

Fiscal policy when individuals differ regarding to altruism and labor supply *

Philippe Michel[†] and Pierre Pestieau[‡]

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Abstract

This paper studies the incidence of tax-transfer policy in a growth model wherein individuals differ according to their level of intergenerational altruism and have an endogenous labor supply. The main results is that public debt is neutral at the macro level but redistributes resources from nonaltruists to altruists. Capital income taxation can hurt the nonaltruists who do not have any wealth more than the altruists who own all of it. Whether or not the altruists supply a positive amount of labor makes a big difference as to the incidence of alternative tax transfer policies.

Keywords: Ricardian equivalence, altruism, tax incidence.

1 Introduction

This paper analyzes the effect of different fiscal instruments, taxes on wages and capital income along with public borrowing, on the welfare of individuals. The setting is that of a simple non-overlapping generations growth model wherein two types of individuals coexist : altruists and nonaltruists. If we consider the standard overlapping generations model *à la* Diamond (1965),

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[†]IUF and GREQAM, University of Marseille II.

[‡]CREPP, University of Liège, CORE and Delta.

wherein individuals are pure life-cyclers and have an endogenous labor supply, we know that the market outcome can be inefficient but at the same time that public borrowing can restore efficiency. We also know from Atkinson and Sandmo (1980) and Stiglitz (1985) that taxation of both capital income and wage income is generally desirable. On the other hand, if we turn to the infinite-lived individuals model (alternatively an overlapping generations model wherein individuals are altruistic and are linked to successive generations through a chain of operative bequests), we expect an efficient outcome along with debt neutrality. Regarding taxation, the standard result is that under rather general conditions, the optimal tax rate on capital income is equal to zero in the long-run. (Chamley, 1986; see also Lucas, 1990).

In this paper, we want to combine these two streams of literature by considering a society in which coexist two types of individuals. The first consists of altruistic (dynastic) individuals leaving their children operative bequests. They thus all together resemble infinite-lived individuals. The second type consists of nonaltruistic (life-cyclers) individuals who cannot or do not want leave altruistic bequests.

The paper is organized as follows. In the next section, we present the model without tax transfer instruments. In the third section, we introduce public debt the service of which is financed by a nondistortionary tax. We then derive a number of results pertaining to the effect of public debt on the welfare of both altruists and nonaltruists. The key feature is that if the altruists are few enough, they become so wealthy as a result of public borrowing that they stop working. In the two following sections, we study the incidence of a distortionary tax on labor earnings and of a tax on capital holding, which is here equivalent to an estate tax. We show that under some assumptions, those taxes can be Pareto-worsening.

Our approach is positive and is thus related to the theory of tax incidence and not to that of optimal taxation. It is an extension of Michel and Pestieau (1998a). In this paper, we study fiscal policy in an overlapping-generations model with altruists and nonaltruists, but with a fixed labor supply. As we shall see endogenizing labor supply makes a big difference. Fiscal policy can indeed induce the altruists to stop working, in which case the incidence of taxation and borrowing is quite different from when both altruists and nonaltruists work.

The main results of Michel and Pestieau (1998a) can be easily summarized. First, the long-run capital accumulation is ruled by the factor of time preference of the altruists. Public debt and social security do not affect the

equilibrium steady-state capital stock; yet, they increase the welfare and the wealth of the altruists and decrease the utility of the nonaltruists. Finally, a tax on bequests is in the long run Pareto-worsening. In this paper, we want to see if these results hold when labor is endogenous. This allows us to see the effects of wealth differentials on labor supply and labor participation and to compare distorting taxes on labor and capital. The price to pay for this extension is that we have to restrict our model to one-period lifetime.¹

The rest of the paper is organized as follows. Sections 2 and 3 present the model and the equilibrium without tax-transfer. In section 4, public debt is introduced. Sections 5 and 6 are then devoted to the incidence of a tax on labor and of an estate tax respectively. A final section concludes.

2 The model

We consider a population of size N_t which grows at the rate of n . It consists of a fraction of p altruistic agents and of $(1 - p)$ nonaltruistic agents; when needed, they are respectively denoted by A and E . Each individual, altruistic or not, lives one period in which he works and earns the same competitive market wage. We have chosen this one-period setting rather than the more traditional two-periods overlapping-generations one because of simplicity. Both types of individuals face the same leisure consumption choice.

2.1 Leisure consumption choice

We assume that they have the same utility function (continuous, differentiable, homothetic) for their lifetime consumption, c_t^i , and leisure, L_t^i , with $i = A, E$. We write:

$$u_t^i = u(c_t^i, L_t^i) \quad (1)$$

where $u_c(c_t^i, L_t^i)$ and $u_L(c_t^i, L_t^i)$ denote the marginal utility of consumption and leisure respectively. For further use, we denote labor supply as $H_t^i = 1 - L_t^i$ and total income as ω_t^i . Depending on the circumstances, total income includes potential earnings, net returns from bequests and government's lump-sum tax or transfer. Each individual of type i belonging to generation t faces the following budget constraint:

¹We thus extend Michel and Pestieau (1998b) in which labor supply is fixed but the productivity of the two types of individuals differs.

$$c_t^i + w_t L_t^i = \omega_t^i \quad (2)$$

where w_t is the net of tax wage rate. He maximizes (1) subject to (2) and to the constraint $0 \leq L_t^i \leq 1$. We thus have to distinguish two types of solutions depending on whether it is an interior one ($0 < L_t^i < 1$)² or a corner one ($L_t^i = 1$).

Case A. Interior solution.

This is given by:

$$-w_t u_c(c_t^i, L_t^i) + u_L(c_t^i, L_t^i) = 0 \quad (3)$$

Because of the homotheticity assumption, this is equivalent to:

$$c_t^i / L_t^i = \lambda_t = \lambda(w_t),$$

with $\lambda'(w_t) > 0$. We can thus write:

$$c_t^i = \frac{\lambda_t \omega_t^i}{w_t + \lambda_t}, L_t^i = \frac{\omega_t^i}{w_t + \lambda_t} \text{ and } H_t^i = \frac{\lambda_t + w_t - \omega_t^i}{w_t + \lambda_t}. \quad (4)$$

The condition for an interior solution is simply:

$$\lambda_t + w_t > \omega_t^i$$

One sees right away that when the only source of income is labor ($w_t = \omega_t^i$), then the solution is necessarily interior. If, as an illustration, we use the CES utility function:

$$u(c, L) = \frac{c^{1-a}}{1-a} + \delta \frac{L^{1-a}}{1-a},$$

where $a, \delta \geq 0$, we obtain a simple expression for $\lambda(\cdot)$:

$$\lambda(w_t) = \left(\frac{w_t}{\delta} \right)^{1/a}.$$

Note that $\sigma \equiv \lambda' w / \lambda = 1/a$ is the elasticity of substitution between leisure and consumption.. When close to 0, a wage tax has a very small substitution effect and thus implies little distortion.

² $L_t^i = 0$ is excluded by assuming that $u_L(c_t^i, 0) = \infty$.

Case B. Corner solution.

The corner solution is given by (3) wherein the equality sign becomes an inequality, namely $>$ replaces $=$. It implies $H_t^i = 0$ and $c_t^i = \omega_t^i - w_t$. It corresponds to the condition:

$$\lambda_t + w_t \leq \omega_t^i.$$

Throughout this paper, we are interested by the effect of policy tools on the utility u^i (we drop the time index because this analysis is conducted in the steady-state). Let us denote z such a tool. One can differentiate u^i with respect to z :

$$\frac{\partial u^i}{\partial z} = u_c^i \frac{\partial c^i}{\partial z} + u_L^i \frac{\partial L^i}{\partial z}.$$

In *case A* when $0 < L < 1$, using (3), this becomes:

$$\frac{\partial u^i}{\partial z} = u_c^i \left(\frac{\partial c^i}{\partial z} + w \frac{\partial L^i}{\partial z} \right).$$

Now from (2), we get:

$$\frac{\partial c^i}{\partial z} + w \frac{\partial L^i}{\partial z} = \frac{\partial \omega^i}{\partial z} - \frac{\partial w}{\partial z} L^i.$$

Hence:

$$\frac{\partial u^i}{\partial z} = u_c^i \left[\frac{\partial \omega^i}{\partial z} - \frac{\partial w}{\partial z} L^i \right] \quad (5)$$

In *case B*, when $L = 1$ and $c = \omega^i - w$,

$$\frac{\partial u^i}{\partial z} = u_c^i \left[\frac{\partial \omega^i}{\partial z} - \frac{\partial w}{\partial z} \right].$$

We now turn to the specific behavior of nonaltruists and then of altruists.

2.2 Altruists and nonaltruists

Nonaltruists.

For the nonaltruists, total income consists of the net of tax wage, w_t , minus a lump sum tax, θ_t , which can be negative and then is lump-sum transfer. The condition for an interior solution ($H_t^E > 0$) is simply:

$$\lambda_t > -\theta_t.$$

Altruists

An altruist belonging to generation t receives a bequest, x_t , plus interest payment, $r_t x_t$, where r_t denotes the rate of interest of consumers. He will leave to each of his $(1+n)$ children an amount of wealth equal to x_{t+1} . We can thus write his budget constraint as:

$$(1+n)x_{t+1} + c_t^A + wL_t^A = (1+r_t)x_t + w_t - \theta_t. \quad (6)$$

Using the above notation, we have $\omega_t^A = w_t - \theta_t + (1+r_t)x_t - (1+n)x_{t+1}$. Each altruistic agent belonging to generation t maximizes:

$$v_t = u_t(c_t^A, L_t^A) + \gamma v_{t+1},$$

where $\gamma < 1$ is a parameter reflecting the degree of his altruism along with the number of his children, and v_{t+1} denotes the maximum utility of each of them. This actually amounts to maximize an infinite horizon utility function:

$$v_t = \sum_s^{\infty} \gamma^s u(c_{t+s}^A, L_{t+s}^A).$$

Here γ can be viewed as a time discount factor reflecting both altruism and population growth.³ The altruist maximizes this function with respect to c_t^A, L_t^A and x_{t+1} subject to the resource constraint (6) and to $L_t^A \leq 1$: The leisure consumption choice has already been studied. As to the optimal choice of bequest, it is given by

$$\frac{\partial v_t}{\partial x_{t+1}} = -(1+n)u_c(c_t^A, L_t^A) + \gamma(1+r_{t+1})u_c(c_{t+1}^A, L_{t+1}^A) = 0, \quad (7)$$

where the equality holds for positive bequests. This is assumed throughout. As we shall see, this assumption is rather innocuous in the present setting where bequeathing is the only source of capital accumulation.

³An alternative specification would be to write $\gamma = \gamma'(1+n)$, γ' being the factor of pure altruism and $(1+n)$ the gross rate of population growth or the number of children per family.

2.3 Average consumption and labor supply.

The average level of consumption, leisure and labor supply is given by:

$$\bar{c}_t = pc_t^A + (1-p)c_t^E; \bar{L}_t = pL_t^A + (1-p)L_t^E; \bar{H}_t = 1 - \bar{L}_t.$$

Again, we distinguish two cases. In *case A*, all agents have a positive supply of labor and in *case B*, only the nonaltruists work. We have indeed seen that these are the only possible regimes when $\theta_t \geq 0$, which is verified in the steady-state.

Case A. $L_t^A < 1, L_t^E < 1$.

This corresponds to the conditions: $\omega_t^E < \omega_t^A < \lambda_t + w_t$. Then, one has:

$$\bar{c}_t = \frac{\lambda_t \varpi_t}{w_t + \lambda_t}; \bar{L}_t = \frac{\varpi_t}{w_t + \lambda_t}; \bar{H}_t = 1 - \bar{L}_t = \frac{w_t - \varpi_t + \lambda_t}{w_t + \lambda_t},$$

where $\varpi_t = p\omega_t^A + (1-p)\omega_t^E = w_t - \theta_t + p[(1+r_t)x_t - (1+n)x_{t+1}]$.

Case B. $L_t^A = 1, L_t^E < 1$.

Then, $\omega_t^A \geq w_t + \lambda_t > \omega_t^E$. One then obtains:

$$\begin{aligned} \bar{L}_t &= p + (1-p)L_t^E; \bar{H}_t = (1-p)\frac{\theta_t + \lambda_t}{w_t + \lambda_t}; \text{ and} \\ \bar{c}_t &= p[w_t - \theta_t + (1+r_t)x_t - (1+n)x_{t+1}] + (1-p)\frac{\lambda_t(w_t - \theta_t)}{w_t + \lambda_t}. \end{aligned} \tag{8}$$

2.4 Firms.

Let us now turn to the production side. In each period, two factors of production capital K_t , and labor, H_t , are used to produce a single output according to a CRS production function $F(K_t, H_t)$. In each period t , there are N_t living individuals that also denotes the size of generation t . Labor is equal to that number duly weighted by individual labor supply. Firms equate the cost of capital, R_t , and the cost of labor, W_t , with marginal productivities:

$$W_t = F_L(k_t, 1) \quad \text{and} \quad R_t = F_K(k_t, 1) \tag{9}$$

where $k_t = K_t/H_t$ is the stock of capital per labor units. Total depreciation is assumed. The difference between the factor price faced by firms and that faced by consumers is due to the taxation of labor income at rate τ_w and of capital income at rate τ_x :

$$w_t = (1 - \tau_w)W_t \text{ and } 1 + r_t = (1 - \tau_x)R_t. \quad (10)$$

3 Equilibrium without tax-transfer.

We first consider the above model with $\theta_t = 0$, $w_t = W_t$ and $1 + r_t = R_t$. The labor market equilibrium is defined by the equality:

$$H_t = N_t \bar{H}_t,$$

where H_t is aggregate labor supply. The capital market equilibrium is given by:

$$pN_t x_{t+1}(1 + n) = K_{t+1}$$

or, in intensive terms,

$$px_{t+1} = k_{t+1} \bar{H}_{t+1}. \quad (11)$$

Equation (11) is crucial in this analysis. First, it reflects one of the stylized feature of this model: capital accumulation only comes from bequests. Second, this relation indicates that the wealth of each altruist as measured by x_t depends on the capital stock but also on the average labor supply.

Steady-state solution.

In the steady-state, optimal bequests given by (7) implies:

$$1 + n = \gamma(1 + r) = \gamma F_k(k, 1). \quad (12)$$

That is, the steady-state capital labor ratio is defined by the *modified golden rule*, that depends on the factor of altruism, γ , but not on the relative number of altruists. Even if these are very few, formula (12) holds, but it implies that these few altruists have to save a lot to compensate for the absence of saving by the nonaltruists. Denoting these steady-state equilibrium values by variables without the time index, we have:

$$1 + r = \frac{1 + n}{\gamma}; \quad w = F_L(k, 1); \quad \lambda = \lambda(w); \quad \omega^E = w; \quad \omega^A = w + (r - n)x,$$

with $x = k\bar{H}/p$.

From (8), one knows that $\bar{H}$ may depend on p . In any case, the life-time income of the altruists depends on their relative size. To study this dependence, we distinguish the two cases.

Case A.

Combining the equations: $\varpi = w + p(r - n)x$; $px = k\bar{H}$; and $\bar{H} = \frac{w - \varpi + \lambda}{w + \lambda}$, we obtain:

$$\bar{H} = \lambda(w + \lambda + (r - n)k)^{-1}. \quad (13)$$

In other words, in case A, aggregate labor supply is independent of p . One can thus write:

$$\frac{\partial \omega^E}{\partial p} = 0 \text{ and } \frac{\partial \omega^A}{\partial p} = -(r - n)k\bar{H}p^{-2} < 0.$$

Case B.

As we now see, in the constrained case, the effect of p on ω^A consists of two parts: the effect of sharing a constant amount among more people, which one already observes in case A and the effect of a lower labor supply on inheritance. These two effects are negative.

When altruists cease to work, average labor supply is simply

$$\bar{H}_t = (1 - p)\frac{\lambda}{w + \lambda}.$$

Therefore:

$$\frac{\partial \omega^E}{\partial p} = 0 \text{ and } \frac{\partial \omega^A}{\partial p} = (r - n)k\left(\frac{\partial \bar{H}}{\partial p} - \bar{H}p^{-2}\right) < 0.$$

Following (4), one knows that these results can be extended to the steady-state utility of the nonaltruists and altruists respectively:

$$\frac{\partial u^E}{\partial p} = 0 \text{ and } \frac{\partial u^A}{\partial p} < 0.$$

Pivotal value of p.

It is interesting to see what are the conditions which determine whether case A or B prevails. The shape of the utility function and, in particular, the preference for leisure are clearly important. The wealth of the altruists is also

an important factor as leisure is a normal good. In that respect, we know that as p decreases, each altruist tends to be wealthier in the steady-state. We thus focus on the critical value of p , denoted $\tilde{p}$, above which $L^A < 1$. This condition is equivalent to $(1 - p)H^E < \bar{H}$, or using (8) and (13),

$$p > \tilde{p} = \frac{(r - n)k}{\lambda + w + (r - n)k}. \quad (14)$$

The numerator of the RHS of (14) reflects the wealth of the altruists and in the denominator λ is related to the preference for leisure. Thus, one can afford more altruists while being in case A when wealth is high and/or their preference for leisure is low. This is pretty intuitive.

We can now sum up the results of this section. First, the steady-state capital stock is determined by the modified golden rule with the time discount factor being the altruism parameter. Second, there is a proportion of altruists below which altruists stop working because they are wealthy enough. As this proportion increases, the equilibrium capital stock as well as the welfare of the nonaltruists remain constant, whereas the welfare of the altruists decreases.

4 Debt policy with lump-sum taxation

We now introduce the public sector. Distortionary taxation is still assumed away ($\tau_x = \tau_w = 0$). The government finances a per capita spending, g_t , with a lump-sum tax, θ_t , and a public debt denoted b_t in per capita terms; this yields a revenue constraint such that:

$$b_t = b_{t-1} \frac{1 + r_t}{1 + n} + g_t - \theta_t.$$

With constant $b = b_t$ and, without loss of generality, $g_t = 0$ ($t \geq 1$), this becomes:

$$\theta_t = \frac{(r_t - n)b}{1 + n}, \quad t \geq 1.$$

Within this setting, saving is devoted to both capital accumulation and public borrowing:

$$px_{t+1} = k_{t+1}\bar{H}_{t+1} + b/(1 + n)$$

In the steady-state, the condition for optimal bequest is unchanged and thus the *modified golden rule* (12) holds. As we now show, the effect of public debt is to lower the welfare of the nonaltruists and to increase that of the altruists. Indeed, public debt increases the steady-state level of bequest:

$$px = k\bar{H} + b/(1+n).$$

One then checks that:

$$\omega^E = w - (r-n)b/(1+n) \text{ and } \omega^A = w + (r-n)\left(\frac{b}{1+n}\frac{1-p}{p} + \frac{\bar{H}}{p}k\right).$$

The steady-state utility of the nonaltruist clearly decreases as a consequence of public borrowing.

$$\frac{\partial \omega^E}{\partial b} = -\frac{r-n}{1+n} < 0.$$

As to the welfare of the altruists, we again have to distinguish the two cases.

Case A

When the altruists work, $\bar{H}$ is unaffected by b following (13). And thus:

$$\frac{\partial \omega^A}{\partial b} = \frac{(1-p)(r-n)}{p(1+n)} > 0.$$

Note that because of our assumption on the utility function (see eq. (4)), H^A decreases but this is totally offset by an increase in H^E . Hence, $\bar{H}$ remains constant.

Case B

When the altruists stop working, an increase in the debt implies an increase in total labor supply. The nonaltruists work more but this cannot be compensated anymore by the altruists lowering their labor supply. One indeed has:

$$\bar{H} = (1-p)H^E = \frac{1-p}{w+\lambda}\left(\lambda + \frac{r-n}{1+n}b\right)$$

and

$$\frac{\partial \bar{H}}{\partial b} = \frac{(1-p)(r-n)}{(w+\lambda)(1+n)} > 0$$

Hence,

$$\frac{\partial \omega^A}{\partial b} = \frac{(1-p)(r-n)}{p(1+n)} \left(1 + \frac{k(r-n)}{w+\lambda} \right).$$

The income of the altruists increase more than in case A. There are two effects at work: a direct effect similar to that observed in *case A* and a wealth effect induced by the increase in labor supply ($dx/d\bar{H} = k/p$). This does not mean that the steady-state utility of altruists increases more as a result of public borrowing in *case B* than in *case A*. In *case B*, the altruist is constrained in his consumption of leisure and his marginal utility for consumption is relatively low (eq. (5)).

The debt has also an impact on $\tilde{p}$.

The steady-state pivotal value of p .

Let us now derive the value of $\tilde{p}$ with public debt:

$$\tilde{p} \equiv 1 - \frac{\lambda(w+\lambda)}{(w+\lambda+(r-n)k) \left(\lambda + \frac{1-\gamma}{\gamma} b \right)},$$

with $\frac{\partial \tilde{p}}{\partial b} > 0$.

In other words, the effect of public debt has two depressive effects on the labor supply of the altruists, one on the condition for participation ($\tilde{p}$) and one on the number of hours worked (H^A).

We can now conclude this section by summarizing its main results. Public borrowing is neutral in aggregate terms. Yet, at the micro level, it redistributes wealth from the nonaltruists to the altruists. This result is already in Pestieau and Michel (1998) and applies to social security as well. What is new here is that public borrowing induces the altruists to work less and can even lead them to cease working in which case wealth redistribution is even more regressive. Note that this result would apply to pay-as-you-go social security as well in a two-period setting..

One of the interests of this positive result is that it may explain in part why in a number of countries wealth inequality has increased over the last decades. The same countries experienced over the same period of time a jump in their endebtmnt. and social security spending.

5 Distortionary tax on labor earnings

In the previous section, the public debt cost $(r - n)b$ was financed in a lump-sum way. We now introduce a rather more realistic setting with a distortionary tax on labor earnings. To keep the analysis simple, this tax is used to finance a lump-sum transfer. Focusing on the steady-state, the government revenue constraint is now:

$$\tau_w W \bar{H} = -\theta.$$

This tax does not interfere with the modified golden rule; it just introduces a wedge between the consumer's and the producer's wage. We thus have:

$$\gamma R = \gamma(1 + r) = 1 + n; \quad w = (1 - \tau_w)W; \quad \text{and } \lambda = \lambda((1 - \tau_w)W),$$

for further use, we write the elasticity of substitution between consumption as:

$$\sigma = \frac{(1 - \tau_w)W \lambda'}{\lambda} = -\frac{(1 - \tau_w)}{\lambda} \frac{\partial \lambda}{\partial \tau_w}.$$

As before, we distinguish the two cases of labor supply.

Case A.

We can now write the income of both types of individuals :

$$\omega^E = (1 - \tau_w)W + \tau_w W \bar{H} \quad \text{and} \quad \omega^A = \omega^E + \frac{r - n}{p} k \bar{H}.$$

The average labor supply is then given by:

$$\bar{H}(w + \lambda + (r - n)k) = \lambda - \tau_w W \bar{H},$$

or

$$\bar{H} = \frac{\lambda}{W + \lambda + (r - n)k}.$$

Differentiating with respect to the tax rate yields the following:

$$\frac{\partial \bar{H}}{\partial \tau_w} = -\frac{\bar{H} \sigma}{(1 - \tau_w)} \left(1 - \frac{\lambda}{\lambda + W + (r - n)k}\right) < 0.$$

The value of $\frac{\partial \bar{H}}{\partial \tau_w}$ depends on σ ; if, e.g., $\sigma \rightarrow 0$, labor supply is not affected by taxation.

We can now obtain the effect of the tax on the income and utility of the nonaltruists and then of the altruists:

$$\frac{\partial \omega^E}{\partial \tau_w} = -W(1 - \bar{H}) + \tau_w W \frac{\partial \bar{H}}{\partial \tau_w} < 0,$$

and

$$\frac{\partial u^E}{\partial \tau_w} \approx \frac{\partial \omega^E}{\partial \tau_w} + W L^E = W(L^E - \bar{L}) + \tau_w W \frac{\partial \bar{H}}{\partial \tau_w} < 0. \quad (15)$$

And turning to the altruists:

$$\frac{\partial u^A}{\partial \tau_w} \approx \frac{\partial \omega^A}{\partial \tau_w} + W L^A = W(L^A - \bar{L}) + \tau_w W \frac{\partial \bar{H}}{\partial \tau_w} + \frac{r - n}{p} k \frac{\partial \bar{H}}{\partial \tau_w} \geq 0. \quad (16)$$

The sign of (15) is not really surprising; the nonaltruists supply more labor and thus pay more taxes than the altruists, and yet they receive the same transfer. The tax incidence for the altruists is ambiguous. The first term of the RHS of (16) is clearly positive; it reflects the income effect for the altruists. Note that the same term is negative for the nonaltruists (see (15)). The two other terms are negative; they correspond to the substitution effect. The first is the same as for the nonaltruists; it is the distortion in the consumption-leisure choice. The second operates through wealth holding. If, e.g., the substitution between leisure and consumption is very small (σ close to 0), the utility of the altruists will increase.

Case B.

Now the sign of $\frac{\partial \bar{H}}{\partial \tau_w}$ is ambiguous. Indeed, we obtain

$$\frac{1}{\bar{H}} \frac{\partial \bar{H}}{\partial \tau_w} = -\frac{\sigma}{(1 - \tau_w)} \left(1 - \frac{\lambda}{\lambda + W + (r - n)k} \right) + \frac{pW}{\lambda + W(1 - p\tau_w)},$$

which can be positive for very small σ . The effect of τ_w on the steady-state utility of both altruists and nonaltruists is also ambiguous. We have:

$$\frac{\partial u^E}{\partial \tau_w} \approx Wp(L^E - 1) + \tau_w W \frac{\partial \bar{H}}{\partial \tau_w} \geq 0,$$

and

$$\frac{\partial u^A}{\partial \tau_w} \approx W(1 - \bar{L}) + (\tau_w W + \frac{r - n}{p}k) \frac{\partial \bar{H}}{\partial \tau_w} \geq 0.$$

What is however the most surprising is not that $\frac{\partial u^E}{\partial \tau_w}$ cannot be signed, but that $\frac{\partial u^A}{\partial \tau_w}$ can be negative in a setting where the altruists do not pay any tax and receive a positive lump-sum transfer. This result will find its counterpart in the next section where we see that nonaltruists do not pay any estate tax and yet suffer from redistributive estate taxation.

6 Inheritance taxation.

We now turn to the tax on capital income, which is equivalent here to an inheritance tax. As with the payroll tax, we assume that the proceeds of this tax are given back to all individuals in a uniform and lump-sum way. The budget constraint of the government is thus:

$$-\theta = \tau_x R p x = \tau_x R k \bar{H} = k \bar{H} (F_K(k, 1) - (1 + r)).$$

The *modified golden rule* does not apply anymore as there is now a wedge between the consumer's and the producer's price of capital; We now have:

$$w = W = F_L(k, 1) \text{ and } 1 + r = \frac{1 + n}{\gamma} = (1 - \tau_x)R = (1 - \tau_x)F_K(k, 1).$$

One easily checks that

$$\frac{dk}{d\tau_x} = \frac{F_K}{(1 - \tau_x)F_{KK}} < 0.$$

Again, we proceed by distinguishing the two cases.

Case A

We write the total income of both types of individuals and the average labor supply:

$$\omega^E = w - \theta = F - kF_K + k\bar{H}(F_K - (1 + r))$$

$$\omega^A = \omega^E + (r - n)x = \omega^E + \frac{r - n}{p}k\bar{H},$$

and

$$\bar{H} = \frac{\lambda + \theta}{\lambda + w + (r - n)k}.$$

Substituting for the value of θ and for $F = w + F_K K$, we have:

$$\bar{H} = \frac{\lambda}{\lambda + F - (1 + n)k}.$$

We then try to see how inheritance taxation affect labor supply. One differentiates $\bar{H}$ with respect to the tax rate τ_x :

$$\frac{\partial \bar{H}}{\partial \tau_x} = \bar{H} \frac{\partial k}{\partial \tau_x} \left[\frac{\lambda' w'}{\lambda} - \frac{\lambda w' + F_K - (1 + n)}{\lambda + F - (1 + n)k} \right],$$

where $w' = \frac{\partial w}{\partial k} = -k F_{KK}$. One observes that

$$\frac{\partial \bar{H}}{\partial \tau_x} \geq 0 \text{ if } \sigma \frac{w'}{w} \leq \frac{F_K - (1 + n)}{F - (1 + n)k}.$$

The average labor supply will increase with inheritance taxation if the elasticity of substitution, σ , is rather small. There are two opposite effects at work here. The first is the negative effect of lower wage on the labor supply; it will be small for σ is low; the second is the wealth effect that implies less leisure and thus more labor. Note that whereas the tax incidence on labor is ambiguous that on average consumption or output is definitely negative.

We are going to differentiate total income of both types of individuals with respect to the inheritance tax rate and then using (6), we will obtain the incidence on individuals' welfare. First, let us differentiate ω^E with respect to k .

$$\frac{\partial \omega^E}{\partial k} = w'(1 - \bar{H}) + [F_K - (1 + r)] k \bar{H} \left(\frac{1}{k} + \frac{1}{\bar{H}} \frac{\partial \bar{H}}{\partial k} \right) > 0$$

as

$$\begin{aligned} \left(\frac{1}{k} + \frac{1}{\bar{H}} \frac{\partial \bar{H}}{\partial k} \right) &= \frac{1}{x} \frac{\partial x}{\partial k} = \frac{\lambda' w'}{\lambda} \left(1 - \frac{\lambda}{\lambda + F - (1 + n)k} \right) \\ &+ \frac{\lambda + F - k F_K}{k(\lambda + F - (1 + n)k)} > 0. \end{aligned}$$

Furthermore, from (6), one has:

$$\frac{\partial u^E}{\partial \tau_x} \approx \frac{\partial \omega^E}{\partial \tau_x} - \frac{\partial w}{\partial \tau_x} L^E = \frac{\partial k}{\partial \tau_x} \left(\frac{\partial \omega^E}{\partial k} - w' L^E \right) < \frac{\partial k}{\partial \tau_x} w' (L^E - \bar{L}) < 0. \quad (17)$$

This is a bit surprising. Inheritance taxation seems to hurt the individuals it is supposed to help. As it appears clearly, the induced reduction in wage more than compensates the positive transfer they receive. What about the altruists? Again, from (6), we write:

$$\begin{aligned} \frac{\partial u^A}{\partial \tau_x} &\approx \frac{\partial \omega^A}{\partial \tau_x} - \frac{\partial w}{\partial \tau_x} L^A = \frac{\partial \omega^E}{\partial \tau_x} + (r - n) \frac{\partial x}{\partial \tau_x} - \frac{\partial w}{\partial \tau_x} L^E \\ &= \frac{\partial k}{\partial \tau_x} \left\{ w' (\bar{L} - L^A) + \frac{\partial x}{\partial k} [r - n + p(F_K - (1 + r))] \right\}. \end{aligned} \quad (18)$$

One cannot sign (18). There are two effects at work. First, there is the effect related to the altruists' lower labor supply; they benefit from the wage decrease. Second, there is the effect on wealth holding which is negative. It is not impossible that the first effect dominates the second and that the altruists end up benefitting from inheritance taxation.

Case B.

In this constrained case, $(\frac{1}{k} + \frac{1}{H} \frac{\partial \bar{H}}{\partial k}) = \frac{1}{x} \frac{\partial x}{\partial k}$ cannot be signed. This in turn makes impossible to sign $\frac{\partial u^E}{\partial \tau_x}$ which can now be positive. However, for $\tau_x = 0$, it can be shown that $\frac{\partial u^E}{\partial \tau_x} < 0$.

7 Conclusion

The main finding of this paper concerns the effect of public debt and of factor taxation on the steady-state welfare of the two types of individuals the society consists of, the altruists and the nonaltruists. We have shown that public debt is neutral according to the Ricardian equivalence. Yet, it implies some redistribution from the poorer nonaltruists to the richer altruists. The contribution of this paper is to show that by making the altruists richer public debt leads them to eventually stop working.

Regarding the incidence of factor income taxes, we have shown that partial equilibrium effects do not hold in general: those supposed to benefit from

such taxes are likely to end up worse off. In particular a tax on capital income has such a depressive effect on wages that wageearners may loose more than wealthholders. These results have been derived previously in a different setting, that of a two-class society.⁴The class distinction was then between capital-owners and workers and not between altruists and not altruists.

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