Referee Report on

A Case Where Barro Expectations Are Not Rational

I

Does the time path of government debt affect the time path of private consumption? This question has been discussed extensively in the economics' literature under the heading of 'Ricardian equivalence' of taxes and government deficits. In the first edition of his textbook, David Romer (1996) summarizes the discussion: "Thus despite its logical appeal, there does not appear to be a strong case for using Ricardian equivalence to gauge the likely effects of governments' financing decisions in practice."

The paper under review argues that even the logic of the argument leading to the Ricardian equivalence result is flawed. If this were true, the paper would indeed make a significant contribution.

I will argue below that the author's proposition rests on a definition of disposable income that is irrelevant for the intertemporal choices of households. Thus, the logic underlying the Ricardian proposition remains intact.

II

Before I will present my argument I should note that the algebra presented in the paper is correct. A minor error appears on the right-hand side of the first equation in (9), where the limit is α/g and not $(\alpha/g)(G_0/Y_0)$.

III

The Ricardian proposition rests on an intuitive argument: for a given path of government spending a debt-financed tax cut will lead to future taxes that have the same present value as the initial cut (Barrow (1989) p. 38). Thus, the intertemporal budget constraint of a household remains unchanged as long as the time path of government spending does not change. Barrow (1974) argues that this argument remains true even if the generations that profit from the tax cut and the generations that have to pay the taxes differ. His argument rests on the observation that an overlapping generations (OLG) model with operative bequests behaves almost exactly like the Ramsey model with infinitely lived households (see Blanchard and Fischer (1989), p. 106.) Barrow (1974) presents his argument within an OLG model with constant population and without technical progress. However, in footnote 12 on p. 1105, he argues that his result will also hold in a growing economy, if the rate of interest i exceeds the rate of GDP growth g.

The paper considers an economy on its balanced growth path (where the rate of output growth and the real rate of interest are constant). Up to time $t = 0$ the government's budget is balanced so that public debt D_0 is zero. At $t = 0$ the government decides to run a budget deficit forever that equals a constant fraction $\alpha \in (0, 1)$ of government spending on goods G_t. Defining private disposable income as $Y_t + iD_t - T_t$ (where Y_t is production and T_t are taxes at time t, respectively) the paper shows that the present value of disposable income is increased by this policy if $i > g$. Thus, households will likely change their consumption.

The author remains silent about the demographic structure of the economy that he has in mind, i.e., whether he considers a Ramsey or an OLG model.

I will start by writing out the intertemporal budget constraint of an infinitely lived representative consumer and the government. The algebra is by no means new and similar derivations (though in continuous time) can be found in Romer (1996), p. 65.

The period-to-period budget constraint of the government reads:

$$D_{t+1} - D_t = G_t + i_t D_t - T_t. \tag{1}$$ GBC

I do not require i_t to be be constant. Integrating this equation from time $t = 0$ to $t = T$ yields:

$$\frac{D_{T+1}}{R_T} = D_0 + \sum_{s=0}^{T} \frac{G_s - T_s}{R_s}, R_T \equiv \prod_{s=0}^{T} (1 + i_s).$$

If the government is not allowed to write chain letters, the left-hand side of this equation will approach zero for $T \to \infty$. This is true in the example considered in the paper, where

$$\frac{D_{T+1}}{R_T} = \frac{\alpha}{g} G_0 \left[\left(\frac{1+g}{1+i} \right)^T (1+g) - \left(\frac{1}{1+i} \right)^T \right]$$

so that we can write the intertemporal budget constraint of the government as

$$0 = D_0 + \sum_{s=0}^{\infty} \frac{G_s - T_s}{R_{s+1}}, \tag{2}$$ iGBC

which simply states that the present value of taxes must exceed the present value of government spending by the amount of the outstanding government debt at time zero.

Let W_t denote the labor income of the household and $A_t = K_t + D_t$ the households assets which consist of his holdings of government bonds D_t and private capital K_t.

For the household to hold both types of assets in a deterministic environment, they must earn the same interest rate. Therefore, the period-to-period budget constraint of the household reads

$$A_{t+1} - A_t = W_t + r_t A_t - T_t - C_t. \tag{3} \qquad \boxed{\mathtt{HBC}}$$

Integrating this expression and assuming $\lim_{T\to\infty} A_T/R_T$ (which will be true if the household is never satiated), yields the household's intertemporal budget constraint:

$$0 = A_0 + \sum_{s=0}^{\infty} \frac{W_s - T_s - C_s}{R_s}. \tag{4} \qquad \boxed{\mathtt{iHBC}}$$

Substituting from (2) establishes:

$$0 = K_0 + \sum_{s=0}^{\infty} \frac{W_s - G_s - C_s}{R_s}. \tag{5} \qquad \boxed{\mathtt{R}}$$

Note that the path of taxes and public debt considered by the author is perfectly consistent with this derivation. Equation (5) establishes the Ricardian proposition: for the household's intertemporal choice it is the time path of government spending that matters and not the time path of taxes and public debt. Note further that the intertemporal consumption choice of the household does not depend on the time path of disposable income as defined in the paper,[1]

$$Y_t + i_t D_t - T_t = \underbrace{W_t + i_t K_t}_{\equiv Y_t - \delta K_t} + i_t D_t - T_t$$

but on the time path of labor income since the time path of capital income is "integrated out". This is the main logical problem of the paper under review.

In an OLG framework these insights remain intact as long as an operative bequest motive exists that links successive generations or as long as the life span of households and the period over which public debt will be retired coincide. Yet, these and other aspects of the Ricardian debate have been intensively discussed elsewhere (see, for instance, Seater (1993)).

References (not cited in the paper)

Blanchard, Oliver and Stanley Fischer. 1989. Lectures on Macroeconomics. The MIT Press. Cambridge, MA and London.

Seater, John J. Ricardian Equivalence. 1993. *Journal of Economic Literature*. Vol. 31. pp. 142-190.

[1]Here I assume that the net return of private capital i_t equals $i_t = r_t - \delta$, where r_t equals the marginal product of capital and δ denotes the rate of capital depreciation.