Active citizen's income, unconditional income and participation under imperfect competition : A normative analysis*

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Abstract

Various types of basic income schemes are considered to compensate the allocative inefficiencies induced by unemployment insurance systems. This paper develops a dynamic general equilibrium model of a unionized economy where participation to the labor market is endogenous and the budget of the State has to balance. It is shown that basic income schemes reduce the equilibrium unemployment rate. The normative analysis suggest that only the active population should be eligible to the basic income. Introducing an 'active citizen's income' can be a Pareto-improving reform.

Keywords: Basic income; wage bargaining; unemployment; participation; optimal taxation; 'WS-PS' model.

JEL classification : H21, H23, J51, J68.

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1 Introduction

Can the introduction of an unconditional income improve well-being in Western Europe? Or would it be preferable to keep providing basic security in a conditional form? This is the issue raised by this paper. The idea of an unconditional income is not recent (see Lange, 1936 and Meade, 1948). In the same vein as an early proposal by Rhys Williams (1943), Atkinson (1995b) has argued that the scheme should be conditional on *participation*. The latter would not be restricted to paid work but should rely on a wider definition of social contribution. The present paper adopts a more restrictive viewpoint and compares the properties of an *unconditional income*, UCI for short, and an *active citizen's income*, ACI for short. Both are lump-sum transfers but the former is handed out to each individual whether (s)he takes part to the labor force or not, while the latter is restricted to the workforce only. Other proposals have restricted the eligibility even more by targeting the transfer to the stock of low-wage employees (Phelps, 1997, and Drèze and Sneessens, 1997). And many other proposals and schemes actually implemented limit the subsidy to (a subset of) the inflow of new employees. A full assessment of these various policies is obviously beyond the scope of a single paper. As a contribution towards a more comprehensive comparison of the general equilibrium implications of selectivity, this paper focus on UCI and ACI schemes. Both will be called 'basic income' schemes.

The ethical foundations of a UCI have been developed at length (see e.g. Van Parijs, 1995). Yet, economists are often concerned about the economic implications of such a scheme. To achieve a coherent view of the consequences of a basic income in Western Europe, one needs a framework that combines at least four characteristics. First, it should be a general equilibrium model with an explicit budget constraint for the State. Second, given the pervasive unemployment problem in Western Europe, it should highlight the working of the labor market and allow for the possibility of involuntary unemployment. Third, it should deal with some heterogeneity between economic agents. Fourth, the analysis of basic income schemes cannot avoid the issue of labor market participation. It is often true that the participation rate has no long-run effect on the unemployment rate. Yet, it typically affects the level of wages and, hence, of well-being.

The model developed in this paper combines these requirements. It draws upon Pissarides (1990), Manning (1993) and Cahuc and Zylberberg (1999). Focusing on the population of working age only, each individual can be 'inactive' (i.e. not interested in joining the (formal) labor force), unemployed or employed. Only those who are inactive enjoy 'leisure'. The participation decision rests on a comparison between the pay-offs in inactivity and in activity. The former pay-off is randomly distributed among the agents. In equilibrium, the latter pay-off is the same for everyone because the labor force is made up of equally productive workers and both firms and firm-specific unions are identical. This paper adopts a general equilibrium setting in which collective bargaining causes unemployment. Ex ante identical workers become heterogeneous : Some of them are ex post unemployed while others are employed and benefit from a higher utility level. Within this framework, it is possible to analyze the effects of basic income schemes on participation, employment and the utility levels achieved in the three labor market positions. These effects are analyzed in a steady state only.

Depending on the way they are framed, basic income schemes can have different implications on participation, unemployment and welfare. First, a UCI and an ACI have presumably very different effects on the participation rate. Within the workforce, whether the basic income has a direct impact on the income of the unemployed or not is obviously a second important issue. It is sensible to assume that unemployment benefits initially exist and are proportional to wages.[1] Two scenarios can then be considered that will turn out to affect unemployment differently. For a given wage, either the basic income is higher than the preexisting unemployment benefits and it replaces them (the so-called *full basic income scheme*) or it is lower than these benefits (the so-called *partial basic income*). In the latter case, the instantaneous net income of the unemployed is left unchanged (at given wages), as the level of unemployment benefits is adjusted to top up the basic income. In both cases, the basic income is indexed to the level of unemployment benefits. Combining the two dimensions (UCI or ACI on the one hand, full or partial basic income schemes on the other), this paper deals with four different reforms. All along, it takes the bargaining power of unions as given.

Several papers have adopted an efficiency wage setting to compare the effects of unconditional income and conditional income-replacement schemes (see Bowles, 1992, Atkinson, 1995a, and Groot and Peeters, 1997). In Bowles (1992), the switch from a conditional to an unconditional scheme leads to a drop in the fall-back position of employed workers, which has the expected effects on wages and employment. In a dual labor market, Groot and Peeters (1997) illustrate that the replacement of unemployment insurance and minimum wages by a UCI can deeply affect the structure of jobs. In a dual labor market also, Atkinson (1995a) emphasizes that the effect of this kind of reform depends on the institutional features of the unemployment benefit system. Adopting a wage-bargaining viewpoint, Késenne (1993) develops a static macro model where output prices are exogenous and wages are the outcome of an efficient bargain. He emphasizes the role of basic income on the fall-back positions. Drèze and Sneessens (1997) compares reductions in social security contributions and UCI schemes but they only consider the latter in combination with market-clearing wages and question the plausibility of this assumption. A comparison between the same schemes that does not make this hypothesis will appear in Van der Linden (2000). The partial equilibrium literature about income maintenance has compared means-tested and universal schemes (see Besley, 1990, and Creedy, 1996). The latter paper shows that the presumption in favor of means-testing (supported by the former paper) should be revised if the normative criterion is not only the alleviation of poverty but includes a concern for inequality. Still at the partial equilibrium level, one should also mention the literature on optimum income taxation (see Atkinson, 1995a).

Section 2 will present the model and develop the positive analysis. Section 3 is devoted to the normative analysis. Section 4 will conclude the paper.

[1] About the implications of imposing or not 'fixed replacement ratios', see Pissarides (1998).

2 The model

This section develops a general equilibrium model with imperfect competition on the labor market and, for simplicity, perfect competition on the market for the produced good. This good is the numeraire. It can be consumed or invested. The model considers also two other goods, namely homogeneous labor and capital. Due to space limitation, the model is immediately presented in steady state.[2] Three positions are considered (employment, unemployment and non-participation). The purpose of the model is to highlight the relationships between basic income schemes on the one hand, participation, employment and welfare on the other. Because of constant returns to scale in production, variations in the participation rate will not affect unemployment but well the marginal tax rate. The model considers a small economy facing an exogenous interest rate r[3]. The setting is deterministic and assumes infinitely lived agents with perfect foresight. For simplicity, there is no growth. In each period t, there are n identical firms and P individuals of working age, of which N are active on the (formal) labor market. n and P are exogenous while N is endogenous. This paper considers a unionized economy in which each of the n employers bargains over wages with a firm-specific union.[4] The employer decides unilaterally on employment and on the level of investment. In a given period t, the sequence of decisions is as follows :

1. Each firm decides upon its current investment level which will increase its capital stock in $t + 1$. Therefore, the capital stock is predetermined in period t.

2. A decentralized bargaining over the current wage level takes place in each firm. In accordance with observed behavior, wages are only set for one period. If an agreement is reached, the employees receive each a *net* real wage w_t at the end of the period. Otherwise, workers immediately leave the firm and start searching for a job. In firms where there is a collective agreement, the firm determines labor demand for the current period. Given w_t, the employment level is fixed by labor

[2] Van der Linden (1997) analyzes the dynamics of a simpler model.

[3] There is implicitly 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 circumvent this 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 and their savings behavior is now independent of their past trajectory on the labor market. This assumption about unemployment insurance contracts is no more restrictive than the assumption of risk neutrality introduced below. However, the assumption of Danthine and Donaldson (1990) turns out to be less elegant than it apparently seems. For, their shirking model needs a genuine loss of utility if a shirker is caught. Therefore,they introduce the ad hoc assumption that a shirker who is fired is not eligible to unemployment benefits. Similarly, in an equilibrium search model with endogenous savings, Langot (1996) assumes that during wage bargaining workers 'forget' that the unemployment risk is fully insured. Contrary to the above mentioned papers that focus on the business cycle, the present one is only concerned with steady state properties. Hence, the assumption of a constant world interest rate has no deep implications. Furthermore, at the level of wage formation, it avoids the type of questionable assumptions made in the cited papers.

[4] If the wage bargain takes place at the sectoral level, all the results obviously remain unchanged if the model of the firm developed below is reinterpreted as the one of the sector.

demand and production occurs. In the absence of a collective agreement, nothing is produced during the current period. Yet, the firm will have the opportunity to bargain and to hire workers (without hiring costs) in $t+1$.

3. A proportional tax on earnings, τ_t, is adjusted in order to balance the current public budget constraint.

4. At the end of the period, an exogenous fraction, $q \in (0,1)$, of the employees leaves the firm and enters unemployment.

To solve the model, let us move backwards.

Workers

Individuals are assumed to be risk neutral. This assumption does not claim to be realistic. It is made for tractability reasons. It implies that the role of unemployment benefits and basic income schemes on risk-sharing is ignored. The utility of an individual is simply the present-discounted value of his net income stream. Each member of the active population supplies one unit of labor. If unemployed, this unit of time is used to search for labor (there is no moral hazard). Someone who is out of the labor force uses this unit of time to enjoy 'leisure'.[5] 'Leisure' is worth l_0 in real terms, is untaxed and is lost as soon as one enters the labor force (and starts an unemployment spell). The active population is made of equally productive workers but their innate ability to enjoy 'leisure' differ. This diversity intends to capture different innate abilities in home production or more generally in informal activities. As in chapter 6 of Pissarides (1990), this paper simply assumes that l_0 is drawn from a given distribution. A uniform distribution is considered below. This convenient hypothesis expresses in a stylized way that Western countries are heterogeneous societies as far as the value of 'leisure' is concerned.

Let V_0 (respectively, V_u) denote the steady-state present-discounted value of the real net income stream of someone who is out of the labor force (respectively, who is currently unemployed). In this paper, either the basic income is a UCI and the inactive population receives this transfer (the parameter $\nu = 1$) or it is restricted to the active population and called an ACI ($\nu = 0$). If B is the real level of the (untaxed) basic income,

$$V_0 = \frac{l_0 + \nu B}{1-\beta}, \tag{1}$$

where $\beta = \frac{1}{1+r}$ is the discount factor (by assumption, $\beta \in (0,1)$ and β is common to all agents). People have the choice to participate or not. Therefore, those who prefer to remain 'inactive' necessarily have a higher utility compared to what they could get if they entered the labor market. With equally productive and homogeneous unions and firms, V_u is the same for everyone. So, in order to participate one needs :

$$V_0 \leq V_u \text{ or } l_0 \leq (1-\beta)V_u - \nu B. \tag{2}$$

[5] How people use this 'leisure' is not an issue for the other agents. Some propositions like the Atkinson's 'participation income' list activities (among what is here called 'leisure') that give the right to a basic income because they are in a way or another valuable for the other members of society (see Atkinson, 1995b). This type of externality is left aside here.

Let l_0 be uniformly distributed over the interval $[0, \mathcal{L}]$, with $0 < \mathcal{L} < +\infty$. The participation rate, p, is then simply

$$p = \frac{(1-\beta)V_u - \nu B}{\mathcal{L}}. \tag{3}$$

It has to be checked whether $0 \leq p \leq 1$.

Let Z be the exogenous level of (untaxed) real unemployment benefits. The instantaneous income of an unemployed, v_u, is equal to Z with a partial basic income and B with a full basic income ($B \geq Z$). An unemployed leaves the unemployment pool with the endogenous probability a. In steady state, the intertemporal discounted income of being unemployed, V_u, is given by

$$V_u = v_u + \beta\{aV_e + (1-a)V_u\}, \tag{4}$$

where V_e is the steady-state intertemporal discounted income of a job on average in the economy.[6]

Let us now turn to the present-discounted value of a job held in a given firm j. The instantaneous income is $w_j + B$, where w_j is the net wage in firm j. At the end of any period t, an employee leaves the firm with an exogenous probability q. He is then unemployed at the beginning of period $t+1$ and will be hired by a firm with probability a. The steady-state intertemporal discounted income associated with a job in firm j, $V_{e,j}$, is then given by the following expression :

$$V_{e,j} = w_j + B \ + \ \beta\{q[aV_e + (1-a)V_u] \ + \ (1-q)V_{e,j}\}, \tag{5}$$

where V_e is of the same form as (5) with only one difference : The average net real wage in the economy, w, replaces w_j.

The endogenous hiring rate a can be derived in the following way. The current unemployment level, U_t, is made of those who where unemployed at the beginning of this period and who are not currently hired : $U_t = (1-a_t)(U_{t-1} + N_t - N_{t-1} + qL_{t-1})$, where L designates aggregate employment. The identity $U_t \equiv p_t P - L_t$ can be substituted in the last equality. After division by the size of the workforce P, the steady-state value of the hiring rate, a, is

$$a = \mathcal{A}(\frac{p}{e}) \equiv \frac{q}{\frac{p}{e} - (1-q)}, \ \mathcal{A}' < 0, \tag{6}$$

where e is the steady-state employment rate ($e \equiv \frac{L}{P}$). Notice that the steady-state unemployment rate, u, is equal to $1 - \frac{e}{p}$.

Firms

Assume n identical firms using two inputs (labor L_j and capital K_j) and endowed with an homogeneous of degree one Cobb-Douglas technology : $(\lambda L_j)^\alpha K_j^{1-\alpha}, \lambda > 0, 1 > \alpha > 0, j = 1, ..., n$. Given the sequence of decisions summarized above, the capital stock is predetermined when wages are bargained. To model this bargaining, one needs a profit

[6] The inequalities (2) assume that someone who enters the active population benefits from an intertemporal income V_u whatever his past employment record. Therefore Z looks more like an unemployment assistance scheme than an unemployment insurance.

function conditional on K_j. Assume that profits are untaxed. For a given stock K_j, labor demand in firm j, $L_j(K_j)$, and current optimal profits net of investment, $\pi_j(K_j)$, can be written as :

$$L_j(K_j) = K_j \lambda^{\frac{\alpha}{1-\alpha}} \left(\frac{w_j(1+\tau)}{\alpha} \right)^{\frac{1}{\alpha-1}}, \tag{7}$$

$$\pi_j(K_j) = (1-\alpha) K_j \left(\frac{w_j(1+\tau)}{\alpha\lambda} \right)^{\frac{\alpha}{\alpha-1}}. \tag{8}$$

Wage bargaining

At the beginning of period t, the number of occupied workers in firm j is $(1-q)L_{j,t-1}$. Each of them keeps his job in period t if $(1-q)L_{j,t-1} \leq L_{j,t}$. This condition is obviously verified in steady state. Therefore, a firm-specific union (worried by the interest of occupied workers only) maximizes $V_{e,j}$. It is assumed that if the bargaining fails, the workers immediately leave firm j and search for a job elsewhere in the economy. Redundant workers are assumed to be immediately rehired in another firm with probability a. Hence, the steady-state outside option is

$$V_g = aV_e + (1-a)V_u \tag{9}$$

and the contribution of workers to the Nash product is $V_{e,j} - V_g$.

The optimal steady-state discounted profit of firm j, $\Pi_j(K_j)$, can be defined by the following relationship : $\Pi_j(K_j) = \pi_j(K_j) - I_j + \beta \Pi_j(K_j)$, where I_j is the optimal level of investment in steady state. If the bargaining fails in period t, nothing is produced but investment and future profits are not affected since the firm will have the opportunity to bargain and to hire workers again in period $t+1$. Therefore, the firm's component in the Nash product, i.e. the difference between intertemporal discounted profits in case of an agreement, Π_j, and in the absence of an agreement, $-I_j + \beta\Pi_j$, is simply $\pi_j(K_j)$.

It is plausible and therefore assumed that when they bargain over wages, the firm-specific union and the firm owner take the tax rate τ, the average wage w, the unemployment outflow rate a and the level of Z and B as given. Conditional on a predetermined capital stock K_j and ignoring constant and predetermined terms, the Nash program is

$$\max_{w_j} (w_j)^{\frac{\alpha(1-\gamma)}{\alpha-1}} (V_{e,j} - V_g)^{\gamma}, \tag{10}$$

where γ is the exogenous bargaining power of the union ($0 \leq \gamma \leq 1$). The first-order condition of this problem can be written as

$$V_{e,j} - V_g = \mu w_j, \text{ with } \mu = \frac{\gamma(1-\alpha)}{\alpha(1-\gamma)} \geq 0. \tag{11}$$

By assumption, the 'mark-up' μ is lower than 1, so that the second-order condition is satisfied. The intertemporal rent of an employee, $V_{e,j} - V_g$, is positive if γ is positive too.

Investment and the factor-price frontier

The timing of investment is such that $K_{j,t+1} = I_{j,t} + (1-\delta)K_{j,t}$, δ being the positive depreciation rate. Therefore, in steady state, $I_j = \delta K_j$. However, to understand the model correctly, a general characterization of the investment problem is needed out of steady state. At the beginning of any period t, the level of investment, $I_{j,t}$, should be chosen in order to maximize $\Pi_j(K_{j,t}) = \pi_j(K_{j,t}) - I_{j,t} + \beta\Pi_j(K_{j,t+1})$. This problem can easily be solved (see Cahuc and Zylberberg, 1999).[7] Recall that the technology is homogeneous of degree one. Therefore the first-order conditions only determine the capital-labor ratio. Moreover, they imply that the anticipated wage, $w_{j,t+1}$, should be the same in each firm :

$$(1+\tau_{t+1})w_{j,t+1} = C, \text{ where } C \equiv \alpha\lambda\left(\frac{\delta+r}{1-\alpha}\right)^{\frac{\alpha-1}{\alpha}} > 0. \tag{12}$$

With constant returns to scale and a perfectly competitive goods market, this equality is simply the requirement that firms break even when all factors are chosen optimally.

The equilibrium unemployment rate

Since all firms and unions' characteristics are identical, in a steady-state equilibrium, $w_j = w$ and $V_{e,j} = V_e$, $\forall j \in \{1, ..., n\}$. Then (9) implies that

$$V_e - V_g = (1-a)(V_e - V_u). \tag{13}$$

Combining (4), (5), (6), (11) and (13) leads to the following wage-setting equation :

$$\frac{(w+B)-v_u}{\mu w} + \beta(1-q) = 1 + \frac{q}{\frac{p}{e}-1}. \tag{14}$$

Let us assume that the replacement ratio is constant ($\frac{Z}{w} = z, z \in (0,1)$) and that the basic income is proportional to the unemployment benefits ($B = \xi Z$, $\xi \geq 0$). ξ will be called the basic income-unemployment benefit ratio or the *'basic income ratio'* for short. Let

$$\mathcal{I}(\xi) \equiv \begin{cases} 1 & \text{if } \xi < 1 \text{ (the partial basic income case)}, \\ \xi & \text{if } \xi \geq 1 \text{ (the full basic income case)}. \end{cases} \tag{15}$$

As is standard in the so-called WS-PS approach,[8] the wage-setting ('WS') equation (14) determines then the $\frac{p}{e}$ ratio and, hence, the equilibrium unemployment rate, u :

$$\frac{p}{e} = \mathcal{D}(\xi, z) \equiv 1 + \frac{q}{E(\xi,z)-1}, \tag{16}$$

$$u = \frac{q}{E(\xi,z)-(1-q)}, \tag{17}$$

where $E(\xi, z) \equiv \frac{1-(\mathcal{I}(\xi)-\xi)z}{\mu} + \beta(1-q)$. One obviously needs to check whether $p \geq e$ and $0 \leq u < 1$. These inequalities are satisfied if $E > 1$. The latter is always true in the case of a full basic income. With a partial basic income, a sufficient condition is $z \leq 1 - \mu(1-\beta(1-q)) < 1$. Assume that this upper bound on z holds true.

Several important implications can be derived from (17). First, nor the size of the labor force nor the marginal tax rate influence the equilibrium unemployment rate. This result is fairly standard in this type of model (see e.g. Layard, Nickell and Jackman, 1991). Moreover :

[7] Among other things, Cahuc and Zylberberg (1999) explains why the so-called 'hold-up' problem is not an issue here.

[8] See e.g. Layard, Nickell and Jackman (1991) or Cahuc and Zylberberg (1999).

Result 1 *(i) In the partial basic income case, the equilibrium unemployment rate, u, decreases with the basic income ratio ξ; (ii) in the full basic income case, the equilibrium unemployment rate is independent of ξ and z.*

Proof From (17), the basic income ratio only influences u through E *via* the expression $1-(\mathcal{I}(\xi)-\xi)z$. When $\xi<1$, $\mathcal{I}(\xi)=1$ and $\frac{\partial E}{\partial \xi}>0$. This implies proposition *(i)*. When $\xi\geq 1$, since $\mathcal{I}(\xi)=\xi$, u is not a function of ξ nor of z (proposition *ii*). ■

As a corollary, the equilibrium unemployment rate reaches its minimum as soon as $\xi=1$. The role of the basic income can be understood in an intuitive way. Unions bargain in order to generate a rent for their members. This magnifies the level of unemployment benefits and so reinforces the allocative inefficiency they generate. The partial basic income reduces the reservation wage effect created by unemployment benefits and the full basic income eliminates it. Yet, the way bargaining affects real outcomes is here more subtle than in models where it determines the wage cost. Under the assumption of perfect foresight, the wage cost instantaneously reaches its value defined by (12). Hence, in steady state the wage cost is exogenous. However, the bargaining defines the intertemporal rent of an employee V_e-V_g (see (11)) and ultimately the unemployment rate. To see how, consider the equilibrium equality (13). It establishes that the difference in intertemporal income between an employed worker and a redundant one, V_e-V_g, is proportional to the same difference between an employed and an unemployed, V_e-V_u. The coefficient of proportionality, $1-a$, is positively related to the equilibrium unemployment rate. Now, from (4) and (5), in steady state equilibrium, $V_e-V_u=\frac{w+B-v_u}{1-\beta(1-q)(1-a)}$. Therefore, taking (11) into account, equation (13) can be rewritten as

$$\mu=\frac{1-a}{1-\beta(1-a)(1-q)}\left[\frac{w+B}{w}\left(1-\frac{v_u}{w+B}\right)\right]. \qquad (18)$$

So, for a given 'mark-up' parameter μ, there is a positive relationship between the hiring rate, a, and the term between brackets, which is equal to $1-(\mathcal{I}(\xi)-\xi)z$ in $E(\xi,z)$. In (18), each of the two ratios between brackets points to a different mechanism through which the basic income influences the steady-state unemployment rate.

The first ratio is related to the literature about the relationship between wage bargaining and progressive taxation (see e.g. Lockwood and Manning, 1993). Intuitively, the main message of this literature is the following. If the tax schedule becomes more progressive, a marginal increase in the negotiated wage has a less favorable effect on the rent of a union member but it remains as detrimental for profits. Hence, the bargained wage becomes lower. Let η designate the so-called coefficient of residual income progression, i.e. the elasticity of the net income of an employed worker $(w+B)$ with respect to w. The lower this elasticity, the less income increases with earnings. Hence, the more the tax schedule is said to be progressive. Obviously here, $\eta\equiv\left(\frac{w+B}{w}\right)^{-1}=(1+\xi z)^{-1}$. As ξ increases, η decreases and progressivity increases. Therefore, from (18), a positive adjustment of the hiring rate a is needed. Put another way, u decreases.

The second ratio, $\frac{v_u}{w+B}$, captures the role of the '*effective* replacement ratio' (namely, the ratio between instantaneous incomes in unemployment and in work). An increase in the 'effective replacement ratio' decreases the bracketed term in (18) because the rent $V_e - V_u$ shrinks in relative terms. To comply with the optimality condition (18), this needs to be compensated by a decrease in a. If the partial basic income ratio increases, the 'effective replacement ratio', $\frac{z}{1+\xi z}$, becomes lower because the basic income favors in-work net income without influencing z. This lowers the equilibrium unemployment rate. On the contrary, an increase in the full basic income ratio boosts the 'effective replacement ratio' and has the opposite effect on unemployment. With risk-neutral workers, the latter effect exactly compensates the first one (hence, proposition *(ii)* in Result 1).

The equilibrium participation rate

In steady state, from (4), (5) and (12), it can be checked that

$$V_u = \frac{\beta a(1+\xi z) + (1-\beta(1-q(1-a)))\mathcal{I}(\xi)z}{(1-\beta)(1-\beta(1-a)(1-q))}\frac{C}{1+\tau}. \tag{19}$$

Equality (19) can now be substituted in (3). This yields the following expression for the steady-state participation rate :

$$p = \frac{C}{\mathcal{L}(1+\tau)}\left[\frac{\beta a(1+\xi z) + (1-\beta(1-q(1-a)))\mathcal{I}(\xi)z}{(1-\beta(1-a)(1-q))} - \nu\xi z\right], \ \nu = 0, 1. \tag{20}$$

Let $\mathcal{P}(\tau, a, \xi)$ designate the right-hand side of (20). It can be verified that

$$\frac{\partial \mathcal{P}}{\partial \tau} < 0 \text{ and } \frac{\partial \mathcal{P}}{\partial a} > 0. \tag{21}$$

Obviously, everything else equal, increasing the marginal tax rate reduces income in case of participation. The second property in (21) is the 'added-worker effect' according to which a higher hiring rate boosts participation. Looking at (20), one should expect that the marginal effect of ξ on participation is very different whether ν is zero (the ACI case) or one (the UCI case). For, in the first case, increasing ξ only raises V_u, while, in the second case, both V_u and V_0 increase. When $\nu = 1$, it can be checked that an increase in the partial basic income ratio has a negative marginal effect on participation. On the contrary, the increases in V_u and V_0 compensate each other in the case of the full UCI. Table 1 summarizes the marginal effects of ξ on $\mathcal{P}(\tau, a, \xi)$:

Table 1: The partial effect of the basic income-unemployment benefit ratio on the participation rate.

	Partial basic income $\xi < 1, \mathcal{I}(\xi) = 1$	Full basic income $\xi \geq 1, \mathcal{I}(\xi) = \xi$
ACI ($\nu = 0$)	$\frac{\partial \mathcal{P}}{\partial \xi} > 0$	$\frac{\partial \mathcal{P}}{\partial \xi} > 0$
UCI ($\nu = 1$)	$\frac{\partial \mathcal{P}}{\partial \xi} < 0$	$\frac{\partial \mathcal{P}}{\partial \xi} = 0$

This table does not provide the total net effect of the basic income on the steady-state participation rate. For the basic income ratio can also have an effect on the hiring rate, a, and on the balanced-budget marginal tax rate, τ. Let us first consider the former. Equation (6) tells that a is a decreasing function of $\frac{p}{e}$. Moreover, from (16), $\frac{p}{e}$ is ultimately a function of ξ, with $\frac{\partial \mathcal{D}}{\partial \xi} < 0$ when $\xi < 1$ and $\frac{\partial \mathcal{D}}{\partial \xi} = 0$ when $\xi \geq 1$. Therefore, increasing the partial basic income ratio has a positive effect on the hiring rate and, because $\frac{\partial \mathcal{P}}{\partial a} > 0$, this boosts the steady-state participation rate. This effect is not present in the full basic income case.

The steady-state balanced budget constraint varies according to the type of basic income one considers. It can be written in the following way :

$$\tau = \mathcal{T}(p, e, \xi) \equiv \begin{cases} \frac{z}{e}\left[p - e + \xi(e + \nu(1-p))\right] & \text{if a partial basic income applies} \\ \frac{\xi z}{e}\left[p + \nu(1-p)\right] & \text{if a full basic income applies.} \end{cases} \tag{22}$$

In these expressions, the n firm owners are included in the inactive population. From (22), it is easily checked that $\frac{\partial \mathcal{T}}{\partial p} \geq 0$, $\frac{\partial \mathcal{T}}{\partial e} < 0$ and $\frac{\partial \mathcal{T}}{\partial \xi} > 0$. When $\nu = 0$, it is convenient to rewrite $\mathcal{T}(p, e, \xi)$ as a function of $\frac{p}{e}$ and ξ, say $T\left(\frac{p}{e}, \xi\right)$, with $\frac{\partial T}{\partial \frac{p}{e}} > 0$ and $\frac{\partial T}{\partial \xi} > 0$. Now, because $\frac{\partial \mathcal{P}}{\partial \tau} < 0$, increasing the basic income ratio has a negative effect on participation through its direct effect on the marginal tax rate. However, with a partial basic income, there is an opposite effect coming from the lower level of unemployment or put differently from $\frac{\partial T}{\partial \frac{p}{e}} > 0$ (or its equivalent when $\nu = 1$).

To sum up, p, e and τ are given by the system of equations (16), (20) and (22). Consider first the full basic income. If it is a UCI, participation is lower when the basic income ratio increases. The balance of the direct effect $\frac{\partial \mathcal{P}}{\partial \xi} > 0$ and the indirect one through taxation is however ambiguous with a full ACI. In the case of a partial basic income, an additional induced effect on the hiring rate comes into play. Improved prospects of employment plays a role through the 'added worker effect' and through taxation. The net impact of the basic income ratio on participation has also an ambiguous sign. Formally, when $\nu = 0$, one has (a somewhat more intricate expression arises when $\nu = 1$) :

$$\frac{dp}{d\xi} = \underset{\gtreqless 0}{\frac{\partial \mathcal{P}}{\partial \xi}} + \underset{<0}{\frac{\partial \mathcal{P}}{\partial \tau}} \Big[\underset{>0}{\frac{\partial T}{\partial \frac{p}{e}}} \; \underset{<0}{\frac{d\mathcal{D}}{d\xi}} + \underset{>0}{\frac{\partial T}{\partial \xi}} \Big] + \underset{>0}{\frac{\partial \mathcal{P}}{\partial a}} \; \underset{<0}{\frac{d\mathcal{A}}{d\frac{p}{e}}} \; \underset{<0}{\frac{d\mathcal{D}}{d\xi}}, \quad \xi < 1$$

where $\frac{\partial \mathcal{P}}{d\xi} > 0$ in the case of a partial ACI and $\frac{\partial \mathcal{P}}{d\xi} < 0$ with a partial UCI. To conclude, no clear analytical conclusion can be reached except for the full UCI (in which case $\frac{dp}{d\xi} < 0$). The next section will report the results of simulations.

3 The effect of basic income schemes on welfare

This section raises two questions. First, what is the optimal level of the basic income ratio ξ conditional on a given value of the replacement ratio z. In a second step, this section deals with the optimal level of the pair (ξ, z). Since the basic income has been defined as proportional to the level of unemployment benefits, it should be remembered that the latter clearly plays a role even in the full basic income case.

In this paper, four types of individuals are distinguished : The employed, the unemployed, the inactive and the firm owners. However, the two last groups can be combined for perfect competition on the goods market and the constant-returns-to-scale assumption imply that the firm breaks even if condition (12) applies. So, it is convenient to consider the firm owners as members of the inactive population. Equation (1) defines the intertemporal discounted income of those who are out of the labor force in steady state. So does equation (19) for the unemployed. The steady-state intertemporal discounted income of those currently employed can be written as :

$$V_e = \frac{[1-\beta(1-a)](1+\xi z) + \beta q(1-a)\mathcal{I}(\xi)z}{(1-\beta)(1-\beta(1-a)(1-q))}\frac{C}{1+\tau} > V_u. \tag{23}$$

Within a *welfarist* perspective, these steady-state intertemporal discounted income (or utility) levels V_e, V_u and V_0 are relevant indicators for a normative analysis.

3.1 A normative analysis conditional on the replacement ratio z

In general, basic income schemes have rather intricate effects on V_e, V_u and V_0. For given values of $\nu \in \{0,1\}$ and $z \in (0,1)$, equalities (6) and (16) allow to rewrite respectively (19) and (23) as $V_u = \mathcal{V}_u(\xi, \mathcal{A}(\mathcal{D}), \tau)$ and $V_e = \mathcal{V}_e(\xi, \mathcal{A}(\mathcal{D}), \tau)$. In these expressions, $\mathcal{D} = \mathcal{D}(\xi, z)$ has been defined in (16) and $\tau = \mathcal{T}(p, e, \xi)$ (or $\tau = T(\mathcal{D}(\xi, z), \xi)$ when $\nu = 0$) has been defined in (22). These expressions emphasize that the basic income ratio, ξ, has not only a direct effect on V_u and V_e but also indirect effects through the hiring rate a and the marginal tax rate τ. Conditional on τ, it can easily be verified that increasing the level of ξ or a pushes up the intertemporal income levels of the employed and the unemployed:

$$\frac{\partial V_e}{\partial \xi} = \begin{cases} \frac{(1-\beta(1-a))zw}{(1-\beta)(1-\beta(1-a)(1-q))} > 0 & \text{if a partial basic income applies} \\ \frac{zw}{(1-\beta)} > 0 & \text{if a full basic income applies.} \end{cases} \tag{24}$$

$$\frac{\partial V_u}{\partial \xi} = \begin{cases} \frac{\beta azw}{(1-\beta)(1-\beta(1-a)(1-q))} > 0 & \text{if a partial basic income applies} \\ \frac{zw}{(1-\beta)} > 0 & \text{if a full basic income applies.} \end{cases} \tag{25}$$

$$\frac{\partial V_e}{\partial a} = \frac{(1-\beta)\beta q[1-(\mathcal{I}(\xi)-\xi)z]w}{[(1-\beta)(1-\beta(1-a)(1-q))]^2} > 0 \tag{26}$$

$$\frac{\partial V_u}{\partial a} = \frac{(1-\beta)\beta[1-\beta(1-q)][1-(\mathcal{I}(\xi)-\xi)z]w}{[(1-\beta)(1-\beta(1-a)(1-q))]^2} > \frac{\partial V_e}{\partial a}. \tag{27}$$

Moreover, from (1) and $B = \xi z w = \xi z \frac{C}{1+\tau}$, it is clear that $\frac{\partial V_0}{\partial \xi}$ is positive if $\nu = 1$ and zero otherwise. Furthermore, conditional on τ, the hiring rate has no effect on V_0. Obviously, a marginal increase in τ has a negative effect on V_e, V_u and, if $\nu = 1$, on V_0.

These partial results can now be combined to yield the total (or net) effect of a marginal increase in ξ on the various intertemporal income levels. If $\nu = 0$, this effect can be written as (a similar expression can be derived if $\nu = 1$) :

$$\begin{array}{cccccccccl} \frac{dV_k}{d\xi} = & \frac{\partial V_k}{\partial \xi} & +\frac{\partial V_k}{\partial a} & \frac{d\mathcal{A}}{\frac{p}{e}} & \frac{d\mathcal{D}}{d\xi} & +\frac{\partial V_k}{\partial \tau} & [\frac{\partial T}{\partial \xi} & +\frac{\partial T}{\frac{p}{e}} & \frac{d\mathcal{D}}{d\xi}] & \lesseqqgtr 0, \quad k = e,\ u \\ & > 0 & > 0 & < 0 & \leq 0 & < 0 & > 0 & > 0 & \leq 0 & \end{array}$$

where $\frac{d\mathcal{D}}{d\xi} < 0$ (resp., $= 0$) in the case of a partial (resp., full) basic income. The sign of $\frac{dV_k}{d\xi}$ is generally ambiguous if a higher basic income implies more heavy taxes (i.e. if $\frac{d\tau}{d\xi} \equiv \frac{\partial T}{\partial \xi} + \frac{\partial T}{\frac{P}{e}} \frac{d\mathcal{D}}{d\xi} > 0$). It can be checked that this condition holds with a full basic income (whether $\nu = 0$ or 1). Numerical simulations show that this is typically also true in the case of the partial basic income. Henceforth, the property $\frac{d\tau}{d\xi} > 0$ is taken for granted.

The net effect of ξ on V_0 is zero if $\nu = 0$. If $\nu = 1$, the sign is typically ambiguous :

$$\frac{dV_0}{d\xi} = \underset{>0}{\frac{\partial V_0}{\partial \xi}} + \underset{<0}{\frac{\partial V_0}{\partial \tau}} \underset{>0}{\frac{d\tau}{d\xi}} \lesseqqgtr 0$$

The following properties can nevertheless be proved:

Result 2 *The intertemporal discounted income of those currently employed, V_e, increases with the level of the partial active citizens' income ratio ξ.*

Proof In the appendix, it is shown that the sufficient condition $\frac{\partial V_e}{\partial \xi} + \frac{\partial V_e}{\partial \tau} \frac{\partial T}{\partial \xi} > 0$ holds when $\nu = 0$ and $\xi < 1$. ■

The same property does not always hold for the unemployed. It can be shown that $\frac{\partial V_u}{\partial \xi} + \frac{\partial V_u}{\partial \tau} \frac{\partial T}{\partial \xi} < 0$. The favorable effect of the partial basic income on the hiring rate has to be strong enough in order to have $\frac{dV_u}{d\xi} > 0$. The level of the discount factor β appears to be crucial here. Intuitively, a too low β means that the future improvement in the hiring probability is heavily discounted and this future effect is outweighed by the increase in taxes that lowers the current net wage and hence the level of the unemployment benefits.

Result 3 *Raising the level of the full basic income ratio cannot be a Pareto-improving reform.*

Proof In the appendix, it is shown that when $\nu = 0$, V_e shrinks and V_u rises when ξ increases. If $\nu = 1$, V_e decreases with ξ while V_0 improves. ■

A numerical analysis is now developed to provide more insight into the normative implications of basic income schemes. Each period is assumed to last a year. Let $\alpha = 0.7, \gamma = 0.4$, hence $\mu = 0.29$, $\beta = 0.95$, $q = 0.2$ and $z = 0.45$. The value of α is very standard. γ is chosen so as to yield an equilibrium unemployment rate close to the values observed during the nineties in the E15 area (about 10%). The value of the separation rate q is in accordance with the results of Burda and Wyplosz (1994). It is fairly difficult to find European data about average ratios of unemployment benefits over *net* wages. Nevertheless, $z = 0.45$ is not at odds with the results provided in OECD (1996). The ratio $\frac{C}{\mathcal{L}}$ plays a role in the participation equation (20). It can be interpreted as the ratio between the net wage that could be paid if taxes were equal to zero (see (12)) and the magnitude of the dispersion of preferences for 'leisure' ($\mathcal{L}$). Since the other parameters are relevant for Europe, the ratio $\frac{C}{\mathcal{L}}$ is fixed so that the participation and employment rates generated in steady state for $\xi = 0$ are close to their values during the nineties in the E15 area (respectively, about 69% and 61%).[9] This leads to the assumption $\frac{C}{\mathcal{L}} = 0.8$.

[9]See the data appendix of the *Employment in Europe* annual issues.

Since the effects of basic income schemes on intertemporal utilities depend on their effect on the unemployment, employment and participation rates, consider first these aggregates (see Figure 1). As far as the participation and employment rates are concerned, the profile is strongly different according to the value of ν. When $\nu = 0$, the participation rate, $p(0)$, increases steadily from 69 % when $\xi = 0$ up to 73%. So the balance of the various net effects introduced at the end of Section 2 yields a monotonous, yet small, increase in participation. The rise in the employment rate, $e(0)$, is more substantial from 61% up to 68%. On the contrary, when $\nu = 1$, both the participation and employment rates, $p(1)$ and $e(1)$, collapse. As it turns out from Figure 2, this leads to an exponential increase in the marginal tax rate $\tau(\nu = 1)$. As ξ tends towards 0.8 (the level of the basic income B tends to 36% of the net wage), the marginal tax rate tends to 100%. The profile is clearly different if an ACI applies. Ignoring all public expenses except those required to finance the unemployment benefits, the marginal tax rate is about 5% when $\xi = 0$. $\tau(\nu = 0)$ amounts to 18% when $\xi = 0.3$ (a basic income equal to 13.5% of the net wage). As shown in Section 2, the unemployment rate is highest in the absence of a basic income (about 10.5%), it decreases with ξ and reaches its minimum (less than 6%) when the ratio between the basic income and the unemployment benefits equals 1 (see Figure 1).

Figure 3 shows the profile of the intertemporal income levels as ξ increases when $\nu = 0$. This figure and the following ones will not display V_0 but well $E_{l_0}[V_0|V_0 > V_u]$, which is the expectation over l_0 of the discounted utility V_0 derived by those who choose to be inactive.[10] As expected from (2) and (23), $E_{l_0}[V_0|V_0 > V_u] > V_e > V_u$ (see Figure 3). Moreover, as the ACI ratio, ξ, increases, the intertemporal discounted income levels of the three categories grows, too. There is no claim that this is a general property. However the same tendency has been observed for a large range of parameter values. As long as the discount factor β is not too low, it turns out that introducing a partial ACI is Pareto-improving. Notice that the picture is very different if one looks at *instantaneous* income levels. The net wage is inversely related to the tax rate (see (12)) and, hence, to ξ (see Figure 4). The same is true for unemployment benefits when $\xi < 1$. With a full basic income, the net instantaneous income of the unemployed increases with ξ and decreases with τ but the net effect is positive. Figure 4 illustrates that the *instantaneous level* of income of those currently unemployed can be higher with a sufficiently small basic income ratio ξ than with a high one. The same figure also shows that the net instantaneous *income* of the employed increases with ξ when $\xi \leq 1$ because the drop in net wages is more than compensated by the basic income.

With a UCI, Figure 5 shows a different profile than Figure 3. When ξ is small, the inactive population takes advantage of the basic income but soon the increase in taxation is so huge that eventually V_0 shrinks. For the active population, the reform is unfavorable.

[10] $E_{l_0}[V_0|V_0 > V_u]$ only depends on the $\frac{C}{\mathcal{L}}$ ratio and increases with V_u. A higher V_u means more participants to the labor market. As the inactive population is characterized by the upper-part of the distribution of l_0, it is easily seen that $E_{l_0}[V_0|V_0 > V_u]$ increases with V_u.

3.2 Searching for the optimal replacement and basic income ratios (z, ξ)

This subsection raises the question of the optimal (z, ξ) pair. Let us start with two preliminary remarks. First, if the optimal z is positive, this value should be seen as a lower bound of the level found in a more comprehensive model dealing with risk aversion. Second, since only steady-state values are considered, nothing is said on the path between two equilibria (say, from a high-z and high unemployment situation to a low-z and low unemployment one). This important issue is out of the purview of this paper.

Lowering z reduces public outlays and the unemployment rate if $\xi < 1$. Yet, reducing z has a negative effect on the intertemporal income level of the three groups.[11] Therefore, the optimal value of z is an open issue. If $\nu = 0$, it can easily be shown that :[12]

$$\begin{array}{cccccccccc} \frac{dV_k}{dz} = & \frac{\partial V_k}{\partial z} & + \frac{\partial V_k}{\partial a} & \frac{d\mathcal{A}}{\frac{p}{e}} & \frac{d\mathcal{D}}{dz} & + \frac{\partial V_k}{\partial \tau} & [\frac{\partial T}{\partial z} & + \frac{\partial T}{\frac{p}{e}} & \frac{d\mathcal{D}}{dz}], & k = e,\ u \\ & > 0 & > 0 & < 0 & \geq 0 & < 0 & > 0 & > 0 & \geq 0 & \end{array}$$

with strict inequalities in the case of the partial basic income. Obviously, z cannot influence V_0 if $\nu = 0$. If $\nu = 1$, the total effect of a marginal increase in z is :

$$\begin{array}{cccccc} \frac{dV_0}{dz} = & \frac{\partial V_0}{\partial z} & + \frac{\partial V_0}{\partial \tau} & [\frac{\partial T}{\partial z} & + \frac{\partial T}{\frac{p}{e}} & \frac{d\mathcal{D}}{dz}] \\ & > 0 & < 0 & > 0 & > 0 & \geq 0 \end{array}$$

Let ϵ be a parameter that reflects different views about the desirability of redistribution. The social welfare function, denoted by Γ, can be written as :

$$\Gamma \equiv \frac{1}{\epsilon} \left[e\,(V_e)^{\epsilon} + (p - e)\,(V_u)^{\epsilon} + (1 - p)\,(E_{l_0}\,[V_0 | V_0 > V_u])^{\epsilon} \right], \text{ with } \epsilon \leq 1,\ \epsilon \neq 0. \qquad (28)$$

Since e, p, V_e, V_u and V_0 are rather involved functions of (ξ, z), this section develops a numerical analysis.[13] Two particular forms of Γ will be considered : The standard utilitarian criterion $\epsilon = 1$ and the limit case as $\epsilon \to -\infty$. The latter is an interpretation of the Rawlsian criteria. It amounts to maximizing the intertemporal utility level V_u.

With the same parameters as before, consider first the ACI. Table 2 is devoted to the standard utilitarian case. It turns out that the average intertemporal income level is a rather flat function of the (z, ξ) pair. As z increases from zero, the aggregate income level shrinks a little if a partial basic income is introduced. One can conjecture that a more comprehensive model with risk aversion would lead to a strictly positive optimal (z, ξ) pair. With the utilitarian criterion, a full basic income is slightly preferable to a partial one and to the 'no social protection' benchmark $(z = 0, \xi = 0)$. Notice that when $\xi \geq 1$, the effect of z is negligible. Unreported numerical results indicate that compared to the 'no social protection' benchmark, V_e is somewhat lower for $z > 0$ and $\xi > 0$ but the difference becomes negligible as $\xi \to 1$. This property is not verified in the case of $E_{l_0}\,[V_0 | V_0 > V_u]$. Compared to $(z = 0, \xi = 0)$, a wide range of positive (z, ξ) pairs improve $E_{l_0}\,[V_0 | V_0 > V_u]$. Table 3 shows how the intertemporal income of the least well-off is affected by changes

[11] If $\nu = 1$; otherwise only the intertemporal income of the active population is directly influenced by z.
[12] A similar expression can be derived if $\nu = 1$.
[13] An analytical property is presented in the appendix.

in (z, ξ). Compared to the benchmark $(0, 0)$, a positive replacement ratio z combined with a sufficiently high partial basic income ratio pushes V_u up, yet the effect is not large. According to Table 3, a 'Rawlsian' (in the sense defined above) would opt for a corner solution (since V_u monotonically grows as z rises if $\xi > 1$). Remember however that the marginal tax rate τ sharply increases. For instance, when $\xi = 1.2$ and $z = 0.6$, $\tau = 0.76$. For political reasons or for economic ones not captured by the model (such as investment in human capital), it is extremely doubtful that such values could be implemented. One interpretation could be that the tax base should be enlarged to finance such a level of social protection.

Table 4 extends the available information by comparing various indicators in three contrasted institutional settings. Column 2 is devoted to the 'no social protection case', column 3 to an example of current institutions (a replacement ratio equal to 50%) and column 4 to a full ACI amounting to 50% of the net wage. This table highlights the consequences of the choice between these stylized settings. If one moves from the 'no social protection case' to the 'current institutional setting', the instantaneous gain for the least well-off is huge but, since the risk of unemployment sharply increases, even the intertemporal income of this category is weakened (this could change if the improvement in risk-sharing was included and/or the discount factor was sufficiently different). Abandoning the 'no social protection case' in favor of the full ACI is not a welfare improvement but the instantaneous and intertemporal advantage for the least well-off should presumably outweigh the small loss for those currently employed. By the way, the instantaneous net income of the latter is nearly unchanged but obviously its composition is deeply modified. Now, if the 'current institutional setting' is replaced by the full ACI, the gains are clear in an intertemporal perspective but the transition from one system to the other is clearly an issue for those currently unemployed whose instantaneous income substantially shrinks.

Unreported simulation results indicate that the introduction of a UCI has a strong negative impact on both the utilitarian criterion and the 'Rawlsian' one. More specifically, starting from the no social protection benchmark, an increase in ξ and z deteriorates these two social welfare indicators. V_e shrinks, too. This type of reform is however not a Pareto-deterioration since $E_{l_0}\left[V_0 | V_0 > V_u\right]$ improves for a wide range of positive values of (z, ξ).

This broad pattern has been observed for other values of the parameters, too. It leads to a rather positive appraisal of ACI schemes and a negative one of UCI schemes. The conclusion will qualify this assessment.

4 Conclusion

In addition to their contribution to risk-sharing, unemployment benefits raise the reservation wage and this leads to an inefficient level of employment. To answer that problem, one can reduce unemployment benefits (and share risks less efficiently) or issue an employment subsidy to firms without reconsidering the level of these benefits. Among the alternatives, a transfer can be handed out to all citizens or only to workers whether they are employed or not. This paper has analyzed the pros and cons of the latter approaches. In a setting where unemployment benefits initially exist, the ratio of these benefits to wages (the replacement ratio) has first been taken as given. Two scenarios have been envisaged. For a given wage, either the basic income is higher than the preexisting unemployment benefits and it replaces them (the *full basic income*) or it is lower than these benefits (the *partial basic income*) and the instantaneous net income of the unemployed is left unchanged. In both cases, the basic income is by assumption indexed to the level of unemployment benefits.

To contribute to the debate about the consequences of a basic income in Western Europe, this paper has proposed a dynamic and general equilibrium model in which collective bargaining magnifies the reservation wage effect. Ex ante identical workers are either unemployed or employed ex post. The model has also dealt with labor market participation. There is no doubt that the introduction of a basic income influences the decision to participate. In this respect, it is useful to introduce a distinction between the 'unconditional income', UCI for short (a basic income paid to each individual whether he takes part to the labor force or not), and the so-called 'active citizen's income', ACI for short (a basic income handed out to the workforce only). Under constant returns to scale in production, the participation rate has no long-run effect on the unemployment rate but it affects the level of taxes needed to finance public outlays and therefore it influences the net wage and ultimately welfare. Compared to microsimulation exercises and to the standard optimal taxation literature, this paper has greatly simplified the heterogeneity of individual situations. This is the price to be paid in order to be able to deal with behavioral changes and imperfect competition on the labor market. Whether the imperfectly competitive European institutions should or could be replaced by a perfect labor market is an issue that this paper has not raised. The relative bargaining power of the agents has been taken as given. This does not preclude that basic income schemes affect the outcome of collective bargaining and eventually unemployment and welfare. Focusing on steady-state properties, this paper has shown that the equilibrium unemployment rate decreases as a partial basic income is introduced and this effect is maximal when the ratio between the basic income and the unemployment benefits is just equal to the one. For then the allocative effect of the unemployment compensation system disappears. For these properties, the distinction between ACI and UCI is irrelevant.

Handing out a basic income that produces this maximal effect on unemployment is however typically expensive. Given the current taxation rules in Europe, it has been assumed that the basic income should be financed by a tax on earnings. For simplicity, linear taxes and a uniform distribution of the value of leisure have been assumed. It turns out that the decrease in unemployment is insufficient to compensate the increase in public expenses due to the basic income. The marginal tax rate has therefore to increase in order to balance the budget of the State. Since proportional taxes are absorbed entirely by workers, this has a negative effect on net earnings and, hence, on the level of unemployment benefits, on participation and on aggregate welfare. This impact turns out to be strong in the case of a UCI. Simulation results indicate that a UCI has a harmful net effect on the intertemporal discounted utilities of the employed and the unemployed. Since the goal is not only to cut unemployment but also to enhance intertemporal levels of utility, this paper has explored the properties of the less unconditional ACI. At first glance, it seems obvious that a more restrictive eligibility condition should reduce public expenses. Things are more complicated however. On the one hand, in the long-run more labor market participants implies an equivalent increase in employment and this enlarges the taxable income. On the other hand, the ACI boosts participation to the labor market, which increases the number of beneficiaries of the basic income. Yet, taking all these effects into account, the increase in the marginal tax rate is substantially lower if the basic income is handed out only to the workforce than if it is distributed unconditionally. Simulation results show that a partial ACI is often a Pareto-improvement compared to a situation without basic income. The intertemporal income of those currently employed increases with the ratio of the partial ACI to the unemployment benefits. This is also true for those currently unemployed provided that the discount rate is not too high.

In the last part of the paper, the replacement ratio has been endogeneized. This has allowed a comparison between the various basic income schemes and a benchmark situation with 'no social protection' (understood as no basic income nor unemployment allowances). For tractability reasons, this paper has assumed risk-neutral workers. Obviously then, the optimal level of social protection can only be a lower-bound of its desirable magnitude when risk aversion is taken into account. Nevertheless, it is interesting to observe that the intertemporal discounted income of the least well-off (the unemployed) is somewhat improved when a positive replacement ratio is associated with a well-chosen partial ACI and even more so when a full ACI is introduced. The effect on the aggregate (intertemporal discounted) income is negative but small if an appropriate partial ACI is chosen and it is negligible with the full ACI. The appraisal of a UCI remains very negative.

Further research is clearly needed. There is a need for an extensive analysis of the effect of a basic income and high taxation on investment made by individuals to promote skills and efficiency. The advantage of ACI compared to UCI partly relies upon the extreme assumption of perfect and costless information about the economic position of individuals. With moral hazard, the distinction between unemployment and inactivity and hence between ACI and UCI would be less clear-cut. The normative conclusions of this paper could also significantly change if people became eligible to a basic income if they develop 'activities' (other than paid work) generating a positive external effect on the welfare of others (as in the Atkinson's 'participation income'). One should also deepen the analysis of the effect of basic income schemes on wage bargaining. In a setting where the lack of an agreement leads to a dispute not to the end of the match, the outcome of the wage bargain would be very different whether or not the basic income increases the fall-back position of workers in case of a strike. This would be the case with a UCI but presumably not with an ACI. It has been assumed that unions and workers are indifferent if a marginal decrease in wages is exactly compensated by a marginal increase in the basic income. More empirical work is needed to check the plausibility of this assumption. Furthermore, there is a need for a thorough investigation of the dynamic path of the economy after a basic income is introduced. For, compared to an initial situation characterized by unemployment benefits and no basic income, the instantaneous income of an unemployed is lower in the new equilibrium with a basic income. In addition, one should check to what extent another representation of preferences for leisure would change the response of participation to income. Finally, more heterogeneity among workers would allow to analyze non unionized segments of the labor market. In this context, it would for instance be interesting to look at the effects of basic income schemes when employers have some monopsony power in these segments.

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Appendix

Proof of Result 2

If $\nu = 0$ and $\xi < 1$, it can be checked that $\frac{\partial V_e}{\partial \xi} + \frac{\partial V_e}{\partial \tau}\frac{\partial T}{\partial \xi} = \frac{qz^2 w}{(1-\beta(1-a)(1-q))(1+\tau)(E-1)} > 0$.

Proof of Result 3

If $\nu = 0$, it can be seen that :

$$\frac{dV_e}{d\xi} = \frac{zw}{1-\beta}\left(1 - \frac{\rho_1 + \xi z}{\frac{e}{p} + \xi z}\right) < 0, \text{ where } \rho_1 = \frac{1-\beta(1-a)}{1-\beta(1-a)(1-q)} > \frac{e}{p} \tag{29}$$

since $\frac{e}{p} = \frac{a}{q+a(1-q)}$ and

$$\frac{dV_u}{d\xi} = \frac{zw}{1-\beta}\left(1 - \frac{\rho_2 + \xi z}{\frac{e}{p} + \xi z}\right) > 0, \text{ where } \rho_2 = \frac{\beta a}{1-\beta(1-a)(1-q)} < \frac{e}{p}. \tag{30}$$

If $\nu = 1$, one shows that :

$$\frac{dV_0}{d\xi} = \frac{zw}{1-\beta}\left(1 - \frac{\xi z}{e+\xi z}\left[1 + \frac{\xi z}{e + \xi z}\right]\right) > 0, \tag{31}$$

for the term between parentheses is a second-order polynomial in $\frac{\tau}{1+\tau} = \frac{\xi z}{e+\xi z}$ taking positive values for all relevant values of τ. In addition,

$$\frac{dV_e}{d\xi} = \frac{zw}{1-\beta}\left(1 - \frac{\rho_1 + \xi z}{e+\xi z}\left[1 + \frac{\xi z}{e + \xi z}\right]\right) < 0,\ \rho_1 > \frac{e}{p} \geq e. \tag{32}$$

Increasing z cannot be recommended on Paretian grounds if $\xi \geq 1$

Looking at the definition of V_e, V_u, V_0 and τ, it is readily seen that properties (29) to (32) are still valid when the derivative is taken with respect to z instead of ξ. More precisely, when $\xi \geq 1$ and $\nu = 0$, the sign of $\frac{dV_e}{dz}$ (respectively, $\frac{dV_u}{dz}$) and $\frac{dV_e}{d\xi}$ (respectively, $\frac{dV_u}{d\xi}$) are the same. Similarly, when $\xi \geq 1$ and $\nu = 1$, the sign of $\frac{dV_0}{dz}$ (respectively, $\frac{dV_e}{dz}$) and $\frac{dV_0}{d\xi}$ (respectively, $\frac{dV_e}{d\xi}$) are the same. So, for a given value of $\xi \geq 1$, increasing the level of z cannot be Pareto-improving.

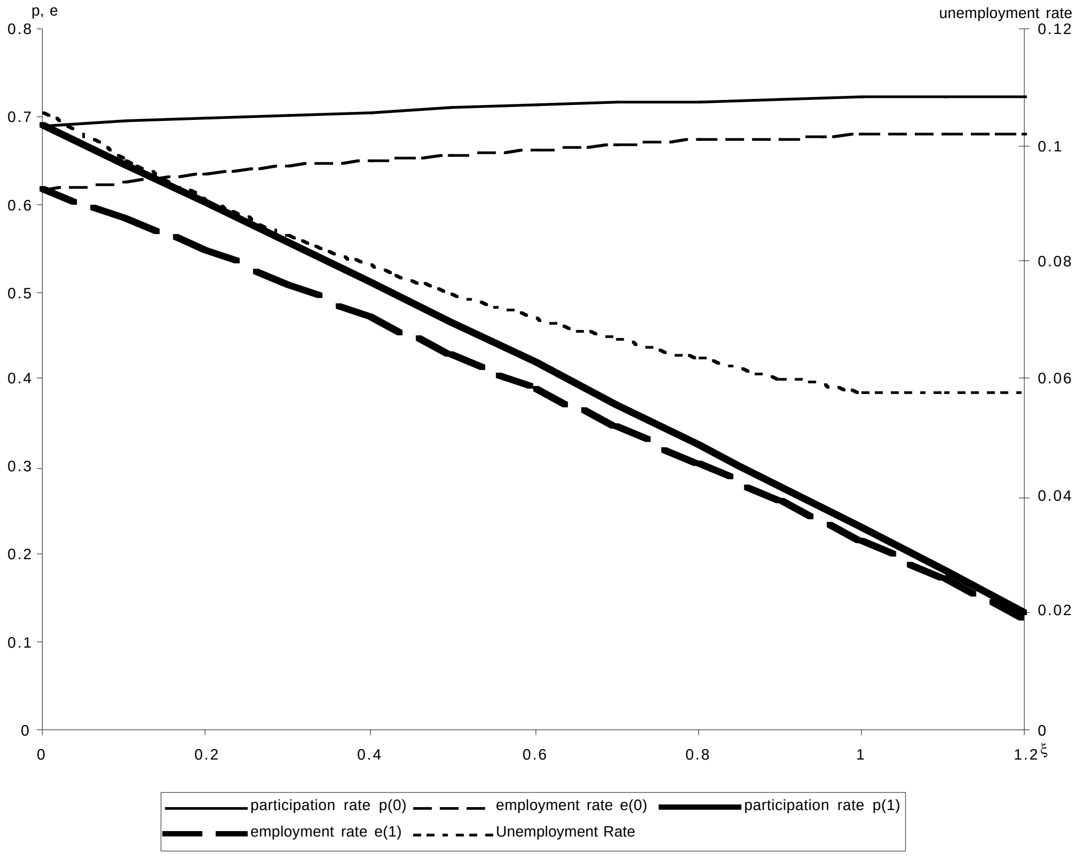

Figure 1: The steady-state equilibrium participation, employment and unemployment rates as a function of ξ and $\nu \in \{0, 1\}$.

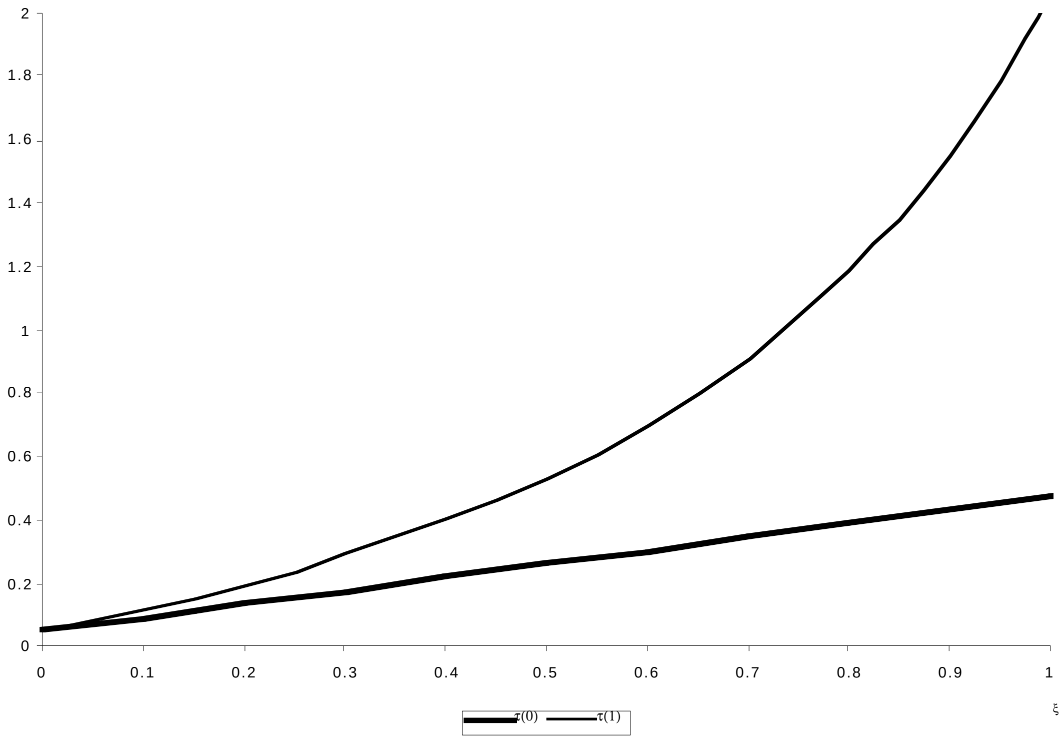

Figure 2: The steady-state equilibrium marginal tax rate τ as a function of ξ and $\nu \in \{0, 1\}$.

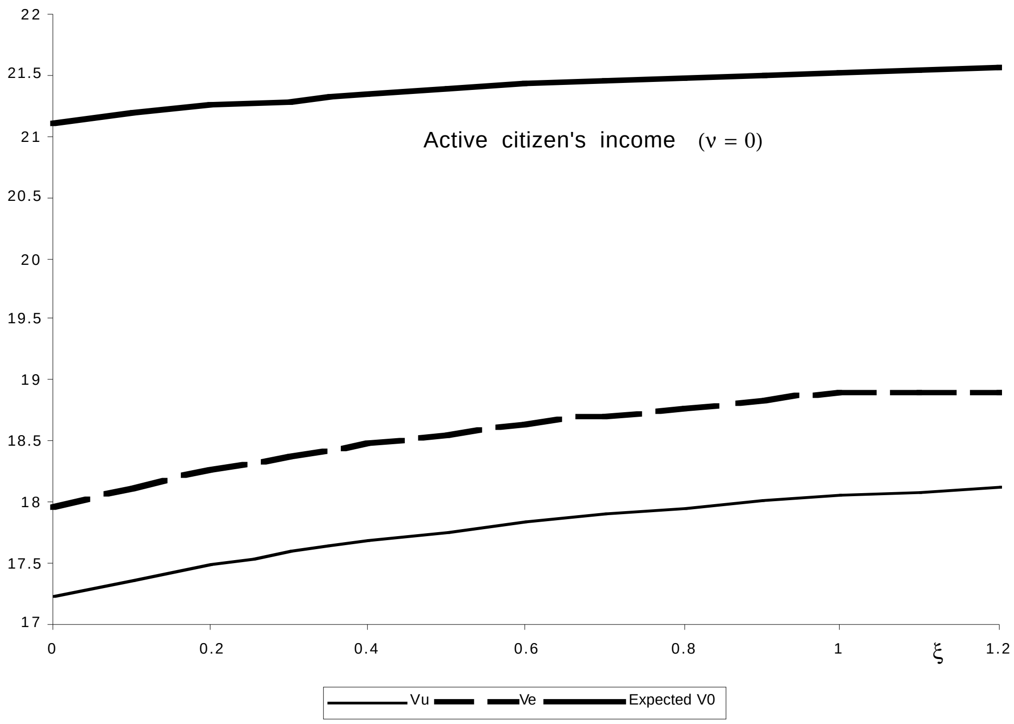

Figure 3: Active citizen's income : The steady-state equilibrium intertemporal income levels V_e, V_u and $E_{l_0}[V_0|V_0 > V_u]$ as a function of the basic income ratio ξ.

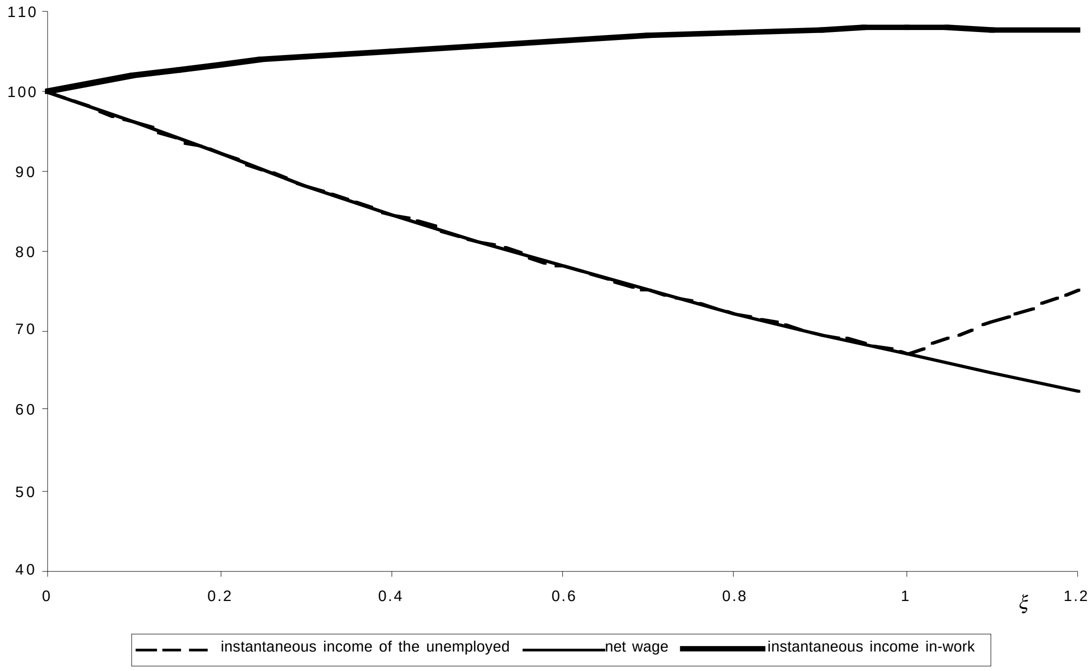

Figure 4: Active citizen's income : The instantaneous earnings and income levels in steady-state (100 for $\xi = 0$).

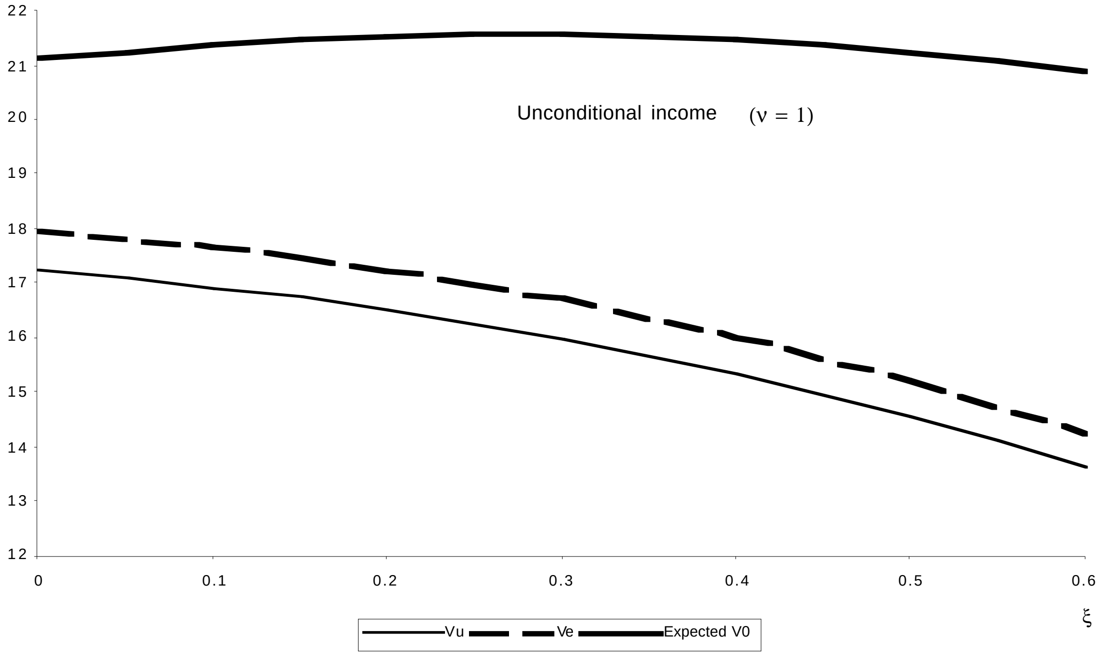

Figure 5: Unconditional income : The steady-state equilibrium intertemporal income levels V_e, V_u and $E_{l_0}\left[V_0|V_0 > V_u\right]$ as a function of the basic income ratio ξ.

Table 2: The effect of ξ and z on the utilitarian social welfare function Γ $(\epsilon = 1)$: The case of the active citizen's income (*).

z	0	0.1	0.2	0.3	0.4	0.5	0.6
ξ							
0	19.58	19.48	19.37	19.21	19.01	18.73	18.32
0.1	19.58	19.49	19.39	19.26	19.10	18.88	18.59
0.2	19.58	19.50	19.42	19.31	19.18	19.01	18.80
0.3	19.58	19.51	19.44	19.35	19.25	19.12	18.97
0.4	19.58	19.52	19.46	19.39	19.31	19.22	19.10
0.5	19.58	19.53	19.49	19.43	19.37	19.30	19.22
0.6	19.58	19.54	19.51	19.47	19.42	19.37	19.32
0.7	19.58	19.55	19.53	19.50	19.47	19.44	19.40
0.8	19.58	19.56	19.55	19.53	19.51	19.49	19.47
0.9	19.58	19.57	19.57	19.56	19.55	19.54	19.54
1	19.58	19.58	19.58	19.59	19.59	19.59	19.59
1.1	19.58	19.58	19.58	19.59	19.59	19.59	19.59
1.2	19.58	19.58	19.59	19.59	19.59	19.59	19.59

(*) The scaling factor is $\frac{1}{C}$ where C has been defined in (12).

Table 3: The effect of ξ and z on the 'Rawlsian' criterion, i.e. on V_u : The case of the active citizen's income(*).

z	0	0.1	0.2	0.3	0.4	0.5	0.6
ξ							
0	17.70	17.68	17.62	17.52	17.35	17.07	16.58
0.1	17.70	17.69	17.66	17.58	17.46	17.26	16.94
0.2	17.70	17.70	17.69	17.64	17.56	17.42	17.21
0.3	17.70	17.72	17.72	17.69	17.64	17.55	17.41
0.4	17.70	17.73	17.75	17.74	17.72	17.66	17.58
0.5	17.70	17.74	17.78	17.79	17.78	17.76	17.72
0.6	17.70	17.76	17.80	17.83	17.85	17.85	17.83
0.7	17.70	17.77	17.83	17.87	17.90	17.92	17.93
0.8	17.70	17.78	17.85	17.91	17.95	17.99	18.01
0.9	17.70	17.80	17.88	17.94	18.00	18.04	18.08
1	17.70	17.81	17.90	17.97	18.04	18.09	18.14
1.1	17.70	17.82	17.91	17.99	18.06	18.12	18.17
1.2	17.70	17.83	17.93	18.01	18.08	18.14	18.19

(*) The scaling factor is $\frac{1}{C}$ where C has been defined in (12).

Table 4: Summary of indicators in steady state.

	$z = 0,\ \xi = 0$	$z = 0.5,\ \xi = 0$	Active citizen's income $z = 0.5,\ \xi = 1$
Instantaneous variables (*)			
net wage w	1	0.94	0.65
net income if employed $(1 + \xi z)w$	1	0.94	0.98
net income if unemployed :zw if $\xi = 0$, $\mathcal{I}(\xi)zw$ if $\xi > 0$ (**)	0	0.47	0.33
Intertemporal discounted utility (*)			
if employed V_e	18.91	17.74	18.89
if unemployed V_u	17.70	17.07	18.09
if inactive $E_{l_0}[V_0 \| V_0 > V_u]$	21.35	21.03	21.55
utilitarian criterion Γ ($\epsilon = 1$)	19.58	18.73	19.59
Other indicators			
marginal tax rate τ	0	0.07	0.53
unemployment rate u	0.058	0.12	0.058
participation rate p	0.71	0.68	0.72
employment rate e	0.67	0.60	0.68

(*) The scaling factor is $\frac{1}{C}$ where C has been defined in (12).
(**) With $\mathcal{I}(\xi)$ defined in (15).