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On the Accuracy of Economic Observations: Do Sub-Saharan Trade Statistics Mean Anything?

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African governments are being urged to promote commodity exports, yet without reliable trade statistics it is difficult to formulate appropriate policies to achieve this goal. This article assesses the accuracy of U.N. trade statistics by comparing the declared value of African exports, plus a transport and insurance cost factor, with partner countries' reported import values. The results show that major discrepancies often exist between the two, with false invoicing and smuggling apparently responsible for much of the difference. Although major disparities exist in data on trade with developed countries, the average differences in intra-African trade statistics are substantially larger. Statistical tests show that these data cannot be relied on to indicate the level, composition, or even direction and trends in African trade.

For more than thirty years economists have been aware of and attempted to correct discrepancies in developed countries' trade data observed in matched export and import statistics (Allen and Ely 1953; Ely 1961; Morgenstern 1963; U.N. Economic and Social Council 1974; Yeats 1978; OECD 1985). Much less attention has been given to the quality of developing countries' trade data because the potential for such analysis was limited by the lack of comparable disaggregated time-series information. It is clear, however, that there are important reasons why such investigations should be undertaken. For example, efforts have been made to increase trade among developing countries through regional arrangements, such as the Andean Group, or through the recent plan for a Global System of Trade Preferences (GSTP) under which tariff concessions could be exchanged among all developing countries. The design and evaluation of these integration efforts require accurate and up-to-date information on participating countries' trade. On a broader scale, errors in developing country trade data could adversely influence government policies relating to investment, balance of payments, initiatives for the liberalization of trade barriers, ex-

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change rate policy, and a host of other factors that affect a nation's industrialization.

In an attempt to evaluate the quality of statistics for one important group of developing countries, this study applies the trade reconciliation and evaluation procedures used on statistics from the Organisation for Economic Co-operation and Development (OECD) (Ely 1961; OECD 1985; Yeats 1978) to reported data on trade among Sub-Saharan African countries and between them and developed countries. This study draws on previous research which identified economic and statistical factors that contribute to discrepancies in partner countries' trade data. Bhagwati's pioneering studies (1964, 1967) showed that subsidies may encourage exporters to "overinvoice" shipments, whereas high tariffs create an incentive to underreport imports. The result may be that reported exports exceed matched imports (see also Sheikh 1974, Wulf 1981, and Gulati 1987). Overvalued exchange rates and foreign exchange controls may have the opposite effect. When the domestic currency is overvalued and exporters must turn in foreign exchange at the official (low) rate, there is an incentive to "underinvoice" and sell the unreported currency balance on the black market. Similarly, when the importing country has an overvalued exchange rate and foreign exchange controls, the importer may overinvoice to obtain excess foreign currency and sell the balance on the black market. In this case, reported export values and quantities may be much smaller than reported imports.

Higher import values than matched exports may also be the result of capital flight. Restrictions on private holdings of foreign assets may be adopted to induce domestic capital investment, and to reduce the demand for scarce foreign exchange (sometimes in response to erosion of the value of the domestic currency). If an exporter is able to make necessary arrangements overseas, by underreporting foreign exchange earnings the excess can be placed in accounts or assets abroad. Similarly, by overinvoicing imports, the excess "paid" to the supplier can be deposited in accounts abroad.

Although false invoicing often can be detected in matched trade data, a disquieting fact is that combinations of incentives may actually be self-disguising. Trade data may show few discrepancies if an exporter earns subsidies while an importer is trying to accrue "extra" foreign exchange; both face incentives to overreport the value of shipments. Or, if an exporter wants to avoid export taxes while the importer faces import tariffs, both may underreport transactions. If the partners recognize their mutual interests in such false reporting and collude in it, the data may look quite consistent.

A further important point is that all inconsistencies in trade data should not be attributed to illicit activities; a range of legitimate factors can cause differences. Shipping costs, diversion en route, re-export of goods, differential time lags in reporting, multiple exchange rates, and differences between countries in commodity classification and valuation procedures all may cause discrepancies between matched trade data. Because exports are reported "free on board"

(f.o.b.), whereas imports normally include "cost, insurance, and freight" (c.i.f.), imports should exceed exports by the value of transport and insurance charges. In cases in which importers pay in advance (providing credit for delivery), the exporter may deduct finance charges from reported (f.o.b.) values, although these costs may be included in the c.i.f. import value. This would further widen the margin resulting from f.o.b. (export) and c.i.f. (import) reporting practices.

Variations in exchange rates may cause trade data discrepancies. Exports and imports are first recorded in their respective national currencies, and if different official exchange rates are used to convert them to a uniform currency (say U.S. dollars), or if exchange rates change over the period of reporting, a disparity in the export and import figures will result. Another problem is that declared invoice values may be adjusted by customs authorities ("up-lifted") for assessing import duties and other taxes. Because these adjusted values are used in the importing country's official statistics, they may not correspond with those recorded by the exporting country.

A problem that seems to be particularly prevalent in the African countries studied here is reporting discrepancies for transshipments in which goods are routed through countries bordering the exporter or importer. In these cases, the country of origin may inaccurately list a routing country as the importer, or the country of final destination may report the routing country as the exporter. A range of discrepancies may thus appear between the three (or more) parties to the transactions.

Finally, the U.N. Statistical Office has followed some procedures that cause discrepancies in the African data to be underestimated. In several cases, the exact figure reported as imports by a partner country was inserted in the African country's export records and then designated as an estimate of trade. In these cases, there would be no differences between partner country trade data because the matched reported import figures were being used for both exports and imports. It was also clear that, in some instances, reported bilateral African trade for a given year was merely a reproduction of records relating to a different year. For example, the 1982 and 1983 records on Zimbabwe's imports from Malawi were generally identical down to the three-digit level of the Standard International Trade Classification (SITC).

I. Data Availability: Coverage of Period and Product

The exclusive focus of this analysis is U.N. trade statistics, including the U.N. Series D Commodity Trade Tapes. They are the sole sources of developing and developed country export and import statistics which use a common classification system—SITC—and are the most widely used source of data on South-South trade. Although national government publications may be available, they use varying product classifications that preclude accurate comparisons across countries. The United Nations reclassifies the government data to the SITC system using available concordances. Many policy or research studies are shaped

as much by the period and level of aggregation of the data as by the specific theoretical or empirical question being addressed. In addition, studies are constrained by the interval or time span for which national trade statistics are available, particularly if trends or long-term changes in the commodity structure of trade are being examined. Trade statistics for the developed countries with market economies are normally available from U.N. sources with a one-year lag. A continuous time series for these countries is available back to 1962 or 1963, with a product breakdown to the five-digit SITC level.

In contrast to the situation for the OECD countries, Sub-Saharan African trade data as of mid–1989 generally extended back to 1962, but there are important gaps in the historical record (see table 1). In three cases, Botswana, Lesotho, and Swaziland, no U.N. trade data exist because the trade of these countries is included in U.N. records for the South African Customs Union. In addition, the African countries' records show a much greater reporting lag: only six of the thirty-nine countries' records extend beyond 1983.

Table 1. *Trade Statistics for Sub-Saharan African Countries Available from U.N. Records as of July 1989*

Region and country	*Years available*	*Region and country*	*Years available*
Customs and Economic Union of Central Africa		*Economic Community of the Great Lakes Countries*	
Cameroon	1962–83	Burundi	1968–83
Central African Rep.	1962–83	Rwanda	1963–83
Chad	1962–83	Zaire	1962–83
Congo	1962–85	*Other Africa*	
Gabon	1962–83	Botswana	—
Economic Community of West African States		Djibouti	1969–83
		Ethiopia	1962–85
Benin	1962–83	Kenya	1962–83
Burkina Faso	1962–83	Lesotho	—
Côte d'Ivoire	1962–85	Madagascar	1962–86
Gambia	1962–83	Malawi	1964–83
Ghana	1962–83	Mauritius	1962–83
Guinea	1979–83	Mozambique	1962–83
Liberia	1962–84	Seychelles	1967–86
Mauritania	1962–83	Somalia	1962–83
Mali	1962–83	Sudan	1962–83
Niger	1962–83	Swaziland	—
Nigeria	1962–83	Tanzania	1962–83
Senegal	1962–83	Uganda	1962–83
Sierra Leone	1962–83	Zambia	1964–83
Togo	1962–83	Zimbabwe	1979–83

—Not available: classified under South African Customs Union.

Note: Records are not available for the following years: Burundi, 1979 (1965 data available); Côte d'Ivoire, 1984; Gambia, 1967, 1978; Mauritania, 1976–78; Rwanda, 1977; Senegal, 1977–78; Seychelles, 1969–70; Sierra Leone, 1977–78; Zaire, 1971; and Zimbabwe, 1966–78 (1963–65 data available). Data for six of the countries extended beyond 1983.

Source: Compiled from U.N. Series D Commodity Trade Tapes.

The problems reflected in table 1 for the African countries do not exist for all, or even most, developing countries, although there have been persistent problems with some, such as India and Indonesia. Most Latin American countries have had data available with a two- or three-year time lag (Mexico and Venezuela are important exceptions), whereas most of the Asian, newly industrializing countries have records that are as current as those of the developed countries. In addition, these countries' records normally extend back into the 1960s down to the four- and five-digit SITC level.

The level of product detail in official trade statistics is often important in trade and commodity studies. Trade data for developed countries with market economies and many developing countries are compiled at very detailed levels. Many African countries' trade statistics lack this degree of precision and incompletely cover total trade even at the three- and four-digit level. In these cases the U.N. trade tapes allocate all trade possible given the available data, but this leaves some (possibly large) portion of trade unallocated.

As shown in table 2, most African countries have relatively complete coverage of total trade down to the three-digit SITC level. Mali is an exception: about one-quarter of its total exports are not reflected in the two-digit classification. But only eleven of the thirty-six countries retain full coverage at the four-digit level. The three-digit product groups are often too aggregated for product-specific studies, such as analyses of the influence of trade barriers (particularly tariff and nontariff barriers), or for investigations which require export and import unit values for fairly homogeneous products. Some problems in the U.N. trade tapes are clearly internal to the compilation process itself. For example, trade reported in component three- or four-digit SITC groups sometimes exceeded the total reported at a higher level (see Ethiopia, table 2).

II. The Accuracy of African Trade Statistics

To assess the quality of the African trade statistics, African export data were compared with corresponding partner import statistics. Total exports of the African countries were tabulated for 1982–83, the last period for which data were available for all countries (see table 1). A two-year period was used to reduce the influence of time lags in recording trade flows and irregularities associated with a single year's statistics. Reported imports for the African countries' trading partners were matched with the corresponding African export statistics. The percentage differences, P, between the matched data were computed as:

$$P = [(I_{ij} - E_{ji}) \div E_{ji}] \times 100 \tag{1}$$

where E_{ji} are reported f.o.b. export values of African country j to destination i, and I_{ij} are reported c.i.f. imports of destination i from j.

African Exports to All Partners

The total reported exports of the thirty-six African countries and the percentage difference between the corresponding reported partner countries' imports are summarized in table 3. The measured disparities are often large and

Table 2. *Level of Product Detail in African Countries' Trade Statistics, 1983*

	Total trade (millions of dollars)		*Proportion of total trade recorded (percent)*					
			Two-digit SITC		*Three-digit* SITC		*Four-digit* SITC	
Country	*Imports*	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*
Benin	348.5	79.4	100.0	100.0	99.6	99.5	—	—
Burkina Faso	287.5	57.0	100.0	100.0	100.0	100.0	100.0	100.0
Burundi	116.1	99.4	100.0	95.1	99.0	95.0	0.1	0.0
Cameroon	1,187.6	1,836.8	100.0	99.8	97.6	99.2	0.1	0.0
Central African Rep.	71.1	109.4	100.0	99.5	99.5	99.5	—	0.0
Chad	70.6	131.6	100.0	100.0	99.6	100.0	—	0.0
Congo	629.0	639.9	100.0	100.0	100.0	100.0	100.0	100.0
Côte d'Ivoire	1,813.5	2,067.7	100.0	100.0	100.0	100.0	100.0	100.0
Djibouti	252.4	33.6	100.0	100.0	99.4	97.2	—	0.0
Ethiopia	587.0	422.6	100.0	98.7	139.9	98.2	0.2	0.0
Gabon	685.6	1,475.4	100.0	100.0	100.0	100.0	100.0	100.0
Gambia	79.4	45.0	100.0	97.4	99.7	97.4	0.1	0.0
Ghana	599.9	512.5	100.0	99.8	98.1	99.6	0.4	0.0
Guinea	252.6	420.5	100.0	99.4	99.3	99.3	0.1	—
Kenya	1,379.1	947.3	100.0	100.0	100.0	100.0	100.0	100.0
Liberia	411.6	422.6	100.0	100.0	100.0	100.0	100.0	100.0
Madagascar	411.5	310.3	100.0	100.0	100.0	100.0	100.0	100.0
Malawi	310.5	239.2	100.0	100.0	100.0	100.0	100.0	100.0
Mali	303.8	98.2	100.0	76.9	99.5	76.3	—	—
Mauritania	350.5	290.7	100.0	100.0	99.8	100.0	0.1	0.0
Mauritius	441.6	360.8	100.0	100.0	100.0	100.0	100.0	100.0
Mozambique	500.1	239.8	100.0	100.0	99.8	99.9	0.1	0.0
Niger	209.3	261.6	100.0	100.0	99.7	100.9	0.1	0.0
Nigeria	7,008.4	12,381.8	100.0	100.0	97.9	99.9	0.4	—
Rwanda	148.1	96.9	100.0	99.7	99.2	99.7	0.1	0.0
Senegal	790.1	440.8	100.0	99.7	98.9	98.8	0.1	—
Seychelles	87.8	3.7	100.0	100.0	100.0	100.0	100.0	100.0
Sierra Leone	165.7	90.7	100.0	100.0	100.0	100.0	100.0	100.0
Somalia	352.3	149.9	100.0	100.0	99.5	99.8	0.3	0.0
Sudan	1,424.0	601.1	100.0	100.0	99.5	98.9	0.1	0.0
Tanzania	537.7	425.0	100.0	99.6	98.2	99.3	0.4	0.0
Togo	479.9	225.6	100.0	99.3	99.6	99.2	—	0.0
Uganda	257.6	360.1	100.0	99.9	99.6	99.9	0.1	0.0
Zaire	841.7	1,387.9	100.0	98.4	98.5	98.1	0.2	0.0
Zambia	560.8	825.4	100.0	100.0	99.4	99.9	0.2	—
Zimbabwe	449.6	672.2	100.0	100.0	100.0	100.0	—	—

—Negligible (less than 0.5 percent of total trade).

Note: All countries reported 100 percent of total trade at the one-digit SITC level. Trade data are not available for Botswana, Lesotho, and Swaziland, which therefore are omitted from this and subsequent analyses.

Source: Author's calculations, based on U.N. Series D Commodity Trade Tapes.

far exceed the average 3–6 percent differences observed for trade between developed countries (see Yeats 1978; OECD 1985). Differences of 100 percent or more are frequently observed, and disparities of more than 600 percent are calculated on the exports of the Gambia, Liberia, Niger, and Seychelles.

Some proportion of the difference between f.o.b. export and c.i.f. import prices is accounted for by the costs of transport. Because the most accurate and comprehensive data for calculation of transport correction factors are available from U.S. Customs invoice data, the factors and analysis here are based on African exports to the United States (see the appendix). In general, U.S.-based transport margins should be between 5 and 15 percent of the value of f.o.b. exports (the margins for the Gambia, Guinea and Somalia are higher). But, as table 3 demonstrates, there are numerous bilateral trade flows in which the differences greatly exceed these transport cost margins. For example, the highest recorded nominal freight rate for Gabon's exports to the United States over 1982–87 was about 9 percent, yet table 3 reports a difference in matched f.o.b.-c.i.f. partner data of 75 percent. Niger is the most extreme case: shipments to the United States have a maximum freight factor of 9 percent, but the difference between the matched trade data exceeds 300 percent.

Given the extremely limited foreign exchange reserves of most African countries, the fact that the reported value of their exports in importing countries exceeds domestic reported values by more than $100 million in several cases takes on special importance. For example, Côte d'Ivoire reported exports of $2.3 billion (billion = 1,000 million) to the EEC, whereas the latter reported imports valued at more than $500 million higher. Discrepancies of more than $500 million also occur on several other bilateral trade flows (for example, Cameroon–EEC, the Congo–the United States, Gabon–the United States, Nigeria–EEC).

Matched export-import data were compiled at the three-digit SITC level for every total bilateral trade flow reported in table 3 that showed a difference of at least $20 million. When possible, matched quantity and unit value statistics were also computed for each of the partner countries. This procedure was adopted to identify specific product groups that generate the overall discrepancies, and to indicate if price or quantity differences might cause them.

Table 4 summarizes the results of this analysis for twenty-five bilateral trade flows. As indicated, several common factors appear responsible for many of the statistical discrepancies. For oil-exporting countries such as Cameroon, the Congo, and Gabon, the data suggest purposeful underreporting of export quantities and values of shipments, possibly to conceal noncompliance with international agreements on production and export quotas. Similarly, quantity and value discrepancies in the coffee and cocoa shipments of Côte d'Ivoire, Ghana, Kenya, and Madagascar may result from attempts to evade quotas established under international commodity agreements. These situations may also reflect, however, false invoicing by exporters to evade foreign exchange controls. The discrepancy for Burundi and the Central African Republic is almost entirely accounted for by precious stones, items that can easily be smuggled out of a

Table 3. *Reported Exports from African Countries and Their Relation to Matched Partner-Country Imports, 1982–83*

	Exports to (millions of dollars):							*Percentage difference between reported imports and exports*[a]						
Exporting country	*All developed countries*	*Canada*	EEC[b]	EFTA[c]	*Japan*	*United States*	*Sub-Saharan Africa*	*All developed countries*	*Canada*	EEC[b]	EFTA[c]	*Japan*	*United States*	*Sub-Saharan Africa*
All Sub-Saharan Africa	50,482.1	405.7	27,216.1	1,538.0	1,522.2	17,497.0	3,016.2	14.4	−2.9	15.2	17.5	22.3	11.6	13.1
Benin	91.1	—	50.4	7.5	3.5	28.7	29.2	13.0*	154.5*	20.1*	0.4	5.1	5.1	−96.2
Burkina Faso	47.3	0.6	39.4	1.0	5.4	0.1	30.8	82.7	−100.0	63.4	141.1	238.8	242.2	−60.2
Burundi	197.0	0.0	113.1	21.7	8.8	47.4	2.2	16.7*	0.0	29.0*	−2.5	0.0	0.0	52.9
Cameroon	2,607.5	1.2	1,547.3	15.0	40.6	947.8	91.6	39.8*	−1.9	35.9*	55.8*	80.1*	43.3*	36.6
Central African Rep.	135.1	0.0	95.3	2.4	18.5	8.6	2.0	49.3*	0.0	67.8*	−29.1	6.2	1.3	11.0
Chad	146.7	0.0	39.4	1.3	3.0	70.6	21.7	3.8	0.0	9.6	0.0	0.0	0.0	−50.3
Congo	1,623.5	0.0	483.1	3.4	12.0	995.2	5.5	46.7*	0.0	36.4*	37.1*	47.8*	54.2*	85.0
Côte d'Ivoire	3,176.9	15.0	2,251.2	20.5	100.3	578.5	727.9	25.5*	23.2*	23.8*	207.3*	12.5	20.4*	−3.5
Djibouti	10.7	0.0	9.8	0.7	0.0	0.1	38.7	1.3	0.0	1.4	0.0	[d]	0.0	−81.2
Ethiopia	541.6	2.3	272.0	11.2	50.8	198.2	74.7	11.3	57.2	7.8	50.6*	23.4*	2.8	47.5
Gabon	2,475.7	72.5	1,401.7	64.7	12.8	752.5	55.6	27.2*	−88.3	6.5	−30.1	58.6*	75.4*	75.2
Gambia	54.8	0.1	34.1	14.2	0.0	0.4	1.0	19.3	0.0	30.9	0.0	0.0	0.0	1,138.2
Ghana	1,005.9	2.6	516.3	41.1	122.9	280.9	19.8	31.0*	116.5*	4.8	79.6*	15.8*	76.4*	−43.1
Guinea	758.1	34.9	281.3	14.6	0.3	304.1	37.3	1.6	0.0	2.5	−1.2	0.0	0.0	−34.4
Kenya	941.7	15.2	710.3	65.1	18.8	115.4	466.2	28.0*	33.1*	24.3*	52.1*	43.8*	27.2*	12.3
Liberia	842.1	2.3	625.2	1.2	9.6	158.7	18.3	82.4*	−95.2	47.8*	1,024.4*	2,011.8*	39.0	137.9
Madagascar	457.9	0.5	275.4	3.1	49.2	118.0	5.7	19.2*	62.0*	6.7	139.5*	72.1*	18.7*	−48.4
Malawi	366.3	2.3	242.5	18.4	20.7	32.5	53.1	6.5	160.6*	8.1	15.5	5.4	51.3*	46.6
Mali	129.3	0.0	106.8	2.2	11.2	0.7	140.1	−12.0	0.0	−15.1	−5.3	4.4	166.1*	−87.4
Mauritania	469.5	—	290.7	0.1	132.4	1.3	39.6	14.2	0.0	22.9	7.4	0.0	0.0	−4.5
Mauritius	698.6	8.9	613.1	10.1	0.1	60.7	3.2	7.1	−14.8	8.2	−23.5	−309.1*	10.8	−41.2

Mozambique	292.7	1.0	107.5	3.9	38.2	87.4	56.6	3.3	0.0	7.3	37.3	0.0	0.0	93.3
Niger	532.4	0.1	527.3	—	2.5	1.2	21.8	−3.8	−100.0	−5.3	−100.0	120.6*	327.2*	641.5
Nigeria	25,542.0	208.8	12,285.0	935.5	14.7	11,156.2	624.8	4.1	0.0	7.4	0.1	0.0	0.0	−13.7
Rwanda	154.2	0.0	70.4	14.7	4.1	64.8	8.3	3.6	0.0	7.5	0.7	0.0	0.0	12.1
Senegal	844.4	1.8	663.0	10.0	82.5	21.5	256.1	−19.1	−38.7	−10.2	−68.6	−67.6	−84.1	45.0
Seychelles	1.1	—	0.3	—	0.7	—	0.2	3,806.2*	[e]	8,043.6*	600.0*	125.8*	[f]	89.4
Sierra Leone	182.2	0.0	136.1	5.1	0.8	39.5	3.8	42.1*	[g]	40.4*	−54.2	59.3*	52.1*	134.9
Somalia	51.3	0.3	49.5	—	0.1	1.3	2.6	7.3	0.0	7.6	3.8	−1.3	−5.1	50.7
Sudan	365.4	3.0	271.7	10.6	41.5	30.3	3.8	37.7*	−58.6	23.3*	50.3*	122.3*	24.9*	−17.8
Tanzania	598.4	3.7	487.3	35.5	29.3	33.0	47.6	0.3	4.4	−10.0	26.2*	24.2*	45.3*	177.2
Togo	256.5	0.1	201.3	10.2	4.1	30.9	72.2	12.2	−26.6	14.8	−1.5	5.9	2.8	65.0
Uganda	669.0	1.0	280.5	3.6	42.4	277.2	5.2	3.5	0.0	1.8	430.6*	0.0	0.0	11.9
Zaire	1,805.8	25.8	746.9	31.5	155.4	802.1	26.1	51.9	0.1	124.6*	2.0	0.0	−0.1	−33.7
Zambia	1,308.4	1.6	728.9	97.2	394.0	84.4	26.6	4.2	0.0	6.9	1.4	0.0	0.0	12.0
Zimbabwe	1,100.3	0.0	661.8	61.0	127.0	166.3	65.6	7.7	[h]	6.0	11.8	0.0	0.0	−16.1

—Negligible.

Note: An asterisk (*) indicates that the partner country trade difference exceeded by at least 5 percentage points the maximum recorded nominal freight rate for exports of the African country to the United States at any time between 1982 and 1987. For the African–European data, both a shorter distance and generally larger shipment volumes to Europe suggest that freight costs should be lower than on shipments to the United States, and thus this underestimates the number of cases in which disparities could not reasonably be attributed to transport costs (see the appendix).

a. The difference between the value of total reported imports and exports divided by the value of exports, times 100.

b. European Economic Community (ten member countries).

c. European Free Trade Association.

d. Djibouti reported no exports to Japan during 1982–83; Japan reported imports from Djibouti.

e. Seychelles reported $6,000 in exports to Canada; Canada reported $33,863,000 in imports from Seychelles.

f. Seychelles reported $7,000 in exports to the United States; the United States reported imports of $3,348,000 from Seychelles.

g. Sierra Leone reported no exports to Canada; Canada reported $56,000 in imports from Sierra Leone.

h. Zimbabwe reported no exports to Canada; Canada reported $7,817,000 in imports from Zimbabwe.

Source: Author's calculations, based on U.N. Series D Commodity Trade Tapes.

Table 4. *Analysis of Differences of More than $20 Million between Matched Reported Import and Export Values, 1982–83*

Exporter–importer	*Major commodities traded (percent share)*	*Observations*	*Reported difference*[a]	
			Percent	*Value (millions of dollars)*
Burkina Faso–European Economic Community (EEC)	Oilseeds (32), cotton (16), hides (10)	Roughly half the discrepancy is in oilseeds, for which unit values differ by more than 40 percent	63.4	25.0
Burundi–EEC	Coffee (61), precious stones (16), natural abrasives(14)	Precious stones imports exceeded exports by $22.2 million	29.0	32.8
Cameroon–EEC	Petroleum (39), cocoa (19), coffee (15)	Discrepancy almost entirely due to underreporting petroleum shipment volume	35.9	554.8
Cameroon–U.S.	Petroleum (89), petroleum products (4)	More than 80 percent of discrepancy caused by underreporting crude petroleum shipments	43.3	409.9
Central African Republic–EEC	Precious stones (42), coffee (40), cotton (7)	Precious stones imports exceeded exports by $98.2 million	67.8	64.6
Congo–EEC	Petroleum (63), wood (9), precious stones (7)	Difference caused by underreporting volume of petroleum exports	36.4	175.6
Congo–U.S.	Crude petroleum (94), petroleum products (4)	Petroleum imports exceeded exports by $494 million	54.2	540.0
Côte d'Ivoire–EEC	Coffee (26), cocoa (26), wood (16)	Coffee import unit value exceeded exports by 24 percent	23.8	536.6
Côte d'Ivoire–European Free Trade Association (EFTA)	Cocoa (41), coffee (17), fruit (16)	Cocoa imports exceeded exports by $45 million. Differences of $5 million to $10 million in coffee and fruit trade	644.1	74.6
Gabon–U.S.	Petroleum (99)	Underreported petroleum exports	75.4	567.9
Ghana–U.S.	Aluminum (73), cocoa (11), petroleum (7)	Aluminum imports exceeded exports by $159 million. Major differences in reported quantities traded	76.4	214.7
Ghana–EFTA	Cocoa (93), nonferrous ore (5)	Cocoa imports exceeded exports by $31.4 million. EFTA omits quantities so source of error could not be determined	94.8	34.6
Kenya–EEC	Coffee (39), tea (27), fruit (19)	Tea and coffee account for about $80 million of the total discrepancy	24.3	172.8

Kenya–U.S.	Coffee (51), crude vegetable material (16), tea (19)	Tea imports exceeded exports by $11 million	21.7	31.4
Kenya–EFTA	Coffee (85), fresh fruit (2)	Coffee imports exceeded exports by $34 million. EFTA omits quantities so source of error could not be determined	68.2	41.7
Liberia–Japan	Special transactions (88)	No "special transactions" (SITC 931) exports reported. Japan's imports were $179 million for this item	2,001.8	193.9
Liberia–EEC	Iron ore (66), precious stones (11)	Iron ore import unit value exceeds exports by more than 40 percent	47.8	298.6
Liberia–EFTA	Ships and boats (98)	Liberia failed to report quantities so source of error could not be determined	1,024.4	127.0
Madagascar–Japan	Fish (60), coffee (22), spices (7)	Over half of the discrepancy is due to fish: exports unit value more than 40 percent below import unit value	72.1	35.4
Madagascar–U.S.	Spices (58), coffee (28)	A discrepancy of $15 million exists in the reported coffee trade	18.7	22.1
Mauritania–EEC	Iron ore (80), fresh fish (15)	Difference caused almost entirely by iron ore. Quantity information was not reported so unit values could not be computed	22.9	66.6
Seychelles–Canada	Sugar and honey (98)	Sugar imports exceeded exports by $33 million	[b]	33.9
Sierra Leone–EEC	Nonferrous metals (28), pearls and precious stones (27)	Approximately 44 percent of the total discrepancy is accounted for by pearls and precious stones	40.4	55.1
Sudan–Japan	Cotton (61), oilseeds (21)	Cotton imports exceeded exports by 80 percent. Oilseeds imports exceeded exports by 460 percent	122.3	50.7
Sudan–EEC	Crude vegetable material (21), cotton (20), oilseeds (15)	Oilseeds imports exceeded exports by $31 million. Unit values could not be computed because quantity information was not available	23.3	63.4

a. Value reflects the amount by which reported imports exceed reported exports. Percent expresses this difference relative to reported exports.
b. Canada reported $33.8 million in imports; Seychelles reported $6,000 in exports to Canada.
Source: Author's calculations, based on U.N. Series D Commodity Trade Tapes.

country in order to evade taxes and secure foreign currencies. Rationales for the discrepancies for most other commodities are less obvious, with the exception of one or two products which constitute special situations.

Differences between official and black market dollar exchange rates were compiled for as many countries listed in table 3 as possible. The differences in exchange rates were found not to be significantly correlated with discrepancies in trade values, possibly because many smuggled goods were not reported in either export or import statistics. If smuggled goods were accurately reported in one of the partners' data, the correlations might achieve statistical significance.

Trade among African Countries

Because the discrepancies in data on intra-African trade were generally found to be considerably larger than those on trade with developed countries, more detailed partner country statistics were compiled and analyzed for these exchanges. Table 5 shows the total reported value of each country's exports to all Sub-Saharan Africa and to its largest trading partner and gives the partner's reported imports. Similar information is also shown for African trade in manufactured goods.

Major discrepancies in the African data are apparent from table 5. An average difference of 64 percent occurs in the matched total trade data of thirty-five of the countries (109 percent if the Gambia is included); the differences with each exporter's largest single trading partner average 61 percent. A peculiarity revealed by the table is the fact that reported imports are less than reported exports for the total trade of eighteen of the thirty-six countries, and for the largest trading partner of twenty-one of the countries. These findings are unexpected because intra-African transport and insurance costs, which would be excluded from exporter f.o.b. values but included in importer c.i.f. import values, have often been found to reach 50 percent or more of a product's export value (Livingstone 1986).

Table 5 shows the African statistics may be of limited use for identifying directions of trade or even trading partners. For example, Benin reported 1982–83 exports of $19 million to its major trading partner, Nigeria, but the latter reported no trade between them. A similar situation occurred for Djibouti–Somalia ($30 million in exports not accounted for) and for Zaire–Togo ($12 million). More broadly, only six of the thirty-six countries' export data reveal disparities of less than 50 percent in all of the categories analyzed. Benin, the Congo, Djibouti, the Gambia, Mozambique, Niger, Seychelles, Sierra Leone, and Tanzania showed discrepancies of greater than 50 percent in all three export categories.

Information on the composition of trade among African countries may be needed for purposes such as formulating plans for regional or international trade agreements. Matched partner trade data could be used to verify information on goods exchanged down to the three-digit SITC level (most countries

Table 5. *Discrepancies in Reported Partner Country Statistics on Trade between African Countries, 1982–83*

	All commodities (millions of dollars)							*Manufactured exports to all Sub-Saharan Africa (millions of dollars)*		
	All Sub-Saharan Africa			*Largest African import market*[a]						
Exporting country	*Exports*	*Imports*	*Difference (percent)*	*Partner*	*Exports*	*Imports*	*Different (percent)*	*Exports*	*Imports*	*Difference (percent)*
Benin	29.2	1.1	−96.2	Nigeria	19.0	0.0	−100.0	20.6	0.5	−97.6
Burkina Faso	30.8	12.2	−60.2	Côte d'Ivoire	16.9	2.0	−88.2	9.1	5.0	−45.1
Burundi	2.2	3.3	52.9	Kenya	0.7	0.8	14.3	0.2	—	−100.0
Cameroon	91.6	125.2	36.6	Chad	20.3	40.5	99.5	45.3	58.2	28.5
Central African Rep.	2.0	1.8	−11.0	Côte d'Ivoire	1.0	0.5	−50.0	0.8	0.6	−25.0
Chad	21.7	10.8	−50.2	Cameroon	21.1	10.6	−49.8	19.1	9.4	−50.8
Congo	5.5	10.1	85.0	Zaire	1.8	3.8	111.1	2.8	5.6	100.0
Côte d'Ivoire	727.9	702.2	−3.5	Somalia	187.4	145.8	−22.3	290.0	225.4	−22.3
Djibouti	38.7	7.2	−81.2	Djibouti	30.2	0.0	−100.0	14.8	1.3	−91.2
Ethiopia	74.7	110.2	47.5	Nigeria	37.8	75.0	98.4	25.9	32.0	23.6
Gabon	55.6	97.4	75.1	Senegal	29.7	16.6	−44.1	9.3	15.4	65.6
Gambia	1.0	12.6	1,138.2	Togo	0.8	0.1	−87.5	0.1	—	−100.0
Ghana	19.8	11.3	−43.1	Cameroon	14.6	0.7	−95.2	1.7	1.2	−29.4
Guinea	37.3	24.5	−34.4	Burkina Faso	36.6	18.5	−49.5	0.1	23.4	[b]
Kenya	466.2	523.6	12.3	Uganda	189.1	200.9	6.2	139.5	185.2	32.8
Liberia	18.3	43.6	137.9	Nigeria	7.8	8.9	14.1	2.8	32.1	1,046.6
Madagascar	5.7	2.9	−48.4	Mauritius	2.1	1.6	−23.8	2.1	1.0	−52.4
Malawi	53.1	77.9	46.6	Zimbabwe	29.7	44.3	49.2	12.0	36.2	201.7
Mali	140.1	17.6	−87.4	Côte d'Ivoire	91.7	4.9	−94.7	7.7	5.7	−26.0
Mauritania	39.6	37.8	−4.6	Côte d'Ivoire	36.9	36.9	0.0	2.2	—	−100.0
Mauritius	3.2	1.8	−41.2	Seychelles	2.0	2.7	35.0	1.8	2.4	33.3

(Table continues on the following page.)

Table 5 *(Continued)*

	All commodities (millions of dollars)							Manufactured exports to all Sub-Saharan Africa (millions of dollars)		
	All Sub-Saharan Africa			Largest African import market[a]						
Exporting country	*Exports*	*Imports*	*Difference (percent)*	*Partner*	*Exports*	*Imports*	*Different (percent)*	*Exports*	*Imports*	*Difference (percent)*
Mozambique	56.6	109.4	93.2	Kenya	37.3	18.6	−50.1	12.8	4.4	−65.6
Niger	21.9	162.2	641.5	Burkina Faso	10.7	0.6	−94.4	1.0	11.3	1,030.0
Nigeria	624.7	539.0	−13.7	Ghana	229.2	205.4	−10.4	58.5	15.0	−74.4
Rwanda	8.3	9.3	12.1	Kenya	8.2	9.2	12.1	—	—	n.a.
Senegal	256.1	371.2	45.0	Burkina Faso	104.9	8.2	−92.2	149.0	120.1	−19.4
Seychelles	0.4	0.2	−89.4	Liberia	0.2	0.3	50.0	—	0.1	[b]
Sierra Leone	9.1	3.9	−134.9	Mauritius	2.9	8.5	193.1	0.4	0.7	75.0
Somalia	2.6	3.9	50.7	Tanzania	2.6	2.8	7.7	2.4	0.9	−62.5
Sudan	3.8	3.1	−17.8	Ethiopia	2.1	0.4	−80.9	1.3	0.6	−53.8
Tanzania	47.6	132.0	177.2	Kenya	11.3	3.0	−73.4	21.0	47.3	125.2
Togo	72.2	119.1	65.0	Côte d'Ivoire	36.4	38.7	6.3	54.5	80.7	48.1
Uganda	5.2	5.8	11.9	Kenya	4.9	3.8	−22.4	0.4	0.2	−50.0
Zaire	26.1	17.3	−33.7	Togo	12.1	—	−100.0	20.2	8.7	−56.9
Zambia	26.6	29.8	12.0	Malawi	10.3	19.8	92.2	6.5	5.8	−10.8
Zimbabwe	64.5	54.1	−16.1	Malawi	42.2	35.8	−15.2	45.7	39.5	−13.6

—Negligible.
n.a. Not applicable.
Note: The difference between the value of total reported imports and exports divided by the value of exports, times 100.
a. Côte d'Ivoire is the largest single destination for all other Sub-Saharan African exports.
b. Because no (or very few) exports were reported, the percentage difference between reported imports and exports could not be computed.
Source: Author's calculations, based on U.N. Series D Commodity Trade Tapes.

do not report data at lower levels of aggregation). Reported values of intra-African trade for the leading fifty manufactured and agricultural exports are shown in tables 6 and 7. The rank of each product in the value of total intra-African trade (imports and exports) is also shown.

Although in both product groups there is a positive rank correlation for export and import statistics that is significant at the 90 percent confidence level, variations for specific products could create important biases in analytical studies. As an illustration, differences of over 18 million dollars exist in the trade of woven textile fabrics (the difference is about 160 percent of reported imports); this item ranks fifth in manufactured exports but only twenty-second in imports. Footwear, road motor vehicles and parts, iron and steel bars, and ships and boats are other manufactured goods for which major differences occur in the rank and value of the partner country data (table 6). In the

Table 6. *Commodity Composition of Reported Trade in Manufactures among African Countries, 1982–83*

SITC	*Description*	*Reported value (thousands of dollars)*		*Difference (percent)*	*Rank in value of reported trade*[a]	
		Exports	*Imports*		*Imports*	*Exports*
661	Lime and cement	135,736	162,832	20.0	1	1
652	Woven cotton fabrics	113,776	143,432	26.1	2	2
554	Soaps and cleaning preparations	45,338	40,883	−9.8	13	3
851	Footwear	32,243	19,154	−40.6	17	4
653	Woven textile fabrics	29,594	11,289	−61.8	22	5
711	Power-generating machinery	27,735	31,170	12.4	6	6
684	Aluminum	27,544	32,903	19.5	3	7
541	Medicinal products	27,389	19,117	30.2	14	8
561	Fertilizers, manufactured	27,003	30,324	12.3	5	9
599	Chemicals	27,001	28,602	5.9	9	10
631	Plywood and veneers	26,704	30,866	15.6	8	11
642	Articles of paper	24,681	24,088	−2.4	10	12
732	Road motor vehicles and parts	23,777	32,425	36.4	4	13
673	Iron and steel bars	22,502	14,487	−35.6	24	14
893	Articles of plastic	18,481	15,502	−16.1	20	15
718	Machines for special industries	17,667	17,612	0.3	15	16
735	Ships and boats	16,431	29,188	77.6	7	17
719	Machinery and appliances	16,078	22,841	42.1	11	18
729	Other electrical machinery	16,037	17,391	8.4	16	19
651	Textile yarn and thread	15,568	18,215	17.0	23	20
629	Articles of rubber	13,785	9,849	−28.5	28	21
581	Plastics and resins	12,192	13,928	14.2	18	22
733	Road vehicles other than motor vehicles	10,776	8,288	−23.1	25	23
691	Finished structural parts	8,938	7,195	−19.5	27	24
678	Iron and steel tubes and pipes	8,128	6,746	−17.0	29	25

a. Rank by value in 103 three-digit SITC manufactured products (excluding U.N. special codes for which no data are available).

Source: Author's calculations, based on U.N. Series D Commodity Trade Tapes.

agricultural products group, a difference of more than 100 million dollars occurs for manufactured tobacco—it is first in imports but twelfth in exports. There are also major differences in the ranks and reported values for regenerated fibers, textile waste, and unmilled maize.

For many of these products, additional information on the underlying bilateral trade flows indicates that transshipment through neighboring countries is a source of major data errors. Whereas the country of final destination may simply list the routing country as the original exporter, the routing country may not list the products transported across its borders either as imports (when entering) or as exports (when exiting). As an example, in 1983, Sudan reports 69 million dollars in tobacco imports from Tanzania, although Tanzania reported no exports to Sudan. Because Tanzania only reported 58 million dollars in tobacco imports from all sources, it is likely that Sudan listed Tanzania as the origin of shipments that were transported through Tanzania but originated elsewhere. Similarly, Mali reported 1982 cotton exports to Côte d'Ivoire, which

Table 7. *Commodity Composition of Reported Trade in Food and Agricultural Raw Materials among African Countries, 1982–83*

		Reported value (thousands of dollars)			*Rank in value of reported trade*[a]	
SITC	*Description*	*Exports*	*Imports*	*Difference (percent)*	*Imports*	*Exports*
044	Maize, unmilled	116,271	23,705	−79.6	15	1
001	Live animals	103,320	132,305	28.1	2	2
031	Fresh fish	98,533	116,293	18.0	3	3
071	Coffee	64,755	69,597	7.5	4	4
263	Cotton	54,453	26,382	−51.5	11	5
074	Tea and maté	47,252	29,087	−38.4	9	6
061	Sugar and honey	43,595	33,809	−22.4	7	7
121	Tobacco, unmanufactured	39,834	30,885	−22.5	8	8
422	Other vegetable oils	33,091	62,530	89.0	5	9
051	Fresh fruit and nuts	31,835	25,004	−21.5	13	10
122	Tobacco manufactures	30,135	138,267	358.8	1	11
292	Crude vegetable material	29,672	34,537	16.4	6	12
099	Food preparations	26,067	25,873	−0.7	12	13
054	Fresh or frozen vegetables	22,437	27,878	24.2	10	14
048	Cereal preparations	21,936	22,195	1.2	16	15
062	Sugar confectionery	16,977	9,241	−45.6	20	16
267	Textile waste	12,448	2,043	−83.6	40	17
243	Shaped wood	10,653	24,987	134.6	14	18
221	Oilseeds and nuts	10,021	4,092	−59.2	28	19
045	Cereals, unmilled	9,831	3,426	−65.2	31	20
112	Alcoholic beverages	8,753	7,208	−17.7	23	21
421	Fixed vegetable oils, soft	8,366	19,348	131.3	17	22
042	Rice	8,273	11,604	40.3	18	23
266	Synthetic and regenerated fibers	5,823	232	−96.0	53	24
242	Wood in the rough	3,980	9,742	144.8	19	25

a. Rank by value in 53 three-digit SITC food and agricultural raw material products (excluding U.N. special codes, for which no data are available).

Source: Author's calculations, based on U.N. Series D Commodity Trade Tapes.

reported no imports from Mali. Again, the available evidence suggests that Mali's cotton was transshipped through Côte d'Ivoire to other destinations. Numerous improperly reported transshipments appear to be causing large errors in the U.N. statistics.

Table 8. *Trends in Intra-African Trade: Reported Partner Country Export and Import Statistics*

	All Sub-Saharan Africa, 1983 (thousands of dollars)		*Percentage change in country exports and reported imports from the country*					
			1979–83		*1980–83*		*1981–83*	
Country	*All exports*	*All imports*	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*	*Imports*
Benin	3,701	514	−54.1	−96.1	−55.1	−88.5	−54.3	−94.6
Burkina Faso	13,303	4,837	−64.4	−11.2	−64.8	−87.3	−52.4	−63.4
Burundi	396	2,863	−74.2	−16.5	−40.0	561.2	−76.9	296.5
Cameroon	5,007	58,951	−92.4	76.2	−84.9	32.0	−80.9	−15.1
Central African Rep.	571	174	−56.3	−84.5	−71.3	−89.5	−65.4	−81.0
Chad	10,695	238	62.7	−96.4	−2.9	−98.7	−2.5	31.9
Congo	3,994	2,815	3.2	−65.5	−25.3	−60.3	47.8	−51.3
Côte d'Ivoire	351,298	332,761	49.2	−87.9	116.3	16.8	3.9	5.7
Djibouti	18,118	1,542	742.7	−90.2	−6.6	−92.6	0.2	−91.4
Ethiopia	35,144	45,991	10.9	2.7	−35.9	−33.4	56.0	−16.0
Gabon	24,322	53,650	1,386.7	8.8	32,767.6	69.7	−51.5	1.3
Gambia	400	92	426.3	−62.9	30.3	−77.0	−33.2	−99.1
Ghana	7,955	2,760	18.2	−79.9	133.3	−79.8	−26.5	−71.3
Guinea	18,665	1,161	46.8	−90.9	6.9	−94.2	0.0	209.6
Kenya	237,772	279,853	18.0	277.2	−22.5	−18.3	−22.2	−18.9
Liberia	8,679	32,512	−29.9	406.3	−22.4	125.5	−18.6	102.0
Madagascar	3,279	2,012	−39.5	−52.4	80.4	−18.0	−22.5	25.1
Malawi	51,792	39,190	193.7	88.8	43.3	8.3	30.8	−8.8
Mali	9,278	8,148	−63.9	−46.0	−48.7	−70.7	35.7	−11.6
Mauritania	20,881	20,280	5,120.3	2,419.3	1,858.8	2,913.3	382.0	412.0
Mauritius	1,462	2,332	−0.8	42.6	−26.5	−48.9	38.7	64.7
Mozambique	27,219	78,133	156.3	458.6	−59.5	16.8	62.5	480.5
Niger	9,094	81,439	−77.0	1,975.9	−87.4	17.1	−88.8	−1.3
Nigeria	200,434	190,111	−28.9	−38.9	−48.2	−63.6	−29.7	−62.5
Rwanda	4,153	5,163	83,060.0	−41.3	−41.5	−27.3	−49.7	−37.4
Senegal	180,514	174,769	97.4	68.4	40.5	34.3	1.2	−10.4
Seychelles	50	155	−86.8	−54.1	−89.5	−82.9	−69.3	−84.7
Sierra Leone	1,665	6,400	−34.2	122.1	−11.7	378.3	−61.1	55.3
Somalia	904	1,238	59.4	177.6	−39.2	−24.4	−44.3	−10.7
Sudan	521	1,163	−11.8	32.3	−64.1	45.9	−74.2	9.7
Tanzania	18,941	70,013	−67.7	315.5	66.4	8.7	−41.8	63.6
Togo	35,939	45,244	31.8	292.9	−59.1	−52.4	9.4	−24.5
Uganda	2,562	3,258	9,388.9	33.7	−74.2	−66.5	9.0	38.1
Zaire	8,508	13,195	21.0	28.3	−46.6	−9.9	−57.0	25.2
Zambia	11,703	15,737	−62.1	−57.4	25.4	−57.7	147.8	−44.8
Zimbabwe	34,057	26,273	344.8	330.8	−35.8	34.2	16.6	−12.6

n.a. Not applicable.

Source: Author's calculations, based on U.N. Series D Commodity Trade Tapes.

Product supply and demand and broader trade policy analyses also require correct identification of trends or changes in the level of trade. Measuring long-term trends is not easily accomplished because of the major gaps in the historical records (see table 1), but data for all Sub-Saharan African countries were available for the 1979–83 period. Table 8 shows intra-African export and import totals for 1983, their percentage change, and the proportion of countries for which partners' trade data show opposing changes in the direction of intra-African trade. This would occur, for example, if a country's reported exports rose while the matched reported imports of its trading partners declined.

The information in table 8 strongly suggests that these data are unreliable as an indicator of changes in the level of trade. The data showed conflicting changes in direction in more than half of the thirty-six countries for 1981–83 and more than 40 percent of the countries over the 1979–83 period. In addition, even when the data showed the same direction of change in trade, there were often major differences in the magnitude. As an indication, African importers of Togo's exports reported increases nine times larger than those shown in Togo's export data. Correlations between changes in partner countries' export and import statistics were not statistically significant for any of the three time periods reported in table 8.

It was not possible to determine if some of these data discrepancies arose because of attempts by other Sub-Saharan Africa countries to conceal trade with South Africa. From 1979 to 1982 the South African Customs Union reported no exports to any of the Sub-Saharan countries, although twenty-two out of the thirty-six countries reported imports from South Africa that totaled about $900 million. In 1983, the U.N. trade tapes show $116 million in South African exports to Malawi, $9 million to Seychelles, $3 million to Kenya, and minor exports (under $1 million) to six other African countries. Coal and petroleum accounted for about one-third of these exports. South Africa reported little trade in those products in which major differences exist in Sub-Saharan partner country data (see tables 6 and 7).

III. The Analytical and Policy Implications

The key question that emerges from this study concerns the utility of African trade data for research and policy studies on intra-African trade. Five general findings bear directly on this question. First, the data cannot be used to assess the overall *level* of trade among African countries; the average discrepancy between matched export and import values is more than 60 percent for thirty-five of the countries (and more than 100 percent when the Gambia is included). Second, the data are probably useless for assessing the *direction* of intra-African trade because countries listed by the exporters as the largest markets for exports often fail to report *any* corresponding imports. Third, the data appear to be

equally deficient for determining the *composition* of trade because major discrepancies are revealed between partner country statistics at greater levels of detail. Fourth, there are large and persistent differences in the *trends* in both the magnitude and direction of intra-African trade as reflected in reported exports and matched imports. Fifth, the fact that reported f.o.b. exports frequently exceed matched reported c.i.f. imports suggests that smuggling is widespread in trade among African countries or that importers are intentionally underinvoicing to avoid high tariffs or quotas. Given these points, it is difficult to see how any confidence could be placed in the official U.N. data or the underlying national data upon which they are based.

Similar conclusions about the reliability and utility of African trade data emerge from a comparison of these statistics with matched OECD data. Discrepancies between the African export and OECD import data are far greater than differences in statistics on trade among developed countries. Analyses of underlying quantity and unit values indicate several factors are responsible. First, discrepancies in reported quantities traded of products such as petroleum, coffee, and cocoa suggest that exporters have intentionally been underreporting shipments in order to circumvent international commodity agreement quotas. Second, for high-value, low-volume products like pearls and precious stones, reported imports greatly exceed reported exports, suggesting that smuggling is occurring on a large scale. Third, large differences in the reported unit values for some products, particularly oilseeds and iron ore, suggest that exporters are purposefully underinvoicing (possibly to avoid government foreign exchange controls or restrictions on foreign asset holdings), or are not receiving full value for these items. Because most of the data errors appear to originate on the export side, this study suggests that any North-South analyses of African trade should primarily rely on OECD data.

Because export subsidies and similar incentives are not widely used in the subject countries, the excess of reported exports over imports is consistent with underinvoicing by importers or smuggling on a fairly massive scale. The very high import tariffs in most African countries provide a strong incentive for such activities. Without further analysis it would be difficult to estimate the magnitude of smuggling in African trade from data drawn from partner countries because there is no way to determine quantities and values that are not reported by *either* the exporter or importer as opposed to (smuggled) trade that is recorded by one of the countries involved.

On a more general level, the results of this study accent the need for more information about the basic quality of official U. N. trade statistics. It would appear useful, for example, to extend the general approach employed in this analysis to other groups of developed and developing countries and make the findings of such investigations generally available. Until this is done, a strong possibility exists that basic research could be seriously biased, and inappropriate policy decisions made because of substantial errors in official trade data.

Appendix. The Transport Costs Correction Factor

One factor which produces a discrepancy between partner country trade data is international transport and insurance costs. Exporters typically value shipments on an f.o.b. basis, whereas imports are normally tabulated on a c.i.f. basis. As such, a key question is how large a difference should be expected between partner country statistics as a result of freight and insurance costs.

Because the United States now tabulates international transport costs actually paid for all imports directly from customs vouchers, these data can be used to derive transport correction factors for partner country trade data with the United States (Finger and Yeats 1976; Brodsky and Sampson 1979; Yeats 1981, 1990). The U.S. Customs information reflects freight charges actually paid, including all discounts and surcharges. (Studies have often had to rely on published liner conference charges. The conferences, organized by unincorporated associations of ocean liner owners, formally establish freight rates, sailing schedules, and regulations that affect competition among members. These are often unreliable as guides to actual transport payments.)

Transport and insurance costs for each African country's exports were compiled and converted to nominal equivalents. The formula used for estimating these nominal freight costs, which serve as "correction factors" for partner country data (C_{ij}), was:

$$C_{ij} = f \div V_{fu} \tag{A-1}$$

where f represents freight and insurance charges and V_{fu} the U.S. f.o.b. value of total imports from each African country. The resulting statistics show the percentage by which c.i.f. imports should exceed partner country f.o.b. data (see appendix table 1).

For total trade the data suggest that most African countries' f.o.b.–c.i.f. correction factor would be in the range of 5 to 10 percent, although there are several exceptions. Guinea, whose exports are highly concentrated in low-grade metallic ores, has a nominal freight rate that ranges from 21 to 37 percent; the corresponding freight factors for Liberia and Somalia reach 25 and 28 percent.

Although the data reported in appendix table 1 are based solely on U. S. statistics, they should be useful for assessing African–European partner country trade figures. Specifically, numerous studies of maritime transport costs show that freight rates are generally positively associated with distance, and for commodities like wood, ores, or petroleum which involve economies of scale in transport, freight rates are inversely related to volumes shipped. Because distance is smaller to European ports, and quantities transported are generally larger, the f.o.b.–c.i.f. correction factors reflected in appendix table 1 would probably serve as upper limits for those that should be applied to most African—European partner country trade data. Equation A-1 will likely understate the correction factor for landlocked African countries, however, because the

Appendix Table 1. *Import Values and Related Nominal Transport Costs for African Countries' Total Exports to the United States*

	1983 U.S. import value (millions of dollars)		*Nominal freight costs (percent)*					
Exporting country	*f.o.b.*	*c.i.f.*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*
Benin	26.9	28.7	7.1	6.7	n.a.	n.a.	n.a.	5.3
Burkina Faso	0.1	0.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Burundi	2.8	3.0	7.5	7.1	5.3	9.0	6.0	6.4
Cameroon	515.0	535.9	4.1	4.1	4.1	4.5	9.3	7.0
Central African Rep.	3.5	3.6	4.1	2.9	n.a.	n.a.	8.1	4.2
Chad	67.6	70.6	n.a.	4.4	n.a.	33.3	n.a.	n.a.
Congo	820.8	859.4	3.6	4.7	5.4	5.9	9.3	6.1
Côte d'Ivoire	342.7	371.3	7.4	8.3	6.4	6.3	6.7	8.5
Djibouti	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	50.0	n.a.
Ethiopia	86.8	93.9	7.4	8.2	7.9	7.7	4.2	6.0
Gabon	657.1	685.1	4.1	4.3	4.0	4.3	8.9	6.0
Gambia	0.2	0.2	n.a.	n.a.	16.6	33.3	20.0	n.a.
Ghana	119.8	125.3	2.3	4.6	7.8	6.0	5.2	4.3
Guinea	104.4	138.6	36.7	32.7	25.7	21.4	25.8	27.7
Kenya	65.0	70.2	7.4	8.0	8.0	7.8	6.5	7.4
Liberia	90.5	107.5	25.2	18.8	20.1	25.0	19.3	14.5
Madagascar	70.7	74.2	5.6	5.0	4.1	4.2	2.9	3.4
Malawi	14.5	15.5	9.8	6.9	8.2	9.0	10.6	8.0
Mali	0.7	0.7	9.1	n.a.	9.1	8.5	9.6	4.3
Mauritania	0.8	0.8	n.a.	n.a.	10.0	25.0	10.5	12.4
Mauritius	31.5	33.9	10.2	7.6	8.1	9.3	9.6	10.2
Mozambique	28.5	31.0	10.8	8.8	9.2	8.8	6.4	6.0
Niger	4.2	4.3	n.a.	2.4	n.a.	8.8	5.1	5.6
Nigeria	3,736.0	3,882.7	3.2	3.9	3.9	3.5	5.9	5.4
Rwanda	28.4	29.9	6.1	5.3	4.7	6.3	5.6	6.4
Senegal	1.9	2.1	18.2	10.5	20.8	12.5	7.5	5.7
Seychelles	2.9	3.1	4.9	5.2	5.6	4.2	3.6	5.3
Sierra Leone	21.5	22.8	6.2	6.1	5.1	6.8	7.5	4.4
Somalia	0.1	0.2	22.2	n.a.	28.5	22.2	n.a.	n.a.
Sudan	19.0	20.4	10.2	7.4	11.5	8.1	3.6	3.5
Tanzania	14.3	16.2	9.7	13.3	10.4	11.5	8.5	5.9
Togo	19.9	21.0	6.9	5.5	5.1	7.0	12.4	13.1
Uganda	103.9	110.6	7.2	6.4	5.4	5.7	4.9	5.8
Zaire	366.3	378.2	4.0	3.2	3.2	3.5	4.1	8.0
Zambia	52.1	53.7	3.7	3.1	3.6	2.1	2.4	3.2
Zimbabwe	73.8	79.5	7.1	7.7	6.6	6.3	5.8	6.5

n.a. Not applicable (no exports or imports recorded in that year).

Note: The figures in this table are used to calculate correction factors for exporter (f.o.b.) and importer (c.i.f.) trade values.

Source: Author's calculations, based on U.S. reported trade data.

U.S. transport data do not account for shipping costs from the border of the landlocked country to the ocean port of export. The ratios could also be higher for such countries as Guinea, Liberia, and Sudan.

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