JOURNAL OF ECONOMIC DEVELOPMENT
Volume 27, Number 1, June 2002

A Note on Testing "Tax-and-Spend, Spend-and-Tax or Fiscal Synchronization": The Case of China

Tsangyao Chang and Yuan-Hong Ho*

The hypothesis of tax-and-spend, spend-and-tax, or fiscal synchronization was tested using annual time series data for China over the period 1977 to 1999. We include GDP as a control variable into the model like Baghestani and Mcnown (1994), Koren and Stiassny (1998), and Chang *et al*. (2002). The results from Granger causality test based on the corresponding multivariate error-correction models (MVECM) suggest feedback between government revenues and government expenditures, supporting the fiscal synchronization hypothesis for China.

I. Introduction

Owing to the great concern over the growing budget deficits, numerous studies have been devoted to testing the "Tax-and-Spend, Spend-and-Tax, or Fiscal Synchronization" hypothesis. The determination of which hypothesis characterizes an economy is more than an intellectual exercise and has implications about solutions to the problem of budget deficits. For country-specific studies, see, for example, Anderson *et al*. (1986), Von Furstenberg *et al*. (1986), Miller and Russek (1990), and Baghestani and Mconwn (1994) for the US study; Hasan and Ian (1997) for the UK study; Payne (1997) for the Canadian study; Darrat (1998) for the Turkey study; Li (2001) for the China study; and Chang and Ho (2002) for the Taiwan study. In the case of multi-country studies, see, Ram (1998a, 1988b), Baffes and Shah (1994), and Chang *et al*. (2002). However, the empirical evidence in testing the validity of these hypotheses has led to inconclusive results.

While previous studies focus most on the industrial and developing countries, this note attempts to make some contributions to this line of research by using recent time series econometric techniques to test the "Tax-and-Spend, Spend-and-Tax, or Fiscal Synchronization" hypothesis in the case of China. The data set used here consists of annual time series on real GDP (1995 = 100), real government revenues, and real government expenditures covering period 1977-1999. First of all, standard Augmented Dickey-Fuller, KPSS, and Zivot-Andrew (1992) tests are applied to examine the time series properties of the GDP, government revenue, and government expenditure variables. The tests reveal that all variables in

* Department and Graduate Institute of Economics, Feng Chia University, Taichung, Taiwan and Department and Graduate Institute of Public Finance, Feng Chia University, Taichung, Taiwan, Tel: 886-4-451-7250 ext. 4306, Fax: 886-4-451-8737. E-mail: yhho@fcu.edu.tw, respectively. The authors acknowledge this journal's editor and one anonymous referee for their helpful comments and suggestions that made this paper more valuable and readable. The usual disclaimer applies.

logarithmic form have unit roots. The Johansen's multivariate cointegration test is subsequently used to examine whether there exists a long-run equilibrium relationship among these three variables. It suggests that these three variables are cointegrated with one vector. Finally, the Granger causality results based on the corresponding multivariate error-correction models (MVECM) suggest feedback between real government revenues and real government expenditures, supporting the "Fiscal Synchronization" hypothesis for China.

This note is organized as follows: Section II briefly describes the fiscal system in China over the past two decades. Section III presents the data used. Section IV describes the methodology employed and the empirical findings were discussed. Finally, Section V presents the conclusions.

II. Brief Description of China's Fiscal System

Before 1979, China's fiscal system was characterized by centralized revenue collection and centralized fiscal transfers, that is, most taxes and profits were collected by local governments and were remitted to the central government, and then in part transferred back to the local governments according to expenditures needs approved by the center.

In 1979, China started market-oriented economic reform. The tax reform is an important part of economic reform, which is aimed at providing state enterprise production incentives, cutting off fiscal dependence of state enterprises on government, equalizing tax burdens among enterprises, and promoting fair competition. According to Lin (2000), the tax reforms experienced the following five stages in China. Stage 1, the central government allows state enterprises to keep some profits and this major fiscal reform started in China since 1979; Stage 2, the success of these experiments in stage 1 encouraged the government to pursue further fiscal system reform in 1983. At this stage, a reform commonly called substituting taxes for profits was occurred; Stage 3, the contract responsibility system (CRS) was introduced on the basis of substituting taxes for profits in December 1986 (details about CRS see Lin (2000)); Stage 4, facing decline government revenues, a tax plus profit system was launched in 1989 to increase government revenues; and Stage 5, a new tax system called tax-sharing system was established in 1994. Several significant changes in the tax system took place at this stage (details about these tax reforms in China see Lin (2000)).

In sum, the fiscal system in China is characterized by the sharing of tax revenues. Under this system, the scopes of expenditures of governments at different levels are determined by their respective responsibilities budgets are managed separately by governments at different levels. The central government budget is approved by the national people's congress (NPC) and the local government budgets are approved by the people's congresses at the local levels. Budgets at the local and central level are divided into current items and capital or construction items. Current expenditure items include expenditure for social development and welfare and expenditures for national defense, armed policies, and administration. On the revenues side, current revenues, primary taxes, made up 96% of total revenues.

III. Data

In this empirical note we use annual data on real GDP (rgdp), real government revenues (rgr) and real government expenditures (rge) for China over the 1977 to 1999 period (deflated by GDP deflator, 1995 = 100). All the data used in this note are taken from IMF's International Financial Statistics (lines 81, 82, and 99b, respectively for government revenue, government expenditure and GDP). Examination of the individual data series make it clear that the logarithmic transformations were required to achieve stationarity in variance; therefore, all the data series were transformed to logarithmic form. A cursory review of the data reveals that the revenue-to-GDP and expenditure-to-GDP ratios both declined from about 32% in 1978 to about 11% in 1999, respectively. The deficit-to-GDP ratios are about -0.6% to 1.5% during this time period.[1] Upon closer examination, it shows that government budget deficits have continuously increased in China since 1988 (details about the reasons of these increasing budget deficits, see Luo and Golembiewski (1996), Ma (1997), Lin (2000)). The persistence and growing size of budget deficits have caused much concern to economists and Chinese policy-makers.

IV. Methodology and Empirical Results

1. Unit Root Tests

A number of authors have pointed out that the standard ADF test is not appropriate for the variables that may have undergone structural changes.[2] For example, Perron (1989, 1990) and Zivot and Andrews (1992) have shown that the existence of structural changes biases the standard ADF tests towards nonrejection of the null of unit root. Hence, it might be incorrect to conclude that the variables are nonstationary on the basis of the results using the standard ADF tests. Perron (1990) developed a procedure for testing the hypothesis that a given series $\{Y_t\}$ has a unit root with an exogenous structural break occurs at time T_B. Zivot and Andrews (1992, hereafter ZA) criticized this assumption of an exogenous break point and developed a unit-root test procedure that allows an estimated break in the trend function under the alternative hypothesis. Therefore, it seems appropriate to treat the structural break as endogenous and test the order of integration by the ZA procedure. The ZA tests are represented by the following augmented regression equations:

1. According to Luo and Golembiewski (1996), in the Chinese calculation, a budget deficit equaled expenditures minus the sum of debt disbursements and current revenues. In other words, in China, debt disbursements constituted revenues rather a means of financing deficits. As a result, the officially published deficits were much smaller than the ones calculated by the method accepted by most countries.
2. The sample period for our data starts from 1977 to 1999, covered the second times oil-price shock and the Mainland China's economic reform period, we expect that there might exist structural breaks for data series studied.

$$\text{Model A:} \quad \Delta Y_t = \mu_1^A + \beta_1^A t + \mu_2^A DU_t + \alpha^A Y_{t-1} + \sum_{j=1}^{k} \theta_j \Delta Y_{t-j} + \varepsilon_t,$$

$$\text{Model B:} \quad \Delta Y_t = \mu_1^B + \beta_1^B t + \gamma^B DT_t^* + \alpha^B Y_{t-1} + \sum_{j=1}^{k} \theta_j \Delta Y_{t-j} + \varepsilon_t, \quad \text{and}$$

$$\text{Model C:} \quad \Delta Y_t = \mu_1^C + \beta_1^C t + \mu_2^C DU_t + \gamma^C DT_t^* + \alpha^C Y_{t-1} + \sum_{j=1}^{k} \theta_j \Delta Y_{t-j} + \varepsilon_t, \tag{1}$$

where $DU_t = 1$ and $DT_t^* = t - T_B$ if $t > T_B$ and 0 otherwise. Here T_B refers to a possible break point. Model A allows for a change in the level of the series, Model B allows for a change in the slope of the trend function, and Model C combines changes in the level and the slope of the trend function of the series.[3] The sequential ADF test procedure estimates a regression equation for every possible break point within the sample and calculates the *t*-statistic for the estimated coefficients. This tests the null hypothesis of a unit root against the alternative hypothesis of a trend stationarity with a one-time break (T_B) in the intercept and slope of the trend function at unknown point in time. The null of a unit root is rejected if the coefficient of Y_{t-1} is significantly different from zero. The selected break point for each data series is that T_B for which the *t*-statistic for the null is minimized. Since the choice of lag length k may affect the test results, the lag length is selected according to the procedure suggested by Perron (1989) with $k_{\max} = 4$.

For comparison purpose, we also incorporate standard Augmented Dickey-Fuller (ADF) and KPSS (Kwiatkowski *et al*. (1992)) tests into our study. Panel A and B in Table 1 report the results of non-stationary tests for real GDP (lrgdp), real government revenues (lrgr), and real government expenditures (lrge) using both ADF and KPSS tests.

Table 1 ADF and KPSS Unit Root Tests

	Panel A: ADF		Panel B: KPSS (η_m)	
	Level	Difference	Level	Difference
lrgdp	-0.871 (1)	-2.728** (1)	1.192* [1]	0.198 [1]
lrgr	0.798 (1)	-3.202* (1)	0.857* [1]	0.050 [1]
lrge	0.755 (1)	-3.468* (1)	0.885* [1]	0.257 [1]

Note: 1. The number in the parenthesis indicates the selected lag order of the ADF model. Lags were chosen based on Perron's (1989) method.

2. The number in the bracket indicate the lag truncation for Bartlett kernel suggested by Newey-West test (1987).

3. * and ** indicate significance at 5% and 10% levels, respectively.

4. Critical values for KPSS are taken from Kwiatkowski *et al.* (1992).

5. Critical values are 0.347 and 0.463 for 10% and 5%, respectively, for KPSS test.

6. Critical values are -2.645 and -3.011 for 10% and 5%, respectively, for the ADF test.

3. When the coefficients of both dummy variables are not significantly different from zero, Model C reduces to the standard ADF equation.

We find each data series is nonstationary in levels and stationary in first differences, suggesting that all the data series are integrated of order one. Table 2 reports the minimum *t*-statistics that correspond to Model C.

Table 2 Zivot-Andrews Unit Root Tests for One Break

	Model	Break	$t(\hat{l}_{\inf})$
lrgdp	C	1987	-3.672
lrgr	C	1989	-4.012
lrge	C	1992	-4.422

Note: 1. Model specification (i.e., which model, A, B, or C, is appropriate) is determined by first running each data series on Model C, with the possibility of both a slope and a level break. Model C is chosen if both dummy variables are significant. If only the slope dummy variable is significant, Model B is estimated. If only the level dummy is significant, Model A is estimated.

2. Critical values are taken from Zivot and Andrew (1992). The 10% and 5% critical values are -4.82 and -5.08, respectively, for Model C.

The test results summarized from Table 2 provide evidence for the existence of a unit root when breaks are allowed. The test results are identical to those of the standard ADF and KPSS tests reported in Table 1 suggesting that all the data series are integrated of order one, even when breaks are allowed. The plausible breaks for the series occur at 1987, 1989, and 1992, respectively, for real GDP, real government revenues, and real government expenditures. On the basis of these results, we proceed to test whether these three variables are cointegrated using the Johansen method.

2. Cointegration Tests

Following Johansen (1988) and Johansen and Juselius (1990), we construct a p-dimensional (3 x 1) vector autoregressive model with Gaussian errors being expressed by its first-differenced error correction form as

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \ldots + \Gamma_{k-1} \Delta Y_{t-k+1} - \Pi Y_{t-1} + \boldsymbol{m} + \boldsymbol{e}_t , \tag{2}$$

where Y_t are data series studied, $\boldsymbol{e}_t$ is i.i.d. N(0, Σ), $\Gamma_i = -I + A_1 + A_2 + ... + A_i$, for $i = 1, 2, \ldots, k-1$ and $\Pi = I - A_1 - A_2 - \ldots - A_k$. The Π matrix conveys information about the long-run relationship between Y_t variables, and the rank of Π is the number of linearly independent and stationary linear combinations of variables studied. Thus, testing for cointegration involves testing for the rank of Π matrix r by examining whether the eigenvalues of Π are significantly different from zero.

Johansen (1988) and Johansen and Juselius (1990) propose two test statistics for testing the number of cointegrating vectors (or the rank of Π): the trace (T_r) and the maximum eigenvalue (L-max) statistics. The likelihood ratio statistic for the trace test is

$$-2\ln Q = -T\sum_{i=r+1}^{p=3}\ln(1-\hat{\lambda}_i), \tag{3}$$

where $\hat{\lambda}_{r+1}\ldots, \hat{\lambda}_p$ are estimated $p-r$ smallest eigenvalues.

The null hypothesis to be tested is that there are at most r cointegrating vectors. That is, the number of cointegrating vectors is less than or equal to r, where r is 0, 1, or 2. In each case, the null hypothesis is tested against the general alternative.

Alternatively, the L-max statistic is

$$-2\ln Q = -T\ln(1-\hat{\lambda}_{r+1}) \,. \tag{4}$$

In this test, the null hypothesis of r cointegrating vectors is tested against the alternative of $r+1$ cointegrating vectors. Thus, the null hypothesis $r=0$ is tested against the alternative that $r=1$, $r=1$ against the alternative $r=2$, and so forth.

It is well known that Johansen' s cointegration tests are very sensitive to the choice of lag length. Schwartz Information Criterion (SIC) was used to select the number of lags required in the cointegration test.[4] A VAR model is first fit to the data to find an appropriate lag structure. The Schwartz Information Criterion (SC) suggests 1 lag for our VAR model. Table 3 presents the results from the Johansen (1988) and Johansen and Jueslius (1990) cointegration test. According to Cheung and Lai (1993), the Trace test shows more robustness to both skewness and excess kurtosis in the residuals than the L-max test; therefore, we use only Trace statistics in our study.

Table 3 Cointegration Tests Based on the Johansen (1988) and Johansen and Juselius (1990) Approach (VAR lag = 1)

	Trace Test	5% Critical Value	10% Critical Value
$H_0: r=0$	36.07*	29.68	26.79
$H_0: r\le 1$	11.61	15.41	13.33
$H_0: r\le 2$	0.55	3.76	2.69

Note: 1. Critical values are taken from Osterwald-Lenum (1992).

2. r denote the number of cointegrating vectors.

3. Schwarzt Information Criteria (SIC) was used to select the number of lags required in the cointegrating test. The computed Ljung-Box Q-statistics indicate that the residuals are white noise.

4. * indicates significance at the 5% level.

As shown in this table, Trace statistic suggests that there exists one cointegrating vector among these three variables. This result suggests that these three variables would not move

4. Using Monte Carlo simulations, Cheung and Lai (1993) show that for autoregressive process standard selection criteria, like the Schwartz Information Criterion (SIC) and Akaike Information Criterion (AIC), can be useful for selecting the correct lag structure for the Johansen' s cointegration test. They found that the SIC performs slightly well than the AIC does.

too far away from each other, displaying a comovement phenomenon for the real GDP, real government revenues, and real government expenditures in China over this sample period.

3. Granger-Causality Results Based on Error-Correction Model (ECM)

Granger (1988) points out that if there exists a cointegrating vector among variables, there must be causality among these variables at least in one direction. Granger (1986) and Engle and Granger (1987) provide a test of causality that takes into account information provided by the cointegrated properties of variables. The model can be expressed as an error-correction model (ECM) as follows (see Engle and Granger (1987)):

$$\Delta Y_{it} = m_{it} + b' Z_{t-1} + \sum_{i=1}^{m} a_i \Delta Y_{1,t-i} + \sum_{i=1}^{m} b_i \Delta Y_{2,t-i} + \sum_{i=1}^{m} c_i \Delta Y_{3,t-i} + e_{it} \ , \tag{5}$$

where Y_{it} denotes real GDP, real government revenues, or real government expenditures. $b' Z_{t-1}$ contains r cointegrating terms, reflecting the long-run equilibrium relationship among variables. Form the system, the Granger-causality tests are examined by testing whether all the coefficients of $\Delta Y_{2,t-i}$ or $\Delta Y_{3,t-i}$ are statistically different from zero as a group based on a standard F-test and/or the $b's$ coefficient of the error-correction is also significant. Since the Granger-causality tests are very sensitive to the lag length selection, in this paper, the lag lengths are determined using Hsiao's (1979) sequential procedure, which is based on the Granger definition of causality and Akaike's (1974) minimum final prediction error (FPE) criterion. This procedure is known as the stepwise Granger-causality technique, which provides a statistical criterion for choosing the optimum lag length using past information. Thornton and Batten (1985) have found Hsiao's method to be superior to both arbitrary lag length selection and several systematic procedures for determining lag length.

Table 4 reports the results from Granger causality tests based on the corresponding multivariate error-correction models (MVECM). Several interesting findings are to be noted.

Table 4 Granger Causality Results Based on Parsimonious Vector Error-correction Models (VECM)

(A) dlrgr [1] dlrge [1]	dlrge [1] dlrgr [1]	Feedback between Real GR and Real GE
(B) dlrgr [1] dlrgdp [1]	dlrgdp [1] dlrgr [1]	Real GDP Granger causes Real GR
(C) dlrge [1] dlrgdp [1]	dlrgdp [1] dlrge [1]	Real GDP Granger causes Real GE

Note: Number in the parenthesis was selected by using Akaike's (1974) Final Prediction Error (FPE) criterion.

First, we find bi-directional feedback between real government revenues and real government expenditures. This empirical result supports the "Fiscal Synchronization" hypothesis indicates that tax and spending decisions are made simultaneously by the fiscal authority for China over this sample period. This result is in agreement with our expectation about the China' s fiscal system that we mentioned earlier in this note. The major implication that we draw from our result is that to attack the problem of continuously increasing budget deficits, the government of China should be cautions, as pointed by Manage and Marlow (1986) simply raising revenue, cutting expenditures, or simply changing both sides without taking into account of the interdependence between the two, may be ambiguous in their impacts on fiscal situation in Ch ina. Our empirical finding is quite consistent with those found in Li (2001) for China study. However, our result is inconsistent with those found in Chang and Ho (2002) for Taiwan study and Chang *et al*. (2002) for a panel of 7 industrial countries and 3 newly industrialized countries study, they find unidirectional Granger causality running from government revenues to government expenditures for most countries studied. This difference may well reflect the different fiscal system used in China from those of other countries (see, Ma (1997), Luo and Golembiewski (1996), Lin (2000), and Li (2001)). Second, we find unidirectional Granger causality running from real GDP to real government expenditures. This result is in agreement with the view of Wagner (1890) states that as the economy grows there exists a tendency for government activities to increase. However, this result is inconsistent with the view of Keynesian states that fiscal policy stimulates economic growth. In fact, a big country, such as China, with abundant resources we would expect some other economic factors which affect its own economic growth. Third, we also find unidirectional Granger causality running from real GDP to real government revenues. This result indicates that as China' s economy grows, the government revenues will increase in the same direction.

V. Conclusion

In this not, we use cointegration analysis and a vector autoregressive model (VAR) to test the "Tax-and-Spend, Spend-and-Tax, or Fiscal Synchronization" hypothesis for China using annual time-series data over the period 1977 to 1999. Our study improves upon research in this area in several respects. First, previous studies focus most on developing and developed countries and not too many have been done on the centrally planned economy of China. In addition, we use a more comprehensive MVECM framework with GDP as a control variable into the model like Baghestani and Mcnown (1994), Koren and Stiassny (1998), and Chang *et al*. (2002). Our application of Johansen (1988) and Johansen and Juselius (1990) cointegration test indicates that there exists one cointegrating vector among real GDP, real government revenues, and real government expenditures for China over this sample period. The results from Granger causality test based on the corresponding multivariate error-correction models (MVECM) suggest a feedback exists between government revenues and government expenditures, supporting the "Fiscal Synchronization" hypothesis for China over this sample period.

References

Akaike, H. (1974), "A New Look at the Statistical Model Identification," *IEEE Transaction on Automatic Control*, AC-19, 716-723.

Anderson, W., M.S. Wallace, and J.T. Warner (1986), "Government Spending and Taxation: What Causes What?" *Southern Economic Journal*, 630-639.

Baffes, J., and A. Shah (1994), "Causality and Comovement between Taxes and Expenditures: Historical Evidence from Argentina, Brazil, and Mexico," *Journal of Development Economics*, 44, 311-331.

Baghestani, H., and R. Mconwn (1994), "Do Revenues or Expenditures Respond to Budget Disequilibria?" *Southern Economic Journal*, 139-156.

Chang, T., and Yuan-Hong, Ho (2002), "Tax or Spend? What Causes What: Taiwan's Evidence," *International Journal of Business and Economics* (forthcoming).

Chang, T., W.R. Liu, and S.B. Caudill (2002), "Tax-and-Spend, Spend-and-Tax, or Fiscal Synchronization: New Evidence for Ten Countries," *Applied Economics* (forthcoming).

Cheung, Y., and K. Lai (1993), "Finite-Sample Sizes of Johansen's Likelihood Ratio Tests for Cointegration," *Oxford Bulletin of Economics and Statistics*, 55, 313-328.

Darrat, A.F. (1998), "Tax and Spend, or Spend and Tax? An Inquiry into the Turkish Budgetary Process," *Southern Economic Journal*, 64, 4, 840-956.

Dickey, D.A., and W.A. Fuller (1979), "Distribution of the Estimators for Autoregressive Time Series with a Unit Root," *Journal of American Statistical Association*, 74, 427-431.

Engle, R., and C.W.J. Granger (1987), "Cointegration and Error Correction: Representation, Estimation, and Testing," *Econometrica*, 55, 251-276.

Granger, C.W.J. (1986), "Developments in the Study of Co-integrated Economic Variables," *Oxford Bulletin of Economics and Statistics*, 48, 213-228.

_____ (1988), "Some Recent Developments in a Concept of Causality," *Journal of Econometrics*, 39, 199-211.

Hasan, M., and I. Lincoln (1997), "Tax then Spend or Spend then Tax? Experience in the UK, 1961-1993," *Applied Economics Letters*, 4, 237-239.

Hsiao, C. (1979), "Causality in Econometrics," *Journal of Economic Dynamics and Control*, 4, 321-346.

Johansen, S. (1988), "Statistical Analysis of Cointegration Vectors," *Journal of Economic Dynamics and Control*, 12, 231-254.

Johansen, S., and K. Juselius (1990), "Maximum Likelihood Estimation and Inference on Cointegration - With Applications to the Demand for Money," *Oxford Bulletin of Economics and Statistics*, 52, 169-210.

Koren, S., and A. Stiassny (1998), "Tax and Spend or Spend and Tax? An International Study," *Journal of Policy Modeling*, 20(2), 163-191.

Kwiatkowski, D., P. Phillips, P. Schmidt, and Y. Shin (1992), "Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root: How sure are we that Economic Time Series have a Unit Root?" *Journal of Econometrics*, 54, 159-178.

Li, X. (2001), "Government Revenue, Government Expenditure, and Temporal Causality: Evidence from China," *Applied Economics*, 33, 485-497.

Lin, S. (2000), "The Decline of China's Budgetary Revenue: Reasons and Consequences," *Contemporary Economic Policy*, 18, 4, 477-490.

Luo, H., and R.T. Golembiewski (1996), "Budget Deficits in China: Calculations, Causes, and Impacts," Working Paper, Department of Political Science, University of Georgia.

Ma, J. (1997), "China's Fiscal Reform: An Overview," *Asian Economic Journal*, 11, 4, 443-458.

Mackinnon, J (1991), "Critical Values for Cointegration Tests in Long-Run Economic Relationships-Readings in Cointegration," eds. by Engle and Granger, Oxford University Press.

Miller, S.M., and F.S. Russek (1990), "Cointegration and Error-correction Models: Temporal Causality between Government Taxes and Spending," *Southern Economic Journal*, 57, 33-51.

Newey, W., and K. West (1987), "A Simple, Positive Semi-definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix," *Econometrica*, 55, 703-708.

Osterwald-Lenum, M. (1992), "A Note with Quantiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics," *Oxford Bulletin of Economics and Statistics*, 54, 461-472.

Payne, J.F. (1997), "The Tax-spend Debate: The Case of Canada," *Applied Economics Letters*, 4, 381-386.

Perron, P. (1989), "The Great Crash, the Oil Price Shock and the Unit Root Hypothesis," *Econometrica*, 57(6), 1361-1401.

_____ (1990), "Testing for a Unit Root in a Time Series with a Changing Mean," *Journal of Business Economics and Statistics*, 8, 2, 153-162.

Ram, R. (1988a), "A Multicountry Perspective on Causality between Government Revenue and Government Expenditure," *Public Finance/Finance Publiques*, 2, 261-269.

_____ (1988b), "Additional Evidence on Causality between Government Revenues and Government Expenditures," *Southern Economic Journal*, 617-628.

Thornton, D., and D.S. Batten (1985), "Lag-length Selection and Tests of Granger Causality between Money and Income," *Journal of Money, Credit, and Banking*, 17, 164-178.

Von Furstenberg, G.M., and R.J. Green (1986), "Tax and Spend, or Spend and Tax?" *Review of Economics and Statistics*, 179-188.

Wagner, A. (1890), *Finanzwissenchaft*, Winter, C.F., Leipzig.

Zivot, E., and D.W.K. Andrews (1992), "Further Evidence on the Great Crash, the Oil-price Shock, and the Unit Root Hypothesis," *Journal of Business and Economic Statistics*, 10, 251-270.