

THE (MIS)MEASUREMENT OF INTERNATIONAL TRADE AND TRANSPORT COSTS

CHASOMERIS, Mihalīs. Graduate School of Business, University of KwaZulu-Natal.

*Address: Rm. 32, Graduate School of Business, University of KwaZulu-Natal,
Westville Campus, University Road, Westville, 3630, KwaZulu-Natal, Republic of
South Africa. e-mail: chasomerism1@ukzn.ac.za or chasomeris@gmail.com*

ABSTRACT

The United Nations, World Bank, African Development Bank and several researchers use import cif/fob ratios to measure and compare a country's or region's international transport costs. The purpose of this paper is to assess the (mis)measurement of country cif/fob ratios and their use as measures of international transport costs. In this paper, the relationship between annual cif/fob ratios and compositions of imports are examined via correlation analysis. The trade data used in this study are sourced from the International Monetary Fund's International Financial Statistics and Standard International Trade Classification (SITC) data from the *World Trade Analyser*. The findings show that where the quality of the data is reliable, a country's composition of imports has a significant effect on that country's cif/fob ratios; hence researchers cannot use the ratio as a dependable measure of direct shipping costs. For countries like Malawi, Zimbabwe, the Democratic Republic of the Congo, inaccurate trade data generate inaccurate and unreliable country cif/fob ratios that are neither able to show the country's actual *ad valorem* shipping costs nor direct costs of transportation. Studies that have used the cif/fob ratios to analyse a country's or region's transport costs may have estimated the levels and trends in international transport costs incorrectly and thus may also misinterpret their impact on trade and economic growth.

Key words: international transport costs; import cif/fob ratios; international trade.

1. INTRODUCTION

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 for most countries with sea-coasts that have large interiors (Africa Development Report, 2004: 171) – have been of concern for centuries and remain significant (see for example Smith, 1776: 14, 16; Radelet and Sachs, 1998).

Despite transport costs' (rising) importance as impediments to international trade, direct measures of transport costs are difficult to obtain (Micco and Perez, 2001; OECD, 2002; Hummels and Lugovskyy, 2006)¹. In the absence of direct measures, researchers have used an indirect measure of international transportation costs – a country's import cif/fob ratio. In principle, the measure compares the "cost, insurance and freight" (cif) value with the "free on board" (fob) value of imports. The country import cif/fob ratio, given by $[(\text{cif}/\text{fob}) - 1]$, provides a measure of *ad valorem* shipping costs. In other words, it is a measure of shipping costs as a proportion of the value of the imported goods.

The purpose of this paper is to assess the (mis)measurement of country cif/fob ratios and their use as estimates of international transport costs for countries within the African region. In this paper, the relationship between annual cif/fob ratios and compositions of imports are examined via correlation analysis. The trade data used in this study are sourced from the International Monetary Fund's International Financial Statistics and Standard International Trade Classification (SITC) data from the *World Trade Analyser*.

This paper proceeds as follows. Section 2 investigates trade data issues and the (mis)measurement of international transport costs. The analyses and case studies, in Section 2, each add additional insights on the use and misuse of country import cif/fob ratios as measures of Africa's shipping costs (cif/fob ratios) within a global context. Additionally, the case studies demonstrate how a developed country's composition of imports has both a substantial and significant effect on the cif/fob ratios. Section 3 concludes the analysis of country cif/fob ratios and shows the severe limitations to using these trade data that are sufficient to bias the findings of studies.

1 "Direct transport costs include freight charges and insurance which is customarily added to the freight charge" (Anderson and van Wincoop, 2004: 703).

2. TRADE DATA ISSUES AND THE (MIS)MEASUREMENT OF INTERNATIONAL TRANSPORT COSTS

Several researchers consider declines in a country's cif/fob ratios as indicative of decreases in direct measures of shipping costs (see for instance, Rose, 1991; Radelet and Sachs, 1998). In other words, declines in a country's cif/fob ratios are meant to be indicative of reductions in the country's direct international transport costs that have contributed to a rise in the country's international trade. With this "shipping cost" understanding of the cif/fob ratio, researchers have then sought to find possible explanations for the variation and often impressive decline in developed countries shipping costs. 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. However, a rise in the proportion of high valued imports like manufactured imports may also cause a decline in the country's cif/fob ratio, *ceteris paribus*. Similarly, 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*. As already explained, this is because a cif/fob ratio assesses transport costs indirectly and presents them as a proportion of the value of the imported good, in contrast with direct transport cost measures, which may be calculated independently of the value of goods.

In this section, the relationship between annual cif/fob ratios and compositions of imports are examined via correlation analysis. Table 1 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. The annual cif/fob ratios for each country are 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 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 1, one must be cognisant of the limitations of these correlations (see Gujarati, 1995: 21; 78-80).² Radelet and Sachs (1998: 3) maintain that although country cif/fob ratios are 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." The following three sections test this claim for three very different sets of examples.

2 Furthermore, 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 (UNCTAD 2005: 71). Hence, these results may be biased.

Table 1. 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	MAURITIUS	AFRICA	MALAWI
	1982-2002	1980-2002	1980-1998	1980-2002	1980-1998	1982-2002	1980-2000
0	0.232	0.933*	0.470**	0.300***	0.806*	-0.624*	0.326***
1	-0.603*	0.779*	0.142	0.458**	-0.400**	0.550*	-0.122
2	0.223	0.845*	0.470**	0.739*	0.822*	-0.458**	-0.578*
3	0.824*	0.666*	0.773*	0.475**	0.777*	0.511*	0.321***
4	0.228	0.417**	0.647*	0.433**	0.848*	-0.548*	-0.140
5	-0.629*	-0.925*	-0.601*	-0.530*	-0.128	0.231	0.038
6	-0.584*	0.853*	-0.522**	0.812*	-0.732*	-0.447**	-0.617*
7	-0.509*	-0.716*	-0.652**	-0.496**	-0.756*	-0.722*	0.406**
8	-0.708*	-0.686*	-0.641*	-0.487*	-0.825*	0.584*	0.186
9	-0.508*	-0.829*	-0.325***	-0.812*	-0.626*	0.646*	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.

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 for the data used in the correlation analyses).

2.1 Example 1: The World, Germany, Australia, Mauritius and the United States of America

Figure A1 and Table A1 (in the Appendix) present the import cif/fob ratios by country groups for 1970, 1980, 1990 and 1997-2005. 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. Before 2008, the *Review of Maritime Transport* reported these values annually. Partly due to the time lags in the compilation of the imports cif and imports fob data the *Review of Maritime Transport 2007* publish the cif/fob ratios for 2005. Figure A1 and Table A1 exhibit the significant 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 2005, import freight costs represented 5.9 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

4.8 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 Appendix 1, Figure A1).

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 Appendix 1, Table A1). 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, it is worth reconsidering these trends in the context of the evolving composition of world trade (Figure 1).

Most evident in Figure 1 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 *ad valorem* nature of cif/fob ratios suggests that the rise in higher valued 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 lower valued 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 rise in demand for sea transport resulted in a freight rates increase for tanker, time- and trip-charters 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.

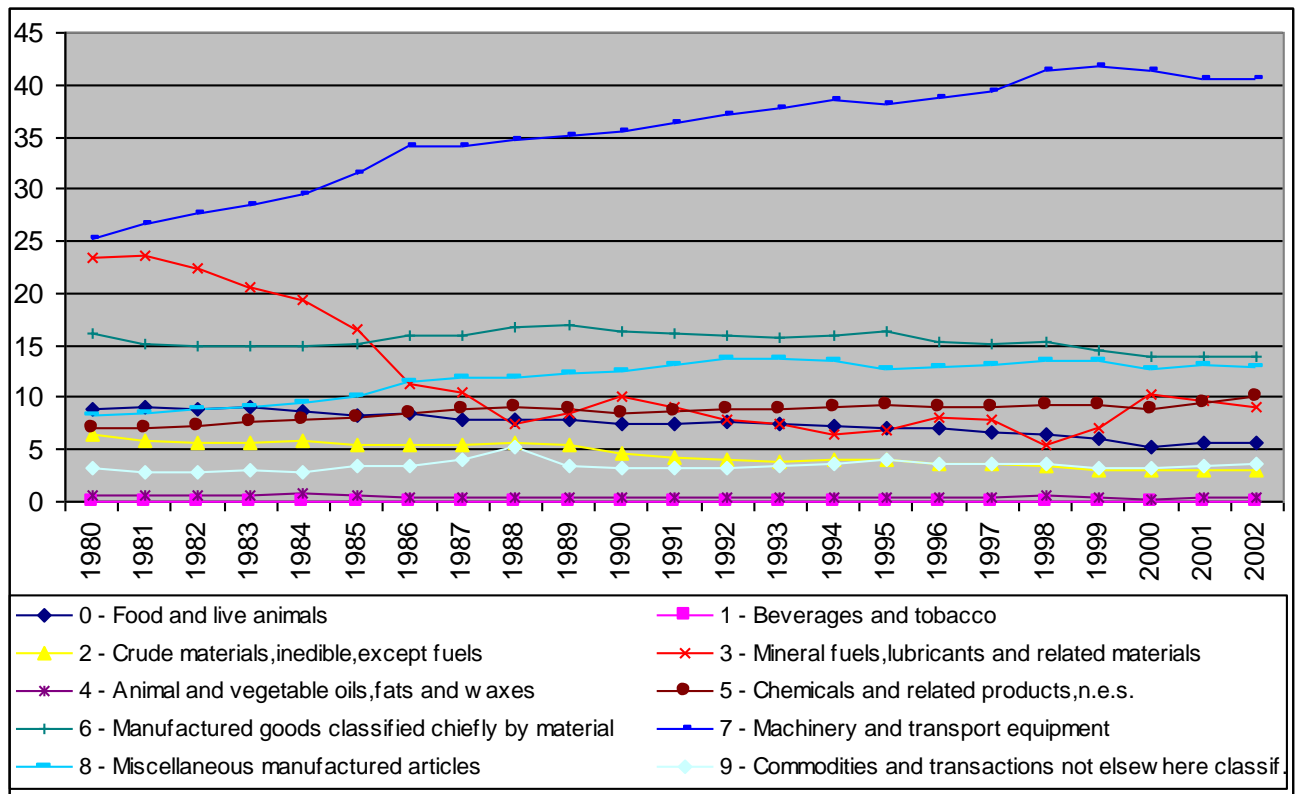


Figure 1. World SITC Imports as a Proportion of Total Imports, 1980-2002

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

Consider the numerous correlation coefficients exhibited in Table 1. 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.

Likewise, 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. More generally, the 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. Some of the unexpected or insignificant correlation coefficients may be due to measurement errors and imports classification errors (see Yeats, 1995 for a fuller discussion). The evidence shows 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 substantial and significant effect on that country's cif/fob ratios and hence researchers cannot use the ratio as a reliable measure of direct shipping costs.

2.2 Example 2: Africa's Trade and Transport Costs in a Global Context

Africa and Oceania typically experience the highest shipping costs (cif/fob ratios): for 2005, these costs were 10 and 9.6 per cent of total import value, respectively (Figure A1 and Table A1). These sub-groups have been consistently and significantly higher than both the developed and world market economies.

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 sub-Saharan Africa 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). 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".

The aggregated ratios, however, conceal vast differences, both apparent and subtle, that persist within the country groups, particularly in Africa. 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 (see Appendix, Table A2). 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.

Landlocked developing countries face the highest *ad valorem* transport costs (import cif/fob ratio), of over 20 per cent, while North Africa faces the lowest transport costs of about 10 per cent (African Development Report, 2004: 193). 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 1.67³ (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 continued to increase post-1994 (as evident in Figure A1).

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 A1). For example, in 2003 then, Africa's cif/fob ratio is 31 per cent higher than in other developing

3 A cif/fob ratio of 1.67 implies transportation costs of 67 per cent *ad valorem*.

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 A1 and Table A1 (in the Appendix) 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. On the one hand, if researchers use the cif/fob ratio as an indicator or proxy for direct shipping costs, then African countries appeared 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 gloomy 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).

Direct measures of shipping costs that are reliable and comparable are difficult to obtain (Micco and Perez, 2001; OECD, 2002; Hummels and Lugovskyy, 2006). 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. 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. 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.

Although several informed academics may agree that it is possible that changes in the composition of imports may affect the cif/fob ratios, their 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, one should keep in mind that the study by Radelet and Sachs was published 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. 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.

Africa exhibits some odd correlation results (Table 1). Presumably, these partly unexpected results may be somewhat affected by data limitations in which the SITC data are for the entire African continent (available from the World Trade Analyser in TIPS, 2005) whereas 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 (Chasomeris, 2007; Yeats, 1995). 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 2.3 will show for Malawi, Zimbabwe and the Democratic Republic of Congo). Despite these data drawbacks, a simple observation of SITC-3 (essentially petroleum oil imports, in Figure 2) 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, 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.

The question is, then, why did Africa's petroleum imports, as a proportion of total imports (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).

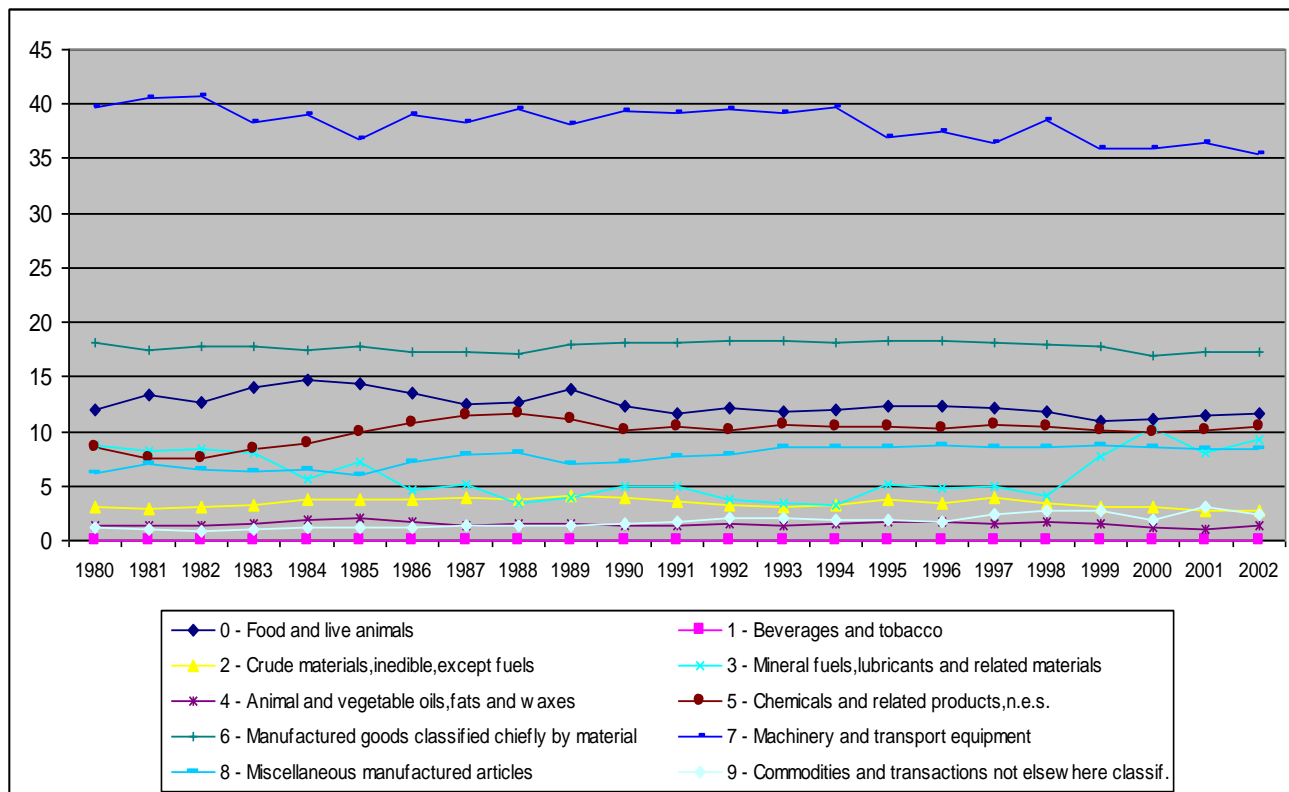


Figure 2. Africa's SITC Imports as a Proportion of Total Imports, 1980-2002

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

2.3 Example 3: Malawi, Zimbabwe and the Democratic Republic of Congo

The correlation results for Malawi evidently contrast with the evidence gleaned from the other case studies, like the United States, Germany and Australia 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 and correlation analysis for Malawi produces peculiar results.

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).

Figure 3 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. Evidently, Malawi's cif/fob ratios calculated from IFS 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. In contrast, Figure 3 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. Furthermore, Malawi's cif/fob ratios do not reflect the substantial changes in Malawi's composition of imports that are particularly evident in SITC-7 (Chasomeris, 2009a). 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. In stark contrast, Malawi's cif/fob ratio plummeted from 60.9 per cent in 1999 to 13.6 per cent in 2000.

Chasomeris (2009a) found 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 67 per cent conversion factor, the IMF calculates the missing import time series values (Moneta, 1959: 42; Yeats, 1995). Such a procedure makes the IMF cif/fob ratios "completely uninformative for many countries and suspect for many others" (Hummels, 1999: 29). Likewise, from 1980 to 1993, the cif/fob ratio for the Republic of Congo was unrealistically stable (set) between 22.2 and 22.9 per cent. The ratio then declines to an unlikely 3 per cent for the years 1994 to 1997, before increasing to 21.8 per cent for 1998 and 21.1 for 1999. In 2000, the final year for which data were available (TIPS, 2005), the ratio is recorded as 6.1 per cent. Similarly, the import data for Zimbabwe generates inconsistent and unreliable import cif/fob ratios. Figure 3 shows that Zimbabwe's ratio is inestimable for several years as well as erratic, unrealistic and unreliable for others. Accordingly, researchers need to examine carefully both trade data and country cif/fob ratios before embarking on econometric studies and other research.

Clearly, in the examples of Malawi, Zimbabwe and the Democratic Republic of the Congo, the IFS trade statistics from the IMF are neither able to show actual *ad valorem* shipping costs nor direct costs of transportation. Contemporary figures for Malawi appear to show a more reasonable measure of *ad valorem* shipping costs with a cif/fob ratio of 14.5 per cent (UNCTAD, 2006: 124). Nevertheless, the cif/fob ratio is still not a reliable measure of direct transportation costs.

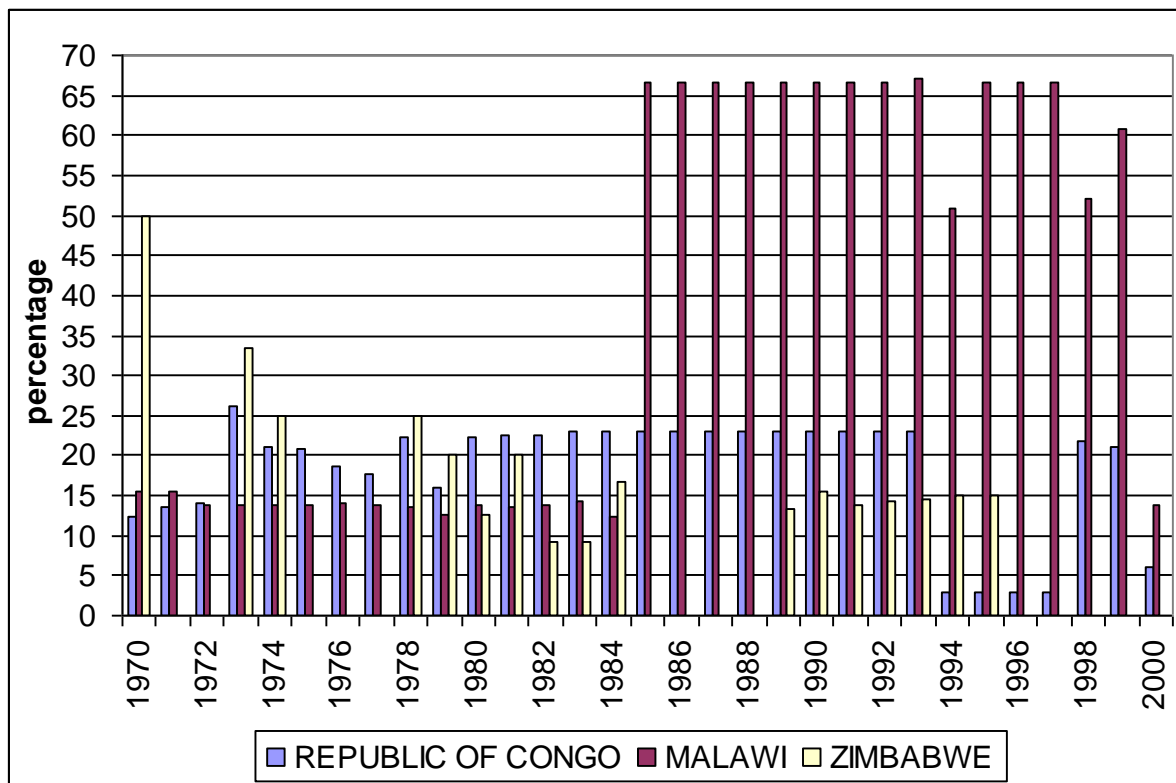


Figure 3. Country Import cif/fob Ratios for Malawi, Zimbabwe and the Republic of Congo, 1970 to 2000

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

3. CONCLUSIONS

The accuracy of a country's derived import cif/fob ratios depends upon the quality of that country's imports cif and imports fob trade data. Unfortunately, for many countries, these trade statistics are not reliable (Yeats, 1995; Hummels and Lugovskyy, 2006; Chasomeris, 2009a).

In this paper, the relationship between annual cif/fob ratios and compositions of imports are examined via correlation analysis. The findings show that where the quality of the data is reliable, a country's composition of imports has a significant effect on that country's cif/fob ratios; hence researchers cannot use the ratio as a dependable measure of direct shipping costs.

Inaccurate trade data generate unreliable country cif/fob ratios. In the examples of Malawi, Zimbabwe and the Democratic Republic of the Congo, the IFS statistics from the IMF are neither able to show actual *ad valorem* shipping costs nor direct costs of transportation.

Future research should be mindful that the cif/fob ratio is an aggregated and import-trade-weighted mean 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 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 in different periods. Consequently, studies that have used import cif/fob ratios to analyse a country's or region's transport costs may have estimated the levels and trends in international transport costs incorrectly and thus may also misinterpret their impact on trade and economic growth (Chasomeris, 2009b).

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APPENDIX

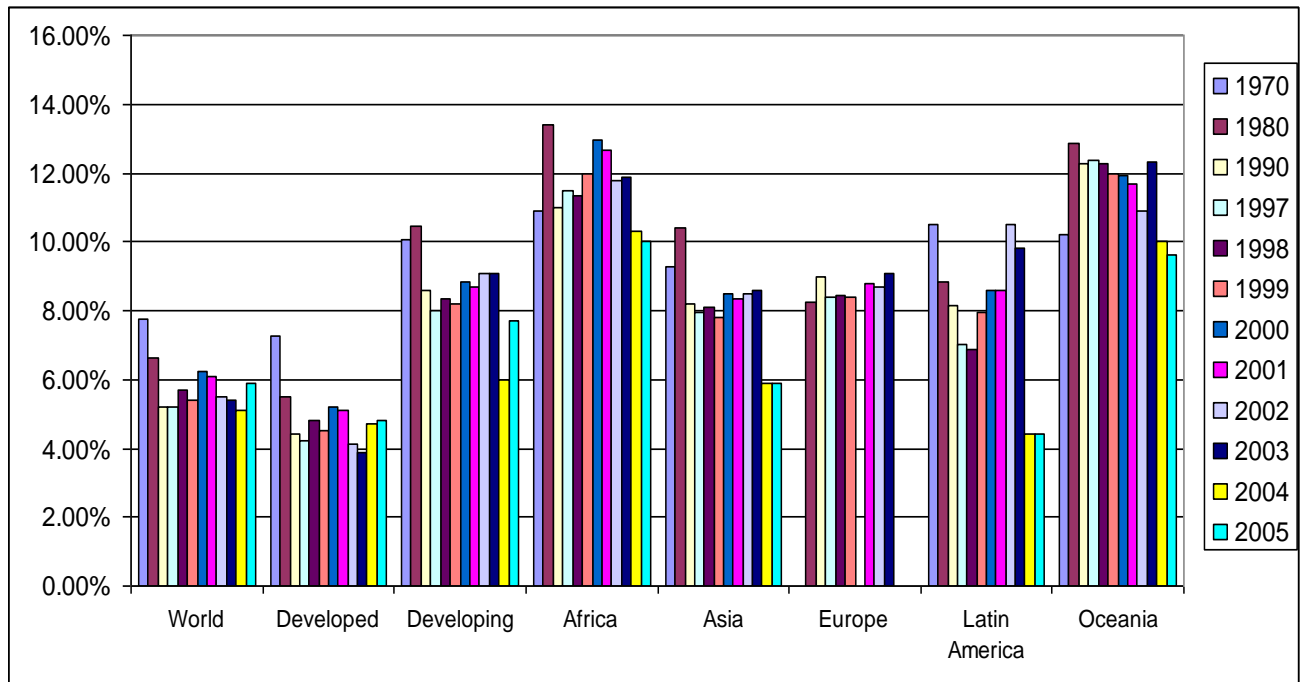


Figure A1. Estimates of the CIF/FOB Ratio for Imports by Country Groups

Source: Author compiled from: UNCTAD 1999; 2000; 2001, 2002; 2003a; 2004; 2005; 2007; McConville, 1999: 177; ISL, 2001; 2002.

Table A1. Estimates of the CIF/FOB Ratio for Imports by Country Groups

	1970	1980	1990	1997	1998	1999	2000	2001	2002	2003	2004 ¹	2005 ¹
World	7.75	6.64	5.22	5.2	5.69	5.39	6.21	6.11	5.5	5.4	5.1	5.9
Developed	7.26	5.49	4.4	4.2	4.83	4.5	5.21	5.12	4.1	3.9	4.7	4.8
Developing	10.04	10.44	8.6	8	8	8.21	8.83	8.7	9.1	9.1	6	7.7
- Africa	10.88	13.42	11	11.50	11.36	12.00	12.97	12.65	11.80	11.90	10.3	10
- Asia	9.30	10.41	8.19	7.95	8.11	7.80	8.51	8.35	8.50	8.60	5.9	5.9
- 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	4.4	4.4
- Oceania	10.21	12.84	12.26	12.36	12.26	12.00	11.94	11.70	10.90	12.30	10	9.6

Source: Author compiled from: UNCTAD 1999; 2000; 2001, 2002; 2003a; 2004; 2005; 2007; McConville, 1999: 177; ISL, 2001; 2002.

Note 1.

The categories of country groups and composition of the country groups has changed significantly for 2004 and 2005. "Data in this table are not comparable to those published in previous issues of this publication owing to changes in source and methodology. World totals

include all countries, but regional aggregates for imports and their freight costs during recent years might be distorted because of slow reporting by some countries.” (UNCTAD 2007: 79).

Note 2.

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).

Table A2. Estimate of Total Freight Costs on Imports of African Countries, 2004

Country group	Estimate of freight costs of imports (billions of dollars)	Value of Imports (c.i.f.) (billions of dollars)	Freight costs as percentage of import value (cif/fob ratio)
World total	270.8	9 244.7	3.6
Developed economies	157.7	5 928.4	3.1
Developing economies	75.8	1 945.2	5.9
<i>of which in:</i>			
Africa	9.9	151.5	9.9
<i>of which:</i>			
North Africa	4.0	68.7	8.8
Southern Africa	0.8	13.5	9.0
West Africa	2.3	32.1	10.9
Horn & East Africa	1.9	22.9	12.6
Central Africa	0.9	14.3	9.5
Sub-Saharan Africa	5.9	82.8	10.3

Source: “Imports based on merchandise imports data from the UNCTAD Handbook of Statistics 2005 (table 1.1); freight and insurance data from the IMF Balance of Payments Statistics on CD-ROM (January); freight ratio estimated as weighted average based on size of economies. This table is not comparable with those found in previous issues of the Review of Maritime Transport owing to changes in source and methodology” (UNCTAD 2006: 123).