Note on the Price Elasticity of Export Demand and Small Country Assumption

J. Riedel
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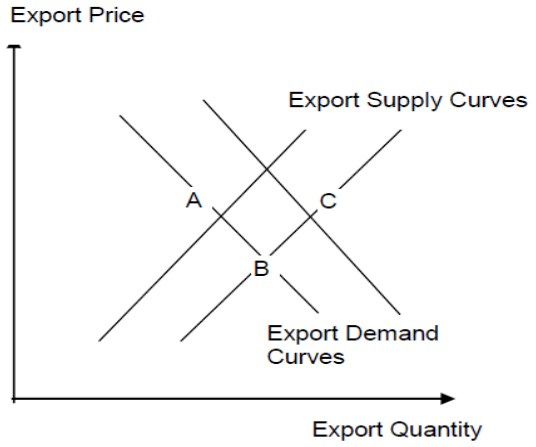
1. The Issue

The price elasticity of demand for exports, especially the exports of developing countries, is a highly contentious issue. Arguments in favor of inward-looking strategies of industrialization were based on the premise that the price-elasticity of demand for LDC exports is low, implying that any success developing countries might have expanding the quantity of exports would be offset by falling prices of the goods they export to the world markets (i.e., declining terms of trade).

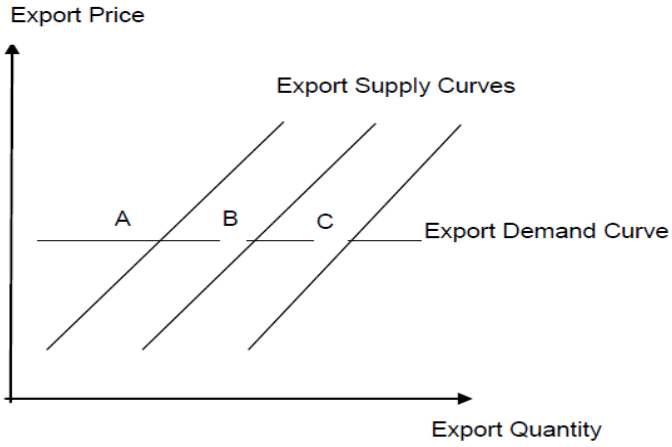
The "elasticity pessimism" that pervaded development economics does not accord with casual evidence. First, since the shares of LDC exports in the developed countries' markets are generally very low, it seems unlikely that they could have much influence on prices in those markets. Second, many developing countries have experienced very rapid export growth, in excess of 20 percent per annum, a rate about five times faster than growth of income (purchasing power) in developed countries, without suffering any loss of terms of trade. Casual evidence suggests, therefore, that LDCs are price-takers rather than price-makers in world markets.

These two points of view are illustrated below. If demand elasticities are low, then export quantity is determined externally by the rate of growth of demand in export markets, and export prices are strongly influenced by the quantity of LDC exports. On the other hand, if demand elasticities are very high, perhaps even infinite, then export growth is determined domestically and export prices are exogenous, i.e. not influenced by the rate of growth of LDC.

Low Elasticity Case: Export supply growth leads to falling export prices (A to B) unless world demand grows at the same pace as export supply (A to C)



Infinite Elasticity Case: Export quantity depends on supply factors alone. Export supply has no effect on export price.



2. The Econometric Evidence

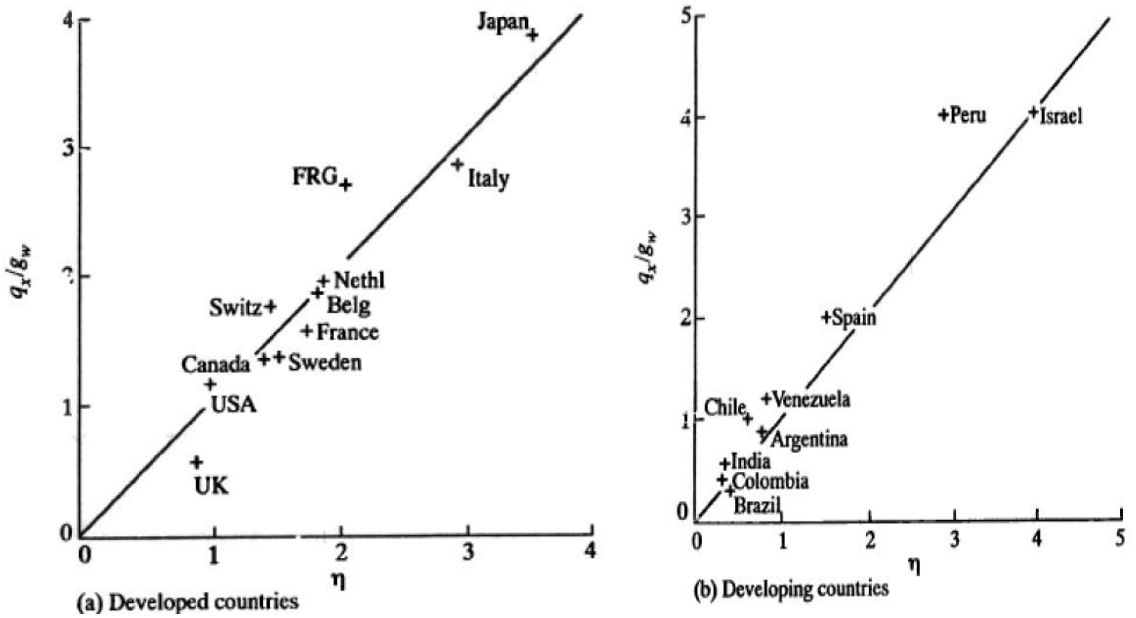
- The econometric evidence on export price elasticities is at odds with the casual evidence. Econometric estimates of the price elasticity of demand for exports for both developed and developing countries are mostly obtained from ordinary-least-squares (OLS) estimates of the following export demand equation:

(1) $$q_X = \varepsilon \cdot (p_X - p_W) + \eta \cdot y_W$$

where all variables are expressed as logarithms (or rates of change) and q_X is the quantity of exports, p_X is the price of exports, p_W is the price of competing goods in world markets, y_W is real world income, and where ε (<0) is the price elasticity and η (>0) is the income elasticity of export demand. Estimates of ε range from -0.5 and -1.0, suggesting that LDC exporters are price-makers, not price-takers in world markets. Why then have the terms of trade of developing countries not fallen, given that their export growth rates have exceeded the growth of world income? The answer provided by the econometrics literature is, curiously enough, that estimated income elasticities vary across countries in direct proportion to export growth rates. That is,

(2) $$\eta = \frac{q_X}{y_W}$$

This empirical regularity was first observed in Riedel (1988) and subsequently labeled by Krugman (1989) the "45-degree rule."



3. Three Hypotheses of the "45-Degree Rule"

The correspondence across countries between export growth rates and income elasticity estimates is too close to be purely coincidental. The likelihood is that export growth influences or is systematically related to a bias in the estimates of the price and income elasticities of export demand. There are three possible sources of bias:

(1) *Simultaneous Equation Bias*: OLS estimates of the price and income elasticities may be biased because they ignore the simultaneous interaction of supply and demand. A subsequent study estimating export demand elasticities using two-stage-least squares (2SLS) also found the 45^0 rule.[1]

(2) *Missing Variable Bias*: Krugman (1989) argues that estimates of η are biased by the failure to account for changing product quality. His argument is that rapid export growth does not cause declining terms of trade because countries are continually shifting to new products or higher quality versions of old products. In other words, instead of sliding down the export demand curve, countries are continually jumping on to new demand curves. Unfortunately Krugman offers no empirical evidence to support his hypothesis.

(3) *The Small Country Case*: If a country is small, then it is supply-side variables—not demand-side variables—that determine the quantity of exports. In this case, equation (1) is misspecified because it attempts to explain export quantity growth without any supply-side explanatory variables. Furthermore, estimates of (1) are unable to identify a small country because one cannot estimate a coefficient value of infinity. In order to identify a small country, one must estimate the inverse of (1):

$$(3) \qquad p_X = p_W + \frac{1}{\varepsilon} \cdot q_X - \frac{\eta}{\varepsilon} \cdot y_W$$

In estimating (3), if it is found that the coefficient on p_W is not significantly different from one and the coefficients on q_X and y_W are not significantly different from zero, then the small country case is confirmed.

4. Testing the Small Country Hypothesis

The first tests of the small country hypothesis were Riedel (1988) and Riedel and Athukorala (1991 and 1996) using data from Hong Kong and Korea. The inverse demand equation (3) was estimated together with an export supply equation to test for simultaneous equation bias. In addition, two-stage-least-squares (TSLS), error-correction models (ECMs) and full-information maximum likelihood (FIML) methods of estimation were employed.
The results for Hong Kong and Korea are summarized in the following Table:

	Standard form Dependent Variable: q_X		Inverse form Dependent Variable: p_X		
Variable Parameter	p_x/p_W ε	y_w η	p_W	q_W $1/\varepsilon$	y_W η/ε
Hong Kong	-0.70 (-3.78)	4.04 (27.00)	1.00	-0.05 (-0.83)	0.14 (0.63)

[1] Morris Goldstein and Mohsin Khan, "The supply and demand for exports: As simultaneous approach," Review of Economics and Statistics, 60 (1978) 275-86.

Korea	-0.84 (-2.15)	7.22 (7.93)	1.00	-0.002 (-0.005)	-0.96 (-1.00)

Notes: The coefficient on p_W was restricted to one (price homogeneity) and the restriction was tested. T-statistics are in parentheses.
Sources: James Riedel, "The demand for LDC exports of manufactures: estimates from Hong Kong," *Economic Journal*, 98, 1988, 138-48; Premachandra Athukorala and James Riedel, "The small country assumption: a reassessment with evidence from Korea," *Weltwirtschaftliches Archiv*, 127, 1991, 138-51.

The above estimates show that the small country case is the best explanation for the 45-degree rule. Most econometric studies of trade elasticities (and there are hundreds of them) are implausible and misleading, indeed they are downright wrong, because they are based on estimates of the standard from rather than the inverse form of the export demand equation. Not everyone agrees, however. See A. Muscatelli, T.G. Srinivasan and D. Vines, "The Empirical Modelling of NIE Exports: An Evaluation of Different Approaches," *Journal of Development Economics* 1994.

Since Hong Kong and Korea were at the time of these studies the largest exporters of manufactures in the developing world, one may presume that if these countries are small (price-taking countries) then so too must be other developing countries. However, there may be some manufactured exports where LDCs have market power. Athukorala and Riedel (1996) find that Korea influences the world price of textile and garment. Korea influenced the world price of textiles and cloth, in spite of its small share in the market, because of the Multi-Fibre Agreement, which uses VERs to segment the market gave Korea market power in the U.S. and Europe.

A subsequent study, following the same approach, found that even the U.S. is a small country.

“United States has long had low and declining levels of protection. This paradox suggests that the United States is failing to exploit its monopsony power by levying optimal tariffs. Using data on world output and trade flows, we find that the United States is a small country in world trade in that its trade policies have negligible impacts on world prices. In the median manufacturing industry, US tariffs reduce world prices by only 0.12%. United States optimal tariffs are also typically small (3.6% in the median industry) and are lower than existing US tariffs in most industries. It is no puzzle that the United States has been a champion of free trade since the 1930s—the United States, like other small countries, benefits economically from tariff reductions (p. 990).”

Christopher S. P. Magee and Stephen P. Magee, (2009). “The United States is a Small Country in World Trade,” *Review of International Economics*, 16(5), 990–1004, 2008