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Causality Between Exports and Economic Growth:
An Empirical Study

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Recent studies on causal relation between exports and economic growth have some technical weaknesses. These studies have used time-series data without investigating their trend properties. Presence of stochastic trend makes the regression analysis misleading. Moreover, the number of lags of the explanatory variables has been chosen arbitrarily. This paper addresses these defects of the causality test techniques in the previous studies. It uses Dickey-Fuller statistics to detect stochastic trends and follows Hsiao's method of determining the optimum lag length of the regressors to identify the nature of the relationship between exports and economic growth in Japan, South Korea, and Taiwan.

I. Introduction

In recent years several empirical studies have been conducted to support the hypothesis of export-oriented growth in developing countries. Most of these studies have investigated the relationship between export expansion and economic growth in two different ways. In one type of investigation, the statistical significance of the correlation coefficient between an economic growth variable and some variant of export growth[1] has been tested with international cross-section data (e.g., Michaely

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1 The economic growth variable is represented by different by growth rates like those of per capita real income, real GDP and real GDP net of exports. Likewise, the export growth is indicated by the growth rates of real exports and of share of exports in the GDP.

(1977), Balassa (1978), Heller and Porter (1978), Tyler (1981) and Kavoussi (1984)). The evidence of a highly significant positive correlation between the two variables[2] has been interpreted as a conclusive support of the hypothesis that export-promoting measures have fostered economic development.[3] The other type of investigation is based on the neoclassical growth accounting technique of production function analysis in which export growth along with others has been introduced as one of the factors explaining the output growth (e.g., Michalopoulos and Jay (1973), Balassa (1978), Tyler (1981), Feder (1982),[4] Kavoussi (1984), Balassa (1985) and Rana (1988)). Then regression equations with output growth as the dependent variable and growth explaining factors including export growth as independent variables have been estimated on the basis of cross-country data. A highly significant positive value of the coefficient of the export growth variable in the growth accounting equation and a significant improvement in the coefficient of determination with the inclusion of the export variable in the regression equation have been treated as an evidence supporting the export-oriented growth hypothesis.

The statistical approach in these studies, however, raises a serious methodological issue. All of these studies make the a priori presumption that export growth causes output growth and none considers the direction of the causal relation between the two variables as a point to be empirically tested. A statistically significant correlation coefficient between two variables and a high value of the coefficient of determination in a regression equation do not indicate that one variable causes the other (Downey and Wearden (1983) and Gujarati (1981)). Although there are strong theoretical reasons why export growth makes a positive contribution to output growth, there can also be some equally plausible reasons why output growth in the domestic economy will lead to the growth of exports. It may be that there exists a feedback relation between the two variables.[5]

Granger (1969) and Sims (1972) have provided statistical methods of detecting the nature of the causal relation in bivariate time-series data.[6] Using these methods, Jung and Marshall (1985), Chow (1987) and Hsiao

2 Some studies have employed nonparametric tests of the Spearman rank correlation coefficients.

3 It has also been found that the positive relationship holds for the countries that have already set up a minimum industrial base.

4 Feder (1982) provides a theoretically elegant method of quantifying the factor productivity difference in the export sector and the externalities generated by export expansion.

5 The theoretical reasons for different types of the relationship are mentioned in the concluding remarks of this paper.

6 These methods are now being widely used a money-income causality tests in macroeconomics.

(1987) have examined the causal relation between export growth and output growth for several countries. Using time-series data on exports and national income, these studies have conducted Granger and Sims causality tests. These studies, however, have some technical weaknesses. Regression analysis is misleading when applied to time-series with stochastic trend (Stock and Watson (1988)). The trend properties of the time-series data used in the causality tests have not been investigated and necessary corrections for the presence of any stochastic trend have not been made. Consequently, the test results are not valid.[7] Moreover, all of these causality studies in this context have chosen arbitrary number of lags of the explanatory variables in the righthand side of the regression equations.

This paper addresses these defects of the causality test techniques in the previous studies and uses the test statistics suggested by Dickey and Fuller (1979) to detect stochastic trends and the method suggested by Hsiao (1981) to perform the Granger causality tests to identify the nature of the relationship between export promotion and economic growth in Japan, South Korea, and Taiwan. The rest of the paper is divided into three sections. Section II describes the causality test technique used in the empirical study. Section III reports the results of the empirical investigation and finally, Section IV makes some concluding remarks in the light of the empirical findings.

II. The Causality Test Technique

Let X_t and Y_t be the time-series data on exports and gross domestic products in period t, respectively, for $t = 1, 2, \ldots, T$. Then the Granger causality tests are performed on the basis of the following regression models:[8]

$$(1) \qquad Y_t = a_0 + \sum_{j=1}^{J} a_j Y_{t-j} + \sum_{i=1}^{I} b_i X_{t-i} + u_t$$

and

$$(2) \qquad X_t = a_o' + \sum_{j=1}^{J} a_j' X_{t-j} + \sum_{i=1}^{I} b_i' Y_{t-j} + v_t,$$

[7] How stochastic trends in time-series regressors invalidate the statistical tests in explained in the next sectin.

[8] When the model makes an arbitrary choice of the lag structure, both J and I are given the same specified value.

where u_t and v_t are zero mean, constant variance, and serially uncorrelated disturbance terms. Regression equations (1) and (2) are used to test two null hypotheses separately: (a)$b_i = 0$, for $i = 1, 2, \ldots, I$, and (b) $b_i' = 0$, for $i = 1, 2, \ldots, I$, with the help of the usual F-statistics. Now, there are four theoretically possible test results. First, if both the null hypotheses (a) and (b) are accepted, it is said that causality[9] runs neither from X to Y nor from Y to X, though there may be some spurious correlation between the two variables. Second, if the null hypothesis (a) is accepted and the null hypothesis (b) is rejected, it is said that unidirectional causality runs from Y to X. Third, if the null hypothesis (a) is rejected and the null hypothesis (b) is accepted, causality is supposed to run unidirectionally from X to Y. Last, if both the null hypotheses (a) and (b) are rejected, it is said that there exists a feedback causal relation between X and Y.

The Granger causality tests in terms of regression equations (1) and (2) have two defects. One is that the time-series data in the regression analysis may be nonstationary. In this case, if the trends are deterministic, a time variable should be included in the equations. This procedure will be useful in examining the causal relation between the detrended values. But in the presence of stochastic trends, the conventional F-tests are invalid with the detrending method suggested above. Then differencing is needed. The other defect is that the number of lags of the regressors is chosen arbitrarily and since the F-statistics are affected by the lag structure, the corresponding tests are also arbitrary.

It is not widely recognized that many macroeconomic time-series data contain unit roots (Nelson and Plosser (1982) and Stock and Watson (1986)) and thus are dominated by stochastic trends. Christiano and Ljungquist (1987) and Granger and Newbold (1974) have found by simulation that the F-statistic computed from the regression involving the data of nonstationary time-series does not follow the standard distribution. This nonstandard distribution has a substantial rightward shift under the null hypothesis of no causality. Thus the significance of the test is overstated and a spurious result is obtained.

So, in any regression analysis involving time-series data, the presence of any stochastic trend must be tested. If stochastic trends exist, detrended values of the time-series with appropriate differencing should be used to make the regression analysis meaningful. The presence of a stochastic trend is determined by testing the presence of unit roots in the polynomials of the lag operators of the time-series. The test statistics suggest by Dickey and

9 When the past values of a variable affect the current value of another variable, it is supposed that the former causes the latter, which does not possess a self-generating history.

Fuller (1979) are used to detect stochastic trends in the time-series.

Once the presence of stochastic trends is found in the data, the Granger causality tests must be done on the basis of the detrended values, which are stationary in nature. For this purpose, the first differences of the logarithmic values of the original variables are used in the regression analysis, if there exists a single unit root. Let the lower case letters x_t and y_t be the first differences of the logarithmic values of exports and gross domestic products, respectively. Then the causality tests are performed in terms of equations (1) and (2), where X and Y are replaced by x and y, respectively.[10]

Following Hsiao (1979 and 1981), the optimum lag structures in the regression equations are determined by the minimum final prediction error criterion. In order to describe the method, the regression equations in terms of the detrended values are written as

$$(3) \qquad y_t = c_o + \sum_{j=1}^{J} d_j y_{t-j} + \sum_{i=1}^{I} c_i x_{t-i} + e_t$$

and

$$(4) \qquad x_t = c_o' + \sum_{j=1}^{J} d_j' x_{t-j} + \sum_{i=1}^{I} c_i' y_{t-j} + e_t'$$

respectively, where e_t and e_t' are the disturbance terms obeying the assumptions of the classical linear normal regression model.[11] The optimim values of J and I in equations (3) and (4) are determined in the following manner. The final prediction error of y is defined as $E(y_t - \hat{y}_t)^2$, where $\hat{y}_t$ is the value of y predicted by the regression equation (3). For specified values of J and I, the following equation is used to calculate the final prediction error:

$$(5) \qquad FPE_y\ (J,I) = \frac{(T+J+I+1)\ \Sigma(y_t - \hat{y}_t)^2,}{(T-J-I-1).T}$$

10 One incidental advantage of this procedure is that the transformation of a variable into the first difference of its logarithmic values gives the growth rate of the variable. Then the causality tests are done in terms of the growth rates of the variables.

11 These assumptions justify the use of the OLS method of estimation.

where T is the number of observations and FPE_y (J, I) is the final prediction error of y for J lags of y and I lags of x.

The method of determining the minimum FPE_y involves the following steps. First, the x values are dropped from equation (3) and lagged values of y are used in regression, starting with J = 1 and increasing the number of lags one by one. Each time the FPE_y is calculated by using equation (5), with $I = 0$ and J being equal to the specified value. That value of J is chosen which gives the minimum FPE_y in this step. Let J^* be this optimum lag of y. Then in the second step, regression equation (3) is estimated with $J = J^*$ for the lag of y and lagged values of x, starting with $I = 1$ and increasing the number of lags one by one. Again, each time the FPE_y is calculated by using equation (5) with J^* lag of y and the specified lag of x. The minimum FPE_y in the last step determines the optimum lag of x. Let I^* be this optimum value. Then J^* and I^* are the optimum lags of y and x, respectively, in equation (3). The same procedure is repeated for the optimum lag structure in the regression equation (4). Let J^{**} and I^{**} be the lags of x and y, respectively, that determine the minimum final prediction error of x, FPE_x. Now, the regression equations with optimum lags are

$$(6) \qquad y_t = c_o + \sum_{j=1}^{J^*} d_j y_{t-j} + \sum_{i=1}^{I^*} c_i x_{t-i} + e_t$$

and

$$(7) \qquad x_t = c_o' + \sum_{j=1}^{J^{**}} d_j' x_{x-j} + \sum_{i=1}^{I^{**}} c_i' y_{t-j} + e_t',$$

respectively. The respective null hypotheses are (a) $c_i = 0$, for $i = 1, 2, \ldots, I^*$, and (b) $c_i = 0$, for $i = 1, 2, \ldots, I^{**}$.

Hsiao's method of determining the minimum final prediction errors suggests a straightforward way of applying the Granger causality tests. A comparison of the minimum final prediction error of y for $j = 1, 2, \ldots, J^*$ and $i = 0$ with that for $j = 1, 2, \ldots, J^*$ and $i = 1, 2, \ldots, I^*$ can be made to test the null hypothesis (a). The null hypothesis is accepted if $FPE_y(J^*,0) < FPE_y(J^*,I^*)$ and it is rejected if $FPE_y(J^*,O) > FPE_y(J^*, I^*)$. Similarly, a comparison of the minimum final prediction error of x for $j = 1, 2, \ldots, J^{**}$ an $i = 0$ with that for $j = 1, 2, \ldots, J^{**}$ and $i = 1, 2, \ldots, I^{**}$ can be made to test the null hypothesis (b). The hypothesis is accepted if $FPE_x(J^{**}, 0) < (FPE_x(J^{**}, I^{**})$ and it is rejected if $FPE_x(J^{**}, 0) > FPE_x(J^{**},$

I**).

As noted by Hsaio (1981, pp. 89-90), the acceptance of the hypothesis according to the minimum FPE criterion is equivalent to an implied F-test. If $FPE_y(J^*, 0) < FPE_y(J^*, I^*)$, it implies that the approximate F-statistic for testing the hypothesis is $F_{I^*, T-J^*-I^*-1} < 2T/(T+J^*+I^*+1)$. As T goes to infinity, the critical value of the approximate F-statistic approaches two. In a large sample, this critical value does not change much with the inclusion of additional regressors. Thus the minimum FPE criterion is equivalent to applying an approximate F-test with an almost fixed critical value but lower levels of significance. As suggested by Anderson (1963), setting a smaller significance level is justified for testing the inclusion of higher order of lags in time-series data, since conventional F-test increasingly favours the inclusion of additional variables in the regression.

III. Empirical Results

Quarterly data on exports and gross domestic products (GDP) at constant prices of Japan (1957:1 to 1987:1) and South Korea (1960:1 to 1984:4) have been obtained from the data base of the International Monetary Fund. Data for Taiwan (1961:1 to 1984:4) have been collected from *Quarterly National Income Statistics in Taiwan Area, The Republic of China, 1961-1984.*[12] The data of Japan are seasonally adjusted at source, while those of South Korea and Taiwan have been deseasonalized by the TSP-computer software package.

Since both exports and the GDP of these three countries exhibit exponential growth during the periods under investigation, the trend properties of the variables have been examined on the basis of the logarithmic values. As shown in Table 1, both $\ln Y_t$ and $\ln X_t$ in all three countries have unit roots in the polynominal of their lag operators. So, both the variables in all the three countries indicate a random walk with a drift in their logarithmic values, and hence possess stochastic trends.

In the regression analysis for causality tests, the variables are detrended to make them stationary by taking the first differences of the logarithmic values. Then the FPEs are calculated for regression equations (3) and (4). Experiments have been made with 12 lags for both variables in all equations within which the minimum FPEs have been found. The results are

12 This data source is a 1986 publication by Executive Yuan, Director-General of Budget, Accounting and Statistics, The Republic of China.

Table 1

NONSTATIONARY TRENDS OF EXPORTS AND GDP IN JAPAN, SOUTH KOREA, AND TAIWAN

Equations	$\hat{\tau}$	$n(\hat{\rho}-1)$
Japan: n = 120		
$\ln Y_t = 0.125 + 0.990 \ln Y_{t-1}$	−4.35*	−1.20
(0.0023)		
$\ln X_t = 0.678 + 0.995 \ln X_{t-1}$	−1.47	−0.60
South Korea: n = 99		
$\ln Y_t = 0.373 + 0.958 \ln Y_{t-1}$	−1.57	−4.16
(0.0268)		
$\ln X_t = 0.130 + 0.991 \ln X_{t-1}$	−2.37	−0.89
(0.0038)		
Taiwan: n = 95		
$\ln Y_t = 0.791 + 0.995 \ln Y_{t-1}$	−0.88	−0.48
(0.0057)		
$\ln X_t = 0.148 + 0.990 \ln X_{t-1}$	−2.37	−0.95
(0.418)		

Notes: (1) The numbers in the parentheses are the "standard errors" output by the regression program.
(b)* indicates that the statistic is insignificant. All other statistics are significant at one percent level.

reported in Table 2 for Japan, in Table 3 for South Korea, and in Table 4 for Taiwan.

For Japan, equation (3) has 9 lags of y for the minimum FPE_y, which shows a marginal decline with the inclusion of 9 lags of x; equation (4) has only one lag of x to yield the minimum FPE_x, which also goes down with the introduction of 3 lags of y in the equation. For South Korea, equation (3) has 4 lags of y to yield the minimum FPE_y, which is reduced by the inclusion of 3 lags of x in the equation; and equation (4) has only one lag of x to give the minimum FPE_x, which also declines with the addition of one lagged value of y in the equation. For Taiwan, equation (3) has 7 lags of y to generate the minimum FPE_y, which declines with the inclusion of 3 lagged values of x in the equation; and equation (4) has only one lag of x to yield the minimum FPE_x, which also goes down with the addition of 2 lags of y in the equation. The technique of applying the minimum FPE criterion to select the optimum lag structures in equations (3) and (4) clearly shows that feedback exists between export growth and GDP growth

Table 2

FINAL PREDICTION ERRORS IN EQUATIONS (3) AND (4) FOR JAPAN

Lag of x		with 9		Lag of y		with 1	
lag of y	$FPE_y.10^3$	lags of y	$FPE_y.10^3$	lag of x	$FPE_x.10^3$	lags of x	$FPE_x.10^3$
1	0.29721	1	0.28167	1	1.60055*	1	1.62370
2	0.29285	2	0.28106	2	1.62983	2	1.65080
3	0.28255	3	0.28078	3	1.61183	3	1.59518*
4	0.28004	4	0.28604	4	1.62028	4	1.62073
5	0.28132	5	0.29147	5	1.61236	5	1.61132
6	0.28650	6	0.29683	6	1.64142	6	1.63986
7	0.28797	7	0.28395	7	1.65525	7	1.65544
8	0.29216	8	0.28912	8	1.68636	8	1.67944
9	0.27775*	9	0.27603*	9	1.70364	9	1.70849
10	0.28164	10	0.28127	10	1.73561	10	1.73674
11	0.28623	11	0.28325	11	1.72935	11	1.66987
12	0.29165	12	0.28840	12	1.75455	12	1.69010

Note: * indicates the mimimum FPE.

Table 3

FINAL PREDICTION ERRORS IN EQUATIONS (3) AND (4) FOR SOUTH KOREA

Lag of x		with 9		Lag of y		with 1	
lag of y	$FPE_y.10^3$	lags of y	$FPE_y.10^3$	lag of x	$FPE_x.10^3$	lags of x	$FPE_x.10^3$
1	16.26175	1	2.33673	1	8.59519*	1	8.15588*
2	16.18078	2	2.39099	2	8.78435	2	8.25332
3	2.48030	3	2.21582*	3	8.98714	3	8.36038
4	2.42859*	4	2.26707	4	9.18764	4	8.54941
5	2.44621	5	2.31441	5	9.00214	5	8.68021
6	2.46012	6	2.36741	6	9.12359	6	8.58174
7	2.50330	7	2.42160	7	8.96749	7	8.74831
8	2.52835	8	2.47893	8	9.15925	8	8.95403
9	2.58772	9	2.52865	9	9.15175	9	9.14215
10	2.64863	10	2.58032	10	9.36394	10	9.26082
11	2.60467	11	2.59069	11	9.56862	11	9.43484
12	2.66441	12	2.63277	12	9.51411	12	9.19933

Note: * indicates the minimum FPE.

Table 4

FINAL PREDICTION ERRORS IN EQUATIONS (3) AND (4) FOR TAIWAN

		Lag of x with 9				Lag of y with 1	
lag of y	$FPE_y.10^3$	lags of y	$FPE_y.10^3$	lag of x	$FPE_x.10^3$	lags of x	$FPE_x.10^3$
1	0.98381	1	0.50866	1	9.19868*	1	7.797446
2	0.69920	2	0.51374	2	9.41870	2	7.79465*
3	0.70458	3	0.50072*	3	9.64882	3	7.97517
4	0.50940	4	0.51210	4	9.88066	4	8.15074
5	0.51897	5	0.50430	5	9.90359	5	8.18999
6	0.50916	6	0.51425	6	10.06765	6	8.09833
7	0.50299*	7	0.52569	7	10.18297	7	8.24986
8	0.50868	8	0.51695	8	10.32813	8	8.42234
9	0.51288	9	0.52277	9	10.51975	9	8.61930
10	0.51038	10	0.53162	10	10.66938	10	8.71247
11	0.52187	11	0.54478	11	10.93424	11	8.77438
12	0.53404	12	0.55583	12	11.20718	12	8.98419

Note: * indicates the minimum FPE.

in Japan, South Korea, and Taiwan.

The bidirectional causal relation between export expansion and GDP growth, indicated by the minimum FPE criterion, can be further investigated by using separate growth equations estimated with their optimum lag structures. Table 5 reports the estimated parameters of regression equation (6) in which the current GDP growth is explained in terms of its past history and the past export growth. The equation, however, does not have a good fit for Japan, which exhibits the longest optimal lag structure with many insignificant coefficients. For South Korea and Taiwan, the equation fits very well with most of the coefficients being statistically significant. In these two countries, almost all the lagged export growth variables have statistically significant positive contribution to the current growth of the GDP.

Table 6 reports the estimated parameters of regression equation (7), which explains the current export growth in terms of its past history and the past growth of the GDP. In this case, the equation does not have a good fit for South Korea, though it shows that the lagged GDP growth variable has a statistically significant negative impact on the current export growth.[13] The equation, however, has a relatively much better fit for

Table 5

ESTIMATED PARAMETERS OF REGRESSION EQUATION (6) FOR JAPAN, SOUTH KOREA AND TAIWAN

Dependent Variable: Y_t Independent Variables:	Regression Coefficients		
	Japan	South Korea	Taiwan
Constant	0.004	0.044*	0.030*
y_{t-1}	0.057	−0.809*	−0.240*
y_{t-2}	0.068	−0.734*	−0.281*
y_{t-3}	0.183*	−0.740*	−0.159
y_{t-4}	0.145	0.225*	0.383*
y_{t-5}	0.035		−0.080*
y_{t-6}	−0.038		−0.151
y_{t-7}	0.064		−0.156
y_{t-8}	−0.038		
y_{t-9}	0.287*		
x_{t-1}	−0.047	0.130*	0.053*
x_{t-2}	0.064	0.012	0.071*
x_{t-3}	−0.048	0.152*	0.049*
x_{t-4}	0.042		
x_{t-5}	−0.025		
x_{t-6}	−0.073		
x_{t-7}	0.101*		
x_{t-8}	0.056		
x_{t-9}	−0.099*		
Number of Observations	108	87	83
R^2	0.334	0.938	0.594
Adjust R^2	0.199	0.933	0.538

Note: * indicates that the coefficient is significant at one percent level.

Japan and Taiwan where the lagged GDP growth variables have significant positive effects on the current growth of exports.

The empirical results of this study may be compared with those of the previous causality tests made in this context. Hsiao (1987) applies the Granger causality test to find no causal relation between exports and out-

13 This finding might support the export-reducing growth hypothesis of Jung and Marshal (1985).

put growth in South Korea and Taiwan, though he observes a feedback relation for the same two countries by the Sims test. Chow (1987) applies the Sims test to show bidirectional causality between expansion of exports of manufactured goods and growth of manufacturing output in South Korea and Taiwan. The Granger causality test in Jung and Marshall (1985) is more discouraging in so far as it supports the export-reducing growth hypothesis in Korea and shows an ambiguous sign of the causality running from output growth to export growth in Taiwan. These studies, though sophisticated in their filtering techniques used to prewhiten the residuals, are based on annual data with a small sample range and are purely arbitrary in the choice of the lag structure. The present study differs from the previous ones in its larger sample size based on quarterly data and in its choice of the lag structure and detrending method based on recent statistical techniques.

IV. Concluding Remarks

The causal link between export promotion and economic development is neither straightforward nor universal. It operates through a variety of channels, which are generally inter-mixed. It also depends on the special feature of the economy and the development strategy followed by it.

Theoretically, export expansion helps economic growth both from the

Table 6

ESTIMATED PARAMETERS OF REGRESSION EQUATION (7)
FOR JAPAN, SOUTH KOREA AND TAIWAN

Dependent Variable: X_t	Regression Coefficients		
Independent Variables:	Japan	South Korea	Taiwan
Constant	0.009	0.091*	0.016*
x_{t-1}	0.514*	−0.085	−0.495*
y_{t-1}	−0.258	−0.145*	1.270*
y_{t-2}	0.071		0.631
y_{t-3}	0.509*		
Number of Observations	108	87	83
R^2	0.304	0.084	0.303
Adjusted R^2	0.277	0.062	0.277

Note: * indicates that the coefficient is significant at one percent level.

demand side and from the supply side. The demand side effect is generated in the presence of excess capacity and unemployed labor in the economy where aggregate production is demand-determined. Export-promoting policies lead to an increase in the aggregate demand,[14] which causes an improvement in the rate of capacity utilization and a reduction in unemployment. As a result, the aggregate output expands.

The supply side effect works through two channels. One is that the supply bottlenecks caused by the relative scarcity of capital and imported raw materials in less developed countries may be relaxed through the loosening of the foreign exchange constraint because of the export promotion. The other is that the diversion of resources from the nonexport sector to the export sector may improve the overall productivity of the economy. Higher factor productivity in the export sector, economies of scale, and externalities due to the learning effect and spinoff effect are the reasons why export promotion may lead to overall productivity improvement.

From a different theoretical point of view, it is quite plausible that the expansion of domestic production causes an increase in the exports of a country. An unbalanced growth strategy in a small open economy generally directs the casual effect from output growth to export expansion. The rate of growth of domestic demand for a product is determined by its income elasticity of demand and the rate of growth of domestic income. If the income growth is highly concentrated in a few sectors with income elasticities less than one, the domestic supply of the expanding products will exceed their domestic demand. As a small opoen economy, it will be no problem for the country to sell the excess supply in the world market. Again, economic growth in a highly specialized country with a high degree of openness means that its exportable sector expands and export growth is the inevitable consequence of economic growth. However, if the nontraded sector expands faster than the traded sector, the increase in the domestic consumption of the exportable may lead to a decline in the exports of a country.

There is no reason why the two directions of the linkage between export expansion and economic growth should be mutually exclusive. When the overall productivity improvement in the domestic economy, caused by the export promotion, generates economic growth, the growth strategy itself may cause a further expansion of the exports of the country in the world market. The bidirectional causality found in this study, however, needs further exploration in terms of a complete set of structural equa-

14 Though export promoting and import substituting policies are noncompeting from this point of view, the latter are restricted by the size of the domestic imports and the former has the world demand as the limit.

tions that might disentangle the different linkages in a small open economy.

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