EXPORTS, DOMESTIC DEMAND AND ECONOMIC GROWTH IN CHINA: GRANGER CAUSALITY ANALYSIS

Wong Hock Tsen
School of Business and Economics, Universiti Malaysia Sabah, Locked Bag No. 2073, 88999 Kota Kinabalu, Sabah, Malaysia
Tel.: 006-088-320000 Ext. 1616
Fax: 006-088-320360
Email: htwng@ums.edu.my

Abstract

This study examines Granger causality among exports, domestic demand and economic growth in China using time series data over the period 1978-2002. This study uses two measures for domestic demand, namely household consumption and government consumption. The results show that bidirectional Ganger causality among these variables, namely exports, domestic demand and economic growth. Thus, there is a dynamic relationship among exports, domestic demand and economic growth. Exports and domestic demand are both important for economic growth in China. Moreover, economic growth in China has an impact on its exports and domestic demand. A successful and sustained economic growth requires growth in both exports and domestic demand.

Keywords: Exports; Domestic demand; Economic growth; China; Granger causality

1. Introduction

China started its economic reform towards a market economy and opened its economy to the world in 1978. During the economic reform period, China on average achieved a higher level of economic growth rate and its external trade expanded at a higher rate (Chow and Lin, 2002: 508). Domestic demand also increased. Generally, it is argued that a higher level of exports have a positive impact on economic growth. Exports allow domestic production to achieve a higher level of economies of scale through exports to international markets. Barro (1991, 1997) and Gemmell (1996) suggested that exports are an important determinant of economic growth. A higher level of exports enables increased productivity, greater production of high value-added goods and an overall increase in economic growth. Exports are said to have contributed to the success of Asian newly industrialising economies (NIEs), namely South Korea, Taiwan, Hong Kong and Singapore and also the second tier of Asian NIEs such as Malaysia and Thailand.

However, there is no general consensus on the role of exports on economic growth. The experiences of Asian NIEs and also the second tier of Asian NIEs are unique in many ways and may not be replicable in other countries. It is questioned whether a reliance on export-lead growth will result in sustained long-run economic growth in less developing economies (LDEs) due to the volatility and unpredictability in the international markets (Jaffee, 1985). Furthermore, it is questioned whether the markets in developed economies are large enough for more exports from LDEs. There are arguments to support the counter development strategy of protectionism or import substitution (Prebisch, 1950;

Singer, 1950). This involves utilising a variety of policy instruments such as tariffs, quotas and subsidies to substitute domestic output for imports.

The import substitution can be implemented without impacts from other economies and the benefits to increase employment and output in the domestic country. Such government policies can be used to foster domestic firms rather than foreign ones. It is argued that trade between the North and the South has been detrimental to some Latin American countries, resulting in high government expenditure on incentive schemes, ecological damage, trade imbalances and setbacks to domestic industry and agriculture (Hamilton and Thompson, 1994). Grossman and Helpman (1991) showed that the use of tariffs may benefit countries with a comparative disadvantage in key sectors and lead to greater economic growth. There are many countries promote exports and at the same time protect other sectors. Export promotion and import substitution strategies may well be complementary. The latter may be a necessary step for export-led growth (Hamilton and Thompson, 1994). Palley (2002) proposed the importance of the domestic demand-led growth strategy as an alternative to the export-led growth strategy.

The export-led growth strategy suffers from a fallacy of composition as not all LDEs can pursue it simultaneously (Felipe, 2003). Thus, it is an issue as to which strategy, namely the export-led growth strategy or domestic demand-led growth strategy shall be adopted by a country. Furthermore, there is possibility of feedback effects from economic growth to exports and domestic demand. It is argued that economic growth could cause trade expansion (Lie, Haiyan and Romily, 1997: 1680). Economic growth also increases

domestic demand. Thus, the above arguments suggest that a better understanding of economic growth is thus required to examine the nexus of exports, domestic demand and economic growth. Nonetheless, research in this area is relatively limited.

The main aim of this study is to examine Granger causality among exports, domestic demand and economic growth in China using time series data over the period from 1978 to 2002. The Elliot, Rothenberg and Stock (1996) (ERS) and Phillips and Perron (1988) (PP) unit root test statistics are employed to examine the stationarity of the data series. The bounds testing approach of Pesaran, Shin and Smith (2001) is used to test the long-run relationship of exports, domestic demand and economic growth. Moreover, Granger causality among exports, domestic demand and economic growth are investigated to examine the export-led growth, growth-led export, domestic demand-led growth and growth-led domestic demand hypotheses. The relative importance of exports and domestic demand to economic growth is examined using the Geweke (1982) methodology.

The remainder of this study is structured as follows: Section 2 provides a background of the economy of China. Section 3 reviews literature related to exports, domestic demand and economic growth. Section 4 explains the data and methodology used in this study and section 5 presents empirical results and discussions. The last section includes some concluding remarks.

2. The Economy of China: A Background

China achieved remarkable economic growth over the past several decades. In 1979, the economic growth rate was 6.1 per cent. In the 1980-1989 period, the economy grew by an average of 8.2 per cent annually, that is, an average of 2 per cent higher than in 1979. In the 1990-1999 period, the average economic growth rate per annum was about the same as in the 1980-1989 period, that is, 8.6 per cent. In 2002, the economic growth rate was relatively low, that is, 7.3 per cent (Table 1). Exports and domestic demand are among the factors that have contributed to the economic growth of China. The high and prolonged economic growth rate has contributed significantly to the transformation of economy in China (Sachs and Wing, 1997).

In the 1979-2002 period, the average exports growth rate fluctuated. In 1979, the exports growth rate was 22.5 per cent. In the 1980-1989 period, the average exports growth rate was 6.1 per cent per annum. In the 1990-1999 period, the average domestic demand rate per annum increased dramatically to 11.9 per cent, that is, almost double the average exports growth rate in the 1980-1989 period. In 2002, the domestic demand rate was 29.4 per cent (Table 1).

The average household consumption growth rate declined over the period from 1979 to 2002. In 1979, the household consumption growth rate was 7.6 per cent. In the 1980-1989 period, the average household consumption growth rate was 12.0 per cent per annum. In the 1990-1999 period, the average household consumption growth rate per

annum declined to 9.6 per cent, that is, an average of 4 per cent lower than in the 1980-1989 period. In 2002, the household consumption growth rate was 3.1 per cent (Table 1).

The average government consumption growth rate tended to rise over the period from 1979 to 2002. In 1979, the government consumption growth rate was 26.8 per cent. In the 1980-1989 period, the average government consumption growth rate was 8.6 per cent per annum and increased to 9.8 per cent per annum in the 1990-1999 period, that is, 1.2 per cent higher than in the 1980-1989 period. In 2002, the government consumption growth rate was 7.0 per cent (Table 1).

Generally, exports, household consumption and government consumption moved in the same direction with economic growth in China. Nonetheless, household consumption tended to move in a closer direction with economic growth than the movements of exports and government consumption with economic growth (Figure 1). Thus, the behaviour of household consumption is very similar to the behaviour of economic growth. The growth rate of exports is generally much higher than the growth rates of household consumption and of government consumption.

Moreover, the ratio of exports to gross domestic product (GDP) increased over the period from 1978 to 2002. In the 1978-1979 period, the ratio was very small, that is, 5.5 per cent per annum. China started to open its economy to the world in 1978. The ratio increased to 10.4 per cent per annum in the 1980-1989 period and to 21.1 per cent per annum in the 1990-1999 period. In 2002, the ratio was 28.9 per cent. On the other hand, the ratio of

household consumption to GDP was rather stable but declined marginally over the same period. In the 1978-1979 period, the ratio was 49.0 per cent per annum. The ratio increased to 51.8 per cent per annum in the 1980-1989 period but decreased to 46.7 per cent per annum in the 1990-1999 period. In 2002, the ratio was 43.4 per cent. The ratio of government consumption to GDP was generally stable. In 1978-1979 period, the ratio was 14.2 per cent per annum. The ratios were 13.5 per cent and 12.4 per cent per annum in the 1980-1989 and 1990-1999 periods, respectively. In 2002, the ratio was 13.2 per cent. On the whole, domestic demand, that is, household consumption and government consumption decreased over the period from 1978 to 2002 while exports increased. Thus, external sector, particularly exports contributed more significantly to economic growth than domestic demand (Table 2).

Economic reform in China towards a market economy and a more open economy promote more trade and encourage more foreign direct investment (FDI) that in turns contributes significantly to economic growth. International trade enables the low-cost and high-quality labour in China to produce goods to be sold at higher prices in international markets. In addition, FDI allows imports of technology and high-quality capital goods for the use in domestic production, which increases productivity and efficiency. The imports of high-quality consumer goods are not only to increase the welfare of consumer indirectly but also act as an important competitive force to stimulate the quality improvement of domestically manufactured goods in China. FDI provides capital, knowledge and new managerial skill to China. Moreover, FDI increases competition in domestic markets and competition enables domestic producers to become more

productive and efficient (Weixian, 1999: 485). A higher level of economic achievement enables more investment including investment in exports and can be expected to increase economic productivity and efficiency.

3. Review of the Literature on Exports, Domestic Demand and Economic Growth

Export-Led Growth, Growth-Led Export and Feedback

The export-led growth hypothesis implies that an increase in exports would lead to an increase in economic growth. There are many reasons to explain the export-led growth hypothesis. An increase in exports could imply that the demand of the country has risen. Thus, this could serve to increase output. An increase in exports could promote specialisation in the production of export products, which in turn may increase the productivity of the export sector. This may then lead to a reallocation of resources from the relatively inefficient non-trade sector to the higher productive export sector. The productivity change may lead to economic growth. Exports that based on comparative advantage would allow the exploitation of economies of scale. This could lead to an increase in economic growth. This argument suggests that domestic markets are too small for optimal scale to be achieved while increasing returns may occur with access to international markets. An increase in exports could earn more foreign exchange, which makes it easier to import inputs to meet domestic production and output expansion (Chenery and Strout, 1966). Generally, foreign exchange is important to LDEs for their development needs. Exports are more efficient means to development needs than foreign

debt since the latter is subject to adverse shocks of currency that may lead to debt default (ADB, 2005). Exports may also give access to advanced technologies, learning-by-doing gains and better management practices, which in turn will stimulate technological diffusion into the economy (Hart, 1983; Ben-David and Loewy, 1998). Thus, exports will increase output. The promotion of exports may also eliminate controls that result in an overvaluation of the domestic currency. Moreover, the export-led growth hypothesis could be seen as part of the product and industry life-cycle hypothesis. This hypothesis describes economic growth as a cycle that begins with exports of commodities. The success of Asian NIEs and also the second tier of Asian NIEs in promoting their economic growth through exports provide some evidence to support the export-led growth hypothesis (Giles and Williams, 2000a; 2000b; ADB, 2005).

Nonetheless, Palley (2002) indicated that the emphasis on the export-led growth strategy had a series of negative impacts. It prevents growth and development of domestic markets. It put LDEs in a race to the bottom among themselves. It put workers in LDEs in conflict with workers in developed economies. It is blamed for financial instability by creating overinvestment booms. The over emphasis on international markets could aggravate the deterioration in terms of trade of LDEs in the long run. Finally, it reinforces the dependency of LDEs on the developed economies. Export-oriented economies are dependent on foreign demand. The problem is that recessions in the international markets translate slow growth in LDEs (Felipe, 2003: 4). Blecker (2002, 2003), amongst others, also contended the dependence of exports for economic growth. It could be concluded

that highly dependent on the export-led growth strategy may not be an optimal strategy for economic growth (ADB, 2005).

There is also possible for the growth-led export hypothesis, that is, an increase in economic growth would lead to more exports. Bhagwati (1988) postulated that the growth-led export hypothesis is likely, unless antitrade bias results from the economic growth-induced supply and demand. Neoclassical trade theory supports this notion, as it suggests that other factors aside from exports are responsible for economic growth. Economic growth leads to enhancement of skills and technology, with this increased efficiency creating a comparative advantage for the country that facilitates exports. Market failure, with subsequent government intervention, may also result in the growth-led export hypothesis (Giles and Williams, 2000a, 2000b).

A feedback relationship between exports and economic growth is possible. Helpman and Krugman (1985) postulated that exports may rise from the realisation of economies of scale due to productivity gains. The rise in exports may further enable cost reductions, which may result in further productivity gains. Bhagwati (1988) argued that increased trade produces more income, which leads to more trade. Nonetheless, there is, potential for no causal relationship between exports and economic growth when the growth paths of the two time series are determined by other, unrelated variables such as investment in the economy (Giles and Williams, 2000a, 2000b).

The export-led growth hypothesis has been subject of considerable research in the last two decades. However, the relationship between export and economic growth is still being subject of debate. Shan and Sun (1998) examined the export-led growth hypothesis for China over the period from 1987 to 1996 using monthly data. The empirical estimation is based on an augmented growth equation. Granger causality is examined by using the Toda and Yamamoto (1995) method. The results show that bidirectional Granger causality between exports and real industrial output in China.

Lie, Haiyan and Romily (1997: 1684) examined the causal relationship between openness to international trade and economic growth in China using quarterly data over the period from 1983, quarter III to 1995, quarter, I. The result showed that a feedback causal relationship exists between economic growth and exports plus imports, which are used as the proxy for openness to international trade. Thus, an important policy implication is that economic growth in China and openness to international trade reinforce each other. A higher degree of openness to international trade is associated with a higher level of economic growth in China.

Narayan and Smyth (2004) employed cointegration and error-correction modelling to examine the causal relationship among exports, human capital accumulation and real income in China over the period from 1960 to 1999. Amongst others, the study reported that real exports, human capital accumulation and real income were found to be cointegrated when the dependent variable was real exports. However, there was no evidence of cointegration when the dependent variable was human capital accumulation

or real income. In the short run, the study found neutrality between exports and real income. Chuang (2000) examined the causal relationship among human capital accumulation, exports and economic growth in Taiwan over the period from 1952 to 1995. The study amongst others reported that exports promoted the long-run economic growth by accelerating the process of human capital accumulation. The study found evidence in support of the export-led growth hypothesis.

Domestic Demand and Economic Growth

The domestic demand-led growth hypothesis implies that an increase in domestic demand would lead to an increase in economic growth. There are two categories of the domestic demand-led growth hypothesis, that is, the domestic demand-led growth hypothesis in the sense of the strictly speaking and the domestic demand-led growth hypothesis in the sense of weakly speaking. The former refers to an increase in domestic demand that lead to an increase in economic growth at the same time net-exports decreased. The latter refers to an increase in domestic demand is greater than an increase in net-exports and therefore, it leads to economic growth (ADB, 2005). Palley (2002) proposed the shifting paradigm from the export-led growth strategy to one that emphasises domestic demand as the export-led growth strategy embodies many weaknesses. The export-led growth strategy seemed to have failed in the face of the economic crisis of Mexico (1994), Asia (1997), Russia (1998) and Brazil (1999). The response of governments in the crisis-hit countries in Asia was the attempt to switch from export-led growth to a more domestic demand-led growth.

The core theoretical criticism of the simplistic export-led growth is that it suffers from a fallacy of composition, that is, it assumes that all countries can grow by depending on demand growth in other countries. In a global context, there is a danger of a beggar-thy-neighbour outcome in which all try to grow on the back of demand expansion in other countries. As a result is global excess supply and deflation. For individual country, export growth represents a way of growing demand. If export growth comes at the expense of international demand growth, then it may just shift the country composition of growth without raising overall world economic growth. The export-led growth strategy is also blamed for partly contributed to the Asian financial crisis, 1997-1998. During the crisis, countries such as Korea, Thailand and the Philippines are very much affected (Palley, 2002: 2-3; ADB, 2005).

Palley (2002: 1) argued that domestic demand-led growth rests on four pillars, that is, improved income distribution, good governance, financial stability and space for counter-cyclical stabilisation policy, and an adequate, fairly priced supply of development finance. The policies needed to put these pillars in place are labour and democratic rights, appropriate reform and regulation of the financial architecture, and a combination of debt relief, increased foreign aid, and increased development assistance provided through expanded Standard Drawing Rights.

Lai (2004) examined the role of exports and domestic demand in the economic growth of Malaysia over the period from 1961 to 2000. Domestic demand is expressed by private consumption expenditure. However, government expenditure is not considered as

domestic demand in the study. The Johansen (1988) cointegration methodology is used. The results show that there exists short run bilateral causality among exports, domestic demand and economic growth. Thus, the results support the export-led growth and domestic demand-led growth hypotheses. Moreover, the results are not supportive of the export-led growth hypothesis in the long run. The study concludes that the use of domestic demand as the catalyst for economic growth is important as highly significant positive impact of domestic expenditure on economic growth.

ADB (2005) conducted a simple analysis based on national account identity and reported that over-expansionary in the private sector and growing trade deficits are among the major factors that have contributed to the Asian financial crisis, 1997-1998. These results are contradicted to the arguments of Palley (2002) that the export-led growth strategy was partly to blame for the crisis and led to bias against the domestic demand sector. Thus, the export-led growth strategy is not a cause for the crisis.

Remarks

It is usually argued that there is a dynamic relationship among exports, domestic demand and economic growth. An increase in exports would lead to an increase in economic growth, which is called the export-led growth hypothesis. Moreover, an increase in output or economic growth would lead to an increase in exports, which is called the growth-led export hypothesis. An increase in domestic demand could also lead to an increase in economic growth and it is called the domestic demand-led growth hypothesis.

Finally, an increase in economic growth in turn would lead to an increase in domestic demand, which is called the growth-led domestic demand hypothesis. Thus, this requires the nexus examination of exports, domestic demand and economic growth. The matter is an empirical issue. However, research in this area is relatively limited.

4. Data and Methodology

GDP, population, exports, household consumption and government consumption were obtained from the World Tables. GDP, exports, household consumption and government consumption are in 1995 price (1995 = 100). Population is in millions. The sample ranges from 1978 to 2002. The data are annual. GDP per capita, exports, household consumption and government consumption were transformed into logarithms. The year 1978 is treated as a beginning of the economic reform period in China, which China opened its economy to the world.

This study uses two measures for domestic demand, namely household consumption and government consumption. More specifically, this study uses the measurements of household consumption and government consumption. First, this study estimates the nexus of the three variables, namely exports, household consumption and economic growth and then the nexus of four variables, namely exports, household consumption, government consumption and economic growth. For the convenience of referring, the nexus of three variables is named as Model 1 while the nexus of four variables is named as Model 2.

The empirical estimation in this study begins with the unit root test. The ERS and PP unit root test statistics are employed. The ERS unit root test statistic is shown to have a higher power for small sample size. The bounds testing approach (Pesaran, Shin and Smith, 2001) is used to examine the long-run relationship among variables in the model, which is based on the Wald or F-statistic for cointegration analysis. The bounds testing approach is said to have superior properties in small sample size. On the other hand, estimates using the Engle and Granger (1987) and Johansen (1988) cointegration methods may not robust for small sample size (Mah, 2000). Furthermore, the bounds testing approach does not impose restrictive assumption that all the regressors are to be integrated of the same order. In other words, regressors could be I(0) or I(1). More specifically, the bounds testing approach is conducted in the following way. Firstly, the unrestricted error correction model (UECM) is estimated:[1]

$$\Delta \ln Z_t = \beta_{10} + \sum^{a}_{i=0} \beta_{11i} \Delta \ln X_{t-i} + \sum^{a}_{i=0} \beta_{12i} \Delta \ln W_{t-i} + \sum^{a}_{i=1} \beta_{13i} \Delta \ln Z_{t-i} + \beta_{14} \ln X_{t-1} + \beta_{15} \ln W_{t-1} + \beta_{16} \ln Z_{t-1} + u_{1,t} \quad (1)$$

where Δ is the first differenced operator; Z_t, X_t and W_t are a series, respectively and $u_{1,t}$ is a disturbance term. Secondly, the Wald or F-statistic is computed to test the null hypothesis, H_0: $\beta_{14} = \beta_{15} = \beta_{16} = 0$ against the alternative hypothesis, H_a: $\beta_{14} \neq \beta_{15} \neq \beta_{16} \neq 0$. The critical bounds values can be obtained from Pesaran, Shin and Smith (2001). If the Wald or F-statistic falls outside the upper bound, the null hypothesis of no cointegration is rejected. In other words, $\ln Z_t$, $\ln X_t$ and $\ln W_t$ are said to be cointegrated. However, no

[1]In this study, a in equation (1) is set to three at the beginning of the estimation.

conclusive inference could be made for the Wald or F-statistic falls inside the critical bounds, unless the order of integration of the regressors is known. If the Wald or F-statistic falls below the lower bound, the null hypothesis of no cointegration can not be rejected.

In the Granger (1969) sense of a variable X causes another variable Y if the current value of Y can better be predicted by using the past values of X.[2] When series are cointegrated, the simple Granger causality test becomes inappropriate and the testing of Granger causality to be in the error correction models (ECMs). For Model 1, the ECMs are:

$$\Delta \ln Y_t = \beta_{20} + \sum^{a}_{i=1} \beta_{21i} \Delta \ln X_{t-i} + \sum^{b}_{i=1} \beta_{22i} \Delta \ln C_{t-i} + \sum^{c}_{i=1} \beta_{23i} \Delta \ln Y_{t-i} + \gamma_1 EC_{1,t-1} + u_{2,t} \quad (2)$$

$$\Delta \ln X_t = \beta_{30} + \sum^{d}_{i=1} \beta_{31i} \Delta \ln X_{t-i} + \sum^{e}_{i=1} \beta_{32i} \Delta \ln C_{t-i} + \sum^{f}_{i=1} \beta_{33i} \Delta \ln Y_{t-i} + \gamma_2 EC_{2,t-1} + u_{3,t} \quad (3)$$

$$\Delta \ln C_t = \beta_{40} + \sum^{g}_{i=1} \beta_{41i} \Delta \ln X_{t-i} + \sum^{h}_{i=1} \beta_{42i} \Delta \ln C_{t-i} + \sum^{j}_{i=1} \beta_{43i} \Delta \ln Y_{t-i} + \gamma_3 EC_{3,t-1} + u_{4,t} \quad (4)$$

where Y_t is GDP per capita; X_t is exports; C_t is household consumption and $u_{i,t}$ (i = 2, 3, 4) is a disturbance term. The term $EC_{i,t-1}$ (i = 1, 2, 3) is the first lagged value of the disturbance, which is obtained from the following cointegrating regression, respectively:

[2]See Granger (1988) for more explanation of causality.

$$\ln Y_t = \beta_{51} \ln X_t + \beta_{52} \ln C_t + EC_{1,t} \quad (5)$$

$$\ln X_t = \beta_{61} \ln Y_t + \beta_{62} \ln C_t + EC_{2,t} \quad (6)$$

$$\ln C_t = \beta_{71} \ln X_t + \beta_{72} \ln Y_t + EC_{3,t} \quad (7)$$

where $EC_{i,t}$ (i = 1, 2, 3) is a disturbance term. The joint test of lagged variables, that is, $\Delta \ln Y_t$, $\Delta \ln X_t$ and $\Delta \ln C_t$, by mean of the F-statistic is significantly different from zero, implies the presence of Granger causality. For example, if the joint test of lagged variables of $\Delta \ln X_t$ in equation (2) is significantly different from zero, then it implies that exports Granger cause economic growth. The minimum final prediction error (FPE) criterion proposed by Akaike (1970) is used to determine the optimal lags of the model. For Model 2, the ECMs are the same as the ECMs discussed for Model 1, except including government consumption (G_t) as a regressor and one more ECM for government consumption.

The Granger (1969) approach does not allow to estimate and to compare the relative magnitude of causality between two series. On the other hand, Geweke (1982) suggested a methodology to distinguish causality between two series, for example, X and Z into three components, namely causality from X to Z, causality from Z to X and contemporaneous causality between X and Z, while controlling for other variable. For the

series that are cointegrated, the methodology shall be in ECMs. For a three variables case, the ECMs are as follows:[3,4]

$$\Delta \ln Z_t = \beta_{80} + \sum^{p}_{i=0} \beta_{81i} \Delta \ln X_{t-i} + \sum^{p}_{i=1} \beta_{82i} \Delta \ln W_{t-i} + \sum^{p}_{i=1} \beta_{83i} \Delta \ln Z_{t-i} + \gamma_1 EC_{4,t-1} + u_{8,t} \quad (8)$$

$$\Delta \ln Z_t = \beta_{90} + \sum^{p}_{i=1} \beta_{91i} \Delta \ln X_{t-i} + \sum^{p}_{i=1} \beta_{92i} \Delta \ln W_{t-i} + \sum^{p}_{i=1} \beta_{93i} \Delta \ln Z_{t-i} + \gamma_1 EC_{4,t-1} + u_{9,t} \quad (9)$$

$$\Delta \ln Z_t = \beta_{100} + \sum^{p}_{i=1} \beta_{101i} \Delta \ln W_{t-i} + \sum^{p}_{i=1} \beta_{102i} \Delta \ln Z_{t-i} + \gamma_1 EC_{4,t-1} + u_{10,t} \quad (10)$$

$$\Delta \ln X_t = \beta_{110} + \sum^{p}_{i=1} \beta_{111i} \Delta \ln X_{t-i} + \sum^{p}_{i=1} \beta_{112i} \Delta \ln W_{t-i} + \sum^{p}_{i=1} \beta_{113i} \Delta \ln Z_{t-i} + \gamma_1 EC_{5,t-1} + u_{11,t} \quad (11)$$

$$\Delta \ln X_t = \beta_{120} + \sum^{p}_{i=1} \beta_{121i} \Delta \ln X_{t-i} + \sum^{p}_{i=1} \beta_{122i} \Delta \ln W_{t-i} + \gamma_1 EC_{5,t-1} + u_{12,t} \quad (12)$$

where W_t is a control variable in this case; $u_{i,t}$ (i = 8, 9, 10, 11, 12) is a disturbance term and $EC_{i,t-1}$ (i = 4, 5) is the first lagged value of the disturbance from cointegrating

[3]See Geweke (1982, 1984) and Granger (1988) for a detailed explanation of the methodology. Chong and Calderon (2000), Calderon and Liu (2003) and Aizenman (2004), amongst others, used the methodology.
[4]For a four variables case, the ECMs are the same as the three variables case, except there will be an additional control variable in each of the ECMs.

regression. The total measure of linear dependence between the two series, that is, X and Z ($F_{X,Z}$) is given as:

$$F_{X,Z} = F_{X\rightarrow Z} + F_{Z\rightarrow X} + F_{X\bullet Z} \quad (13)$$

where $F_{X\rightarrow Z}$ denotes causality from X to Z; $F_{Z\rightarrow X}$ denotes causality from Z to X and $F_{X\bullet Z}$ denotes contemporaneous causality between X and Z. Geweke (1982) concluded that $F_{X\rightarrow Z} = \log [\text{var}(u_{10,t}) / \text{var}(u_{9,t})]$, $F_{Z\rightarrow X} = \log [\text{var}(u_{12,t}) / \text{var}(u_{11,t})]$ and $F_{X\bullet Z} = \log [\text{var}(u_{9,t}) / \text{var}(u_{8,t})]$. The null hypothesis ($H_o$: F=0) can be statistically examined using the χ^2 distribution.

5. Empirical Results and Discussions

The results of the ERS and PP unit root test statistics are reported in Table 3. The lag length used to estimate the ERS unit root test statistic is based on Schwarz Bayesian criterion (SBC). For the PP unit root test statistic, the results that are reported are based on three truncation lags, which are used to compute the test statistics after considering truncation lags one to three in computing the test statistics. Generally, the results of the ERS and PP unit root test statistics show that all the variables are non-stationary in levels but become stationary after taking the first differences, except GDP per capita and exports. For GDP per capita, the results of the ERS test statistic show that it is a stationary series after taking the first differences while the results of the PP test statistic show no evidence of a unit root. Conversely for exports, the results of the ERS test

statistic show that no evidence of a unit root while the results of the PP test statistic show that it is a stationary series after taking the first differences. However, they could be considered as a borderline case. Thus, all the variables, namely GDP per capita (Y_t), exports (X_t), household consumption (C_t) and government consumption (G_t) are said to be a unit root process.

According to Engle and Granger (1987), series that are integrated in the same order may cointegrate together. The cointegrated series may drift apart from each other in the short run but the distance between them tends to be constant or in a stationary process in the long run. Thus, this study proceeds to examine the long-run relationship among variables in the model. The results of the F-statistic for the bounds testing approach are reported in Table 4. For Model 1 and Model 2, all the F-statistics fall outside the upper bound and statistically significant at the 5 per cent level. Thus, evidence of cointegration among the variables is not rejected.[5]

On the whole, the findings above suggest that there is a long-run equilibrium relationship among exports, domestic demand and economic growth. In other words, they are moving together and would not move too far from each other in the long run. Thus, the analysis of Granger causality should be in the ECMs. The results of Granger causality test are reported in Table 6.[6] The result of the F-statistic shows that exports and economic growth, domestic demand and economic growth, and exports and domestic demand are

[5]The results of the Johansen (1988) cointegration test statistics show that there is one cointegrating vector for Model 1 and Model 2, respectively. Thus, there is a long-run relationship among exports, domestic demand and economic growth (Table 5).

[6]The plots of cumulative sum of recursive errors (CUSUM) and cumulative sum of squares of recursive errors (CUSUMSQ) statistics which are not reported show no evidence of the ECMs instability.

found to have bidirectional Granger causality. Therefore, there is a dynamic relationship among exports, domestic demand and economic growth.[7] More specifically, for Model 1, there is bidirectional Granger causality between GDP per capita and household consumption, bidirectional Granger causality between GDP per capita and exports, and bidirectional Granger causality between household consumption and exports. For Model 2, there is bidirectional Granger causality between GDP per capita and household consumption, bidirectional Granger causality between government expenditure and household consumption, bidirectional Granger causality between government expenditure and exports, unidirectional Granger causality from GDP per capita to exports and unidirectional Granger causality from GDP per capita to government consumption. Generally, the results of Model 1 and Model 2 produce about the same conclusion regarding Granger causality among exports, domestic demand and economic growth.

The results of the Geweke (1982) decomposition of causality are given in Table 7. The order of p is determined by SBC. In estimating equations (8) to (12), p = 4 is used for Model 1 while p = 2 is used for Model 2. For Model 1, the results show that most of linear dependence between household consumption and GDP per capita can be accounted by causality from GDP per capita to household consumption, that is, 51.7 per cent. Causality from household consumption to GDP per capita is accounted for 35.5 per cent and contemporaneous causality between household consumption and GDP per capita is accounted for 12.8 per cent. For exports and GDP per capita, causality from GDP per capita to exports is accounted for 59.8 per cent. Causality from exports to GDP per capita

[7]This study also has examined exports, household consumption and government consumption to GDP, respectively rather than in their levels. However, the results are not reported. On the whole, the about he same conclusion is drawn as those variables in their levels.

is accounted for 36.2 per cent and contemporaneous causality between exports and GDP per capita is accounted for 4 per cent.

For Model 2, the results show that most of linear dependence between household consumption and GDP per capita is accounted by causality from GDP per capita to household consumption is accounted, that is, 74.0 per cent. Contemporaneous causality between household consumption and GDP per capita is accounted for 15.5 per cent and causality from household consumption to GDP per capita is accounted for 10.5 per cent. For government consumption and GDP per capita, causality from GDP per capita to government consumption is accounted for 44.7 per cent. Contemporaneous causality between government consumption and GDP per capita is accounted for 29.1 per cent and causality from government consumption to GDP per capita is accounted for 26.1 per cent. Finally, 65.6 per cent of total linear dependence between exports and GDP per capita is accounted by causality from exports to GDP per capita. Contemporaneous causality between exports and GDP per capita is accounted for 30.0 per cent and causality from GDP per capita to exports is accounted for 4.4 per cent.

Generally, the results of the Geweke (1982) decomposition of causality show that linear dependence between household consumption and GDP per capita and linear dependence between government consumption and GDP per capita are dominated by the growth-led domestic demand hypothesis. On the other hand, the results of linear dependence between exports and GDP per capita are mixed. For the three variables case, the growth-led export

hypothesis is dominant while for the four variables case, the export-led growth hypothesis is dominant.

The finding that exports and economic growth reinforce each other in China is consistent with the findings of Shan and Sun (1998) and Lie, Haiyan and Romily (1997), amongst others. Nonetheless, the finding is contrast with the finding of Narayan and Smyth (2004), who reported neutrality between real exports and real income. This may because they combine the non-reform and reform period in the estimation, that is, the sample period from 1960 to 1999 is used. Kwan and Cotsomitis (1991) also reported bidirectional Granger causality between exports and economic growth in China over the period from 1952 to 1985. However, the result does not hold over a sub-period, that is, from 1952 to 1978. The different results between the two sample periods point to a change in causal relation after 1978, which coincides with the economic reform period in China.

The finding that domestic demand and economic growth reinforce each other is consistent with the argument of Palley (2002) and the finding of Lai (2004). Palley (2002) argued the important role of domestic demand in promoting economic growth. Lai (2004) found that domestic demand, particularly household consumption and economic growth reinforce each other for the case of Malaysia. However, this study finds no evidence to support domestic demand-led growth is preferred than export-led growth, which is claimed by Palley (2002) and Lai (2004). On the other hand, this study finds that both domestic demand-led growth and export-led growth are important. Moreover,

household consumption and government consumption are important for economic growth in China.

Generally, exports and domestic demand are important for economic growth in China, especially during the economic reform period. Moreover, economic growth reinforces exports and domestic demand. Thus, this study provides evidence that export-led growth and domestic demand led-growth are important for economic growth in China. Exports are important for LDEs including China to enable domestic production to achieve economies of scale and to obtain foreign exchange to finance their imports for domestic consumption and production. Therefore, exports stimulate economic growth. As domestic consumption increase, it stimulates domestic production and thus, economic growth. Moreover, an increase in domestic production would lead to an increase in the capability of domestic producers to increase their exports. In the long run, economic growth of China could serve as export markets for other economies. At present, it imports mainly from Japan, Korea, the United States, Germany and Malaysia, amongst others. A successful and long-run economic growth requires the emphasis on the role of exports and domestic demand.

6. Concluding Remarks

This study has investigated Granger causality among exports, domestic demand and economic growth in China using time series data. Generally, the results of the ERS and PP unit root test statistics show that all the variables in this study are said to be integrated

of order one. Therefore, this study proceeds to the cointegration tests. The results of the bounds testing approach show that exports, domestic demand and economic growth are cointegrated. Thus, the findings suggest a co-movement among those variables. Therefore, the analysis of Granger causality should be in the ECMs. The result of Granger causality test shows some evidence that exports and economic growth, domestic demand and economic growth, and exports and domestic demand are respectively found to have bidirectional Granger causality. In other words, there is a dynamic relationship among exports, domestic demand and economic growth. Therefore, the findings support the export-led growth, growth-led export, domestic demand-led growth and growth-led domestic demand hypotheses. Moreover, there is some evidence to support that the growth-led domestic demand hypothesis is more dominant than the domestic demand-led growth hypothesis and both the growth-led export hypothesis and export-led growth hypotheses are important.

Exports and domestic demand are both important for economic growth in China. More specifically, domestic household and government consumption are important for economic growth. Moreover, economic growth will increase exports and domestic demand. There is no evidence that exports or domestic demand is superior to each other and therefore, a balance emphasises on the role of exports and domestic demand is important for successful and sustained economic growth.

Acknowledgement

The author would like to thank Tuck Cheong Tang from Monash University Malaysia for providing some of data used in this study.

References

Aizenman, Joshua (2004) "Endogenous Financial and Trade Openness Efficiency and Political Economy Considerations", *Economics Department, University of Hawaii, Manoa Saunders Hall, Working Paper No. 04-4*.

Akaike, H. (1970) "Statistical Predictor Identification", *Annals of the Institute of Statistical Mathematics*, 22: 203-217.

Asia Development Bank (ADB) (2005) *Asian Development Outlook 2005*, Asia Development Bank.

Barro, Robert J. (1991) "Economic Growth in a Cross-Section of Countries", *Quarterly Journal of Economics*, 106: 407-443.

Barro, Robert J. (1997) *Determinants of Economic Growth: A Cross-Country Empirical Study*, The MIT Press: Cambridge Massachusetts, The United States.

Ben-David, D. and Loewy, M.B. (1998) "Free-Trade, Growth, and Convergence", *Journal of Economic Growth*, 3: 143-170.

Bhagwati, J.N. (1988) *Protectionism*, The MIT Press: Cambridge, MA.

Blecker, Robert (2002) "The Balance-of-Payments-Constrained Growth Model and the Limits to Export-Led Growth" in Paul Davidson (ed.) *A Post Keynesian Perspective on Twenty-First Century Economic Problems*, Edward Elgar: Northampton, MA.

Blecker, Robert (2003) "The Diminishing Returns to Export-Led Growth" in Walter Russell Mead and Sherle R. Schwenninger (eds.) *The Bridge to a Global Middle Class: Development, Trade, and International Finance in the 21st Century*, Kluwer Academic Publishers for the Milken Institute: Norwell, MA.

Calderon, Cesar and Liu, Lin (2003) "The Direction of Causality between Financial Development and Economic Growth", *Journal of Development Economics*, 72, 321-334.

Chenery, H.B. and Strout, A. (1966) "Foreign Assistance and Economic Development", *American Economic Review*, 56: 679-732.

Chong, Alberto and Calderon, César (2000) "Causalilty and Feedback between Institutional Measures and Economic Growth", *Economics and Politics*, 12(1), 69-81.

Chow, Gregory and Lin, An-Loh (2002) “Accounting for Economic Growth in Taiwan and Mainland China: A Comparative Analysis”, *Journal of Comparative Economics*, 30: 507-530.

Chuang, Yih-Chyi (2000) “Human Capital, Exports and Economic Growth: A Causality Analysis for Taiwan 1952-1995”, *Review of International Economics*, 8(4): 712-720.

Cushing , Matthew J. and McGarvey, Mary G. (1990) “Feedback between Wholesale and Consumer Price Inflation: A Reexamination of the Evidence”, *Southern Economic Journal*, 56(4), 1059-1072.

Elliot, Graham, Rothenberg, Thomas J. and Stock, James H. (1996) “Efficient Tests for an Autoregressive Unit Root”, *Econometrica*, 64: 813-836.

Engle, Robert F. and Granger, C.W.J. (1987) “Co-Integration and Error Correction: Representation, Estimation and Testing”, *Econometrica*, 55(2): 251-276.

Felipe, Jesus (2003) “Is Export-Led Growth Passe? Implications for Developing Asia”, *Economic Research Department, Asian Development Bank Working Paper No. 48*.

Gemmell, Norman (1996) “Evaluating the Impacts of Exports Stocks and Accumulation on Economic Growth: Some New Evidence”, *Oxford Bulletin of Economics and Statistics*, 58: 9-28.

Geweke, John (1982) “Measurement of Linear Dependence and Feedback between Multiple Time Series”, *Journal of the American Statistical Association*, 77(378), 304-313.

Geweke, John (1984) “Measures of Conditional Linear Dependence and Feedback between Time Series”, *Journal of the American Statistical Association*, 79(388), 907-915.

Giles, J.A. and Williams, C.L. (2000a) “Export-Led Growth: A Survey of the Empirical Literature and some Non-Causality Results”, Part 1, *Journal of International Trade and Economic Development*, 9(4): 265-341.

Giles, J.A. and Williams, C.L. (2000b) “Export-Led Growth: A Survey of the Empirical Literature and some Non-Causality Results”, Part 2, *Journal of International Trade and Economic Development*, 9(4): 445-470.

Granger, C.W.J. (1969) “Investigating Causal Relations by Econometric Models and Cross Spectral Models”, *Econometrica*, 37(3): 424-438.

Granger, C.W.J. (1988) “Some Recent Development in a Concept of Causality”, *Journal of Econometrics*, 39: 199-211.

Grossman, G.M. and Helpman, E. (1991) *Innovation and Growth in the Global Economy*, The MIT Press: Cambridge, MA.

Hamilton, N. and Thompson, C. (1994) "Export Promotion in a Regional Context: Central America and Southern Africa", *World* Development, 22: 1379-1392.

Hart, O. (1983) "The Market Mechanism as an Incentive Scheme", *Bell Journal of Economics*, 14: 366-382.

Helpman, E. and Krugman, P.R. (1985) *Market Structure and Foreign Trade*, The MIT Press: Cambridge, MA.

Jaffee, D. (1985) "Export Dependence and Economic Growth: A Reformulation and Respecification", *Social Forces*, 64: 102-118.

Johansen, Soren (1988) "Statistical Analysis of Cointegration Vectors", *Journal of Economic Dynamics and Control*, 12(2-3): 231-254.

Kwan, Kyuwon C.C. and Cotsomitis, John A. (1991) "Economic Growth and the Expanding Export Sector: China 1952-1985", *International Economic Journal*, 5(1): 105-117.

Lai, Yew Wah (2004) "The Role of Domestic Demand in the Economic Growth of Malaysia: A Cointegration Analysis", *International Economic Journal*, 18(3): 337-352.

Lie, Xiaming, Haiyan, Song and Romily, Peter (1997) "An Empirical Investigation of the Causal Relationship between Openness and Economic Growth in China", *Applied Economics*, 29(12): 1679-1687.

Mah, Jai S. (2000) "An Empirical Examination of the Disaggregated Import Demand of Korea - The Case of Information Technology Products", *Journal of Asian Economics*, 11(2): 237-244.

Narayan, Paresh Kumar and Smyth, Russel (2004) "Temporal Causality and the Dynamics of Exports, Exports and Real Income in China", *International Journal of Applied Economics*, 1(1): 24-45.

Palley, Thomas I. (2002) "A New Development Paradigm: Domestic Demand-Led Growth", *Discussion Paper, Foreign Policy in Focus*, Albuquerque, New Mexico.

Pesaran, M. Hashem, Shin, Yongcheol and Smith, Richard J. (2001) "Bounds Testing Approaches to the Analysis of Level Relationships", *Journal of Applied Econometrics*, 16: 289-326.

Phillips, P.C.B. and Perron, P. (1988) "Testing for a Unit Root in Time Series Regression", *Biometrika*, 75(2): 335-346.

Prebisch, R. (1950) *The Economic Development of Latin America and its Principal Problems*, The United Nations: New York.

Sachs, Jeffrey D. and Wing, Thye Woo (1997) "Understanding China's Economic Performance", *NBER Working Paper 5935*.

Shan, Jordan and Sun, Fiona (1998) "On the Export-Led Growth Hypothesis: The Econometric Evidence from China", *Applied Economics*, 30: 1055-1065.

Singer, H.W. (1950) "The Distribution of Gains between Investing and Borrowing Countries", *American Economic Review Papers and Proceedings*, 40: 473-485.

Toda, H.Y. and Yamamoto, T. (1995) "Statistical Inference in Vector Autoregressions with Possibly Integrated Processes", *Journal of Econometrics*, 66(1-2): 225-250.

Weixian, Wei (1999) "An Empirical Study of the Foreign Trade Balance in China", *Applied Economics Letters*, 6: 485-490.

Table 1
The Growth Rates of Economy, Exports, Household Consumption and Government Consumption in China, 1979-2002 (%, 1995 = 100)

Year	Economic Growth	Exports	Household Consumption	Government Consumption
1979	6.1	22.5	7.6	26.8
1980-1989	8.2	6.1	12.0	8.6
1990-1999	8.6	11.9	9.6	9.8
2000	7.2	30.6	7.2	12.2
2001	6.7	9.6	2.8	10.5
2002	7.3	29.4	3.1	7.0

Source: The World Tables.

Table 2
Exports, Household Consumption and Government Consumption to GDP in China, 1978-2002 (%)

Year	Exports	Household Consumption (C)	Government Consumption (G)	C + G
1978-1979	5.5	49.0	14.2	63.2
1980-1989	10.4	51.8	13.5	65.3
1990-1999	21.1	46.7	12.4	59.1
2000	25.9	47.9	13.1	61.0
2001	25.5	45.7	13.4	59.1
2002	28.9	43.4	13.2	56.6

Source: The World Tables.

Table 3
The Results of the Elliot, Rothenberg and Stock (1996) (ERS) and Phillips and Perron (1988) (PP) Test Statistics

	$t_{\gamma 1}$	$t_{\gamma 2}$
$\ln Y_t$	-0.3425(1)	-0.1076(3)
$\Delta \ln Y_t$	-3.4705***(1)	-2.5320(3)
$\ln X_t$	2.0357(3)	2.0419(3)
$\Delta \ln X_t$	-0.7812(2)	-4.4836***(3)
C_t	-1.3577(4)	-1.4197(3)
ΔC_t	-3.8005***(1)	-3.0552**(3)
$\ln G_t$	0.9048(1)	-1.1898(3)
$\Delta \ln G_t$	-3.2583***(0)	-5.0890***(3)

Notes: $t_{\gamma 1}$ denotes the ERS t-statistic. $t_{\gamma 2}$ denotes the PP t-statistic. All the unit root test statistics are estimated based on the model with a drift only. Values in parentheses are the lag length used in the estimation for the unit root test statistics. *** Denotes significance at the 1% level. ** Denotes significance at the 5% level.

Table 4
The Results of the Bounds Testing Approach for Cointegration

Model 1	F-statistic
$\Delta \ln Y_t$	27.6051**
$\Delta \ln X_t$	27.0049**
$\Delta \ln C_t$	24.4894**
Model 2	
$\Delta \ln Y_t$	94.1679**
$\Delta \ln X_t$	6.3913**
$\Delta \ln C_t$	25.4720**
$\Delta \ln G_t$	212.4752**

Notes: The critical values for the bounds testing approach were obtained from Pesaran, Shin and Smith (2001). The critical values for unrestrictive intercept and no trend case with two regressors at the 5% level are 3.79 for lower critical bound (I(0)) and 4.85 for upper critical bound (I(1)). The critical values for unrestrictive intercept and no trend case with three regressors at the 5% level are 3.23 for I(0) and 4.35 for I(1). ** Denotes significance at the 5% level.

Table 5
The Results of the Johansen (1988) Likelihood Ratio Test Statistics

	λ_{Max} Test Statistic				λ_{Trace} Test Statistic			
H_0:	r=0	r<=1	r<=2	r<=3	r=0	r<=1	r<=2	r<=3
H_a:	r=1	r=2	r=3	r=4	r≥1	r≥2	r≥3	r≥4
Model 1	55.29**	10.90	0.34	-	66.53**	11.24	0.34	-
c.v. (95%)	21.12	14.88	8.07	-	31.54	17.86	8.07	-
c.v. (90%)	19.02	12.98	6.50	-	28.78	15.75	6.50	-
Model 2	28.39**	12.81	6.91	0.04	48.15*	19.76	6.94	0.04
c.v. (95%)	27.42	21.12	14.88	8.07	48.88	31.54	17.86	8.07
c.v. (90%)	24.99	19.02	12.98	6.50	45.70	28.78	15.75	6.50

Notes: The λ_{Max} and λ_{Trace} test statistics are computed with unrestricted intercepts and no trends. For Model 1, the VAR=4 is used in the estimation. For Model 2, the VAR=2 is used in the estimation. c.v. (95%) denotes the 95% critical value. c.v. (90%) denotes the 90% critical value. ** Denotes significance at the 95% critical value. * Denotes significance at the 90% critical value.

Table 6
The Results of Granger Causality Test

Model 1	EC_{t-1}	$\sum \Delta \ln Y_{t-i}$	$\sum \Delta \ln C_{t-i}$	$\sum \Delta \ln X_{t-i}$	$\sum \Delta \ln G_{t-i}$
$\Delta \ln Y_t$	4.7354***	-	31.9967***	35.3293***	-
$\Delta \ln C_t$	3.1207***	52.6584***	-	24.9271***	-
$\Delta \ln X_t$	-9.1955***	83.3678***	91.5171***	-	-
Model 2					
$\Delta \ln Y_t$	2.2127**	-	3.7770*	16.7733***	2.0580
$\Delta \ln C_t$	-7.9397***	12.3220***	-	.50152	9.7397***
$\Delta \ln X_t$	.48063	1.3235	.23378	-	3.0493*
$\Delta \ln G_t$	-3.1336***	8.5724***	10.5534***	24.4409***	-

Notes: Values under EC_{t-1} are t-statistic. Values under $\sum \Delta \ln Y_{t-i}$, $\sum \Delta \ln C_{t-I}$, $\sum \Delta \ln X_{t-i}$ and $\sum \Delta \ln G_{t-i}$ are the F-statistic. *** Denotes significance at the 1% level. ** Denotes significance at the 5% level. * Denotes significance at the 10% level.

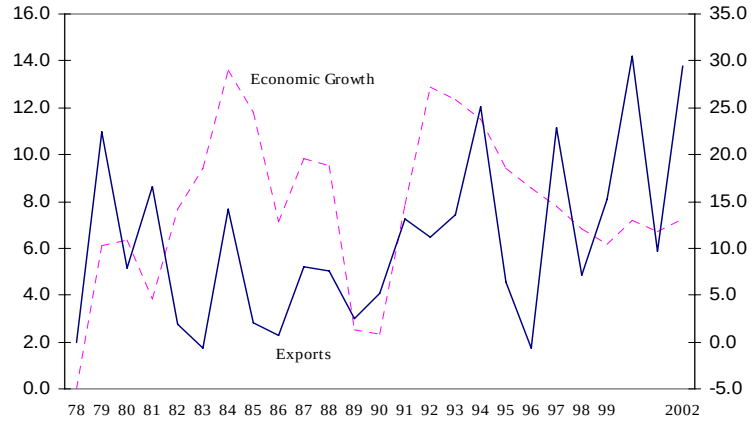
Table 7
The Results of Geweke (1982) Decomposition of Causality

Model 1	Percentage of Overall Linear Feedback
$\Delta \ln Y_t \rightarrow \Delta \ln C_t (F_{Y \rightarrow C})$	51.7
$\Delta \ln C_t \rightarrow \Delta \ln Y_t (F_{C \rightarrow Y})$	35.5
$\Delta \ln C_t \leftrightarrow \Delta \ln Y_t (F_{Y \bullet C})$	12.8
Total ($F_{Y,C}$)	100.0
$\Delta \ln Y_t \rightarrow \Delta \ln X_t (F_{Y \rightarrow X})$	59.8
$\Delta \ln X_t \rightarrow \Delta \ln Y_t (F_{X \rightarrow Y})$	36.2
$\Delta \ln X_t \leftrightarrow \Delta \ln Y_t (F_{Y \bullet X})$	4.0
Total ($F_{Y,X}$)	100.0
Model 2	
$\Delta \ln Y_t \rightarrow \Delta \ln C_t (F_{Y \rightarrow C})$	74.0
$\Delta \ln C_t \rightarrow \Delta \ln Y_t (F_{C \rightarrow Y})$	10.5
$\Delta \ln C_t \leftrightarrow \Delta \ln Y_t (F_{Y \bullet C})$	15.5
Total ($F_{Y,C}$)	100.0
$\Delta \ln Y_t \rightarrow \Delta \ln G_t (F_{Y \rightarrow G})$	44.7
$\Delta \ln G_t \rightarrow \Delta \ln Y_t (F_{G \rightarrow Y})$	26.1
$\Delta \ln G_t \leftrightarrow \Delta \ln Y_t (F_{Y \bullet G})$	29.1
Total ($F_{Y,G}$)	100.0
$\Delta \ln Y_t \rightarrow \Delta \ln X_t (F_{Y \rightarrow X})$	4.4
$\Delta \ln X_t \rightarrow \Delta \ln Y_t (F_{X \rightarrow Y})$	65.6
$\Delta \ln X_t \leftrightarrow \Delta \ln Y_t (F_{Y \bullet X})$	30.0
Total ($F_{Y,X}$)	100.0

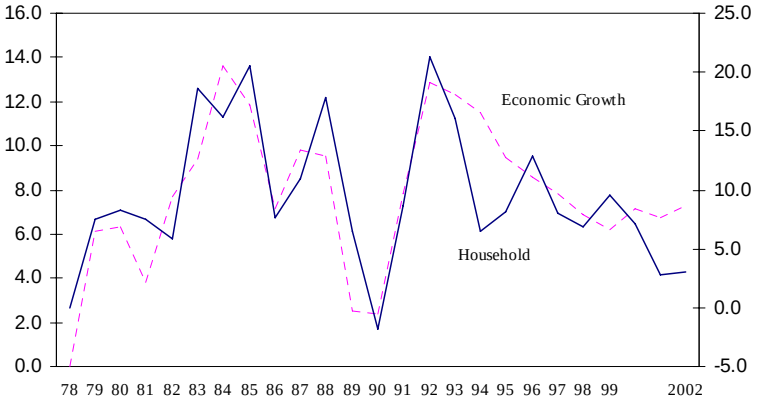
Notes: $\rightarrow$ Denotes causality from. $\leftrightarrow$ Denotes contemporaneous causality.

Figure 1
The Growth Rates of Economy, Exports, Household Consumption and Government Consumption, 1978-2002

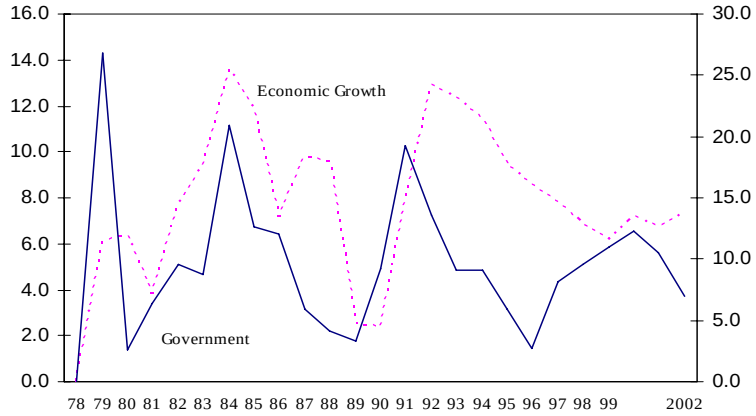
Economic Growth and Exports



Economic Growth and Household Consumption



Economic Growth and Government Consumption



Source: The World Tables.