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Ricardian Equivalence revisited: introductory notes*

Revisitando o teorema da Equivalência Ricardiana: notas introdutórias

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RESUMO: Estas notas visam retornar o debate sobre o modelo, resultados e principais objeções à validade da Equivalência Ricardiana conforme apresentada em Barro (1974). Pretende-se explorar sua tese de que impostos e dívidas se equivalem e não têm efeitos reais sobre a riqueza percebida pelos agentes, a demanda, a taxa real de juros e nem sobre a economia como um todo. A tese refere-se à análise sobre as formas de financiamento de um *dado* volume de gastos e não trata dos efeitos de uma expansão naquele volume, analisando, especificamente, os efeitos do aumento da dívida pública em decorrência da redução nos impostos. Após sua apresentação, a tese foi bastante debatida, consolidando-se algumas premissas necessárias para sua validade. O texto objetiva explorar a primeira rodada de debates sobre o tema, explicitando as restrições às quais estão sujeitas o teorema Barro-Ricardo ou o teorema da Equivalência Ricardiana a partir das publicações de Barro (1976), Buchanan (1976) e Feldstein (1976), todas elas dentro do 'terreno' da ortodoxia econômica, incluindo nas considerações finais revisões e análises sobre o tema feitas por Barro em artigos posteriores (1989 e 1996).
PALAVRAS-CHAVE: Equivalência Ricardiana; Teorema Barro-Ricardo.

ABSTRACT: These notes aim to revisit the debate, the model, the results, and main objections to the validity of the Ricardian Equivalence Theorem as presented in Barro (1974). It is intended to explore his thesis that tax and debt are equivalent and have no real effect on perceived wealth, demand, the real interest rate or on the economy. The thesis refers to the analysis of the ways of financing debt at a given level of government expenditure and does not address the effects of an expansion of this volume of spending, nor it specifically analyzes the effects of an increase in public debt due to a tax reduction policy. After this presentation, the thesis is debated, consolidating some of the premises that are necessary to vali-

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date it. The purpose of the paper is to explore the first round of debates on the theme, explaining the restrictions to which the Barro-Ricardo Theorem or the Ricardian Equivalence Theorem is subject, based on the publications by Barro (1976), Buchanan (1976) and Feldstein (1976), all of them within the 'realm' of economic orthodoxy. The final section presents some remarks and an analysis of Barro's later work (1989 and 1996).
KEYWORDS: Ricardian Equivalence; Barro-Ricardo Theorem.
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INITIAL CONSIDERATIONS

The last trying months that mark one of the worst crises Brazil and the world have ever faced, renewed the relevance of debating on the pressing need for government intervention in the economy to deal not only with sanitary and health issues, but fundamentally, the need for the government to handle demand, income, and employment decrease. The current debate on debt, budget deficit, and ways of financing debt in the pandemic context stimulates an analysis of the 1974 prominent paper by R. Barro named "Are Government Bonds Net Wealth?", and of the discussions had in the aftermath of its publishing.

Barro (1974) analyzed the effects of debt issues following a reduction of tax revenue without new debt issue, due to alterations in government spending. The author claims that there is debt/taxation equivalence. In other words, Barro states that, at a given level of public expenditure, shifting tax and debt will not have any effect on wealth, aggregate demand, on the real interest rate, nor on the output.

The potential effect tax revenue has on aggregate demand, through an increase in consumption, was a theme of discussion during the 1970s, and is a topic revisited by scholars on a regular basis. Before the equivalence hypothesis was elaborated, the most discussed effects of tax reduction at a given level of government spending were the ones considered in the IS-LM and in the neoclassical models. In the IS-LM model, tax reduction increases disposable income and private consumption, aggregate demand, output, and employment. In this perspective, if the functional form of taxation is specified as an increasing function of income (tY), the effect of tax reduction is observed on the spending multiplier. Nonetheless, one way or another, the referred effect will increase aggregate demand, output and employment, thus producing, to some extent, a crowding-out effect on private investment, but not one strong enough to compensate the effects of the expansionary policy on income and employment. In the neoclassical tradition, in which output is an increasing function of the factors of production and of factor productivity (K, L, A), a tax cut would increase disposable income and private consumption. Since private consumption concomitantly elevates private income, the effect on private savings (Y – C – T) depends on the parameters[1]. As to public savings (T – G), considering a given level

[1] Propensity to consume, tax rate.

of government expenditure, a tax cut equals a reduction of public savings. In turn, a reduction in aggregate savings generates an increase in the real interest rate (Loanable Funds Theory), which then causes a reduction of private investment, and the outcome of such scenario is that consumption overtakes investment in the composition of spending, then producing a complete crowding out effect. In the long run, in accordance with Solow, less investment would lead to a reduction of capital stock and of income *per capita* in a steady state, which would, in turn, reduce well-being.

In 1974, Robert Barro confronted both of the aforementioned perspectives when he stated that there was equivalence between tax and debt, a proposition now known as Ricardian Equivalence. According to this theorem, variations in the amount of sovereign debt or of tax, at a given level of government spending, do not qualify as additional economic cost, do not impact demand, do not cause a crowding out effect, and do not affect the real interest rate. This finding was based on two fundamental hypotheses: (i) the existence of some sort of intergenerational solidarity, which means that different generations, the current and the next, are connected when it comes to their utility functions. This connection is represented by a "concern" regarding the level of intergenerational well-being; and (ii) the fact that the government has intertemporal budget constraints, which means that debt will eventually be redeemed. However, in the debate on the *Journal of Political Economy* in April 1976, it was pointed out that the Ricardian Equivalence Theorem lacked additional hypotheses. The most prominent debaters on this theme were J. Buchanan with his paper named "Barro on the Ricardian Equivalence Theorem" and M. Feldstein, with his paper called "Perceived Wealth in Bonds and Social Security: A Comment", followed by Barro's article "Perceived Wealth in Bonds and Social Security and the Ricardian Equivalence Theorem: Reply to Feldstein and Buchanan".

In view of the above, the main objective of the present paper is to expose the restricting hypotheses that validate the theorem revisited and are pointed out in the debate. In accordance with its main purpose, the article starts with a brief presentation of Barro's model; in the following section, the limitations of Ricardian Equivalence reasoning brought up by Buchanan and Feldstein will be examined, as well as Barro's reply. The last section of the paper includes final remarks and some of Barro's analyses presented in more recent work (1989, 1996).

THE BARRO MODEL – A BRIEF INTRODUCTION

The title of Barro's article (1974) suggests the message behind his hypotheses and main findings: are government bonds net wealth? The real effects proposed by the current theory are essentially based on the premise that the agents perceive government bonds as net wealth. However, according to the author, if current generations are connected to future generations (or vice versa), government bonds would only be perceived as net wealth if their value exceeded the present value of

the implied stream of future liabilities[2] (Barro, 1974, p. 1095). Thus, all the possible real effects of a tax cut policy may be macroeconomically neutral due to the existing equivalence between future debt and current taxation[3]. Barro also rejects the idea that there is a limit to the debt-to-GDP ratio[4], a theme earnestly discussed at the moment in Brazil and all around the world. In this vein, there is not a negative effect due to an increase in budget deficit, since all adjustments will be made through public and household balance sheets. An increase in household net wealth in the present will be fully compensated by a future reduction due to the need to finance interest and government debt.

The model was elaborated considering overlapping-generations and intergenerational solidarity[5] and was based, according to Barro (Barro, 1974, p. 1098 and the next), on Samuelson's (1958) and Diamond's (1965) models. The Barro model main hypotheses are the following:

i) Each individual lives two periods: youth, distinguished by 'y' (young); and old age, distinguished by 'o'.

ii) Generations are numbered starting with the generation that is currently old, which corresponds to the first subscript (subscript 1), followed by the next generation, its descendant, that are currently young, which corresponds to the second subscript (subscript 2), and so on.

iii) Each generation has the same number of members who are equal when it comes to productivity; technological change over time is not considered in the model.

iv) The members of each generation work while young and receive a corre-

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[2] In Barro's model this realization would lead to the neoclassical standard result. In the current Fiscal Theory of the Price Level (FTPL) debate, if the present expected value of future surpluses is inferior to lifetime earnings, the adjustment will be made through an increase in the price levels of the adjustment mechanism via wealth effects. In other words, if $B/P > S$ (where B is the nominal stock of debt; P is the price level; and S is the present expected value of future surpluses), prices will increase to secure the adjustment. This mechanism is exposed in Woodford (2005): if the present expected value of surpluses is not enough to lead to an equilibrium, at a given nominal stock of debt, the agents perceive that additional debt (regarding the expected surpluses) as wealth and expand their spending. The adjustment will be made through an increase in price levels.

[3] Barro pointed out that this was already a theme of debate, as James Tobin stated: "How is it possible that society merely by the device of incurring a debt to itself can deceive itself into believing that it is wealthier? Do not the additional taxes which are necessary to carry the interest charges reduce the value of other components of private wealth?" (Tobin, 1971, p. 91 apud Barro, 1974).

[4] This becomes clearer when Barro (1976) claims that debt increase causes anxiety among the agents who will, in turn, save more. Hence, balance sheets would continuously be compensated, regardless the amount of debt.

[5] When designing a model in which you analyze infinite time horizons –as if families had an infinite time horizon and lived eternal life– Barro's hypothesis becomes more obvious: an increase in the present value of assets will be fully compensated by a future decrease, therefore, it would not be reasonable to alter consumption plans throughout life.

sponding amount of wage income, w. Expectations on income for the future generations are considered static (equal w at their current value).

v) Asset holdings take the form of equity capital; government bonds are an additional form of these assets. The rate of return on assets is denoted by r, and its expectations for future periods is also considered static; the returns are paid at the beginning of each period.

vi) Each member of the ith generation is the holder of the amount of assets A_i^y while young and A_i^o while old. These asset holdings correspond to a bequest, which will go to the immediate descendants (generation i + 1) of the members of the current generation.

vii) A portion of the lifetime resources of a member of generation i is inherited by generation i +1 and is modeled by the introduction of consumption levels of the next generation into the utility function of the ith generation.

viii) The government issues a certain amount of debt, B; these bonds pay the total that corresponds to the real interest rB in the current period, and principal debt in the next period[6].

ix) The current interest payments are financed by a lump-sum tax levy on generation 2 households (while young), but the specified principal will be paid off at the beginning of the subsequent period with the addition of a lump-sum tax levy on generation 2 households (while old)[7].

The model aims to evaluate the effects of tax and public debt changes at a given government expenditure level. In the first section of his article, Barro assumes that government spending and tax amount to zero. In accordance with the purpose of the present paper, we will move on to section "B" of Barro's article, in which government debt is incorporated.

Next, the model's initial equation will be presented, without government, followed by the expanded version in which government debt is incorporated, in accordance with the second section of the referred article.

Considering c as consumption, an intertemporal budget constraint equation for a member of generation 1 while old in the basic model is given by:

$$A_1^y + A_0^o = c_1^o + (1 - r)A_1^o \qquad (1)$$

On the left side of the equation are the assets (a total of the available resources, given by the sum of assets held while young A_i^y plus the bequest from the previous generation A_0^o). In turn, total spending (right side of the equation) is given by

[6] Barro states that "[...] the government may not reissue the bonds when they come due in the next period¨ (op. cit., p. 1102).

[7] Barro (1974) later analyzes the effect of government debt issue and its financing in generation 3 and future generations. The author presented similar conclusions, given that intergenerational solidarity is observed between at least two generations.

consumption while old, c_1^o, added to the bequest provision that goes to the next generation (generation 2), less interest earnings[8].

The utility function of a member of generation i depends on their own two-period consumption (while young and while old), given by c_i^y and c_i^o, as well as on the attainable utility of their immediate descendant (U_{i+1}^*).

$$U_i = U_i(c_i^y, c_i^o, U_{i+1}^*) \qquad (2)$$

By incorporating government debt, it is possible to rewrite the intertemporal budget constraint for a currently old member of generation 1:

$$A_1^y + A_0^o + B = c_1^o + (1 - r)A_1^o \qquad (3)$$

On the left side of the equation are B plus all resources of generation 1, representing lump-sum payments received from the government because of a tax cut policy, fully compensated by debt increase.

Regarding generation 2, the current budget constraint equation (while young) is the following:

$$w = c_2^y + (1 - r)A_2^y + rB \qquad (4)$$

The expenditure of generation 2 (while young) must include the tax levy for the payment of government interest (rB). The budget constraint for generation 2 (when old) will now include taxation necessary for the amortization of debt:

$$A_2^y + A_1^o = c_2^o + (1 - r)A_2^o + B \qquad (5)$$

In equation (5), B represents the tax levy necessary for principal repayment. Therefore, generation1 benefits from the proceeds (B) of fiscal policy as the weight of debt and of interest is ultimately borne by the future generation. In view of this, a question remains: the generation that has benefited from the conduction of fiscal policy (i.e., a tax cut) will then believe it is wealthier? The answer to this question depends directly on the two fundamental hypotheses of Barro's model: the first, regarding the form of intergenerational utility functions (there is an operative chain of intergenerational transfers that are connected to one another and is expressed in equation (2)); the second regarding the inability of the government to roll over its debt (hypothesis ix).

According to Barro's model, the utility function of generation 2 that combines this generation's two constraints, youth and old age (eqs. (4) and (5)), is the following[9]:

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[8] The specifications of the model include that interest are only paid once per period. Considering equation (1), interest (r) on this asset holding were paid off at the beginning of the period (while young); thus, are already accumulated in the agent's assets while old (A_1^o) For this reason, interests are multiplied by the resources available while old. In other words, (A_1^o) includes assets held by the agent while young; these proceeds correspond to wage income received during youth, bequest provisions from previous generations, and to the earnings (interest) received on their assets.

[9] The author combines budget constraints of both youth and old age periods of generation 2. After a few manipulations this is what we get: regarding the youth budget constraint, it is possible to rewrite:

$$w + (1-r)A_1^o - B = c_2^y + (1-r)c_2^o + (1-r)^2 A_2^o \qquad (6)$$

The utility function for each member of generation 2 is given by:

$$U_2^* = f_2^*[(1-r)A_1^o - B, w, r] \qquad (7)$$

Hence, the net bequest left by members of generation 2 to the next generation $[(1-r)A_1^o - B]$ is an argument of the utility function of generation 2, which indicates that there is intergenerational solidarity. As shown in the article, in equation (2) the consumption of members of generation 1 and bequest provision for the next generation compete for the available resources. Therefore, there is a negative relationship between c_1^o and $[(1-r)A_1^o - B]$ at a given $A_1^y + A_0^o$.

For a given (initial) value of c_1^y, using equations (2), (3) and (5) in addition to the arguments below, it is possible to obtain the following equation:

$$U_1 = U_1\left(c_1^y, c_1^0, U_2^*\right) = f_1[(1-r)A_1^o - B; c_1^y, A_1^y + A_0^o, w, r] \qquad (8)$$

The equation above shows that the utility attainable for generation 1 depends on the generation's consumption choices throughout life (youth and old age) and on the utility of their immediate descendants. The utility of their descendants will, in turn, depend on their own consumption choices (during both life periods) and on the utility of the subsequent generation (equation (2)). Nonetheless, both consumption and bequest provision for future generations depend on the amount of bequest received (and left) by (and to) the previous generation (and the next). In this sense, given the initial values of $c_1^y, A_1^y + A_0^o$, w and r, the optimization problem of generation 1 comes to the determination of optimal net bequest, $[(1-r)A_1^o - \mathrm{B}]$ for the next generation, subject to the constraint imposed by the model that determines that gross bequest cannot be negative, $A_1^o \geq 0$.

Thus, it is possible to infer the effects of an increase in government debt at a given level of government expenditure. Any changes in B (government debt) will be compensated by a change in A_1^o equal to the change in B multiplied by 1/(1 – r), which will maintain net bequest $[(1-r)A_1^o - B]$ unchanged. This composition of household balance sheets between generations 1 and 2 will establish the neutrality of any change in debt on $c_1^o, c_2^y, c_2^o, A_2^o$ and r This occurs due to the fact that the generations are interconnected and because of the compensating shifts in the balance sheets, since increases in current private savings (increasing in the bequests big enough so that the next generation pays off interest and secures principal payment) fully compensate the reduction of government savings due to debt increase. Intergenerational solidarity increases current savings, and, consequently, current bequest, so that the next generation's utility is attainable. For this reason, there would be equivalence between debt and tax, without any effect on perceived wealth in the private sector.

$A_2^y = \frac{w - c_2^y - rB}{1-r}$. If we substitute this equation for the old age period, we then get: $\frac{w - c_2^y - rB}{1-r} + A_1^0 = c_2^0 + (1-r)$, $A_2^o + B$, multiplying by $(1-r)$: $w - c_2^y - rB + (1-r)A_1^0 = (1-r)c_2^0 + (1-r)^2 A_2^o + (1-r)B \rightarrow w + (1-r)A_1^0 - rB - (1 - -r)B = c_2^y + (1-r)c_2^0 + (1-r)^2 A_2^o$.

Indeed, to Barro, tax reduction/increase or debt reduction/increase as isolated actions do not have any relevant impact on the economy, not even a negative one. In this sense, it is important to point out that, to the author, "the focus of the analysis concerns shifts in tax liabilities and government debt for a given level of government expenditure" (1974, p. 1099). Finally, Barro concludes that his findings on government debt for overlapping-generations models will also apply to social security payments.

BARRO, FELDSTEIN AND BUCHANAN: A DEBATE ON THE NECESSARY CIRCUMSTANCES THAT VALIDATE RICARDIAN EQUIVALENCE[10]

Right after Barro's article was published in 1974, a series of papers by orthodox authors were written to question the validity of his arguments under various circumstances. Polarization was due to, especially, the fact that a great deal of neoclassical scholars projected long term negative impact of changes in fiscal liabilities because of alterations in taxation or social security policies. It was believed that these alterations would necessarily impact savings, the real interest rate, and private accumulation of capital.

The debate to be explored was published in 1976 on the *Journal of Political Economy* and had as its most relevant contributions the ones brought by M. Feldstein, with his article "Perceived Wealth in Bonds and Social Security: A Comment" and by J. Buchanan, with his paper "Barro on the Ricardian Equivalence Theorem"; these contributions were addressed in Barro's reply named "Perceived Wealth in Bonds and Social Security and the Ricardian Equivalence Theorem: Reply to Feldstein and Buchanan". The objective of the present section is to describe the restricting hypotheses pointed out by Feldstein and Buchanan that limit the validity of the Ricardian Equivalence theorem.

A contrapositive statement by Martin Feldstein and Barro's comments

Feldstein starts by giving emphasis to the main finding of Barro's article (1974), namely, that debt and social security are not perceived as household wealth, for they are inserted in operative intergenerational transfer systems and, because of that, government debt does not affect private capital accumulation[11]. The author, in accordance with the neoclassical tradition, claims that Barro's conclusions contradict modern theories on government debt and on its depressing impact on the economy. M. Feldstein even refers to studies by authors such as Buchanan, Modigliani and Diamond,

[10] An outstanding reference on this theme and a great empirical study applied to the Portuguese economy is found in Marinheiro (1996).

[11] Barro is not examining the effects of public spending, but the alternative financing with taxes or debt.

to legitimate his reasoning "models in which public debt is regarded as net wealth by the households so that real capital accumulation is depressed" (1976, p. 331).

The author also claims Barro's results are based on the fact that generations are interconnected through their utility functions and intergenerational voluntary transfers. This way, debt issue increases wealth for the current generation but imposes liability to future generations, whom the current generation is concerned about, as they are going to finance debt eventually. In order to prevent a loss of well-being in the next period, the current generation responds to an increase in wealth via bequest provisions, even if their bequest plans had already been made; the same goes for social security. Nonetheless, Feldstein's argument (1976, p. 332) is centered on a hypothesis that, if altered, would change Barro's findings:

> These conclusions reflect the crucial assumption in Barro's analysis that the economy has a constant population and no economic growth. Consider instead an economy in which total national income grows at rate g, the sum of the growth rate of population and the rate of technical progress. It is useful to analyse first the special case in which the rate of interest on government debt (r) is not greater than the rate of economic growth.

As long as g > r (the income rate[12,13] grows faster than the rate of interest the government pays on its debt), the government will never have to actually pay off the debt, and can substitute it for a new one, only paying interest. Feldstein defends that, as no future generation will have to pay the debt, the current generation, even if they include in their own utility function the concern for future generations, will not have to alter their previously planned bequests and, therefore, the first generation "that receives the debt as a transfer from the government" will increase their own consumption, thus reducing capital accumulation (1976, p. 333). Well, argues the author, in order to maintain a stable ratio of debt to national income, the government can create new debt to pay the interest corresponding to the previous debt, because, provided g > r, it will not be necessary for the government to increase the interest rate for the payment of debt interest, not for amortizations due to an increase in tax base.

If that is the case, the outcome is compatible with the one considered in the neoclassical tradition: a tax cut policy leads to an increase in disposable income, and in the perceived wealth. The increase related to tax reduction causes a decrease in total savings, which elevates the real interest rate, and reduces investment. Then, there will be a re-composition of demand with the increased consumption and reduction of investment and of private accumulation of capital. This outcome is also

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[12] "Consider instead an economy in which total national income grows at rate g, the sum of the growth rate of population and the rate of technical progress" (Feldstein, p. 932).

[13] Marinheiro (1996).

observed with an increase in social security, provided g > r (Feldstein, 1976, p. 333). In sum, the author accepts Barro's conclusions (1974) in the case of a static economic scenario but concludes that expanding social security or government debt at a positive income growth rate will cause a reduction of private accumulation of capital.

Moreover, Feldstein indicates that Barro's hypotheses (1974) are to be tested empirically, even if the aforementioned condition, g > r, is not satisfied. He claims that "the empirical evidence strongly suggests that social security does reduce savings" (p. 333) and highlights that:

> [T]he complexity of these anticipations casts doubt on the empirical relevance of this entire exercise. In determining their bequests, households are required to understand the effect of these bequests and of the financing requirements of the public debt and the social security program on all future generations (p. 335).

The author also argues that it would be plausible if computation difficulties increased individual uncertainty, thus the model should explicitly incorporate an uncertainty component. In addition, Feldstein also mentions a practical difficulty regarding the differential of the interest rate that pays private savings and the interest rate that pays debt, as the first is naturally lower. This would be an additional element for the agents to save the necessary amount to secure future capital[14]. Regarding this argument, Barro claims that it is unlikely that the agents incur systematic errors (rational expectations) to the point that a debt increase will necessarily impact aggregate demand. In contrast, Barro (1976) states that government deficits could make one feel anxious enough to reduce consumption in the face of debt issue. Finally, Feldstein stresses that even for the case $g \leq r$, the results obtained would be compatible with the ones considered in neoclassical tradition, due to the impossibility of balance sheets to be fully compensated, among other reasons.

When answering Feldstein, Barro (1976) claims that his conclusions regarding the second case ($g \leq r$) are due to a calculation error (p. 344). However, regarding the first case ($g > r$)[15], he admits that:

> In this case it is possible to finance all of the future interest payments without incurring in any future taxes by having the debt grow forever at rate r. In this situation, where r < g in a steady state, it appears that

[14] In Barro's seminal model (1974), government bonds or private capital accumulation are the only alternatives for households to maintain their resources. In the article by Feldstein (1976), the argument is not explored, but becomes a relevant point against Barro's thesis. This is because, even if the agents made an effort to accumulate private capital long enough so that future generations did not suffer the effects of a utility reduction, savings would be capitalized at a lower rate than debt, thus resulting in a growth discrepancy between savings and debt. This discrepancy would only be impossible in flawless markets, objection already acknowledged by Barro (1976).

[15] Barro reconsiders his findings not only for g strictly greater than r, but also for [illegible] (p. 343).

> debt issue would be regarded as net wealth and would therefore raise aggregate demand. Further, it seems that a sufficient amount of debt issue would cause enough of a shift from saving to consumption so that the steady-state rate of return would be raised to (just) exceed the growth rate (p. 344).

Hence, "I cannot rigorously rule out the existence of the case, $r < g$, in which debt issue would raise net wealth". However, there is not any difference that stems from debt increase at a given level of government expenditure between Barro's model and more traditional neoclassical theorists' models considering the case of economic growth and a $g \geq r$ scenario.

Contrapositions of James M. Buchanan and Barro's reply

Buchanan (1976, p. 337), after questioning whether debt issue is equivalent to tax, highlights that the equivalence proposed by Barro could only be valid at a given level of government expenditure. Regarding this observation, Barro replied (1976, p. 346):

> [M]y analysis was directed toward fiscal operations that involve shifts between tax and debt finance for a given volume of public expenditures. Shifts in the expenditure level have real effects that depend on the degree of substitutability between public and private expenditures in individual utility functions[16,17].

In addition, Buchanan shows that Barro's thesis (1974) was already present in David Ricardo' contribution, which was promptly recognized by Barro[18].

Exploring the theme further when analyzing Barro's original argument (1974),

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[16] Indeed, this position had already been exposed in Barro's seminal article (1974, p. 1096), when he stated that he intended to analyze the "effect on aggregate demand of 'expansionary' fiscal policy, which is defined here as a substitution of debt for tax finance for a given level of government expenditure," (emphasis mine). Interpreting Ricardian Equivalence as if it were applicable to changes in government spending is a quite common misconception that has been reproduced in current debates.

[17] Regarding the effects of the alterations in government spending, Barro suggests that these effects depend on the substitutability degree between government and private expenditure; the author indicates Bailey (1971) or Grossman and Lucas (1974), as more thorough analyses of such effects (Barro, 1976, p. 346).

[18] The argument was already presented in other papers of that time, for instance, Bailey (1971) when analyzing the effects of an increase in government investment stated that aggregate income would increase. However, he highlighted that such result depends on the agents' perception regarding the amounts received by the government as income. Therefore, if a typical family saved all the amount received for debt financing, interest on savings would correspond to all future tax liability to finance government bond interest (1971, p. 156). He continues: "If the household has a definite consumption plan for the future, and if it knows the future tax effects of disposable income it gets from the switch from current taxes to a bond issue, that is, the household will consume exactly the same amount, whichever form of financing is used" (p. 156).

Buchanan questioned the form that Barro presents debt issue, and compares it to a "helicopter drop"; the helicopter drops bonds on generation 1, currently old[19]. The author, like Feldstein, agrees that Barro's findings depend directly on the conditions that involve overlapped generations that live indefinitely. Thus, this would be the main reason why the impact of fiscal policy would not be expansionary on private spending.

In this regard, Buchanan (1976, p. 337) raises two questions: (i) are future tax liabilities fully capitalized? And, even if they get to this point, (ii) does this necessarily imply that the fiscal policy shift has no effect on total spending?

According to the author, to establish the second result, it would be necessary to examine differential impacts of taxation and debt issue. A tax reduction policy is designed to be lump-sum, but government spending, however stable, could cause different effects on each agent. Buchanan states that Barro's neglection of such aspects may stem from his failure to properly specify the complex set of transactions that debt issue represents. Barro's conclusion, since it does not consider the aforementioned issues, (which are extremely important to conduct any sort of comparative analysis between these two fiscal instruments) "is not nearly so relevant for policy as it seems to be" (p. 337).

As to Buchanan's arguments regarding full capitalization of future tax liabilities, Barro (1976) states that he considers all the risk and liquidity-related characteristics of bonds and tax liabilities. Moreover, he mentions having addressed in his seminal article the effects of "imperfect" private capital markets. To Barro, the implications of these considerations for the net effect of public debt issue on aggregate demand depend on aspects such as government and/or private sector efficiency when it comes to liquidity services, the carrying out of loans, among others, as well as how closely tax liabilities are correlated with individual earnings.

Finally, Buchaman (p. 340) highlights the dispute between government bonds and private bonds, stimulating competition and a displacement effect to some extent. About that, Barro (1976) responded that if future tax liabilities are fully capitalized and if perceived wealth remains unchanged in the face of tax reduction and debt issue, there will not be displacement, since private savings (demand for bonds) will rise one-to-one with the supply (Barro, 1976, p. 346).

FINAL REMARKS

The aim of the present article was to map the debate that rose from Barro's 1974 seminal paper on the Ricardian Equivalence hyphothesis. The objective was to provide an outlook of this debate by presenting some objections to the theorem

[19] It is worth citing the excerpt, since this theme has drawn a lot of interest in current debates: "If the purpose is to increase total spending in the economy, this might be done much more readily by the straightforward issue of money, which does not involve future payment obligations" (p. 338).

formulated by M. Feldstein and J. Buchanan and Barro's reply to these observations in 1976. In these final remarks, Barro's main argument will be summarized and his final comments in other papers will be presented (i.e., Barro, 1989, 1996). For further information on the spending effect, see Bailey (1971) and/or Grossman and Lucas (1974).

The elaboration of the present notes was motivated by the return of the Ricardian Equivalence as a topic in the current macroeconomic debate in Brazil, which motivates the promotion of a better understanding of the limitations of that model, but it also, mainly, motivates reflection regarding the fact that Barro's model is restricted (or not) to the equivalence (or not) of debt and tax, without presenting further consideration of the effects on public spending.

The Ricardian Equivalence Theorem must be understood as a theoretical exercise that aims to argue that the individuals' perceived wealth remains unchanged in the face of a tax cut policy[20] as they receive the equivalent amount in government bonds. This is because, if the current generation is by any chance concerned with the next generation, their immediate descendants, then bond-financed tax reductions amounts are going to be saved. Ultimately, this means that these tax reductions would not have any effect on aggregate savings, the real interest rate, consumption decisions, among other macroeconomic variables.

As shown in the present paper, for the Ricardian Equivalence reasoning to become plausible, a series of conditions would have to be satisfied[21], such as: (a) the existence of a static world, without economic growth; (b) the inexistence of market flaws; (c) non-distortionary taxation; (d) superrational agents, perfectly able to anticipate tax liabilities, as well as their earnings and the earnings of future generations; (e) existence of immediate descendants[22] and of infinite generations; (f) analysis at a given level of government spending; (h) government debt should eventually be paid off.

In addition to the observations acknowledged by Barro in the exposed debate, in other discussions (1989) the author himself listed the main theoretical objections

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[20] In addition, it should be noted that, for consistency, Barro's point (1974) must also be valid in backward reasoning. An increase in current tax, at a given level of government spending would lead to a reduction of private current disposable income, but also to a re-composition of balance sheets between current and future generations, since the future generation would have to pay less debt and interest. This allows the current generation to reduce their savings (to compensate the increase in government savings) and to reduce the amount devoted to bequest provisions, within reason, since bequest provisions must always be positive. Consequently, a limit is imposed to each generation regarding the re-composition of balance sheets, once individuals are not allowed to leave negative provisions to the next generation. This should be carefully considered, since the impossibility of leaving negative bequest provisions might hinder a full compensation of balance sheets and might affect the utility of the current generation.

[21] G. P. O'Driscoll (1976) also took part in the debate with a paper named "The Ricardian Non-Equivalence Theorem" (1976). His intention was to properly characterize previous contributions by David Ricardo on the theme; such contributions will not be addressed in the present paper.

[22] This limitation was pointed out by Tobin, 1980 (apud Snowdon and Vane, 2005), along with 15 other reasons why the Ricardian Equivalence Theorem could not work as proposed by Barro (1974). This debate is beyond the scope of the present article.

he agreed that represented limits to the Ricardian Equivalence's reasoning: (i) the finiteness of life – finite time horizons[23]; (ii) imperfections of private credit markets[24]; (iii) uncertainty regarding the incidence of future taxes; and (iv) the distortionary nature of taxation[25]. Thus, Barro (1989) recognized that the incorporation of these aspects "[…] tends to generate results that are not strictly Ricardian", but, as he continues, "the quantitative significance of these departures from Ricardian Equivalence is unclear" (p. 12).

Finally, in his 1996 article Barro revisits the theme and claimed that, among the main limitations to the validity of Ricardian Equivalence, is the distortionary nature of taxation, which confirms that the theory is not valid with $r < g$ (the real interest rate inferior to the economic growth rate). In turn, the overall validity of the theorem depends on the government debt being eventually paid off. Regarding distortionary taxes, Barro (1996) adjusted his argument, and his interpretation approaches the one of the Real Business Cycle theory:

> The most important consideration is the distorting nature of real-world taxes. Budget deficits influence the timing of taxes, and this timing generally matter if the levies apply to labour income, consumption, and so on. People are motivated to earn labour income in periods of low labour tax rates and to consume in periods of low consumption tax rates. Hence, variations in the anticipated timing of these levies alters the intertemporal allocation of work effort and consumption.

Hence, to Barro, expansions are the result of Ricardian Equivalence, due to (especially) the increase labor supply even during times of lower tax rates, which led the author to conclude that tax rates should be smoothed over time.

Ultimately, even amidst the countless objections brought about in the debate exposed, Barro concludes the discussions (1996, p. 16) by saying "so, unlike my youthful research on Keynesian economics, I have never wished to recant any of my work on Ricardian Equivalence."

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[23] According to Snowdon and Vane (2005), this limitation was originally mentioned by Tobin in 1980, when he argued that families with no children have no incentive to leave bequests at all; Barro (1989) accepted his objection but stated that the impact of this particular case on consumption would not be significant.

[24] This had already been addressed in the 1976 debate with Feldstein and Buchanan.

[25] This had already been addressed in the 1974 debate.

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