Export-led growth or growth-driven exports? The Canadian case

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Abstract. In this paper we investigate the export-led growth hypothesis for Canada by constructing a vector autoregression (VAR) in order to test for Granger (1969) causality between the following variables: real Canadian exports, real Canadian GDP, and real Canadian terms of trade. Two principal results emerge from our research. First, real Canadian exports, real Canadian terms of trade, and real Canadian GDP are co-integrated. This implies that there exists a long-run steady state among these three variables. Second, we find evidence that a one-way Granger causal relationship exists in Canada whereby changes in GDP precede changes in exports.

Croissance économique enclenchée par les exportations ou exportations résultant de la croissance économique? Le cas canadien. Dans ce mémoire, les auteurs examinent l'hypothèse de la croissance économique enclenchée par les exportations pour le Canada en construisant une autoregression de vecteurs pour vérifier s'il y a causalité à la Granger entre les variables suivantes: exportations réelles canadiennes, PIB réel canadien et termes d'échange réels du Canada. Deux résultats principaux s'imposent au terme de cette recherche. D'une part, il semble que les exportations réelles canadiennes, les termes d'échange du Canada et le PIB canadien réel sont co-intégrées. Cela implique qu'il existe un cheminement à long terme en régime permanent entre ces variables. D'autre part, les auteurs montrent qu'il y a causalité unidirectionnelle à la Granger au Canada et que les changements dans le PIB précèdent les changements dans les exportations.

I. INTRODUCTION

Does rapid income growth lead to rapid trade expansion, or is it the other way around? Anecdotal evidence suggests that countries with strong export performance have strong growth performance and vice versa. Bhagwati (1988) suspects that, as with most economic phenomena, there is a reciprocal relationship between the two economic indicators. The degree to which the relationship is 'genuine' for Canada

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and the extent to which export growth in Canada drives GDP growth or vice versa are issues we attempt to address in this paper.

Although the idea that trade might influence growth is not new, empirical research exploring the idea has only recently appeared. Relevant literature can be divided into two broad categories. The first consists of papers that explore the relationship in developing countries (see Michaely 1977; Balassa 1978; Feder 1982; Jung and Marshall 1985; Chow 1987; Hsiao 1987; Kwan and Cotsomitis 1991). The second includes research on developed or industrialized economies (see Kunst and Marin 1989; Marin 1992; Serletis 1992). Our analysis falls into the second category.

With regards to developed or industralized countries, Marin (1992) finds that the hypothesis of export-led growth cannot be rejected for the United States, the United Kingdom, Germany, and Japan. Kunst and Marin (1989) find that the growth-driven export hypothesis cannot be rejected for Austria.

In this paper we investigate the export-led growth hypothesis for Canada by constructing a vector autoregression (VAR) in order to test for Granger (1969) causality between the following variables: real Canadian exports, real Canadian terms of trade, and real Canadian GDP. Two principal results emerge from our research. First, real Canadian exports, real Canadian terms of trade, and real Canadian GDP are co-integrated. This implies that there exists a long-run steady state among these three variables. Second, we find evidence that a one-way Granger causal relationship exists in Canada whereby changes in GDP precede changes in exports.

This paper is organized as follows. In the following section we briefly describe and provide examples of the relationship between exports and GDP. In section III the methodology, the data, and the results are presented. In section IV conclusions are presented.

II. THE RELATIONSHIP BETWEEN EXPORTS AND GDP

Three possible relationships between exports and GDP are examined here: export-led growth, growth-driven exports, and the two-way causal relationship that we term feedback. Each relationship will be discussed in turn.

1. Export-led growth

Michaely (1977), Feder (1982), and Marin (1992) found that countries exporting a large share of their output seem to grow faster than others. The growth of exports has a stimulating influence across the economy as a whole in the form of technological spillovers and other externalities.[1] Models by Grossman and Helpman (1991), Rivera-Batiz and Romer (1991), and Romer (1990) posit that expanded international trade increases the number of specialized inputs, increasing growth

1 Increased exports also can arise from reduced protectionism. For an excellent discussion regarding protectionism see Bhagwati (1988).

rates as economies become open to international trade.[2] Buffie (1992) considers how export shocks can produce export-led growth.

2. Growth-driven exports
In contrast to the export-led growth hypothesis, scholars such as Bhagwati (1988) have noted that an increase in GDP generally leads to a corresponding expansion of trade, unless the pattern of growth-induced supply and corresponding demand creates an anti-trade bias.[3] Neoclassical trade theory typically stresses the causality that runs from home-factor endowments and productivity to the supply of exports (see, e.g., Findlay 1984). In the case of Austria, Kunst and Marin (1989) find empirical evidence of growth-driven exports. The product life cycle hypothesis developed by Vernon (1966) also has attracted considerable attention among international trade theorists in recent years. Segerstrom, Anant, and Dinopoulos (1990), for example, use the product life cycle hypothesis as a basis for analysing North-South trade in which research and development races between firms determines the rate of product innovation in the North.

3. Feedback
The most interesting economic scenarios suggest a two-way causal relationship between growth and trade. According to Bhagwati (1988), increased trade (for whatever reason) produces more income (increased GDP), and more income facilitates more trade – the result being a 'virtuous circle.' This type of feedback has also been noted by Grossman and Helpman (1991) in their models of North-South trade.

The relationship between GDP growth and export growth is extremely complex, among other reasons because price fluctuations and political intervention both influence the relationship. To control for these factors the terms of trade are included.

Terms of trade are defined here as export unit value divided by import unit value. Terms of trade are included to control for export growth which results from price competitiveness. Price competitiveness in this case reflects fluctuations in the real exchange rate and possible trade policies (in the form of tariff and non-tariff barriers). Terms of trade is an especially important variable for a small open economy such as Canada, which is highly susceptible to changes in world prices. In fact, recent reports have cited the lower Canadian dollar as one reason Canada has had higher economic growth than other nations, including the United States.[4]

2 For a good overview, see Pack (1994). Helpman and Krugman (1985), however, make it clear that the effect of trade on technical efficiency is not conclusive in models of imperfect competition and increasing returns to scale. In such cases the trade effect depends on the type of competition assumed on the domestic market, entry, and exit and on how market structures will change in response to a trade disturbance. As a result, the effect of trade on technical efficiency is an empirical issue.

3 Since our data describe an industrialized country, the pattern of growth-induced supply and corresponding demand is likely to be characterized by a pro-trade bias.

4 See the *Globe and Mail*, 'Canada bucks the trend,' 1 June 1993.

III. METHODOLOGY

Whether exports cause GDP gains or losses, whether GDP gains cause exports, or whether a two-way causal relationship exists between exports and GDP can, in the end, be decided only empirically.

Our investigation of the relationships between Canadian exports and various other macroeconomic variables proceeds by studying the integration properties of the data and undertaking a systems co-integrating analysis and examining Granger causality tests. In order to check the temporal stability of the GDP, exports, and terms of trade relationships, our analysis is performed over two subsamples in addition to the full sample. The first period, 1877–1945, was chosen so as to include the first two world wars and the Great Depression. The second period, 1946–91, is the postwar period.

1. The data

The data are annual Canadian observations on real GDP,[5] real exports, and real terms of trade defined as export unit value divided by import unit value. Annual data on all variables are available from 1870 to 1991. Data definitions and sources are listed in the data appendix.

Plots of the logarithms of the three time series are shown in figures 1 to 3. Figures 1 and 2 demonstrate that both the natural logarithm of real GDP, lrgdp, and natural logarithm of real exports, lrex, exhibit strong upward trends. This provides anecdotal evidence that the two series tend to move together. Figure 3 is a plot of the natural logarithm of real terms of trade, lrtt. This series is extremely volatile, reflecting possible linkages of real exchange rate fluctuations as well as possible effects of trade policy. Summary statistics of lrgdp, lrex, and lrtt indicate that these variables have means equal to 6.0796, 4.3539, and −0.1903 with associated standard deviations of 1.3785, 1.4674, and 0.1681, respectively.

2. Integration properties of the data

In order to investigate the stationarity properties of the data, a univariate analysis of each of the three time series (real GDP, real exports, and real terms of trade) was carried out by testing for the presence of a unit root. Augmented Dickey-Fuller (ADF) t-tests (Dickey and Fuller 1979) and Phillips and Perron (1988) $Z(t\hat{\alpha})$-tests for the individual time series and their first differences are shown in table 1. The lag length, k, for the ADF tests was selected to ensure that the residuals were white noise.

We first consider the levels of the series of the three variables, namely, the natural logarithms of (a) real GDP (lrgdp), (b) real exports (rex), and (c) real terms of trade (lrtt). It is obvious from the ADF and Phillips and Perron tests that at conventional levels of significance, none of the variables represents a stationary

5 Real GDP has some advantages over the use of GNP in that it is more closely related to employment within Canada and easier to reconcile with measurements of output by province (Hall, Taylor, and Rudin 1990).

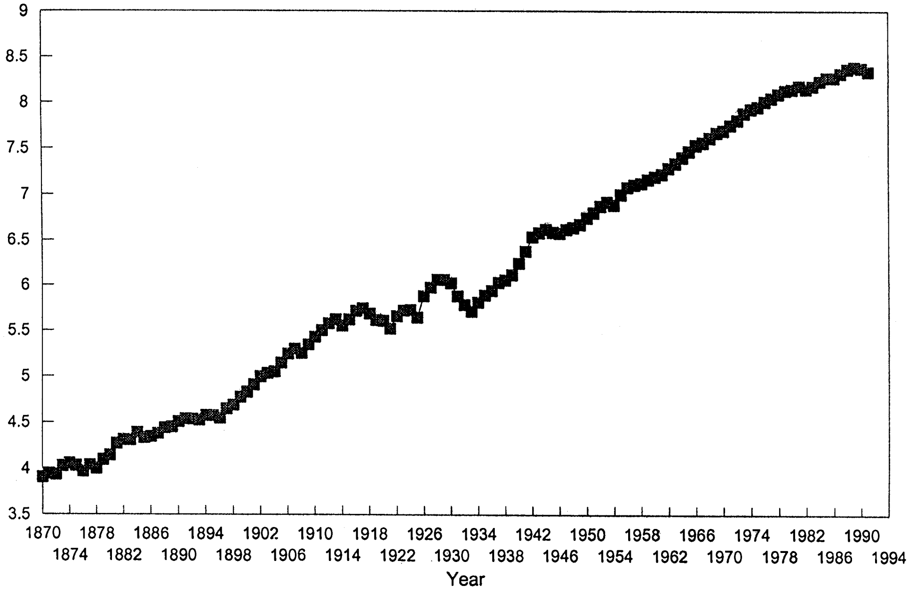

FIGURE 1 Graph of the series lrgdp

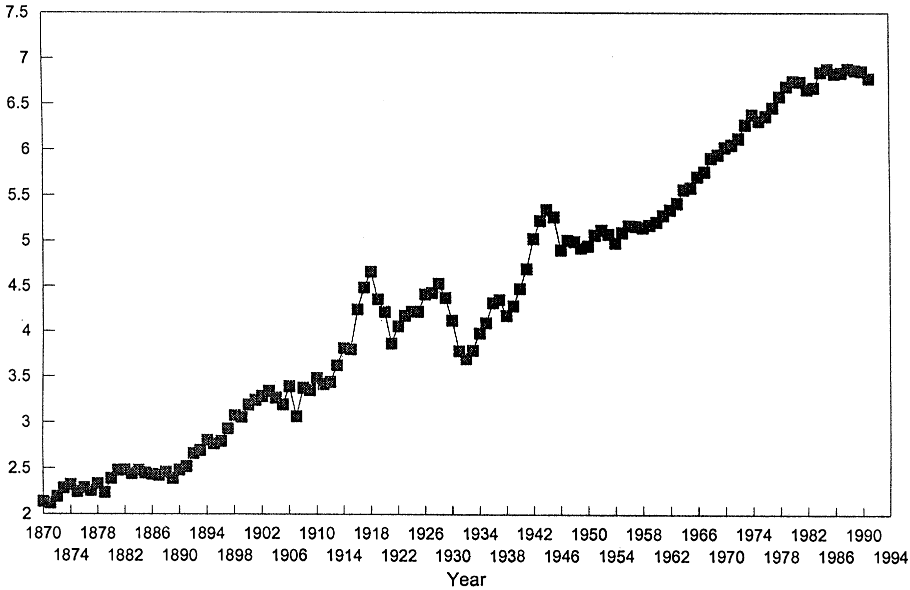

FIGURE 2 Graph of the series lrex

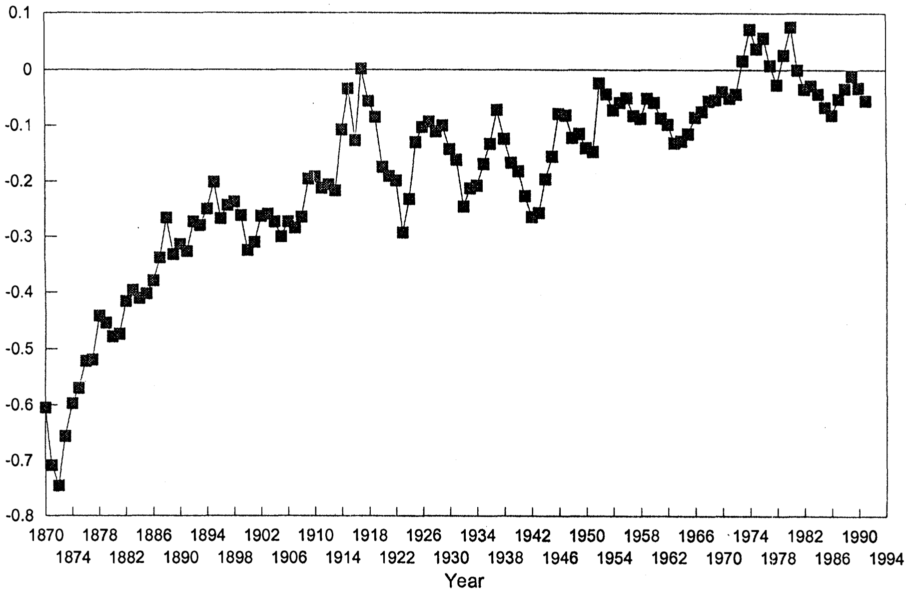

FIGURE 3 Graph of the series lrtt

process. ADF and Phillips and Perron tests computed using the first difference of lrgdp, lrex, and lrtt indicate that these tests are individually significant at the 1 per cent level of significance. As differencing once produces stationarity, we conclude that each of the series lrgdp, lrex, and lrtt is integrated of order 1 ($I(1)$).

3. Systems co-integrating analysis

We begin the analysis with a congruent statistical system of unrestricted reduced forms represented by equation (1).

$$y_t = \mu + \sum_{\tau=1}^{p} \Pi_\tau y_{t-\tau} + \epsilon_t, \ \epsilon_t \sim IN(0, \Omega), \qquad t = 1, \dots, T, \tag{1}$$

where y_t is an $(n \times 1)$ vector of $I(1)$ and/or $I(0)$ variables and μ is an $n \times 1$ vector of constants. Letting $\Delta y_t = y_t - y_{t-1}$, a convenient reparameterization of (1) is given by (2).

$$\Delta y_t = \mu + \sum_{\tau-1}^{p-1} \bar{\Pi}_\tau \Delta y_{t-\tau} + \bar{\Pi} y_{t-p} + \epsilon_t, \tag{2}$$

where both $\bar{\Pi}_\tau = \Sigma_{i=1}^{\tau} \Pi_i - I$ and $\bar{\Pi} = \Sigma_{\tau=1}^{p} \Pi_\tau - I$ are of dimension $n \times n$. This is the vector autoregression (VAR) approach that Johansen (1988, 1991) and Johansen and Juselius (1990) used to investigate the co-intergration properties of a system.

TABLE 1
Unit root tests

Augmented Dickey-Fuller (Dickey and Fuller 1979) test regression

$$\Delta y_t = \mu + \alpha y_{t-1} + \sum_{k=1}^{\bar{k}} c_k \Delta y_{t-k} + u_t, \qquad t = 1877\text{–}1991$$

Variable	ADF	$\bar{k}$
lrgdp	−0.540	1
lrex	−0.311	3
lrtt	−0.276	5
Δlrgdp	−5.842***	4
Δlrex	−6.166***	4
Δlrtt	−6.462***	5

Phillips and Perron (1988) test regression

$$y_t = \mu + \alpha y_{t-1} + u_t, \qquad t = 1877\text{–}1991$$

Variable	$Z(t\hat{\alpha})$	l
lrgdp	0.383	9
lrex	0.043	9
lrtt	−2.279	6
Δlrgdp	−8.570***	10
Δlrex	−9.034***	9
Δlrtt	−11.239***	6

NOTES
***, **, and * denote that a test statistic is significant at the 1 per cent, 5 per cent, and 10 per cent levels of significance, respectively. The 1 per cent, 5 per cent, and 10 per cent critical values, from Fuller (1976, 373) are −3.51, −2.89, and −2.58, respectively. l is a truncated lag parameter used in the non-parametric correction for serial correlation and is set as the highest significant lag order from either the autocorrelation function or the partial autocorrelation function of the first differenced series.

The lag length, p, is chosen to ensure that the errors are iid. Since ϵ_t is stationary, the rank, r, of the 'long-run' matrix $\bar{\Pi}$ determines how many linear combinations of y_t are stationary. If $r = n$, all y_t are stationary, while if $r = 0$ so that $\bar{\Pi} = 0$, Δy_t is stationary and all linear combinations of $y_t \sim I(1)$. For $0 < r < n$ there exist r co-integrating vectors, meaning r stationary linear combinations of y_t. In that case, $\bar{\Pi}$ can be factored as $\alpha\beta'$, where both α and β are $n \times r$ matrices. The co-integrating vectors of β are the error correction mechanisms in the system, while α contains the adjustment parameters. This result is known as Granger's Representation Theorem and can be found in Engle and Granger (1987). Johansen and Juselius (1990) provide a full maximum likelihood procedure for estimation and testing within this framework.

Johansen's procedure was originally derived under the assumptions of normal errors and an optimal lag length, p, for the VAR shown in equation (2). In practice the question arises as to how sensitive the Johansen procedure is to the choice of lag length and non-normality. Using Monte Carlo techniques, Gonzalo (1994) compares cointegrating parameter estimates from OLS, NLS, and MLE in an error correction model and finds that all parameter estimates from each of these three estimation methods are super consistent. He also finds that maximum likelihood estimation in a fully specified error correction model has better properties than the other methods even when the errors are non-Gaussian or when the dynamics are unknown.

The co-integrating rank, r, can be formally tested with two statistics. The first is the maximum eigenvalue test. Denoting the estimated eigenvalues as $\hat{\lambda}_i$, $i = 1, 2, \ldots, n$, the maximum eigenvalue test is given by

$$\lambda_{\max} = -T \ln (1 - \hat{\lambda}_{r+1}), \tag{3}$$

where the appropriate null is $r = g$ co-integrating vectors against the alternative that $r \leqq g + 1$. The second statistic is the trace test and is computed as

$$\text{Trace} = -T \sum_{i=r+1}^{n} \ln (1 - \hat{\lambda}_i), \tag{4}$$

where the null being tested is $r = g$ against the more general alternative $r \leqq n$. The distribution of these tests is a mixture of functionals of Brownian motions that are calculated via numerical simulation by Johansen and Juselius (1990) and Osterwald-Lenum (1992).

Cheung and Lai (1993) use Monte Carlo methods to investigate the small sample properties of Johansen's $\lambda_{\max}$ and trace test statistics. In general, they find that both the $\lambda_{\max}$ and trace test statistics are sensitive to underparameterization of the lag length although they are not so to overparameterization. They suggest that information criteria such as Akaike's (1974) AIC or Schwarz's (1978) BIC can be useful in determining the correct lag length. They also find that the trace test statistic is more robust to both skewness and excess kurtosis than the $\lambda_{\max}$ test.

Various order selection criteria were applied to unrestricted VAR models in order to determine the appropriate order of the VAR. The order selection criterion does not require stationarity of the system (see Lütkepohl 1991). The Akaike (1974) AIC, Schwarz (1978) BIC, and Hannan and Quinn (1979) HQ criteria were used to determine the order of the VAR. The AIC, BIC, and HQ criteria chose $p = 4$, $p = 2$, and $p = 3$, respectively. A VAR with $p = 2$ exhibited a high degree of serial correlation in the residuals and was therefore excluded as a possible candidate. VARs with both $p = 3$ and $p = 4$ demonstrated white-noise residuals. In the interest of parsimony, a VAR with lag length $p = 3$ was chosen. To investigate the sensitivity of our results with respect to choice of lag length, we also report results from models estimated with $p = 4$.

The results of Johansen's tests for co-integration for the three sample periods with VAR lag lengths $p = 3$ and $p = 4$ are presented in table 2. When the lag length

TABLE 2
Tests for co-integration using the Johansen procedure

$$\Delta y_t = \mu + \sum_{\tau=1}^{p-1} \bar{\Pi}_\tau \Delta y_{t-\tau} + \bar{\Pi} y_{t-p} + \epsilon_t, \qquad -\bar{\Pi} = \alpha\beta'$$

1877–1991, $p = 3$			
eigenvalues	0.1714	0.1175	0.0008
The test statistics			
Hypothesis	$r = 0$	$r \leqq 1$	$r \leqq 2$
Trace test	36.092***	14.465*	0.093
λ max test	21.627**	14.372**	0.093
Co-integrating equation			
lrgdp = 0.761·lrex + 2.637·lrtt − 3.227			
1877–1945, $p = 3$			
eigenvalues	0.2568	0.1299	0.0000
The test statistics			
Hypothesis	$r = 0$	$r \leqq 1$	$r \leqq 2$
Trace test	30.089**	9.609	0.002
λ max test	20.484*	9.606	0.002
Co-integrating equation			
lrgdp = 0.802·lrex + 1.433·lrtt − 2.795			
1946–1991, $p = 3$			
eigenvalues	0.5057	0.1977	0.0599
The test statistics			
Hypothesis	$r = 0$	$r \leqq 1$	$r \leqq 2$
Trace test	45.389***	12.976	2.842
λ max test	32.413***	10.134	2.842
Co-integrating equation			
lrgdp = 0.736·lrex − 1.454·lrtt − 3.149			
1877–1991, $p = 4$			
eigenvalues	0.1603	0.1125	0.0001
The test statistics			
Hypothesis	$r = 0$	$r \leqq 1$	$r \leqq 2$
Trace test	33.828**	13.731	0.013
λ max test	20.096*	13.718*	0.013
Co-integrating equation			
lrgdp = 0.678·lrex + 3.737·lrtt − 3.784			

TABLE 2 (*Concluded*)

1877–1945, $p = 4$			
eigenvalues	0.2069	0.1313	0.0020
The test statistics			
Hypothesis	$r = 0$	$r \leqq 1$	$r \leqq 2$
Trace test	25.854	9.851	0.139
λ max test	16.003	9.712	0.139
Co-integrating equation			
lrgdp = 0.779·lrex + 1.540·lrtt − 2.899			
1946–1991, $p = 4$			
eigenvalues	0.5699	0.1909	0.0503
The test statistics			
Hypothesis	$r = 0$	$r \leqq 1$	$r \leqq 2$
Trace test	50.939***	12.119	2.372
λ max test	38.821***	9.746	2.372
Co-integrating equation			
lrgdp = 0.788·lrex − 1.779·lrtt − 2.834			

NOTES
***, **, and * denote that a test statistic is significant at the 1 per cent, 5 per cent, and 10 per cent levels of significance, respectively. Critical values are taken from Osterwald-Lenum (1992, table 1).

is set at $p = 3$, both the trace and λ max test statistics indicate that a co-integration rank of one is present in each of the three sample periods. Consequently, lrgdp, lrex, and lrtt are co-integrated. When the lag length is set at $p = 4$, co-integration is established for the periods 1877–1991 and 1946–91 but not for the period 1877–1945. Our results indicate that with longer lag lengths in the VAR it is easier to establish co-integration over the periods 1877–1991 and 1946–91 than over the period 1877–1945.

4. Granger causality tests

It is interesting to analyse the Granger causality structure of the three variables considered. According to a theorem developed by Sims, Stock, and Watson (1990), such an analysis is very simple if the variables are cointegrated, as in our case, because the standard F-statistics for the hypothesis $\Pi_{ij\tau} = 0$, $\tau = 1, 2, \ldots, p$ in the level VAR have asymptotic F-distributions in spite of the fact that they are obtained within the framework of an $I(1)$ system. Probability values for various F-statistics are presented in table 3.

The results reported in table 3 indicate that for all cases, changes in lrgdp Granger cause changes in lrex. For the three sample periods considered with $p = 3$,

TABLE 3
Granger causality tests

$$y_t = \mu + \sum_{\tau=1}^{p} \Pi_\tau y_{t-\tau} + \epsilon_t$$

F-statistics ($H_o : \Pi_{ij\tau} = 0, \quad \tau = 1, 2, \ldots, p$)
$y_t' =$ [lrgdp, lrex, lrtt]

1877–1991, $p = 3$

Causation From: To:

	lrgdp	lrex	lrtt
lrgdp	–	0.0001***	0.1130
lrex	0.3179	–	0.0054***
lrtt	0.6555	0.3732	–

1877–1945, $p = 3$

Causation From: To:

	lrgdp	lrex	lrtt
lrgdp	–	0.0038***	0.0861*
lrex	0.5376	–	0.0044***
lrtt	0.6809	0.6767	–

1946–1991, $p = 3$

Causation From: To:

	lrgdp	lrex	lrtt
lrgdp	–	0.0016***	0.6399
lrex	0.5796	–	0.5480
lrtt	0.0158**	0.1139	–

1877–1991, $p = 4$

Causation From: To:

	lrgdp	lrex	lrtt
lrgdp	–	0.0022***	0.1927
lrex	0.5752	–	0.0124**
lrtt	0.7191	0.6416	–

TABLE 3 (*Concluded*)

1877–1945, $p = 4$

Causation From: To:

	lrgdp	lrex	lrtt
lrgdp	–	0.0528*	0.1895
lrex	0.6873	–	0.0141**
lrtt	0.6582	0.9026	–

1946–1991, $p = 4$

Causation From: To:

	lrgdp	lrex	lrtt
lrgdp	–	0.0100***	0.4869
lrex	0.8095	–	0.3994
lrtt	0.0419**	0.2556	–

NOTES
Table 3 shows probability values. ***, **, and * denote that a test statistic is significant at the 1 per cent, 5 per cent, and 10 per cent levels of significance, respectively.

the hypothesis that changes in lrgdp do not Granger cause changes in lrex can be rejected at the 1 per cent level of significance. For $p = 4$ the hypothesis that changes in lrgdp do not Granger cause changes in lrex can be rejected at the 1 per cent level of significance for the sample periods 1877–1991 and 1946–91, while the hypothesis can be rejected at the 10 per cent level of significance for the period 1877–1945. This provides strong evidence in favour of the growth-driven export hypothesis.

Also of interest in table 3 is the fact that for the samples 1877–1991 and 1877–1945, lrex exhibits Granger causality on lrtt. This suggests that historically Canada may not be the small open economy that it is often thought of. One possible explanation for this result is that Canada is natural resource abundant and that while natural resources currently account for about 50 per cent of exports (Anderson 1985, 13) it is also the case that historically natural resources have represented a large share of exports. Moreover, fifty to a hundred years ago, Canada was a larger player in world resource markets, suggesting that Canada's role in international markets during the period 1877–1945 may have been greater than its role today.

Since Serletis (1992) is the only paper, to our knowledge, that has used Canadian data to explore the relationship between exports and GNP, a few words regarding his approach and how it differs from ours are necessary.

Serletis (1992) uses annual Canadian data (exports, imports, and GNP) from 1870 to 1985 to explore the relationship between export growth and economic growth. With single-equation techniques, he suggested that growth in GNP and export growth are independent. Serletis's findings support an export-led growth strategy in that expansion in exports is described as promoting growth in national income. Our approach differs from Serletis (1992) in two fundamental ways. First, we include a terms-of-trade variable to account for price competitiveness. Second, we employ a multivariate estimation methodology which takes explicit account of possible feedback and simultaneity effects as well as the long-run properties of the data.[6]

In summary, our results tend to favour the one-way Granger causal relationship that suggests that the growth rate of GDP influences export growth.

IV. CONCLUSIONS

Our objective was to test the causal relations implied by three competing, although not mutually exclusive, hypotheses: (1) the export-led growth hypotheses; (2) the growth-driven exports hypothesis; and (3) the two-way causal hypothesis, which is a combination of (1) and (2).

Before we tested the various relationships it was necessary to determine whether lrgdp, lrex, and lrtt were co-integrated. We found that they were, implying that there exists a long-run (or steady-state) relationship between them.

Empirical evidence from a VAR suggests that the growth-driven exports hypothesis cannot be rejected. There is no evidence supporting the export-led growth hypothesis.

It is important to realize that our study of Granger causal orderings of export and GDP does not identify causal directions but instead asks the question whether movements in exports tend to precede or to follow movements in GDP. Our empirical results for Canada, like those of Kunst and Marin (1989) for Austria, suggest that changes in growth precede changes in exports. This is in accord with the development of a small open economy, since a small economy developing efficiently in line with its comparative advantage will specialize and hence turn to foreign markets for exports of goods that use its most abundant factor of production most intensively.

DATA APPENDIX

1. The terms of trade is the export price as a percentage of import price. Data from 1870 through 1991 were collected.

   Source: 1870–1975: Leacy, F.H. (1983) *Historical Statistics of Canada*, second edition, Catalogue 11-516, table G386-388 (Ottawa: Statistics Canada)

   The table in question had various base years, but given that each subseries overlapped, the SPLICE command in SHAZAM was employed. The years 1870–1975 were converted in terms of a 1971 base (i.e., 1971 = 100).

6 Serletis (1992, 134) acknowledges a possible simultaneity problem. This could give rise to misleading results.

Source: 1976–91: Statistics Canada, CANSIM (in conformance with the Leacy data, the Laspeyres import and export price indices were retained). The specific sources are as follows:

import price index 1971 = 100: Matrix 3681 D395700
import price index 1981 = 100: Matrix 3635 D448729
import price index 1986 = 100: Matrix 3622 D750816
export price index 1971 = 100: Matrix 3684 D399017
export price index 1981 = 100: Matrix 3638 D449761
export price index 1986 = 100: Matrix 3625 D751848

Once again, the SPLICE command in SHAZAM was employed to convert the entire terms of trade series (1870 through 1991) into a 1981 base year.

2. GDP in millions of current Canadian dollars 1870–1985

   Source: Urquhart, M.C. (1988) Canadian economic growth, 1870–1980.' Discussion Paper No. 734, Department of Economics, Queen's University

   For 1986 to 1991 we made use of Statistics Canada, CANSIM matrix series # 6917 D 11908.

3. Exports in millions of current Canadian dollars.

   Source: 1870–1975: Leacy, F.H. (1983), *Historical Statistics of Canada*, second edition, Catalogue 11-516 (Ottawa: Statistics Canada)

   Source: 1976–91: Exports – Statistics Canada, CANSIM matrix series # 2333 D 70009

4. All values expressed in current Canadian dollars were expressed in real terms using the implicit Price Index (1981 = 100).

   Source: 1870–1985: Urquhart, M.C. (1988) 'Canadian economic growth, 1870–1980.' Discussion Paper No. 734, Department of Economics, Queen's University

   Source: 1986–91: Statistics Canada, CANSIM matrix series # 6120A 48662. Since after 1986 the base year was set to 1986 = 100, data for 1987–1991 were adjusted to 1981 = 100 using Statistics Canada, CANSIM matrix series # 6841 D 14477.

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