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RICARDIAN EQUIVALENCE: FURTHER EVIDENCE

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The Ricardian Hypothesis states that for a given level of government expenditure, aggregate demand is neutral to changes in the debt-to-tax ratio. Many economists argue that the private and government sectors have different planning horizons which will lead to deviations from Ricardian equivalence. In this paper, by using a model that nests both Ricardian equivalence and an alternative hypothesis, we empirically investigate whether the private sector has a shorter planning horizon than the government sector. The evidence presented in this study suggests that there is no difference between the planning horizons of the private and government sectors. [E62]

1. INTRODUCTION

The question of whether fiscal policies have any impact on consumer behavior or on aggregate demand in general has created a controversy among both economists and the general public. The recent debate over the effects of the large United States government budget deficit highlights this controversy. The center of the controversy is the effectiveness of government deficits as a stabilization instrument.

Barro (1974) revived what is now called Ricardian equivalence. According to this view, a change in the debt-to-tax ratio will not have any impact on consumer behavior. In particular, a bond-financed tax reduction will not change consumption, but will increase saving by the exact amount of the tax reduction. The reason for the saving increase is that a tax reduction today indicates a future tax increase. Consumers save more in order to repay the face value of the debt plus interest. In other words, the timing of taxes does not affect the real equilibrium of the economy.

Opponents of Ricardian equivalence reject the idea that consumers behave as if they are infinitely-lived and instead claim that the debt-to-tax ratio will have an impact on aggregate demand. They argue that a reduction in taxes financed by debt will increase consumption, since consumers and government have different planning

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horizons. If consumers have a shorter planning horizon than the government then a current tax-reduction financed by debt will increase their consumption. The reason is that consumers will not incur all of the future tax increase needed to retire the government debt.

The empirical research on this question is inconclusive. Two methods have been used to implement an empirical test of the Ricardian hypothesis. The first is based on regressing consumption on variables like taxes and debt without explicitly deriving the estimating equation from the consumer's maximization problem. Authors like Feldstein and Elmendorf (1990) and Modigliani and Sterling (1990) report evidence against the Ricardian equivalence hypothesis, while Kormendi and Meguire (1990), and Barro (1978) report evidence favorable to it. These studies do not consider the intertemporal maximization problem of the consumer which is at the heart of Ricardian equivalence. For example, in these studies consumer expectations are never considered, even though in an intertemporal setting consumers' expectations about future variables will affect their behavior. Another shortcoming in these studies is that they implicitly assume that consumers' decision rules are invariant to changes in economic policies. As Lucas (1976) proposed, it is misleading to assess the impact of changes in policy on private sector behavior by using consumption and investment functions which are considered structural equations. In a dynamic setting the consumer's decision rules will not be invariant to policy interventions.

In the second method, the estimating equation is derived by taking into consideration the intertemporal setting of the consumer's decision-making process. Aschauer (1985) reported results favorable to the Ricardian equivalence hypothesis by using an intertemporal framework that assumes infinitely-lived consumers.

A shortcoming of the two methods mentioned above is that they fail to nest both the Ricardian equivalence and the Keynesian hypotheses in implementing their empirical investigation. For example, in the first method consumers are assumed to consider government debt as net wealth, while in the second method consumers do not consider government debt as net wealth.

One of the few models that nests both the Ricardian and Keynesian hypotheses is that of Blanchard (1985). In Blanchard's model consumers are assumed to have finite lives—that is, they face a positive probability of dying in each period. If there is a positive probability that a consumer might not be around when taxes become due, then a debt-financed by a tax cut will increase consumption. Thus far few researchers have used Blanchard's model to test for Ricardian equivalence. Van Wijnbergen (1985) employed a version of Blanchard's model and rejected the Ricardian hypothesis by using data from members of the OECD. But, as Barro (1985) and Buiters (1985) have pointed out, van Wijnbergen's results are based on an ad hoc model that is not derived from intertemporal optimization and does not incorporate expectations about future income and taxes, as is required to test the Ricardian equivalence hypothesis. Thus, his estimating equation is misspecified and his results are not reliable.

The purpose of this paper is to derive an estimable consumption function from the intertemporal maximization problem of the consumer and to test whether consumers behave as though they are infinitely-lived within a rational expectations framework. Using a version of Blanchard (1985), we test whether consumers have a shorter planning horizon than the government. The empirical investigation is implemented by using aggregate time series data from five members of the Organization of Economic Cooperation and Development (OECD). Our results support the view that consumers behave as though they are infinitely lived.

The rest of the paper is organized as follows. Section two develops the maximization problem of the consumer. In section three we present the empirical specifications and results. Section four provides a summary and concluding remarks.

2. THE MODEL

We consider a small open economy with overlapping generations, where in every period a new generation is born and the older generations face a fixed probability of survival, γ . Every consumer maximizes her own utility function taking into consideration that she might not survive until the next period. It is also assumed that consumers have complete access to capital markets and can borrow and lend at the going rate. Since consumers have a positive probability of not surviving between periods, the interest factor charged will reflect this uncertainty and is given by R/γ where R is one plus the rate of return, r . Given a discount factor of $1 + d$, where d is the discount rate, the discounted expected utility of the consumer at time t can be written as

$$V = E_t \sum_{i=0}^{\infty} \left(\frac{\gamma}{1 + d} \right)^i U(c_{t+i}), \quad (1)$$

where γ is the probability that a consumer survives until period $t + i$.¹ The expectation operator, conditioned on information available at time t , reflects the uncertainty about future consumption which depends on stochastic labor income y_{t+i} and taxes τ_{t+i} . In this model we assume that taxes are lump-sum, thus ignoring the efficiency (tax smoothing) aspect of fiscal policy. It is also assumed that there are actuarial bonds. Consumers either lend to or borrow from the financial intermediaries by either receiving or paying the risk adjusted rate. At the time of death of the borrower or the lender, all claims are canceled.² Consumers maximize

¹This model ignores population growth.

²For complete discussion of the model see Blanchard (1984, 1985).

equation (1) subject to the usual budget constraint

$$c_t = y_t - \tau_t + b_t - \frac{R}{\gamma} b_{t-1}, \quad (2)$$

where b_t is debt or credit acquired in period t . Solving equation (2) forward and imposing the transversality condition $\lim_{i \rightarrow \infty} \left(\frac{\gamma}{R}\right)^i b_{t+i} = 0$, the consumers' lifetime budget constraint can be written as:

$$\sum_{i=0}^{\infty} \left(\frac{\gamma}{R}\right)^i E_t c_{t+i} = E_t \sum_{i=0}^{\infty} \left(\frac{\gamma}{R}\right)^i (y_{t+i} - \tau_{t+i}) - \frac{R}{\gamma} b_{t-1}. \quad (3)$$

The representative consumer maximizes equation (1) subject to (3). Assuming that the utility function is quadratic, the consumption function can be written as:

$$c_t = \beta_0 + \beta_1 E_t \omega_t, \quad (4)$$

$$\text{where } \beta_0 = \frac{\alpha \gamma (1 + d) - R}{R(R - \gamma)} \text{ and } \beta_1 = \frac{R^2 - \gamma(1 + d)}{R^2}.$$

$E_t \omega_t$ is the expected lifetime wealth of the consumer. Note that the marginal propensity to consume out of wealth (β_1) depends on the probability of survival. On the one hand, if $\gamma = 0$, which is the case where consumers are certain of not surviving until the next period, the marginal propensity to consume out of total wealth is one. On the other hand, if $\gamma = 1$, the marginal propensity to consume is less than one. In the case where $0 < \gamma < 1$, the marginal propensity to consume will be higher than it would in the case where consumers are infinitely lived ($\gamma = 1$). The assumption of a constant and non-stochastic interest rate restricts β_0 and β_1 to also be constant and non-stochastic.

The consumption function we have derived so far is an individual's consumption function. In order to derive aggregate consumption for the whole society, we have to sum individual consumption functions across all (finitely lived) cohorts at period t . Normalizing the population of each cohort to one, the size of a cohort at age a is γ^a . Total population is given by summing across all cohorts

$$\sum_{a=0}^{\infty} \gamma^a = \frac{1}{1 - \gamma}. \quad (5)$$

Aggregate consumption in period t is given by the sum of the consumption of each cohort. Dividing aggregate consumption by population size, we have per-capita consumption

$$C_t = (1 - \gamma) \sum_{a=0}^{\infty} \gamma^a c_{t,a}, \quad (6)$$

where $c_{t,a}$ is the consumption of an individual at age a in period t .

Similarly we define aggregate per-capita wealth as the sum of the individual wealth of all cohorts at time t divided by population size:

$$E_t W_t = (1 - \gamma) \sum_{a=0}^{\infty} \gamma^a \omega_{t,a} = E_t \sum_{i=0}^{\infty} \left(\frac{\gamma}{R} \right)^i (Y_{t+i} - T_{t+i}) - R B_{t-1}, \quad (7)$$

where $\omega_{t,a}$ is the expected wealth of a consumer of age a at time t , B_{t-1} is the aggregate per-capita national debt issued at time $t-1$, and Y_{t+i} and T_{t+i} are aggregate income and taxes at period $t+i$, respectively. Note that the aggregate private debt is discounted by the risk free interest factor, R , instead of R/γ as in the individual's budget constraint. This difference is due to the assumption of independent probability of death among individuals. In other words there is no aggregate risk.

Thus aggregate per-capita consumption can be written as:

$$C_t = \beta_0 + \beta_1 E_t W_t, \quad (8)$$

where $E_t W_t$ is given by equation (7). Notice that the marginal propensity to consume out of expected aggregate per-capita wealth is the same as that of individual expected wealth. This result follows from the assumption that all cohorts, although born in different periods, have the same probability of survival. This assumption enables us to impose the same planning horizons on all cohorts, and hence, the same marginal propensities to consume. This assumption

facilitates aggregation across cohorts. One shortcoming of this assumption is that it does not capture the change in individual behavior over time as the life-cycle model predicts.

The aggregate budget at time t for all cohorts can be calculated by summing their individual budget constraints at time t . The individual budget constraint is rearranged as:

$$B_t = C_t - (Y_t - T_t) + RB_{t-1}. \quad (9)$$

The aggregate per-capita wealth can now be rewritten as:

$$E_t W_t = H_t - RB_{t-1}, \text{ where human wealth } H_t = \sum_{i=0}^{\infty} \left(\frac{\gamma}{R} \right)^i E_t (Y_{t+i} - T_{t+i}). \quad (10)$$

Expanding H_t and substituting into equation (9) we have

$$B_t = C_t - \left(EH_t - \frac{\gamma}{R} E_t H_{t+1} \right) + RB_{t-1}. \quad (11)$$

Equation (10) can now be rewritten as:

$$E_t W_t = E_{t-1} H_t - RB_{t-1} + \varepsilon_t, \text{ where } (E_t - E_{t-1}) H_t = \varepsilon_t. \quad (12)$$

The error term captures the innovations or news that arrives between periods. Any news that arrives between periods t and $t-1$ will induce the consumer to adjust her decision variables. Under the assumption of rational expectations, ε_t is orthogonal to information available at time $t-1$. Lagging equation (11) and substituting into equation (12), we derive

$$E_t W_t = (1 - \gamma) E_{t-1} H_t - RC_{t-1} + RW_{t-1} + \varepsilon_t. \quad (13)$$

Lagging equation (8) and substituting into equation (13) we get:

$$C_t = \beta_0(1 - R) + \beta_1(1 - \gamma)E_{t-1}H_t + R(1 - \beta_1)C_{t-1} + \beta_1\varepsilon_t. \quad (14)$$

Equation (14) gives us an estimable consumption function once we describe the stochastic processes of income and taxes. Notice that if $\gamma = 1$ we have the familiar consumption function of Hall (1978), where consumption can be predicted knowing only last period's consumption. If $0 \leq \gamma < 1$ consumption can be predicted from only last period's consumption and expected human wealth. Van Wijnbergen (1985) tests an equation similar to equation (14) with the assumption that expectations about H_t are static and replaces H_t with current income. This assumption is very restrictive since it does not allow consumers to revise their expectations over time. Estimation of equation (14) with static expectations about future income and taxes will not capture the intertemporal nature of the model unless the stochastic processes of income and taxes are random walks.

It is important at this point to note that while it is possible that the Ricardian and Keynesian hypotheses are observationally equivalent when taxes are distortionary and are set efficiently our estimating framework is immune to this problem. Observational equivalence arises when analyzing the response of current consumption to changes in taxes. If, however, the relationship between consumption and taxes is conditioned on the path of government spending, then even if taxes are set efficiently so that all changes are permanent, Ricardian equivalence would predict no additional response of consumption to changes in taxes once changes in government spending have been accounted for. In our approach we include consumption lagged one period as a variable in our regression equation. This variable will have adjusted fully to a permanent change in tax policy associated with a change in government spending at time $t-1$ and thus accounts for the "permanent" feature of tax changes under efficient tax policy. The lagged disposable income variable then captures only temporary changes in tax policy. If efficient tax policy and Ricardian equivalence hold, then lagged disposable income should not help explain current consumption after accounting for lagged consumption.

Finally the evidence on efficient taxes, is also quite inconclusive, for example, see Bizer and Durlauf (1990) and Bohn (1990). In addition, in our estimating procedure the relationship between consumption and taxes is conditioned on the path of government spending, thus avoiding the observational equivalence problem.

3. EMPIRICAL SPECIFICATION AND RESULTS

In order to estimate equation (14), H_t the unobservable present discounted value of human wealth, should be eliminated and be replaced by variables observable to the consumer at time t . In the literature there are two ways to eliminate H_t . One method, suggested by Hansen and Sargent (1980), is to derive a closed form solution for H_t by

assuming that labor income and taxes are functions of current and lagged values of a set of variables. Parameter estimates can be obtained by jointly estimating the consumption function and the stochastic processes governing labor income and taxes by using the maximum likelihood method. The second method, which is used in this paper, was proposed by Hayashi (1982). In his method we need not specify the stochastic processes governing labor income and taxes; instead we exploit the stochastic difference equation of H_t :

$$H_t = \frac{R}{\gamma}(H_{t-1} - (Y_{t-1} - T_{t-1})) + \varepsilon_t. \quad (15)$$

Lagging equation (14) and multiplying by R/γ and then subtracting from equation (14) and using the definition of human wealth, we get:

$$\begin{aligned} C_t = & \beta_0(1 - R)\left(1 - \frac{R}{\gamma}\right) + R\left(\frac{1}{\gamma} + (1 - \beta_1)\right)C_{t-1} - R^2\frac{1 - \beta_1}{\gamma}C_{t-2} - \\ & \beta_1(1 - \gamma)\frac{R}{\gamma}(Y_{t-1} - T_{t-1}) + \beta_1\varepsilon_t - \beta_1\frac{R}{\gamma}\varepsilon_{t-1}. \end{aligned} \quad (16)$$

Note that in equation (16), we ignore transitory income. As Flavin (1981) suggested, the value of per-capita transitory consumption will be negligible compared to per-capita permanent income if realizations across consumers are independent. γ , R , and β_1 can be estimated from equation (16) by using non-linear least squares. Also note that equation (16) can be estimated by using linear least squares since we can rewrite equation (16) as

$$C_t = \mu + \phi C_{t-1} + \eta C_{t-2} + \delta(Y_{t-1} - T_{t-1}) + \xi_t, \quad (17)$$

where

$$\begin{aligned} \mu = & \beta_0(1 - R)\left(1 - \frac{R}{\gamma}\right), \quad \phi = R\left(\frac{1}{\gamma} + (1 - \beta_1)\right), \quad \eta = -R^2\frac{1 - \beta_1}{\gamma}, \\ \delta = & -\beta_1(1 - \gamma)\frac{R}{\gamma} \quad \text{and} \quad \xi_t = \beta_1\left(\varepsilon_t - \frac{R}{\gamma}\varepsilon_{t-1}\right). \end{aligned}$$

By assumption, β_1 and R are different from zero, which implies that δ will only be zero if $\gamma = 1$. Since our interest lies in testing whether γ is different from one, we can use a linear method to test whether the coefficient on $Y_{t-1} - T_{t-1}$, δ , is significantly different from zero. However, estimating equation (17) by ordinary least squares will not give us consistent estimates for two reasons. The first is the conventional one: a lagged dependent variable as a regressor when the errors are serially correlated. The second reason, which is also related to the serial correlation of the error terms, is that Y_{t-1} and T_{t-1} will be correlated with the error terms, since they will be adjusted for any information that arrives between periods $t-1$ and $t-2$. In order to overcome these problems we use instrumental variables, which are required to have zero correlation with the error terms but to be correlated with consumption and disposable income.³

Equation (17) was estimated by using annual aggregate time series data from five members of the Organization of Economic Cooperation and Development (OECD): Canada, France, Germany, the United States and the United Kingdom. The data used were retrieved from the National Accounts of the OECD, and the sample period considered was 1950-86. Per-capita consumption of non-durable goods and services deflated by the consumer price index was used as the dependent variable for each country.⁴ In order to calculate disposable labor income we need a measure of taxes on labor income. Since data for taxes on labor income are not available separately from other income taxes, they were proxied to be proportional to the share of labor income in total income of households and nonprofit organizations.⁵ The instruments used were per-capita money supply (M1) deflated by the lagged consumer price index, the import price index, per-capita exports deflated by the export price index, per-capita consumption and disposable labor income lagged for two periods. The results of the estimation of equation (17) are shown in table 1. We estimate equation (17) for a group of 5 OECD countries simultaneously using a Three-Stage-Least Squares method in order to control for correlation in the error across countries.

For all the five countries, the coefficient of disposable labor income is not significantly different from zero at the 5% level. The coefficient of lagged consumption, ϕ , is significantly different from zero and has a point estimate that is greater than one. The coefficient of the second lag of consumption, η , is negative and significantly different from zero for all countries, except for France. Further we cannot reject the hypothesis that the coefficient of disposable income, δ , is not

³The instruments are only required to be predetermined rather than econometrically exogenous. The procedure however requires that we must lag some of our instruments by two periods due to the nature of the error term.

⁴The measure of consumption used in this paper enables us to avoid the difficulty of estimating the flow of services from durable consumption goods

⁵The model was also estimated by defining disposable income as total income received by households minus total taxes. The results are basically the same as those reported.

Table 1. Parameter Estimates of Equation (17) by Three-Stage-Least Squares

	Canada	France	Germany	USA	UK
μ	-0.084 (-0.875)	1.552 (0.423)	2.431 (0.485)	-0.019 (-0.095)	0.615 (0.795)
ϕ	1.335 (5.162)	1.248 (7.185)	1.270 (6.123)	1.523 (5.086)	1.906 (11.737)
η	-0.606 (-2.649)	-0.290 (-1.787)	-0.311 (-2.044)	-0.629 (-2.617)	-0.925 (-3.836)
δ	0.281 (1.939)	-0.168 (-0.273)	-0.412 (-0.400)	0.109 (0.554)	0.003 (1.489)
R^2	0.990	0.830	0.816	0.985	0.991

Note: The numbers in parentheses are t-ratios.

significantly different from zero. Since the data cannot reject a point estimate of zero for δ , we can infer that γ is not significantly different from one. This supports the idea that consumers behave as if they are infinitely-lived. Thus, there is no evidence in these data that the planning horizon of consumers is shorter than that of the government, as others have argued. Also, the results seem to support the random walk specification of the consumption function. Except for the U.S. and U.K., the coefficient of the first lag of consumption is not significantly different from one. But as expected, the coefficient on the second lag of consumption is not significantly different from negative one for the U.S. and U.K.⁶

Table 2. Parameter Estimates of equation (17) by Three-Stage-Least Squares with $\gamma = 1$

Coefficients	Canada	France	Germany	USA	UK
μ	0.021 (0.291)	0.447 (1.113)	0.293 (0.878)	0.070 (0.812)	0.041 (0.855)
ϕ	1.494 (7.481)	1.227 (4.662)	1.202 (4.528)	1.597 (7.112)	1.737 (9.577)
η	-0.493 (-2.415)	-0.328 (-1.289)	-0.312 (-1.222)	-0.610 (-2.655)	-0.745 (-4.009)
R^2	0.990	0.746	0.716	0.987	0.994

Note: The numbers in parentheses are t-ratios.

Equation (17) was re-estimated imposing the constraint that γ is equal to one, as the results in Table 1 suggest. As shown in Table 2, there is little difference between the parameter estimates for the two specifications. With $\gamma = 1$, we expect the point estimate of the coefficient of lagged consumption to be greater than one. For the U.S., U.K., and Canada, although the coefficient of the first lag of consumption is significantly greater than one, the coefficient of the second lag of consumption is not significantly different from one, as predicted by the model. For Germany and France the coefficient of the first lag of consumption is not significantly different from one. These results are broadly consistent with the random walk specification for consumption.

4. SUMMARY AND CONCLUSION

The aim of this paper was to present additional empirical evidence on the effectiveness of fiscal policy as an instrument of macro-economic stabilization. Early Keynesian models suggested that consumers consider government debt as net wealth. As a result a bond-financed tax reduction was perceived as a potent economic stabilization instrument. A contrary view, dubbed Ricardian equivalence, argues that rational forward-looking consumers will not increase their consumption due to a mere change in the timing of taxes. A current bond-financed tax reduction indicates a future tax increase, and this leads consumers to increase saving in the exact amount of the tax reduction.

Opponents of Ricardian equivalence argue that consumers have a shorter planning horizon than the government and consequently will not internalize a tax increase beyond their planning horizon. Blanchard (1985) shows that if consumers have a finite lifetime -- a positive probability of death in every period -- they will react to changes in the debt-to-tax ratio.

Using a version of Blanchard (1985) we empirically tested whether consumers have a shorter planning horizon than the government. The evidence presented in this study does not support the often-argued hypothesis of different horizons for the government and consumers. For the five OECD countries included in this study, the data suggest that consumers do not have a shorter planning horizon than the government.

⁶Note that equation (17) is the first difference of equation (14), and with $\gamma = 1$, the coefficient of lagged consumption, $R(1 + (1 - \beta_l))$, is expected to be greater than one and the coefficient of the second lag of consumption, $R^2(1 - \beta_l)$, is just R times the coefficient of lagged consumption in equation (14) with a negative sign, which is expected to be close to one.

REFERENCES

- Aschauer, D. A., "Fiscal Policy and Aggregate Demand," *American Economic Review*, March 1985, 117-27.
- Barro, Robert, "Are Government Bonds Net Wealth?" *Journal of Political Economy*, November-December 1974, 117-27.
- Barro, Robert, *The Impact of Social Security on Private Saving: Evidence from the U.S. Time Series*, Washington, D.C.: American Enterprise Institute for Public Policy Research, 1978.
- Barro, Robert, "Federal Deficits, Interest Rates, and Monetary Policy: Comment." *Journal of Money Credit and Banking*, November 1985, 682-85.
- Bizer, D. S., and Durlaf, S. N., "Testing the Positive Theory of Government Finance," *Journal of Monetary Economics*, August 1990, 123-141.
- Blanchard, O., "Debt, Deficits and Finite Horizons," *Journal of Political Economy*, April 1985, 223-47.
- Blanchard, O., "Current and Anticipated Deficits, Interest Rates and Economic Activity," *European Economic Review*, June 1984, 7-27.
- Bohn, H., "Tax Smoothing with Financial Instruments," *American Economic Review*, December 1990, 1217-1230.
- Buiter, W. J., "A Comment," *Economic Policy*, November 1985, 138-140.
- Feldstein, M., and Elmendorf, D., "Government Debt, Government Spending, and Private Sector Behavior Revisited: Comment," *American Economic Review*, June 1990, 589-99.
- Flavin, M., "The Adjustment of Consumption to Changing Expectations about Future Income," *Journal of Political Economy*, October 1981, 974-1009.
- Hansen, L. and Sargent, T., "Formulating and Estimating Dynamic Linear Rational Expectations Models," *Journal of Economic Dynamics and Control*, February 1980, 7-49.
- Hayashi, F., "A New Estimation Procedure Under Rational Expectations," *Economics Letters*, vol. 4, 1979, 41-3.
- Kochin, L. A., Benjamin, K. B., and Meador, M., "The Observational Equivalence of Rational and Irrational Consumers if Taxation is Efficient," Seventh West Coast Academic/Federal Reserve Economic Research Conference, 1985, 103-121.
- Kormendi, R., and Meguire, P., "Government Debt, Government Spending, and Private Sector Behavior: Reply and Update," *American Economic Review*, June 1990, 605-17.
- Lucas, R. E., "Econometric Policy Evaluation: A Critique," *Journal of Monetary Economics*, Supplementary Series, July 1976, 19-46.
- Modigliani, F., and Sterling, A., "Government Debt, Government Spending, and Private Sector Behavior; A Further Comment," *American Economic Review*, June 1990, 601-603.
- van Wijnbergen, S., "Interdependence Revisited: A Developing Countries Perspective on Macroeconomic Management and Trade Policy in the Industrial

World," *Economic Policy*, November 1985, 82-137.

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