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DEBT NEUTRALITY, PROFESSOR VICKREY AND HENRY GEORGE'S "SINGLE TAX"

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ABSTRACT

In the overlapping generations model with uncertain lifetimes, efficient life insurance markets and no operative intergenerational gift and bequest motive, a positive birth rate has been shown to be sufficient and necessary for absence of debt neutrality: equilibrium prices and quantities are independent of the mix of government borrowing and lump-sum taxation, holding constant the path of exhaustive public spending.

Implicit in this analysis has been the assumption that the lump-sum tax is a tax on the income from human capital. Postponing lump-sum taxes then makes it possible to shift (part of) the tax burden to future generations if the birth rate is positive. If instead the tax falls on the income from a non-human fixed factor ("land") whose ownership claims are priced efficiently, then, if all land is owned by generations currently alive, changes in the intertemporal pattern of taxation do not permit current generations to shift the tax burden to future generations. Taxes on the income from all "fully owned" non-human factors have this property, even those factors supplied elastically, but the latter will of course be subject to the familiar incentive or allocative effects ofchanges in (non-lump-sum) taxation.

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Introduction

In the overlapping generations model without operative intergenerational gift and bequest motives due to Blanchard [1985] (based on Yaari [1965]), a positive birth rate has been shown to be sufficient (Weil [1985]) and necessary (Buiter [1988a,b]) for absence of debt neutrality. Debt neutrality prevails when equilibrium prices and quantities are independent of the mix of government borrowing and *lump-sum* taxation, holding constant current and future exhaustive public spending.

Professor W. Vickrey recently [1] pointed out to me that even with a positive birth rate, debt neutrality would still prevail if the tax in question were a tax on land. This note simply demonstrates that Professor Vickrey is correct. Models in the Blanchard tradition assume (implicitly) that the lump sum tax is a tax on the income from *human* capital. Postponing the tax means that some of it will be paid by the "new entrants", i.e. by new generations not yet alive when the tax was postponed. (This holds true even if each agent lives forever; finite or uncertain lifetimes are irrelevant; only the positive birth rate matters (see Buiter [1988a,b])). Postponing taxes will make those currently alive better off and ***cet.par.*** this will boost current consumption.

If instead the tax is paid on the income from (or on the capital value of) a fixed factor of production ("land" in what follows), if all land that is or ever will be is owned by those currently alive and if the land market is efficient, then postponing land taxes will (assuming the government

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1 At the Conference in Honor of James Tobin, May 6 and 7, 1988 at Yale University.

satisfies its solvency constraint) leave the value of land and aggregate consumption unchanged.

With a tax on human capital income, debt neutrality would prevail only if those currently alive possessed ownership claims on the after-tax wage income of all future generations, i.e. if future generations were, effectively, the slaves of the generations currently alive. Operative intergenerational gift and bequest motives effectively (at the margin) give those alive today command over the human capital of future generations, and debt neutrality results.

The Model

All the ingredients of the model are familiar, so little time will be spent in motivating it (see e.g. Buiter [1988a, b]).

$$c(t) = \mu(t)\, w(t) \tag{1}$$

$$\mu(t) = \left\{ \int_t^{\infty} e^{-\left[\left[\frac{\gamma}{\gamma-1}\right] \int_t^s r(u)du + (s-t)(\lambda+\left[\frac{1}{1-\gamma}\right]\delta)\right]} ds \right\}^{-1} \tag{2}$$

$$w(t) = a(t)+h(t) \tag{3}$$

$$\dot{a} = (r-n)a+v-\tau-c \tag{4}$$

$$h(t) = \int_t^{\infty} e^{-\int_t^s (r(u)+\lambda)du} [v(s)-\tau(s)]ds \tag{5}$$

$$n \equiv \beta-\lambda \tag{6}$$

$$a = qz+b \tag{7}$$

$$r(t) = \frac{f'(\ell(t))L(t)(1-\theta(t))}{q(t)\bar{Z}} + \frac{\dot{q}(t)}{q(t)} \tag{8}$$

$$z(t) = \bar{Z}e^{-nt} \tag{9a}$$

$$\ell(t) = L(t)e^{-nt}, \qquad L(t) \text{ exogenous.} \tag{9b}$$

$$v = f(\ell)-\ell f'(\ell) = v(\ell) \tag{10}$$

$$\dot{b} = (r-n)b+g-\tau-\theta\ell f'(\ell) \tag{11}$$

$[\gamma<1;\ \delta>0;\ \lambda\geq 0;\ \beta\geq 0]$

All stocks and flows are (real) per capita quantities. c is private consumption, v the real wage, τ the lump-sum tax on wage income, g exhaustive public spending, θ the tax rate on land rental income, w total private wealth, the sum of non-human wealth (a) and human wealth (h). Human capital is the present discounted value of future after-tax labour income. The stock of government interest-bearing debt is denoted b, the fixed stock of ownership claims to current and future land rentals is $\bar{Z}>0$. Land ownership claims per capita are denoted z. The physical stock of land at time t is L(t) and land per worker is $\ell(t)$. Note that a "share" of land, with price q, is an entitlement to $1/Z^{th}$ of the future income stream from all physical land. The physical stock of land may vary over time. β is the constant instantaneous birth rate and λ the constant instantaneous probability of death; $n\equiv\beta-\lambda$ is the instantaneous growth rate of population and labour force. The size of population at time zero is scaled to unity.

Each household maximizes a time additive objective functional over an infinite horizon. The instantaneous pure rate of time preference is δ and

the risk-of-death adjusted subjective discount rate is $\delta+\lambda$. Each surviving agent, regardless of age, has the same expected streams of future labour income and of future taxes on labour income and therefore possesses the same stock of human capital.

Instantaneous utility is given by the constant elasticity of marginal utility function $(1/\gamma)\bar{c}^{\gamma}$ where $\bar{c}$ denotes individual consumption.[2] Competitive life insurance or annuities markets exist (with free entry and exit).

The economy produces a single non-storable commodity which can be used either for private or for public consumption. There is a constant returns to land and labour production funtion, strictly concave with positive marginal products and satisfying the Inada conditions. Output per capita is denoted $f(\ell)$. The labour market is competitive (equation (10)).

Financial wealth consists of claims on land (with unit price q) and government debt. These two claims are perfect substitutes in private portfolios as shown in equation (8). The riskless instantaneous real interest rate is r. The government spends on goods and services, pays interest on its debt, raises revenue through lump sum taxes on labour income and a land tax and borrows to cover any shortfall of current revenue from current outlays. Imposing the terminal condition:

$$\lim_{s\to\infty} e^{-\int_t^s (r(u)-n)du}\, b(s) = 0$$

the government budget identity (11) implies the government solvency constraint (12)

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2 when $\gamma=0$, the instantaneous utility function is $\ln\bar{c}$

$$b(t) = \int_t^{\infty} [\tau(s)+\theta(s)\ell(s)f'(\ell(s))-g(s)]e^{-\int_t^s (r(u)-n)du} ds \qquad (12)$$

Substitute for w in eq tion (1) using (3) and use the R.H.S. of equation (5) to substitute for h(t). Substitute qz+b for a and note that, solving (8) forward for q (imposing the terminal condition

$$\lim_{s\to\infty} e^{-\int_t^s r(u)du} q(s)=0)$$ we get:

$$q(t)\bar{Z} = \int_t^{\infty} e^{-\int_t^s r(u)du} f'(\ell(s))L(s)(1-\theta(s))ds \qquad (13)$$

Substituting for ℓ using (9a) and for b using the government's solvency constraint (12) and rearranging we get (14)

$$c(t) = \mu(t)\left\{ \int_t^{\infty} [f'(L(s)e^{-ns})L(s)e^{-ns}-g(s)]e^{-\int_t^s (r(u)-n)du} ds \right.$$

$$+ \int_t^{\infty} v(L(s)e^{-ns})e^{-\int_t^s [r(u)+\lambda]du} ds$$

$$\left. + \int_t^{\infty} \tau(s)e^{-\int_t^s (r(u)+\lambda)du} (e^{\beta(s-t)}-1)ds \right\} \qquad (14)$$

From the last term inside the brackets on the R.H.S. of equation (14) it is apparent that, unless $\beta=0$, there will not be debt neutrality for intertemporal redistributions of lump-sum taxes on human capital τ. Note, however, that the tax on land, which is of course also a lump-sum tax, "disappears" when the valuation equation for land (equation (13)) and the government solvency constraint (12) are substituted into the consumption function. Holding constant the paths of exhaustive public spending and of lump-sum taxes on human capital income, changes in the path of the land tax rate and associated changes in government deficits or surpluses do not alter private consumption. (In the model under consideration where $c(t)=f(\ell(t))-g(t)$ and $\ell(t)$ and $g(t)$ are exogenous, debt neutrality shows up in equilibrium through the absence of changes in the path of interest rates). Since land is supplied inelastically ($L(t)$ is exogenous), the tax on land rental income will not alter equilibrium allocations through familiar incentive or allocative effects.

The price of land, $q(t)$, is independent of intertemporal redistributions of land taxes that satisfy the government's solvency constraint. It is of course not only for inelastically supplied factors such as land that the equality in equation (15) (whose L.H.S. comes from the land valuation equation and whose R.H.S. comes from the government solvency constraint) holds. It holds for all non-human factors of production, fixed or variable, already in existence or still to emerge (or to be produced), for which ownership claims exist today (and are priced efficiently).

$$e^{-nt}\int_t^\infty e^{-\int_t^s r(u)du} f'(L(s)e^{-ns})L(s)\theta(s)ds$$

$$= \int_t^{\infty} e^{-\int_t^{\infty}(r(u)-n)du} f'(L(s)e^{-ns})L(s)e^{-ns}\theta(s)ds \qquad (15)$$

Other "fully owned" non-human assets that are supplied elastically (in the short run and/or the long run) will share with land the property that current owners cannot, by postponing taxes, shift (part of) the tax burden to future owners of new assets that will become available in the future but are not currently owned by anyone. In the case of elastically supplied factors, a proportional tax such as the land tax considered here is distortionary and will have the usual allocative and welfare effects. Debt neutrality therefore prevails only (assuming a positive birth rate and no operative intergenerational gift and bequest motive) for changes in non-distortionary taxes on the income from non-human factors of production.

Note again that debt neutrality will hold if the fixed factor grows or shrinks in an exogenously given manner (e.g. through exogenous quality improvement or deterioration or even through (exogenous) land reclamation[3]). What matters for debt neutrality to prevail is that agents alive today possess ownership claims to the current and future after-tax income from ***all*** land, both that physically present today and any land "emerging" in the future. In this way, the ownership claims to the land will, if the market for these claims is efficient, fully reflect all current and future land taxes.

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3 A matter of some interest for the Netherlands!

Conclusion

Henry George had a solution to the U.S. budget deficit problem: scrap all existing taxes and replace them by taxes on fixed factors. His "single tax" on (unimproved) land values is one example. Any tax on the productive contribution of "nature" would do equally well. A suitable compensation scheme could take care of one unpleasant distributional implication of this proposal: large-scale redundancy among specialists on deficit financing. Since the imposition of such a tax would (in spite of this note) come as a complete surprise to everyone, the associated compensation scheme would also be lump-sum and would not distort the process of investment in (redundant) knowledge.

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