

# REASSESSING THE MEASUREMENT OF INTERNATIONAL TRANSPORT COSTS

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## ABSTRACT

The United Nations, World Bank, African Development Bank and several other researchers use import cif/fob ratios to measure a country's international transport costs. This paper contributes towards a better understanding of country cif/fob ratios and shows the severe limitations to using these data that are sufficient to bias findings. The trade data used in this study are sourced from the International Monetary Fund's International Financial Statistics, World Development Indicators and Standard International Trade Classification (SITC) data from the World Trade Analyser. These trade data are used in correlation analyses between various countries annual cif/fob ratios and annual compositions of imports. The findings show that where the quality of the data is reliable, as in the case of the United States, a country's composition of imports has a significant effect on that country's cif/fob ratios and hence researchers cannot use the ratio as a reliable measure of direct shipping costs. In Malawi's case, the International Financial Statistics from the International Monetary Fund are neither able to show Malawi's actual *ad valorem* shipping costs nor direct costs of transportation. Researchers should be wary of substituting country cif/fob ratios for direct cost measures.

Keywords: international transport costs; country import cif/fob ratios; *ad valorem* shipping costs.

JEL code: F13

# 1. INTRODUCTION

The United Nations, World Bank, African Development Bank and several other researchers worldwide, use import cif/fob ratios to measure (proxy) country's and groups of countries' international transport costs. To use the ratios as a measure of (direct) shipping costs, many authors have essentially assumed that a country's import composition is reasonably stable so that the ratio "reveals true differences in shipping costs rather than commodity mix effects" (Radelet and Sachs, 1998: 3). The econometric use of the cif/fob ratio, however, has extended this assumption to an extreme by essentially assuming a country's composition of imports as constant. Consequently, a rise in a country's cif/fob ratios is supposed to indicate a rise in that country's (direct) international transport costs that may lead to a reduction in international trade.

The purpose of this paper is to contribute towards a better understanding of country cif/fob ratios and to assess their global use as a measure (proxy) for international transport costs. In particular, the paper aims to show how the broad trends in the composition of imports have an effect on these import cif/fob ratios. The trade data used in this study are sourced from the International Monetary Fund's International Financial Statistics, World Development Indicators and Standard International Trade Classification (SITC) data from the World Trade Analyser. These trade data are used in correlation analyses between various countries annual cif/fob ratios and annual compositions of imports.

This paper proceeds as follows. Section 2 reassesses the definition and source of country cif/fob ratios. Section 3 contrasts a shipping cost perspective with that of a composition of imports perspective on Africa's cif/fob ratios in a global context. The analyses and case studies on the United States (Section 4) and Malawi (Section 5) each add additional insights on the use and misuse of country import cif/fob ratios as measures of transportation costs. Additionally, the US case study demonstrates how a developed country's composition of imports has both a substantial and significant effect on the cif/fob ratios<sup>1</sup>. Section 6 concludes the analysis of country cif/fob ratios and shows the severe limitations to using these data that are sufficient to bias the findings of studies.

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<sup>1</sup> In order not to confuse statistical significance with economic significance, Goldberger (1991, in Gujarati, 1995: 134) notes that it "may be a good idea to reserve the term 'significance' for the statistical concept, adopting 'substantial' for the economic concept." Furthermore, "a statistical relationship, however strong and however suggestive, can never establish causal connection: our ideas of causation must come from outside statistics, ultimately from some theory or other" (Kendall and Stuart, 1961:279 in Gujarati, 1995: 20). Chasomeris (2004; 2007: 15-17) use economic theory to show the cause-and-effect relationship between a country's import composition and cif/fob ratio.

## 2. SHIPPING COSTS: REASSESSING THE DEFINITION AND SOURCE OF COUNTRY CIF/FOB RATIOS

In the absence of direct measures, researchers have used an indirect measure of international transportation costs – a country’s import cif/fob ratio<sup>2</sup>. Radelet and Sachs (1998: 3) state: “the FOB price measures the cost of an imported item at the point of shipment by the exporter, specifically as it is loaded on to a carrier for transport.... The CIF price measures the cost of the imported item at the point of entry into the importing country, inclusive of the costs of transport, including insurance, handling, and shipping costs, but not including customs charges.” Similarly, Hummels (1999b: 26) explains that “exporting countries report trade flows exclusive of freight and insurance (fob), and importing countries report flows inclusive of freight and insurance (cif). Comparing the valuation of the same aggregate flow reported by both the importer and exporter yields a difference equal to transport costs.” In principle, then, the measure compares the “cost, insurance and freight” (cif) value with the “free on board” (fob) value of imports; the difference constitutes a measure of transportation costs. The country import ratio (cif/fob)-1 provides a measure of *ad valorem* shipping costs (Yeats, 1977: 459; Radelet and Sachs, 1998: 4)<sup>3</sup>. Among others, Radelet and Sachs (1998), Naudé (1999a; 1999b) and Limão and Venables (1999; 2000; 2001) use this (cif/fob)-1 ratio as their basic measure of shipping costs. This paper uses the cif/fob ratio both as a true ratio (1.12) and as a percentage (12 per cent *ad valorem*).

Probing further into the definition and use of country cif/fob ratios, this study uncovered that there is more than one definition of the concepts cif and fob. Charged with publishing the official rules for the interpretation of trade terms, the International Chamber of Commerce (1999) has defined the fob and cif terms as follows:

“Free on Board” means that the seller delivers when the goods pass the ship’s rail at the named port of shipment. This means that the buyer has to bear all the costs and risks of loss of or damage to the goods from that point. The fob term requires the seller to clear the goods for export.

This term can be used only for sea and inland waterway transport.

(International Chamber of Commerce, 1999: 49).

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<sup>2</sup> A country’s import cif/fob ratio has received various names in the literature, for instance: shipping costs (Radelet and Sachs, 1998), *ad valorem* transport costs, *ad valorem* shipping costs and *ad valorem* freight rate (Yeats, 1977), freight factor, a country’s average freight rate (UNCTAD, 2003b:13), CIF-FOB band on imports and transport cost *rate* (Naudé, 1999a;1999b), c.i.f.-f.o.b. transport-cost factor and average c.i.f.-f.o.b. factor (Baier and Bergstrand, 2001).

<sup>3</sup> Yeats (1977) uses a similar *ad valorem* shipping cost measure. “The f.a.s. [free along side] value represents the transaction value of imports at the foreign port of exportation and is based on the purchase price plus all charges incurred in placing merchandise alongside the vessel at the port of exportation. The c.i.f. value measures the value of imports at the first port of entry in the United States and includes all freight, insurance, and other charges (excluding import duties) incurred in bringing the merchandise from the country of exportation and placing it alongside the vessel at the port of entry. Furthermore, (c.i.f./f.a.s.) - 1 provides the ‘*ad valorem* freight rate’” (Yeats, 1977: 459).

“Cost, Insurance and Freight” means that the seller delivers when the goods pass the ship’s rail in the port of destination. The seller must pay the costs and freight necessary to bring the goods to the named port of destination BUT the risk of loss of or damage to the goods, as well as any additional costs due to events occurring after the time of delivery, are transferred from the seller to the buyer<sup>4</sup>. The cif term requires the seller to clear the goods for export.

This term can be used only for sea and inland waterway transport.

(International Chamber of Commerce, 1999: 65).

Thus according to the above definition, both the cif and fob terms of shipment should only be used for sea and inland waterway transport. How then has it been possible for researchers like Limão and Venables (1999; 2000; 2001) to use a country’s cif/fob ratio to estimate the impact of a country’s infrastructure, and particularly landlocked country infrastructure, on transport costs and trade flows? An answer to this question is essentially that there is a significant difference in the use and definition of the terms of shipment cif and fob, as compared to the imports cif and imports fob used by the international trade statistics. The differences in the definitions became clearer after having studied and compared the various views presented by the International Chamber of Commerce (1999) Radelet and Sachs (1998) and Hummels (1999b). For instance, Radelet and Sachs (1998: 3) use a trade statistic definition and understanding of the fob and cif measures that are significantly different from the official Incoterms (International Chamber of Commerce, 1999) definition and use of these terms. In particular, the Incoterms definition specifically states that both cif and fob terms of shipment are to be used only for sea and inland waterway transport. In contrast the definition of cif and fob in the international trade statistics (for instance the *International Financial Statistics*), is much broader, and includes costs for maritime and other modes of transport<sup>5</sup>. Furthermore, inconsistencies in standard textbook definitions of import cif and import fob are exacerbating the potential for misuse and misunderstandings of country cif/fob ratios. On the one hand, it appears that textbooks on international trade (see Salvatore, 2001) define and briefly discuss the concepts of imports cif, imports fob and a country’s cif/fob ratio, using the international trade definitions from the IMF. On the other hand, maritime transport textbooks (see Stopford, 1997; Alderton, 1995; McConville, 1999) define and discuss these same concepts using the official Incoterms (International Chamber of Commerce, 1999).

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<sup>4</sup> Note however, that “in cif the seller also has to procure marine insurance against the buyer’s risk of loss of or damage to the goods during the carriage. Consequently, the seller contracts for insurance and pays the insurance premium. The buyer should note that under the cif term the seller is required to obtain insurance only on minimum cover. Should the buyer wish to have the protection of greater cover, he would either need to agree as much expressly with the seller or to make his own extra insurance arrangements” (International Chamber of Commerce, 1999: 65).

<sup>5</sup> This finding was important for me and may be of assistance to other researchers. A difficulty and potential challenge to other researchers will be to distinguish the international trade statistics use of cif and fob from the traditional Incoterms – maritime trade use – of cif and fob. In other words, although several researchers, in various fields may be using the concepts cif and fob, they may not all have the same definition and therefore understanding of these concepts. Consequently, there is a potential for misunderstanding and misuse of the ratio.

Hummels and Lugovskyy (2003: 5) explain “there are actually three IMF sources that report cif/fob ratios: the DOTS [Direction of Trade Statistics] data tapes contain bilateral data aggregated over all commodities, while DOTS yearbooks and the *International Financial Statistics* (IFS) contain trade data that are aggregated over all commodities and partners for a particular importer. All report trade flows using as a primary source the UN’s *COMTRADE* database, with *COMTRADE* supplemented in some cases by national data sources.” “While the measurement of transportation costs are not the primary purpose of these publications, DOTS and IFS are sometimes used to this end” (Hummels, 1999b: 26)<sup>6</sup>. This paper investigates country import cif/fob ratios using data from the *International Financial Statistics* (IFS).

One advantage of the cif/fob measure is that there are data available for many countries and this aids in international comparisons<sup>7</sup>. Because of their availability and coverage, several authors use IMF cif/fob ratios to assess the effect of transportation costs on trade<sup>8</sup>. Typically, these authors assume that “a decline in such shipping costs [that is, the cif/fob ratios] can be expected to lead to more international trade, all things remaining equal” (Rose, 1991: 421). In other words, a rise in a country’s cif/fob ratios is supposed to measure (indicate) a rise in that country’s (direct) international transport costs that can be expected to lead to a reduction in international trade. Even UNCTAD’s *Review of Maritime Transport*, the principal annual publication on international transportation and trade issues, uses IMF cif/fob ratios to monitor and report *ad valorem* shipping costs on a worldwide basis (see Section 3).

The data, however, have several drawbacks, as summarised below by Limão and Venables (2000: 7)<sup>9</sup>.

The first is measurement error; the cif/fob ratio is calculated for those countries that report the total value of imports at cif and fob values, both of which involve some measurement error. The second concern is that the measure aggregates over all commodities imported, so it is biased if high-transport cost countries systematically import lower-transport cost goods. This would be particularly important if the study were analysing exports, which tend to be concentrated in a few specific goods. It is less so for imports that are generally more diversified and vary less in composition across countries. Finally, the measure aggregates over the different sources of supply, so for

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<sup>6</sup> Chasomeris (2007) discusses several papers that have used the IMF cif/fob data in analysing the role of transport costs in world trade. Among others, Radelet and Sachs (1998), Naudé (1999a; 1999b) and Limão and Venables (1999; 2000; 2001). The *Review of Maritime Transport* perhaps the most comprehensive source of data on international transport cites these data as a primary (and only systematic) source for *ad valorem* shipping costs (Hummels, 1999b: 26).

<sup>7</sup> “Forty one of the largest countries are available in every year of the data [that is, IMF DOTS data], and well over one hundred countries are represented in most of the available time series” (Hummels and Lugovskyy, 2003: 2).

<sup>8</sup> For instance, Radelet and Sachs (1998), Naudé (1999a; 1999b) and, Limão and Venables (1999, 2000, 2001).

<sup>9</sup> Radelet and Sachs (1998), Hummels and Lugovskyy (2003), and Hummels (1999b) mention these drawbacks of country cif/fob ratios. Further limitations and errors in country cif/fob ratios are analysed in Chasomeris (2007).

each importer there is a single cif/fob measure, not a full set of cif/fob measures for imports from each supplying country.

Nonetheless, Radelet and Sachs (1998: 3) maintain that although subject to shortcomings, “these data are relatively consistent and complete, and provide a good starting point for examining the general costs of international shipping for almost all countries in the world.” Accordingly, Section 3 investigates empirical evidence on Africa’s “shipping costs”, as measured by IMF cif/fob ratios, in a global context.

### 3 ALTERNATIVE PERSPECTIVES ON AFRICA’S CIF/FOB RATIOS IN A GLOBAL CONTEXT

International trade is widely viewed as an engine of economic growth and social development. Transport costs are significant impediments to Africa’s trade growth and socio-economic development. High international transport costs serve, on the one hand, to protect domestic producers from foreign competition, and yet on the other hand, they provide a significant anti-export bias that reduces international competitiveness. The problems posed by Africa’s high transportation costs – not only for the 15 landlocked countries but also as most countries with sea-coasts have large interiors (Africa Development Report, 2004: 171) – have been of concern for centuries and remain significant (see Smith, 1776: 14, 16)<sup>10</sup>.

The United Nations Conference on Trade and Development’s (UNCTAD) *Review of Maritime Transport* as the principal annual publication on international transportation and trade issues, relies greatly on IMF trade data to calculate *ad valorem* shipping costs (that is, import cif/fob ratios) for groups of countries on a worldwide basis. Figure 1 and Table 1 present these import cif/fob ratios by country groups for 1970, 1980, 1990 and 1997-2003. The *Review of Maritime Transport* reports these values annually<sup>11</sup>. Figure 1 and Table 1 exhibit the marked differences in shipping costs between country groups. The developing countries’ costs, in all regions, are consistently and substantially higher than the average for developed countries. In 2003, import freight costs represented 5.4 per cent of world imports (fob). This percentage is largely driven by developed countries, which typically account for more than 70 per cent of total imports and had relatively low transport costs of 3.9 per cent (Micco and Perez, 2001). Compared with 1970, the contraction in the world cif/fob ratios of both developed and developing market economies has been substantial (see Figure 1). Radelet and Sachs (1998: 11) explain that shipping costs are undoubtedly falling over time for all countries as improved technologies reduce port and transit times. “Unfortunately, this trend is not evident in the IMF’s published CIF/FOB bands, which do not show a significant time trend” (Radelet

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<sup>10</sup> Two and a quarter centuries ago, Adam Smith, in the *Wealth of Nations* (1776), stressed the relationship between geographic location and international trade. Shipping, as today, was viewed as a catalyst, a means to greater markets and hence greater levels of efficiency that are a consequence of the division of labour and degree of specialisation (Smith, 1776 in Radelet and Sachs, 1998: 1).

<sup>11</sup> Partly due to the time lags in the compilation of the imports cif and imports fob data the *Review of Maritime Transport* 2005 publish the cif/fob ratios for 2003.

and Sachs, 1998: 11)<sup>12</sup>. The authors' explanation for this is merely that "this is most likely due to the IMF's tendency to update these estimates only infrequently" (Radelet and Sachs, 1998: 11).

Shipping costs, in 2003, are 3.9 per cent for developed countries and more than double for other country groups. Latin America had the lowest transport cost in 1997 relative to other developing countries (7.02 per cent, compared to 7.95 per cent for Asia and 11.5 per cent for Africa). These low average transport costs were led by Mexico, which is close to its main trading partner (the United States). Excluding Mexico, Latin American average transport costs rise to 8.3 per cent, more similar to the rest of developing countries (Micco and Perez, 2001: 4). Figure 1 illustrates a significant rise in Latin America's ratio from a low of 6.86 per cent in 1998 to a high of 10.5 per cent in 2002<sup>13</sup>. Furthermore, Alderton (1995: 21) notes: "the irony and implications of this [the differences between developed and developing nations transport costs] are obvious in that countries which most need to stimulate their economies face the greatest financial hurdles."

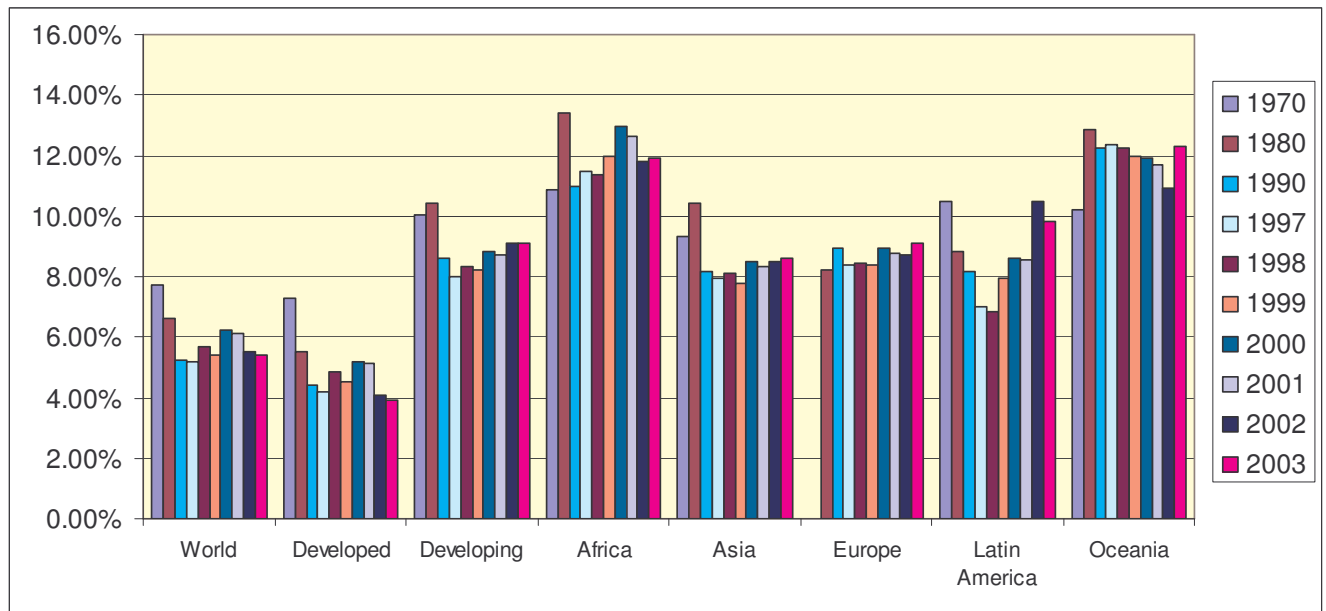
Africa and Oceania typically experience the highest shipping costs: for 2003, these costs were 11.9 and 12.3 per cent of total import value, respectively. These sub-groups have been consistently and significantly higher than both the developed and world market economies by two or three times in percentage terms. Figure 1 and Table 1 show developing countries in Africa typically experience the highest cif/fob ratios of all the country groups. Most evident, and arguably a cause for concern, is Africa's significant rise in shipping costs from 11 per cent in 1990 to 12.97 per cent in 2000 (also see Chasomeris, 2003c). Likewise, the African Development Report (2004: 172) compared the ratios for various regions of the world in 1980, 1990 and 1994. Two interesting patterns emerged. The first was that for all regions except sub-Saharan Africa (SSA), shipping costs declined between 1980 and 1994 - SSA is the only region in which transport costs increased. In most regions except for Central and Eastern Europe, this decline was moderate, but by 1994 transport costs were less than 10 per cent. The second observation is that, by 1994, SSA had the highest transport costs of any region. Interestingly, 28 per cent of the sub-Sahara African population lives in landlocked economies where the cif/fob ratio for 2001 was 13.84 per cent (Bloom et al., 1998: 239; UNCTAD, 2003a).

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<sup>12</sup> "By contrast, the implicit cif/fob band from the US Department of Commerce import data shows a significant downward trend over time.... Hence, shipping costs are much less of a barrier to international trade than they once were. There are reasons to believe that these costs will continue to fall in the future" (Radelet and Sachs, 1998: 11). Hummels (1999b: 3) with reference to the cif/fob ratios states that "the time series derived from IMF sources accords well with conventional wisdom - transportation costs have declined". In contrast, Hummels (1999b) offers evidence from an eclectic mix of data including ocean freight rates that reveal that transport costs had increased. Chasomeris (2007) shows South Africa's rising cif/fob ratios have not been indicative of the declines in the country's real direct shipping costs.

<sup>13</sup> Though not the primary focus of this study, visual observation of the changes in Latin America's composition of imports suggests that the rise in SITC-3 (oil imports) is partly responsible for this rise in Latin America's cif/fob ratios (Chasomeris, 2007: 222).

**FIGURE 1. ESTIMATES OF THE CIF/FOB RATIO FOR IMPORTS BY COUNTRY GROUPS**



Source: Author compiled from: UNCTAD 1999; 2000; 2001, 2002; 2003a; 2004; 2005; McConville, 1999: 177; ISL, 2001; 2002.

**TABLE 1. ESTIMATES OF THE CIF/FOB RATIO FOR IMPORTS BY COUNTRY GROUPS**

	1970	1980	1990	1997	1998	1999	2000	2001	2002	2003
World	7.75	6.64	5.22	5.20	5.69	5.39	6.21	6.11	5.50	5.40
Developed	7.26	5.49	4.40	4.20	4.83	4.50	5.21	5.12	4.10	3.90
Developing	10.04	10.44	8.60	8	8	8.21	8.83	8.70	9.10	9.10
- Africa	10.88	13.42	11	11.50	11.36	12.00	12.97	12.65	11.80	11.90
- Asia	9.30	10.41	8.19	7.95	8.11	7.80	8.51	8.35	8.50	8.60
- Europe	NA	8.23	8.96	8.39	8.46	8.38	8.92	8.78	8.70	9.10
- Latin America	10.48	8.85	8.17	7.02	6.86	7.94	8.58	8.57	10.50	9.80
- Oceania	10.21	12.84	12.26	12.36	12.26	12.00	11.94	11.70	10.90	12.30

Source: Author compiled from: UNCTAD 1999; 2000; 2001, 2002; 2003a; 2004; 2005; McConville, 1999: 177; ISL, 2001; 2002.

Note:

This study uses the cif/fob ratio both as a true ratio (1.1) and as a percentage (10 per cent *ad valorem*). “The estimate for the world total is not complete, since data for countries that are not members of the IMF, the countries of Central and Eastern Europe and republics of the former Soviet Union, and the socialist countries of Asia are not included for lack of information or other reasons” (UNCTAD 2005: 71). I am interested, in future research, to gain access to and analyse the raw data used to compile these country group ratios. I have concerns that the changing composition of imports and “missing” partner trade data with the consequent IMF staff imputations may be introducing biases that in turn provide a distorted perspective on the actual *ad valorem* shipping costs.

The factors underlying Africa's remarkable disadvantages in transport costs include: "great distance from major world markets in the northern midlatitudes...; a very small coastline relative to land area; very few natural coastal ports; populations generally far from the coast; the highest proportion of landlocked states, of any continent; and the absence of rivers leading into the interior of the continent that are navigable by ocean-going vessels" (Bloom et al., 1998: 236-237)<sup>14</sup>. Africa's economic performance rates well below those of other developing regions largely because of poor transport infrastructure and inefficient transport corridors, and unless such issues are addressed it remains unlikely that the continent's developing countries will rise among the trading nations of the world (Drewry Shipping Consultants, 2004). Likewise, Limão and Venables (2000: 25) found that most of Sub-Saharan Africa's poor trade performance is explained by poor infrastructure, "and by a particular penalty on long distance (typically cross-continental) trade in Africa."

The aggregated ratios, however, conceal vast differences, both apparent and subtle, that persist within the country groups, particularly in Africa. Significant diversity in terms of geographical location and infrastructure; international trade composition; income and development; government bureaucracy and market structure; result in enormous variances in transport costs. Both importers and exporters in Africa face high costs for sea and land transport where "the average freight rate"<sup>15</sup> is 47 per cent higher than in other developing countries and twice the rate in developed countries, estimated at 5.21 per cent. Those hardest hit by excessive transport costs are the continent's 15 landlocked countries" (UNCTAD, 2003b: 13)<sup>16</sup>. Lack of territorial access to the sea as well as remoteness and isolation from world markets imposes serious constraints on landlocked developing countries and their ability to participate in world trade. The impact of this directly hinders their overall level of socio-economic development. Landlocked developing countries are generally among the poorest of the developing countries, with the weakest growth rates, and are typically heavily dependent on a very limited number of commodities for their export earnings<sup>17</sup> (Chowdhury, 2003: 2). Limão and Venables (2000: 25) show that the representative landlocked economy had transport costs 50 per cent higher and trade volumes 60 per cent lower than the representative coastal economy.

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<sup>14</sup> "In regard to length of coastline relative to land area, note that while western Europe has about one-eighth the land area of Africa (3.5 million km<sup>2</sup> compared with 29 million km<sup>2</sup>), its coastline is about 50 percent longer (54,000km compared with 35,000 km). In regard to water-borne access to the interior, all of Africa's major rivers, including the Nile, the Niger, the Congo, and the Zambezi, have sharp cataracts." (Bloom et al., 1998: 237).

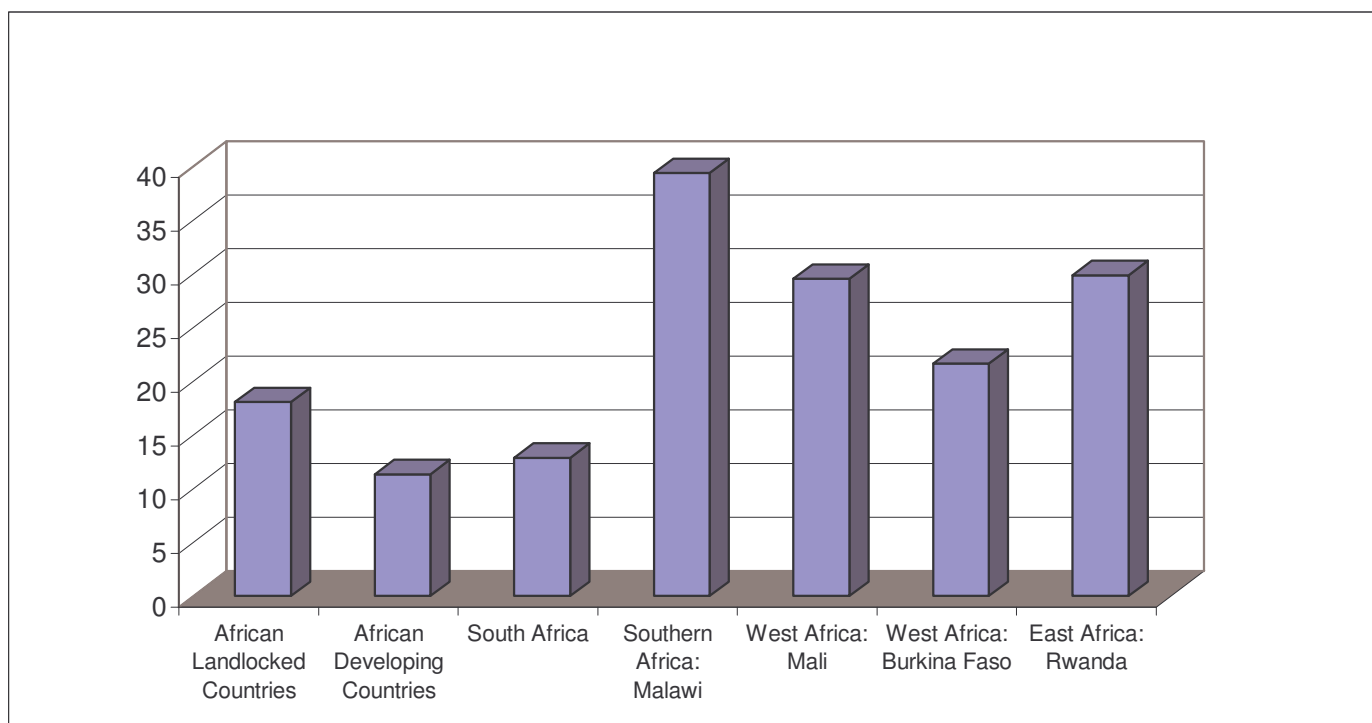
<sup>15</sup> UNCTAD's Review of Maritime Transport (2002, Table 14, in UNCTAD, 2003b: 29) state: "Freight and insurance costs for Africa, excluding South Africa, were 12.97 per cent of imports CAF in 2001". This statement, however, is incorrect as the freight and insurance costs for Africa actually declined from 12.97 in 2000 to 12.65 in 2001 (UNCTAD, 2003a: 3).

<sup>16</sup> It is important to note that in the above quotation, UNCTAD in 2003 have essentially referred to the cif/fob ratio as "the average freight rate". The conceptualisation of the cif/fob ratio as a country's or group of countries "average freight rate" is misleading as the ratio is essentially total import freight costs (transport costs) as a proportion of imports fob.

<sup>17</sup> Of the 30 landlocked developing countries, 16 are included in the list of least developed countries. The bottom ranked country according to the 2002 UNDP Human Development Index was Sierra Leone (not landlocked), ranked 172. The next nine countries ranked 162-171 were landlocked countries (in Chowdhury, 2003: 2).

These authors suggest that a substantial proportion of this disadvantage may be overcome through improvements in their own and their transit countries' infrastructure. Figure 2 shows that in 1998, the average freight costs of the 15 landlocked African countries constituted a higher proportion of total import value (18.08 per cent) than the ratio for all African developing countries (11.36 per cent). Some extreme cases recorded for West Africa include Mali and Burkina Faso with a much higher transport cost percentage of 29.57 per cent and 21.67 per cent respectively. Rwanda registered the highest ratio in East Africa (29.91 per cent) while Malawi in southern Africa represented as much as 39.41 per cent (UNCTAD, 2000 and UNCTAD Media Summary, 2000). These landlocked African countries continue to suffer from excessive transport costs and are estimated to have paid 20.8 per cent in freight charges in 2001, that is, four times the world average rate (UNCTAD, 2003b: 29). The existence of a well-functioning transport system is a prerequisite not only for trade to take place, but also for foreign direct investment to be channelled to a specific country. Some of the main economic factors for selecting a host country for FDI are physical infrastructure and the availability of reliable and efficient transport and communication services (Chowdhury, 2003: 5). The World Investment Report (2001 in Chowdhury, 2003: 5) revealed that for the 30 landlocked developing countries, inward flows of FDI stood at only US\$4.6 billion or 0.34 per cent of world flows in 2001. The 15 landlocked developing countries in Africa received only US\$984 million. The international community is undertaking measures to address transit transport problems of landlocked and transit developing countries. These efforts include financial assistance in transport infrastructure by the World Bank, regional development banks, and bilateral assistance programmes; multilateral and bilateral assistance projects; trade facilitation measures promoted by UNCTAD, regional commissions, WTO and other relevant international, regional and professional organisations (Chowdhury, 2003: 4).

**FIGURE 2. FREIGHT COSTS AS A PERCENTAGE OF IMPORT VALUES FOR AFRICAN COUNTRIES, 1998**

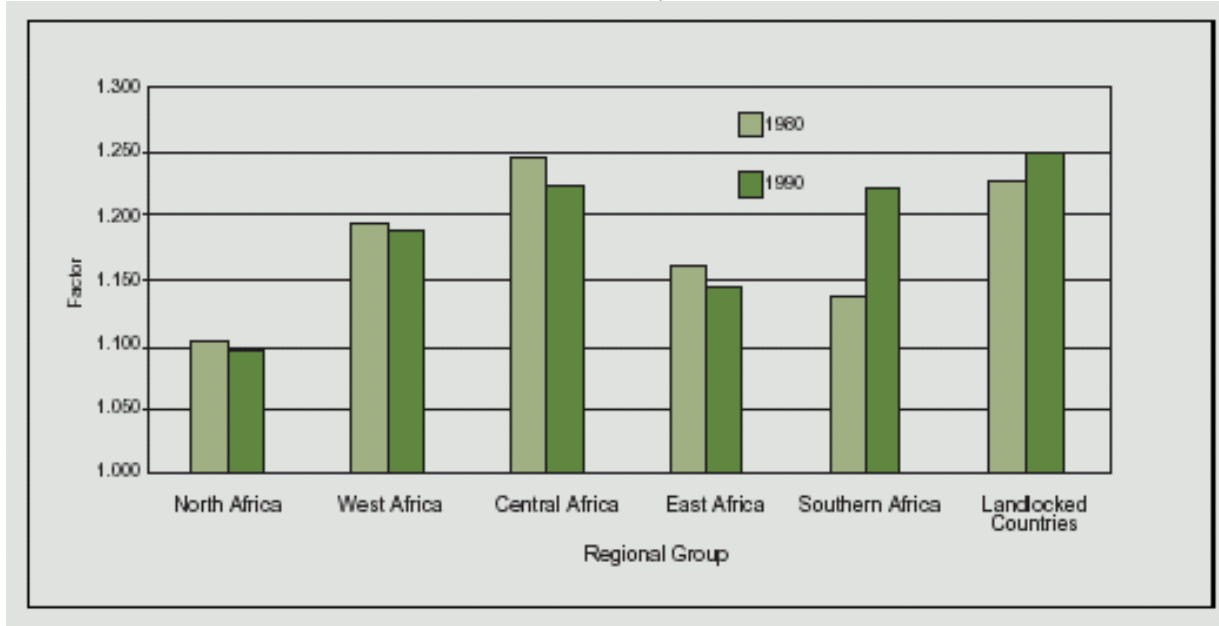


Source: UNCTAD, 2000 and *International Financial Statistics*, 2001 in Chasomeris, 2003: 139.

Figure 3 illustrates the diversity in the level of transport costs, reporting the cif/fob ratio for groups of African countries. Decomposing the composite cif/fob ratio for Africa into the different regions presents a fascinating perspective on what is happening to transportation costs within the various regions of the African continent. Interestingly, transportation costs have declined in all African groups represented in Figure 3 except landlocked developing countries and Southern Africa. Landlocked developing countries face the highest transport costs, of over 20 per cent unit values, while North Africa faces the lowest transport costs of about 10 per cent. The African Development Report (2004: 191) showed that, in general, transport costs declined slightly between 1980 and 1994 for all African groups except landlocked, Southern Africa and agriculture groups. The African Development Report (2004: 191) went on to explain, “The increases in all of these groups are largely due to Malawi, where the ratio in 1994 rose to 1.67<sup>18</sup> (because the war in Mozambique denied the shortest route to the sea)”. The war in Mozambique, however, does not explain why Africa’s cif/fob ratios have continued to increase post-1994 (as evident in Figure 1).

<sup>18</sup> A cif/fob ratio of 1.67 implies transportation costs of 67 per cent *ad valorem*.

**FIGURE 3. AVERAGE CIF/FOB RATIO BY REGIONS, AFRICA**



Source: World Trade Organisation International Trade Statistics, 2002 in African Development Report, 2004: 193.

Note:

1. A cif/fob ratio or factor of 1.2 suggests that transport and related costs are 20 per cent of the import fob value.

If researchers use country and country group cif/fob ratios as a proxy for *direct* shipping costs, then the analysis above presents a dismal perspective on both the level and trends in worldwide shipping costs, particularly for groups of developing countries (see Figure 1). For example, in 2003 then, Africa's cif/fob ratio is 31 per cent higher than in other developing countries and three times the rate in developed countries, estimated at 3.9 per cent (own calculations using data in UNCTAD 2005). Furthermore, from Figure 1 and Table 1 it is evident that developing countries in Africa experienced a considerable rise in the cif/fob ratio from 11.36 per cent in 1998 to 12.97 per cent in 2000<sup>19</sup>. On the one hand, if researchers use the cif/fob ratio as an indicator or proxy for direct shipping costs, then African countries appear to face extremely high and rising international transport costs. Accordingly, promoting this dismal scenario of extremely high and rising costs of transport may encourage additional development aid from various sources. On the other hand, this dismal perspective on Africa's transportation costs is likely to undermine the competitiveness of these countries in foreign markets, and reduce trade opportunities together with the potential to attract export-oriented foreign direct investment (FDI).

<sup>19</sup> This study uses the cif/fob ratio both as a true ratio (1.12) and as a percentage (12 per cent *ad valorem*).

Chasomeris (2007: 7-22), however, found that those who use the cif/fob ratios must be especially careful and aware that they are using, in essence, an aggregated and weighted average ratio where the weightings are, in large part, determined by the composition of imports that are not the same across countries and regions. Furthermore, these weightings of the ratios change over time, adding a further element of non-comparability – not only between countries, but also, between a country’s ratios over time. Consequently, some may have misunderstood and misused the ratio measure. The misuse of the ratio has led to some rather interesting, but also probably incorrect results and conclusions that may have influenced policy decisions (see Chasomeris, 2007: 81-94). Chasomeris (2005) presents evidence that *ad valorem* transportation costs implied by IMF cif/fob ratios are significantly different from the explicitly collected data on South Africa’s direct shipping costs. Unfortunately, direct measures of shipping costs that are reliable and comparable are difficult to obtain (Micco and Perez, 2001; OECD, 2002; Hummels and Lugovskyy, 2003). This, in part, is an important reason for the widespread use of country and country group import cif/fob ratios to proxy for direct shipping costs. UNCTAD (2003b: 13) explains that both importers and exporters in Africa face high costs for sea and land transport where “the average freight rate is 47 per cent higher than in other developing countries and twice the rate in developed countries.” Statements like the above may be misleading for a number of reasons<sup>20</sup>. Consider that UNCTAD (2003b: 13) explains how both land and sea transport costs, for importers and exporters in Africa, are high. The next sentence then explains that the “average freight rate is 47 per cent higher than in other developing countries and twice the rate in developed countries...” (UNCTAD, 2003b: 13). Although the statement is presumably made to support their assertion that African importers and exporters continue to face high costs for both sea and land transport, the use of the concept “average freight rate” is potentially misleading. The concept of “freight rate” is commonly used to refer to direct costs of transportation. However, the measure UNCTAD (2003b) is reporting is the indirect or *ad valorem* transportation cost measure, the cif/fob ratio. Additionally, the ratio’s aggregated and composite character is often more indicative of changes in the import composition rather than reflecting direct shipping costs! (Chasomeris, 2007). Furthermore, there are multitudes of potential meanings implied by the word “average”. In the case of a country or country group cif/fob ratio, the ratio is more than a simple “average”. Rather, the cif/fob ratio is a measure that is an aggregated and import trade weighted mean (or in some instances median), where the *ad valorem* trade weighted measure continuously changes determined by both the evolution in transportation costs and the evolving composition of imports. Consequently, a meaningful and useful comparison of a country or country group “average cif/fob ratio” is very difficult to justify, especially without a sound contextual understanding of the evolution and composition of imports.

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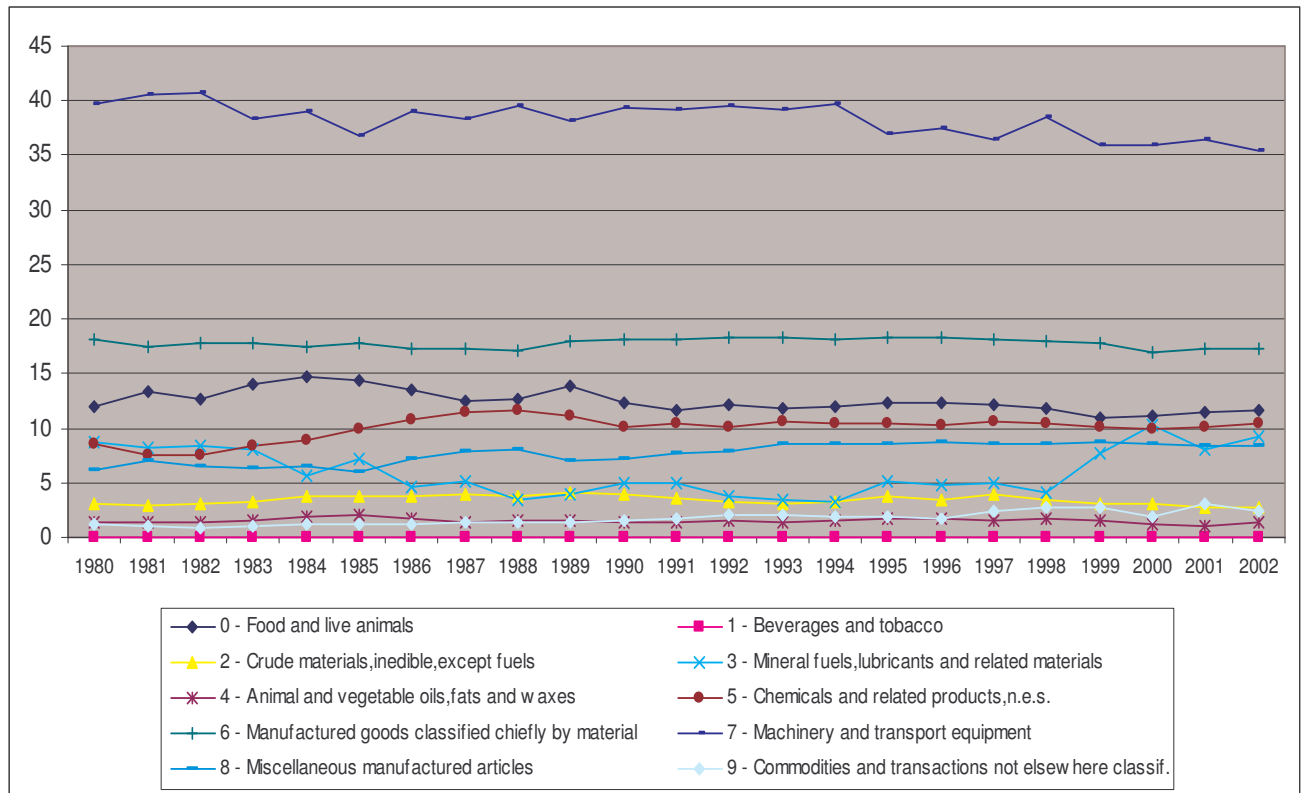
<sup>20</sup> Even though “average freight rate” is qualified with a footnote on page 29 that states “freight and insurance costs for Africa, excluding South Africa, were 12.97 per cent of imports CAF in 2001”, the statement made by UNCTAD (2003) on page 13 remains misleading.

Although several informed academics may agree that it is possible that changes in the composition of imports may affect the cif/fob ratios, their assumptions and subsequent econometric use of the ratios show that they essentially assume a constant composition of imports. For example, despite acknowledging that the composition of imports may influence the cif/fob ratios, Radelet and Sachs (1998: 3) state: “We hope that since the import basket of developing countries is more homogeneous than the export mix, the measure of the cif/fob ratio will reveal true differences in shipping costs rather than commodity mix effects.” To be fair, keep in mind that the study by Radelet and Sachs was in 1998. Figure 4 illustrates the actual changes in Africa’s composition of imports over the period 1980 to 2002. Visual analysis of Figure 4 indicates that much of the period between 1980 and 1998 was relatively stable in comparison with the marked changes from 1998 to 2000. Theory suggests that a fall in the proportion of high-valued imports, like manufactured imports, may cause a rise in the country’s cif/fob ratio, *ceteris paribus*, while a rise in the proportion of low-valued imports (like oil, mining and agricultural products) may cause a rise in the country’s cif/fob ratio, *ceteris paribus*. Analysis suggests that the substantial changes in the composition of imports appear to be an important factor contributing to the rise in Africa’s cif/fob ratios from 11.36 per cent in 1998 to 12.97 per cent in 2000. A simple observation of SITC-3 (essentially petroleum oil imports, the light blue line in Figure 4) shows that SITC-3 (oil) as a proportion of total imports to the African region increased substantially from 4.1 per cent in 1998 to 10.3 per cent in 2000. Indeed, correlation analysis between Africa’s cif/fob ratio and Africa’s composition of imports, discussed below, confirms a significant relationship between SITC-3 and Africa’s cif/fob ratios. The question is, then, why did Africa’s petroleum imports, as a proportion of total import (by value) rise so significantly from 1998 to 2000? The answer may be primarily due to the rise in crude oil prices. In 1998, the average annual crude oil price was 13US\$ per barrel - by 2000 it stood at just over 28US\$ per barrel, an increase of more than 116 per cent! Indeed, from 1999 to 2000 the average annual increase in crude oil prices rose from just under 18US\$ per barrel to more than 28US\$ per barrel, an increase of more than 57 per cent (these calculations use data sourced from TIPS, 2005)<sup>21</sup>.

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<sup>21</sup> Interestingly, this 57 per cent rise was the highest average annual increase in crude oil prices since the oil crises of 1979 where annual average oil prices rose by 134 per cent.

**FIGURE 4. AFRICA'S SITC IMPORTS AS A PROPORTION OF TOTAL IMPORTS, 1980-2002**



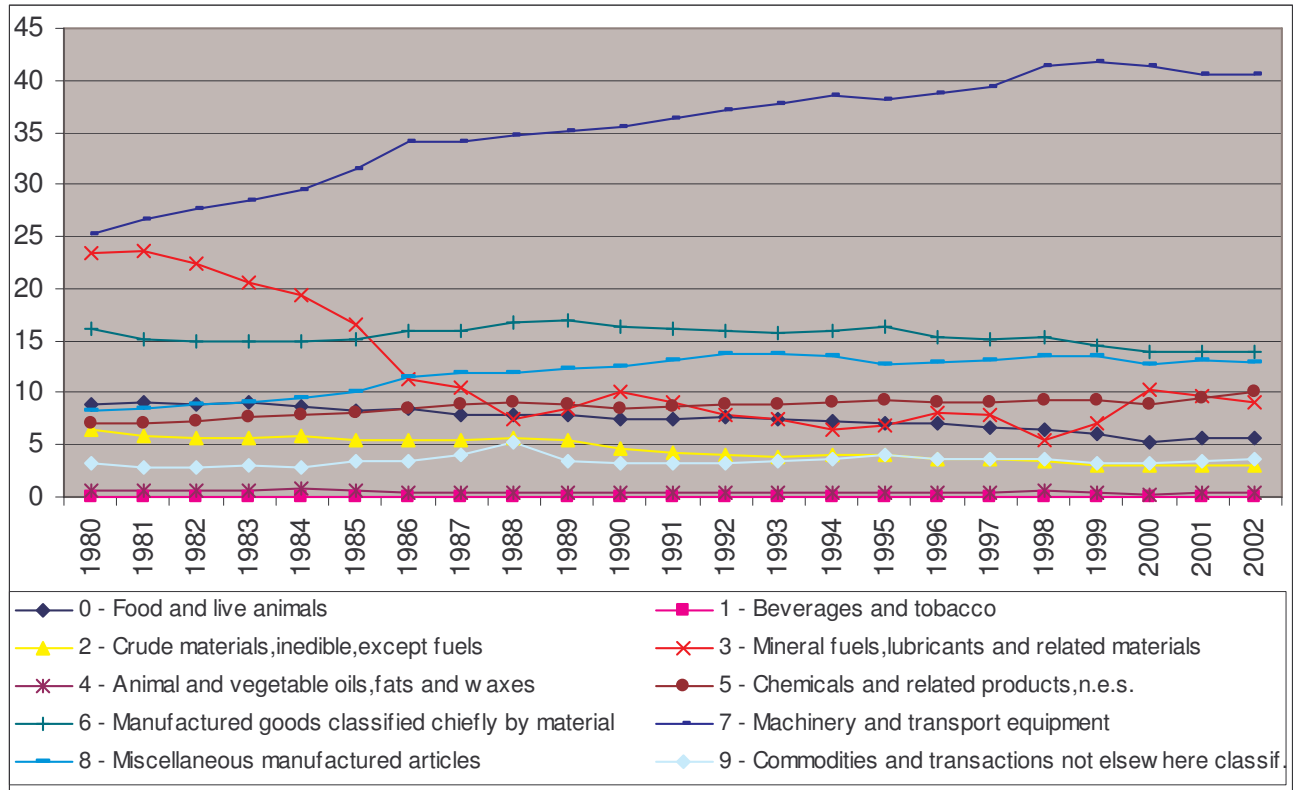
Source: own calculations based on SITC data in TIPS, 2005.

The world's cif/fob ratio has declined: 7.75 per cent in 1970; 6.64 per cent in 1980; 5.22 per cent in 1990 (see Table 1). In contrast to these declines, 2000 witnessed a significant increase to 6.21 per cent. Rather than view the trends in these ratios as indicative of changes in direct measures of shipping costs, reconsider these trends in the context of the evolving composition of world trade (Figure 5). Most evident in Figure 5 are the substantial decline in oil imports (SITC 3) as a proportion of total imports and the substantial rise in machinery and transport equipment (SITC 7). The economic theory suggests that the rise in manufactured goods (in this case SITC 7) as a proportion of total imports would contribute to a decline in the world cif/fob ratio. Likewise, a decline in oil imports (SITC 3) as a proportion of total imports would also contribute to a decline in the cif/fob ratio. Hence, even if there was no information on the actual levels of the world cif/fob ratios, a simple observation of the evolution in the composition of world imports (in particular SITC 3 and SITC 7) suggests that the ratio (*ad valorem* shipping costs) may be substantially lower in 1990 as compared with 1980, as is evidently the case. In 2000, however, the world experienced an increase in the cif/fob ratio to 6.21 per cent. On the one hand, the evident increase in the ratio for all groups except Oceania may partially be explained through an understanding of supply and demand in the freight markets. World seaborne trade boasted its fifteenth consecutive increase in absolute terms in 2000 (UNCTAD, 2001, and UNCTAD Media Summary 2001). The increase in demand for sea transport resulted in a general increase in freight rates for tanker, time- and trip-charterers and main containerised routes (UNCTAD, 2001). On the other hand, an analysis of the world's composition of imports also suggests that the rise in oil (SITC-3) as a proportion

of total imports, primarily because of the 57 per cent average annual rise in crude oil prices, have contributed to the higher ratio in 2000.

The visual analysis in Figure 4 and Figure 5 suggests that to ignore, or assume constant, the composition of imports appears to be an unrealistic and unacceptable practice. Table 2 uses correlation analysis to investigate the significance, magnitude and direction of the relationships between the composition of imports and various country and country group cif/fob ratios.

**FIGURE 5. WORLD SITC IMPORTS AS A PROPORTION OF TOTAL IMPORTS, 1980-2002**



Source: SITC data proportions, author calculated from raw data in TIPS, 2005.

Table 2 shows the results of correlation analysis between various country and country group SITC imports as a proportion of total imports, and their respective cif/fob ratios. Table 2 uses the annual cif/fob ratios for each country calculated from the IMF's IFS trade statistics. Furthermore, the World Trade Analyser is used to decompose and then calculate the SITC import categories as a proportion of total imports (SITC Revision 2, in TIPS, 2005). The correlation results between a particular country's annual cif/fob ratio and that country's annual composition of imports are summarised in Table 2. The shading of the negative correlation coefficients is to aid the visual analysis of trends in these correlations. To begin a reasonable analysis of the results in Table 2, one must be cognisant of the limitations of these correlations (see Gujarati, 1995: 21; 78-80). Firstly, consider the case studies using country groups. Here the limitations include that the SITC data for the world and African continent include all the countries for which data are available using the World Trade Analyser (TIPS, 2005).

**TABLE 2. CORRELATION RESULTS BETWEEN VARIOUS COUNTRY AND COUNTRY GROUP CIF/FOB RATIOS AND THEIR RESPECTIVE SITC IMPORTS AS PROPORTION OF TOTAL IMPORTS**

SITC	World	USA	GERMANY	AUSTRALIA	NEW ZEALAND	MAURITIUS	AFRICA	SOUTH AFRICA	SOUTH AFRICA	MALAWI
	1982-2002	1980-2002	1980-1998	1980-2002	1981-2002	1980-1998	1982-2002	1980-2002	1995-2002	1980-2000
0	0.232	0.933*	0.470**	0.300***	-0.457**	0.806*	-0.624*	0.251	0.053	0.326***
1	-0.603*	0.779*	0.142	0.458**	-0.412**	-0.400**	0.550*	0.706*	-0.182	-0.122
2	0.223	0.845*	0.470**	0.739*	0.341***	0.822*	-0.458**	0.015	0.030	-0.578*
3	0.824*	0.666*	0.773*	0.475**	0.578*	0.777*	0.511*	0.429**	-0.403	0.321***
4	0.228	0.417**	0.647*	0.433**	0.584*	0.848*	-0.548*	0.180	0.092	-0.140
5	-0.629*	-0.925*	-0.601*	-0.530*	-0.090	-0.128	0.231	0.766*	0.178	0.038
6	-0.584*	0.853*	-0.522**	0.812*	0.571*	-0.732*	-0.447**	0.478**	-0.139	-0.617*
7	-0.509*	-0.716*	-0.652**	-0.496**	-0.663*	-0.756*	-0.722*	0.706*	-0.174	0.406**
8	-0.708*	-0.686*	-0.641*	-0.487*	-0.634*	-0.825*	0.584*	0.727*	-0.181	0.186
9	-0.508*	-0.829*	-0.325***	-0.812*	-0.169	-0.626*	0.646*	-0.675*	0.257	0.282

Notes:

SITC Codes: 0 - Food and live animals; 1 - Beverages and tobacco; 2 - Crude materials, inedible, except fuels; 3 - Mineral fuels, lubricants and related materials; 4 - Animal and vegetable oils, fats and waxes; 5 - Chemicals and related products; 6 - Manufactured goods classified chiefly by material; 7 - Machinery and transport equipment; 8 - Miscellaneous manufactured articles; 9 - Commodities and transactions not elsewhere classified.

\*: significant at probability level (p) = .010

\*\* : significant at p = .050

\*\*\*: significant at p = .100

1. For South Africa, the end of economic sanctions witnessed the largest portion of other unclassified goods (HS99), which mainly consisted of crude oil, included under HS27 (that is within SITC category 3) as from 1995.

Source: Own calculations of cif/fob ratios using IMF trade data; Own decomposition of SITC imports using World Trade Analyser from TIPS, 2005. Own correlation analysis using Microsoft Excel (see Chasomeris 2007: 207-222 for the data used in the correlation analyses).

The IMF cif/fob data from UNCTAD exclude some countries (non-IMF members, Central and Eastern Europe and republics of the former Soviet Union, and the socialist countries of Asia) from the world cif/fob data, and only include developing countries in Africa's cif/fob ratio. Hence, these results may be biased.

Of the many interesting relationships and trends demonstrated through the results in Figure 2, consider the following six observations. One, as mentioned above, theory suggests that a rise in the proportion of high valued imports like manufactured imports may cause a decline in the country's cif/fob ratio, *ceteris paribus*. A rise in the proportion of low valued imports (like oil, mining and agricultural products) may cause an increase in the country's cif/fob ratio, *ceteris paribus*. Mindful of this theory, consider the numerous correlation coefficients exhibited in Table 2. Indeed, the results of the correlation analysis between import categories SITC-0 through SITC-4 and the country cif/fob ratios for the US, Germany and Australia show positive and statistically significant coefficients (only SITC-1 for Germany was not significant). Interestingly, except for SITC-6 in the US and Australia, all the other correlation coefficients between SITC-5 through SITC-9 and the country cif/fob ratios for the US, Germany and Australia show negative and significant coefficients. In other words, changes in the proportion of lower-valued imports categories (SITC0-SITC4) and the proportion of higher-valued imports (SITC 5-SITC9), appear to have a substantial and significant effect on the variation in the cif/fob ratios of the US, Germany and Australia, essentially as the theory predicted. More specifically, the theory suggests and observation of these correlation coefficients shows that a fall in the proportion of the lower-valued imports (SITC0-SITC4) and a rise in the proportion of higher-valued imports (SITC 5-SITC9) will cause a decline in these countries cif/fob ratios<sup>22</sup>.

Two, the direction of the relationships between the composition of imports and the cif/fob ratio for the World and Mauritius appear similar. In particular, note how SITC-1 and SITC-5 through SITC-9 show negative coefficients.

Three, in New Zealand's case, SITC-2 through SITC-4 and SITC-6 show significant positive correlation coefficients. Similar to Africa, the correlation results for SITC-0 for New Zealand exhibits a significant negative correlation. In contrast, all the other cases investigated show a positive correlation.

Four, Africa exhibits some odd results. Presumably, these partly unexpected results may be somewhat affected by the limitation explained earlier in which the SITC data are for the entire African continent (available from the World Trade Analyser in TIPS, 2005) whereas the the IMF cif/fob data from UNCTAD only include developing countries in Africa's cif/fob ratio. Furthermore, there are likely to be, on the one hand, problems caused by measurement errors and imports classification errors in the SITC data (see Chasomeris, 2007: 122-132 and Yeats, 1995 for a fuller discussion). On the other hand, the quality of the aggregated cif/fob ratios is also not reliable for many of the developing countries in Africa (as Section 5 will show for Malawi). Despite these data drawbacks,

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<sup>22</sup> Some of the unexpected or insignificant correlation coefficients may be due to measurement errors and imports classification errors (see Chasomeris, 2007: 7-22 and Yeats, 1995 for a fuller discussion).

the correlation coefficient for SITC-3 is positive, with both economic and statistical significance, adding support for the earlier observations made between Africa's rising oil (SITC-3) imports and Africa's rising cif/fob ratios, particularly evident for the period 1998 through 2000<sup>23</sup>.

Five, analysing South Africa's SITC data (from DTI, 2003), for the then available period 1988-2001, shows a substantial and significant ( $p = .010$ ) correlation between the cif/fob ratio and the proportion of manufacturing (-0.76 coefficient) and mining (+0.76) imports. Using World Development Indicators data (in TIPS, 2004), as an alternative to the SITC import data for the same period 1988-2001, confirms a substantial and significant ( $p = .010$ ) correlation between the country's cif/fob ratios and manufactures as a proportion of merchandise trade (-0.69). In other words, when the proportion of manufacturing import increases and the proportion of mining import decreases, South Africa's cif/fob ratios typically increase and vice versa. However, an essential assumption commonly asserted by studies that use country cif/fob ratios as a measure of shipping costs is that "the cif/fob ratio will reveal true differences in shipping costs rather than commodity mix effects" (Radelet and Sachs, 1998: 3). If South Africa's recorded trade data were reliable, then these correlation results might imply that South Africa's composition of imports has a substantial and significant effect on the country's cif/fob ratios. Accordingly, South Africa's cif/fob ratios might then rather be indicative of changes in the country's composition of imports than changes in the country's direct shipping costs. South Africa's trade data, however, are not reliable. Using the more disaggregated analysis of the SITC data from TIPS (2005 in Table 2) reveals serious data quality problems. South Africa's correlation results only show a strong, negative and statistically significant correlation coefficient between the cif/fob ratio and SITC-9 (that is, -0.675). Evidently, there appear to be problems with the data. Chasomeris (2007) shows that South Africa's odd correlation results for the period 1980 to 2002 are likely to be caused by shortcomings in the disaggregated SITC data. The shortcomings in these SITC data are, in turn, most probably the consequences of non-disclosure of imports and misclassification, largely by design rather than chance or mistake, resulting from South Africa's most controversial political economy. Indeed, Chasomeris (2007: 208) illustrates that before 1994, the year in which South Africa became a recognised democracy, by far the largest proportion of South Africa's imports, by value, were classified under SITC-9 (that is, commodities and transactions not elsewhere classified). Due to the end of economic sanctions, 1995 witnessed a significant re-enumeration and re-classification of the largest portion of other unclassified goods (HS99), which primarily consisted of strategically sensitive petroleum imports, included under HS27 (that is, as SITC-2 excludes fuels, petroleum is recorded under SITC-3). The correlation coefficients for post economic sanctions (1995-2002), though interesting to observe the change in magnitude and sign, are statistically insignificant. Hence, using import cif/fob ratios computed from these trade data are neither likely to accurately indicate South

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<sup>23</sup> An attempt to remove South African imports from the total imports for the Africa region results in a negative value for SITC-9. This is indicative that South Africa's classification and total values of imports are not accurately captured in the aggregated data for the Africa region. These data problems require further investigation that might begin through a discussion with those responsible for compiling the data for the World Trade Analyser (TIPS, 2005).

Africa's actual *ad valorem* shipping costs nor direct costs of transportation. Despite these analyses and findings on South Africa's cif/fob ratios, the absence of direct measures of shipping costs limits the Section's ability to answer a research question on whether South Africa's cif/fob ratios approximate actual shipping costs so that researchers can confidently substitute them for direct measures. Chasomeris (2005; 2007) provides an answer to this research question. The evidence investigated shows that South Africa's cif/fob ratios are significantly different from the direct cost data collected by the study on port charges and liner shipping freight rates. Additionally, there are serious data quality problems that include efforts to conceal trade data due to sanctions. These trade data generate inaccurate and unreliable country cif/fob ratios that are neither able to show South Africa's actual *ad valorem* shipping costs nor direct costs of transportation. Researchers cannot and should not use the ratio as a reliable indicator for South Africa's direct shipping costs (Chasomeris, 2005; 2007).

Six, the correlation results for Malawi evidently contrast with both the predictions of theory and the evidence gleaned from the other case studies, like the US and Mauritius where the country data are considered more reliable. Except for the correlation coefficients of SITC-0 and SITC-6, that might be considered plausible, the correlation coefficients exhibit incorrect signs and incorrect magnitudes; that is, they do not show economic significance. Furthermore, half of the correlation coefficients are statistically insignificant. Evidently, there appears to be a problem with the data. Indeed, the correlation analysis for Malawi has produced peculiar results. The contradictory and insignificant results are indicative of data quality problems, as the case study on Malawi will confirm in Section 5. Thus, in addition to the usual basic descriptive statistics and checks on the quality of the raw data observed by researchers, correlation analysis, like that performed in Table 2, could become a standard check of these data before using these data in further research.

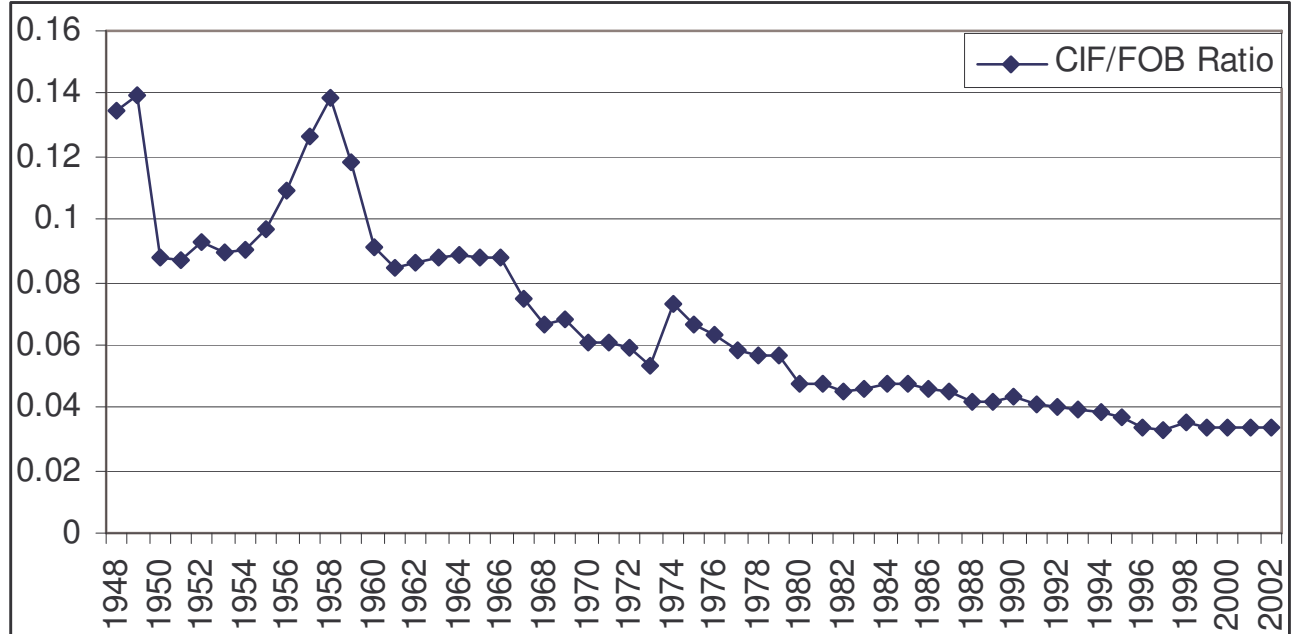
Section 4 investigates and contrasts a shipping cost perspective with that of an evolving composition of imports perspective on the US cif/fob ratios.

#### **4. A SHIPPING COST VERSUS TRADE COMPOSITION PERSPECTIVE ON UNITED STATES CIF/FOB RATIOS**

The following case study of the United States demonstrates that the substantial and statistically significant relationships between a country's composition of imports and that country's consequent cif/fob ratios is even more distinct in developed countries. If one assumes that country import cif/fob ratios reveal actual differences in shipping costs rather than changes in that country's composition of imports, then Figure 6 essentially shows a rather impressive decline in the United States import shipping costs. Although referring to the worldwide cif/fob ratio, Frankel's (et al., 1997: 43-44) analysis may also apply to the US cif/fob ratio: "One suspects that the decline in shipping costs per kilometer of a given commodity is offset to a degree by the (resulting) tendency to undertake trade in commodities that would have previously been deemed too expensive,

and with partners that would have previously been deemed too far away.” This suggests that the US shipping costs may have fallen more steeply than the Figure 6 indicates.

**FIGURE 6. UNITED STATES CIF/FOB RATIO, 1948-2002**



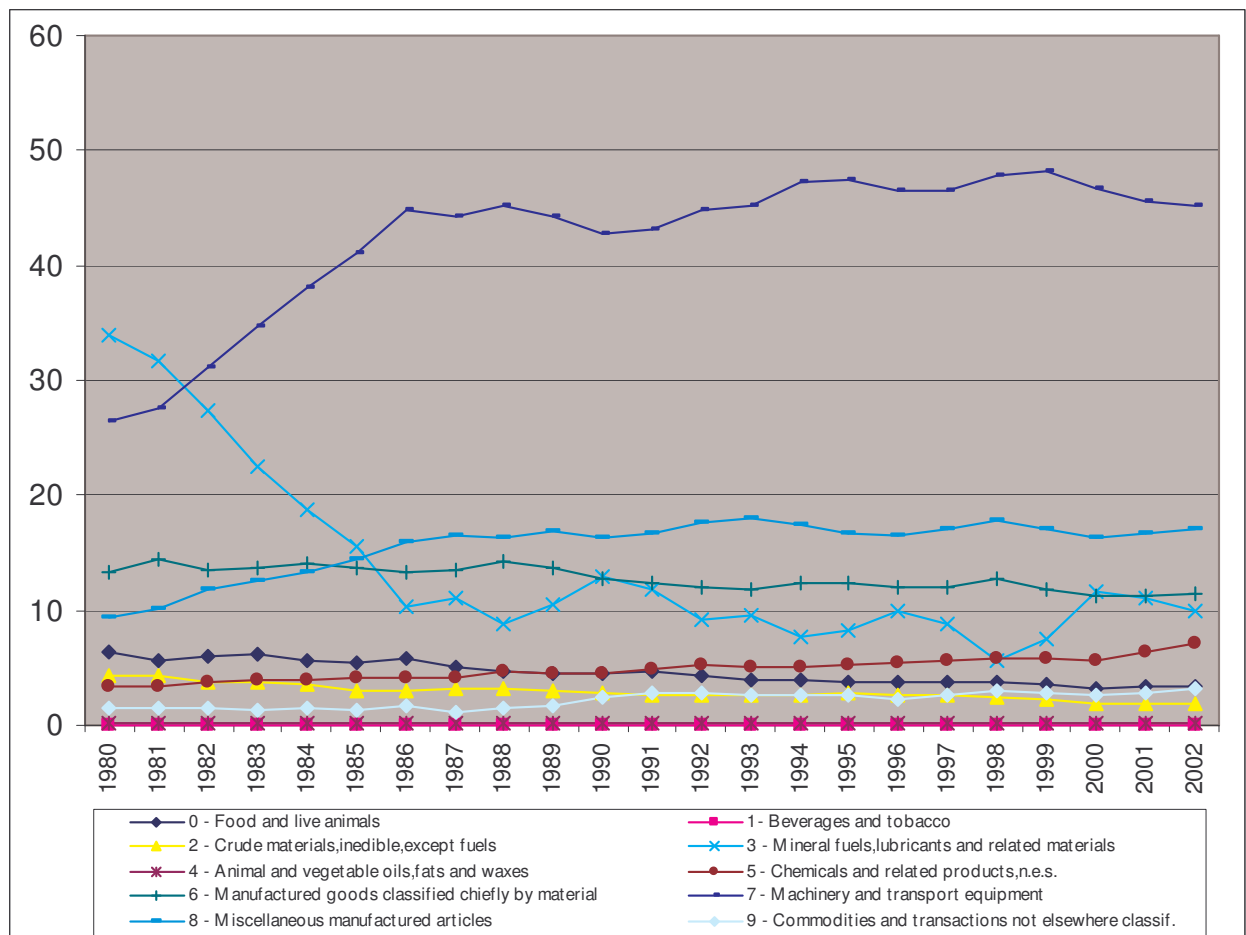
Source: Author calculated from *International Financial Statistics* in TIPS, 2004.

With this understanding of the cif/fob ratio, researchers have then sought to find possible explanations for the impressive decline. The explanations may have typically included: changes in distance from international markets; improved infrastructure; improved technology; more efficient ports; the benefits derived from economies of scale and scope and a significant reduction in maritime related anti-competitive practices, partially caused by changes in the legislative environment like the Shipping Act of 1984 and the US Ocean Shipping Reform Act of 1998. Many researchers consider the declines in the US cif/fob ratios as indicative of declines in direct measures of shipping costs (see for instance, Rose, 1991; Radelet and Sachs, 1998). In other words, the declines in the US cif/fob ratios are meant to be indicative of the fall in the country’s direct international transport costs that have contributed to the rise in the country’s international trade.

Table 2 presented the correlation results between the US cif/fob ratios and SITC composition of imports (Revision 2, in TIPS, 2005). Figure 7 illustrates the evolution in the composition of US imports between 1980 and 2002. The evolution of the US composition of imports appears rather similar to the evolution of world imports, in Figure 5, and is dominated by the clear trends in SITC-3 and SITC-7. Briefly, recall from Section 3 that a decline in SITC-3 and a rise in SITC-7 are expected to lead to a decline in the US cif/fob ratio, *ceteris paribus*. Indeed, the evolving composition of US imports has directly contributed to the observed declines in the US cif/fob ratios. Additionally, Yeats (1978) decomposed variation in the COMTRADE cif/fob ratios into a transport

cost component and residual factor<sup>24</sup>. The objective of Yeats (1978) was to assess the quality of the official statistics, and to estimate the *ad valorem* incidence of shipping costs. Yeats (1978: 355) conducted tests that indicate cif/fob ratios “do not approximate nominal transportation costs in spite of the assumption often made in gravity flow and trade related models”. Furthermore, Yeats (1978: 358) concludes, “the magnitudes of the discrepancies revealed in the official trade statistics are certainly sufficient to bias findings of the theoretical and empirical studies.” Likewise, Chasomeris (2005; 2007) provides evidence that shows how *ad valorem* transportation costs implied by IMF cif/fob ratios are significantly different from the explicitly collected data on South Africa’s real (GDP deflated) direct shipping costs. Accordingly, researchers need to be sceptical of substituting country cif/fob ratios for more direct measures of international transport costs.

**FIGURE 7. USA SITC IMPORTS AS PROPORTION OF TOTAL IMPORTS, 1980-2002**



Source: Own calculations with SITC data from TIPS, 2005.

<sup>24</sup> Although the evolving composition of imports affects transportation costs (cif/fob ratios), transportation costs may also affect the composition of imports. This problem of simultaneity could be a focus for future research. Nonetheless, Yeats (1978: 355) concludes that cif/fob ratios “do not approximate nominal shipping costs” and Chasomeris (2007) shows that South Africa’s cif/fob ratios do not approximate the country’s real Europe-South Africa freight rates.

Using World Development Indicators data, as an alternative to the SITC data and source, Figure 8 illustrates the annual variation in the US cif/fob ratio and manufactured imports as a proportion of total merchandise imports for the period 1962-2001.

**TABLE 3. CORRELATION RESULTS: UNITED STATES CIF/FOB RATIOS AND IMPORT MANUFACTURES**

<b>Years (Inclusive)</b>	<b>Number of observations (n)</b>	<b>Correlation coefficient (r)</b>	<b>Coefficient of determination (r<sup>2</sup>)</b>	<b>t statistic (t)</b>
1962 - 2001	40	- 0.876	0.767	-4.062 *
1962 - 1974	13	- 0.925	0.851	-8.074 *
1975 - 2001	27	- 0.859	0.738	-8.389 *

Source: Author calculations from *World Development Indicators*, 2003 and *International Financial Statistics*, 2003 in TIPS, 2004.

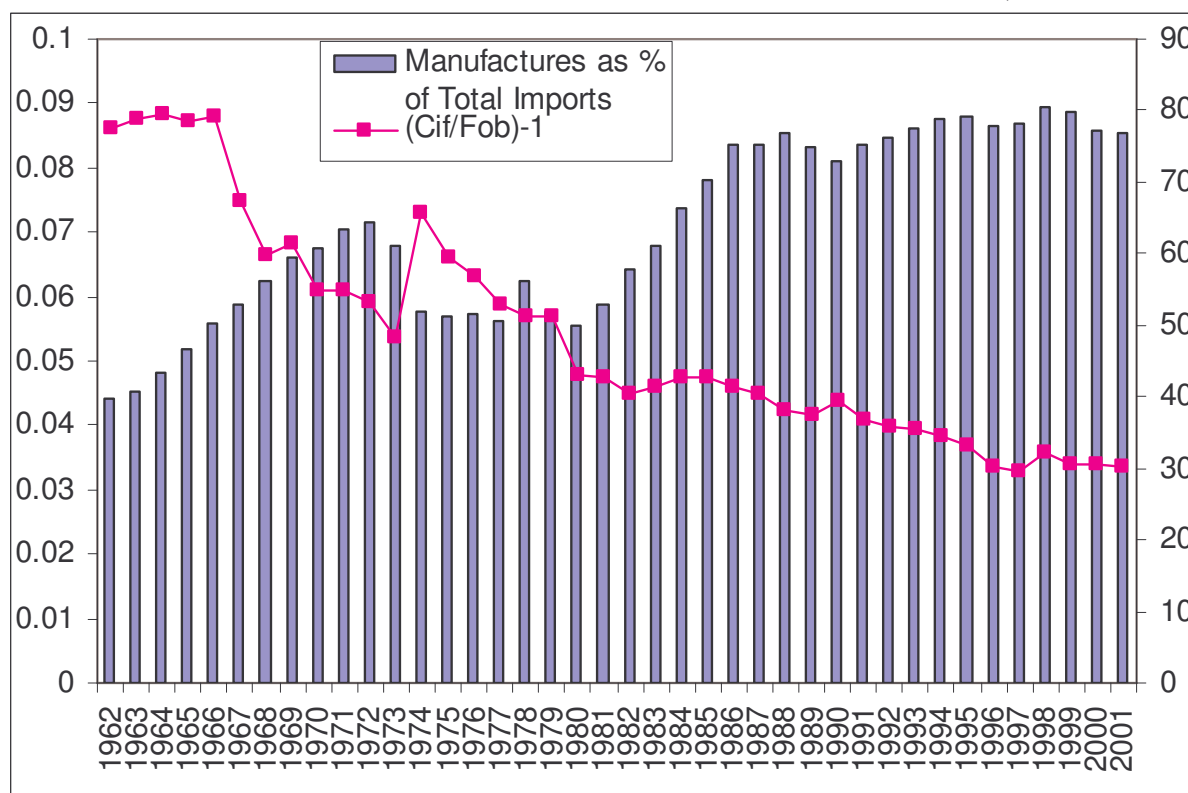
Note: \*: significant at  $p = 0.010$

1. Hummels (1999b: 29) taking the national data as the accurate source notes that “the IMF data taken from IFS seems quite accurate for the US beginning in 1974 – the year that US national sources began reporting both cif and fob values of the flow”. Hence, the reason for the periods analysed.

Observation of Figure 8 reveals what appears to be a negative correlation between manufactures as a proportion of imports and US cif/fob ratios. In other words, it appears that as the US proportion of manufactured imports has risen, so the country’s cif/fob ratios have declined. Interestingly, the correlation results in Table 3 confirm a very high and statistically significant inverse relationship (-0,876) between US cif/fob ratios and manufactures as a proportion of merchandise imports. This economically and statistically significant relationship has a coefficient of determination of 0.767 that implies that over the period 1962 to 2001, about 77 per cent of the variation of the cif/fob ratio may be explained by the relationship between manufactures as a proportion of imports and the cif/fob ratios. Hummels (1999b: 29) explains that “the IMF data taken from IFS seems quite accurate for the US beginning in 1974 – the year that US national sources began reporting both cif and fob values of the flow.” Accordingly, correlation analysis post-1974 reveals a similar relationship with a correlation coefficient of -0.859. This economically and statistically significant relationship between the cif/fob ratios and a country’s composition of imports suggests that a rise in the proportion of manufactured imports will contribute to the decline in the recorded cif/fob ratios<sup>25</sup>. These results show, yet again, the substantial and significant effects that changes in the composition of imports may have on the US cif/fob ratios.

<sup>25</sup> The US correlation coefficient between manufactures as a proportion of total imports and the cif/fob ratios is even higher than that of South Africa’s -0.688 (using WDI data, 2003) and -0.76 (SITC data from DTI, 2003) over the period 1988-2001.

**FIGURE 8. UNITED STATES CIF/FOB RATIOS AND MANUFACTURED IMPORTS, 1962-2001**



Source: Author calculations from *World Development Indicators*, 2003 and *International Financial Statistics*, 2003 in TIPS, 2004.

Note:

1. Hummels (1999b: 29) explains that “the IMF data taken from IFS seems quite accurate for the US beginning in 1974 – the year that US national sources began reporting both cif and fob values of the flow”.

## 5. MALAWI: A TRANSPORT COST TRAGEDY

“Five million face death as famine grips Malawi” was the news headline in early October 2005 (Corcoran, 2005). A country already plagued by AIDS and malaria is further contending with severe drought and famine. Compounding these hardships is the fact that Malawi faces extremely high international transportation costs.

So how high are Malawi’s international transport costs? According to the African Development Report (2004: 192), between 1980 and 1994, most regions in Africa had experienced a slight decline in transport costs as measured by the regional cif/fob ratios. “The main exceptions are landlocked, Southern Africa and agriculture groups. The increases in all of these groups are largely due to Malawi, where the ratio in 1994 rose to 1.67 (because the war in Mozambique denied the shortest route to the sea)” (African Development Report, 2004: 192). This revelation that Malawi’s international transport costs were measured at 67 per cent *ad valorem* is indeed tragic for many reasons that include reduced trade competitiveness and reduced potential to attract trade-oriented

foreign direct investment. Both may be harmful to economic growth in the long run (Radelet and Sachs, 1998; Chowdhury, 2003).

So, can Malawi's international transport costs, proxied by the country's cif/fob ratio, plausibly be 67 per cent *ad valorem*? In other words, were Malawi's *ad valorem* shipping costs more than 17 times higher than the average for developed countries, measured at 3.9 per cent in 2003? (Author's calculations based on 2003 data from UNCTAD, 2005). Is it plausible that in 1994 the ratio rose to 67 per cent *ad valorem* "because the war in Mozambique denied the shortest route to the sea"? Is this disastrous scenario probable or even possible? The findings of Chasomeris (2007) clearly reveal that a country's cif/fob ratios are often error riddled and depend significantly upon the country's composition of imports. Consequently, as in South Africa's case, a country's cif/fob ratio does not necessarily reflect the level or variation in a country's direct international transport costs. Understandably, it would be prudent to examine Malawi's cif/fob ratio to evaluate these findings and statements made by the African Development Report (2004). Figure 9 illustrates Malawi's cif/fob ratio with the available data from the IMF's IFS, the same source used by the African Development Report (2004), for the period 1980-2000. Figure 10 illustrates Malawi's SITC imports as a proportion of total imports for the period 1980-2002.

Evidently, Malawi's cif/fob ratios calculated from *International Financial Statistics* data (in TIPS, 2005) were 67 per cent for each of the nine years prior to 1994, and for each of the three years after 1994. The African Development Report (2004: 192) claims that Malawi's "ratio in 1994 rose to 1.67 (because the war in Mozambique denied the shortest route to the sea)." In contrast, Figure 9 illustrates that for 1994, Malawi's ratio apparently declined to 1.508, that is, 50.8 per cent *ad valorem* shipping costs. Besides, the civil war in Mozambique ended in 1992 (Sunday Times, 2006). Furthermore, notice that Malawi's cif/fob ratios do not reflect the substantial changes in Malawi's composition of imports that are particularly evident in SITC-7<sup>26</sup>. Likewise, consider that most developed and developing countries experienced a rise in cif/fob ratios for 2000, largely because of the significant rise in crude oil prices (see Table 1). In stark contrast, Malawi's cif/fob ratio plummeted from 60.9 per cent in 1999 to 13.6 per cent in 2000.

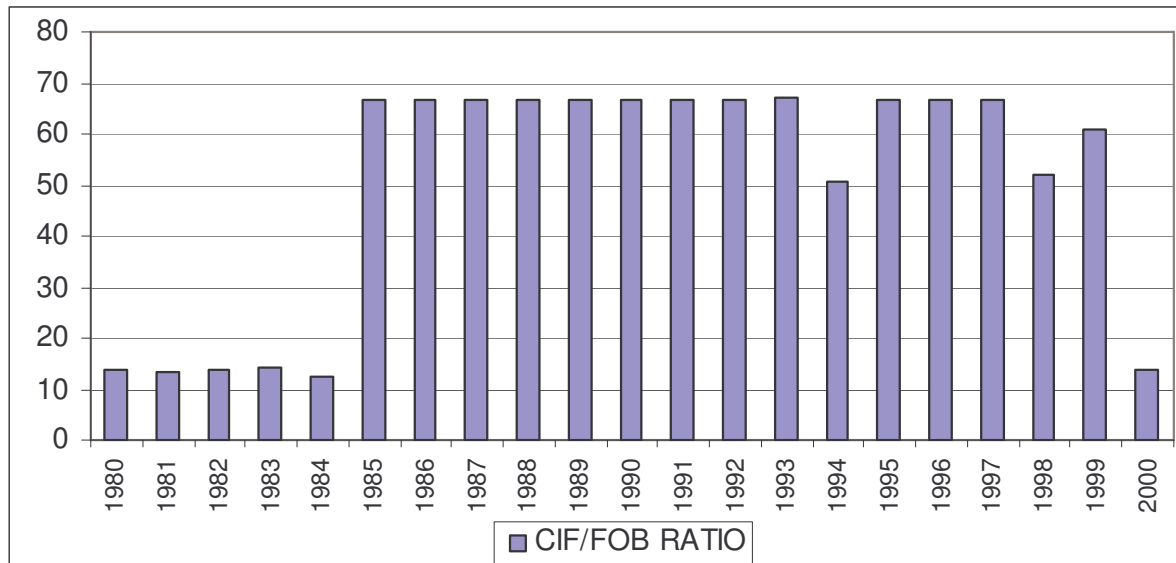
It appears that Malawi's consistently high ratio of 67 per cent *ad valorem* is largely the result of IMF staff imputations. Essentially, with IMF staff imputations either Malawi's imports cif or imports fob data are available, but not both. Using a constant conversion factor, in this case apparently 67 per cent, the IMF staff calculates the missing import time series values (also see Moneta, 1959: 42; Yeats, 1995)<sup>27</sup>. Evidently, imputations of the data, as in the case of Malawi, make the IMF cif/fob ratios "completely uninformative for many countries and suspect for many others" (Hummels, 1999b: 29). Accordingly, researchers need to examine carefully both trade data and country cif/fob ratios before embarking on econometric studies and other research.

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<sup>26</sup> Interestingly, notice how SITC-7 is substantially higher over the period 1986 to 1991, the same period during which Europe imposed economic sanctions on South Africa.

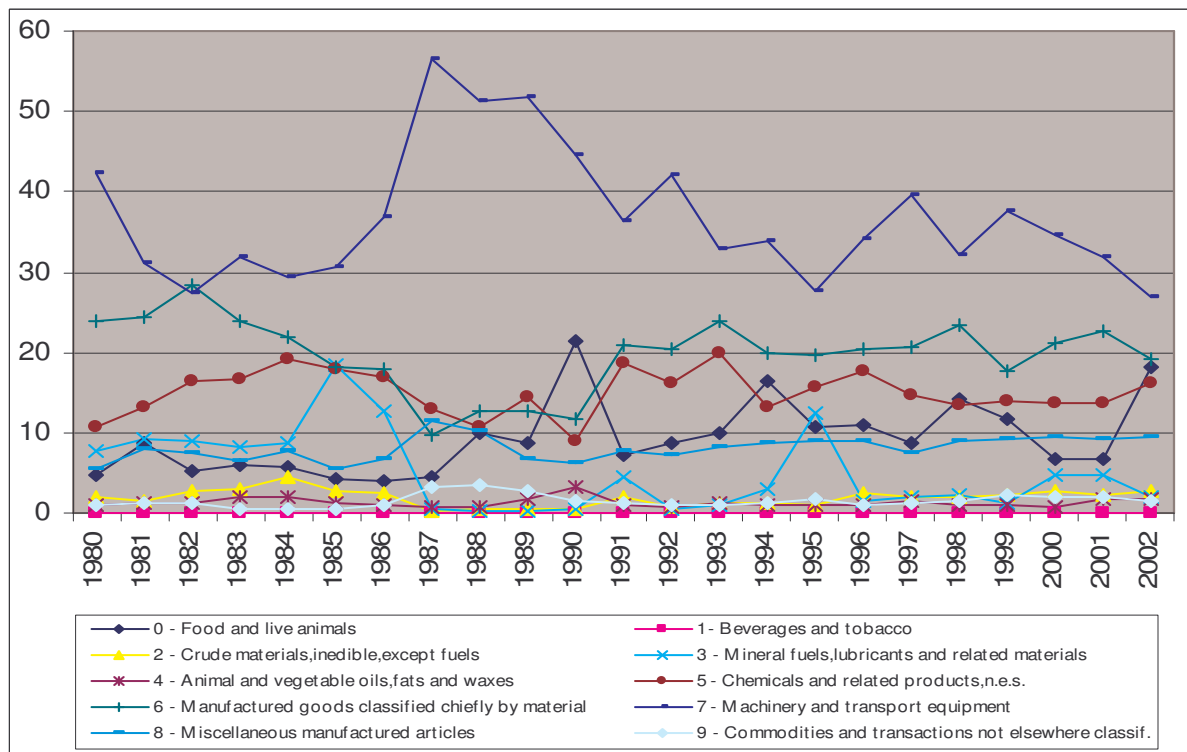
<sup>27</sup> How, then, is UNCTAD (2000) able to report Malawi's cif/fob ratio at just below 40 per cent? The answer might be that the DOTS data set was used rather than the IFS data.

**FIGURE 9. MALAWI'S CIF/FOB RATIOS, 1980-2000**



Source: own calculations using *International Financial Statistics* data in TIPS, 2005.

**FIGURE 10. MALAWI SITC IMPORTS AS A PROPORTION OF TOTAL IMPORTS, 1980-2002**



Source: own calculations using SITC (Revision 2) data in TIPS, 2005.

## 6. CONCLUSIONS

The purpose of this paper was to contribute towards a better understanding of country cif/fob ratios and to assess their global use as a measure (proxy) for international transport costs.

The evidence investigated by Chasomeris (2005; 2007) showed that *ad valorem* transportation costs implied by IMF cif/fob ratios are significantly different from the explicitly collected data on South Africa's direct shipping costs. Chasomeris (2007: 166) concludes that the findings on South Africa's cif/fob ratios imply that researchers cannot and should not use the ratio as a reliable indicator (proxy) for South Africa's direct shipping costs. Furthermore, South Africa's (historical) trade data are not reliable as there are serious data quality problems that include efforts to conceal trade data for political (sanctions) reasons, re-enumeration and re-classification of trade data, particularly the strategically sensitive petroleum imports. Consequently, South Africa's inaccurate trade data generate inaccurate and unreliable country cif/fob ratios that are neither able to show South Africa's actual *ad valorem* shipping costs nor direct costs of transportation<sup>28</sup> (see Chasomeris 2005; 2007).

South Africa's experience also suggests that other countries, like transition economies, undergoing trade liberalisation with improvements in the quality of trade statistics, may experience an increase in mining (petroleum) as a proportion of total imports that contributes to a rise in that country's cif/fob ratio. This increase in the country's cif/fob ratio, however, should not necessarily be interpreted as an increase in direct shipping costs, but rather may be a consequence of changes in the nature and recorded values of a country's imports. Consequently, studies that have used the cif/fob ratios to analyse a country's or region's transport costs may have estimated the true levels and trends in international transport costs incorrectly and thus may also misinterpret their impact on trade. Indeed, this study has found numerous instances in which use of these ratios have resulted in misunderstandings, misleading and misinterpreted findings, and spurious econometric results on both the determinants of transport costs and the impact of transport costs on trade and economic growth.

The analyses of the definition, source, composition and nature of country cif/fob ratios raised legitimate concerns and showed severe limitations to using these data. In brief, the evidence investigated in this study shows:

- **Problems with inconsistent definitions and use of terminology**

A country's import cif/fob ratio has received various names in the literature, for instance: shipping costs (Radelet and Sachs, 1998), *ad valorem* transport costs, *ad valorem*

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<sup>28</sup> The quality of South Africa's post-sanctions trade data appears to be improving (Chasomeris 2007: 166). As the quality of a country's trade data and the derived cif/fob ratios improves, so the ratio will become more indicative of actual *ad valorem* shipping costs. Nonetheless, these improved cif/fob ratios may remain an unreliable and/or unusable indicator of direct transportation costs, largely because of the evolving composition of imports.

shipping costs and *ad valorem* freight rate (Yeats, 1977), freight factor, a country's average freight rate (UNCTAD, 2003b:13), CIF-FOB band on imports and transport cost rate (Naudé, 1999a;1999b), c.i.f.-f.o.b. transport-cost factor and average c.i.f.-f.o.b. factor (Baier and Bergstrand, 2001). Furthermore, inconsistencies in standard textbook definitions of imports cif and imports fob are exacerbating the potential for misuse and misunderstandings of country cif/fob ratios. The Incoterms (International Chamber of Commerce, 1999) definition specifically states that both cif and fob terms of shipment are to be used only for sea and inland waterway transport. In contrast, the definition of cif and fob in the international trade statistics (for instance the International Financial Statistics), is much broader, and includes costs for maritime and other modes of transport. Consequently, it appears that textbooks on international trade (see Salvatore, 2001) define and briefly discuss the concepts of imports cif, imports fob and a country's cif/fob ratio, using the international trade definitions from the IMF. In contrast, maritime transport textbooks (see Stopford, 1997; Alderton, 1995; McConville, 1999) define and discuss these same concepts using the official Incoterms (International Chamber of Commerce, 1999).

Textbooks and research should be more consistent and explicit in their definitions, reporting, and use of such measures as imports cif, imports fob, and the import cif/fob ratios. Researchers should be careful not to "change the subject" by using potentially misleading terms like "shipping costs" or "freight rates" that may be misunderstood and create an impression, to the uninformed reader, of using direct transportation costs, whereas the actual measure used is a country's cif/fob ratios, that is, import *ad valorem* transportation costs.

- **Trade data issues**

The quality (accuracy) of a country's derived cif/fob ratios depends upon the quality of that country's imports cif and imports fob time series data. Unfortunately, for many countries, these trade data are not reliable (see Yeats, 1995, and Hummels and Lugovskyy, 2003 for a fuller discussion).

Be acutely aware of IMF staff imputations. For instance, contrary to the findings of the African Development Report (2004: 192), this study finds that Malawi's consistently high cif/fob ratio of 67 per cent *ad valorem* appears largely the result of IMF staff imputations. Using a constant conversion factor, in this case apparently 67 per cent, the IMF staff calculates the missing import time series values (also see Moneta, 1959: 42; Yeats, 1995). Evidently, imputations of the data, as in the case of Malawi, are not only counterproductive for research, but also may be harmful to the economy insofar as such a distorted perspective is able to discourage investment and trade. In addition, regional measures of shipping costs, like that of Africa's cif/fob ratio (reported and used by UNCTAD's *Review of Maritime Transport*), may be biased by the inclusion of such "imputed" data – distorting the recorded levels and variation in a regions or group of country's aggregated cif/fob ratios.

Unfortunately, it is sometimes unclear which countries have unreliable data and whether there has been consistent quality over time. This study used and recommends the following simple, yet effective, diagnostic procedures that will assist in assessing the quality of the import time series data. First, conduct visual analyses of the cif/fob ratio trends over time using descriptive statistics, preferably with an understanding of the historical trade context. Never use one or even a few years without first looking at those particular years within its historical time series context. Second, check the data for errors in the disaggregated (monthly) cif/fob ratios. For example, are any of the ratios negative or above one, that is, are *ad valorem* shipping costs negative or above 100 per cent? Third, correlation analyses between various country and country group annual cif/fob ratios and their respective SITC imports as a proportion of total imports, may alert the researcher to potential problems with the quality of these data. Finally, this study recommends that if the cif/fob ratio is used, it should be analysed within the evolving context of a country's import composition, within its historical context and, where possible, compared to other more direct indicators of international transport costs like ocean freight rates.

- **A country's cif/fob ratio is frequently misunderstood and misused as a descriptive statistic**

A typical assumption made in the literature that uses country cif/fob ratios as a measure (proxy) for direct transport costs is that a rise in a country's cif/fob ratios is supposed to measure (indicate) a rise in that country's (direct) international transport costs that can be expected to lead to a reduction in international trade (see Rose, 1991: 421; Radelet and Sachs, 1998: 3). In addition, a higher country cif/fob ratio is typically considered less desirable than a lower country cif/fob ratio (see for instance Bloom et al., 1998).

This study has shown that a country's cif/fob ratio statistic alone does not give enough information to make such judgements. Rather, there needs to be an understanding of the reasons for the exhibited level and variation in these country cif/fob ratios. In the search for better understanding and use of country cif/fob ratios, be mindful that the measure is an aggregated and import trade weighted average ratio where the weightings are, in large part, determined by the composition of imports that are not the same across countries and groups of countries. Furthermore, these trade weightings of the ratios change over time, adding a further element of non-comparability – not only between countries, but also, comparing changes in a particular country's ratios over time (also see Hummels 1999b). Consequently for some countries, a rising ratio may be positively correlated with a rise in direct shipping costs, whereas in other countries, a rising ratio may be negatively correlated with direct shipping costs. Thus it is possible, as Chasomeris (2005; 2007) has shown in the case study of South Africa, that a country's *ad valorem* shipping costs may rise despite a decline in direct shipping costs.

The study by Bloom (et al., 1998), for instance, labels their Table 2 as "Indicators of Accessibility for Trade, by Region". These indicators were actually cif/fob ratios, labelled as shipping costs, and shows that the situation looks dismal for Sub-Saharan Africa with 20 per cent "shipping costs", as compared with only 5 per cent for Western

Europe – there is no mention of the shortcomings and most importantly no explanation of how the composition of imports is likely to affect these “Indicators of Accessibility for Trade”. Such biased cif/fob ratio comparisons between countries and groups of countries may be misunderstood and undermine the competitiveness of some (developing) countries in foreign markets, and reduce trade opportunities together with the potential to attract trade-oriented foreign direct investment. Interestingly, if South Africa were included in these indicators of accessibility for trade, potential investors may be confused as South Africa’s mean cif/fob ratio was 8.87 per cent for the period that included economic sanctions (1985-1993), significantly lower than the post-sanctions (1995-2002) mean of 12.9 per cent. Clearly, the level and variation in a country’s cif/fob ratios do not necessarily indicate the level and variation in that country’s direct shipping costs.

- **Erroneous assumptions and econometric (mis)use of country import cif/fob ratios**

In addition to the abovementioned concerns and limitations, this study showed that whether a developed or developing country, where the quality of the data is reliable, a country’s composition of imports has a substantial and significant effect on that country’s import cif/fob ratios, and thus should not be ignored or assumed constant. Understood in this context, changes in country cif/fob ratios may be perceived to be a *consequence* rather than a *cause* of changes in international trade. Yet several studies view a country’s cif/fob ratio as a measure of “shipping costs” and, to a large degree, discount the effects that changes in the composition of imports may have on country cif/fob ratios. Starting with the assumption that the ratio reflects changes in shipping costs rather than changes in the composition of imports, econometric use of the cif/fob ratios as a proxy for shipping costs have perhaps ventured too far - to assume a constant composition of imports. Hence, whether implicitly (Naudé, 1999a; 1999b) or explicitly (Radelet and Sachs, 1998; Rose, 1991), transportation cost studies that use country cif/fob ratios as “shipping costs” typically make the above-mentioned limiting assumption. In other words, these studies assume and use a country’s cif/fob ratios as exogenous explanatory variables whereas, in reality, a country’s cif/fob ratio may indeed be an endogenous variable, which has consequently generated spurious empirical results (see Chasomeris, 2007 for a fuller discussion). Additionally, the findings of studies that use country cif/fob ratios may suffer severe bias, not only from the potential misuse of these ratios in econometric modelling, but also because of shortcomings in the trade data used to calculate these import cif/fob ratios<sup>29</sup>. Clearly, researchers should carefully reassess the use of a country’s cif/fob ratio and ought to be wary of substituting country cif/fob ratios for direct measures of international transport costs.

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<sup>29</sup> Recall, Yeats (1978: 355) conducts tests that indicate cif/fob ratios “do not approximate nominal transportation costs in spite of the assumption often made in gravity flow and trade related models”. Thus, Yeats (1978: 358) concludes, “the magnitudes of the discrepancies revealed in the official trade statistics are certainly sufficient to bias findings of the theoretical and empirical studies.” In addition, Hummels and Lugovskyy (2003: abstract) conclude that “IMF c.i.f./f.o.b. ratios are badly error-ridden in levels, and contain no useful information for time-series or cross-commodity variation.”

Despite the rising importance of international transport costs, a lack of reliable and comparable data continues to hinder research. This study confirms that direct measures of transportation costs are difficult to obtain – but not impossible. Researchers in the public and private sectors, including perhaps the Department of Transport, South African Revenue Services and the Department of Trade and Industry, should collaborate in devoting more effort and resources towards compiling and maintaining a good quality time series database on direct measures of transport costs for all modes of transport. Assembling such data sets on direct measures of transportation costs, which are comprehensive, continuous and contains time series of sufficient length, can be the basis for substantial contributions to trade and transportation research.

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