

# **The Empirical Evidence on the Ricardian Equivalence Hypothesis**

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## **I. Introduction**

The economic consequences of public debt constitute an important topic for economic research. Traditionally it was thought that – for a given level of government expenditure – a change from tax to debt finance will stimulate private consumption, raise interest rates and possibly crowd out private expenditure. This view is, however, no longer unanimously accepted by the economic profession. According to the *Ricardian* equivalence or debt neutrality hypothesis a change from tax to debt financing of government expenditure does not change the opportunity set for private agents. Rational economic subjects fully perceive that the issue of government debt requires future taxation proceeding from the need to finance the interest and amortization payments. The present value of these taxes equals the current value of the debt. This implies that only the level of government expenditure is important; tax and debt financing are equivalent ways to finance government expenditure [see *Barro* (1974)].

In the theoretical debate on the debt neutrality hypothesis the validity of the various assumptions of the theory – and hence the sources of non-neutrality – are examined [see e.g. *Kitterer* (1986)]. One may, however, agree with *Milton Friedman* that “the relevant question to ask about the ‘assumptions’ of a theory is not whether they are descriptively ‘realistic’, for they never are, but whether they are sufficiently good approximations for the issue at hand. And this question can be answered only by seeing whether the theory works, which means whether it yields sufficiently accurate predictions” [*Friedman* (1953), p. 15].

In this paper the empirical evidence on the debt neutrality hypothesis is examined (section II). It is argued that the evidence is rather unsatisfactory, because some empirical tests are of little – if any – use to see “whether the theory works” (section III). Moreover, the conclusions are not robust; very

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often they are highly sensitive to (minor) changes of the specification, the kind of test which is used and the sample period chosen. To illustrate this, we have examined the robustness of *Kitterer's* (1986) empirical estimates for Germany (section IV).

## II. A Review of the Empirical Evidence

In table 1 the empirical evidence with regard to debt neutrality is shown systematically.<sup>1</sup> Eight different methods have been used – generally more than one in the same study – to examine the equivalence hypothesis. A first test used by many authors is to include government debt in the specification of the consumption function and to check whether the coefficients of total wealth and government debt are equal. As *Feldstein* states: “[s]ince the overall wealth variable ... includes the value of the public debt, the [equivalence] ... hypothesis implies that a separate debt variable should have a coefficient that is negative, but equal in magnitude to the coefficient of the total wealth variable ... [*Feldstein* (1982), p. 11]. Two other wealth tests have been used. First, to investigate the equality of the coefficients of household net worth minus government debt and government debt, and second, to check whether the coefficient of government debt is zero.

A second procedure is to examine the influence of a government deficit on private consumption. According to *Kochin* “[t]he hypothesis tested is that consumers act as if they know that in the long-run current deficits mean future taxes. Therefore, when the deficit is high, consumers realize that their true permanent income is lower than is indicated by the level of their current and past disposable incomes” [*Kochin* (1974), p. 390]. So, the coefficient of government deficits will be negative if the equivalence hypothesis holds.

A third test procedure is to inquire into the coefficients of the taxes and the deficit. If tax and debt finance are equivalent the coefficients of these variables in the consumption function will be the same. Similarly, some authors have tested whether the coefficients of disposable income and the deficit are equal, but of opposite sign. An alternative procedure is to examine the coefficients of income and government spending. According to e.g. *Modigliani* et al. (1985) the coefficient of government spending must be

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<sup>1</sup> Only the evidence which is based on consumer behaviour is presented. Some authors have examined the relationship between deficits and interest rates. According to the equivalence hypothesis government's dissaving is matched by additional private sector saving; a deficit therefore will not raise interest rates. *Evans* (1985), (1987) interpretes the lack of a statistical significant relationship between the US federal deficit and the rate of interest as supportive for the debt neutrality theory. See also *Plosser* (1982).

equal, but of opposite sign, to the coefficient of income if the debt neutrality holds. This can be regarded as a fourth possible test.

A fifth test procedure has been proposed by *Feldstein* (1982) who argued that increases in government spending and decreases in taxes may not have the same effect on consumer spending. If the deficit is included in the specification of the consumption function an artificial constraint is introduced. Therefore both government spending and taxes are included in *Feldstein's* specification. He goes on to argue that “[a] key prediction of the pre-Ricardian hypothesis is that a change in taxes has no effect when the level of government spending and transfers are held constant” [ibid, p. 9]. Moreover, this “line of reasoning also suggests that an increase in transfer payments financed by a government deficit should have no effect on current consumption. The current transfer payment is analogous to a reduction in taxes. While households have currently more spendable income they also have a new future tax liability ... [and] these two effects should just balance to leave current consumption unchanged” ibid, p. 9]. This transfer test is testing procedure number six.

Some authors have argued that the propensity to consume out of (real) government interest income should be zero according to the equivalence proposition. This is the seventh testing procedure.

Finally, some authors have included some measure of social security wealth in their equation to test whether this variable differs significantly from zero. Parallel to the discussion on the effects of public debt, the issue is discussed whether social security – in the sense of any public scheme that provides retirement benefits – reduces private saving. Both discussions show some similarities. In a pay-as-you-go system social security benefits may be regarded as a perfect substitute for bequests, in which case private saving will not be altered due to the introduction of the social security system. The outcomes of these tests are also reported in table 1.

A plus sign in table 1 indicates that the author(s) conclude(s) that the evidence is consistent with debt neutrality; a minus sign implies a falsification of the theory. It should however be noted that differences of opinion may exist with regard to the specification and the interpretation of the tests. As follows from this table, the empirical evidence provides mixed support for the debt neutrality theory. The conclusions generally prove to be sensitive to the sample period chosen and minor changes of specification.<sup>2</sup> Moreover,

<sup>2</sup> See also *Aschauer* (1985) who has used an alternative approach in which restrictions are placed on the data due to the necessary conditions for intertemporal optimization of consumption. *Aschauer* used Full Information Maximum Likelihood. His empirical evidence is supportive for the equivalence hypothesis.



*Table 1*  
**Empirical Evidence With Regard to the Debt Neutrality Hypothesis**

study	tests <sup>1</sup>							
	I	II	III	IV	V	VI	VII	VIII
1. Tanner (1970)	+ <sup>2</sup>							
2. Kochin (1974)		+ <sup>3</sup> <sup>4</sup>						
3. Yawitz & Meyer (1976)	—							
4. Barro (1978)		+ <sup>3</sup> <sup>5</sup>						+
5. Tanner (1979a)		+ <sup>3</sup>						
6. Tanner (1979b)	+ <sup>6</sup>	+ <sup>3</sup>						
7. Buiter & Tobin (1979)			— <sup>7</sup>	—				
8. Carmichael & Hawtrey (1981)			+ <sup>8</sup>					
9. Holcombe et al. (1981)		— <sup>9</sup>						
10. Holcombe et al. (1982)			— <sup>9</sup>					
11. Feldstein (1982)	—			—	— <sup>10</sup>	—		+
12. Seater (1982)	+	+ <sup>11</sup>						+
13. Koskela & Viren (1983)		—	— <sup>12</sup>					
14. Perelman & Pestieau (1983)	—		—					
15. Kormendi (1983)	— <sup>13</sup>			+	+		+	
16. Seater & Mariano (1985)	+				+	+ <sup>14</sup>		+
17. Sarantis (1985)				—	—	—		
18. Modigliani et al. (1985)	— <sup>15</sup>		—	—	—		—	
19. Reid (1985)		— <sup>16</sup>						
20. Kitterer (1986)			—					
21. Schokkaert & Van Rompuy (1986)			— <sup>17</sup>		—			
22. Kessler et al. (1986)			—	—				
23. Modigliani & Sterling (1986)			— <sup>18</sup>	—				

1 I is the wealth test, II is the deficit test, III is the deficit and taxes test, IV is the government expenditure test, V is the tax test, VI is the transfer test, VII is the interest test and VIII is the social security wealth test. See the main text for an explanation.

2 Tanner (1970) examined the proper base for the real balance effect; the best fit occurred when government debt was almost fully discounted.

3 The coefficient of the government surplus/deficit does not equal the coefficient of disposable income.

4 When Buiter & Tobin (1979) extended Kochin's sample period, the federal deficit was deprived of all explanatory power.

5 According to Feldstein (1978) the significance of the coefficient of the government surplus may be due to the simultaneous movements of consumption and surplus. When the deficit is omitted the social security wealth variable is no longer significant.

some testing procedures should be treated very carefully as will be argued in the following section.

### III. The Testing Procedures

Some of the procedures to test the debt neutrality hypothesis require some comments. *Carmichael* (1982) has shown that even if the growth rate ( $n$ ) exceeds the interest rate ( $r$ ) debt neutrality may occur in the steady state, provided the same intergenerational transfer mechanism is operational before and after the policy change. If  $n > r$  government can acquire the means for interest and amortization payments by issuing new bonds without increasing the debt ratio. Therefore, rational economic subjects know that no future taxes will be levied, and therefore the government bonds can be treated as net wealth. *Carmichael's* analysis implies that if the wealth tests reject the hypothesis that government debt is regarded as net wealth, the (extended) debt neutrality hypothesis is falsified. It is however not true that the opposite result implies a confirmation of the theory.

6 The conclusion of *Tanner's* wealth test was reversed when the sample period was extended by *Barth et al.* (1986a).

7 The hypothesis that the coefficients of taxes and the government deficit are equal, could not be rejected due to the non-significance of both variables. It could, however, be rejected for an extended sample period as *Barth et al.* (1986a) showed.

8 In the unrestricted version of their equation the deficit is not significant.

9 *Holcombe et al.* omit some variables which are not significant in their first estimation result. One of the omitted variables is permanent income. This model therefore does not make much sense.

10 *Feldstein* can only reject the hypothesis that the tax coefficient exceeds zero at the 20 % level. According to *Seater & Mariano* (1985), *Feldstein* has not adequately corrected for simultaneity bias.

11 In the regression for non-durables the deficit is insignificant, while both the coefficients for government debt (and capital gains on it) and the social security wealth variable differ significantly from zero.

12 *Koskela & Viren* could not reject the hypothesis that the coefficients of taxes and the deficit equal each other. In their equation with proxies for permanent income this equality can be rejected, but here they failed to correct for serial correlation.

13 *Kormendi* has tested whether the debt coefficient is zero, but found a negative coefficient for government debt, which does not make much sense. *Barth et al.* (1984) replicated *Kormendi's* estimates for another sample period. The debt coefficient is now significantly positive. *Barth et al.* (1986b) also found that the results were sensitive to a breakdown in federal and local government debt and to the measurement of government debt, particularly par versus market value. Moreover, *Modigliani & Sterling* (1986) have criticized *Kormendi's* construction of data and his specification.

14 In some of their estimates the transfer coefficient was significant, but *Seater & Mariano* think this is caused by its acting as a proxy for omitted variables.

15 Government debt is not significant at all.

16 *Reid* has estimated an equation including government expenditure on goods and services and tested for this specification whether the deficit coefficient is zero.

17 The conclusion is highly sensitive to omission of the rate of inflation.

18 *Kormendi & Meguire* (1986) criticize the implicit restrictions in *Modigliani & Sterling's* definition of taxes which is net of all transfers. Moreover, they argue against estimating in level form. Finally, the estimated coefficients are sensitive with respect to the sample period; extending the sample period back to 1931 changes the coefficient for deficits which becomes significantly negative, while the coefficient for net-taxes drops considerably.

The second testing procedure – to check whether the deficit variable has a negative coefficient – cannot differentiate between debt neutrality and the life cycle hypothesis (LCH). As *Modigliani et al.* (1985) note “the LCH calls for adding [to the consumption functional] a [deficit] term . . . , predicted to have a negative coefficient on the ground that, for a given level of current taxes, the presence of a deficit signals that future taxes will have to rise to service the interest (and pay back the principal) on new debt issues” (p. 97). Similarly, a negative deficit coefficient is consistent with *Feldstein’s* (1982) “fiscal expectations approach”. To falsify a theory it is not only required that the theory be testable, but also that it is independently testable, i.e. capable of predicting an outcome that is not also predicted by a rival theory. Therefore we do not think the second way to test the equivalence theorem is of much importance.

The third testing procedure has one drawback, i.e. it is implicitly assumed that government spending and private consumption are no substitutes. Therefore if the deficit and tax coefficients are not equal this might not be due to the absence of debt neutrality but the outcome of a substitution relationship between private and public consumption. This can be shown as follows:

Suppose consumer expenditure depends on government spending ( $G$ ), taxation ( $T$ ), deficit spending ( $D$ ) and other variables ( $X_i$ ).

$$(1) \quad C = C(G, T, D, X_i)$$

Differentiating yields:

$$(2) \quad dC = \partial C / \partial G . dG + \partial C / \partial T . dT + \partial C / \partial D . dD + \partial C / \partial X_i . dX_i$$

According to the equivalence hypothesis a change from tax to debt financing for a given level of government spending does, *cet. par.*, not affect private consumption. So:  $dC = dG = dX_i = 0$  and  $dD = -dT$ . This yields:

$$(3) \quad dC/dD = 0 = \partial C / \partial D - \partial C / \partial T, \text{ implying } \partial C / \partial D = \partial C / \partial T.$$

Suppose now that government spending is increased and that a perfect substitution relationship exists between private and public spending, implying  $\partial C / \partial G = -1$ . Abstracting from money finance,  $dG = dT + dD$ , while  $dC = -dG$ . So we can write:

$$(4) \quad 0 = \partial C / \partial T . (dG - dD) + \partial C / \partial D . dD$$

This can be rewritten as:

$$(5) \quad 0 = \partial C / \partial T \cdot dG + dD \cdot (\partial C / \partial D - \partial C / \partial T) .$$

It follows that  $\partial C / \partial T$  and  $\partial C / \partial D$  cannot be the same.

Similarly, if government consumption is a substitute for private consumption, the results of the fourth tests may be biased. Both *Kormendi* (1983) and *Aschauer* (1985) present evidence suggesting some substitutability. A negative coefficient for government consumption may therefore be due to this relationship.

Finally, one should also be very careful with regard to the transfer test. Transfer payments will generally shift resources from people with a low propensity to consume to people with a high propensity to consume. The magnitude of the transfer coefficient is influenced by this mechanism, and testing for a zero coefficient is therefore too restrictive [see also *Kormendi & Meguire* (1986)].

#### IV. Empirical Estimates for Germany

As we have shown in the second section, the empirical evidence with regard to the debt neutrality hypothesis which is based on consumer behaviour is rather sensitive to the sample period chosen and to minor changes of specification. In this section we will examine whether this also holds for *Kitterer's* (1986) estimates for Germany.

*Kitterer* (1986) has estimated the following consumption function to test for the neutrality hypothesis in Germany:<sup>3</sup>

$$(6) \quad C_t = a_1 \cdot \Delta \ln P_t + a_2 \cdot C_{t-1} + a_3 \cdot Y_t + a_4 \cdot T_t + a_5 \cdot D_t$$

where  $C_t$  denotes private sector consumption;  $P_t$  is the consumption price-index;  $Y_t$  denotes net national income;  $T_t$  is taxes (including social security contributions and net of transfers) and  $D_t$  is government deficit.

*Kitterer* examines whether the hypothesis that  $a_4 = a_5$  holds. His results are shown as equation (I) in table 2; the null hypothesis is rejected. We have

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<sup>3</sup> *Kitterer* states that – to his knowledge – no empirical estimates for Germany exists. However, *Sarantis* (1985) has also estimated a consumption function for Germany to test for the neutrality hypothesis, while *Koskela & Viren* (1983) and *Kessler, Perelman & Pestieau* (1986) included Germany in their estimates for a sample of OECD countries.



updated Kitterer's sample period and the results are shown as equation II in table 2. His general conclusion is not changed.

*Table 2*  
**Consumption Functions for Germany**

variable	equation			
	I	II	III	IV
	1962 - 1978	1961 - 1983	1962 - 1983	1963 - 1983
$\Delta \ln P_t$	3.362.23 (4.63)	-0.06 (-4.96)	0.12 (1.79)	0.02 (0.31)
$C_{t-1}$	0.34 (3.13)	0.41 (9.22)	0.20 (2.04)	
$Y_t$	0.47 (6.69)	0.42 (14.09)	0.90 (8.21)	0.91 (6.66)
$T_t$	-0.21 (-2.96)	-0.12 (-2.24)	-0.18 (-3.24)	-0.03 (-0.21)
$D_t$	0.17 (3.03)	0.25 (4.66)	0.001 (1.21)	
$\Delta \Delta \ln Y_t$				-0.25 (-2.25)
$\Delta \ln Tr_t$				0.26 (5.67)
$\Delta \ln C_g$				-0.18 (-1.75)
$\bar{R}^2$	0.99	0.99	0.85	0.91
$D - W$	2.57	1.67	2.27	2.27

The independent variables show a high degree of multicollinearity (see table 3). One might therefore prefer to estimate the equation in rates of change form. This is shown as equation III in table 2. The deficit is no longer significant. Another potential problem is the assumed exogeneity of the right hand side variables. Reestimating the equation using the instrumental variables approach did not substantially change our results.

As we have noted in the second section, various other procedure have been used to test the equivalence hypothesis. It is possible that these tests yield



Table 3  
Correlations of Explanatory Variables of Equation (6)

	$d\ln P$	$C(-1)$	$Y$	$T$	$D$
$d\ln P$	1.00	0.58	0.60	0.63	0.41
$C(-1)$		1.00	0.99	0.97	0.81
$Y$			1.00	0.99	0.75
$T$				1.00	0.69
$D$					1.00

another outcome, and therefore we have also used *Sarantis's* (1985) specification:<sup>4</sup>

$$(7) \quad \Delta \ln C_t = a_1 \cdot \Delta \ln Y_t + a_2 \cdot \Delta \Delta \ln Y_t + a_3 \cdot \Delta \ln P_t + a_4 \cdot \Delta \ln Cg_t + \\ + a_5 \cdot \Delta \ln Tr_t + a_6 \cdot \Delta \ln T_t^*$$

where  $C_g$  denotes government consumption;  $Tr$  is transfers to households and  $T^*$  is taxes (including social security contributions, but not corrected for transfers).

The results using the instrumental variable approach are shown as equation IV in table 2.<sup>5</sup> It is interesting to note that the coefficient for the tax variable is not significant which is in accordance with the *Ricardian* equivalence hypothesis.

Various authors have included the change in the unemployment rate in their specification. *Koskela & Viren* (1983) argue that this may be interpreted as a proxy for real income uncertainty, expected to have a negative effect on household consumption. We have estimated equation IV including this additional variable. It has indeed the expected negative sign, but is not significant. The other coefficients are not very sensitive to this alteration and therefore the outcome is not shown in table 2.

Finally, we have experimented with two specifications of the consumption functions, suggested by others. The first specification is from *Modigliani* et al. (1985), the second from *Seater & Mariano* (1985).

<sup>4</sup> *Sarantis* also includes  $\ln(C/Y)_{t-1}$  in his specification, but this clearly deteriorates the results from the multicollinearity perspective. We have therefore not included this variable. The general conclusions are not changed due to this alteration.

<sup>5</sup> We have used the current and lagged values of the following variables as instruments: government consumption, transfers, exports and investments.

Modigliani et al. (1985) have used the following specification:

(8)  $C = \alpha_1 \cdot Y_d + \alpha_2 \cdot W + \alpha_3 \cdot D + \alpha_4 \cdot \text{Debt}$

where  $W$  is private sector wealth and  $\text{Debt}$  is government debt at the beginning of the period and  $Y_d$  (disposable income) is defined as:  $Y_d = Y + RD - T$  where  $RD$  is nominal interest payments on government debt. The other variables are defined as before.

In table 4 the results are shown. Equation V is the conventional life cycle specification, corrected for serial correlation. The coefficient for disposable income is similar to the one found by *Modigliani et al.* (1985) for Italy, while our wealth coefficient is somewhat higher. In equation VI government debt and deficit are included. According to the debt neutrality theorem  $\alpha_3 = -\alpha_1$  and  $\alpha_4 = -\alpha_2$ . The hypothesis that  $\alpha_3 + \alpha_1 = 0$  can be rejected ( $t = 2.82$ ), but the hypothesis that  $\alpha_2 + \alpha_4 = 0$  cannot be rejected ( $t = 0.47$ ).<sup>6</sup>

Table 4  
Estimation Results for Equation (8), 1962 - 1983

	$C_0$	$Y_d$	$W$	$D$	Debt	AR (1)
V	0.01 (1.05)	0.65 (7.43)	0.12 (3.23)			0.67 (3.03)
VI	0.01 (1.49)	0.56 (5.11)	0.20 (2.51)	-0.07 (-0.66)	-0.12 (-1.06)	0.71 (3.11)

*Seater & Mariano* (1985) have used equation (9) to test for tax discounting:<sup>7</sup>

(9)  $C = C_0 + \alpha_1 \cdot Y^* + \alpha_2 \cdot (Y - Y^*) + \alpha_3 \cdot G^* + \alpha_4 \cdot (G - G^*) + \alpha_5 \cdot RS + \alpha_6 \cdot RL + \alpha_7 \cdot T + \alpha_8 \cdot Tr + \alpha_9 \cdot \text{Debt}$

where  $G$  is government expenditure on goods and services,  $RS$  is the short-term interest rate and  $RL$  is the long-term interest rate.

The asterisk indicates the permanent part of the series concerned. *Seater & Mariano* have used the method as development by *Beveridge & Nelson*

<sup>6</sup> We have also estimated equations V and VI in first difference form, but this did not change the estimated coefficients substantially.

<sup>7</sup> *Seater & Mariano* also included the average marginal tax rate and social security wealth.

(1981) to construct series for permanent and transitory parts. The procedure is to estimate an ARIMA model and then to compute the stochastic steady state values of the variables concerned. These steady state values are the normal levels, which are a proxy for the permanent part of the variable. The best low order model for  $Y$  was:

$$\Delta Y = 0.0045197 + 0.62043 \Delta Y_{t-1} - 0.4092726 \Delta Y_{t-2}$$

The values for  $Y^*$  are shown in the data appendix, as are the values for  $G^*$ , which are computed in a similar way.<sup>8</sup>

The estimation results for the period 1960 - 1983 using the instrumental variable approach are:<sup>9</sup>

$$\begin{aligned} \text{VII } C = & 0.01 + 0.50 Y^* + 0.65 (Y - Y^*) - 0.22 G^* + 0.05 (G - G^*) + 0.75 Tr \\ & (5.04) \quad (13.63) \quad (10.56) \quad (-2.00) \quad (0.45) \quad (8.44) \\ & -0.08 T + 0.12 Debt \\ & (-0.88) \quad (9.44) \end{aligned}$$

The tax coefficient does not differ significantly from zero which is in accordance with the debt neutrality hypothesis. However, both the coefficients for transfers and government debt differ significantly from zero which might be interpreted as evidence against the equivalence hypothesis.

## V. Conclusions

In this paper the empirical evidence on the debt neutrality hypothesis is reviewed. It is shown that, in principle, there is widespread agreement how the theory should be tested. Both opponents and supporters of the equivalence hypothesis use the same approach, i.e. testing whether some restrictions in the consumption function as implied by the hypothesis actually hold. We have argued, however, that some testing procedures have certain serious drawbacks. Moreover, the conclusions of various studies are very sensitive with regard to the sample period chosen and the tests used. This is illustrated for the case of Germany. So one might doubt whether the debate

<sup>8</sup> *Seater & Mariano* have differentiated between federal and state-local government spending and between federal military and non-military spending, but we could not dispose of sufficient data to do the same for Germany.

<sup>9</sup> The results are shown for the equation in which the interest rates, which were not significant, are excluded. The results are not very sensitive with respect to this omission.

on the debt neutrality hypothesis can be settled on the basis of empirical tests as generally used.

### Data Appendix

All variables are in real per capita terms. The data on population are taken from the 1985/86 report of the *Sachverständigenrat* „Auf dem Weg zu mehr Beschäftigung“ (table 18). We have used the price index for private consumption (1980 = 100) as deflator (table 14). The other data are also from the *Sachverständigenrat*: *Y* (table 22); *C* (table 7); *C<sub>g</sub>* (table 8); *G* (table 34); *Tr* (table 34); *T* (table 34); *D* (table 34); *R* (table 34); *Dept* (table 37); exports (table 10); investments (table 9). The data on financial wealth (*W*) are taken from Sonderdruck Nr. 4 of the *Deutsche Bundesbank* for the period 1960 - 1982 and data for more recent years are taken from the May issues of *Finanzbericht*. The data on long-term and short-term interest rates are taken from International Financial Statistics (line 61 and line 60b). All data are available on request.

year	Y*	G*
1962	0.116231	0.023966
1963	0.117809	0.025581
1964	0.127852	0.026863
1965	0.130022	0.028897
1966	0.131810	0.029415
1967	0.131468	0.029902
1968	0.143924	0.031233
1969	0.153159	0.034339
1970	0.162117	0.037068
1971	0.168977	0.039544
1972	0.176257	0.040214
1973	0.184026	0.045090
1974	0.180911	0.048226
1975	0.181187	0.047724
1976	0.195848	0.049545
1977	0.193484	0.051477
1978	0.206667	0.054087
1979	0.211327	0.054749
1980	0.210616	0.056843
1981	0.206762	0.055351
1982	0.205743	0.055017
1983	0.211197	0.056093



## References

- Aschauer, D. A. (1985): "Fiscal Policy and Aggregate Demand", *American Economic Review*, 75, 117 - 127. — Barro, R. J. (1974): "Are Government Bonds Net Wealth?". *Journal of Political Economy*, 82, 1095 - 1117. — Barro, R. J. (1978), *The Impact of Social Security on Private Saving*, AEI Studies nr. 199. — Barth, J. R., G. Iden & F. S. Russek (1984): "Do Federal Deficits Really Matter?", *Contemporary Policy Issues*, 3, 79 - 95. — Barth, J. R., G. Iden & F. S. Russek (1986a): "The Economic Consequences of Federal Deficits: An Examination of the Net Wealth and Instability Issues", *Southern Economic Journal*, 53, 27 - 50. — Barth, J. R., G. Iden & F. S. Russek (1986b): "Government Debt, Government Spending, and Private Sector Behavior: Comment", *American Economic Review*, 76, 1158 - 1167. — Beveridge, S. & C. R. Nelson (1981): "A New Approach to Decomposition of Economic Timeseries into Permanent and Transitory Components with Particular Attention to Measurement of the 'Business Cycle'", *Journal of Monetary Economics*, 7, 151 - 174. — Buiter, W. & J. Tobin (1979): "Debt Neutrality: A Brief Review of Doctrine and Evidence", in: G. M. von Furstenberg (ed), *Social Security and Private Saving*, Cambridge. — Carmichael, J. (1982): "On Barro's Theorem of Debt Neutrality: The Irrelevance of Net Wealth", *American Economic Review*, 72, 202 - 213. — Carmichael, J. & K. Hawtrey (1981): "Social Security, Government Finance and Saving", *Economic Record*, 57, 332 - 343. — Evans, P. (1985): "Do Large Deficits Produce High Interest Rates?", *American Economic Review*, 75, 68 - 87. — Evans, P. (1987): "Interest Rates and Expected Future Budget Deficits in the United States", *Journal of Political Economy*, 95, 34 - 58. — Feldstein, M. (1982): "Government Deficits and Aggregate Demand", *Journal of Monetary Economics*, 9, 1 - 20. — Friedman, M. (1953): "The Methodology of Positive Economics", in: *Essays in Positive Economics*, Chicago. — Holcombe, R. G., J. D. Jackson & A. Zardkoohi (1981): "The National Debt Controversy", *Kyklos*, 34, 186 - 202. — Holcombe, R. G., J. D. Jackson & A. Zardkoohi (1982): "The National Debt Controversy: A Reply", *Kyklos*, 35, 575 - 588. — Kessler, D., S. Perelman & P. Pestieau (1986): "Public Debt, Tax, and Consumption: A Test on OECD Countries", *Public Finance*, 41, 63 - 69. — Kitterer, W. (1986): "Sind Steuern und Staatsverschuldung äquivalente Instrumente zur Finanzierung der Staatsausgaben?", *Kredit und Kapital*, 19, 271 - 291. — Kochin, L. A. (1974): "Are Future Taxes Anticipated by Consumers?", *Journal of Money, Credit and Banking*, 6, 385 - 394. — Kormendi, R. C. (1983): "Government Debt, Government Spending and Private Sector Behavior", *American Economic Review*, 73, 994 - 1010. — Kormendi, R. C. & P. Meguire (1986): "Government Debt, Government Spending and Private Sector Behavior: Reply", *American Economic Review*, 76, 1180 - 1187. — Koskela, E. & M. Viren (1983): "National Debt Neutrality; Some International Evidence", *Kyklos*, 35, 575 - 588. — Modigliani, F., T. Jappelli & M. Pagano (1985): "The Impact of Fiscal Policy and Inflation on National Saving: The Italian Case", *Banca Nazionale del Lavoro Quarterly Review*, nr. 153, 91 - 126. — Modigliani, F., T. Jappelli & M. Pagano & A. Sterling (1986): "Government Debt, Government Spending and Private Sector Behavior: Comment", *American Economic Review*, 76, 1168 - 1179. — Perelman, S. & P. Pestieau (1983): "Deficit Budgetaire et Epargne Nationale", *Cahiers Economiques de Bruxelles*, nr. 8, 194 - 207. — Plosser, C. I. (1982): "Government Financing Decisions and Asset Returns", *Journal of Monetary Economics*, 9, 325 - 352. — Reid, B. G. (1985): "Aggregate Consumption and Deficit Financing: An Attempt to Separate Permanent from Transitory Effects", *Economic Inquiry*, 23, 4745 - 486. — Sarantis, N. (1985):

"Fiscal Policies and Consumer Behavior in Western Europe", *Kyklos*, 38, 233 - 248. — *Schokkaert, E. & V. van Rompuy* (1986): "Intergenerational Distribution of the Burden of Debt: The Case of Belgium", in: B. P. *Herber* (ed), *Public Finance and Public Debt*, Detroit. — *Seater, J. J.* (1982): "Are Future Taxes Discounted?", *Journal of Money, Credit and Banking*, 14, 376 - 389. — *Seater, J. J. & R. S. Mariano* (1985): "New Tests of the Life Cycle and Tax Discounting Hypothesis", *Journal of Monetary Economics*, 15, 317 - 321. — *Tanner, J. E.* (1970): "Empirical Evidence on the Short-run real Balance Effect in Canada", *Journal of Money, Credit and Banking*, 2, 473 - 485. — *Tanner, J. E.* (1979a): "Fiscal Policy and Consumer Behavior", *Review of Economics and Statistics*, 61, 214 - 218. — *Tanner, J. E.* (1979b): "An Empirical Investigation of Tax Discounting", *Journal of Money, Credit and Banking*, 11, 317 - 321. — *Yawitz, J. B. & L. H. Meyer* (1976): "An Empirical Investigation of the Extent of Tax Discounting", *Journal of Money, Credit and Banking*, 8, 247 - 254.

## Summary

### The Empirical Evidence on the Ricardian Equivalence Hypothesis

In this article the empirical evidence on the *Ricardian* equivalence (or debt neutrality) hypothesis which is based on consumer behaviour is reviewed. The various testing procedures are critically discussed and the outcomes of the tests are shown schematically. It appears that the results are rather sensitive with regard to the sample period chosen and to minor changes of specification. This is further illustrated for the case of Germany with specifications of the consumption function as suggested by *Seater & Mariano* and *Modigliani* et al.

## Zusammenfassung

### Empirischer Beweis der Äquivalenzhypothese Ricardos

In diesem Artikel wird der empirische Beweis der auf dem Konsumentenverhalten basierenden Äquivalenz-(oder Schuldenneutralitäts-)hypothese *Ricardos* überprüft. Die verschiedenen Prüfverfahren werden kritisch besprochen und die Prüfergebnisse schematisch dargestellt. Es scheint, daß die Resultate in bezug auf den gewählten Stichprobenzeitraum sowie auf auch nur geringe Beschreibungsänderungen recht anfällig sind. Für Deutschland wird dies durch Beschreibung der Verbrauchsfunktion in dem von *Seater & Mariano* sowie *Modigliani* et al. vorgeschlagenen Sinne näher erläutert.

## Résumé

### La preuve empirique de l'hypothèse d'équivalence de Ricardo

La preuve empirique de l'hypothèse d'équivalence de *Ricardo* (ou de la neutralité de la dette), qui se base sur le comportement du consommateur, est examinée dans cet article. L'auteur discute de façon critique les différentes procédures d'essai et montre schématiquement les résultats des tests. Ceux-ci se révèlent plutôt sensibles quant à la période d'échantillonnage choisie et quant à des changements mineurs de spécification. En outre, l'auteur démontre ceci au cas de l'Allemagne avec des spécifications de la fonction de consommation suggérée entre autres par *Seater & Mariano* et *Modigliani*.