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Exports, imports and economic growth: empirical evidence from selected countries.

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TABLE OF CONTENTS

1. Introduction

The relationships among exports, imports and economic growth in developed and developing countries have been of continuing interest both in theoretical and empirical literature. A large number of empirical studies have been conducted during the last two decades to investigate the role of exports on economic growth or the export-led growth hypothesis using either time-series or cross-section data, other studies have been conducted whether or not imports hinder or help economic growth.

Casual inspection of exports and productivity in developed and developing market economies reveals that these two time series move together. Countries which do well in their export performance seem also to do well in their productivity performance and vice-versa. What is the nature of this link? Does the co-movement between exports and productivity reflect only a growth accounting identity-exports area component of GDP-or a real casual link? Regarding imports, there is a common misperception that import spending lowers output. The source of the fallacy is understandable: Imports enter the GDP tally with a negative sign. Because GDP measures the aggregate value of goods and services produced in a country, items bought abroad must be taken out. However, import spending seems to appear that people who import a lot have high income per capita. Do imports hinder economic growth? And is there any relationship between imports and exports? These are some questions that we will try to answer in the following sections.

The objective of this paper is to investigate the casual relationship for four developed market economies (United States of America, Japan, Ireland and Singapore) and for four developing market economies (Malaysia, Pakistan, Argentina and Indonesia) based on causality tests.

There is an ongoing debate on whether increased trade spurs growth and industrialization, or whether it is economic growth that enables trade to increase. The implicit question with respect to developing and developed countries is whether the major sources of growth and industrialization are external (learning through trade generally or exports or imports specifically) or internal (through human and physical capital investment and increased research and development).

On one side of the debate, the phenomenal increase in trade and exports particularly in East Asia is cited as the source of East Asia's rapid industrialization and convergence toward the developed economy level. On the other side, the reported interventionist policies of the East Asian governments (through industrial, technology and human development policies) is cited as being instrumental in shaping the comparative advantage and hence the development paths of those economies. Resolving the debate on trade and growth linkages would allow developing countries to formulate trade and domestic economic policies that raise growth and induce industrialization. If the sources of growth are external, then developing countries should reduce the barriers to trade which restrict imports and reduce the externality effects of exporting. If, on the other hand, the critical sources of growth are internal, then developing countries need not concentrate their scarce resources on undertaking trade liberalization measures exclusively to the neglect of programs for physical capital investment and human resource development.

Since Adam Smith's era, economists have realized that nations grow rich through the process of specialization and trade. The extent, to which countries can feasibly specialize in certain types of production, depends on the scope of markets. Because bigger, broader markets permit access to a wider range of goods and services, they enable a greater degree of specialization among individual countries. Advances in international commerce have followed innovations that reduced the cost of engaging in trade. Globalization progressed fairly steadily throughout the second half of the twentieth century on advances in transportation and communications and with a lowering of trade barriers.

Specialization stems from two sources, comparative advantage and economies of scale. Developing countries tend to have a lot of low-skilled labour relative to capital and highly skilled labour. Because the abundant factor is cheap to produce in these countries, they can produce goods that require relatively large amounts of low-skilled labour less expensively than they could produce goods requiring high proportions of physical and human capital. Economists contend that developing nations have a comparative advantage in the production of labour-intensive goods and services. More developed countries, which have a lot of capital relative to labour, tend to have comparative advantages in

capital-intensive goods.

2. Factors that affect Growth

Export growth is often considered to be a main determinant of the production and employment growth of an economy. This so-called hypothesis of export-led growth (ELG) is, as a rule, substantiated by the following four arguments. First, export growth leads, by the foreign trade multiplier, to an expansion of production and employment. Second, the foreign exchange made available by export growth allows the importation of capital goods which, in turn, increase the production potential of an economy. Third, the volume and the competition in export markets cause economies of scale and an acceleration of technical progress in production. Fourth, given the theoretical arguments mentioned above, the observed strong correlation of export and production growth is interpreted as empirical evidence in favour of the ELG hypothesis.

Export growth leads to an expansion of production and employment. The competition in export markets causes economies of scale and an acceleration of technical progress in production. Economies of scale and acceleration of technical change by international trade are potentially important sources of economic growth. However, Japan is sometimes an example of export-led growth. But it is not true. For nearly 40 years Japan's terms of trade for its manufactures declined, meaning that it had to export more and more for the same quantity of imports. But the fundamental difference between the Japanese experience and the Australian one is that Japan's was entirely due to increasing productivity and not, as in Australia's case, a depreciating currency. This is why Japanese living standards rose even as it developed an "adverse" terms of trade.

In a country savings fuel the economy and entrepreneurship drives it. Japan has an extremely high saving rate which enormously increased its productive capacity while entrepreneurs did the rest, despite powerful government intervention for which the country is now suffering.

There is a false opinion that when someone imports, lowers the output. And this is because imports have a negative sign. Imports, however, do not reduce GDP. We pay for our foreign purchases by exporting, by reducing our financial claims on foreigners, or by giving foreigners claims on our future output. In the first case, imports do not lower GDP, because they are accompanied by exports. If one rises, so does the other. In the latter two cases, we incur a trade deficit and an inflow of foreign capital accompanies the imports. This capital inflow finances domestic investment, government spending or private consumption or a combination of them. In all cases, the act of paying for the foreign goods contributes to domestic output. The persistent myth of imports and economic growth belies their historical relationship. Although foreign purchases have risen fairly dramatically as a share of GDP since WWII, economic growth has not faltered. Instead, the data reveal a positive relationship between year-to-year GDP growth and the corresponding percent change in U.S. imports.

A similar pattern emerges from a longer-term cross-country comparison of imports and economic growth. Imports promote growth. Importing provide people with a wider array of products than they otherwise could have enjoyed. In this way imports improve standard of living. For example, most Americans express concern about the rapid overall expansion of imports but fail to connect this aggregate pattern to the welfare of individuals. This is because of the fast pace of U.S. business expansion and the creation of wealth. Imports do not lower economic growth as the Economic Commentary (published by the Research Department by the FED of Cleveland) point out. It also says that imports and economic growth are positively correlated, with causality running in both directions.

The direction of causality seems to run predominantly from income to imports, not the other way around. The intuition is straightforward: When incomes rise, people tend to buy foreign goods and services. Similarly, countries whose incomes are high, import more. Thus, the direction from economic growth to imports is positive. Economists estimate that 1% increase in real GDP in the U.S. will lead to a 2% rise in U.S. import spending (FED of Cleveland). Nevertheless, the causal relationship underlying import

spending and economic growth is a little bit intricate. Countries that remove trade barriers and encourage openness gain from specialization and from cross-border technological transfers, all of which promote economic growth. In a recent cross-country study, economists **Jeffrey Frankel** and **David Romer** found evidence that higher trade contributes to long-term economic growth, after accounting for the effect of growth on trade. Although they consider total trade, their research methodology attributes the same response to imports that it applies to exports. Thus, imports cause economic growth.

Apart from exports and imports that promote economic growth, a general increase in trade can be promoted through R&D, specialization and comparative advantage, technology advancements, saving & investment, diminishing returns, investment from abroad, education, political stability, free trade, geographic place and of course population.

2.1 R&D

The primary reason that living standards are higher today than they were a century ago is that technological knowledge has advanced. Thousands of innovations have improved the ability to produce goods and services. Although most technological advance comes from private research by firms and individual inventors, there is also a public interest in promoting these efforts. To a large extent, knowledge is a public good: Once one person discovers an idea, the idea enters society's pool of knowledge, and other people can freely use it. Just as government has a role in providing a public good such as national defence, it also has a role in encouraging the R&D of new technologies. **Paul Krugman** in 1994 stated that growing exports of manufactured goods from country A to country B will lead to a net loss of B industrial jobs only if they are not matched by growth in exports from B to A. He also said that in many industries competitive advantage seems to be determined neither by underlying national characteristics nor by the static advantages of large-scale production but rather by the knowledge generated by firms through R&D and experience. Technological innovation is an activity that may well generate important spillovers to the rest of the world. **Krugman** in 1984 also stated that economic growth leads to enhancement of skills and technology that creates comparative advantage for the country facilitating exports.

2.2 Specialization and Comparative Advantage

Grossman and Helpman (Innovation and Growth in the Global Economy, Cambridge, MA: MIT Press, 1991), claims that economically motivated R&D activities are the fundamental source of sustained economic growth and that such sustained growth is possible because of the spillovers of R&D results. Such spillover effects exist across countries, which explain the convergence of income per capita across countries. Empirical research on R&D spillovers across countries, motivated by endogenous growth theory, was first attempted by **Coe and Helpman** 1995. Coe and Helpman claimed that the influence of foreign R&D capital is proportional to the country's share of imports in GDP. They also concluded that the results of R&D investment clearly spillover through trade in intermediate goods. They further found that the size of these spillover effects depends on 2 factors. First, importing from a country with a high level of R&D capital raises the productivity of the importing country more than would importing from a country with a low level of R&D capital. Second, a country should benefit more from foreign R&D capital the higher is its share of imports in GDP.

In 1776 the Scottish economist **Adam Smith** (1723-1790), in his masterpiece "The Wealth of Nations", proposed that specialization in production leads to increased output. Smith believed that in order to meet a constantly growing demand for goods, a country's scarce resources must be allocated efficiently. According to Smith's theory, a country that trades internationally should specialize in producing only those goods in which it has an absolute advantage—that is, those goods it can produce more cheaply than can its trading partners. The country can then export a portion of those goods and, in turn, import goods that its trading partners produce more cheaply. Smith's work is the foundation of the classical school of economic thought. Half a century later, the English economist **David Ricardo** (1772-1823) modified this theory of international trade. Ricardo's theory, which is still accepted by most modern economists, stresses the principle of comparative advantage. Following this principle, a country can still gain from trading certain goods even though its trading partners can produce those goods more cheaply. The comparative advantage comes if each trading partner has a product that will bring a better price in another country than it will at home. If each country specializes in producing the goods in

which it has a comparative advantage, more goods are produced, and the wealth of both the buying and the selling nations increases.

Industrial growth (let us identify economic growth with industrial growth) has typically been dependent on large and expanding markets for the products of industrialization. Increased production not only enhances the export industries themselves, but tends to spillover into related domestic industries which may be connected in various ways as supplies to the export industries. Growing activity in the export related sector, will generate higher incomes (higher GDP) which will be sent throughout the economy with stimulating effects. Such export-led growth has often been an important part of industrial growth. A two-way relationship exists between trade and economic growth. While growth affects trade in its patterns and gains trade, in turn it has important implications for economic growth. (**Klaus Friedrich**).

Due to the fact that many countries spend a huge part of their GDP, we have considered to mentioned whether military spending is stimulating for economic growth or not. **Benoit** 1973, 1978 argues that an increase in a defence component of aggregate demand may increase the utilization of capital stock, which may lead to increased purchasing power, profit rate and investment that will generate both short run multiplier effects as well as higher long term rates of economic growth. **Hall** 1988 finds that the growth of military spending stimulates services but retards non durable goods and construction. However, the opponents of defence spending argue that these expenditures have a negative impact on growth because they result in a reallocation of resources from the more productive market ventures to the less productive military ventures, which create welfare losses and reduce labour supply. Moreover, increasing defence budgets come at the expense of other budgets such as education and health, which reflect investment in human capital - a significant factor in long term economic growth **Mankiw, Romer and Weil** 1992(MRW 1992). Speaking of human capital, the military R&D sector employs a large number of skilled workers and talented scientists who could make productive contributions elsewhere in the market economy – this represents the opportunity cost of employing human capital in the military sector at the expense of the civilian market economy.

2.3 Technological Knowledge

A hundred years ago, most Americans worked on farms, because farm technology required a high input of labour in order to feed the entire population. Today, thanks to advances in the technology of farming, a small fraction of the population can produce enough food to feed the entire country[1]. This technological change made labour available to produce other goods and services. Technological knowledge takes many forms. Some technology is common knowledge –after it becomes used by one person, everyone becomes aware of it. For example when in 1914 successfully introduced production in assembly lines, other car makers quickly followed suit. Other technology is proprietary-it is known only by the company that discovers it. Only the Coca-Cola Company, for instance, knows the secret recipe for making its famous soft drink. Still other technology is proprietary for a short time. When a drug company discovers a new drug, the patent system gives that company a temporary right to be the exclusive manufacturer of this particular drug. When the patent expires, other companies are allowed to make the drug. All these forms of technological knowledge are important for the economy's production of goods and services.

It is worthwhile to distinguish between technological knowledge and human capital. Although they are closely related, there is an important difference. Technological knowledge refers to society's understanding about how the world works. Human capital refers to the resources expended transmitting this understanding to the labour force.

[1] Farmers in the United States not only produce enough food to feed the nation's population they also export more farm products than any other nation. Despite this vast output, the U.S. economy is so large and diversified that agriculture accounted for only 2 percent of annual GDP and employed only 3 percent of the workforce in 1998.

2.4 The Importance of Saving and Investment

One way to raise future productivity is to invest more current resources in the production of capital. Because resources are scarce, devoting more resources to producing capital requires devoting fewer resources to producing goods and services for current consumption. A country that wants to invest more in capital, it must consume less and save more of its current income. The growth that arises from capital accumulation is not a free lunch: It requires that society sacrifice consumption of goods and services in the present in order to enjoy higher consumption in the future. Encouraging saving and investment is one way that a government can encourage growth in the long-run, raise the economy's standard of living. **Robest J. Barro** and **Xavier Sala-i-Martin**, (*Economic Growth*, New York: McGraw-Hill, 1995) argue that countries that devote a large share of GDP to investment, tend to have high growth rates. Countries that devote a small share of GDP to investment tend to have low growth rates.

2.5 Diminishing Returns

When the government pursues policies that raise the nation's saving rate the percentage of GDP devoted to saving rather than consumption. With the nation saving more, fewer resources are needed to make consumption goods, and more resources are available to make capital goods. As a result, the capital stock increases, leading to rising productivity and more rapid growth in GDP. The traditional view of the production process is that capital is subject to diminishing returns: As the stock of capital rises, the extra output produced from an additional unit of capital falls. In other words, when workers already have a large quantity of capital to use in producing goods and services, giving them an additional unit of capital increases their productivity only slightly. Because of diminishing returns, an increase in the saving rate leads to higher growth only for a while. As the higher saving rate allows more capital to be accumulated, the benefits from additional capital become smaller over time and growth slows down. In the long run, the higher saving rate leads to a higher level of productivity and income, but not to higher growth in these variables. Reaching this long-run can take quite a while. According to

studies of international data on economic growth, increasing the saving rate can lead to substantially higher growth for a period of several decades.

2.6 Investment from Abroad

Policies aimed at increasing a country's saving rate can increase investment and long-term economic growth. Yet, saving by domestic residents is not the only way for a country to invest in new capital. The other way is investment by foreigners.

Investment from abroad is one way for a country to grow. Even though some of the benefits from this investment flow back to the foreign owners, this investment does increase the economy's stock of capital, leading to higher productivity and higher wages. In addition, investment from abroad is one way for poor countries to earn the state-of-the-art technologies developed and used in richer countries. For these reasons, many economists who advise governments in less developed economies advocate policies that encourage investment from abroad. Often this means removing restrictions that governments have imposed on foreign ownership of domestic capital. An organization that tries to encourage the flow of investment to poor countries is the World Bank. This organization obtains funds from the world's advanced countries and uses these resources to make loans to less developed countries so that they can invest in roads, schools and other types of capital. Also, it offers advice to countries about how the funds might best be used. The World Bank together with its sister organization, the International Monetary Fund, was set up after the World War II.

2.7 Education

Education –or else, investment in human capital- is at least as important as investment in physical capital for a country's long-run economic success. In USA each year of schooling raises a person's wage on average by about 10 percent. In less developed countries, where human capital is especially scarce, the gap between the wages of educated workers is even larger. Thus, one way in which government policy can enhance the standard of living is to provide good schools and to encourage the population to take advantage of them. Investment in human capital, like investment in physical capital, has

an opportunity cost. When students are in school, they forgo the wages they could have earned. In less developed countries, children often drop out school at an early age, even though the benefit of additional schooling is very high, simply because their labour is important to help support the family. Some economists have argued that human capital is particularly important for economic growth because human capital conveys positive externalities. An educated person might generate new ideas about how best to produce goods and services.

2.8 Property Rights and Political Stability

Another way in which policymakers can foster economic growth is by protecting property rights and promoting political stability. Although those people who live in developed countries tend to take property rights for granted, those living in less developed countries understand that lack of property rights can be a major problem.

In many countries, the system of justice does not work well. Contracts are hard to enforce, and fraud often goes unpunished. In more extreme cases, the government not only fails to enforce property rights but actually infringes on them. To do business in some countries, firms are expected to bribe powerful government officials. Such corruption impedes the coordination power of markets. It also discourages domestic saving and investment from abroad. One threat to property rights is political stability. When revolutions and coups are common, there is doubt about whether property rights will be respected in the future. If a revolutionary government might confiscate the capital of some businesses, as was often true after communist revolutions, domestic residents have less incentive to save, invest and start new business. At the same time foreigners have less incentive to invest in the country. Even the threat of revolution can act to depress a nation's standard of living. Thus, economic prosperity depends in part on political prosperity. A country with an efficient court system, honest government officials, and a stable constitution will enjoy a higher economic standard of living than a country with a poor court system, corrupt officials and frequent revolutions and coups.

2.9 Free Trade

Some of the world's poorest countries have tried to achieve more rapid economic growth by pursuing inward-oriented policies. These policies are aimed at raising productivity and living standards within the country by avoiding interaction with the rest of the world. The infant-industry argument, along with a general distrust of foreigners, has at times led policymakers in less developed countries to impose tariffs and other trade restrictions. However, most economists today believe that poor countries are better off pursuing outward-oriented policies that integrate these countries into the world economy. Trade is, in some ways, a type of technology. When a country exports wheat and imports steel, the country benefits in the same way as if it had invented a technology for turning wheat into steel. A country that eliminates trade restrictions will experience the same kind of economic growth that would occur after a major technological advance.

The adverse impact of inward orientation becomes clear when one considers the small size of many less developed economies. The total GDP of Argentina, for instance, is about that of Philadelphia. Imagine what would happened if the Philadelphia city council were prohibit city residents from trading with people living outside the city limits. Without being able to take advantage of the gains of trade, Philadelphia would need to produce all the goods it consumes. It would also have to produce all its own capital goods, rather than importing state-of-the-art equipment from other cities. Living standards in Philadelphia would fall immediately, and the problem would likely only get worse over time. This is precisely what happened when Argentina pursued inward-oriented policies throughout much of the 20th century. By contrast, countries pursuing outward-oriented policies, such as South Korea and Taiwan have enjoyed high rates of economic growth.

2.10 Geography location

The amount that a nation trades with others is determined not only by government policy but also by geography places. Countries with good natural seaports find trade easier than countries without this resource. It is not a coincidence that many of the world's major cities, such as New York, San Fransisco, Hong-Kong and Shanghai are located next to Oceans. Similarly, because landlocked countries find international trade more difficult, they tend to have lower levels of income than countries with easy access to the world's waterways.

2.11 The Control of Population Growth

A country's productivity and economic growth are determined in part by its population growth. Obviously, population is a key of a country's labour force. It is no surprise that countries with large populations (such as USA and Japan) tend to produce greater GDP than countries with small populations (such as Luxembourg and The Netherlands). But total GDP is not a good measure of economic well-being. GDP per capita is more important, because it tells us the quantity of goods and services available for the typical individual in the economy. High population growth reduces GDP per person. The reason is that rapid growth in the number of workers forces the other factors of production to be spread more thinly. When population growth is rapid, equipping each worker with a large quantity of capital is more difficult. A smaller quantity of capital per worker leads to lower productivity and lower GDP per worker.

This problem is most apparent in the case of human capital. Countries with high population growth have large numbers of school-age children. This places a larger burden on the educational system. It is not surprising, that educational attainment tends to be low in countries with high population growth. The differences in population growth around the world are large. In developed countries the population has risen about 1 percent per year in recent decades, and it is expected to rise even more slowly in the future. By contrast, in many poor African countries, population growth is about 3 percent per year. At this rate, the population doubles every 23 years. Reducing the rate of population growth is widely thought to be one way less developed countries can try to raise their standards of living. In

some countries, this goal is accomplished directly with laws regulating the number of children families may have. China, for instance, allows only one child per family; couples who violate this rule are subject to substantial fines. In countries with greater freedom, the goal of reduced population growth is accomplished less directly by increasing awareness of birth control techniques. Moreover, women with the opportunity to receive good education and desirable employment tend to want fewer children than those with fewer opportunities outside the home. Hence, policies that foster equal treatment of women are one way for less developed economies to reduce the rate of population growth.

3. Bibliography Review

Dalia Marin (The Review of Economics and Statistics, Vol. 74, No. 4. Nov., 1992, pp. 678-688) investigates the relationship between exports, productivity, the terms of trade and world output for four OECD countries (United States of America, United Kingdom, Japan and Germany) during the period 1960-1987, based on the cointegration and causality concept. The findings of the econometric analysis can be summarized as follows. Exports, productivity, and the terms of trade share common trends. They move together in the long run in all countries except the United Kingdom. Furthermore, the causality F-tests suggest that exports Granger cause productivity in all four countries. The hypothesis of export-led growth cannot be rejected for the United States, Japan, United Kingdom and Germany, An "outward looking" regime seems to favour productivity performance of developed market economies as well and seems, therefore, not to be restricted to developing countries only as commonly asserted.

The findings might also be an explanation for the favourable productivity performance in Japan and Germany and the relatively poor one in the United States and United Kingdom. Exports seem to have played a serious role. Moreover, the positive long-run relation between the terms of trade and productivity, and the significant causal link from the terms of trade to productivity in the United States and United Kingdom

suggest that the terms of trade (the real exchange rate) has mattered for the productivity performance in these two countries. Interpreting this result, increases in the real exchange rate might have induced entry of foreign low-cost producers into the British and U.S. market leading to the exit of high-cost domestic producers giving rise to improvements in average productivity. If the number of firms declines as a result, the productivity effect might work via two channels: first, through the exit of low-productivity firms; second, through the scale effect of production, since the market share of the exiting firms is taken by the incumbent firms which might lead to increased output per firm.

For the United States and United Kingdom, the exchange rate might play a productivity enhancing role in two different ways. Either through devaluations of the real exchange rate boosting productivity via exports or through revaluations of the real exchange rate improving productivity through the rationalization of production of the import competing sector at the disadvantage of the export sector. Finally, **Dalia Marin** finds that world output proved to Granger cause productivity independently of exports in all countries except the United States which might be an indication of international increasing returns to scale in which productivity of an industry on the size of the world market rather than the domestic market.

Francisco F. Ribeiro Ramos (Economic modelling 18 2001 pp. 613-623) investigates the Granger-causality between exports, imports and economic growth in Portugal over the period 1865-1998 using the following data: GDP deflator, 1833-1998, 1914=1, exports and imports 1865-1998, in millions of current Portuguese escudos. Also all values denoted in current Portuguese escudos were expressed in real terms using the GDP deflator (1914=1). The role of the import variable in the investigation of exports-output causality is emphasized, enabling one to test for the cases direct causality, indirect causality, and spurious causality between export growth and output growth. The empirical results do not confirm a unidirectional causality between the variables considered. There is a feedback effect between exports-output growth and imports-output growth. More interestingly, there is no kind of significant causality between import-export growth. More simply, the results of the causality tests support the two-way causal relationship between

income and exports and between income and imports. Nevertheless, there is no relevant causality between imports and exports.

According to **Bhagwati** (Bhagwati, J., Protectionism, Cambridge, MA MIT Press, 1988), increased trade 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.

Gershon Feder (*Journal of Development Economics* 12, 1982 pp. 59-73) analyzes in 1982 the sources of growth in the period 1964-1973 for a group of semi-industrialized less developed countries. An analytical framework is developed, incorporating the possibility that marginal factor productivities are not equal in the export and non-export sectors of the economy. Econometric analysis utilizing this framework indicates that marginal factor productivities are significantly higher in the export sector. The difference seems to derive, in part, from inter-sectoral beneficial externalities generated by the export sector. **Feder** provides evidence supporting the view that the success of economies which adopt export-oriented policies is due, at least partially, to the fact that such policies bring the economy closer to an optimal allocation or resources. The estimates show that there are, on average, substantial differences in marginal factor productivities between the export and non-export sectors. These differences derive in part from the failure of entrepreneurs to equate marginal factor productivities and in part due to externalities. The latter are generated because the export sector confers positive effects on the productivity in the other sector, but these are not reflected in market prices.

The results are such that social marginal productivities are higher in the export-sector, and economies which shift resources into exports will gain more than inward-oriented economies. The empirical findings suggest that even when entrepreneurs optimize resource allocation given the prices they face, these are substantial gains to be made due to the externality effects.

E. M. Ekanayake (*Journal of Economic Development* Volume 24, Number 2, December 1999, Exports and economic growth in Asian Developing Countries) uses cointegration and error-correction models to analyze the causal relationship between export growth and economic growth in eight Asian developing countries (India, Indonesia,

Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand) using annual data from 1960 to 1997. While conventional wisdom suggests that export growth contribute positively to economic growth, this study also provides strong evidence supporting the export-led growth hypothesis. The empirical results show that bi-directional causality exists between export growth and economic growth in India, Indonesia, Korea, Pakistan, Philippines, Sri Lanka and Thailand. There is also evidence for export-led growth in Malaysia. Furthermore, there is evidence for short run Granger causality running from economic growth to export growth in all cases except Sri Lanka. While there is strong evidence for long-run Granger causality running from export growth to economic growth in all cases, there is evidence of short-run causality running from export growth to economic growth only in Indonesia and Sri Lanka.

Export-led growth hypothesis generally reflects the relationship between exports and economic growth, in particular, output growth is driven by exports. This relationship is of great importance. Some studies provided empirical results to support this hypothesis (**Thornton, J.** 1996. Cointegration, causality and export-led growth in Mexico,1895-1992. Economic Letters 50:413-416) some found contrasting evidence that export is Granger caused by the economic growth (**Al-Yousif** 1999, on the role of exports in the economic growth of Malaysia: A multivariate analysis. *International Economic Journal* 13: 67-75.) while others demonstrated that there exists a bi-directional relationship between these variables (**Thornton 1997.** Export and economic growth: Evidence from 19th century Europe. Economics Letters 55: 235-240). Since the mid-1980s, Malaysia has been growing very rapidly with a widely held view that such growth is export-led. Empirical evidence is generally not supportive of this view. For example, **Dorado S.**(1993, Exports and growth: a reconsideration of causality, *Journal of Developing Areas* 27: 227-244.) noted that export growth has had a negative (rather than positive) effect on the Malaysian economic growth. **Doraisami A.** (1996, Export growth and economic growth: A re-examination of some time series evidence of Malaysian experience. *Journal of Developing Areas* 30: 233-230) showed that there is a two-way causality between Malaysian export and economic growth. Meanwhile, in a more recent paper, Al-Yousif (1999) claimed that in the long run, the Malaysia case is supportive of internally generated

growth, instead. **Al-Yousif** (1999) has evaluated the robustness of the relationship between exports and economic growth in the context of a single country like Malaysia. As a small open economy, Malaysia is highly dependent on the foreign trade, Any change in the international markets, either the prices of commodities or international demand, will give a great impact on both exports and economic growth. This phenomenon could be clearly reflected by the Malaysian trade dependency ratio which has been increasing from 1980 until 2000 and it is expected that the ratio will continue to grow in the future. This implies that the Malaysian economy is highly dependent on foreign trade, especially during the Asian financial crisis, from 1997 to 2000, in which the volume of foreign trade (both exports and imports) doubles that of GDP. Obviously, the Malaysian government has been implementing the export-promotion policy in order to revive the economy performance.

Balassa B.(1985, Exports, policy choices, and economic growth in developing countries after the 1973 oil shock. *Journal of Development Economics* 18: 23-35) argued that in general, the production of export goods is focused on those economic sectors which are already more efficient. Therefore, export expansion helps to concentrate investment in these sectors, which in turn increase the overall total productivity of the economy. Moreover, the growth of exports has a stimulating effect on total productivity of the economy as a whole through its positive impact on higher rates of capital. The theory also recognises that the causality may run from output to exports. **Lancaster K.**(1980, Intra-industry trade under perfect monopolistic competition. *Journal of International Economics* 10: 151-175) and **Krugman P. R.**(1984, Import protection as export promotion. *In Monopolistic Competition in International Trade*,)**,** justify a one-way causality from output to exports. They argue that output growth has a positive impact on productivity growth and improved productivity, while cost reduction in labour and capital are expected to promote exports. Clearly, these arguments lead us to hypothesize that a causal relationship exists from export growth to output growth.

Choong Chee Keong, Zulkornain Yusop and Venus Khim-Sen Liew (Export-led Growth Hypothesis in Malaysia: An application of Two-Stage Least Square Technique) investigate the case of Malaysia. They use real GDP, real exports, real imports

gross fixed capital formation, labour force and exchange rates. The data for the variables such as exports and imports were obtained from monthly Bulletin of Bank Negara Malaysia. Besides, the annual data covers the period from 1959-2000 and all of the series are transformed into log form. They found that exchange rate is inconsistent with a priori the depreciation of the exchange rate will slow down the economic growth. In fact, the Malaysian government has succeeded to devaluate its currency in order to improve the competitiveness of exported goods in the international markets and then stimulate the economic performance in early 1990s.

However, the same policy may not work after the 1997 Asian financial crisis as most of the currencies in East Asian countries have already been depreciated. In this critical period, the depreciation of one country in the region of East Asia may induce contagion effects to other countries, as they will also depreciate their currencies to improve the international competitiveness. Consequently, depreciation will make a country worse off. This is why Malaysian government has been implementing fixed exchange rate to avoid variability in the foreign exchange market, which may further jeopardise the domestic growth performance. They also conclude that the hypothesis of export-led growth is valid in the Malaysian economy in both short and long-term with a positive effect. In addition they conclude that the growth rate of capital formation and imports have positive impacts on economic growth, while labour has a negative causality in the short-term. Nevertheless, in the short-run, all variables significantly Granger-cause real GDP at standard significance levels.

Liberalized investment policies in encouraging the huge inflows of FDI in mid-1980 and early 1990s are viewed as a main catalyst in stimulating the Malaysian economic performance. FDI inflows can create the spillover effects and technological improvements, as well as human capital development in the domestic economy. This, in turn, will contribute to the higher productivity of capital and labour, and sustain the stability of exchange rate movements. Nonetheless, as there is an inverse short-run causality between labour and growth, policymakers should be careful in making their foreign labour policies; they should attract more skilled and professional foreign labours rather than less skilled workers in huge bundle. As a small open economy, Malaysia

heavily relies on foreign trade, as the trade ratio is relatively higher than GDP. This means that domestic economic performance is sensitive to the changes in the international markets. Therefore, liberalization of trade and investment policies without comprehensive preparations may hurt domestic economy and industries, as there is great pressure from abroad when the country implementing its liberalization policy. Thus policymakers should liberalise its policies carefully in terms of trade and foreign direct investment in attracting multinational corporations to setup their factory in certain resource-abundant and high technology industries locally in order to improve the overall economic prosperity.

Frankel, Romer and Cyrus (1996, Trade and Growth in East Asian Countries: Cause and Effect?) use instrumental variables as a means of addressing the perceived simultaneity problem. They base their regression equation on **Mankiw, Romer** and **Weil** (1992, A contribution to the Empirics of Economic Growth. *Quarterly Journal of Economics* 107 (2): 407-437) where the dependent variable is GDP per capita (and not growth of GDP per capita). Mankiw, Romer and Weil have derived their specification from the steady state predictions of a Solow growth model with a Cobb-Douglas production function and exogenous technological progress and population growth. Frankel. Romer and Cyrus extend the MRW regression by adding the trade to GDP ration (exports plus imports divided by GDP) as an additional regressor. The instrument used for the trade to GDP ratio is the predicted trade to GDP ratio of their trade gravity model. They find that the coefficient on trade flows is positive.

Jung and **Marshall**(1985, Exports Growth and Causality in Developing Countries. *Journal of Development Economis* 18: 1-12) were among the first to question simple conclusions from OLS regressions. For the period of 1950 to 1981, they find the direction of causality between exports and growth to be inconclusive, with results ranging from exports that cause growth (Indonesia) and growth causes exports (Thailand) to exports that yield less growth (Korea) and no causal relationship at all (Philippines and Taiwan).

Harrison(1996, Openness and Growth: A Time-Series, Cross-Country Analysis for Developing Countries. *Journal of Development Economics* 48: 419-447) studies the effects of trade and openness on growth using panel data and compares predictions of several measures of trade and openness. When she undertakes Granger causality tests, she

finds that openness and growth cause each other in both directions. She concluded that "the direction of causality between openness and growth is by no means resolved".

Clerides(1998, Is Learning by Exporting Important? micro-Dynamic Evidence from Columbia, Mexico and Morocco, *Quarterly Journal of Economics* 113: 903-947) start from the observation that exporting firms are more productive than non-exporting firms. They then investigate whether firms (in their samples from Columbia, Mexico and Morocco) export because they are productive or whether they are productive because they export. They look at the evolution of productivity of firms three years before they started to export to three years afterwards. Their main finding is that firms are first productive and then start exporting rather than the other way round: They find no evidence that exporting firms become more productive while exporting. It is therefore self-selection of productive firms into the export sector that explains the positive productivity-export correlation. They also find that the presence of exporters in some cases makes it easier for domestically-oriented firms to break into export markets.

Through empirical studies, **Rodrigue Tremblay** suggested that improvement in productivity and growth is a result of increased exports and imports, especially in the manufacturing sector, but the sustainable increased growth requires industrial diversification. During the period 1966-1983 in 19 countries of the OECD, export growth stimulated the overall rate of economic growth by as much as the rate of capital accumulation.

Srisuda Thungsuwan and **Henry Thompson** (*Exports and Income in Thailand* Bangkock University-Auburn University) examine the causality between exports and income in Thailand between 1969 and 1995. The 27 years of annual data come from various yearbooks of the Bank of Thailand (1996a *Annual Economic Report*, 1996b *Yearly Statistical Bulletin*, 1997 *Economic and Financial Report*). During the 1950s and 1960s, Thailand pursued a restrictive trade policy of import substitution with incentives for imported intermediate and capital goods. Since the late 1960s, trade policy has shifted to export promotion and tariff reform. Thai industries have undergone rapid diversification

and industrial production has become more evenly spread across a number of sectors from consumer goods to intermediate and capital goods.[2] Relationships between exports and national output have been examined with a focus on developing countries. Exports might stimulate output through a number of channels. Srisuda Thungsuwan and Henry Tompson find that exports cause higher income and the effects are strongest for manufacturing exports. Higher income stimulates total and manufacturing exports, but has no effect on agricultural. Bidirectional causality between exports and income has an elasticity of 0.69. A 10% increase in exports would lead to a 6.9% increase in income and vice-versa.

Regarding agricultural exports, the results favour export-led growth theory. Thailand was an agricultural economy in its early development and agriculture continues to contribute to economy. For manufacturing exports, there is evidence of bidirectional causality, supporting both export-led growth and the growth driven export hypothesis. Manufacturing exports have a slightly stronger effect than agricultural exports. **McKinnon** (1964, "Foreign Exchange Constraint in Economic Development and Efficient Aid Allocation" *Economic Journal*, 74, pp. 388-409) and **Chenery and Strout** (1966, "Foreign Assistance and Economic Development", *American Economic Review*, 56(4), pp.679-733) point out that the foreign exchange earned from exports allows imports of intermediate and capital goods that increase production potential. **Keesing** (1967, :Outward-Looking Policies and Economic Growth: Further Empirical Evidence", *Journal of Development Economics*, 14, pp.241-250), **Balassa** (1978, "Exports and Economic Growth": Further Evidence", *Journal of Development Economics*, 5, pp. 181-189) point to the positive external benefits of exports, including greater capacity utilization, economies of scale, incentives for technological improvement and more efficient management due to competitive pressures of foreign markets. Formal testing of causality between exports and output began in the early 1980s. He points out that increased output might cause increased exports due to economies of scale in newly established industries. Technical progress that

[2] The Thai economy has grown rapidly during this transition. Output (GDP) increased at an average annual rate of 8% between 1969 and 1995 while exports revenue grew 13% annually. Agriculture accounted for 65% of export revenue in 1969 but by 1995 manufacturing exports dominated with an 82% share. In spite of this transition, Thailand remains one of Asia's main agricultural exporters.

occurs with rising output might improve export sector performance.

Americans would not enjoy the high standards of living they do today if people could consume only those goods and services produced in their own states. The world could similarly benefit from free trade among countries.

N. G. Mankiw (1998)

4. The Winners and Losers from Trade

To analyze the welfare effects of free trade the economists of country A (let denote country A as the country that produces steel) begin with the assumption that country A is a small economy compared to the rest of the world so that its actions have negligible effect on world markets. The small economy assumption has a specific implication for analyzing the steel market: If country A is a small economy, then the change is country's A trade policy will not affect the world price of steel. People of country A are said to be price takers in the world economy. They take the world price of steel as given. They can sell steel at this price and be exporters or buy steel at this price and be importers.

4.1 The Gains and Losses of an Exporting Country

Figure 1 shows Country's A steel market when the domestic equilibrium price before trade is below the world price. Once free trade is allowed, the domestic price rises to equal the world price. No seller of steel would accept less than the world price, and no buyer would pay more than the world price.

With the domestic price now equal to the world price, the domestic quantity supplied differs from the domestic quantity demanded. The supply curve shows the quantity of steel supplied by Country's A sellers. The demand curve shows the quantity of

steel demanded by Country's A buyers. Because, the domestic quantity supplied is greater than the domestic quantity demanded, Country A sells steel to other countries. Thus, Country A becomes a steel exporter.

Although domestic quantity supplied and domestic quantity demanded differ, the steel market is still in equilibrium because there is now another participant in the market: the rest of the world. One can view the horizontal line at the world price as representing the demand for steel from the rest of the world. This demand curve is perfectly elastic because Country A, as small economy, can sell as much steel as it wants at the world price. Let us consider now the gains and losses from opening up trade. Clearly, not everyone benefits. Trade forces the domestic price to rise to the world price. Domestic producers of steel are better off because they can now sell steel at a higher price, but domestic consumers of steel are worse off because they have to buy steel at a higher price. To measure these gains and losses, we look at the changes in consumer and producer surplus, which are shown in Figure 1 and summarized in Table 1. Before trade is allowed, the price of steel adjusts to balance domestic supply and domestic demand. Consumer surplus, the area between the demand curve and the before-trade price, is area A+B. Producer surplus, the area between the supply curve and the before-trade price, is area C. Total surplus before trade, the sum of consumer and producer surplus, is area A+B+C. After trade is allowed, the domestic price rises to the world price. Consumer surplus is area A (the area between the demand curve and the world price). Producer surplus is area B+C+D (the area between the supply curve and the world price). Thus, total surplus with trade is area A+B+C+D.

These welfare calculations show who wins and who loses from trade in an exporting country. Sellers benefit, since producers surplus increases by the area B+D. Buyers are worse off, since consumer surplus decreases by the area B. Because the gains of sellers exceed the losses of buyers by the area D, total surplus in Country A increases.

The analysis of an exporting country yields two conclusions:

A. When a country allows trade and becomes an exporter of good, domestic producers of the good are better off and domestic consumers of the good are worse off.

B. Trade raises the economic well-being of a nation, the gains of the winners exceed the losses of the losers.

Figure 1

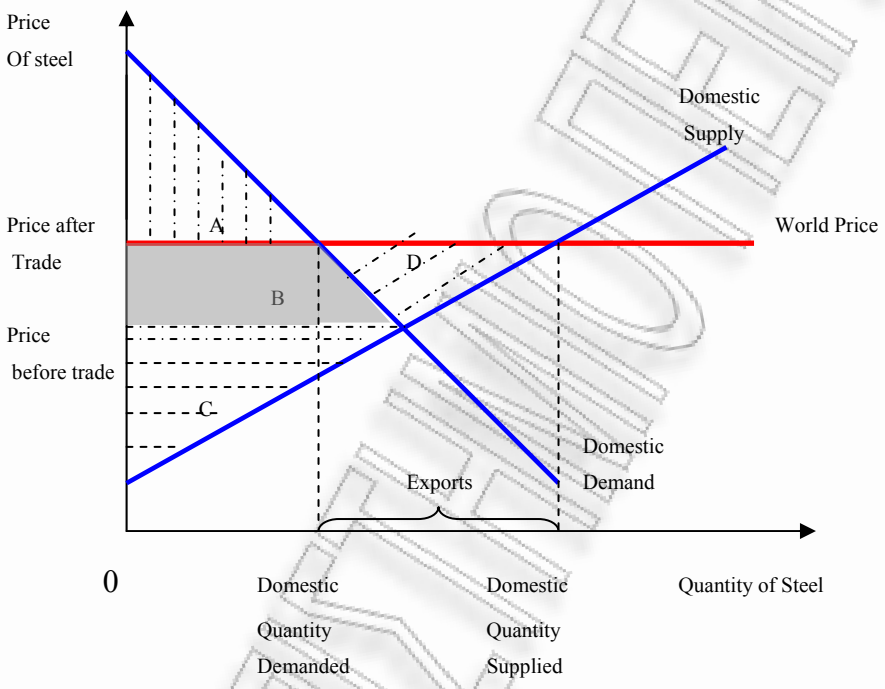

Table 1

	BEFORE TRADE	AFTER TRADE	CHANGE
Consumer surplus	A+B	A	-B
Producer surplus	C	B+C+D	+B+D
Total surplus	A+B+C	A+B+C+D	+D

4.2 The Gains and Losses of an Importing Country

Now suppose that the domestic price is above the world price. Once again, after free trade is allowed, the domestic price must equal the world price. As figure 2 shows, the domestic quantity supplied is less than the domestic quantity demanded. The difference between the domestic quantity demanded and the domestic quantity supplied is bought from other countries, so Country A becomes a steel importer.

In this case, the horizontal line at the world price represents the supply of the rest of the world. This supply curve is perfectly elastic because Country A is a small economy and, therefore, can buy as much steel as it wants at the world price.

Now consider the gains and losses from trade. Once again, not everyone benefits. When trade forces the domestic price to fall domestic consumers are better off (they can now buy steel at a lower price), and domestic producers are worse off (they can now have to sell at a lower price). Changes in consumer and producer surplus measure the size of the gains and losses, as shown in figure 2 and summarized in table 2. Before trade, consumer surplus is area A, producer surplus is area B+C, and total surplus is area A+B+C. After trade, is allowed, consumer surplus is area A+B+D, producers surplus is area C and total surplus is area A+B+C+D.

The welfare calculations show who wins and who loses from trade in an importing country. Sellers are worse off because producer surplus falls by the area B. The gains of buyers exceed the losses of sellers, and total surplus increases by the area D.

The analysis of an importing country yields two conclusions parallel to those for an exporting country:

A. When a country allows trade and becomes an importer of a good, domestic consumers of the good are better off, and domestic producers of the good are worse off.

B. Trade raises the economic well-being of a nation, the gains of the winners exceed the losses of the losers.

Figure 2

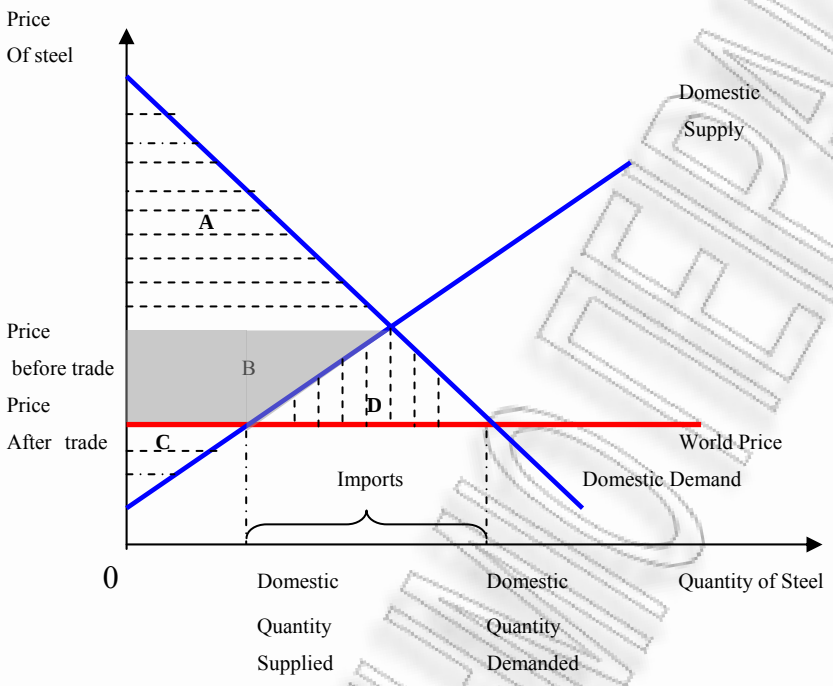

Table 2

	BEFORE TRADE	AFTER TRADE	CHANGE
Consumer surplus	A	A+B+D	B+D
Producer surplus	B+C	C	-B
Total surplus	A+B+C	A+B+C+D	+D

5. A Theoretical Perspective on the Links between Trade Policy and Growth

The main section of this paper will be concerned with empirical studies that are focused on estimating certain trade and growth links. Policy recommendations are often inferred from these estimates. In order to be able to judge how well-founded the policy recommendations are, one needs to have several theories in mind. The objective of this section is to provide an overview of various theoretical predictions to facilitate interpretation of the empirical findings presented in the next section. In a sense, having these theoretical possibilities in mind makes the empirical studies afterwards tests of these theories.

5.1 STATIC EFFECTS

From trade to GDP

More openness understood as lower trade barriers can affect output of an economy in a static and in a dynamic way. Consider a static economy where the only distortion is a tariff on the imported good. International goods prices are constant. When the country reduces the tariff on the imported good, imports rise, exports rise and GDP grows. In such an economy, one observes a positive correlation of output with exports and the cause of growth is more openness. Other sources of output growth include better exploitation of economies of scale, which implies that exporting firms have higher productivity compared to non-exporting firms.

By contrast, realistic examples where more openness leads to static losses can just as easily be constructed. But assume a downward rigid real wages or any other distortion. More openness measured by lower tariffs that implies a lower domestic price for the labour intensive good leads to unemployment and potentially a loss in GDP and welfare.

From GDP to trade

In contrast to these trade-to-GDP links, GDP-to-trade links can be easily imagined as well. In a growing economy an (exogenous) increase in an economy's capital stock leads to an increase in the output of the capital-intensive good and a decrease of the other, the labour-intensive, good. If the country is capital-abundant in comparison with the rest of the world, the increase in the capital stock leads to more trade (as the economy becomes more specialized). If the economy is labour-abundant, a growth of the economy's capital stock leads to less trade as specialization diminishes.

5.2 DYNAMIC EFFECTS

From trade to growth

Rivera-Batiz and **Romer** (Economic integration and endogenous growth. Q. J. Econ. 106, pp. 531-556) have studied growth effects of integration (defined as knowledge spillovers or trade in goods or both) by comparing integrated and non-integrated countries. They found two links through which integration can have an impact on growth. First, in models where growth is driven by the public good nature of knowledge spillovers that result from R&D, integration leads to higher growth if it increases the stock of knowledge available to a country. With perfect international knowledge spillovers, countries grow faster after integration than before. As growth increases because of these spillovers, this

can be interpreted as "learning by trading". In this knowledge –spillover-driven model, trade in goods does not have any impact in growth. Second, in their "lab-equipment model", production is characterized by constant returns to scale in capital and the number of intermediate goods, which implies the positive long-run growth rate. This leads to a growth effect of integration. When countries trade in intermediate goods, these goods increase productivity in R&D and therefore the growth rate. Here, growth increases when opening up to trade as the number of different intermediate goods rises. If knowledge spillovers are not perfect – imagine a developing country that can not use all the knowledge available in industrialized countries – opening up to trade leads to divergent growth paths. As shown by Grossman and Helpman (1991, ch. 8), the growth rate of the economy that was rich at the moment of trade liberalization will increase while the growth rate of the economy that was poor will fall to zero. From a welfare perspective, the poor country might even be worse off under free trade.

A country's long-term, sustainable rate of economic advance depends on the growth of its labour force and capital stock, the education of its workers and its willingness to adopt political and legal institutions consistent with free markets. But a country's ability to generate persistent gains in its standard of living depends critically on its rate of technological advance. Competition and exposure to new products seem to promote innovation and diffusion of technology. Moreover, technological gains generate knowledge spillovers that reduce the costs of future scientific advances. International trade expands markets and global competition, firms achieving substantial economies of scale may be best poised to adapt to new technologies. Importation, particularly of capital goods, facilitates the transfer of technology and encourages the development of new products and production process. Exports can similarly promote technological transfer through the exposure to foreign markets. Technological transfers should enhance the productivity and therefore the real wages of all workers. However, the biggest gains should accrue to the more highly skilled since they are best able to adapt new technologies. Hence, technological transfer may increase wage inequalities within countries and these can slow the growth of trade.

The ambiguous way from trade to growth

Let us now turn to the dynamic effects of trade policy. Generally speaking, the effects of tariffs on growth are ambiguous and depend on the effect of tariffs on factors allocated to R&D. Whatever policy leads to more employment in R&D will lead to more growth (new growth models, Grossman and Helpman, 1991, 1995, ch. 4.1). Imagine a small open economy consisting of an R&D sector and two final goods sectors. This economy uses two factors of production and let the R&D sector, which is the non-traded goods sector, be the most human capital intensive sector. When the price of the human capital intensive final good goes down, the human capital intensive final good sector shrinks and human capital becomes less expensive. Factors of production move both to the other final good sector and the R&D sector. As human capital becomes cheaper relative to labour and the R&D sector is the most human capital intensive final good sector, any decrease in the price of the human capital intensive final good sector implies higher growth. By contrast, any decrease in the price of the labour intensive final good sector implies lower growth.

When each country specializes in the production of goods for which it has a comparative advantage and trades these goods for the output of other countries, everyone can consume more goods and services than in the absence of trade. This process creates wealth by enabling countries to acquire more through importation than could be attained from domestic production. Imports, then, are the key to improving standards of living.

Trade is always a two-way exchange, but when undertaken freely, both parties are better off. This is as true when participants reside in different countries as it is when they live in the same place. Imports do not reduce or slow economic growth. By fostering specialization and the transfer of technology, they lead directly to faster economic growth and improved standards of living. Unfortunately, the benefits of specialization and technological progress do not accrue equally to everyone, and may worsen the economic lot of some people. No one, however, seriously scorns economic advancements.

From growth to trade

In contrast where changes in the trade policy affect growth, one can just easily think of reverse causality links from growth to trade. The starting point of such a line of a argument are two small open economies which differ in their growth rates because agents in one economy are more patient than in the other or because one economy pays R&D subsidies and the other does not. R&D subsidies lead to more allocation of resources to the R&D sector, to a higher relative price of the factor intensively used in R&D, say human capital, and a relative specialization of the economy in the good that uses human capital less intensively. This induces more trade with the rest of the world as it purchases more of the non-specialized good.

6. Key developments in the theory of economic growth

This section sketches out the main developments in the formal modelling of economic growth in recent years. The section begins by explaining the Solow model and reasons why in certain respects it has proved to be at odds with some of the stylized facts of economic growth. This is followed by a brief description of extensions to the Solow model and the development of endogenous growth models.

The Solow model or Neoclassical model emphasises the role of capital accumulation. It is assumed that population growth, depreciation and most notably technological progress are exogenous to the growth process with the result that it is only the accumulation of capital that is determined endogenously. To get a feel for the dynamics of the Solow approach it is useful to consider a simplified version with zero population growth and no technological progress. When the economy is in a transition state, there is growth (or decline)in the capital stock according to whether the investment generated from savings is greater that the investment required to cover the amount of depreciation. Dynamic equilibrium, where the capital stock is constant, is achieved by assuming a diminishing marginal product of capital. With a growing capital stock the

diminishing marginal product implies diminishing marginal saving as the same saving rate is applied to smaller increases in output. Gradually, the economy moves to a point where savings provide investment only sufficient to cover depreciation. The dynamic equilibrium involves no further growth in output. In the standard version of the model the steady-state rate of output growth is the sum of the exogenously determined rates of population growth and technological progress.

One point sometimes emphasized about the Solow growth model is that the long-run rate of growth is unaffected by the rate of savings (or investment). However, it should be stressed that this refers to the concept of dynamic and does not necessarily equate with what policymakers might typically think of as being a long-run rate of growth. A transition period of increased growth resulting from an increase in the savings rate could be prolonged. The Solow model in fact stresses the significance of transitional states, demonstrating the potential for increases in saving rates to generate periods of increased growth in addition to whatever growth may be generated by demographic or technological processes. Also this model describes the dynamics of output based on the assumption that the resources of the economy are efficiently utilized. According to the neoclassical growth theory, exports in developing countries depend on the world demand for exported goods, and world demand depend on the price of goods and the income of buyers.

Endogenous growth theory was developed in the 1980s as a response to criticism of the neo-classical growth model. In neo-classical growth models, the long-run rate of growth is exogenously determined. In other words, it is determined outside of the model, generally by an assumed rate of technological progress and an assumed rate of labour force growth. This does not explain the origin of growth, which makes the neo-classical model appear very unrealistic. Endogenous growth theory tries to endogenize the rate of technological progress. Several competing models have been developed by various authors. Endogenous growth theories usually rely on virtuous cycles. Crucial importance is usually given to the "production" of new technologies and human capital. Firms and individuals have an incentive to invent in order to exploit an advantage over their competitors, thereby improving their own productivity. Some of the knowledge associated

with the innovation "spills over" to other economic sectors, which increases those sectors' ability to innovate. The virtuous cycle arises through this mechanism.

In contrast to the older neo-classical growth theory or Solow growth model, endogenous growth theory argues that policy measures can have an impact on the long-run growth rate of an economy, even if they do not change the aggregate savings rate. The neo-classical model implies that changes in the savings rate will not affect economic growth, but they will increase income levels. Under the neo-classical model, if savings rate change, the growth rate in output will adjust so that it will be at the level it was before the change in savings rate. The endogenous growth theory assumes constant marginal product of capital. The endogenous growth theory also implies that higher savings levels will lead to higher economic growth.

Endogenous theory stresses the importance of increasing returns in generating economic growth. However, none of the endogenous growth models acknowledge the simple empirical tests made by Nickolas Kaldor in the 1960's demonstrating the existence of increasing returns in the industrial economies. Nevertheless, there are important differences from the theoretical point of view. Endogenous growth theory starts from the basic hypothesis that the supply of labour and capital constrains the growth of output in the economy, whereas Kaldor starts from the premise that demand constrains the growth of output. Most of the endogenous growth models introduce some variable that is external to the enterprise (externalities) such as R&D and improved human capital that help to overcome the supply constraints and sustain growth in the long-run. Kaldor's (1957) model had already recognized the importance of endogenously determined technical change and technological learning, but emphasized the importance of the expanding market to explain the presence of increasing returns. Kaldor's empirical analysis of economic growth is generally seen as being macroeconomic due to economies of scale that are generated endogenously through technical change and technological learning.

A review of studies of 20th century economic growth reveals a conviction, held alike by many economists in Britain, that industrial expansion has been the prime mover of British economic growth. The popularity of Kaldor's engine-of-growth (KEG) among

economists demonstrates the extent to which the industrial sector is regarded as the prime source of productivity growth. The critics of Kaldor's theory have tended to concentrate on problems of modelling this relationship rather than questioning the applicability of the theory to modern economic growth. The (KEG) hypothesis that industrial sector is the engine of the economic growth is recently attracting considerable interest in the industrialized world as seen in papers such as (Bairam, 1991), (Atesoglu, 1993) and (Scott, 1999). Recent studies found a significant statistical association between growth rate of industrial production and economic growth in industrial and developing countries. Such a finding has been used to support the KEG hypothesis. The testing methodology employed in all three studies, has concentrated on simple regression analyses.

Previous studies tested the validity of the KEG hypothesis by regressing real output growth on the growth rate of industrial output. If the coefficient of the growth rate of industrial output is found to be statistically significant and positive, it is then concluded that the growth rate of industrial output totally or partially determines the overall growth. This kind of methodology is not appropriate and sufficient to test the KEG hypothesis because simple regression equations used in the previous studies can only show the presence of the statistical correlation between growth of industrial output and economic growth, but have no bearing on the causal relationship between the two variables. The validity of the KEG hypothesis requires not only the existence of the significant correlation between industrial and economic growth but also the existence of the causality running from the growth in the industrial sector to the overall economic performance.

Alejandro Diaz-Bautista (Mexico's Industrial Engine of Growth: Cointegration and Causality) examines the KEG hypothesis in Mexico using Granger causality technique. The test is applied on the quarterly Mexican data on GNP and industrial production from the first quarter of 1980 to the third quarter of 2000. The data used in this study is quarterly in thousands of pesos, with base year 1993 and comes from Bank of Mexico's website and publications. The methodology employed in this study is Granger causality which is carried out as well as the cointegration test. Engle and Granger (1987), in a seminal work show that the logarithm of the level of the industrial production (log IND) and the logarithm of the level of the real GNP (log GNP) are cointegrated if

each is non-stationary but there exists a linear combination of two that is stationary. Alejandro Diaz-Bautista tests the null hypothesis that a single unit root exists in the level logarithm as well as first (logged) difference of each series. Based on the Augmented Dickey-Fuller t-statistics, the null hypothesis of a unit root in log levels cannot be rejected, while using the ADF test with difference of the series show that the null hypothesis of a unit root is rejected. Thus, the evidence suggests that the levels of log GNP and log IND are characterized by a $I(1)$[3] process. The Granger causality F-test was performed with P-values at 95% significance levels. First, he takes into consideration the hypothesis that Δlog GNP does not Granger cause Δlog IND (where IND is the industrial production). The p-value of 0.027, calls for rejecting the null hypothesis of no Granger causality and accepting the alternative hypothesis that Δlog GNP does cause Δlog IND. Furthermore, he rejects the hypothesis that Δlog IND does not Granger-cause Δlog GNP since the p-value is 0.021. Through Granger causality F-tests, Alejandro Diaz-Bautista accepts the hypothesis that Δlog IND does Granger-cause Δlog GNP. Thus, there is enough evidence to show a two-way linear Granger causality between real GNP and industrial production. Eventually, the validity of the KEG hypothesis for Mexico is demonstrated in the study of Diaz-Bautista, showing the existence of significant correlation between industrial output and economic growth and by bi-directional causality running from the growth of the industrial sector to the overall economic performance.

[3] In autoregressive models a unit root is present if the coefficient $|b| \geq 1$ in $y_t = a + by_{t-1} + \varepsilon_t$,where y_t is the variable at time t, b is the slope coefficient, and ε_t is the error component. If the unit root is present, the time series is said to have a stochastic trend, or being *integrated of order one* or $I(1)$.

7. Methodology and Data

i. Methodology

The present study employs Unit root tests and Granger causality tests. Augmented Dickey-Fuller (ADF, 1979) tests are used to infer the order of integration for the log level and the log of the difference of each variable. In order to avoid spurious regression, we need to discern the stationarity of the series. By doing so, we ensure the validity of the usual test statistics (t- and F-statistics, and R^2). Stationarity could be achieved by appropriate differencing and this appropriate number of differencing is called order of integration. We use Augmented Dickey-Fuller (ADF) [Dickey and Fuller 1979] and Phillips-Perron (PP) [Phillips and Perron 1988] tests to check the stationarity of the variables.

Consider the equation:

$$y_t - y_{t-1} = \alpha + \beta y_{t-1} - y_{t-1} + \varepsilon_t \Rightarrow \Delta y_{t-1} = \alpha + (\beta - 1) y_{t-1} + \varepsilon_t \Rightarrow$$
$$\Delta y_{t-1} = \alpha + \theta y_{t-1} + \varepsilon_t$$

Where y_t is our variable of interest = (real exports, real imports, industrial production), Δ is the differencing operator, t is the time trend and ε is the white noise residual of zero mean and constant variance. $\{\alpha, \beta\}$ is a set of parameters to be estimated. Both the null and alternative hypothesis in unit root test are:

$H_0 : \theta = 0$ (y_t is non-stationary / a unit root process)

$H_1 : \theta < 0$ (y_t is stationary)

The unit root of the Augmented Dickey-Fuller can be rejected if the t-test statistic from these tests is negatively less that the critical value tabulated. In other words, by the Augmented Dickey-Fuller (ADF) test, a unit root exists in the series y_t (implies non-stationary) if the null hypothesis of θ equals zero is not rejected.

The number of lags used in the ADF regressions has to be selected using the Akaike Information Criterion (AIC). The critical values of ADF statistic can be used to test this hypothesis. If the null hypothesis cannot be rejected, it implies that the time series is non-stationary at the level and therefore it requires taking first or higher order differencing of the level data to establish stationarity. Based on t-statistics for all series from ADF tests are statistically insignificant to reject the null hypothesis of non-stationary at 0.05 significance level. This indicates that these series are non-stationary at their level form. Therefore, these variables are containing unit root process or they share a common stochastic movement. The data of all countries are integrated of order one and a higher order of differencing is not required to execute.

The next step is the Granger causality tests. The causality between predetermined and dependent variables can be examined by conducting Wald test, by calculating the F-statistic based on the null hypothesis that a set of coefficients on the lagged values of independent variable are equal zero. If the null hypothesis is accepted (Prob.>5%) then it can be concluded that the independent variable do not cause dependent variable. In a few words, when Prob.<5% then we reject the hypothesis (Ho:no causality) and there exists the alternative which implies that there is causality between the two data series. On the other hand when the Prob.>5%, then we cannot reject the hypothesis, so there is not any causality between the variables.

ii. Data

We have acquired historic data throughout a long period in order not to miss the long-run dynamics. Moreover, we have found and used monthly data for exports imports and industrial production so as to catch the short-run dynamics as well. In this paper, the real exports, real imports and real industrial production of eight aforementioned countries are under study. For all countries all figures are seasonally adjusted. Exports and Imports data were in current prices and transformed to constant prices. Further, all the series are transformed into log form.

In the case of USA the data for the variables such as exports and imports (constant prices, 1990=100) were obtained from the DEPARTMENT OF COMMERCE-BUREAU OF CENSUS from January 1955 until December 2005 and the industrial production from the same Department, from January 1950 until December 2005 (Base year 2000=100). Exports and imports are in millions of US dollars.

The other seven countries the sources of data are listed below:

Singapore: Source (exports and imports are in constant prices, 1990=100) TRADE DEVELOPMENT BOARD, Singapore from January 1980 – December 2005. Source (Industrial Production) DEPARTMENT OF STATISTICS, from January 1989 – December 2005 (Base year 2003=100). Exports and imports are expressed is thousands of Singapore dollars.

Japan: Source (exports and imports are in constant prices, 1990=100) MINISTRY OF FINANCE, Japan from January 1963 – December 2005. Source (Industrial Production) MINISTRY OF ECONOMY, TRADE and INDUSTRY, from January 1955 – December 2005 (Base year 2000=100). Exports and imports are expressed in billions of Yen.

Ireland: Source (exports and imports are in constant prices, 1990=100) CENTRAL STATISTICS OFFICE, Ireland from January 1970 – December 2005. Source (Industrial Production) CENTRAL STATISTICS OFFICE, Ireland from January 1980- December 2005 (Base year 2000=100). Exports and imports are expressed in thousands of Euro.

Pakistan: Source (exports and imports are in constant prices, 1990=100) STATE BANK OF PAKISTAN from January 1989 – December 2005. Source (Industrial Production) STATE BANK OF PAKISTAN from July 1989 – September 2005 (Base year 2000=100). Exports and imports are expressed in millions of Rupees.

Malaysia: Source (exports and imports are in constant prices, 1990=100) STATISTICAL OFFICE OF MALAYSIA from January 1970 – December 2005. Source (Industrial Production) STATISTICAL OFFICE OF MALAYSIA from January 1990 – December 2005 (Base year 2000=100). Exports and imports are expressed in million of Malaysia Ringgit.

Indonesia: Source (exports and imports are in constant prices, 1990=100) BIRO PUSAT STATISTIK from January 1960 – December 2005. Source (Industrial Production) BIRO PUSAT STATISTIK from January 1994 – December 2005 (Base year 2000=100). Exports and imports are expressed in million of US dollars.

Argentina: Source (exports and imports are in constant prices, 1990=100) INDEC, FIEL, Argentina from January 1957 – December 2005. Source (Industrial Production) FIEL, Argentina from January 1985 – December 2005 (Base year 1993=100). Exports and imports are expressed in millions of US dollars.

8. Empirical Results

Table 1 (see Appendix) presents the results of unit root tests in their first difference obtained using the Augmented Dickey-Fuller and Phillips-Perron test. All variables for all countries are non-stationary in the levels but stationary in first differences. Dickey-Fuller and Phillips Perron unit root tests are employed to test for the stationarity of the macroeconomic series at level and then first difference of each series. The optimal lag length criteria that used in VAR's for all countries is determined by (AIC) Akaike Information Criterion (see Appendix).

The results support the presence of unit roots in all the series in first differences. This is confirmed by the fact that the null hypothesis is rejected in favour of alternative hypothesis of series are stationary when the first difference are taken. Thus, their first

difference is found to be stationary and hence ln real exports, ln real imports and ln real Industrial Production are integrated of order one, *I*(1). Natural logs of real Exports, real Imports and real Industrial Production are presented in the Appendix; depicts non-stationarity in the levels. The results of the causality tests are presented in the Appendix (Causal Relationships). All countries support the Export-Led Growth except Ireland, Singapore and Argentina. The opposite direction (economic growth Granger-cause exports) seems to be valid in USA, Singapore, Argentina and Pakistan.

The other relationship that is on main critic is whether or not imports promote growth. There is evidence for Granger causality running from imports to economic growth only in Japan, in Singapore and in Argentina. Furthermore, there is evidence for Granger causality running from economic growth to imports in USA, in Japan, in Singapore, in Argentina and in Pakistan.

Moreover, we conclude that imports Granger-cause exports in all developed countries (USA, Japan, Singapore, Ireland) while this causality is not valid in developing countries (Pakistan, Argentina, Malaysia, Indonesia). Further, we claim that exports cause imports in Japan, in Singapore, in Argentina and in Pakistan.

9. Conclusions

This paper tests causal relationships among exports, imports and economic growth in four developed (USA, Japan, Singapore, Ireland) and four developing countries (Malaysia, Pakistan, Argentina, Indonesia). We have found as many data as we could in order to have more precise results.

The previous empirical studies that used also Granger causality tests have been concerned mostly with causal relationship between export growth and economic growth, and have provided mixed conclusions. In this paper we have also mixed conclusions between countries, but we have revealed that there is directional (one way) causality between imports and exports ($IM \rightarrow X$) in all four developed countries whereas, this causality (imports granger-cause exports) is not valid in the other four developing selected countries. The common relationship of Export-Led Growth is valid in Unites States of America, in Japan, in Malaysia, in Indonesia and in Pakistan. The opposite relationship whether exports are driven by growth is valid in USA, in Singapore, in Argentina and in Pakistan.

History has proved that empirical evidence is of great importance. However, the theoretical perspective has to be applied and the combination of these two (empirical and theoretical) along with some policy recommendations will contribute to economic prosperity especially in developing countries. The policy implication of the positive association between exports and economic growth reveals that economic reform policies and the shift to a free market have helped the economy to reallocate its resources to productivity uses.

Despite the government's efforts in reforming tariff and custom duties services, there is need for further tariff reduction. Abolishing all non-trade barriers on import and export is important issue facing the government. Furthermore, exchange rate stability is another economic policy, as it does not only affect imports and exports but also FDI(Foreign Direct Investments), and the stock market. Finally, the adequate infrastructure is a main concern for the business communities.

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11. Appendix

Table 1.

	First Difference					
	ΔLn*REALXP*		ΔLN*REALIMP*		ΔLN*REALIND*	
	ADF	PP	ADF	PP	ADF	PP
USA	-18,22464***	-44,38407***	-27,16596***	-40,90613***	-16,64297***	-17,05889***
JAPAN	-11,36991***	-29,89050***	-10,96805***	-29,81450***	-6,88814***	-30,45134***
SINGAPORE	-4,32638***	-44,31399***	-21,27127***	-38,82426***	-8,50125***	-38,50660***
IRELAND	-23,79300***	-36,39160***	-21,04035***	-32,70210***	-19,05321***	-34,65550***
PAKISTAN	-6,76811***	-97,17702***	-11,30955***	-40,58477***	-15,04556***	-17,66217***
INDONESIA	-21,53208***	-56,72804***	-28,92973***	-53,52373***	-2,82193*	-24,60594***
MALAYSIA	-6,24656***	-40,01817***	-21,19245***	-31,03280***	-2,69117*	-27,06711***
ARGENTINA	-8,82387***	-39,15370***	-5,74807***	-35,94749***	-17,67284***	-18,17246***

The critical values of the Augmented Dickey-Fuller statistics are -3,44, -2,86, -2,56 at 1%, 5% and 10% levels of significance respectively. * denotes statistical significance 10%. ** and *** denote statistical significance at the 5% and 1% levels, respectively. All data are non-stationary in their levels.

Causal relationships

Country	Direction	
USA	IM=>X	
	IP=>IM	
	IP⇔X	bidirectional causality
JAPAN	X=>IP	
	IM⇔X	bidirectional causality
	IP⇔IM	bidirectional causality
IRELAND	IM=>X	
SINGAPORE	IP=>X	
	IM⇔X	bidirectional causality
	IP⇔IM	bidirectional causality
MALAYSIA	X=>IP	
ARGENTINA	X=>IM	
	IP=>X	
	IP⇔IM	bidirectional causality
INDONESIA	X=>IP	

Country	Direction	
PAKISTAN	X=>IM	
	IP=>IM	
	IP⇔X	bidirectional causality

Optimal lag Criteria

USA

VAR Lag Order Selection Criteria
Endogenous variables: DLNEXPORTSUS DLNIMPORTSUS DLNIPUS
Exogenous variables: C
Date: 09/20/06 Time: 18:55
Sample: 1950:01 2005:12
Included observations: 603

Lag	LogL	LR	FPE	AIC	SC	HQ
0	3688.801	NA	9.85E-10	-12.22488	-12.20298	-12.21635
1	3857.271	334.7051	5.80E-10	-12.75380	-12.66620	-12.71971
2	3928.872	141.5402	4.72E-10	-12.96143	-12.80813*	-12.90177
3	3952.848	47.15628	4.49E-10	-13.01110	-12.79210	-12.92587*
4	3966.032	25.79940*	4.42E-10*	-13.02498*	-12.74028	-12.91418
5	3968.875	5.536413	4.52E-10	-13.00456	-12.65416	-12.86819
6	3972.741	7.487538	4.59E-10	-12.98753	-12.57143	-12.82559
7	3977.592	9.348994	4.66E-10	-12.97377	-12.49197	-12.78626
8	3983.967	12.22139	4.70E-10	-12.96507	-12.41756	-12.75198

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

JAPAN

VAR Lag Order Selection Criteria
Endogenous variables: DLNEXPORTSJP DLNIMPORTSJP DLNIPJP
Exogenous variables: C
Date: 09/20/06 Time: 19:10
Sample: 1950:01 2005:12
Included observations: 507

Lag	LogL	LR	FPE	AIC	SC	HQ
0	3251.802	NA	5.45E-10	-12.81579	-12.79077	-12.80598
1	3327.787	150.7707	4.19E-10	-13.08003	-12.97994	-13.04078
2	3352.456	48.65738	3.94E-10	-13.14184	-12.96669	-13.07315
3	3411.301	115.3688	3.23E-10	-13.33847	-13.08826*	-13.24034
4	3431.508	39.37707	3.09E-10	-13.38267	-13.05740	-13.25512*
5	3441.892	20.11158	3.08E-10	-13.38813	-12.98780	-13.23114
6	3451.107	17.74081	3.08E-10	-13.38898	-12.91359	-13.20255
7	3460.361	17.70448*	3.07E-10*	-13.38998*	-12.83953	-13.17411
8	3466.229	11.15793	3.11E-10	-13.37763	-12.75211	-13.13232

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

SINGAPORE

VAR Lag Order Selection Criteria
Endogenous variables: DLNEXPORTSSI DLNIMPORTSSI DLNIPSI
Exogenous variables: C
Date: 09/20/06 Time: 19:15
Sample: 1950:01 2005:12
Included observations: 195

Lag	LogL	LR	FPE	AIC	SC	HQ
0	712.3384	NA	1.39E-07	-7.275265	-7.224912	-7.254878
1	795.2782	162.4769	6.51E-08	-8.033622	-7.832207	-7.952071
2	858.5309	121.9642	3.73E-08	-8.590060	-8.237583*	-8.447346*
3	868.2165	18.37789	3.71E-08	-8.597092	-8.093554	-8.393216
4	882.2295	26.15759	3.52E-08	-8.648508	-7.993908	-8.383468
5	892.7215	19.26216	3.47E-08*	-8.663810*	-7.858148	-8.337607
6	901.5586	15.95223	3.48E-08	-8.662140	-7.705417	-8.274774
7	902.8970	2.374650	3.77E-08	-8.583558	-7.475774	-8.135030
8	914.5840	20.37734*	3.67E-08	-8.611118	-7.352272	-8.101426

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

IRELAND

VAR Lag Order Selection Criteria
Endogenous variables: DLNEXPORTSIR DLNIMPORTSIR DLNIPIR
Exogenous variables: C
Date: 09/20/06 Time: 19:20
Sample: 1950:01 2005:12
Included observations: 303

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1439.462	NA	1.53E-08	-9.481599	-9.444829	-9.466888
1	1569.615	256.8688	6.88E-09	-10.28129	-10.13421	-10.22244
2	1610.686	80.24397	5.57E-09	-10.49297	-10.23559*	-10.39000*
3	1621.555	21.02156*	5.50E-09*	-10.50531*	-10.13762	-10.35821
4	1628.138	12.60065	5.59E-09	-10.48936	-10.01135	-10.29812
5	1635.021	13.03993	5.67E-09	-10.47539	-9.887074	-10.24002
6	1641.431	12.01624	5.77E-09	-10.45829	-9.759670	-10.17880
7	1643.411	3.671960	6.04E-09	-10.41195	-9.603023	-10.08833
8	1646.975	6.540417	6.26E-09	-10.37608	-9.456834	-10.00832

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

MALAYSIA

VAR Lag Order Selection Criteria
Endogenous variables: DLNEXPORTSMA DLNIMPORTSMA DLNIPMA
Exogenous variables: C
Date: 09/20/06 Time: 19:23
Sample: 1950:01 2005:12
Included observations: 183

Lag	LogL	LR	FPE	AIC	SC	HQ
0	737.6458	NA	6.54E-08	-8.028916	-7.976301	-8.007588
1	821.4434	163.9320	2.89E-08	-8.846376	-8.635918	-8.761067
2	851.1130	57.06935	2.30E-08*	-9.072273*	-8.703972*	-8.922982*
3	859.9942	16.79169	2.31E-08	-9.070974	-8.544829	-8.857702
4	864.2965	7.993443	2.43E-08	-9.019634	-8.335645	-8.742380
5	871.2666	12.72140	2.49E-08	-8.997449	-8.155617	-8.656213
6	878.8381	13.57069	2.53E-08	-8.981837	-7.982161	-8.576619
7	890.1363	19.87995	2.47E-08	-9.006954	-7.849434	-8.537755
8	904.7130	25.17074*	2.33E-08	-9.067902	-7.752539	-8.534721

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

PAKISTAN

VAR Lag Order Selection Criteria
Endogenous variables: DLNEXPORTSPA DLNIMPORTSPA DLNIPPA
Exogenous variables: C
Date: 09/20/06 Time: 19:26
Sample: 1950:01 2005:12
Included observations: 186

Lag	LogL	LR	FPE	AIC	SC	HQ
0	338.3200	NA	5.45E-06	-3.605591	-3.553563	-3.584508
1	377.6311	76.93139	3.94E-06	-3.931517	-3.723404	-3.847182
2	401.3405	45.63429	3.36E-06	-4.089683	-3.725486	-3.942096
3	414.9930	25.83685	3.20E-06	-4.139709	-3.619427	-3.928871
4	429.4074	26.81402	3.02E-06	-4.197929	-3.521563	-3.923840
5	470.5101	75.13394	2.14E-06	-4.543119	-3.710669	-4.205779
6	497.0012	47.57005	1.77E-06	-4.731196	-3.742661*	-4.330604*
7	505.2039	14.46497	1.79E-06	-4.722623	-3.578003	-4.258779
8	524.4167	33.26090*	1.61E-06*	-4.832438*	-3.531734	-4.305343

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

INDONESIA

VAR Lag Order Selection Criteria
Endogenous variables: DLNEXPORTSIND DLNIMPORTSIND DLNIPIND
Exogenous variables: C
Date: 09/20/06 Time: 19:29
Sample: 1950:01 2005:12
Included observations: 135

Lag	LogL	LR	FPE	AIC	SC	HQ
0	447.9476	NA	2.75E-07	-6.591816	-6.527254	-6.565580
1	479.9915	62.18898	1.96E-07*	-6.933207*	-6.674961*	-6.828263*
2	487.8069	14.82030	1.99E-07	-6.915658	-6.463726	-6.732005
3	491.6793	7.171139	2.15E-07	-6.839693	-6.194077	-6.577333
4	494.8267	5.688680	2.35E-07	-6.752989	-5.913687	-6.411920
5	498.6626	6.762464	2.54E-07	-6.676483	-5.643496	-6.256706
6	512.7004	24.12430	2.36E-07	-6.751117	-5.524446	-6.252633
7	518.4659	9.651902	2.48E-07	-6.703199	-5.282843	-6.126006
8	529.1016	17.33220*	2.44E-07	-6.727431	-5.113390	-6.071530

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

ARGENTINA

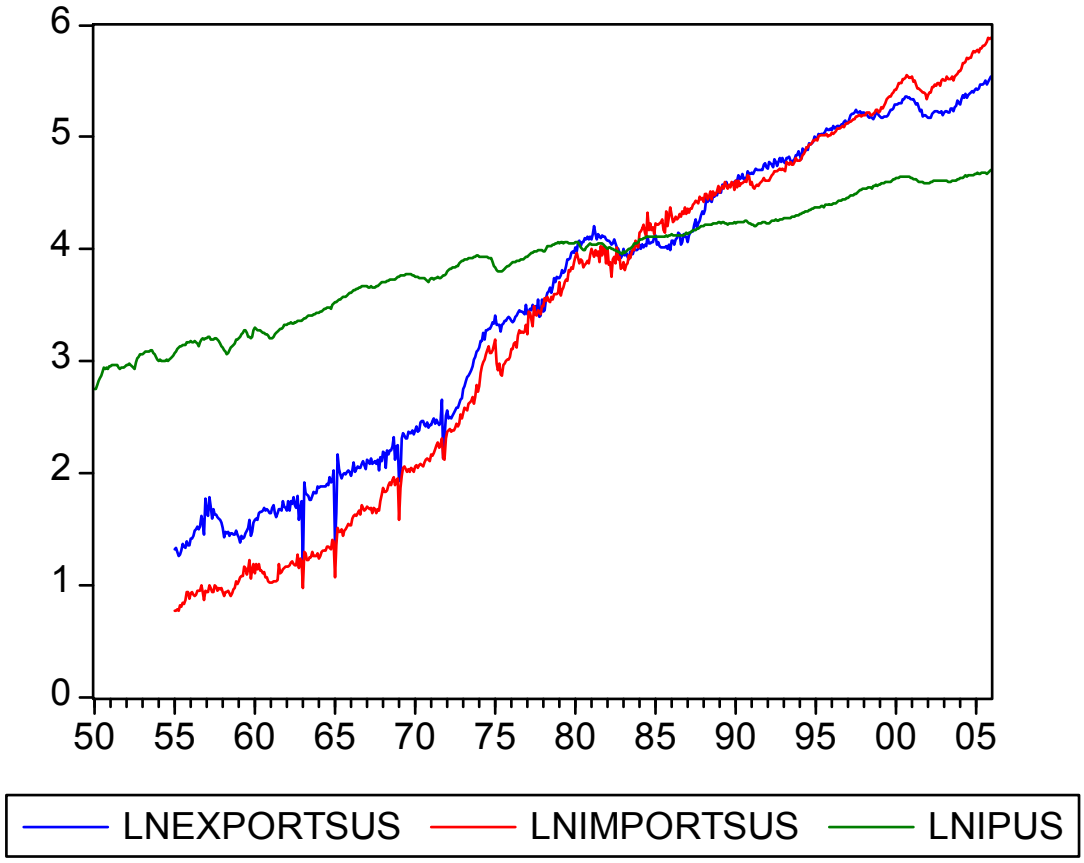
VAR Lag Order Selection Criteria
Endogenous variables: DLNEXPORTSARG DLNIMPORTSARG DLNIPARG
Exogenous variables: C
Date: 09/20/06 Time: 19:31
Sample: 1950:01 2005:12
Included observations: 243

Lag	LogL	LR	FPE	AIC	SC	HQ
0	846.1166	NA	1.94E-07	-6.939231	-6.896107*	-6.921861
1	870.0687	47.11582	1.72E-07	-7.062294	-6.889797	-6.992814*
2	881.7448	22.67937	1.68E-07	-7.084319	-6.782450	-6.962729
3	897.6762	30.55160	1.59E-07	-7.141368	-6.710126	-6.967668
4	911.1279	25.46424	1.53E-07	-7.178008	-6.617393	-6.952198
5	922.2184	20.72042	1.51E-07	-7.195213	-6.505226	-6.917293
6	935.1376	23.81808	1.46E-07	-7.227470	-6.408110	-6.897439
7	946.5598	20.77624*	1.43E-07*	-7.247406*	-6.298673	-6.865265
8	955.1532	15.41860	1.44E-07	-7.244059	-6.165954	-6.809809

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

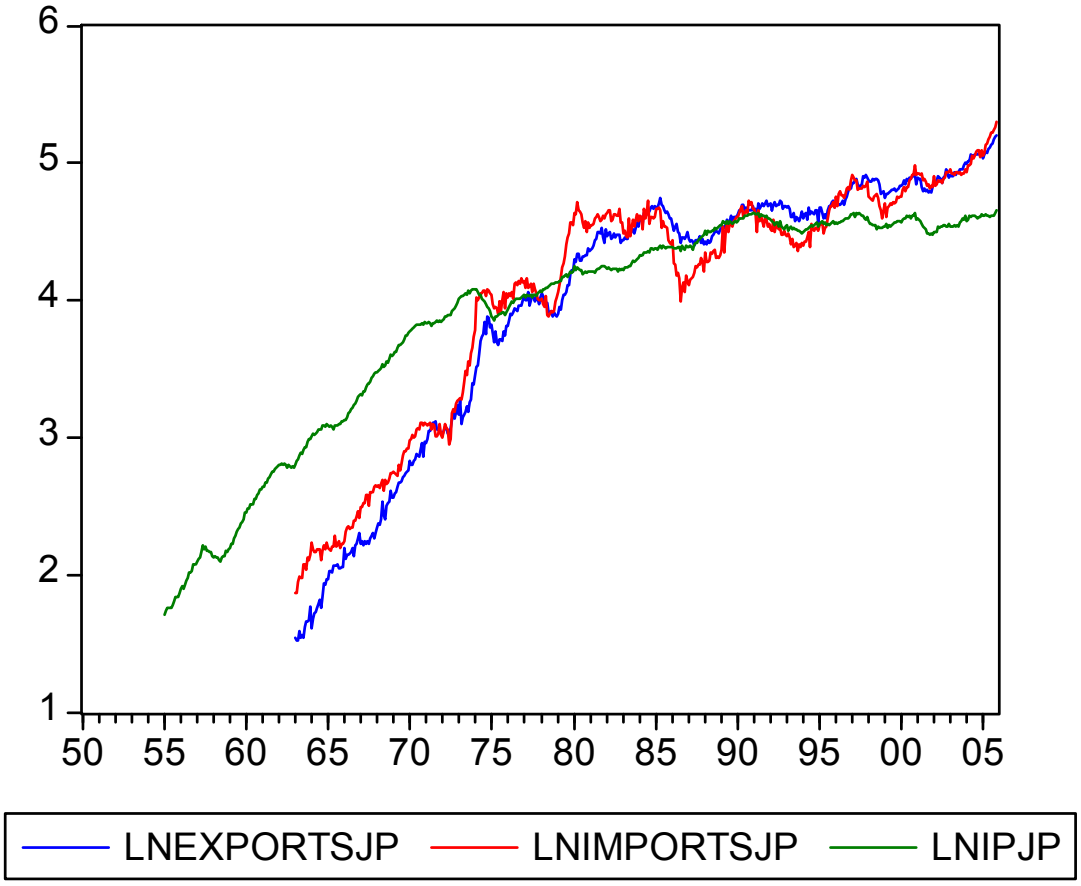
Natural logarithm of real Exports, Imports and Industrial Production

USA



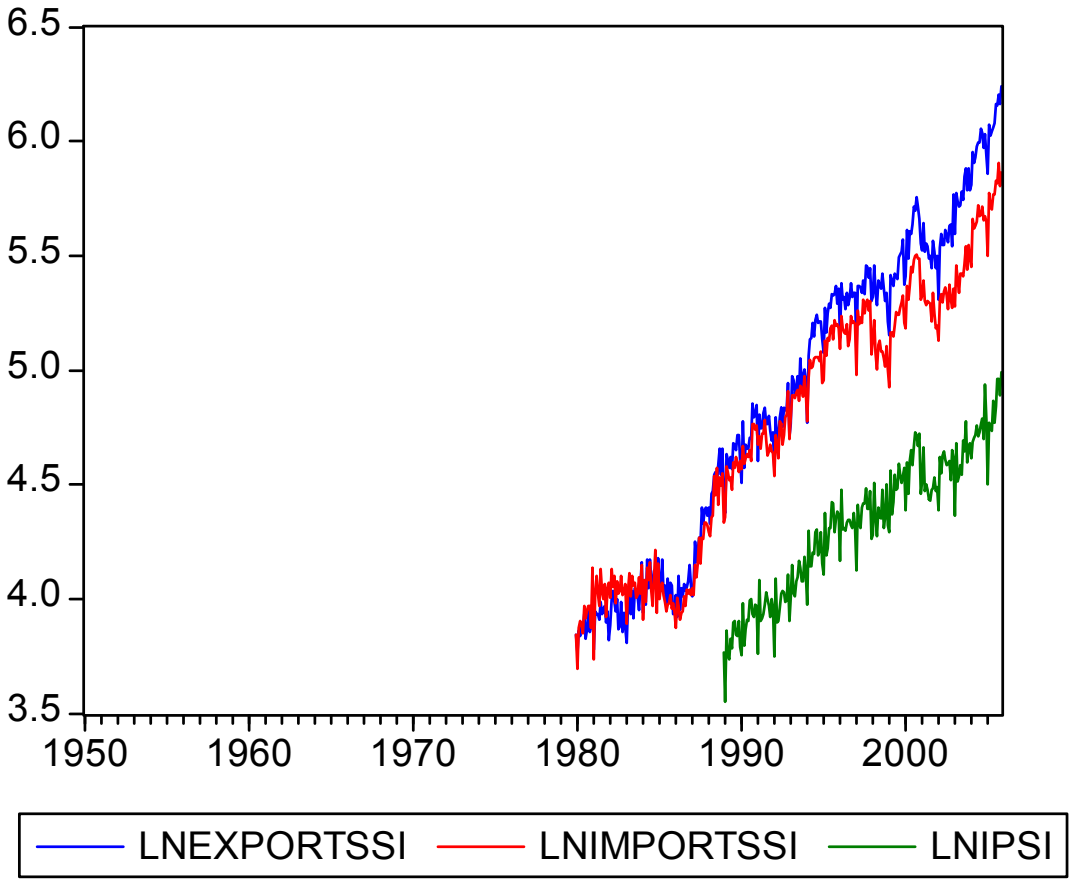
Natural logarithm of real Exports, Imports and Industrial Production

JAPAN



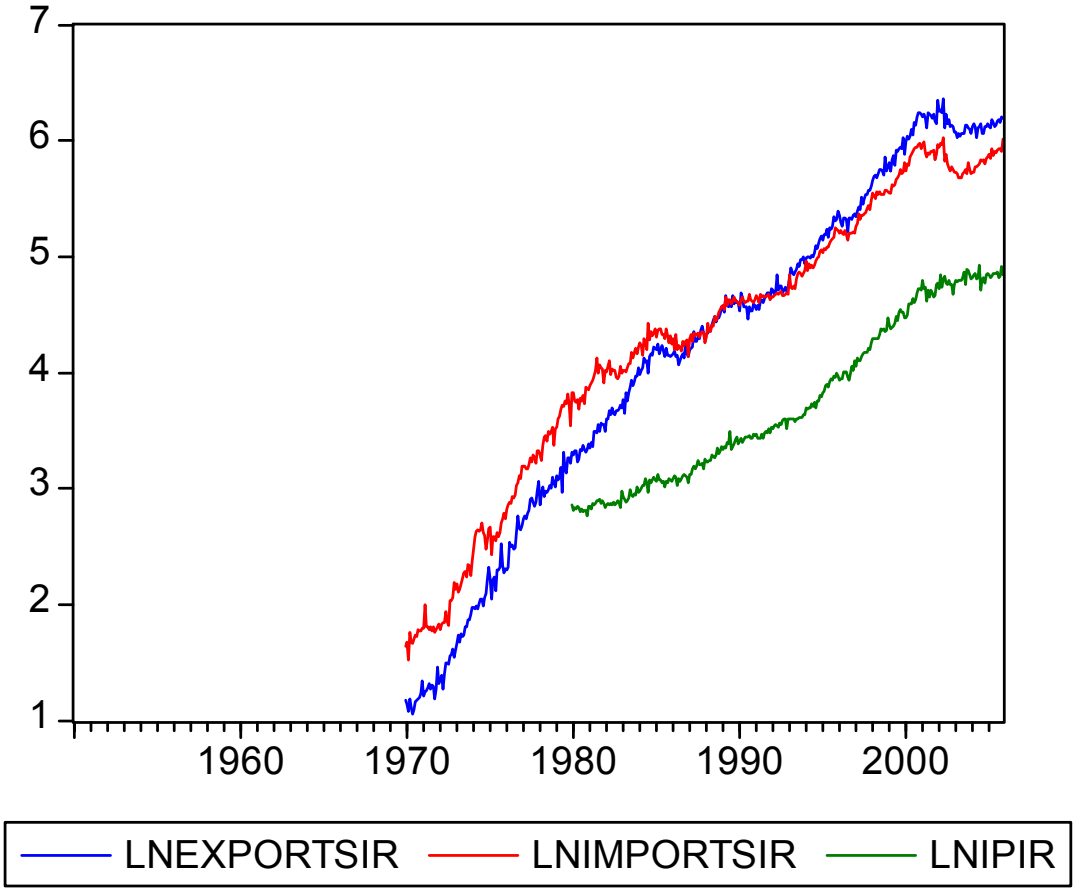
Natural logarithm of real Exports, Imports and Industrial Production

SINGAPORE



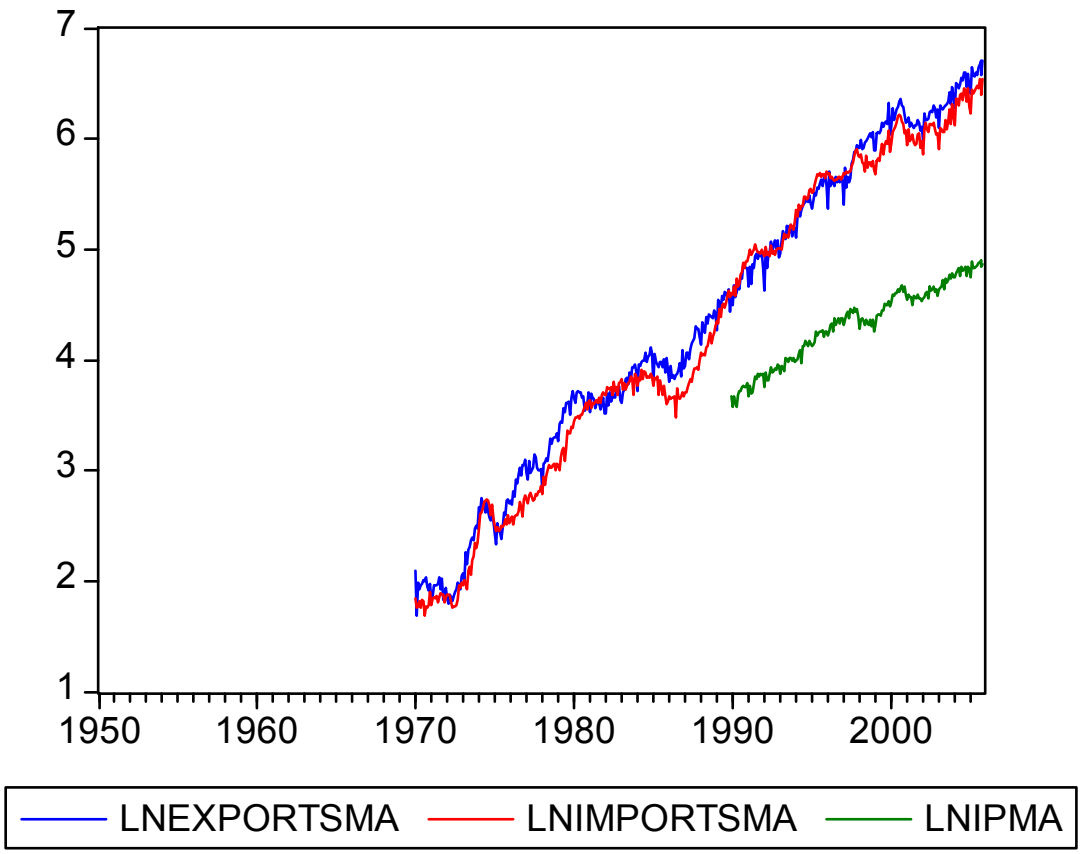
Natural logarithm of real Exports, Imports and Industrial Production

IRELAND



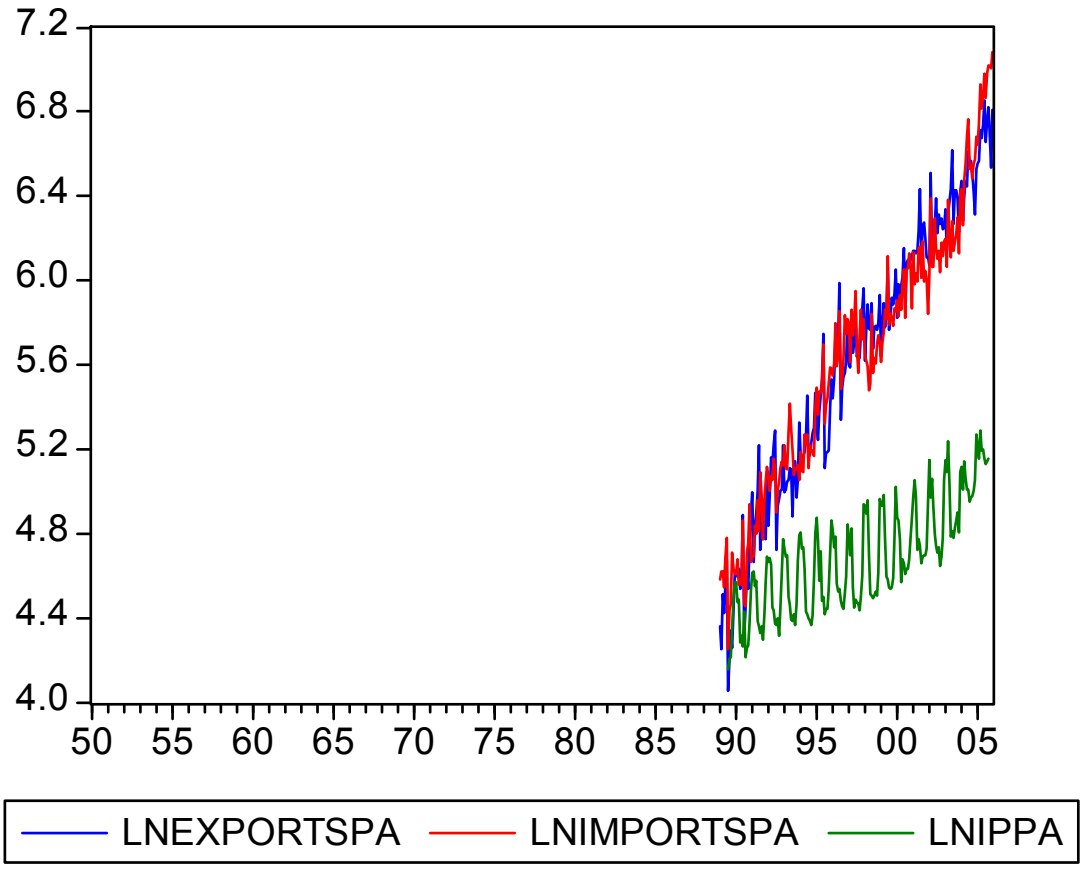
Natural logarithm of real Exports, Imports and Industrial Production

MALAYSIA



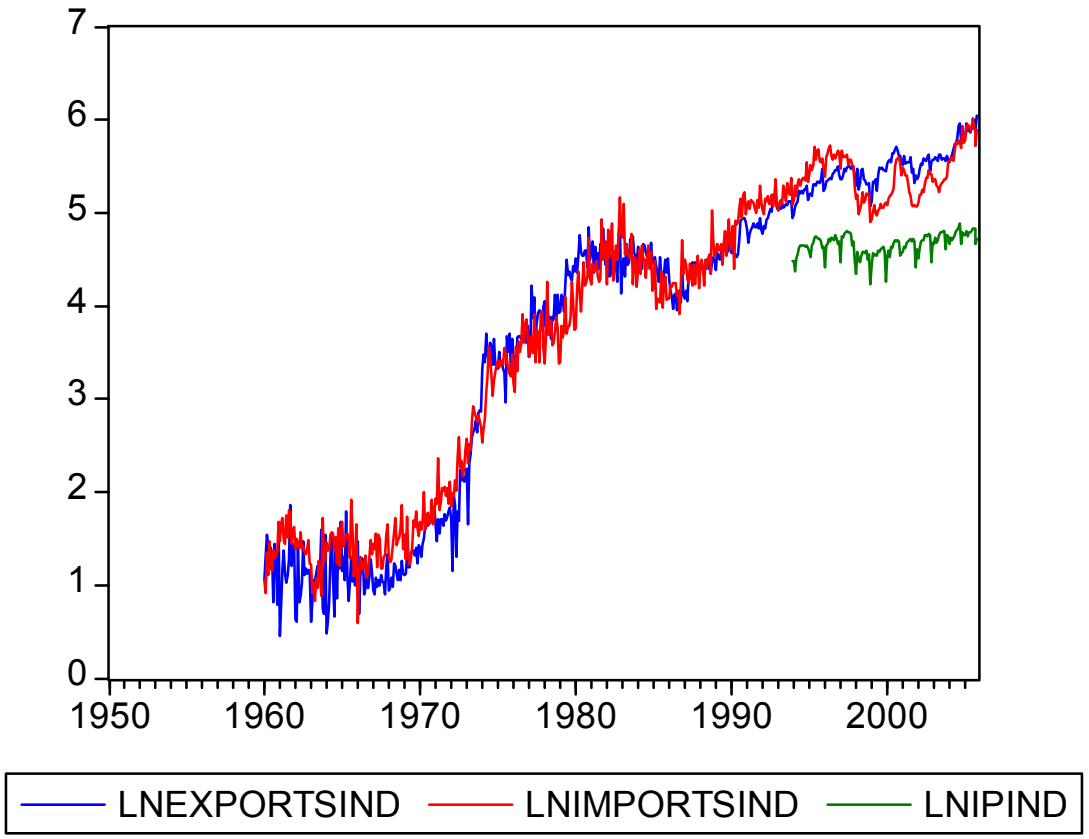
Natural logarithm of real Exports, Imports and Industrial Production

PAKISTAN



Natural logarithm of real Exports, Imports and Industrial Production

INDONESIA



Natural logarithm of real Exports, Imports and Industrial Production

ARGENTINA