TRADE DETERMINANTS AS SOURCES OF ECONOMIC GROWTH

An Empirical Inquiry

THOMAS L. VOLLRATH

PAUL V. JOHNSTON

Economic Research Service

U.S. Department of Agriculture

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ABSTRACT

Trade specialization patterns generally correspond to the stages of development explanation of growth. Commercial policy distortions and factor intensity reversals explain why trade does not always fit the skilled labor continuum. Calculated income elasticities with respect to openness imply that economies become less dependent on international markets as they grow.

TRADE DETERMINANTS AS SOURCES OF ECONOMIC GROWTH:
AN EMPIRICAL INQUIRY

The engine of economic growth during the nineteenth century was thought to be fueled by trade and industrial growth. Trade, viewed an engine, served simply to transmit growth impulses from developed to developing countries (19).

This trade engine hypothesis has been criticized because it falsely dichotomizes the world into developed countries which produce and export industrial manufactured goods and the developing countries which produce and export primary products (24). In fact, however, agricultural exports, as well as manufactured goods, are an important source of revenue for many developed countries. Moreover, developing countries have diversified their export portfolio beyond primary commodities to include manufacturing, an increasingly important source of foreign exchange.

Most econometric studies examining the influence of trade on economic growth have sought more sophisticated explanations than that provided by the simple trade engine hypothesis (1-4,10,15,20-23,27). At first blush, these studies provide persuasive evidence for linking domestic economic growth to international trade.[1] Most restricted attention to exports. Some (4,10,27) focussed exclusively on the newly industrializing or semi-industrial countries. Excluding imports ignores half of the trade linkages affecting growth. Basing conclusions upon analyses of data restricted to the more successful developing countries limits the ability to draw generalizations that are relevant to all countries.

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[1]However, some development economists have questioned whether some basic level of development is necessary before a country can benefit from trade-oriented growth. Michaely (15) observed "that the positive association of the economy's growth with the growth of the export share appears to be particularly strong among the more developed countries, and not to exist at all among the least developed". Chenery (8) believes that the greater role of trade in explaining growth is one of the features that distinguishes developing from developed countries. Helleiner (10) contends that there is "no evidence to support the proposition that the degree of export orientation is associated with growth performance either in Africa or in poor countries elsewhere".

Other studies have dissected the relationship between trade and growth using an accounting framework. Kavoussi (*14*) explains country-trade performance in terms of such factors as competitiveness, diversification, and world-demand. His analysis shows that rapid expansion of export earnings require both favorable external markets and outward-oriented commercial policies. Kavoussi concludes that when world demand is strong the benefits accruing to developing countries having liberal trade policy regimes (eg., improved allocation of resources, enhanced factor productivities, realization of scale economies, accumulation of additional capital, etc.) clearly outweigh its dangers (eg., possible deterioration in terms of trade, tariff and nontariff restriction impeding trade flows, and slow growth in the demand for developing-country commodity exports). But, his findings suggest that when external demand is weak the gains from outward-oriented policies are somewhat offset by their negative effects.

Using the same accounting framework, Singer and Gray (*25*) extend Kavoussi's analysis by differentiating among developing country regions. They show that the correlation between outward orientation and growth under favorable market conditions is relative weak for the low-income countries. They also show that in the low-income countries the gains from openness are offset by its negative effects when external demand is weak.

Decomposition analyses, based upon accounting formulae, leave much to be desired. They provide little information about the cause and effect relationships among economic determinants.

In this study, we combine the econometric and decomposition traditions in examining linkages between trade and income growth. We contend that the trade-growth relationship is not merely determined by trade policies and world economic conditions (as suggested by Kavoussi et al), but is also affected by comparative advantage. The role trade can play in inducing economic growth critically depends upon countries' exploiting their comparative advantages. The trade-growth nexus is, therefore, dependent upon global competition and specialization patterns.

We examine the relationship between income at various levels of development and country trade competitiveness patterns across economic sectors. Essentially, our approach is a sources of growth equation which concentrates on trade determinants thought to affect income differentials and economic growth.

There are six country classifications, five of which are differentiated by the level of development and the sixth is an oil export group (OPEC). We look at both low income (LIC) and high income (HIC) countries as well as three intermediate groups--the upper low income (ULIC), middle income (MIC), and upper middle income (UMIC) countries.[2] Following the Heckscher-Ohlin factor abundance theory, we categorize commodities on the basis of what is known about production processes. Commodities with high substitution elasticities are aggregated together into eight economic sectors because they embody similar factor requirements.

Dynamic Comparative Advantage
and the Stages Approach to Development

According to the stages approach to development and dynamic comparative advantage, the composition of a country's trade will change in response to changing relative factor endowments. Such change is associated with movement up the ladder of economic development.[3] Countries climb this ladder as they accumulate additional physical and human capital per worker. Low income countries, situated on the lowest rung of the development ladder, tend to specialize in the

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[2]The LIC includes Burkina Faso, Ethiopia, Ghana, India, Kenya, Madagascar, Malawi, Niger, Senegal, Sudan, and Togo. The ULIC includes Bolivia, Cameroon, Egypt, El Salvador, Honduras, Morocco, Pakistan, Philippines, and Sri Lanka. The MIC includes Colombia, Costa Rica, Dominican Republic, Guatemala, Jordan, Nicaragua, Paraguay, South Korea, Thailand, Tunisia, and Turkey. The UMIC includes Brazil, Chile, Greece, Ireland, Israel, Italy, Malaysia, Mexico, Portugal, South Africa, Spain, Syria, Trinidad, and Uruguay. The OPEC includes Algeria, Gabon, Indonesia, Iran, Kuwait, Nigeria, Saudi Arabia, and Venezuela. The HIC includes Australia, Austria, Canada, Denmark, Finland, France, Iceland Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom, United States, and West Germany.

[3]Balassa (3) concluded that the prospects of economic growth through exports appear much brighter once we understand the character of the changing pattern of comparative advantage because developing countries replace each other as they move up the comparative advantage continuum.

production of commodities that intensively use their relatively abundant unskilled labor. As these countries develop, they progressively move to higher rungs, corresponding to increasingly skilled labor.

Bowen (7) examined relationships between changes in national resource endowments and changes in the composition a country's trade structure. He found them to be consistent with the dynamic factor proportion explanation of trade.

Here, we identify three primary sectors, agriculture, mining, fish and forestry, as well as five manufacturing sectors, namely high tech, finished capital goods, intermediate differentiated goods, basic intermediates, and agriculturally linked industries (table 1). These economic sectors, and especially the five manufacturing sectors, symbolize a ladder of development because of their varying needs for skilled labor. At the bottom manufacturing rung are the agriculturally linked industries which use substantial semi-skilled labor relative to other inputs. Next come intermediate differentiated goods and basic intermediates. These two sectors depend upon moderately skilled labor. The top two rungs--finished capital and high tech industries--require skilled- and highly skilled-labor.

The Econometric Accounting Model

Our theoretical model examines the extent to which income growth, at different stages of economic development, is affected by trade specialization patterns, government intervention, and world economic conditions:

$$y^* = f(wc, op, RCA),$$

where,

y^* = real per capita income;

wc = global economic conditions;

Table 1

A Sketch of Eight Economic Sectors: Input-Output Descriptions

Sector	Typical Industries	Factor Intensity Requirement
High Tech	Medical products, optical and medical instruments, telecommunication equipment, organic and inorganic chemicals, etc.	highly skilled labor
Finished Capital	automobiles, trucks, buses, boats, ships, aircraft, agricultural machinery, war firearms, etc.	skilled labor and capital
Basic Intermediates	iron and steel, electrical energy, processed petroleum and coal, paper, fertilizer, rubber, plastic, etc.	moderately skilled labor and capital
Intermediate Differentiated Goods	office supplies, maps, musical instruments, hunting and sporting equipment, watches, clocks, plumbing, heating, and lighting equipment, etc.	moderately skilled labor
Agriculturally Linked Industries	textiles, yarn, fabrics, clothing, leather, footwear, furniture, etc.	semi-skilled labor
Mining	unprocessed coal and petroleum, crude fertilizer, natural gas, metalliferous ores, etc.	unskilled labor and natural resources
Fish and Forestry	wood, lumber, and cork; pulp and waste paper; fish and fish preparations, etc.	unskilled labor and natural resources
Agriculture	food and live animals; beverages and tobacco; animals and vegetable oils, etc.	unskilled-to-moderately skilled labor, land, & capital

Source: Data were obtained from the U.S. Trade Net System housed at the National Institute of Health, Bethesda, Maryland.

op = government intervention;

RCA = vector of comparative advantage;

We define global economic conditions as the real value of world exports. We use Johnston's openness index[4] (op) as a proxy for government intervention:

$$op = 1/(1+E/T),$$

where E is the total domestic production consumed at home (ie., consumption plus investment plus government expenditures minus imports) and T is total trade, (ie., exports plus imports).

The RCA vector needs some elaboration. Balassa (4) explored the possibility of relying on various theoretical explanations of international trade to determine patterns of comparative advantage. He became pessimistic about identifying comparative advantage and explaining trade on the basis of a few general principles derived from these theories because no single theory seemed capable of taking into consideration all of the elements affecting trade. Moreover, he questioned the usefulness of explicitly accounting for all of the influences affecting trade since comparative advantage is the outcome of so many factors, "some measurable, others not, some easily pinned down, others less so". As a practical alternative, Balassa suggested that comparative advantage be "revealed" through examination of country/commodity trade patterns because actual trade "reflects relative costs as well as differences in non-price factors".

The focus on broad economic sectors in this study entails tracking both exporting and importing behavior. Vollrath's revealed competitiveness (RC) index accounts for such two-way trade, so we

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[4]Johnston's index is strictly monotonic and bounded by zero and one, unlike alternative measures of openness used by Leamer (18) and Kravis, Heston, and Summers (17). Zero defines autarky. One defines perfect dependency in which all goods produced at home are exported and all domestically consumed goods are imported.

chose it to measure revealed comparative advantage. RC^5 is defined as follows:

$$RC_{a,n}^{i,r} = Ln\{[XS_a^i/XS_a^r)/(XS_n^i/XS_n^r)]/[MD_a^i/MD_a^r)/MD_n^i/MD_n^r]\},$$

where XS refers to exports, MD to imports, subscript a to any particular sector, subscript n to a commodity composite aggregate, consisting of all other sectors, and superscripts i and r to the home country and to the rest of the world, respectively.

Economic Interpretations

We identify leading and lagging trade sectors for countries at different levels of development and gauge their impact on income growth. A leading sector is as a group of commodities for which a country has a comparative advantage. Enhancing a particular sector's comparative advantage generates additional income in both the sector and the national economy. Comparative disadvantage identifies a lagging sector. Increased relative disadvantage diminishes sector income but increases overall domestic income because of increased efficiency of resource use. Evidence is provided here showing correspondences between leading and lagging trade sectors and the chain of comparative advantage as countries move up the ladder of development.

The empirical results largely confirm our *a priori* expectations (table 2). Agriculture, which intensively uses unskilled labor in developing countries, is identified as leading sector for ULIC and MIC. It is an especially important source of foreign exchange for the middle income countries. But, increases in relative agricultural competitiveness do not increase per capita income in LIC, contrary to the pure chain of comparative advantage theory. This finding is

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[5]A positive value for revealed competitiveness indicates that the country or region in question possesses a relative competitive advantage for the particular commodity being investigated. Conversely, a negative value indicates a relative competitive disadvantage.

Table 2
Trade Determinants of Real Per Capita Income
in Five Income Groups and OPEC Countries

	High Income Countries	Up-Middle Income Countries	Middle Income Countries	Upper-Low Income Countries	Low Income Countries	OPEC Oil Exporters
Intercepts	-.807081 (-3.54)	-1.05422 (-1.99)	-.73235 (-1.29)	.50854 (1.08)	4.61440 (8.16)	2.86295 (1.85)
Total Agriculture	.010568 (4.33)	-.033296 (-6.02)	.043609 (6.02)	.018279 (2.83)	-.000617 (.09)	-.055972 (-3.24)
Mining	.017298 (9.14)	-.001326 (-.40)	.001878 (.72)	.013105 (2.94)	.015569 (4.27)	.119446 (5.33)
Fish & Forestry	-.021903 (-12.14)	-.034094 (-10.06)	.006135 (1.79)	-.017825 (-3.66)	.012284 (4.45)	.012021 (1.33)
Agriculturally Linked Commodities	-.033888 (-8.78)	-.009648 (-2.52)	.053852 (10.68)	-.007077 (-1.67)	-.007270 (-2.07)	-.007977 (-.74)
Intermediate Differentiated Gds	.003110 (1.42)	.000159 (.03)	.022913 (5.12)	-.006432 (-1.60)	.002206 (.78)	.040375 (3.77)
Basic Intermediates	-.020535 (-9.79)	.010614 (1.93)	-.009200 (-1.20)	.031920 (5.53)	-.000353 (-.12)	.029372 (2.04)
Finished Capital Goods	.008587 (4.47)	.000188 (.05)	.002121 (.60)	.005159 (2.14)	.003083 (1.04)	.005479 (.91)
High Tech	-.002047 (-.73)	.026268 (5.56)	.001168 (.27)	.005414 (1.43)	-.000050 (-.01)	.018254 (1.72)
Gov't Intervention (Trade Dependency)	.000519 (2.48)	.001221 (3.97)	.002782 (4.37)	-.000155 (-.53)	.005852 (11.14)	.009337 (6.54)
Global Conditions (World Exports)	.466785 (42.45)	.442101 (17.38)	.384396 (14.15)	.310701 (13.85)	.061143 (2.27)	.182476 (2.52)

$$Ln[y^*_{jk(j)t}] = \beta_{0j} + \Sigma_i^8 \beta_{ij} Ln[RCA_{jk(j),i}] + \beta_{9j} op_{jk(j)t} + \beta_{10j} Ln[wc_{jk(j)t}] + \mu_{jk(j)t}, \text{ where}$$

i = agriculture, fish and forestry, mining, agriculturally linked industries, intermediate differentiated goods, basic intermediates, finished capital goods, and high tech;

j = LIC, ULIC, MIC, UMIC, OPEC, HIC;

k_j = country in group j; and

t = 1966,......1985.

The t-values appear in parentheses beneath the regression coefficients. A times series cross country statistical program that corrects for serial correlation, heterosckedasticity, and contemporaneous correlation was used to estimate the coefficients.

consistent with the observation that policies in low income countries often descriminate against the agricultural sector. Biased interventions which squeeze returns in agriculture induce resource flight, reducing efficiency and income in the overall economy.[6]

Agriculture was also found to be a leading sector in HIC. Policies protecting agriculture may contribute to the positive relationship found in the developed countries between increases in relative agricultural competitiveness and increases in per capita income. Note should be made, however, that world-wide agriculture is characterized by factor intensity reversals. In developed countries, it requires a more highly skilled labor force, relatively abundant capital, and--in the case of Australia, Canada, and the United States--considerable land.

Our results show that taking resources out of agriculture and increasing imports of agricultural commodities would actually increase income growth in UMIC and OPEC. This is perfectly understandable given the fact that both UMIC and OPEC have comparative disadvantages in agriculture.

We anticipated, on the basis of the factor proportion explanation of trade, that the developing and OPEC countries would have a comparative advantage in such extractive sectors as mining and fish and forestry. Both sectors utilize unskilled labor and natural resources, inputs that are relatively abundant in these countries. We found that mining was a leading sector in LIC, ULIC, OPEC as well as HIC. To the extent that petroleum and coal deposits are concentrated in OPEC and HIC, these results seem reasonable.

The other extractive sector, fish and forestry is a leading sector in OPEC, LIC, and MIC. The other three country categories, namely UMIC, HIC, and ULIC, display negative relationships between income growth and rising competitiveness in fish and forestry. With the exception of

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[6]Our openness measure does not adequately capture all aspects of government intervention.

the ULIC, these results are consistent with the stages approach to development and the chain of comparative advantage. The upper low income countries protect and subsidize domestic manufacturing, thereby discriminating against primary sectors in which a natural comparative advantage exists.[7]

The middle income countries are clearly benefiting from being suppliers of such semi-skilled labor intensive light manufactures as textiles, shoes, and furniture. MIC is the only country category with a positive income elasticity with respect to relative competitiveness in agriculturally linked industries, and this elasticity, (.054), is comparatively very strong. Judging from the magnitude of corresponding negative elasticities, the high income countries have the strongest interest in importing light manufactures, followed in order of importance by UMIC, LIC, and ULIC.

In addition, the middle income countries are reaping growth dividends by being competitive in such intermediate differentiated goods as maps, watches, heating and lighting equipment. The econometric results also show that intermediate differentiated goods is a leading sector for OPEC and a lagging sector for ULIC.

Moving up the commodity chain of comparative advantage, we find that a source of growth for OPEC, ULIC, and UMIC occurs in being competitive in such basic intermediates as processed petroleum and coal and iron and steel production--industries which require considerable capital and moderately skilled labor. The only trade theory misfit among these groups is ULIC. The drive toward industrialization in many developing countries entailed the adoption of import-substitution development strategies. These strategies may explain why basic intermediates became the greatest trade-sector source of national income growth for the upper low income countries. We do not have sufficient information to determine how much national income would

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[7]The World Bank (20) considers all countries within our ULIC category as being inwardly-oriented, with the exception of Egypt and Morocco--two countries they did not classify.

have increased had the ULICs pursued more market-oriented development strategies, permitting them to exploit their natural comparative advantages.

Finished capital, consisting of industries requiring skilled labor and capital, is a leading sector for both HIC and ULIC. Again, the inclusion of ULIC seems counter-intuitive, until consideration is given to distortions arising from policy and planning interventions in these countries.

UMIC and OPEC experience income expansion as they become more competitive in high tech manufacturing. Given the relatively high level of aggregation in defining this sector, our finding that high tech is a leading sector in UMIC, and not in HIC, is not really surprising. It suggests that the domestic supply (demand) for high tech products outstrips domestic demand (supply) in the upper-middle income countries (high income countries). It also suggests that Vernon's product cycle explanation of trade is operative. According to this explanation, the mass production of new innovative products is quickly transferred (especially in today's increasingly integrated international capital market) to countries possessing less highly skilled labor than in originating countries. Often these transfers occur as multinational corporations seek foreign sources of cheap, but relatively well educated labor. Even though the profits of such investments are partially transmitted to the home country, high tech commodity exports are recorded on the national account registers of producing countries.

Oil exporting countries come closest to being perfectly open. Perfect openness occurs when all domestic production is exported and all domestic consumption is imported. It is, therefore, not surprising that OPEC has the highest income elasticity with respect to the openness index than any other of our country categories.

Excluding the OPEC group, the income elasticity with respect to openness is inversely related to the level of development. This rank order suggests that domestic income growth is less (more) dependent upon the international market the higher (lower) the level of economic development.

An exception to this generalization is ULIC. Here again, we have evidence that upper lower income countries are not reaping growth dividends from participating in global markets, most likely due to their adoption of inward-oriented development strategies. The pursuit of self-sufficiency and balanced internal growth appears to have a high opportunity cost.

Generally speaking, the responsiveness of domestic income growth to global economic conditions is directly related to the level of development. Economists have observed that the relative importance of differentiated products in a country's trade bundle declines as one moves from the high- to the upper middle-income countries, from the upper middle- to middle income countries, and from the middle- to lower income countries. In addition, we know that the income elasticities of demand for differentiated products are usually higher than for undifferentiated and primary products. The magnitude of the world export coefficients across income groups, therefore, seems reasonable. Incomes in high income countries, outside of OPEC, rise (fall) more than those in lower income countries during global economic upswings (downswings).

Concluding Comment

This study goes beyond previous analytical efforts using inter-country data in that it accounts for the effects of the commodity composition of trade on economic growth. We found that trade specialization patterns generally correspond to the stages of development explanation of growth. Policy distortions and factor intensity reversals explain why trade does not always fit the skilled labor continuum. Calculated income elasticities with respect to openness imply that economies become less dependent on international markets as they grow. Improved indicators of commercial policy and development strategy are needed to assess the impact of government intervention more comprehensively.

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