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Are Partner-Country Statistics Useful for Estimating “Missing” Trade Data?

Alexander J. Yeats

Partner-country statistics — which some propose to use for approximating missing trade data — are so unreliable and incorporate such variations that they are of limited use for general economic analysis or hypothesis testing. Significant progress in upgrading the accuracy and coverage of trade statistics can be achieved only by improving each country's procedures for data collection.

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Summary findings

Because many developing countries fail to report trade statistics to the United Nations, there has been an interest in using partner-country data to fill these information gaps.

Yeats used partner-country statistics for 30 developing countries to “estimate” actual (concealed) trade data and analyzed the magnitude of the resulting errors. The results indicate that partner-country data are unreliable even for estimating trade in broad aggregate product groups such as foodstuffs, fuels, or manufactures.

Moreover, tests show that the reliability of partner-country statistics degenerates sharply as one moves to more finely distinguished trade categories (lower-level SITCs).

Equally disturbing, about one-quarter of the partner-country comparisons take the wrong sign. That is, one country’s reported free-on-board (f.o.b.) exports exceed the reported cost-insurance-freight (c.i.f.) value of partners’ imports.

Aside from product composition, tests show that partner-country data are equally inaccurate for estimating the direction of trade.

Why are partner-country data so unreliable for approximating “missing” trade data? Evidence shows:

- Problems in reporting or processing COMTRADE data.
 - Valuation differences (f.o.b. versus c.i.f.) for imports and exports.
 - Problems relating to entrepot trade, or exports originating in export processing zones.
 - Problems associated with exchange-rate changes.
 - Intentional or unintentional misclassification of products.
 - Efforts to “conceal” trade data for proprietary reasons.
 - Financial incentives to purposely falsify trade data.
- Yeats concludes that efforts to improve the *general* quality, or availability, of trade statistics using partner-country data holds little or no promise, although this information may be useful in specific cases where the trade statistics of a certain country are known to incorporate major errors. Significant progress in upgrading the accuracy, and coverage, of trade statistics can be achieved only by improving each country’s procedures for data collection.

This paper — a product of the International Trade Division, International Economics Department — is part of a larger effort in the department to analyze structural changes in trade and assess their influence on developing countries. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Jennifer Ngaine, room R2-052, telephone 202-473-7959, fax 202-676-1341, Internet address jngaine@worldbank.org. August 1995. (36 pages)

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I. Introduction

For several reasons there is a growing interest in "estimating" reliable trade statistics when actual data are inaccurate or unavailable. For some developing countries the most recent trade data reported in the United Nations COMTRADE base may be as much as nine years out of date, as compared with a lag of about one year for OECD members. Second, when UN statistics are available for some developing countries they may not be disaggregated to the four or five-digit Standard International Trade Classification (SITC) level required for many policy and research investigations. Third, some exporters have an incentive to intentionally withhold (or intentionally misstate) trade in products like petroleum, cocoa or coffee which are subject to internationally agreed export quotas, while countries may intentionally conceal trade data in order not to divulge (often firm specific) confidential business information.¹ Fourth, importers and exporters may intentionally mis-invoice trade to avoid high tariffs, or facilitate capital flight, and these actions may make official statistics unreliable (see Bhagwati, 1964 and 1967; Sheik 1974; or de Wulf 1981).² Fifth, some countries, like the former Soviet Union, did not report trade to the UN prior to the 1990s so their statistics are not included in official COMTRADE records. Finally, there is an increasing failure on the part of some developing countries -

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¹The United Nations handles such problems through the use of "special codes" that are not part of the official SITC classification. Special codes are a device that essentially transfers information from a higher to a lower level of aggregation in order to preserve confidentiality, or to mask the fact that the UN does not have sufficiently precise information to classify the transaction. Rozanski and Yeats (1994) estimate that these entries covered about \$40 billion or 7 percent of United States exports in 1990.

²In an interesting development involving partner country data, Canadian statistics on imports from the United States are now shown in official U.S. tabulations of exports to Canada. This substitution was made on the assumption that insufficient U.S. border controls made the Canadian data far more reliable. For details, see U.N. Economic and Social Council (1990). The OECD has advanced the proposition that, because of their different uses, import statistics are normally more reliable than export data. See Blades and Ivanov (1985).

- particularly those in Africa -- to collect and report reliable trade statistics to the United Nations.

In order to satisfy informational needs, there is an interest in the possible use of partner country statistics (trade inversion) to "gap fill" missing or unreliable data.³ However, several technical problems may produce biases that reduce the utility of this approach. For example, imports are normally valued cost-insurance-freight (c.i.f.) while exports are reported in free-on-board (f.o.b.) values. Yeats (1981)(1989) and Brodsky and Sampson (1979) show this factor alone can produce discrepancies of 25 to 50 percent, or more, in partner country data. Second, trade may be diverted on route, or passed through a "way port," so the exporter (importer) may not know the true destination (origin) of these shipment (Yeats, 1978). Third, if a substantial transit period is required, exports and imports may be recorded in different time periods. Fourth, importers and exporters may report trade transactions in different currencies so exchange rate conversion problems may bias UN statistics (which are reported in US dollars). Finally, UN trade data may incorporate processing errors which are of sufficient importance that attempts to employ gap filling procedures would incorporate major discrepancies in estimates for the missing trade statistics (Rozanski and Yeats, 1994).

Empirical analyses of OECD countries' statistics show these, and other factors, may produce discrepancies in partner country data of 50 percent or more in trade totals, with even larger errors in less aggregate trade statistics (Blades and Ivanov, 1985). However, no tests have yet been undertaken which attempt to measure the associated error for developing countries where gap filling procedures might make a major contribution in the estimation of missing data (see Table 1 for information on the recent status of trade data availability for non-OECD countries). This study will derive, and evaluate, such information in order to determine whether the partner country approach has any potential for gap filling

³In most cases, this involves the direct substitution of a partner country's trade data for another's missing statistics. A modified approach may use partner country data to estimate certain aggregates, like total imports and exports of given products, and then allocate these values to individual countries using some allocation procedure (see, for example, Baras, 1993). Clearly, such a procedure will "break down" if the partner country totals are highly inaccurate.

Table 1. The Availability of non-OECD Countries' SITC Revision 1 Comtrade Statistics as of January 1994.

Statistics Through	Countries with Available Information	1992 OECD Imports (\$ billion)	Number of Countries' Records	
			Containing Gaps	Total
1992	Argentina, Bangladesh, Belize*, Bolivia, Brazil, Bulgaria*, Chile, China*, Colombia*, Cyprus, Ecuador, Egypt, Fiji, French Guiana*, Guadeloupe, Guatemala, Honduras, Hong Kong, Hungary*, Indonesia, Israel, Jordan, Kiribati*, Macau*, Martinique, Mauritius*, Mexico, Morocco, Nicaragua*, Taiwan (China), Pakistan, Panama, Papua New Guinea*, Paraguay, Philippines*, Reunion, Singapore, Sri Lanka, Thailand, Trinidad/Tobago*, Tunisia, Turkey, Uruguay, Venezuela	372,931.7	13	44
1991	Algeria, Angola*, Barbados, Cameroon*, Cook Islands*, Costa Rica, Djibouti, Dominica*, El Salvador, Ethiopia, Faeroe Islands*, Grenada*, India*, Jamaica, Madagascar*, Malaysia, Netherland Antilles*, Oman*, Peru, Poland*, Qatar*, Romania*, Senegal*, Seychelles*, St Lucia*, Togo*, Tonga*, Vanuatu*, Zimbabwe*	84,781.9	19	28
1990	Czechoslovakia*, Kenya*, Libya*, Malta*, Nepal*, Syria*	23,620.0	6	6
1989	Aruba*, Brunei*, Central African Republic*, Cuba*, Kuwait*, Saudi Arabia	42,463.9	5	6
1988	Bahamas*, Bahrain*, French Polynesia*,	1,748.6	3	3
1987	Nigeria*, United Republic of Tanzania*	11,647.6	2	2
1986	Congo, Malawi*, United Arab Emirates	15,269.4	1	3
1985	Bermuda*, Cote d'Ivoire*, Dominican Republic, South African Customs Union*	16,816.6	3	4
1984	Cape Verde*, Ghana, Liberia, Sierra Leone*	1,973.9	2	4
1983	Afghanistan*, American Samoa*, Antigua-Barbuda*, Benin*, Bhutan*, British Virgin Islands*, Burkina Faso*, Burundi*, Cayman Islands*, Chad*, Christmas Islands*, Cocos Islands*, Comoros*, Equatorial Guinea*, Falkland Islands*, Yemen*, Gabon, Gambia, Gibraltar*, Guam*, Guinea*, Guinea-Bissau*, Guyana*, Haiti*, Iran, Iraq, Lebanon*, Maldives*, Mali*, Mauritania*, Mozambique*, Mymar*, New Caledonia*, Niger*, Rwanda*, St. Vincent and the Grenadines*, Samoa, Sao Tome & Principe*, Somalia*, Sudan, Suriname*, Tokelau*, Turks and Cacaos, Tuvalu*, Uganda*, U.S. Virgin Islands, Zaire*, Zambia*	19,417.1	40	48

*UN COMTRADE records may extend back to 1962. Countries having an asterisk have missing annual data for one or more years between 1962 and the latest year for which trade statistics, either D or N series, are available.

missing data. An attempt is also made to identify factors responsible for differences in partner country statistics, and to determine how extensively they occur. The report closes with an overall evaluation of gap filling procedures and provides recommendations as to the most promising ways for improving the quality and coverage of international trade statistics.

II. The Methodological Approach

The methodology used in this study intentionally creates "gaps" in selected countries' official UN trade data and then employs partner country statistics to generate estimates for this "missing" information. That is, country i 's official trade statistics (imports or exports) for product j , with partner country k (A_{ijk}), are "concealed" and estimates for this exchange are generated from the statistics of k (E_{kji}). That is, on bilateral trade flows it is assumed that,

$$(1) \quad A_{ijk} = E_{kji} \quad (j \text{ is a specific SITC group})$$

If i 's export data are being estimated then k 's import statistics are used for this purpose, while the latter's exports are used to estimate country i 's imports. A similar procedure is used to estimate aggregate trade flows with individual countries,

$$(2) \quad \sum_{j=1}^m A_{ijk} = \sum_{j=1}^m E_{kji} \quad (j = 1, 2, \dots, m)$$

or aggregate trade in individual products,

$$(3) \quad \sum_{k=1}^n A_{ijk} = \sum_{k=1}^n E_{kji}$$

where the summation is over all trading partners (k). Equations (2) and (3) can also be aggregated to yield estimates of total imports, or exports, of all goods. One problem that must be overcome, however,

regards valuation practices. Exports are normally reported on an f.o.b. basis while imports are recorded in c.i.f. terms. Transport and insurance charges can be of sufficient importance to bias gap filling procedures unless correction factors could be derived to account for their influence. This key point is discussed further in section IV of this study.

Before proceeding, several problems must be addressed concerning the countries and products to be included in the tests. Since there is little need for gap filling OECD members trade, the tests are confined to developing countries.⁴ Two considerations were used in making selections. First, the countries whose trade was to be "estimated" were drawn solely from those with available UN COMTRADE Series D statistics.⁵ This was to ensure that the tests were not biased by errors in the statistics of countries whose trade was being "estimated". Second, the countries records had to be distributed among partners, and to be available down to at least the four-digit level of the SITC.⁶ After compiling a list of countries that satisfied these criteria in 1983 (i.e., the year that COMTRADE records were relatively complete -- see Table 1), 30 countries were chosen with an objective being to achieve

⁴Australia is an OECD country where gap filling procedures might be employed. In an effort to preserve confidentiality, \$6.3 billion or 16.4 percent of Australia's 1992 exports were categorized as Special Transactions (SITC 931) so one is not able to identify the product composition of this exchange. Partner country trade data show the \$6.3 billion total was spread fairly evenly in three groups: metalliferous ores -- largely uranium (SITC 28); chemical elements and compounds (SITC 51); and coal and coke (SITC 32). Second, in 1993 customs controls on most EU intra-trade were removed with the result that statistics on this exchange have become highly unreliable. Partner country comparisons could be helpful for "flagging" flows where major discrepancies exist in report trade data.

⁵UN COMTRADE statistics are classified as Series D or N. The latter are generally composed of UN estimates based on partial information. The N series are less accurate and reliable than D series information.

⁶Rozanski and Yeats (1994) show discrepancies often exist in the compilation of UN COMTRADE statistics that may cause trade in component products, or with partner countries, to be inconsistent with reported trade totals. For example, the 1984 four-digit exports of Mauritania and Mozambique summed to 39 and 54 percent less than reported total trade, while Sudan's three-digit imports were 20 percent lower. From the mid-1960s to 1992 over 100 developed and developing countries had similar inconsistencies with their import and export statistics.

variation in terms of regions and levels of development. Table 2 lists the countries selected.⁷

While software developed within the World Bank -- specifically, the Trade Analysis and Retrieval System (TARS) -- allows one to aggregate the COMTRADE records of all partner countries of an exporter or importer, a question to be resolved is which products would be selected for the tests. To achieve as high a degree of precision as possible, both import and export totals were tabulated for partners of each "test group" country along with similar statistics at the one through four-digit level of the SITC. This procedure allowed one to determine how the comparability (equality) of partner country statistics changes with levels of aggregation.⁸ In other words, an attempt was made to determine whether partner country data useful for gap filling at high levels of aggregation, but are less reliable at (say) the three or four-digit SITC level.

A related question concerns the "weights," or relative importance, to be attached to partner country discrepancies at different levels of product aggregation. A review of research studies undertaken by the World Bank's International Trade Division over the last five years indicated that over 80 percent were based primarily on three and four-digit SITC statistics, although these data were often supplemented with information on aggregates like trade totals, or groups like foodstuffs, agricultural raw materials,

⁷If a year later than 1983 were chosen for these tests the results would have been biased by a lack of trading partner data. This point has important implications since it indicates "gap filling" can only be used for holes in historical records. As Table 1 shows the problem of "missing countries" increases as one moves from the early 1980s to 1990s with the result missing trade data for a growing number of potential partners increases.

⁸The average absolute percentage deviation (AVE_{ijk}) between the test and partner country data was used in these tests. It is defined as,

$$(4) \quad AVE_{ijk} = [\sum \sum | A_{ijk} - E_{jki} | \div A_{ijk}] \div N * J,$$

where N is the number of countries in the test group, and J is the number of products for which comparisons are made. This summation is carried out over all products and weighted using the trade of the test country. A problem exists with the "test" countries' statistics when some of their partners do not report trade data to the UN Statistical Office. In 1983 the most important of these missing partner countries were the Soviet Union, Peoples Republic of China and several East European Countries. To account for these gaps and exports to (or imports from) the missing countries, as well as those for which D series statistics were unavailable, were deleted from the records of the 30 test countries.

fuels, or manufactures. In contrast, little use was made of one or two-digit data. Therefore, the focus in this study is on the accuracy of gap filling procedures at quite high, and low, levels of detail.

Aside from its composition, many World Bank studies also focused on the direction of trade. Information on country origins, or destinations, of trade are particularly important in analyses of regional integration initiatives like the European Union, North American Free Trade Association (NAFTA), or the proposed Western Hemisphere Free Trade Agreement (WHFTA). In recognition of this point, separate tests were employed to assess the accuracy of gap filling for determining the direction of trade.

Two further points regarding the tests should be noted. First, Table 1 shows that missing country records are too extensive for gap filling to improve current, or even relatively recent, trade data. That is, too many partner's statistics are unavailable for gap filling to generate reliable estimates of a country's recent imports or exports. This problem appears to be particularly important for gap filling sub-Saharan Africa's intra-trade -- at least after 1983. Therefore, this paper examines the possibility of gap filling the historical record.⁹ For this reason 1983 was selected for tests since this was the last year that COMTRADE records were relatively complete. This point is important since the tests in this study are conducted under strictly controlled conditions which are, admittedly, most favorable to partner country gap filling. However, if they prove unreliable, even under such special (favorable) conditions, *the conclusion that must follow is that partner country data have no general utility for upgrading, or extending, international trade statistics* (they might, however, be useful in a case where it is known that a specific country's statistics incorporates serious errors). This conclusion would apply, equally, to procedures that directly gap fill partner country data, as well as to those where such data are allocated to missing records using some purely mechanistic procedure (Baras 1993).

⁹The potential utility of the gap filling approach has been complicated by some countries reporting trade data in different revisions of the SITC system. Revision 2 and 3 data may be of greater utility for research and policy studies since they provide more detail at lower levels of aggregation than the established Revision 1 system. However, in 1992 only 82 countries reported Revision 3 trade statistics to the UN Statistical Office so there were too many holes to try and gap fill these records.

A final important problem was how to deal with major trading countries that did not report to UN COMTRADE in the test period (China, the former USSR, and several Eastern European countries are among the most important missing reporters). In order to perform the gap filling tests on a "closed" group of countries, exports to (or imports from) these missing countries were deleted from the UN trade data of the test countries. In addition, the possibility existed that the tests could be "contaminated" by some estimated data stored in COMTRADE (i.e., the so called N Series). To prevent this from occurring, all countries without official UN Series D statistics were also deleted from the partner countries' records.¹⁰ In other words, the analysis in this report is based on a closed group of countries for which D Series trade data were available.

III. The Accuracy of Gap Filled Data

Table 2 compares export statistics of the 30 test countries with imports reported by their trading partners. Total exports, as well as those for broad product groups like foods and feeds, fuels, or manufactures are shown in the left half of the table (see the table notes for the SITC based definitions of these groups). The right side shows the percentage differences between the test country export statistics and the matched partner country import data. Due to the practice of reporting exports on an f.o.b. basis, and (partner country) import data in c.i.f. terms, the latter should exceed the former's exports. However, although it is known that wide variations exist in nominal freight costs across products and countries, there is insufficient information to precisely indicate what magnitude of f.o.b.-c.i.f. differences should be expected in Table 2 (see Tables 7 and 8 for some partial information relating to this point). The average (absolute) percentage difference between the partner country data is also shown to provide an overall indication of the importance of the discrepancies.

¹⁰In some cases, the test countries' reported exports going to geographically undetermined destinations like "areas not elsewhere specified." These entries were retained in the test countries records in order to determine their influence on partner country data comparisons. See Table 5 for more information concerning this point.

Table 2. Analysis of Differences Between Test Countries' Reported 1983 Exports and Partner Countries Reported Imports

Test Country	Value of Test Country Reported Exports (\$million)					Test Country/Partner Countries Difference (%)*				
	All Goods	Foods	Fuels	Manufactures	Other Goods	All Goods	Foods	Fuels	Manufactures	Other Goods
Argentina	4972.7	3221.1	320.8	1176.2	102.3	-16.7	-17.7	-5.6	-13.4	-28.1
Bangladesh	575.3	142.1	29.3	320.3	0.6	-4.2	-9.6	-0.2	-0.4	na
Brazil	19160.7	7702.0	911.4	7428.9	2034.0	-5.0	-10.5	2.7	0.1	-13.3
Burkina Faso	30.2	15.3	0.0	5.1	0.0	-62.5	-66.2	na	39.2	na
Congo	626.9	5.9	560.7	48.3	0.0	-82.7	-136.9	-75.5	-14.5	na
Costa Rica	831.8	574.5	14.7	225.3	5.0	-34.2	-28.9	39.2	-45.1	-36.5
Cote d'Ivoire	1805.1	1115.2	185.4	139.9	3.0	-20.7	-29.3	31.6	15.2	na
Dominican Republic	590.7	437.4	0.0	148.7	2.4	-56.2	-17.1	na	-123.9	na
Ethiopia	337.4	263.1	25.2	1.6	0.6	-15.1	-12.7	92.1	na	na
Egypt	2815.6	93.2	2004.9	216.3	93.5	-49.2	-104.6	-58.9	-74.2	-32.3
Gabon	1452.1	5.3	1166.7	80.7	97.3	-21.5	-280.0	-20.3	-26.1	4.4
India	7600.2	1553.3	1538.9	3719.4	469.4	-13.2	-18.9	7.4	-9.4	-32.9
Indonesia	20729.9	1245.8	16032.5	1258.2	739.8	5.9	-12.0	6.9	-18.4	-6.0
Jamaica	693.8	158.9	22.9	397.4	112.0	-6.8	1.5	-57.6	-2.4	-10.7
Jordan	226.9	39.2	0.0	56.8	129.5	-136.9	-299.7	na	-205.9	-16.4
Kenya	697.2	511.1	74.5	44.9	10.7	-17.0	-17.3	45.3	-117.8	84.5
Rep. of Korea	22625.5	1151.8	533.1	20534.4	227.1	12.6	-5.4	27.8	18.3	5.6
Madagascar	305.8	243.6	20.7	22.7	9.4	-7.6	-12.8	94.6	-27.1	-35.8
Malawi	192.2	185.4	0.0	5.6	0.0	-3.5	-1.7	na	-11.4	na
Mauritius	359.4	249.4	0.0	108.8	0.0	-4.2	-0.6	na	-9.4	na
Mexico	24486.3	1806.2	15815.9	5561.0	1074.6	-14.5	-16.6	-9.5	-31.1	-17.7
Pakistan	1930.9	360.0	56.9	1243.9	13.1	-11.0	-45.4	-74.2	3.8	-27.1
Philippines	4715.2	1392.4	102.8	1200.5	510.1	-24.1	-29.5	-134.0	-127.6	-30.2
Reunion	70.1	62.2	0.0	7.6	0.1	-11.2	-4.8	na	35.4	na
Sierra Leone	90.3	29.4	3.5	29.2	27.6	-74.3	-128.9	na	-51.8	-43.1
Sri Lanka	885.0	382.4	97.9	302.5	8.2	-20.7	-29.7	21.2	-23.0	-595.5
Singapore	20026.6	1229.3	5668.7	10066.4	530.2	14.3	45.7	-40.7	26.1	55.9
Trinidad & Tobago	2139.8	51.8	1769.3	311.4	3.6	8.5	3.6	9.1	14.8	-179.7
Tunisia	1805.7	133.8	851.6	752.2	48.1	10.6	-43.9	35.9	-5.9	-19.1
Uruguay	797.5	390.0	0.8	280.8	1.1	3.2	9.8	na	-10.8	na
Average Deviation	--	--	--	--	--	25.6	48.0	40.4	38.0	63.7

*The difference between the "test" country's reported exports and partner countries' reported imports divided by the export value. This result is then multiplied by one hundred. Negative values should occur since the import statistics include transport and insurance costs. Comparisons are not made for trade under \$3 million.

Source: Trade data compiled from the UN COMTRADE Data Base for countries with Series D statistics.

Table 2 results come as something of a surprise since such wide margins of error were not expected for these aggregate product groups. For example, total Dominican Republic exports are more than 50 percent lower than partner countries' reported imports, while overall discrepancies for the Congo, Jordan, and Sierra Leone exceed 70 percent.¹¹ For the 30 countries combined the average deviation in partner country data is about 26 percent for total exports, but the discrepancies for the foods and the "other" products group are considerably larger.

The most "perverse" data differences occur in fuels where more than one third of the partner country comparisons take the wrong sign. The Congo, Egypt, Jamaica and the Philippines report energy exports at least 50 percent below partner country imports, while Singapore is under-reporting exports by about one-quarter of a billion dollars. These differences are partially due to noncompliance with UN reporting guidelines. Egypt, for example, does not report crude oil exports from foreign corporations operating within its borders -- this produces major partner discrepancies in some years -- while Singapore fails to report refined petroleum exports to Indonesia (which were processed from Indonesian crude).

Aside from the magnitude of data discrepancies a second troubling point concerns the direction of the partner country differences. For the 131 bilateral trade comparisons in Table 2 almost one-quarter take the wrong sign. That is, the reported f.o.b. value of exports exceeds the c.i.f. value of partner countries' imports. This poses a serious problem for gap filling procedures since it implies any attempt to adjust for valuation differences would often increase the size of the errors in matched data.

Although the average partner country differences are higher for the test countries exports than for imports (25.6 versus 16.1 percent), Table 3 shows a major discrepancy again occurs for fuels. A

¹¹Statistical authorities in the Dominican Republic provided one explanation for this discrepancy. The Dominican Republic does not report exports originating in its export processing zones (EPZs), yet shipments from these zones are recorded as imports by the recipient country. A recent World Bank (1994) study estimated that approximately 40 percent of all Dominican Republic exports originate in EPZs. This problem is not confined to the Dominican Republic since Jamaica, Haiti and Mexico follow related practices. Export processing zones have been established in over 100 countries and there are major differences in the treatment of exports from, or imports into, these areas.

Table 3. Analysis of Differences Between Test Countries' Reported 1983 Imports and Partner Countries Reported Exports.

Reporter	Value of Test Country Reported Imports (\$million)					Test Country/Partner Countries Reported Difference (%) ^a				
	All Goods	Foods	Fuels	Manufactures	Other Goods	All Goods	Foods	Fuels	Manufactures	Other Goods
Argentina	4446.3	173.4	463.4	3359.7	210.4	-13.0	-8.1	6.2	0.6	11.4
Bangladesh	1331.4	298.0	129.6	753.0	49.6	-1.3	-20.8	34.5	-1.1	30.8
Brazil	10791.8	1414.5	3012.5	5708.1	433.5	14.7	9.4	26.3	10.5	17.2
Burkina Faso	270.3	68.2	48.4	146.5	1.4	14.6	31.3	33.5	4.2	na
Congo	592.0	79.7	14.2	493.3	3.4	9.6	14.8	-65.8	18.6	44.6
Costa Rica	970.4	100.3	189.2	639.1	24.1	8.3	11.1	15.8	7.0	26.4
Cote d'Ivoire	1647.4	328.1	271.7	1000.7	20.6	23.0	23.3	45.0	21.0	25.0
Dominican Republic	1249.1	178.6	463.4	568.7	13.6	-2.4	-17.7	35.3	-23.0	-7.0
Ethiopia	664.5	122.5	16.0	502.1	5.9	9.0	16.7	-115.2	17.8	0.1
Egypt	9492.0	2483.4	365.5	6109.1	113.3	-11.5	-7.2	-5.8	-11.4	6.7
Gabon	674.0	121.0	12.1	526.1	7.6	8.9	29.3	31.2	10.0	47.6
India	10701.3	1725.9	856.0	7070.2	647.6	6.1	10.8	41.0	-0.8	40.2
Indonesia	14658.2	1083.3	3234.0	9626.1	306.0	40.2	27.6	94.8	28.4	23.9
Jamaica	1505.4	259.2	457.4	709.8	25.1	21.3	24.3	21.6	19.8	58.7
Jordan	2153.0	463.6	19.5	1444.9	34.2	-11.4	-3.2	-68.2	2.3	31.3
Kenya	1154.4	121.2	305.3	680.6	17.6	25.0	19.2	73.9	8.5	41.1
Rep. of Korea	23727.8	2031.8	4915.5	13072.1	1426.7	22.2	7.0	40.3	18.8	30.6
Madagascar	341.8	77.7	25.6	225.1	3.3	11.2	10.3	43.3	15.4	53.2
Malawi	273.2	23.1	43.3	200.7	2.6	69.7	71.8	97.4	65.6	na
Mauritius	407.4	98.5	82.8	206.4	4.6	41.7	32.8	89.0	32.9	66.0
Mexico	10745.8	2195.0	244.5	7594.5	307.7	-13.4	0.3	-36.4	-14.0	5.1
Pakistan	4258.7	701.9	725.0	2499.8	129.4	4.0	13.7	27.7	-4.6	26.3
Philippines	6647.8	697.6	1177.6	3401.0	127.7	-0.1	3.5	15.5	-33.7	-31.3
Reunion	827.9	188.5	88.5	525.2	3.7	28.3	23.5	95.6	22.5	34.7
Sierra Leone	154.9	40.6	57.4	54.1	0.7	18.4	35.3	34.5	-0.9	na
Sri Lanka	1426.4	294.4	152.8	925.7	21.9	1.5	18.5	-8.8	3.8	19.1
Singapore	22749.1	1814.9	4902.5	14337.2	361.2	8.2	13.6	-7.4	14.4	-25.3
Trinidad & Tobago	2477.4	424.5	82.7	1846.4	35.3	-12.0	27.9	-1331.8	38.8	28.3
Tunisia	3009.8	460.7	366.5	1953.6	121.9	14.5	12.2	67.4	6.7	28.1
Uruguay	619.2	59.0	203.9	312.2	9.4	18.0	-1.2	62.5	-3.6	26.9
Average Deviation	--	--	--	--	--	16.1	18.2	89.1	15.3	29.1

^aThe difference between the "test" country reported imports and partner countries' reported exports divided by the import value. The result is then multiplied by one hundred. Positive values should occur since the test country import statistics include transport and insurance charges. Comparisons are not made for trade under \$3 million.

Source: Trade data from UN COMTRADE Data Base for countries with Series D information available.

large part of the overall problem is connected with Trinidad and Tobago's practice of not reporting crude oil imports, which will be refined and then re-exported. However, almost one-third of the fuel comparisons take perverse negative signs (which range upwards from 60 percent). This could result from OPEC members exceeding their quotas and under-reporting oil exports to conceal this fact. The broad product group comparisons (Table 2 and 3) revealed a surprisingly high degree of error which cast serious doubts on the general utility of partner country statistics for gap filling. A key question is how the reliability of the procedure changes at different levels of product detail. For a test, the average (absolute) percentage discrepancy between the 30 countries' statistics and their partner countries' data were computed for total trade, and also at the one through four-digit SITC levels.¹² Table 4 summarizes the results of these tests, for both imports and exports, by showing average percentage differences in the matched statistics at these different levels of aggregation.

Although it was anticipated that the data discrepancies would widen as one moved to more disaggregate levels, the size of the discrepancies was unexpected. At the four-digit SITC level the average difference between the test countries' exports and partners' imports is 47 percent -- almost double the error for trade totals. Sierra Leone and the Philippines have differences of 80 percent in their partner country data and two different factors appear at least partly responsible. Further investigation showed the Philippines shipments from export processing zones are not being recorded in its official trade statistics, while Sierra Leone's data appears to be biased by a major under-reporting (smuggling) of diamonds.¹³

¹²As one moves from higher to lower levels of detail an increasing problem of unmatched trade occurs. That is as one moves from (say) a one-digit category to its two-digit components partner country trade in the latter may be recorded in completely different products. As a result no direct trade statistics comparisons can be made. Where this problem is important the higher level (in this case one-digit SITC) error was employed in the computation of the more disaggregate (two-digit) product average error. Clearly, this required substitution causes a downward bias in the partner country data discrepancies.

¹³As an illustration, in the 1980s Sierra Leone reported annual exports of pearls and precious stones (SITC 667) ranging from \$2 to \$3 million while partner countries reported imports which were 30 to 60 times larger.

Table 4. Analysis of Differences Between Test Country and Partner Countries' Reported Trade at Different SITC Levels.

Test Country	Differences in Test Countries' Exports and Partner Countries Imports (%)					Differences in Test Country Imports and Partner Countries' Exports				
	All Goods	One-Digit SITC Level	Two-Digit SITC Level	Three-Digit SITC Level	Four-Digit SITC Level	All Goods	One-Digit SITC Level	Two-Digit SITC Level	Three-Digit SITC Level	Four-Digit SITC Level
Argentina	16.7	18.4	21.2	24.1	31.4	13.0	28.8	29.0	31.6	36.2
Bangladesh	4.2	10.2	15.6	18.1	26.2	1.3	20.4	29.2	43.5	49.1
Brazil	5.0	8.5	11.8	17.1	27.6	14.7	16.0	23.4	53.6	58.6
Burkina Faso	62.5	77.1	95.6	98.4	101.4	14.6	20.0	29.4	35.2	37.9
Congo	82.7	82.2	82.7	87.4	87.6	9.6	15.8	26.9	36.2	38.2
Costa Rica	34.2	35.8	37.1	38.5	40.5	8.3	19.9	25.4	30.3	34.7
Cote d'Ivoire	20.7	31.7	34.8	40.1	48.6	23.0	23.0	23.5	33.6	39.1
Dominican Rep.	56.2	56.5	62.6	69.5	74.2	2.4	32.5	35.5	45.4	52.8
Ethiopia	15.1	29.0	35.7	42.7	48.0	9.0	16.7	27.5	35.1	38.2
Egypt	49.2	49.2	51.2	67.9	69.7	11.5	28.6	36.6	43.9	44.5
Gabon	21.5	26.1	27.1	28.7	37.2	8.9	16.7	29.5	37.1	41.4
India	13.2	16.2	20.7	24.7	29.6	6.1	18.9	27.5	47.8	50.2
Indonesia	5.9	8.8	12.7	15.0	19.5	40.2	42.0	44.6	52.9	56.1
Jamaica	6.8	12.2	16.0	16.1	21.1	21.3	25.1	30.9	46.1	48.4
Jordan	136.9	136.9	141.7	143.1	146.0	11.4	22.0	37.6	56.9	60.1
Kenya	17.0	26.8	30.1	38.3	47.2	25.0	29.2	33.7	47.5	49.7
Korea, Rep. of	12.6	17.4	20.6	24.2	26.2	22.2	23.7	24.2	34.4	36.0
Madagascar	7.6	22.0	23.8	29.2	31.5	11.2	15.9	19.1	38.4	40.2
Malawi	3.5	19.1	19.9	28.8	32.9	69.7	70.2	70.7	74.8	76.7
Mauritius	4.2	4.2	5.6	5.8	7.1	41.7	43.2	44.9	48.6	50.4
Mexico	14.5	14.6	16.8	17.6	20.4	13.4	15.0	18.9	32.1	40.5
Pakistan	11.0	19.1	23.3	39.1	42.5	4.0	12.4	17.4	37.7	39.6
Philippines	24.1	74.2	75.9	80.1	84.0	0.1	40.4	45.4	53.2	56.5
Reunion	11.2	18.9	28.6	33.1	41.9	28.3	28.3	29.4	31.0	36.7
Sierra Leone	74.3	73.8	85.9	86.4	87.2	18.4	28.2	33.1	41.6	44.4
Sri Lanka	20.7	28.6	30.6	32.4	35.5	1.5	13.7	20.7	40.4	46.2
Singapore	14.3	37.3	38.4	41.8	47.0	8.2	13.2	16.0	29.8	38.7
Trinidad & Tobago	8.5	12.5	13.8	21.2	23.2	12.0	77.7	78.4	81.9	84.8
Tunisia	10.6	23.6	25.9	28.2	36.7	14.5	18.8	22.0	27.2	37.1
Uruguay	3.2	14.9	25.3	29.3	32.0	18.0	32.7	42.0	50.5	56.7
Average Deviation	25.6	33.5	37.7	42.2	46.8	16.1	27.0	32.4	43.2	47.3

A similar pattern occurs in the tests countries' import statistics except that even wider discrepancies occur in the partner country data as one moves to more disaggregate levels. At the four-digit level average discrepancies of 47 percent are observed with Jordan, Malawi and Trinidad and Tobago having discrepancies that exceed 60 percent. The clear message that follows from Table 4, however, is that the partner country approach to data gap filling for the product composition of trade incorporates such a wide degree of error that it is of very limited utility.

Direction of Trade Tests

Can partner country data convey useful information about the direction of trade? Although the previous tests show these statistics are inadequate for identifying its composition, the possibility exists that they may be more useful for identifying a country's trading partners, and indicating their relative importance.

Table 5 provides relevant information using export statistics of the 30 test countries. The table utilizes four indices that convey information relating to the direction of trade. The first measure, shown in column (2), indicates the number of individual countries that were reported to be trading partners in the test country's export statistics, while column (3) shows the number of bilateral flows where no matched trade is reported. The latter figure includes situations where: (i) the test country reported exports while the "partner" failed to report any matched imports, and (ii) cases where a "partner" reported imports while the test country did not report any matched exports.

Column (4) shows the share of each test country's exports that are assigned to various "not elsewhere specified," or other indeterminate geographic destinations. These tabulations are relevant since they indicate the overall importance of those exports that cannot enter into any partner country's data. Column (5) reports the share of total exports going to the three largest destinations (as shown in the test country's statistics), while column (6) shows the share of these same importers as reflected in partner

Table 5. Analysis of Differences in the Direction of Trade as Reflected in the Test and Partner Countries' Exports.

Test Country	Number of Trading Partners ¹		Share of test countries exports that are unallocated ²	Combined export share of the three largest trading partners ³		Partner country data comparability index ⁴
	Reported by the test country	Lacking bilateral reporting		Reported by the test country	Reported by importers	
Argentina	96	13	0.00	37.3	30.9	0.84
Bangladesh	74	29	0.05	36.8	26.6	0.76
Brazil	112	8	1.41	39.8	37.9	0.90
Burkina Faso	26	13	0.39	61.7	39.4	0.61
Congo	32	21	0.31	91.9	84.3	0.89
Costa Rica	74	16	0.74	58.2	56.3	0.84
Cote d'Ivoire	84	24	2.90	49.4	47.1	0.82
Dominican Rep.	45	16	0.00	83.0	84.2	0.87
Ethiopia	46	25	0.01	52.2	47.0	0.88
Egypt	72	29	10.05	46.6	50.2	0.66
Gabon	42	29	1.65	64.3	68.2	0.74
India	112	12	19.93	48.7	34.0	0.63
Indonesia	71	53	0.42	81.2	81.0	0.78
Jamaica	64	37	0.40	68.3	72.7	0.89
Jordan	47	19	0.00	51.3	42.8	0.74
Kenya	74	25	8.69	45.5	47.8	0.80
Korea, Rep. of	108	18	3.99	54.1	60.9	0.85
Madagascar	41	45	4.44	67.3	67.9	0.88
Malawi	52	21	0.00	50.9	47.0	0.81
Mauritius	44	22	0.00	29.1	28.0	0.48
Mexico	99	16	0.03	76.3	74.1	0.89
Pakistan	97	21	1.75	36.0	27.2	0.85
Philippines	100	24	0.01	64.5	61.0	0.91
Reunion	28	20	0.00	79.5	71.7	0.79
Sierra Leone	18	24	0.21	89.1	47.3	0.54
Sri Lanka	88	21	8.39	37.0	23.6	0.82
Singapore	84	37	1.87	47.5	36.0	0.76
Trinidad & Tobago	64	32	3.64	73.8	74.0	0.91
Tunisia	68	21	0.05	67.3	45.2	0.66
Uruguay	51	18	0.00	47.6	39.5	0.85

¹Column (2) shows the number of destinations reported by the test country for its exports while column (3) shows the number of bilateral trade flows where no partner country data are reported. Column (3) includes situations where a partner reports imports from a test country and the latter fails to report any matching exports.

²The share of total exports going to "nes" or other indeterminant country destinations.

³The share of exports going to the three largest country destinations as reported in the test country statistics compared with the share of these same country destinations as reported in partner country data.

⁴See the text for a definition of this index. Differences between the index value and unity indicate the share of a test country's total exports that cannot be accounted for by partner country data.

Source: Based on UN COMTRADE Series D trade statistics.

country data. The larger the differences between these two ratios the more "inconsistent" are the direction of trade patterns reflected in the test and partner country data. Finally, column (7) reports results for a index of "similarity" that was used to assess the overall importance of differences between the test and partner countries' statistics.¹⁴ Differences between these index values and unity indicate the share of each test country's exports that cannot be accounted for by partner country statistics.

Overall, the general impression conveyed by Table 5 is that the partner country data are no more useful for estimating the direction of trade than they were for its composition. Major discrepancies are observed in the number of trade contacts reflected in the two sets of statistics -- in the case of Madagascar more countries have unmatched trade (41) than have matched records (41) -- while geographically unallocated exports are also an important problem for some test countries. For example, between 8 to 10 percent of Egypt, Kenya and Sri Lanka's exports are assigned to "geographically indeterminant" categories, while the corresponding share for India is just under 20 percent.

Sizeable discrepancies are also observed in the ratios reported for the test countries three largest trading partners (columns 5 and 6). Differences of 10 percentage points, or more, occur for almost one third of the test countries. Three, Burkina Faso, Sierra Leone, and Tunisia actually have differences in their "three largest partner" ratios of 20 points or more. Finally, the partner country data comparability index also testifies to the importance of the discrepancies in the matched data. For the 30 countries combined this index averages 0.78, which indicates that more than one-fifth of the variation in the test countries' trade was not accurately reflected in partner country data. In the case of Mauritius over one half the variation in trade patterns is "unexplained".

¹⁴The similarity index (I_s) is defined as,

$$I_s = 1 - [\Sigma | x_{ii} - i_{pi} |] \div 2$$

where x_{ii} is the share the test country's exports reported as going to partner i , while i_{pi} is the corresponding share for i as reflected in the partner country data. The index ranges between zero and one. The higher the index value the more similar the two trade structures.

IV. Why Does Partner Country Gap Filling Fail?

Why are partner countries' data so unreliable for estimating the level, composition, or direction of trade? World Bank analyses of COMTRADE indicate quality control problems in processing UN statistics, difficulties in accounting for trade through entrepots, or that originating in export processing zones, valuation problems, misclassification of goods, incentives to intentionally falsify trade data, or efforts to preserve commercial confidentiality are among the factors responsible. The following discussion indicates how these problems affect partner country data comparability, and also provide some indicative examples of their potential importance.

A point that should be recognized is that the discussion which follows is based on previously identified anomalies in COMTRADE that will cause discrepancies in partner country data. Although the specific examples cited are significant, in themselves, there is no way of accurately determining the full extent to which they occur throughout COMTRADE. Put differently, there is no way to quantitatively assess their full influence in the COMTRADE Data Base. In this sense, the examples which are cited may only provide a "tip of the iceberg" indication as to the full extent and importance of their influence on partner country data.

A. "Quality Control" Problems

From trade totals down through the first four levels the SITC is, with a few exceptions, a closed hierarchial system. That is, if one accounts for the exceptions, the sum of trade in one, two, three or four-digit SITC products should equal total trade. If this equivalency is broken an error has been made in processing, or reporting, trade data.

Tests show this "non-equivalency" error occurs in COMTRADE with a surprisingly high frequency. As an illustration, Table 6 reports findings for 40 countries -- 20 exporters and 20 importers -- where total trade values were compared with the sum of reported trade in lower level products. The

Table 6. Examples of Discrepancies between Reported Trade Totals and Trade In Component Products.

Flow and Country (Year)	Years with Discrepancies ¹	SITC Level	COMTRADE Statistics ²		
			Reported Total (\$mill.)	Sum of Components (\$mill.)	Percentage Difference (%)
EXPORTS³					
Afghanistan (79)	15	3	223	1,672	651
Zimbabwe (81)	7	3	656	819	25
Sudan (82)	6	3	562	625	11
France (89)	12	4	172,561	161,110	-2
Germany, Fed. (87)	11	4	293,790	282,038	-4
India (87)	10	4	12,040	11,558	-4
Sweden (89)	29	4	51,497	49,437	-4
Canada (87)	24	4	92,886	86,384	-7
United States (87)	26	4	243,682	226,624	-7
Rep. South Africa (83)	2	2	10,144	9,129	-10
Austria (82)	25	4	15,690	14,121	-11
Ecuador (86)	3	4	2,184	1,922	-12
Czechoslovakia (80)	6	2	14,891	11,913	-20
Panama (82)	24	4	310	239	-23
Venezuela (90)	6	2	17,220	12,054	-30
Mauritania (84)	5	4	297	181	-39
Mozambique (84)	4	4	86	40	-54
Poland (89)	10	4	13,446	5,387	-60
Papua, New Guinea (79)	7	3	963	273	-72
Mauritius (86)	2	4	682	68	-89
IMPORTS³					
Mali (86)	21	4	496	982	98
United States (88)	26	4	458,681	454,094	-1
United Kingdom (87)	16	4	154,406	152,862	-1
France (90)	29	4	232,525	227,874	-2
Ecuador (86)	7	4	1,806	1,751	-3
Germany, Fed. (85)	2	4	157,597	152,869	-3
Japan (90)	3	4	231,236	221,975	-4
Netherlands (86)	26	4	75,580	72,557	-4
Norway (90)	9	1	26,889	25,449	-5
Iran (88)	20	4	7,074	6,649	-6
Nigeria (85)	27	4	6,205	5,832	-6
Austria (82)	26	4	19,514	17,758	-9
Haiti (88)	19	4	344	313	-9
Iceland (90)	4	4	1,659	1,510	-9
Peru (83)	12	4	2,234	2,011	-10
India (84)	11	4	14,412	12,826	-11
Libya (86)	27	4	3,789	3,107	-18
Sudan (82)	26	3	1,736	1,389	-20
Syria (87)	14	4	4,269	3,067	-28
Nepal (89)	10	4	545	370	-32

¹The number of years in which the sum of the components failed to equal the reported trade total. The maximum number of years for which comparisons could be made is 29 although most countries have fewer years.

²The independently reported total trade figure is compared with the sum of component SITC products. The SITC component product level is indicated in column three.

³Over 200 countries had differences between their reported export totals and the sum of SITC components for at least one year.

table shows the COMTRADE total for each country, the sum of trade reported for components, and the percentage difference between these figures. The table also indicates the level of SITC components being aggregated, and the number of years for which similar discrepancies occur.¹⁵

These comparisons show important inconsistencies exist in which will influence the accuracy of partner country gap filled data. For example, in 1987 discrepancies of 10 percent occur between US total exports and the sum of trade in two-digit SITC components. This implies that approximately \$17 billion was "lost" from US records -- which would not show up in gap filled data.¹⁶ Similarly, a \$1.4 billion difference occurs between Norway's 1990 total imports and the sum of this country's one-digit level imports. A surprising point concerns the number of other OECD countries like the France, Canada, Germany and Austria which have similar discrepancies, and the fact that these differences persisted for 20 years or more. These data "quality control" problems will clearly have a major negative impact on the reliability of COMTRADE statistics for gap filling missing data.

B. The Freight and Insurance Factor

International transport and insurance costs are responsible for some of the discrepancies observed (Tables 2 through 4) in partner country statistics, yet the true importance of these charges often is not fully recognized. Exports are normally reported in free-on-board (f.o.b.) values while imports include transport and insurance charges (c.i.f.). As such, if a partner's imports are substituted (gap filled) for a country's exports the results should be upward biased. Gap filled data should be downward biased if

¹⁵Normally, if an error occurs at a higher SITC level it carries through to more disaggregated products. For example, Table 6 shows that Venezuela's 1990 two-digit exports sum to 30 percent less than the \$17.2 billion total export figure. This, or a larger discrepancy, exists in the sum of three and four-digit SITC products.

¹⁶The results for Canada, India and the United States are explained, in part, by the complex and often rapidly changing national trade classification systems these countries maintained and problems in deriving accurate concordances to the SITC. World Bank studies of US trade barriers have often found that some products defined in the national system are not included in existing concordances and, therefore, drop out of records when the data is translated into the SITC.

exports are substituted for imports. A key question is whether freight and insurance charges are relatively small (and can, therefore, be ignored) or whether they will produce an unacceptable bias in gap filled data. Available evidence indicates detailed information on transport and insurance costs for bilateral trade flows will be needed before partner country gap filling procedures can hope to work. At present, the required data do not exist, nor do there appear to be any prospects for deriving this information in the foreseeable future. *These points, by themselves, appear sufficient to invalidate any proposal for estimating missing trade statistics that utilize partner country data as an important input.*

As an illustration, Table 7 provides statistics, which are based on transport and insurance cost data collected by six Latin American countries, as to the potential importance of f.o.b.-c.i.f. valuation differences -- particularly for developing countries' intra-trade where the most serious gaps occur in COMTRADE. Major variations occur (from 1.1 to 94.8 percent) in nominal freight rates for individual country's exports to the six Latin American markets -- reflecting factors like the composition of goods shipped, or variations in the quality and type of transport services utilized.¹⁷ These sizeable differences in international transport costs have important implications for gap filling in that they show separate transport cost factors will be required both for each individual country's trade that is to be "approximated". If the f.o.b.-c.i.f. adjustment is not made, with unique ratios for each bilateral trade

¹⁷Generally, the f.o.b.-c.i.f. adjustment factor on bilateral trade between developing countries is higher than on North-North or South-North trade flows. There are various reasons for this discrepancy such as the direction of liner conference routes. Typically, liner routes follow South-North or North-North patterns so many developing countries' intra-trade must be completed on indirect routes that involve off-loading in a way-port. This trade often involves smaller volumes which can mean higher freight rates if transport economies of scale are important. Also, capital costs (and small volumes) may prevent the most efficient shipping technologies -- like unitized or cargo bulking procedures -- from being used. Finally, the anti-competitive cargo reservation laws adopted by some developing countries have inflated their own freight rates. For a discussion and empirical evidence see Bennathan (1989), Fashbender and Wagner (1973), Lipsey and Weiss (1974), Livingston (1986), UNCTAD (1978), or Yeats (1981).

Table 7. Nominal Freight Rates for Selected Countries' Exports to Latin America.

Exporting Country	Nominal Freight Rate to Destination (%)					
	Argentina	Brazil	Chile	Mexico	Peru	Uruguay
Argentina	--	6.2	8.4	9.0	15.6	2.2
Australia	20.4	24.5	19.3	9.0	41.7	21.2
Austria	6.5	11.1	7.1	4.6	10.8	9.9
Bahamas	6.0	24.8	3.4	2.8	1.3	11.0
Bangladesh	6.4	4.2	14.9	6.7	5.2	32.1
Bolivia	2.9	5.7	13.3	10.8	28.8	19.8
Brazil	9.0	--	9.2	7.4	12.3	1.4
Bulgaria	25.1	6.1	10.6	17.3	24.4	--
Cameroon	25.4	7.2	--	3.8	17.9	20.0
Canada	14.7	13.2	11.5	6.1	17.6	15.5
Chile	6.5	6.8	--	4.0	10.2	16.3
China	17.2	14.2	15.6	6.1	18.5	12.7
Colombia	11.0	29.9	10.7	7.9	13.5	12.3
Congo	25.1	--	--	19.8	--	37.7
Costa Rica	5.3	4.5	6.2	3.3	9.1	11.1
Cuba	33.6	12.6	7.8	11.6	27.4	9.6
Ecuador	25.0	9.2	15.6	2.2	10.4	10.6
European Community (12)	8.1	7.8	9.5	3.9	8.6	9.7
Egypt	30.6	9.7	20.6	25.3	17.8	13.1
El Salvador	5.8	14.9	10.3	4.9	19.5	2.2
Ethiopia	3.8	--	13.9	11.5	17.8	--
Finland	17.7	14.5	7.5	6.8	18.0	12.6
Guyana	34.2	32.5	31.4	30.7	31.1	--
Hong Kong	11.5	11.5	--	6.1	18.5	19.1
India	19.7	15.2	20.9	8.5	17.2	21.7
Indonesia	34.0	15.6	22.6	8.5	12.3	11.7
Japan	10.2	10.6	11.1	6.3	11.4	13.6
Mexico	9.0	11.7	12.2	--	10.1	10.6
Morocco	94.8	23.5	--	27.5	--	9.1
Pakistan	15.2	9.3	19.5	11.1	33.7	14.5
Peru	12.3	6.3	8.9	11.3	--	9.9
Philippines	27.0	20.5	29.3	5.5	67.2	13.9
Saudi Arabia	31.1	12.7	17.3	--	14.1	29.5
Singapore	15.3	8.3	10.2	6.8	20.4	17.8
Rep. South Africa	12.3	17.3	16.6	--	21.7	17.2
Rep. South Korea	16.4	9.8	13.8	4.1	12.7	17.3
Sri Lanka	21.2	20.7	31.8	13.4	10.1	23.4
Sweden	9.9	7.6	7.9	3.2	19.7	5.9
Taiwan, China	17.7	13.8	12.2	--	9.5	16.6
Turkey	18.5	17.7	14.4	14.2	15.2	19.0
United States	9.7	8.2	9.9	4.6	19.0	12.2
Uruguay	2.8	1.1	9.5	8.2	12.7	--
Venezuela	45.5	8.2	20.6	7.8	9.1	9.1
Zimbabwe	31.9	11.3	15.8	30.8	--	19.2
MEMO ITEM:						
Nominal Freight Rate Range						
Low Value	2.8	1.1	3.4	2.2	1.3	1.4
High Value	94.8	32.5	31.4	30.8	67.2	37.7

Source: Yeats (1989)

flow, the resulting error will generally invalidate the use of gap filled data for analytical purposes.¹⁸

Assuming one can (somehow) derive transport cost information for bilateral trade flows for each country, and year, trade data are to be gap filled (accepted empirical procedures for generating such information do not now exist), a key question is whether an aggregate f.o.b.-c.i.f. ratio derived for all goods can be applied to individual products. In other words, if (say) the three-digit SITC level is to be gap filled, is the variation in freight costs for individual products sufficiently small that one overall transport factor -- like that derived for total trade flows -- can be applied to the lower level information. If this is not the case, then the amount of estimation required to derive individual product factors will preclude the use of partner country data for gap filling.

A hypothetical example is useful for making this point. Assuming that gap filling will be done for both imports and exports, and (say) there are an average of 20 partner countries that comprise origins and destinations of trade, a total of 7,200 separate f.o.b.-c.i.f. adjustment factors would have to be estimated *for each country per year*.¹⁹ This total assumes some 180 different three-digit products are traded.²⁰ Unfortunately, the available evidence strongly suggests that freight cost adjustment factors

¹⁸Although comprehensive information on international transport costs is relatively sparse, there are other investigations that support this conclusion. Drawing on data for the early 1950s, Moneta (1959) shows that the average aggregate ad valorem freight rate for exports to the Federal Republic of Germany range from about 2 percent for the United Kingdom and Netherlands to more than 40 percent for Tunisia, Honduras, Iraq and Venezuela. MacFarland (1983) shows that the average nominal transport costs for least developed countries' exports to the United States are about four times the average for other countries.

¹⁹The need for annual freight factors is evident from nominal freight rates compiled by UNCTAD (various issues) for commodities shipped over specific liner routes. Over a ten year period, for example, ad valorem transport costs for rubber fluctuated between 8 and 19 percent, while freight rates for copra, jute, coffee, cocoa, tin, and tea experienced fluctuations of a similar magnitude.

²⁰At the four-digit SITC level (A_f) annual adjustment factors are needed for each country whose data were to be gap filled,

$$(1) \quad A_f = I_n * P_m * Y_k * N_c * 2$$

where: I_n is the number of products traded (roughly 500 on average at the four-digit level of the SITC for the types of countries that need to be gap filled); P_m is the number of partners (20 appears to be a reasonable number for this

would have to be approximated individually -- across countries -- at the product level of detail.

As an illustration, Table 8 summarizes estimates of India, Indonesia, Republic of South Africa, Australia, United Kingdom nominal freight rates for three-digit SITC products exported to the United States. India's ad valorem transport costs differ between products by more than 50 times with non-ferrous ores (SITC 283) having a nominal freight rate of about 53 percent and pearls and precious stones' (SITC 667) have a rate averaging under one percent. A range of about 74 percentage points occurs in South Africa's nominal transport cost for individual products (the range is 44 percentage points for Indonesia, and 42 points for Australia). Even for the United Kingdom a surprisingly wide variation occurs with exports of fresh fruit having a nominal freight rate more than 12 times that for silver and platinum. A point to note is that these comparisons are all made for North-North and South-North trade flows -- evidence exists that even wider variations occur on South-South trade (see Yeats 1981). In short, **Tables 7 and 8 show that comprehensive and accurate information on f.o.b.-c.i.f. ratios are required for partner country gap filling to achieve minimal standards required for research and policy studies, yet such information is not now unavailable, nor does it appear to have any prospect of becoming available in the foreseeable future.**

term); N_c is the number of countries whose trade needs to be gap filled (at least 20 -- see Table 1 -- but the true figure could be in the 40 to 60 range); Y_k is the number of years that require gap filling (say 5 on average -- see Table 1; and the factor of 2 is required to account for imports and exports. These parameters suggest that, in order to gap fill a single country's data for only one year the minimum number of adjustment factors would be,

$$(2) \quad A_r = 500 * 20 * 1 * 1 * 2 = 20,000 \text{ factors}$$

To gap fill a minimum 20 countries would require,

$$(3) \quad A_r = 500 * 20 * 1 * 20 * 2 = 400,000 \text{ factors}$$

with some two million adjustment factors needed if the gap filling were extended over a five-year period.

Table 8. Cross-Product Variations in Nominal Freight Rates for Specific Countries Exporting to the U.S.

SITC	Description	Average nominal freight rate for all US imports (%)	Nominal freight rates for exports to the U.S. (%)				
			India	Indonesia	Rep. South Africa	Australia	U.K.
653	Woven textile fabrics	5.8	20.0	19.3	--	--	9.4
652	Woven cotton fabrics	5.4	8.7	34.1	--	--	9.4
841	Clothing	8.0	15.9	10.4	--	--	6.6
667	Pearls and precious stones	0.5	0.8	1.4	0.6	2.4	3.9
051	Fresh fruit and nuts	12.7	6.4	21.0	74.3	38.4	17.0
061	Sugar and honey	6.8	9.3	--	35.6	8.2	12.1
292	Crude vegetable materials	12.0	13.4	38.6	29.0	8.0	7.4
031	Fresh and preserved fish	7.0	12.6	10.2	6.4	3.7	8.7
657	Floor coverings	8.7	14.0	25.0	18.2	--	9.4
075	Spices	8.9	12.6	8.4	--	--	7.6
656	Articles of textile material	8.2	11.1	32.8	24.1	10.3	9.4
074	Tea and Mate	15.9	18.4	18.3	--	--	7.6
071	Coffee	5.4	8.0	10.6	--	--	7.6
011	Fresh and frozen meat	10.5	15.6	--	--	14.1	9.5
611	Leather	4.9	9.4	16.1	3.9	8.0	3.9
032	Fish in airtight containers	5.6	12.6	12.7	20.0	3.7	8.7
697	Household equipment	12.2	17.6	--	19.6	6.2	8.0
693	Wire products	9.8	14.2	18.1	19.3	6.7	8.0
673	Iron and steel bars	12.0	20.1	--	24.6	14.0	14.1
851	Footwear	9.2	25.3	--	--	--	6.5
695	Hand tools	6.7	6.7	--	4.1	3.1	8.0
671	Pig Iron	7.9	17.0	--	--	--	14.1
422	Fixed vegetable oils	4.0	10.4	5.5	4.4	--	5.1
897	Jewellery	3.9	13.7	5.6	--	--	5.5
681	Silver and platinum	0.5	2.1	--	2.1	--	1.4
651	Textile yarn	8.6	26.9	18.0	12.3	7.2	9.4
663	Mineral manufactures	7.0	8.1	26.1	24.6	5.2	3.9
694	Nails, screws and bolts	7.3	17.0	26.0	23.8	6.8	8.0
654	Lace and embroidery	5.7	9.1	--	--	--	9.4
632	Wood manufactures, nes	8.6	28.4	29.7	--	--	14.8
291	Crude animal materials	11.0	10.5	19.6	29.2	8.0	7.4
512	Organic chemicals	8.3	7.9	11.6	17.9	15.2	8.9
276	Other crude materials	12.8	35.7	45.0	32.0	8.0	9.9
729	Electrical machinery, nes	3.2	9.7	1.5	12.6	4.9	6.5
612	Leather manufactures	6.2	21.1	--	--	16.1	3.9
831	Travel goods	10.2	17.1	--	--	--	11.0
698	Metal manufactures, nes	6.8	16.8	--	23.8	6.2	8.0
284	Non-ferrous metal scrap	3.8	37.8	--	3.0	43.4	2.2
896	Antiques and works of art	1.0	9.3	6.5	1.4	--	5.5
679	Iron and steel castings	7.8	28.5	--	17.7	14.0	14.1
283	Non-ferrous metal ore	16.5	52.8	--	30.6	18.6	2.2
599	Chemical materials, nes	7.1	17.1	9.4	12.1	15.2	6.0
655	Special textile fabrics	9.7	16.1	23.1	10.6	15.2	9.4
678	Iron and steel tubes	10.9	15.8	15.2	--	16.0	14.1
263	Cotton	4.6	17.8	--	--	--	7.3
	MEMO ITEM						
	Minimum Freight Rate	0.5	0.8	1.4	0.6	1.4	1.4
	Maximum Freight Rate	16.5	52.8	45.0	74.3	43.4	17.0

Source: Yeats (1976)(1977)(1979) and Sampson and Yeats (1977)(1978).

C. The Problem of Entrepots

Entrepots also contribute to the sizeable discrepancies in partner country statistics. Entrepots are commercial centers through which exports (from the true country of origin) pass to the true final destination of the shipment. Because entrepot trade transits through these intermediate centers (goods are normally off loaded from a vessel, stored in a bonded warehouse, and then forwarded to the final destination) an exporting country will often report the entrepot as the destination for its shipments since the true importer may be unknown. An importing country, on the other hand, should have more accurate information on the origin of these shipments from customs vouchers. As such, the exporter and importer would report different origins (destinations) of trade, thereby producing discrepancies in partner country statistics.²¹

Table 9 employs data on Hong Kong's entrepot trade to illustrate the potential magnitude of bias that may result. This example focuses on persistent discrepancies between official Chinese and United States trade statistics. Chinese trade data consistently under reports exports to the United States (by as much as \$18.9 billion in 1992), and Hong Kong re-exports seemingly account for about one half of the discrepancy. Two points should be noted regarding these comparisons. First, Chinese goods are often transshipped through other entrepots (like Singapore -- which does not report this exchange to the UN) and this may explain why Hong-Kong re-exports account for only about one-half of the US-Chinese trade data discrepancy in 1992 and 1993.

²¹Various COMTRADE classifications for the origins or destinations of trade will produce a similar bias. Two such categories are "for ships" or "for bunkers". These are used when an exporting country does not have information on the true destination of goods that are loaded on docked in a national harbor. The country eventually receiving these shipment would probably have reliable information on their origin. Major divergences in partner country statistics are often caused by diversion of shipments "on route". The destination of a vessel may be changed while the ship is in open ocean (this often happens for petroleum exports) and the original exporting country would probably not be informed of this change.

Table 9
Discrepancies in Chinese and United States Partner Country Trade Statistics
Compared with Reported Re-Exports from Hong Kong

Year	China's Reported Exports to the US	US Reported Imports from China	US-China Reported Trade Difference	Hong-Kong Re-Exports to US
1990	5,175.3	16,260.8	11,085.5	8,532.6
1991	6,147.5	20,276.4	14,128.9	8,104.1
1992	8,599.4	27,450.2	18,850.8	8,356.6
1993	16,972.7	33,673.2	16,700.5	7,801.4

Source: United Nations COMTRADE Data Base

Although statistics on the global dimensions of entrepot trade are not available, data which exist strongly suggest it should have an important negative impact on the comparability of partner country statistics. For example, two of the 24 countries (out of close to 200 reporters in COMTRADE) that provide this data (the United States and Hong Kong) report annual entrepot trade in excess of \$100 billion, and estimates place Singapore's (unreported) entrepot trade around \$30 billion. Even higher totals have been estimated for some major European access ports such as Rotterdam. In short, entrepots are another reason why partner country data prove to be of little utility for gap filing.

D. The Treatment of Export Processing Zones

Export processing zones (EPZs) can account for a sizeable share of some countries' trade, yet major differences exist as to how shipments from these areas are recorded -- many countries simply do not report exports from, or imports into, EPZs in their official statistics. In contrast, importing countries of the final goods manufactured in these areas will normally record such shipments as coming from the country where the zone is located. As an example of their potential importance, a recent World Bank (1994) study determined that 40 percent of the Dominican Republic, Jamaica, and Haiti's exports are unreported in national trade statistics since these shipments originate in export processing zones.

Comparisons of Mexican-American trade data provide a further, useful, example of how EPZs produce discrepancies in partner country data. Mexico established processing zones along its border with the US where intermediate goods are imported, further processed, and then re-exported to the United States.²² Mexico excludes these shipments from export statistics reported to the United Nations, while US import data record them as originating in Mexico. Table 10 illustrates the potential importance of this problem by comparing reported Mexican exports to the United States with the latter's imports from Mexico. As indicated, these reporting differences produce annual discrepancies ranging from 22 to over 70 percent of the exports reported by Mexico.²³

Table 10
Mexican-United States Trade Data Differences and the Problem of Export Processing Zones

Year	Reported Mexican Exports to US (\$million)	Reported US Imports from Mexico (\$million)	Difference (million)	Percentage Difference (%)
1985	15,858.3	19,351.7	3,493.4	22.0
1986	13,733.8	17,538.8	3,805.0	21.5
1987	13,265.1	20,511.2	7,246.1	54.6
1988	13,453.2	23,518.6	10,065.4	74.8
1989	16,091.9	27,442.1	11,350.2	70.5
1990	18,491.3	30,766.1	12,274.8	66.4
1991	18,728.7	31,767.4	13,038.7	69.6

Source: United Nations COMTRADE Data Base

In short, inconsistencies in reporting shipments from EPZs are another reason why partner country data are very unreliable for gap filling missing data. Available UN statistics are insufficient to permit a global assessment of their influence, but the existing country specific data indicate EPZs are of

²²This activity is encouraged by special tariff provisions which only levy import duties on the value added content of US intermediate goods that are further assembled abroad. See Finger (19) for an early economic analysis of the importance and effects of these provisions.

²³Sometimes differences of the sort reflected in Table 10 may be the result of other factors -- such as false invoicing of trade to facilitate capital flight. This should not be a consideration in the US-Mexican case as the two countries' currencies are fully convertible. Also, the trade data discrepancies are closely comparable to other studies that have attempted the value of shipments from Mexico's processing zones.

considerable importance.

E. Insufficient Attention to Exports

Countries clearly have a greater incentive to compile more accurate information on imports than they do on exports. Tariffs are applied to imports, as are nontariff barriers for "sensitive" goods like textiles, clothing, footwear, ferrous metals and many agricultural products. Customs authorities do not have a similar incentive to monitor exports. For example, investigations that attempted to reconcile US export statistics and partner country import data clearly show the potential major importance of this problem (see UN Economic and Social Council 1990, for example) and the magnitude of bias it could implant in gap filled data.

As an illustration, Table 11 indicates that, over 1980 to 1986, reported US exports to Canada ranged between \$6.7 to \$12.4 billion below totals shown in Canadian import statistics. These comparisons suggested that 20 to 30 percent of United States exports may have gone unreported. The persistent discrepancies drew special attention since the US and Canada are contiguous countries, therefore, f.o.b.-c.i.f. valuation differences should not be a causative factor.

Detailed analyses of the data discrepancies, including spot surveys of the value and composition of border traffic, showed inadequate US customs controls and procedures for monitoring exports was the principal factor behind the discrepancies. As a result, the United States essentially acknowledged it could not compile reliable information on its exports to Canada, and now substitutes *import statistics compiled by Canada* in its official export records.

Table 11
The Unreliability of Export Statistics: An Example Drawn from US-Canadian Trade

Year	Reported United States Exports to Canada (\$million)	Reported Canadian Imports from United States (\$million)	Difference (\$million)	Percentage Difference (%)
1980	32,557.3	40,439.5	7,882.2	24.2
1981	37,192.2	44,755.3	7,563.1	20.3
1982	31,755.0	38,421.3	6,666.3	21.0
1983	35,666.6	43,118.4	7,451.8	20.9
1984	43,496.6	52,033.6	8,537.0	19.6
1985	44,142.9	53,179.2	9,036.3	20.5
1986	41,894.2	54,307.0	12,412.8	29.6

Source: United Nations COMTRADE Data Base.

What are the implications of the US-Canadian reconciliation study for using partner country statistics for gap filling? Put directly, the US-Canadian tests show that even a country like the United States, which probably has procedures for monitoring trade that are generally as accurate as any other OECD member, and almost certainly more reliable than those in most developing countries, has inaccurate information about the level and composition of its exports. The observation, by itself, is sufficient to invalidate the use of some official data for gap filling missing import statistics.

F. Commercial Confidentiality

When exports originate in a small number of enterprises, countries may wish to obscure details for reasons of business confidentiality. This "concealment" can be accomplished by classifying shipments in various "not specifically provided for" (nspf), "not elsewhere classified" (nec), or "special transactions" classifications in the SITC, or in some 20 UN geographic categories that do not identify the true trading partner. The latter may include designations such as "other Europe n.e.s.", "areas n.e.s.", "special categories", or a "not specified" group. Importing countries, on the other hand, normally will not have a similar incentive to preserve (exporters) confidentiality and are generally report the origin and composition of this exchange correctly. The latter may, however, conceal the nature of transactions

where issues relating to importer confidentiality arise. As a result, partner country data will often incorporate important discrepancies that are the result of efforts to mask the nature of trade transactions.

As an illustration of the global importance of this problem, over 1989 to 1992 annual global exports averaging \$63 billion were classified in COMTRADE in one such "miscellaneous" category (SITC 931 -- Special Transactions), while the corresponding import total was about \$10 billion lower. This implies that 3 to 4 percent of world imports and exports will not "match up" in comparisons of partner country trade data due to this one factor alone. However, for some countries the bilateral discrepancies are far higher. Over 1988-92, for example, about one-fifth of Australia's exports were classified as special transactions (SITC 931), while the corresponding share for the Philippines fluctuated between 25 to 35 percent. Export data will, accordingly, fail to identify the nature of these goods, yet they should be accurately recorded in importing countries statistics.

Table 12
How Special Transactions (SITC 931) Produce Discrepancies in Partner Country Data:
Examples from Australian and the Philippines Export Statistics

Year	Australian Exports		Philippines Exports	
	Value (\$ mill.)	Special Transactions (%)	Value (\$mill.)	Special Transactions (%)
1987	24,165.0	2.4	5,570.9	28.7
1988	29,765.8	17.1	6,994.4	29.2
1989	33,246.9	18.9	7,820.6	29.1
1990	36,022.1	20.4	8,090.7	30.9
1991	37,772.3	19.4	8,838.3	--
1992	38,081.2	16.4	9,789.6	31.6

Source: United Nations COMTRADE Data Base.

The conclusion which follows is that efforts to preserve commercial confidentiality are one further reason why large discrepancies may occur in partner country statistics.

G. Incentives to Falsify Trade Data

Partner country trade data can also be biased by the fact that countries (or individual traders) may have incentives for purposefully falsifying details of some transactions. For example, OPEC members may intentionally not provide accurate information on the direction of some exports (which have been shipped on concessional terms), while partner country comparisons suggest there has also been under-reported to conceal noncompliance with export quotas. As an example, in 1985 and 1986 the UAE reported global petroleum exports of \$22.4 and \$31.6 million while partner countries reported imports of \$14.2 and \$8.7 billion respectively. Similar discrepancies occur in coffee or cocoa producing countries' statistics where exports were (supposedly) limited by ceilings that were negotiated in international commodity agreements (see Yeats 1990).

Individual exporters and importers may also have important incentives to falsify information on the true value of trade. Importers may, for example, try to misstate (downward) the value of trade in products that encounter relatively high tariffs -- while an opposite bias may occur when importers are attempting to effect capital flight.²⁴ Studies by Bhagwati (1964)(1967) and Sheik (1974) show significant over reporting of exports may occur for products receiving export subsidies. Other investigations have found that trade in product facing high customs duties may go under reported as importers attempt to evade tariffs. These various incentives to falsify trade data are further reasons why partner country data are so unreliable for gap filling.

²⁴The incentive to over- or under-invoice trade transactions depends on the relative height of the foreign exchange black market premium and the tariff rate. If the black market premium is relatively high this encourages over-invoicing to facilitate capital flight, while a relatively high tariff encourages under-invoicing to minimize import duties. Expressed algebraically, if t_i is the nominal tariff, p is the black market premium (measured as a percentage above the official exchange rate), V_t is the true value of imports, and V_f is the falsified invoice price, then the importers net gain (or loss) on product i (N_i) will equal,

$$N_i = (t_i - p)[V_t - V_f]$$

If $p > t_i$ importers have an incentive to over-invoice, $V_f > V_t$. If $p < t_i$ the incentive operates in the opposite direction.

H. Misclassifications

As one moves from higher to lower levels of detail (as reflected in, say, one versus four-digit SITC products) there are various reasons why items may be classified differently. Assessments by customs inspectors in the trading partners may honestly differ as to the precise nature of the traded goods. In addition, importing customs agents may have an incentive to classify a good in a higher tariff line category, which could facilitate bribe taking. The World Bank has also found that purposeful misclassifications into higher tariff lines may be the result of government directives to increase tax revenues from imports. Alternatively, discrepancies in partner country data may occur due to imprecise concordances between national tariff classifications and the SITC. World Bank experience with United States and Australian concordances that were available in the 1980s indicated that between 5 to 10 percent of these countries imports were misclassified at the four-digit SITC level. Finally, misclassification may be the result of honest mistakes by customs authorities who lack familiarity with some products being traded.

Globally there is simply no way of determining the true extent to which misclassifications bias partner country data, but the growing disparity between these statistics as one moves to lower levels of detail suggests their influence is considerable. Misclassifications are simply one further reason why partner country gap filling will not work.

I. Valuation Problems

United Nations COMTRADE data are expressed in United States dollars. These values are calculated using a weighted annual exchange rate factor between the US and foreign currencies. However, developing countries often have very high rates of inflation and unstable exchange rates against the dollar and other major currencies that may vary considerably over the course of a year. Suppose, for example, that the imports or exports of a specific commodity by such a developing country consist of one large

shipment near the beginning of the year. The country records its payment for the goods (in national currency) applying the current exchange rate. UNSTAT receives the data after the end of the period and applies the "average" rate to all items including this shipment with the result that the shipment is undervalued in US dollar terms in the developing country file. This type of difference can be substantial, but cannot be corrected as we do not have statistics on the original shipments.

J. Other Factors

In the course of this analysis, numerous country specific procedures for reporting data were identified which also have an important negative impact on the quality of partner country statistics. All were deviations from established UN standards for tabulating and reporting trade statistics. Illustrative examples include: numerous cases where African countries were reporting trade with Republic of South Africa which failed (for political reasons) to report matched statistics -- similar discrepancies were observed in many countries' trade with Israel. Several "unusual" practices were observed, such as Egypt's decision not to report petroleum produced and exported by foreign firms operating within its national boundaries,

V. **Summary and Conclusions**

Given the large number of developing countries for which trade data are either missing or unreliable, there is an interest in the possible use of partner country statistics to gap fill this information. In theory, the imports (exports) of partners should provide some relevant information on the composition and direction of trade for countries with missing data. It is recognized that problems like f.o.b.-c.i.f. valuation differences, entrepot trade, offshore assembly operations, product classification discrepancies, incentives to falsify information on trade transactions, or errors in reporting and processing UN statistics will produce discrepancies in partner country statistics. However, little information was previously

available concerning the magnitude and importance of the discrepancies, and their influence on attempts to gap fill trade statistics. This study produced, and evaluated, empirical information concerning this point.

Any assessment of this information must specifically recognize that it was generated under special (artificial) conditions that were admittedly most favorable to the potential use of partner country data. In particular, situations where both reporter and partner country data were unreported were excluded from the tests. This omission essentially acknowledged that these gap filling procedures had no applicability in many important areas, like generating data on the intra-trade of most sub-Saharan African countries or the newly formed CIS states.

Stated simply, this report concludes that partner country gap filling procedures have little or no potential for improving the general coverage or quality of international trade data, although they may be useful in cases where the trade data of a specific country are known to incorporate a large error component (i.e., Mexico, China, Egypt, etc.). The conclusion applies equally to attempts to substitute partner country directly into missing records, or where such information is allocated to missing records using some purely mechanistic procedure. Significant progress in upgrading the accuracy, and coverage, of trade statistics will require improved procedures for data collection and reporting at the country level.

References

Baras, John S. (1993). **World Trade Data Estimation: A Methodology Using Progressive Elimination and Constrained Quadratic Optimization**, (Rockville, Maryland: AIMS Incorporated, 30 March).

Bennathan, Esra (1989). "Deregulation of Shipping: What is to be Learned from Chile," **World Bank Discussion Paper No. 67**, (Washington: World Bank,

Bhagwati, Jagdish (1964). "On the Underinvoicing of Imports," **Oxford Bulletin of Economics and Statistics**, 26, no. 4 (November).

Bhagwati, Jagdish (1967). "Fiscal Policies, the Faking of Foreign Trade Declarations, and the Balance of Payments," **Oxford Bulletin of Economics and Statistics**, (February).

Blades, Derek and Marina Ivanov (1985). **Discrepancies Between Imports and Exports in OECD Foreign Trade Statistics**, (Paris: OECD Department of Economics and Statistics Working Paper No. 25, September).

Brodsky, David and Gary Sampson (1979). "International Transport and Latin American Exports to the U.S.," **International Journal of Transport Economics**, 7, no. 4, (December).

Bryan, Ingrid (1974). "Ocean Liner Freight Rates," **Journal of Transport Economics and Policy**, vol. 8, (May).

Fashbender, Karl and Wolfgang Wagner (1973). **Shipping Conferences, Rate Policy and Developing Countries**, (Hamburg: Verlag Weltarchiv).

Janson, Jan and Dan Shneerson (1978). "The Effective Protection Implicit in Liner Rate Shipping," **Review of Economics and Statistics**, vol. 60 (November).

Lipsey, Robert and Merle Weiss (1974). "The Structure of Ocean Transport Charges," **NBER Explorations in Economic Research**, vol. 1, no. 1.

Livingston, Ian (1986). **International Transport Costs and Industrial Development in Least Developed Countries**, (UNIDO/IS.66)(Vienna; UNIDO, 6 March).

Moneta, Carmellah (1959). "The Estimation of Transport Costs in International Trade," **Journal of Political Economy**, (February).

OECD, **Discrepancies Between Imports and Exports in OECD Foreign Trade Statistics**, (Paris: OECD - Department of Economics and Statistics).

Rozanski, Jerzy and Alexander Yeats (1994). "On the (in) Accuracy of Economic Observations: An Assessment of Trends in the Reliability of International Trade Statistics," Paper presented at a Ford Foundation Conference, **Database of Development Analysis**, Yale University 15-16 May, 1992. Also in **Journal of Development Economics**, (in press).

Sheikh, Munir (1974). "Underinvoicing of Imports in Pakistan." **Oxford Bulletin of Economics and Statistics**, 36, no. 4 (November).

U.N. Economic and Social Council (1990). **International Trade Reconciliation Study**, (E/CN.3/454)(Geneva: United Nations).

UNCTAD (1991). **Review of Maritime Transport, 1991**, (Geneva: UNCTAD).

World Bank (1984). **Caribbean Region: Coping With Changes in the External Environment**, (Washington: World Bank, 1 April).

Wulf, Luc de (1981). "Customs Valuation and the Faking of Invoices," **Economia Internazionale**, 34, no. 1 (February).

Yeats, Alexander (1978). "On the Accuracy of Partner Country Trade Statistics," **Oxford Bulletin of Economics and Statistics**, 40, no. 1 (November).

Yeats, Alexander (1981). **Shipping and Development Policy: An Integrated Assessment**, (New York: Praeger Press).

Yeats, Alexander (1989). **Do Caribbean Countries Pay Higher Freight Costs**", (Washington: World Bank Discussion).

Morgenstern, Oscar (1963). **On the Accuracy of Economic Observations**, (Princeton: Princeton University Press).

Statistical Office of the United Nations (1961). **Standard International Trade Classification, Revised**, (New York: United Nations, Department of Economic and Social Affairs, Series M Number 4).

UNCTAD (1990 and other years). **Handbook of International Trade and Development Statistics, 1990**, (New York: United Nations).

World Bank (1988). **World Development Report**, (Washington: Oxford Press)

World Bank (1989). **World Development Report**, (Washington: Oxford Press).

World Bank (1992). **Global Economic Prospects and the Developing Countries, 1992**, (Washington: World Bank).

Yeats, Alexander (1978). "On the Accuracy of Partner Country Trade Statistics," **Oxford Bulletin of Economics and Statistics**, vol. 40, no. 1 (November), pp. 341-361.

Yeats, Alexander (1990). "On the Accuracy of Economic Observations: Do Sub-Saharan Countries' Trade Statistics Mean Anything?" **World Bank Economic Review**, vol. 2, no. 4, pp. 135-156.

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