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TESTING THE SMALL COUNTRY HYPOTHESIS FOR DEVELOPING COUNTRIES

Jonathan Perraton[*]

1. Introduction

The relative importance of demand and supply factors in the growth of less developed countries' (LDCs) exports is central to the debates on development strategy for open economies. A range of theories argue that growth in world, and especially developed country income, is central to LDCs' export growth. Developing countries themselves often perceive their trade fortunes as rising and falling with the fluctuations of the world economy. Conversely, neo-classical development theory observes that LDCs have small shares of world trade and typically asserts or assumes that they are small countries in the trade theory sense, i.e. that they face infinitely elastic demand schedules for their exports.

Recent work has tested these hypotheses for several developing countries, lending support to various theoretical positions. This paper reports tests of the small country hypothesis for a larger sample of LDCs than past studies, points out difficulties with the methods and theories involved, and suggests some directions for future research.

2. Past Studies .

Conventional estimates of export demand functions for LDCs typically indicate that the income elasticity coefficient is strongly significant; the results for the price coefficient vary, but generally indicate that it was not high. This holds not just for estimates using single equation methods, which are biased by assuming (usually implicitly) infinitely elastic supply, but also for estimates incorporating an export supply function (Khan, 1974; Arize, 1988).

Riedel (1988; 1989) argues that such results are implausible, since they imply that differences in LDCs' export growth rates are largely matched by differences in apparent income elasticities for demand for their exports.[1] He argues that the small country hypothesis is more plausible and that the significant income elasticity estimates arise due to strong trending between export and world income growth in most LDCs. This would be expected to lead to serial correlation in the estimates, which is not universally observed.

Riedel (1988) proposes a test for the small country hypothesis (SCH) and applies it to Hong Kong. It is now recognised that an export supply function should be incorporated into export demand functions (Goldstein and Khan, 1985). The general approach is to specify a supply side model of exports in order to derive instruments for a two-stages least squares (2SLS) estimation of export demand coefficients. Thus, for example, export demand could be modelled as:

$$X_d = \alpha_0 + \alpha_1 Y^* + \alpha_2 PX + \alpha_3 PW + \mu \qquad (1)$$

where:
$Y^* = $ World income
$PX = $ Export prices
$PW = $ World prices
$\mu = $ error term

and export supply can be modelled as:

$$X_s = \beta_0 + \beta_1 Y + \beta_2 PX + \beta_3 PD + \mu \qquad (2)$$

where:

Y = Domestic real income
PD = Domestic prices

With all above variables in logs, and price variables expressed in a common currency. Assuming that:

$$X_d = X_s = X \tag{3}$$

where X is export volume, then Y, PD, PW and Y^* can be used as instruments in a 2SLS estimation of (1). The precise series used for these variables varies between studies and has been debated in the literature. This is briefly considered in section three.

Riedel's (1988) procedure is to rearrange the function with the export price as the dependent variable, on the basis that if quantity sold has no effect on price this implies infinitely elastic demand. Thus (1) is rearranged as:

$$PX = \psi_0 + \psi_1 Y^* - \psi_2 X + \psi_3 PW + \mu \tag{4}$$

Where the rearranging of (1) implies that: $\psi_0 = \alpha_0/\alpha_1$, $\psi_1 = 1/\alpha_1$, $\psi_2 = -\alpha_2/\alpha_1$, $\psi_3 = -\alpha_3/\alpha_1$. Price homogeneity dictates that $\psi_3 = 1$. Riedel argues that the small country hypothesis can be tested by testing for $\psi_2 = 0$. Estimating a lagged version of (4) by 2SLS with the same instruments as above for Hong Kong's exports he finds the SCH supported by the data.

Subsequent studies have produced mixed results. Muscatelli *et al* (1992) rework Riedel's Hong Kong example using more sophisticated econometric techniques and reject the SCH; later work of theirs (1994) for the East Asian newly industrialising economies (NIEs) estimated price elasticities of demand around -0.5 and income elasticities around 5. Arize (1990) rejected the assumption for seven Asian developing countries based on an essentially identical function due to Browne (1982). Moran (1988) and Faini *et al* (1992) find mixed results for small samples of LDC manufactures exporters. In the latter analysis even when the SCH was not rejected, in all but one case testing could not

reject the hypothesis that the price elasticity equalled zero, indicating specification problems rather than acceptance of the SCH. Nguyen (1989) offers several criticisms of Riedel's approach. The basic problem is that with a perfectly fitting model parameter estimates will be independent of normalisation, but these will diverge further the poorer the model. Muscatelli *et al* (1994) extend this point by arguing that both extreme results - the low price elasticities using (1) and acceptance of the SCH using (4) - are both artifacts of mis-specification. The sample of LDCs is extended here, possible explanations for the results advanced and some observations made on this debate.

3. The Data

Annual data for 57 LDCs over 1970-88 were derived from World Bank (1991). Past studies are hampered because international statistics source books report price data based on export unit values. Price movements then reflect a mixture of quality changes and *bona fide* price movements; if the SCH held, then price movements relative to the world index would entirely reflect quality changes. The dollar export price series reported in the balance of payments statistics pages of World Bank (1991) are presumably derived in this manner. For this reason, the dollar series are not used as data for PX. Instead, the national income accounting figures for each country give export data in both current and constant (domestic) price terms. Although a domestic export price deflator is not reported directly, it can be derived from this data. This deflator, adjusted for the exchange rate is used as the data for PX; this should afford testing of the effects of exchange rate movements on exports. Similar series are not, unfortunately, available for separate categories of exports as well as the total. (It should be noted that the export price and volume data from this source do not necessarily tally with the data reported in the balance of payments pages of World Bank (1991). No basis for reconciling the data is given in the source and none is offered here.)

There has been some debate in the literature over the appropriate series for the domestic variables. For domestic prices, the GDP deflator (for convenience), the consumer price index (arguably the closest domestic substitute for exports) and the services price index (as a proxy for non-tradeables) have each been proposed.

A services price deflator was not available, and so the domestic absorption deflators was used.

As far as the domestic capacity variable is concerned, apart from real GDP the main alternatives are a capacity level variable (Y_t), fitted values from a regression of real GDP on a time trend (which eliminates the effects of business cycles on growth, thus providing a better measure of the growth of the capacity of the economy), or the capital stock (estimated by taking cumulative investment data with a specified depreciation rate). The difficulties of estimating capital stocks are well-known; clearly the estimated values of the capital stock will be sensitive to the estimate of the initial stock value and the chosen depreciation rate; there are also the conceptual problems. Such a series is not estimated here (but see Dadkhah and Zahedi (1986) for a possible method). Ideally a measure of the growth of the exportables sector should be used; this could be proxied by the combined real growth of the agricultural and industrial sectors. However, previous results (Perraton, 1992, ch. 2) suggest that the share of services does not vary systematically with growth. This can be used to justify taking GDP capacity growth as a proxy for the growth of the capacity of the exportables sector.

The world income variable has sometimes been proxied by the real growth rate of imports in the trading partners of the country under consideration. This can be justified by invoking the separability assumption that consumers first decide the allocation of their expenditure on imports, and then its distribution between various suppliers. However, the theoretical and empirical bases for this assumption are weak (Winters, 1984) and world income growth (from IMF, 1990) is used throughout for Y^* instead.

World prices should ideally refer to the prices of a basket of goods competing with each country's exports. The construction of such an index would be difficult and a general world export price index (from IMF, 1990) is used instead. If this was an inappropriate series, then one would expect problems with the price homogeneity assumption in testing, but for the majority of estimations this assumption was accepted. Multicollinearity is likely to be a problem with these regression since the correlation between lnYW and lnPW is 0.93. As all three variables may be

strongly correlated, a bias towards insignificance is likely.

In common with other studies price homogeneity is tested for, rather than imposed by making PX/PW the dependent variable in (4), as suggested by Nguyen (1989); this could be explored in further study. Although there are no strong reasons for prefering either formulation, it could be argued that imposing price homogeneity rather than testing for it ignores a means of testing for possible mis-specification.

4. The Results
Estimates of (4) were made using 2SLS and the instruments as above for 57 LDCs. Although Riedel tested the SCH by testing for $\psi_2=0$, it should be apparent from (4) as a rearrangement of (1) that it implies $\psi_1=\psi_2=0$, the form favoured by Faini *et al* (1992).[2] Most studies have used a standard F-test, but this is only valid asymptotically with 2SLS regressions and would tend to bias the test towards accepting the small country hypothesis (Faini *et al*, 1992). In this study the more appropriate Wald test (which takes a chi-square distribution) was computed for a joint variable deletion test on the world income and export volume variables; ten per cent is taken as the critical level. The Wald test is a standard Maximum Likelihood test for restrictions on parameters. As such, unlike the F-test, it is valid in cases of non-normal error distribution which may be found here, and is the recommended procedure on MICROFIT. The performance of the Wald test with small samples is more ambiguous than the F-test; although Kiviet (1985) reports some poor trials for this, many seem to result from the inclusion of lagged terms not incorporated here. Ideally advanced procedures and testing would be undertaken with detailed reference to the model estimated, particularly the instrumental variables. This seems computationally very costly in comparison to the standard procedures used here given the unreliability of the data used and the lack of a data for variables which would ideally be incorporated. Serial correlation is tested using the Lagrangean multiplier test, as the Durbin-Watson statistic is not robust with 2SLS estimates. Price homogeneity - i.e. $\psi_3=1$ - is also tested using a Wald test. Although these tests may remain valid for regressions where the R^2 is less than zero (the lower limit for the R^2 with 2SLS is $-\infty$), they are only carried out on regressions with a positive R^2; others are declared a failure.

Appendix one reports the tests for the small country hypothesis, together with reports for the tests for serial correlation and homongeneity. Of the 57 estimates, the small country hypothesis was rejected in seventeen cases and accepted (i.e. the SCH was not rejected) in sixteen.[3] In a further eight cases it was rejected but the result declared ambiguous because either the price homogeneity assumption is rejected, or serial correlation is detected, or both; similarly, in four cases the SCH would accepted by the test but on an ambiguous regression. There were twelve failures, i.e. cases where the regression yielded a negative R^2.

5. Interpretations
The above results indicate that the small country hypothesis does not hold for a number of LDCs. The interpretation of these results focuses on two issues, firstly the plausibility and explanation of them, and secondly the econometric issues raised by this form of testing.

The most straight-forward interpretation is that where the SCH is rejected, this indicates that such countries do not face infinitely elastic demand for their exports. Some of these may be explained by shares of world exports of various commodities (see appendix two), although there are also cases where countries with large shares of world exports of certain commodities are still classed as small countries on this test. (A ten per cent share of world exports is often taken as indicating some market power).

The supposed plausibility of the SCH can be questioned on a number of grounds. Firstly, this assumes a given external price and thus output and sales are determined supply-side by the cost function. However, this implicitly assumes full knowledge of the price; the Walrasian auctioneer must be shouting loud enough to be heard across the globe. If this information was not so widely disseminated, the likely result would be sharp fluctuations in LDC export levels as they found their produce wrongly priced on the world market; this does not seem to have happened.

Secondly, the terminology itself is misleading: whether countries' products are differentiated or not, and thus face less than perfectly elastic demand, is not necessarily anything to do with their size or market share. Apart from standard sources of product

differentiation, with developing country exports differentiation can arise from consumer bias forcing them to sell at a significant discount, at least initially (Frankena, 1973; Khanna, 1986). Aw (1993) found evidence of pricing to markets by Taiwanese footwear exporters. Although he explicitly concurs with Riedel that price elasticities are high (although not infinite in this case) and that Taiwan's export growth has been driven by low costs, the income elasticity coefficients are significant in his estimates and the inverse demand functional form would tend to bias the price elasticity estimate upwards as described above. Product differentiation in manufactured products is well-known, but recent research suggests it may be more significant than previously thought for primary exports (Lord, 1991).

Thirdly, there is protection. Documenting the extent of protection against developing country exports is difficult, but it appears to have a significant and rising impact (cf. Laird and Yeats, 1990). The experience of Taiwan[4] is instructive here: 'the foreign demand curve for each product would suddenly turn from a nearly horizontal and infinitely elastic curve into a downward vertical curve at zero elasticity' (Tsiang, 1984, p. 310) due to such protection.

A fourth element, neglected until recently in most research, is the nature of the market for LDC exports. Rather than being a textbook open market, LDC exports are often sold through marketing contracts with developed country importers (Keesing and Lall, 1992; Egan and Mody, 1992). This has a number of consequences. The need to develop such contracts 'creates a barrier to entry for LDC firms in the formation of relationships with buyers which in turn prevents entry into valuable industry networks' (*ibid.*, p.322). Such contracts will typically stipulate levels of non-price factors which the SCH ignores. The problems here are not confined to countries without such contracts, which are thus hampered from exerting competitive pressure; to the extent that these contracts are necessary for exporting , rather than having free access to world markets, LDC exporters will be limited by the demand of the purchasers they have contracts with. More generally, even if contracts are not needed, it will still generally be necessary to develop overseas networks to market exports, a further limitation on export expansion to world - as

opposed to established bilateral - markets. Krugman (1989b) shows that such sunk costs lead to exporters taking losses during (perceived) temporary exchange rate appreciations (and not necessarily expanding exports following depreciation) preventing the 'law of one price' from operating.

Fifthly, there is competition from other developing countries. Faini *et al* (1992) explain the failure of the small country hypothesis in their analysis by their finding that sample countries' exports are significantly more elastic with respect to a developing country export price index than with respect to a similar developed country index. In certain categories of low skill manufactures, developing country exporters have virtually eliminated developed country exports (Wood, 1994, esp. part A).[5] In these areas, rather than having small shares in world exports as indicated by aggregate data, a relatively small number of developing countries are competing against each other.

Muscatelli *et al* (1994) point out that with a perfectly fitting regression, the coefficient estimates will be invariant to the normalisation, and thus attribute the divergence between estimates using (1) or (4) to misspecification. Rather than using 2SLS with no lag structure (as here) or lagged one period (as with Riedel, 1988; Arize, 1988; 1990; Moran, 1988; Faini *et al*, 1992), they use an error correction mechanism, testing for the optimal lag structure, producing estimates of high income elasticities and low price elasticities of demand for the NIEs. However, it is not clear that such sophisticated econometrics is justified by the quality, and limited time series, of the data, or that Muscatelli *et al* really take their own results seriously.

Lagged adjustment is computationally costly and loses degrees of freedom, but more than that it was not incorporated into the estimates of this study since such a sluggish response to world market conditions seems difficult to reconcile with the small country hypothesis as it would imply sharp fluctuations in the quantities sold as agents responded to changing conditions; as remarked earlier, this does not appear to have been the case. It should be noted that allowing profits to fluctuate instead of sales, as implied by Krugman (1989b) discussed above, is difficult to reconcile with the SCH since in such a competitive world only

normal profits would be made in equilibrium. Use of an error correction mechanism is questionable with a short run of probably poor quality data - for example, Muscatelli *et al* (1994) use the dollar export price series discussed in section three. Muscatelli *et al* themselves in effect reject the hypothesis of a long run equilibrium demand function implied by such methods. Rather they invoke Krugman's (1989a) model which, using a standard Dixit-Stiglitz (1977) model of monopolistic competition, argues that 'fast-growing countries expand their share of world markets not by reducing the relative prices of their goods but by expanding the range of goods that they produce as their economies grow.' Thus, rather than a fixed export basket facing a stable demand function, as assumed in export demand estimation, the basket itself is changing. With price changes playing little role, but world income growing smoothly, fitting an export demand function thus leads to the apparent result of low price elasticities and high income elasticities for rapidly growing exporters. The main problem with this theory (which was originally designed to explain developed countries' growth) is that neither its description of the process of export expansion nor its underlying demand functions seem to be accurate characterisations of the situation in developing countries. The NIEs have expanded the variety of products they export, but expansion and up-grading of existing exports has also been an important source of export growth; up-grading, too, would change the export basket. Moreover, there is a danger here of generalising from the NIEs to other LDCs, where the expansion of the variety of products traded has less obvious. Here the assumption of a fixed basket of exports is more realistic, and hence the conventional demand function methods more appropriate. Finally, although the literature has considered changes in the nature of the exports, it has not considered the possibility of changes in the demand function itself, although this is not implausible and is equally problematic for fitting the function.

6. Conclusions

This study has tested the small country hypothesis for a large number of developing country exporters and rejected it outright for about thirty per cent of the sample, with further ambiguous cases. These results are not necessarily robust, and are open to empirical disproof, but they do provide a case to answer together

with explanations of why the small country hypothesis is not necessarily plausible for developing countries. Two-stages least squares is not the most advanced technique, but it is not clear that the problems with these functions are avoided by using more sophisticated methods. More disaggregated analysis of developing country exporters might well reveal greater insights into the market conditions they face.

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Appendix One: Tests of the Small Country Hypothesis

Country	Serial Correlation $\chi^2(1)$	Homogeneity $\chi^2(1)$	Small Country Hypothesis $\chi^2(2)$	Decision
Argentina				Failure
Bangladesh	3.51§	4.37†	0.95	Ambiguous
Benin	0.59	0.11	3.15	Accept
Botswana	1.02	0.00	4.52	Accept
Brazil	1.74	0.00	7.93†	Reject
Burkina Faso	0.33	0.04	0.53	Accept
Burundi	0.09	0.00	0.42	Accept
Cameroon	1.52	0.01	7.40†	Reject
C.A.R.	1.75	0.39	27.73*	Reject
Chile				Failure
Colombia	1.75	0.39	7.39†	Reject
Congo	0.37	15.41*	23.89*	Ambiguous
Cote d'Ivoire	7.24*	2.12	2.98	Ambiguous
Dom Rep				Failure
Ecuador	0.77	1.80	1.91	Accept
Egypt				Failure
El Salvador	0.59	0.64	0.55	Accept
Fiji	1.17	2.42	9.48*	Reject
Gabon	0.94	1.91	3.58	Accept
Ghana	0.09	3.41§	22.21*	Ambiguous
Greece	1.18	1.27	14.51*	Reject
Haiti	1.80	2.49	3.77	Accept
Honduras	0.07	0.53	0.15	Accept
Hong Kong	1.69	43.79*	33.51*	Ambiguous
India	4.00†	3.64§	1.75	Ambiguous
Indonesia	0.12	0.22	0.03	Accept
Jamaica	0.45	0.50	4.62§	Reject
Kenya	1.05	0.03	7.91†	Reject
Korea	0.11	4.13†	4.69§	Ambiguous
Madagascar	4.52†	34.27*	74.35*	Ambiguous
Malawi	1.84	10.53*	19.52*	Ambiguous
Malaysia				Failure
Mauritius				Failure
Mali	1.20	0.51	1.67	Accept
Malta	1.18	0.61	1.45	Accept
Mauritania	0.46	0.01	0.24	Accept
Mexico				Failure
Morocco	2.90	0.03	4.77†	Reject
Pakistan	0.02	2.01	5.92§	Reject
Panama	1.90	6.14†	4.92§	Ambiguous
Peru	1.37	0.25	13.66*	Reject
Philippines	0.04	0.02	11.03*	Reject
Portugal	0.43	0.38	0.43	Accept
Rwanda	0.09	0.06	0.43	Accept
Senegal				Failure
Sudan				Failure
Syria				Failure
Sri Lanka	2.25	6.50†	1.53	Ambiguous
Tanzania	0.50	0.00	9.52*	Reject

Thailand	0.45	0.68	2.72	Accept
Togo				Failure
Tunisia	1.64	7.64*	35.18*	Ambiguous
Trinidad	0.03	0.11	26.53*	Reject
Turkey	0.33	1.05	36.61*	Reject
Uruguay				Failure
Yugoslavia	0.01	0.05	36.43*	Reject
Zaire	0.46	0.54	8.17†	Reject

Key: §, †, * - significant at the 10, 5, 1 per cent levels.

Appendix Two: Selected LDCs' Shares of World Commodity Exports, 1982/83

Country	Commodity	SITC	Share of World Exports (%)
Brazil	Coffee	071	22.53
	Iron Ore	281	22.55
	Cocoa	072	15.50
	Pig Iron	671	8.83
	Footwear	851	5.02
Colombia	Coffee	071	15.71
Ghana	Cocoa	072	10.28
Greece	Fur clothes	842	8.14
Hong Kong	Clothes	841	13.18
	Toys,sports	894	16.02
	Watches/clocks	864	19.31
	Domes Elec Eq	725	5.98
	Cotton fabric	652	6.99
	Travel goods	831	8.61
	Fur clothes	842	17.37
Kenya	Tea & Mate	074	11.76
Korea	Clothes	841	10.50
	Ships & boats	735	15.49
	Footwear	851	10.14
	Woven textiles	653	8.44
	Iron steel primary	672	8.52
	Structures & parts	691	6.06
	Travel goods	831	13.14
Pakistan	Textile products	656	6.89
Philippines	Silver/	285	12.61
	Platinum		
Turkey	Floor covering	657	5.02

Source: UNCTAD (1987), tables 4.3. and 4.4.

[1] Similar arguments were advanced for developed countries by Browne (1982).

[2] This point has not been discussed explicitly in the literature.

[3] In a comparative study (Perraton, 1992, ch. 6) the SCH was rejected in fewer instances using dollar-denominated price data, in line with expectations from the discussion in section 3.

[4] Because Taiwan is not included in international agency data books, no estimates are made for it in this study.

[5] These categories are typically at a greater degree of disaggregation than the 3-digit SITC data in appendix two; unfortunately such fine data is not readily available.