition of skills is taken into account (on this issue, see also Andersen and Rasmussen, 1997). Finally, the mechanism through which the partial basic income affects the unemployment rates is in essence the same whether labour supply is endogenous or not. From (41), it should be clear that the ratio $(1-u_{lt})/(1-u_{ht})$ is the same whatever the value of b. Therefore, the long-run labour supply mix given by (47) is not modified by b. This conclusion should obviously be reconsidered if the basic income is financed by a restructuring of the tax rates s_{jt} that modifies the ratio $(1-s_{ht})/(1-s_{lt})$.

4. Conclusion

Long periods of high unemployment and of large inequalities in the risk of unemployment are very detrimental as they are synonymous to wasted resources, they enhance poverty and they raise distributional problems. Therefore, reforms such as those studied in this paper should be analysed from different viewpoints. Do they improve the allocation of resources? Do they contribute to income maintenance (i.e. do they contribute to keep each individual's income above a certain minimum)? Do they improve the distribution of well-being? Instead of raising the latter ex post question, it is sensible to raise a different ex ante question : Do these reforms improve the way risks are borne by the socio-economic groups ?

To such broad questions, this paper has only given a partial answer. It has only dealt with two possible reforms (cutting payroll taxes on the less-skilled and introducing a basic income) financed by taxes levied on salaried employment. It has focussed on general equilibrium steady-state effects in a sufficiently simple deterministic setting. The analysis was only conducted for unionised and (strongly) regulated economies. Distributional problems could only be lightly touched on because the degree of agents' heterogeneity was very limited. Furthermore, the very diverse effects of the reforms on the informal economy have been ignored. This clearly points to further research.

However, facing the sharp contrast between the recommendations of Drèze and Malinvaud (1994) and those of Nickell and Bell (1997), it was worth trying to clarify how reductions in

social security contributions (RSSC) work in the ‘wage setting-price setting’ (WS-PS) model made popular by Layard, Nickell and Jackman (1991). Since this model is one of the major reference to deal with imperfect labour markets and is at the root of Nickell and Bell's pessimistic view on RSSC, this paper has tried to develop a rigorous WS-PS model in order to scrutinize the reasons of this view. This examination has taken place with homogeneous labour and with two types of workers. It turns out that the pessimistic view of Nickell and Bell relies upon questionable assumptions at least if RSSC are not implemented accross-the-board but are instead appropriately non linear. More precisely, targetting RSSC on low skilled workers or introducing a lump-sum cut in employers social security contributions has a long run favourable effect on (less-skilled) unemployment. With two types of skills, this is true if relative real gross wages are rigid and if the supply of skills is not perfectly elastic in the long run. These are plausible assumptions, at least in Continental Europe. These non linear RSSC cannot claim to solve the unemployment problem. However, if one agrees that biased-technical progress is a major trend, this paper has argued that cutting payroll taxes on the less-skilled or in a lump-sum way is one, at least partial, response to this problem that does not worsen the position of low-wage groups..

The paper had a second objective. It intended to discuss the performances of an alternative to RSSC, namely basic income schemes. In the WS-PS framework, without questioning unions' bargaining power, it turns out that appropriately designed partial basic income schemes have interesting long-run effects on (less-skilled) unemployment. This conclusion hinges upon the assumption that unions do not care about their members' net earnings but well net income. Put differently, they accept that real wages decrease as the level of the basic income rises.

This paper has also shown that an analysis that focuses on the unemployment rate is very incomplete. For the reforms considered here induce adjustments in wages. Furthermore, the reduction in unemployment is insufficient to cover the additional costs generated by the reforms. Hence, an increase in marginal tax rates seems unavoidable. This paper has therefore developed an analysis of the impact of these reforms on the utility levels and on profits. In this respect, the distinction between instantaneous and inter-temporal effects turns out to be important in some cases. For instance, if unemployment benefits are proportional to net earnings, a basic income can both raise the inter-temporal utility of the unemployed and have very gloomy effects on their income in the very short-run. Therefore, the precise design of these reforms crucially matters. This is also true as far as the degree of unconditionality is concerned. To avoid a trade-off between the utility of the inactive population and the active one, this paper recommends to restrict the basic income to the labour force. This viewpoint has been developed under a set of assumptions. First, the distinction between the active and the inactive population is costlessly made. Second, before the introduction of the basic income, the inactive population is not eligible for a (means-tested) minimum income guarantee. Third, the informal productive activities that a fully unconditional basic income could promote have not been taken into account. Since it leaves the income of the unemployed unchanged at given wages, such an ‘active citizen’s income’ can then be reinterpreted as a lump-sum allowance handed out to the employed. This policy clearly presents some similarity with the EITC. In a numerical simulation, it has been shown that well-defined RSSC and active citizen’s income schemes can have very similar properties. To broadly the same extent, they reduce the unemployment rate and raise both profits and the inter-temporal utility levels of each group without worsening the position of the unemployed in the very short-run. Yet, the rise in marginal tax rates is always substantial. Although the

models developed in this paper have paid attention to the general equilibrium effects of these increases in taxes, more research is needed to deal with this issue in non competitive labour markets.

A final question needs to be raised. Do we really have good reasons to believe that the WS-PS model is the most appropriate framework to use? For, to generate persistent unemployment, it relies on efficiency wage stories or bargaining. Now, the former has been under attack (the so-called bonding critique) and authors like Frank and Malcomson (1994) and Booth (1997) have challenged the view that wage bargaining is really a sufficient condition for equilibrium unemployment to emerge. In the latter case, one clearly needs additional (often implicit) assumptions (such as the absence of two-tier contracts or the hypothesis that redundancy payments are not bargained over). This final question is a very large one. Even if it lies out of the scope of this paper, there is no doubt that it is a priority at the research agenda of the economists.

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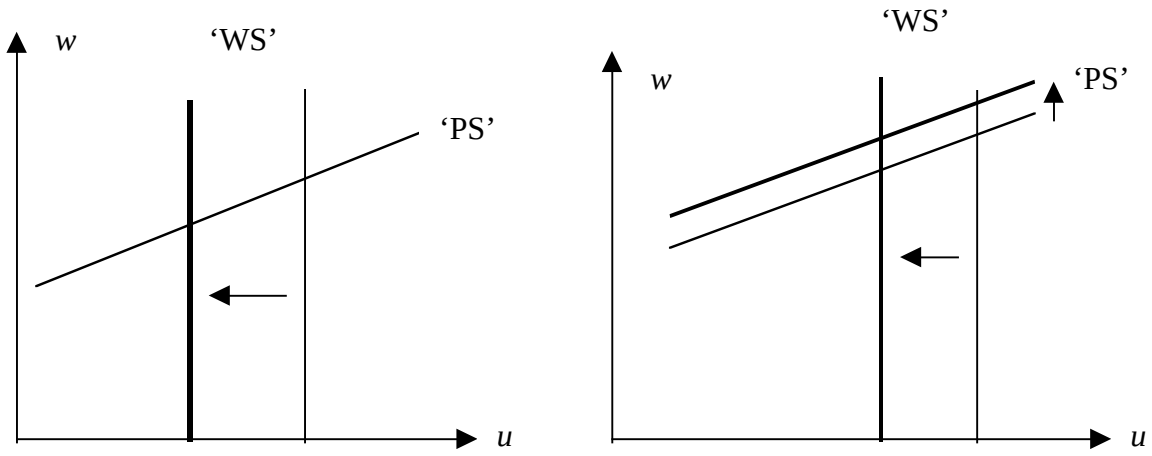

Panel a. Steady-state properties of an increase in the partial basic income-net wage ratio, *b*.

Panel b. Steady-state properties of an increase in the ESIC exemption-net wage ratio, *e*.

Figure 1. Comparative static results with one skill.

e = 0	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
b	*u*	*s*, τ	*(1-s)w* (*)	R_e = *(1+b)(1-s)w* (*)	*(1-e)(1+τ)w* (*)	V_e (*)	V_u (*)	Π (*)
0	0.087	0.019	1.000	1.000	1.000	1.000	1.000	1.000
0.1	0.068	0.061	0.917	1.009	0.997	1.019	1.010	1.019
0.2	0.054	0.100	0.845	1.014	0.996	1.032	1.014	1.032
0.3	0.044	0.137	0.783	1.018	0.994	1.042	1.016	1.041
0.4	0.037	0.172	0.729	1.020	0.993	1.050	1.015	1.048
0.5	0.043	0.207	0.678	1.017	0.994	1.052	1.037	1.042
b = 0								
e								
0	0.087	0.019	1.000	1.000	1.000	1.000	1.000	1.000
0.1	0.078	0.069	1.003	1.003	0.999	1.014	1.015	1.008
0.2	0.069	0.126	1.006	1.006	0.998	1.027	1.029	1.017
0.3	0.061	0.189	1.008	1.008	0.996	1.041	1.044	1.025
0.4	0.052	0.260	1.011	1.011	0.995	1.054	1.058	1.034
0.5	0.043	0.341	1.014	1.014	0.994	1.067	1.073	1.042

(*) 1 if *b* = 0

Table 1. Simulation results in a steady state.

e = 0	*u*		R_u (*)		V_e (*)		V_u (*)		Π (*)	
b	*'A'*	*'B'*	*'A'*	*'B'*	*'A'*	*'B'*	*'A'*	*'B'*	*'A'*	*'B'*
0	0.087	0.087	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
0.1	0.068	0.079	0.917	1.003	1.019	1.012	1.010	1.013	1.019	1.008
0.2	0.054	0.072	0.845	1.005	1.032	1.023	1.014	1.025	1.032	1.014
0.3	0.044	0.067	0.783	1.007	1.042	1.031	1.016	1.034	1.041	1.019
0.4	0.037	0.062	0.729	1.008	1.050	1.039	1.015	1.042	1.048	1.024
0.5	0.043	0.058	0.678	1.009	1.052	1.045	1.037	1.049	1.042	1.028

(*) 1 if *b* = 0

Case *'A'* refers to assumption (17), case *'B'* to assumption (26).

Table 2. Comparing assumptions (17) and (26) about the level of the basic income.

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[3] Hiring or marginal employment subsidies are even more frequently observed. As they are only issued for newcomers, these subsidies improve the efficiency of a given expenditure. However, they introduce new and often neglected distortions. They generate substitution effects at the margin of the targeted groups. Moreover, they raise moral hazard problems such as internal displacement (i.e. simultaneous hiring and firing by the same firm to benefit from the subsidy) or fictitious recruitment (by transferring workers across firms). In addition, they do not tackle the problem of (skill-specific) job destruction. This and space limitation explain why this paper does not consider these subsidies.

[4] Similar results are found in the matching literature (see chapter 8 of Pissarides, 1990). However, in an overlapping-generations-model, linear taxes can affect unemployment (see Daveri and Tabellini, 1997).

[5] For an analysis of the same type of policies in a general equilibrium search model see Pissarides (1990, Chapter 8) and Mortensen and Pissarides (1998).

[6] Implicitly, there is an international financial market with perfect mobility. An alternative would be to consider savings and the interest rate as endogenous. However, the level of saving of a given individual would then be a function of his employment/unemployment status in the past. To avoid such a difficulty, Danthine and Donaldson (1990) have assumed that actuarially fair unemployment insurance contracts are available without transaction costs. At the optimum, risk averse workers are then fully insured. So, their savings behaviour is independent of their past trajectory on the labour market. However, some ad hoc assumption is then needed to generate a genuine loss of utility when a worker looses his job. In this paper that focuses on steady-state properties, the assumption of an exogenous interest rate seems preferable.

[7] To simplify the notations, no subscript is added to designate a particular firm.

[8] The case with constant returns-to-scale is developed in Van der Linden (1999a, 1999b).

[9] Van der Linden (1999a) introduces an extension where M and N become endogenous.

[10] In a model with homogeneous workers, E_t captures the Drèze, Malinvaud *et al* (1994) proposal.

[11] Hence, s_t captures both the SIC paid by the employees and the income tax.

[12] The latter paper deals with the dynamic properties of the model, that are not considered here.

[13] This condition is always fulfilled if $\psi = 1$. Otherwise, this inequality imposes an upper-bound on γ.

[14] Although Figure 2.2 in OECD (1996) uses the pre-tax level of benefits divided by gross wages, this figure offers some support to this assumption.

[15] In actual economies where marginal income taxes are increasing, combining a basic income and a flat tax (Atkinson, 1995a) would therefore not be the best thing to do. See however the discussion in Andersen and Rasmussen (1997).

[16] A formal proof is provided in Van der Linden (1999b).

[17] See Van der Linden (1999a).

[18] Hence, this paper does not raise the interesting question whether some broadening of the tax base can be implemented.

[19] The assumption $\psi = 0$ is in accordance with the so-called seniority model. Moreover, sufficiently close to the steady state, each union member is certain to keep his job since new hirings should compensate the number of quits that occurred at the end of the previous period. Hence, the assumption $\psi = 0$ is plausible in the neighbourhood of the steady state.

[20] For more information on this, the reader is referred to Van der Linden (1999a).

[21] If e = b, it is easily checked that $\frac{E}{B} = \frac{(1+\tau_E)w_E}{(1-s_B)w_B}$, where the subscript E or B refer to the corresponding institutional setting.

[22] See the discussion about the 'participation income' in Atkinson (1995b).

[23] This phenomenon is essentially a cyclical one. Ignoring it is not a major shortcoming since this paper focuses

on long-run effects.

[24] A more rigorous treatment should take into account the fact that the elasticity of labour demand depends on the wage cost of the two types of workers.

[25] The function Ω_h varies with the progressivity parameter ζ, which is here equal to $(1+b)^{-1}$. In the compact notation used in (39) this relationship is implicit.

[26] The last assertion should be revised in an extended setting where the outcome of the bargaining process is influenced by the fact that the elasticity of labour demand depends on the wage cost of the two types of workers.

[27] This specification is linked to the cobweb model of labour supply.

[28] Notice that (48) does not guarantee that $0 \leq u_{lt} < 1$. To satisfy these conditions, appropriate constraints need to be imposed on *D*.