



**UNIVERSITY OF
KWAZULU-NATAL**

Graduate School of Business

**THE (MIS)MEASUREMENT OF AFRICA'S
SHIPPING COSTS IN A
GLOBAL CONTEXT**
Dr Mihalis Chasomeris

e-mail: chasomeris@gmail.com

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The (Mis)Measurement of International Transport Costs

- International trade is widely viewed as an engine of economic growth and social development.
- Transport costs are significantly able to impede international trade.
 - High transport costs:
 - protect domestic producers from foreign competition
 - provide a significant anti-export bias that reduces international competitiveness

The (Mis)Measurement of International Transport Costs

- Direct measures of transport costs are difficult to obtain.
- The United Nations, World Bank, African Development Bank and several other researchers use import cif/fob ratios to measure a country's and groups of countries' international transport costs.

Purpose

- to assess the (mis)measurement of country cif/fob ratios as estimates for international transport costs for countries within the African region.
- to show how the broad trends in the composition of imports have an effect on these import cif/fob ratios.

Trade data are sourced from:

- International Monetary Fund's International Financial Statistics
- 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.

- **Cif/fob ratio misunderstood and misused**
 - The country import ratio (cif/fob)-1 provides a measure of *ad valorem* shipping costs that compares the “cost, insurance and freight” (cif) value with the “free on board” (fob) value of imports.
- Ratios are determined by changes in both the level of transportation costs and changes in the composition of a country’s imports.
 - high-value imports, like manufactured imports, will have very low cif/fob ratios
 - low-value agricultural/oil imports may have high ratios

Other names used for cif/fob ratios:

- shipping costs
- *ad valorem* transport costs
- *ad valorem* shipping costs
- *ad valorem* freight rate
- freight factor
- a country's average freight rate
- CIF-FOB band on imports
- transport cost *rate*
- c.i.f.-f.o.b. transport-cost factor
- average c.i.f.-f.o.b. factor

Definition (Mis)Use

- Inconsistencies in textbook definitions
- Incoterms definition - both cif and fob terms of shipment - used only for sea and inland waterway transport.
- The international trade statistics (IFS) – broader definition - includes costs for maritime and other modes of transport.
- Textbooks and researchers should be more consistent and explicit in their definitions and use imports cif, imports fob and cif/fob ratios.

- **Unfortunately, several shortcomings of ratios:**
 - measurement errors in the values of imports cif and imports fob;
 - IMF staff imputations, that is, constructed ratios;
 - concerns over potential bias;
 - aggregation over the different sources of supply, so for each country there is a single cif/fob ratio;
 - misunderstanding, misinterpretation and misuse of these country cif/fob ratios (Limão and Venables, 2001: 7; Chasomeris, 2007).

- Nonetheless, Radelet and Sachs (1998: 3) maintain:
“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”

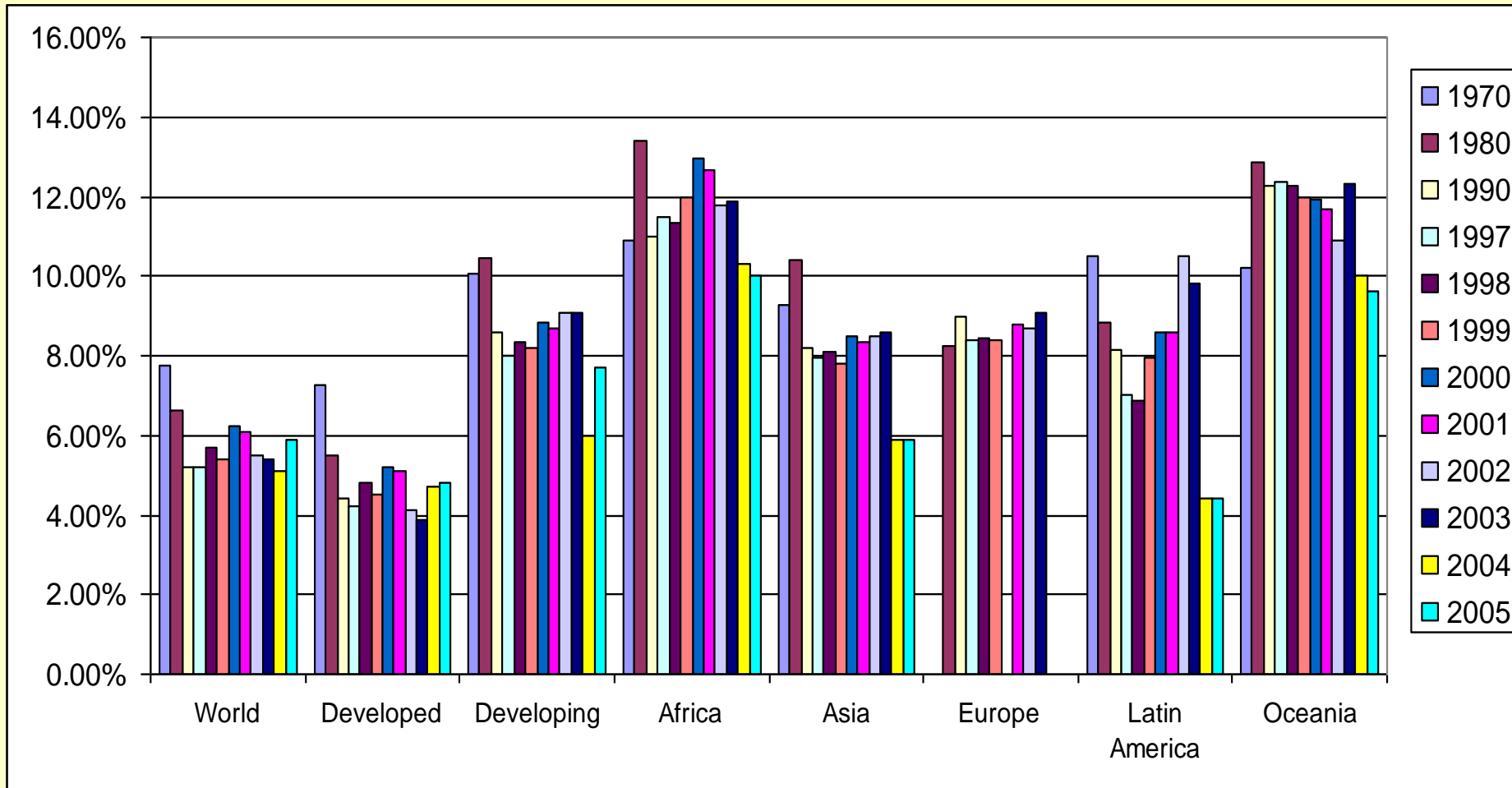
- Likewise, because of their availability and coverage
 - Rose (1991)
 - Radelet and Sachs (1998)
 - Naudé (1999; 2001)
 - Limão and Venables (2001)
 - Baier and Bergstrand (2001)

- used IMF import cif/fob ratios to assess the effect of transportation costs on trade.

Incorrect Assumptions?

- 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.
- A higher country cif/fob ratio is typically considered less desirable than a lower country cif/fob ratio (Bloom and Sachs, 1998).
- So, do high and rising ratios = high and rising costs?

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 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>	9.9	151.5	9.9
Africa	4.0	68.7	8.8
<i>of which:</i>	0.8	13.5	9.0
North Africa	2.3	32.1	10.9
Southern Africa	1.9	22.9	12.6
West Africa	0.9	14.3	9.5
Horn & East Africa	5.9	82.8	10.3
Central Africa			
Sub-Saharan Africa			

Source: 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).

Case Studies

- **Example 1.** The World, US, Germany, Australia & Mauritius
 - **Example 2.** Africa
 - **Example 3.** Malawi, Zimbabwe & Democratic Republic of Congo
 - **Example 4.** South Africa
-
- **Show ratio alone does not give enough information to make such judgements.**
 - **Rather, need understanding of the reasons for the exhibited level and variation in these ratios.**



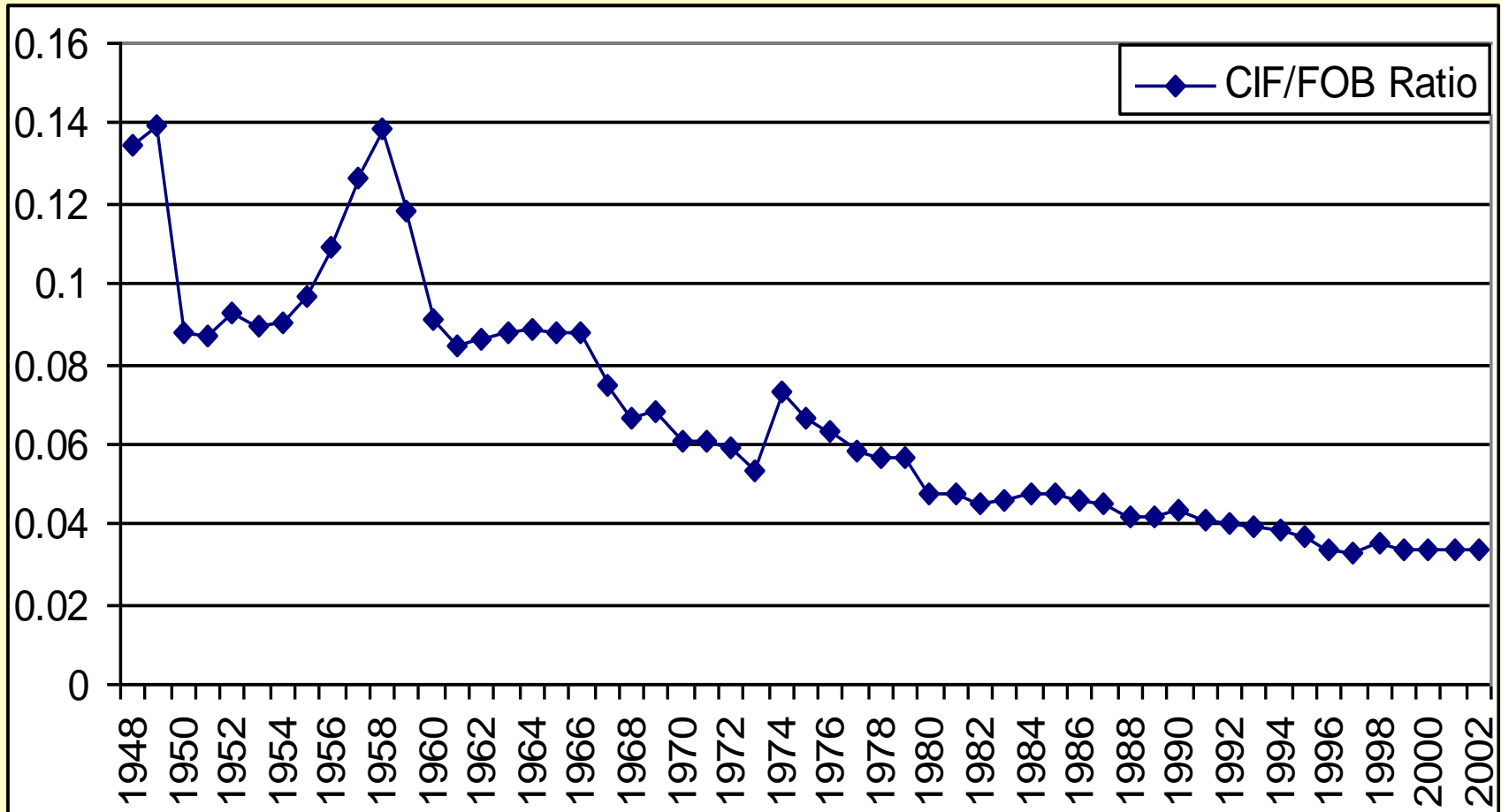
Trade Data (Mis)Measurement

- **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, often unclear which countries have unreliable trade data and whether there has been consistent quality over time**

United States of America

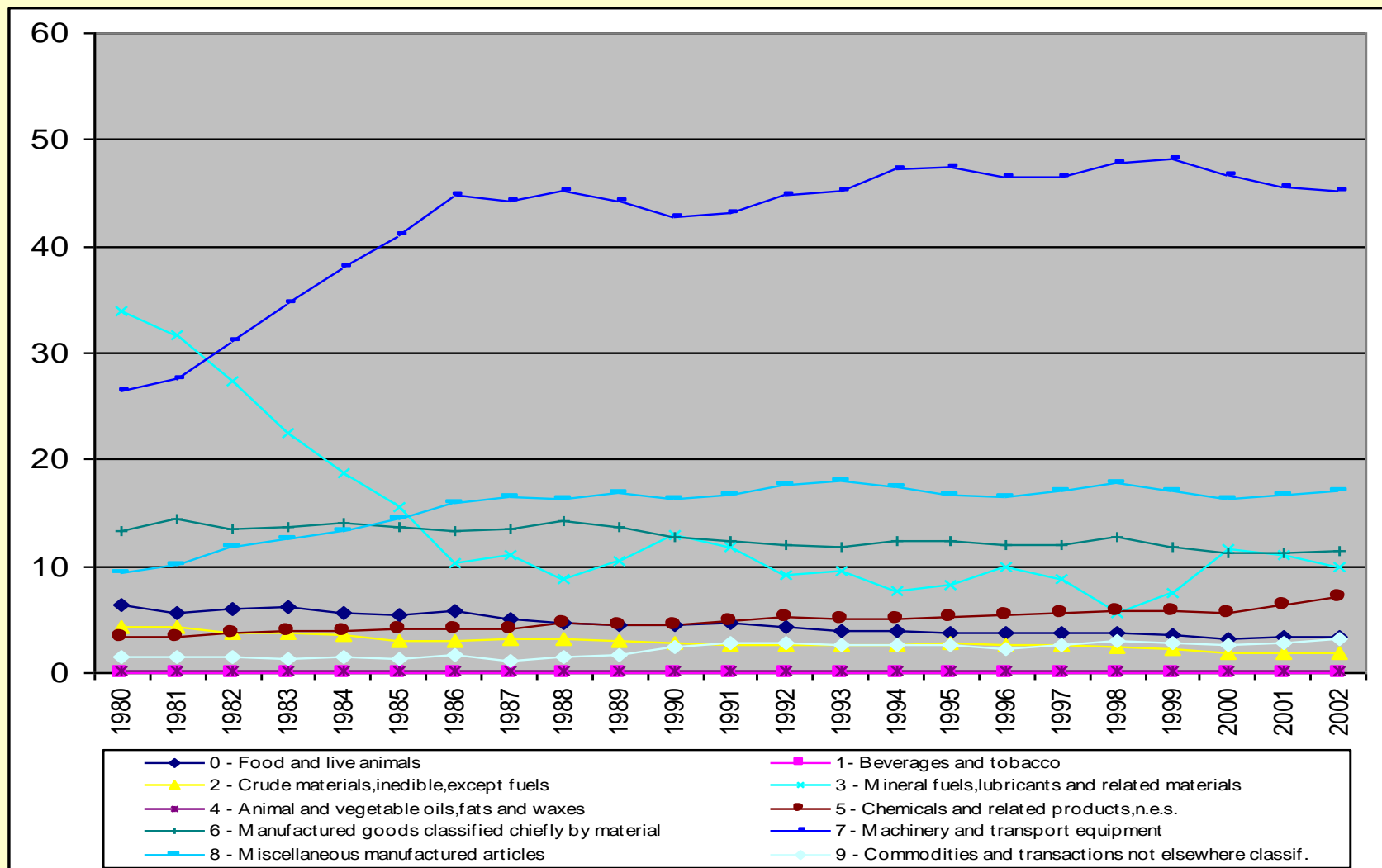


FIGURE 1.
**UNITED STATES CIF/FOB RATIO,
1948-2002**



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

FIGURE 2. USA SITC IMPORTS AS PROPORTION OF TOTAL IMPORTS, 1980-2002



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

TABLE 1. CORRELATION RESULTS: UNITED STATES CIF/FOB RATIOS AND IMPORT MANUFACTURES

Years (Inclusive)	Number of observations (n)	Correlation coefficient (r)	Coefficient of determination (r²)	t statistic (t)
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 *

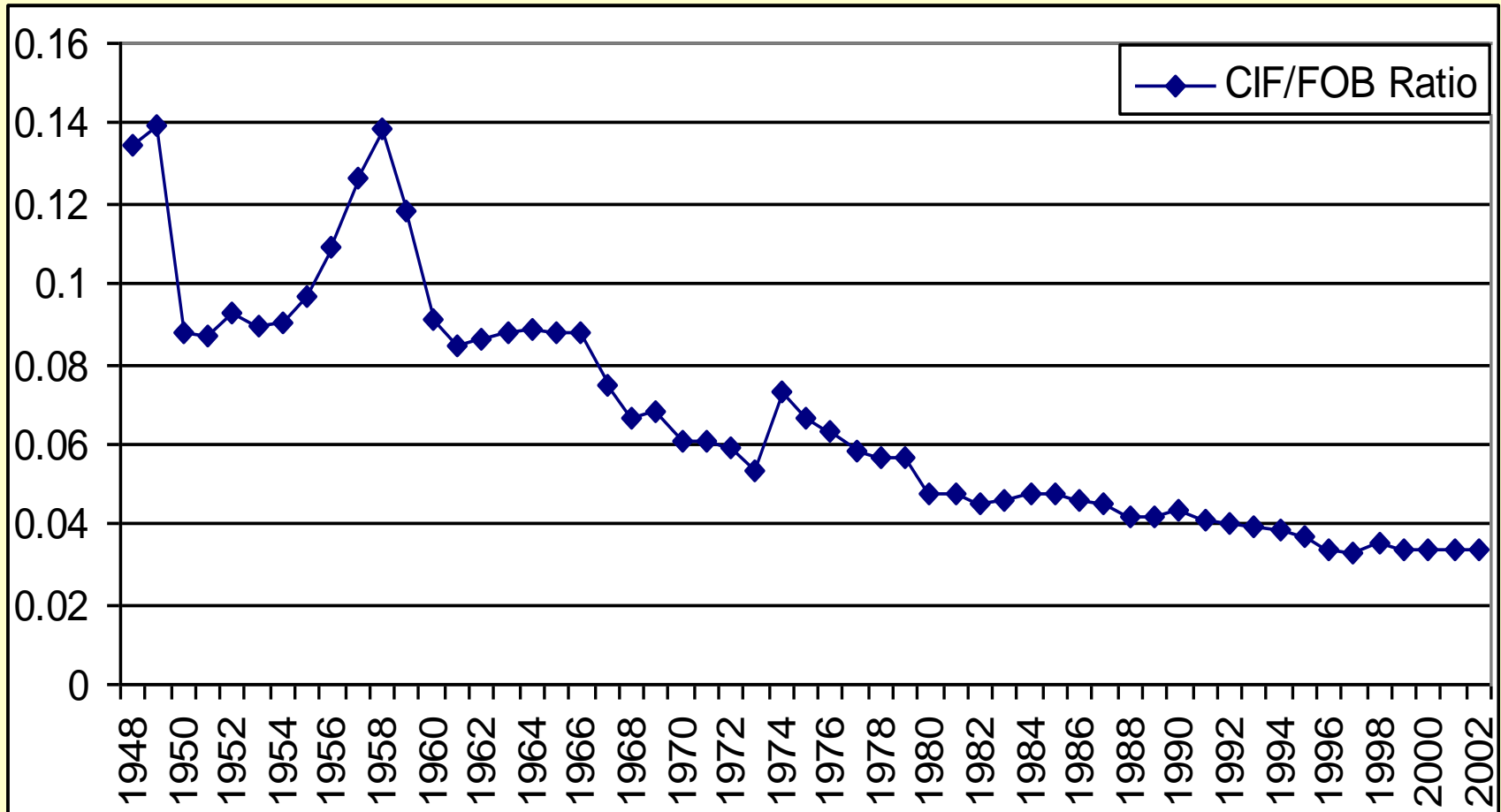
Source: Author calculations from *World Development Indicators*, 2003 and *International Financial Statistics*, 2003 in TIPS, 2004.

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”.

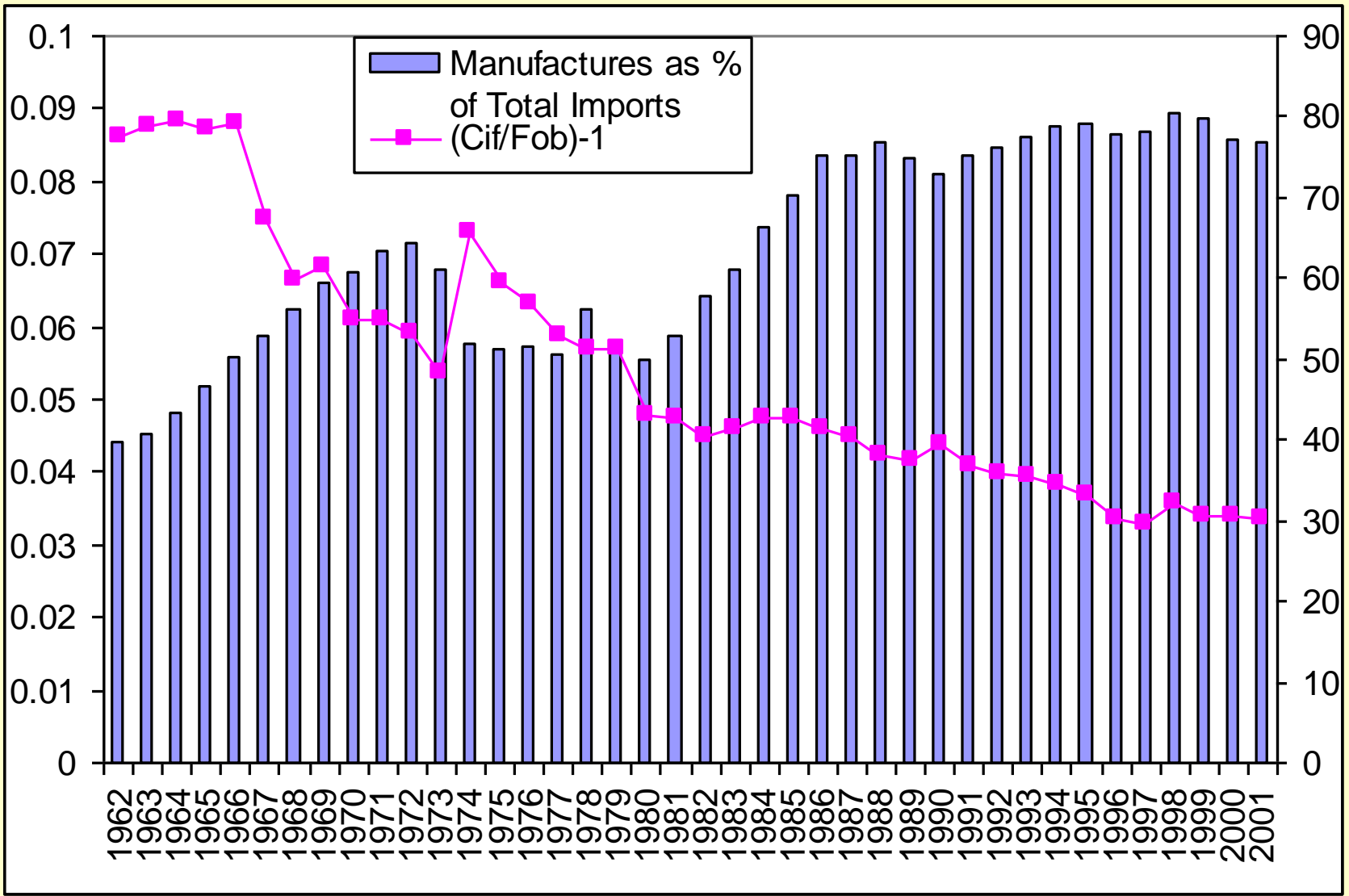
Hence, the reason for the periods analysed.

FIGURE 3.
**UNITED STATES CIF/FOB RATIO,
1948-2002**



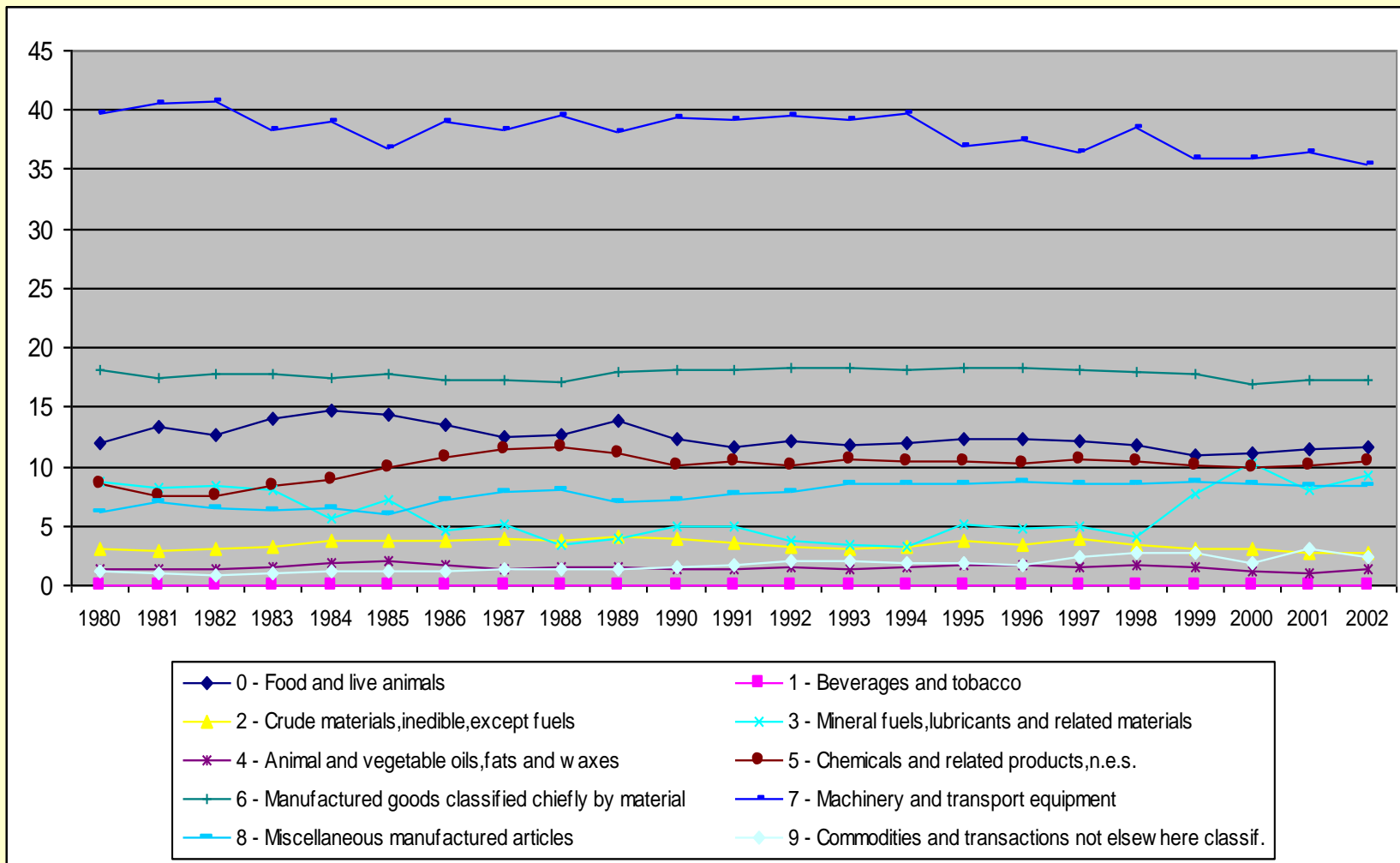
Source: Author calculated from *International Financial Statistics* in TIPS, 2004.

FIGURE 4. UNITED STATES CIF/FOB RATIOS AND MANUFACTURED IMPORTS, 1962-2001



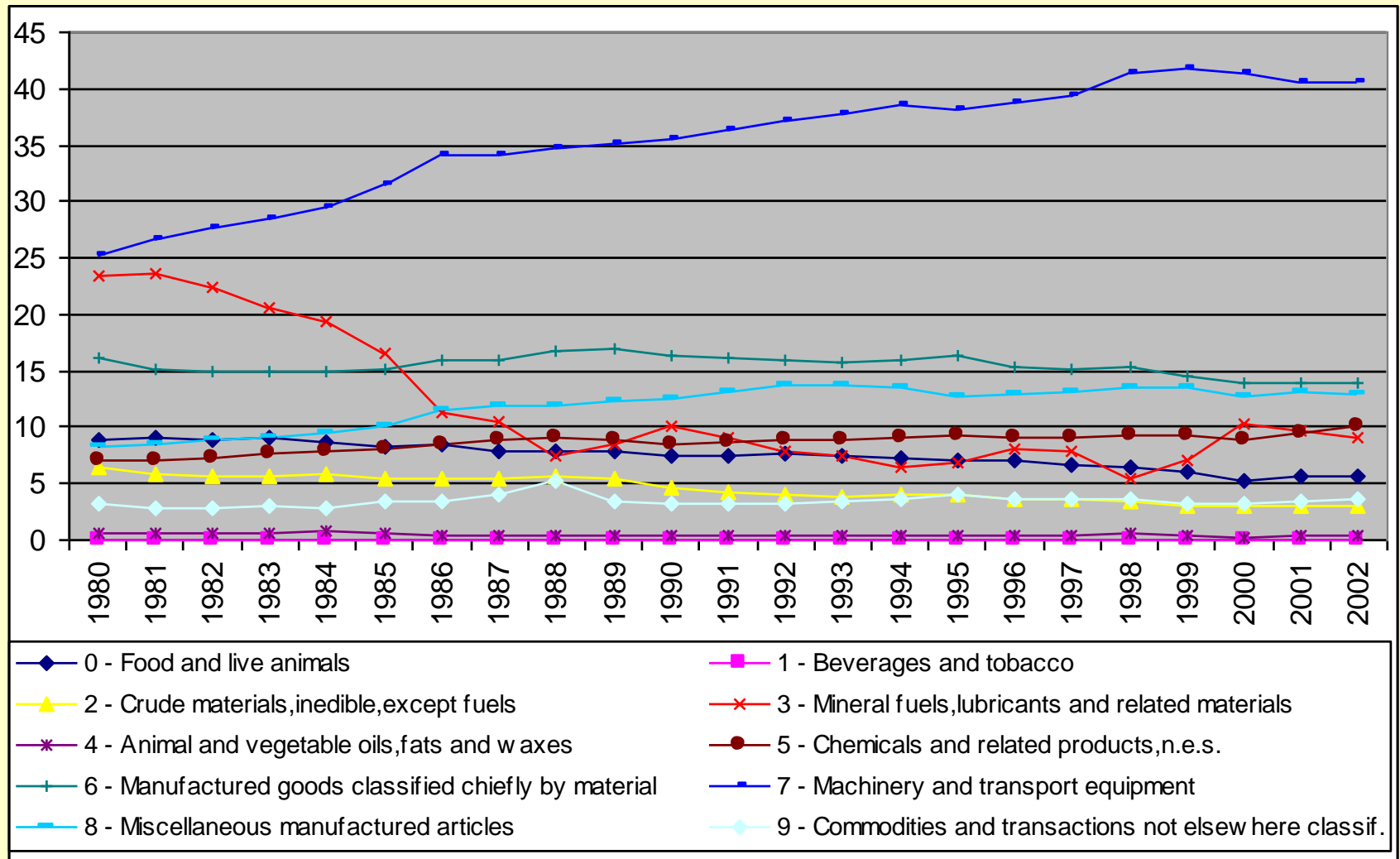
Source: Author calculations from *World Development Indicators*, 2003 and *International Financial Statistics*, 2003 in TIPS, 2004.

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



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

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 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	SOUTH AFRICA	SOUTH AFRICA
	1982-2002	1980-2002	1980-1998	1980-2002	1980-2002	1995-2002
0	0.232	0.933*	0.470**	0.300***	0.251	0.053
1	-0.603*	0.779*	0.142	0.458**	0.706*	-0.182
2	0.223	0.845*	0.470**	0.739*	0.015	0.030
3	0.824*	0.666*	0.773*	0.475**	0.429**	-0.403
4	0.228	0.417**	0.647*	0.433**	0.180	0.092
5	-0.629*	-0.925*	-0.601*	-0.530*	0.766*	0.178
6	-0.584*	0.853*	-0.522**	0.812*	0.478**	-0.139
7	-0.509*	-0.716*	-0.652**	-0.496**	0.706*	-0.174
8	-0.708*	-0.686*	-0.641*	-0.487*	0.727*	-0.181
9	-0.508*	-0.829*	-0.325***	-0.812*	-0.675*	0.257

Table 1. Correlation Results between Various Country and Country Group cif/fob Ratios and their Respective SITC Imports as Proportion of Total Imports

MAURITIUS	AFRICA	SOUTH AFRICA	SOUTH AFRICA	MALAWI
1980-1998	1982-2002	1980-2002	1995-2002	1980-2000
0.806*	-0.624*	0.251	0.053	0.326***
-0.400**	0.550*	0.706*	-0.182	-0.122
0.822*	-0.458**	0.015	0.030	-0.578*
0.777*	0.511*	0.429**	-0.403	0.321***
0.848*	-0.548*	0.180	0.092	-0.140
-0.128	0.231	0.766*	0.178	0.038
-0.732*	-0.447**	0.478**	-0.139	-0.617*
-0.756*	-0.722*	0.706*	-0.174	0.406**
-0.825*	0.584*	0.727*	-0.181	0.186
-0.626*	0.646*	-0.675*	0.257	0.282

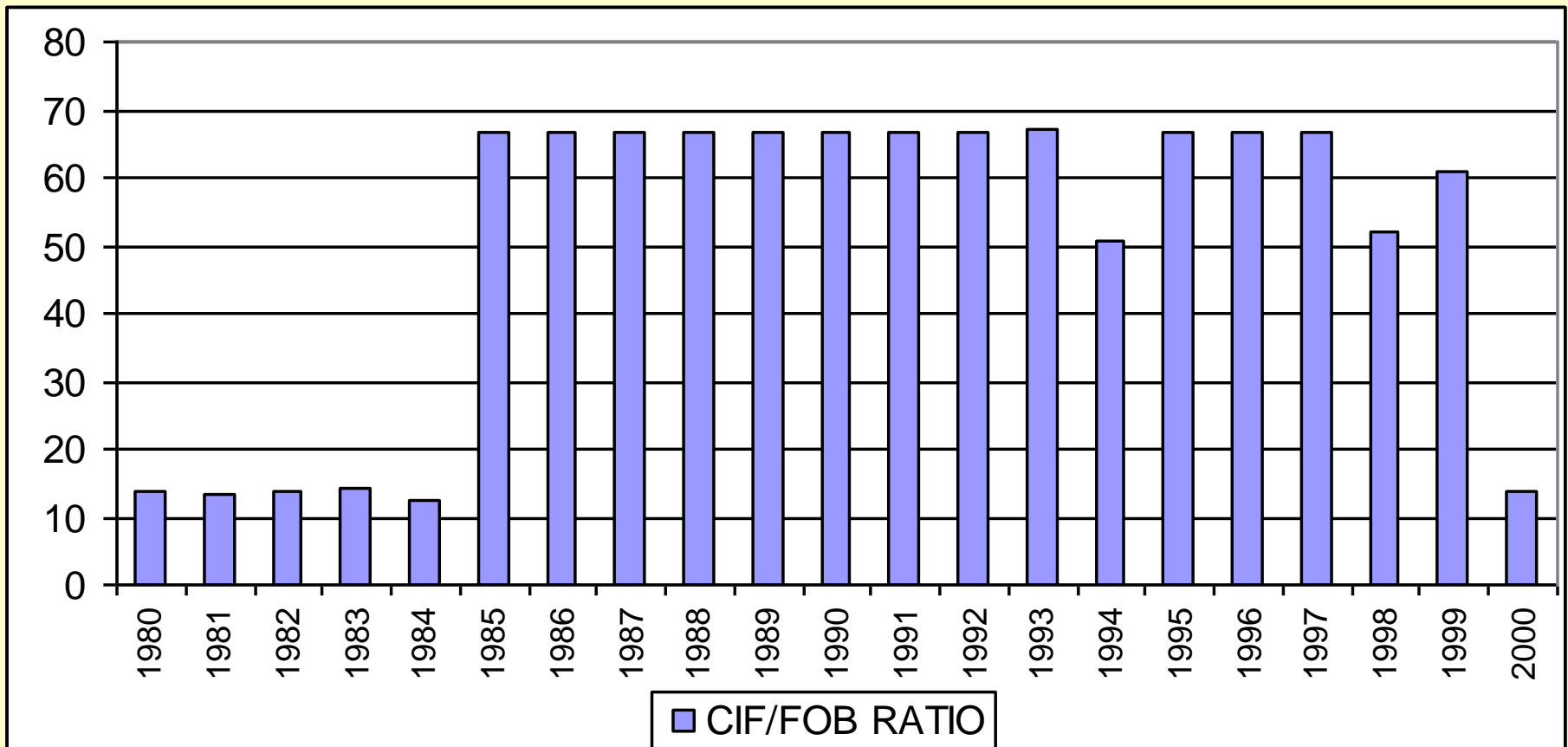
Malawi



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)."

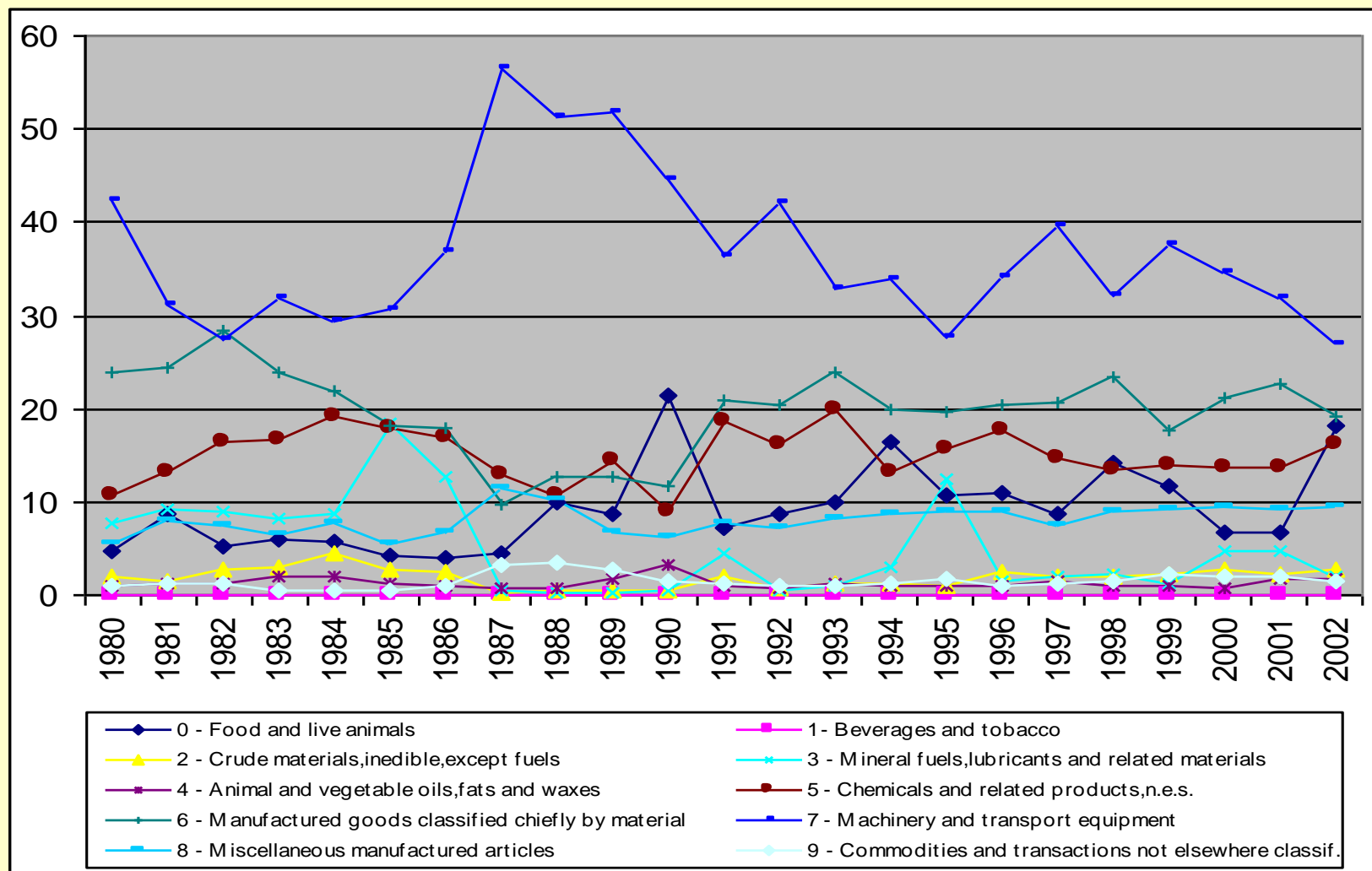
The African Development Report (2004: 192) claims that Malawi's "ratio in 1994 rose to 1.67 (because the war in Mozambique denied the shortest route to the sea)."

FIGURE 5. MALAWI'S CIF/FOB RATIOS, 1980-2000



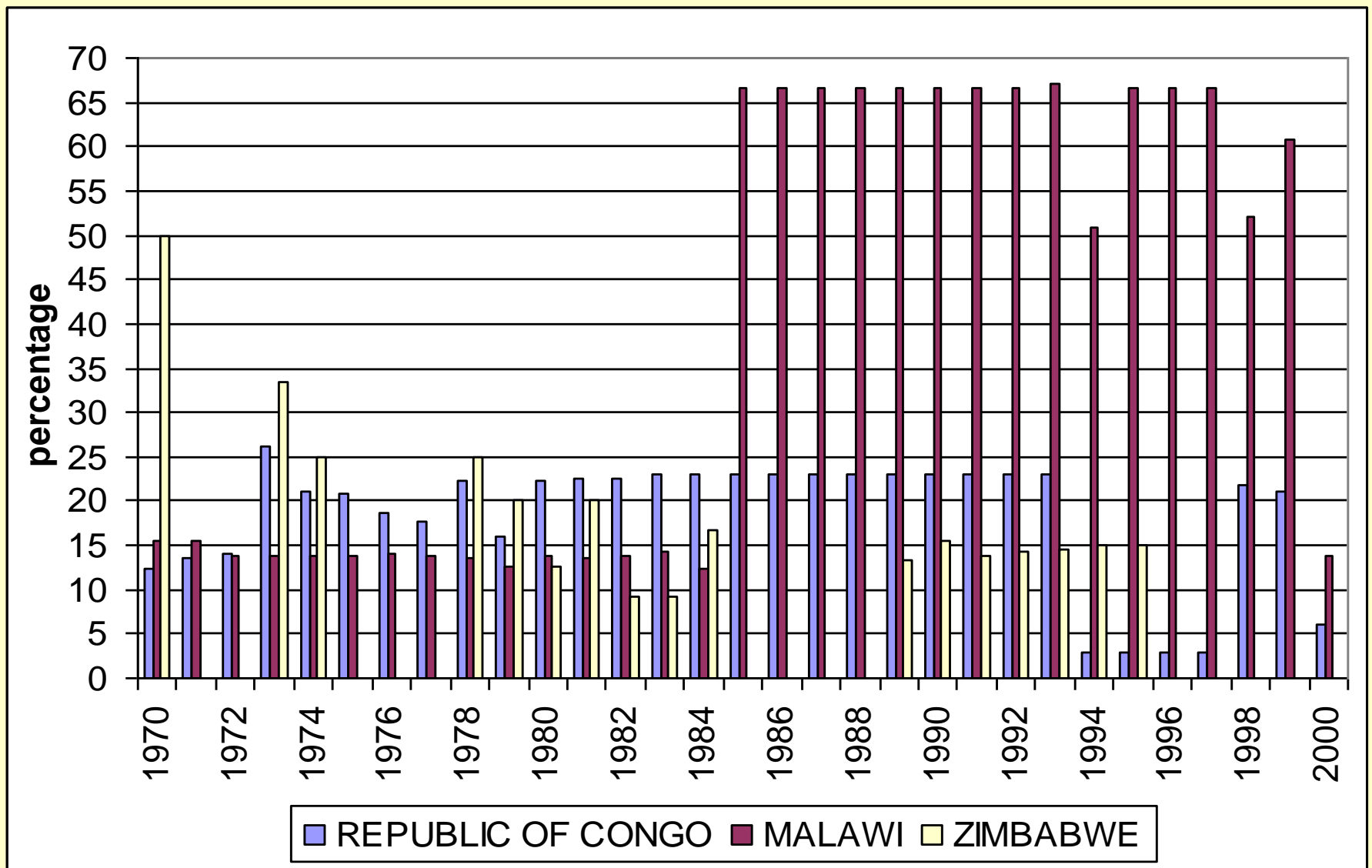
Source: own calculations using *International Financial Statistics* data in TIPS, 2005.

FIGURE 6. MALAWI SITC IMPORTS AS A PROPORTION OF TOTAL IMPORTS, 1980-2002



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

FIGURE 3. COUNTRY IMPORT CIF/FOB RATIOS FOR MALAWI, ZIMBABWE AND THE REPUBLIC OF CONGO, 1970 TO 2000

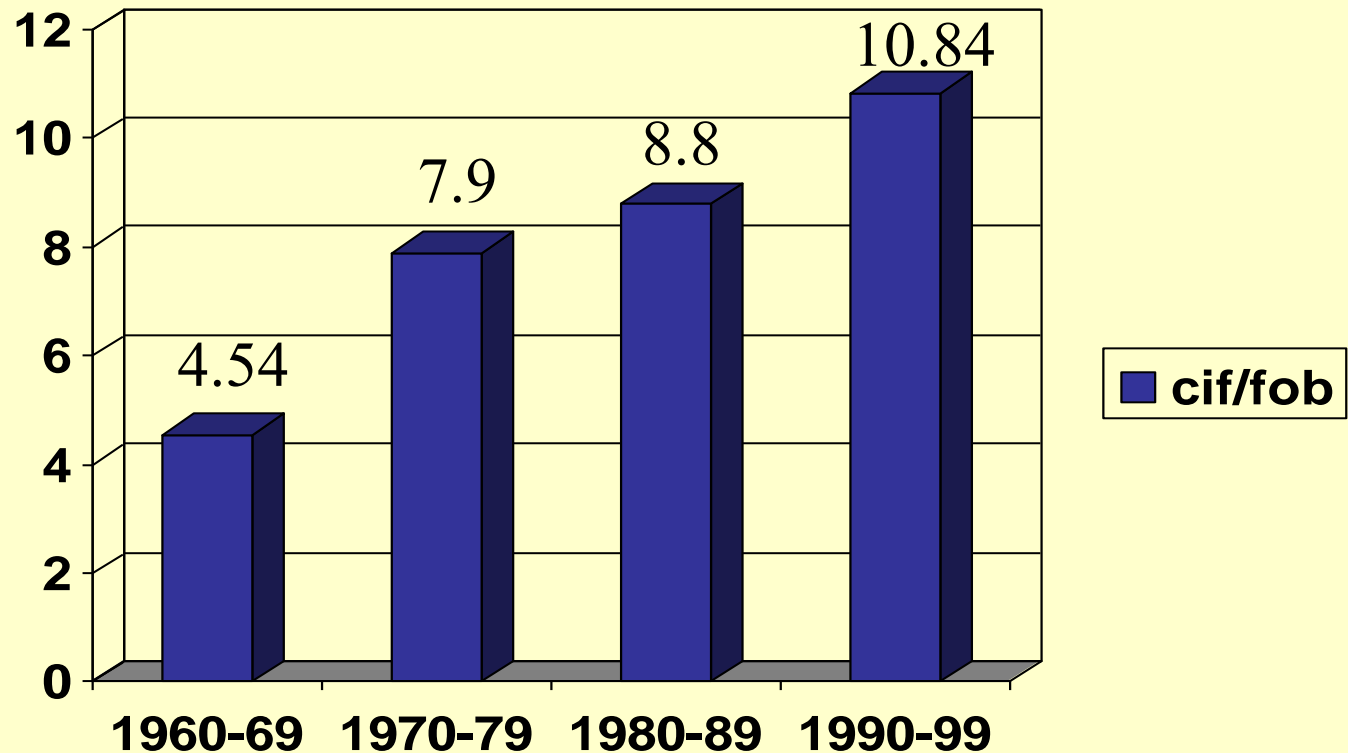


Source: own calculations using *International Financial Statistics* data in TIPS, 2005.

South Africa

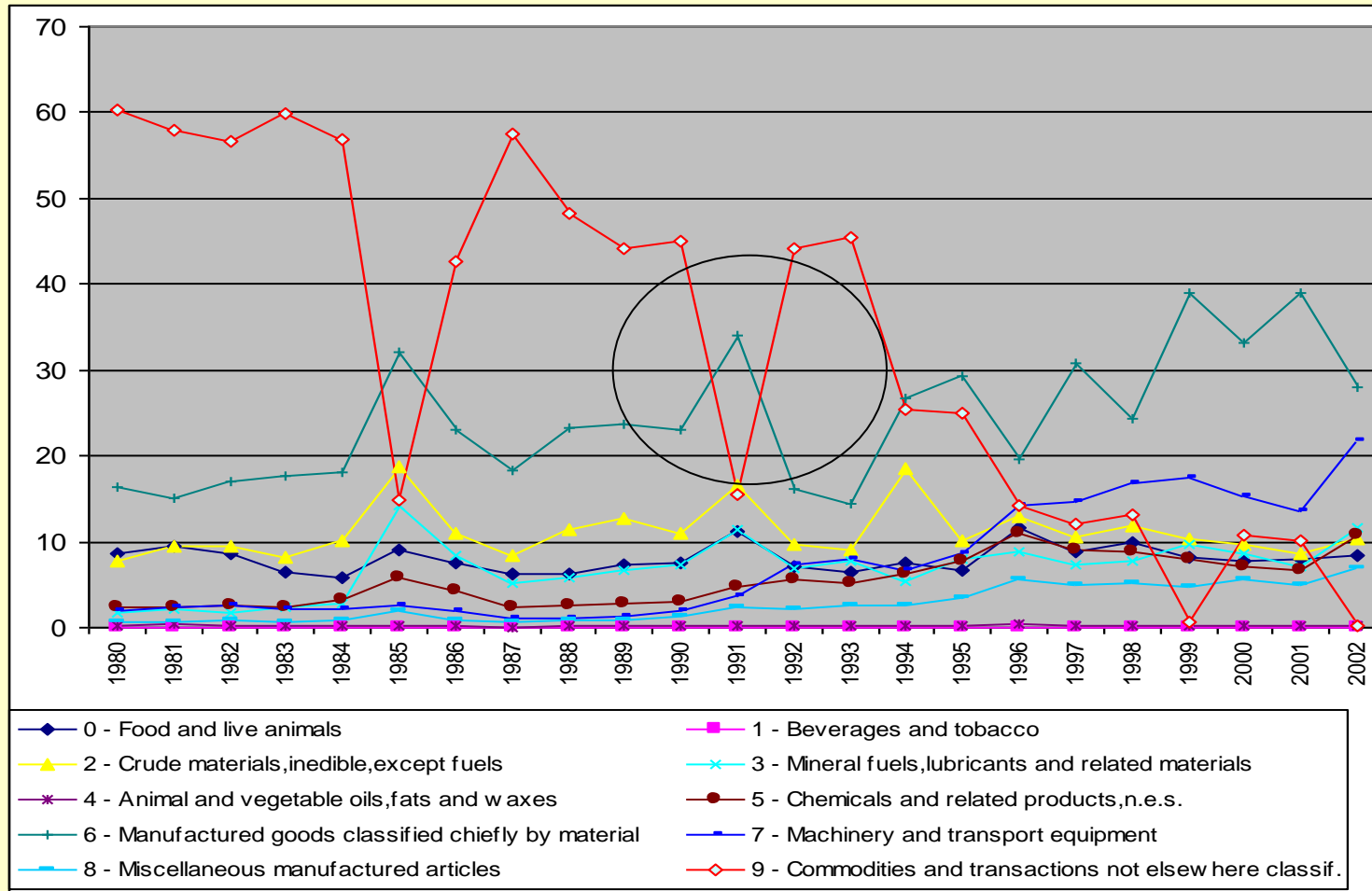


FIGURE 7.
SOUTH AFRICA'S FREIGHT COSTS AS A PERCENTAGE
OF IMPORT VALUES (CIF/FOB RATIO)



Source: Chasomeris, 2003a: 147.

FIGURE 9. SOUTH AFRICA'S SITC IMPORTS AS A PROPORTION OF TOTAL IMPORTS, 1980-2002



SA's trade data are not reliable, especially during sanctions

Need to improve understanding and use of country cif/fob ratios:

- Aggregated and import trade weighted average ratio
- Weightings are largely determined by the composition of imports
- Weightings are not the same across countries and groups of countries
- Trade weightings 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.
- Consequently, a rising ratio may be positively, negatively or not correlated with a rise in direct shipping costs.
- Thus it is possible, as evident in the case study of South Africa, that a country's *ad valorem* shipping costs may rise despite a decline in direct shipping costs.

- Bloom and Sachs (1998), Table 2: “Indicators of Accessibility for Trade, by Region” shows:
 - Sub-Saharan Africa with 20% “shipping costs”
 - Western Europe only 5%

NB: actually cif/fob ratios, labelled as shipping costs

No mention of the shortcomings of ratios and no explanation of how the composition of imports may affect these “Indicators of Accessibility for Trade”.



Conclusions(1)

- Evidence shows:
- **Problems with inconsistent definitions and use of terminology**
- International trade statistics definition and use of imports cif and imports fob
Versus
- International commercial terms definition and use (Incoterms, 2000)

Conclusions (2)

- **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

- **The case studies of South Africa, Zimbabwe, DRC and Malawi show:**

- Inaccurate trade data generate inaccurate and unreliable country cif/fob ratios
- International Financial Statistics from the International Monetary Fund are neither able to show the country's actual *ad valorem* shipping costs nor direct costs of transportation.

Conclusions (3)

- **A country's cif/fob ratio is frequently misunderstood and misused as a descriptive statistic**
- US, Malawi and South Africa
- 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**
- Studies essentially use the ratio as an endogenous explanatory variable
- Therefore, estimate incorrectly the levels and trends in international transport costs and misinterpret their impact on trade.

Conclusions (4)

- Researchers should be wary of substituting country cif/fob ratios for direct measures of international transport costs.



Way Forward

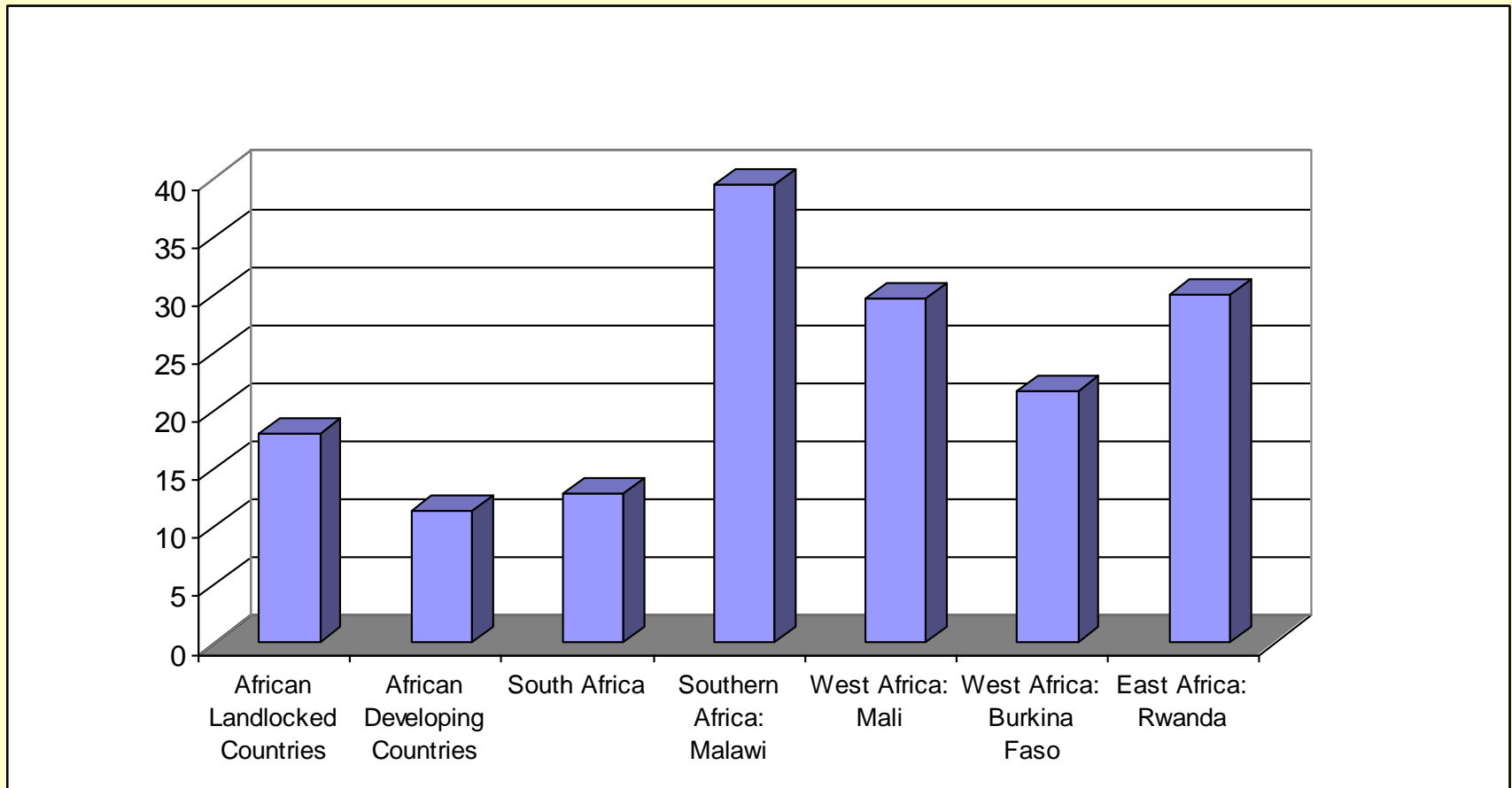
- A lack of reliable and comparable data continues to hinder research.
- Direct measures of transportation costs are difficult to obtain – but not impossible.
- Assembling data sets on direct measures of transportation costs, which are comprehensive, continuous and contains time series of sufficient length, can be the basis for substantial contributions to trade and transportation research.



Acknowledgements

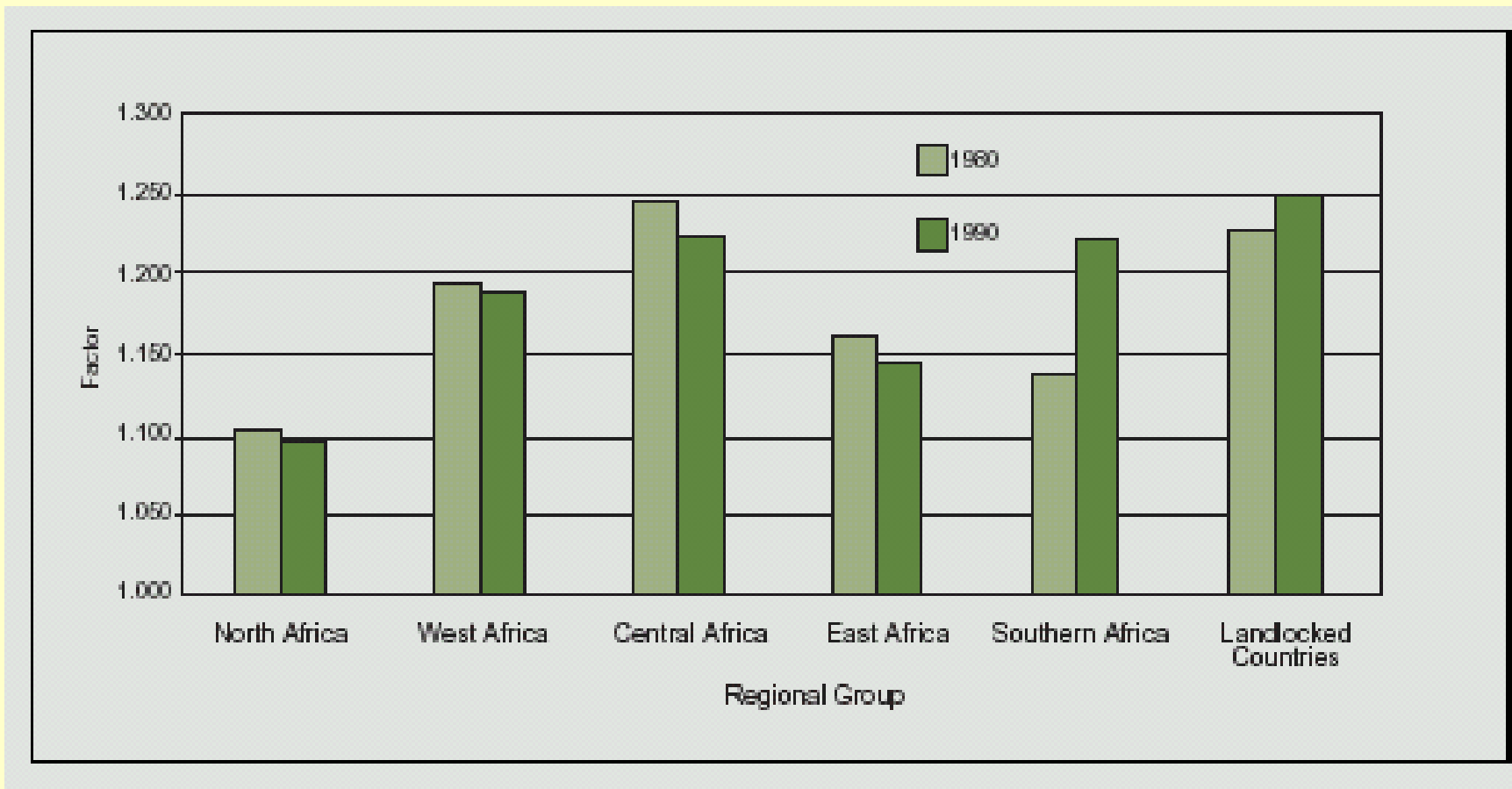
- Prof. Holden, Prof. Jones and Prof. Harris for guidance and helpful comment.
- Economics studies the confrontation between unlimited wants and limited resources. I am learning, from experience, that: “The Lord is my shepherd; I shall not want...” (Psalm 23). “But seek first the kingdom of God and his righteousness; and all these things will be added to you” (Matthew 6: 33)

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



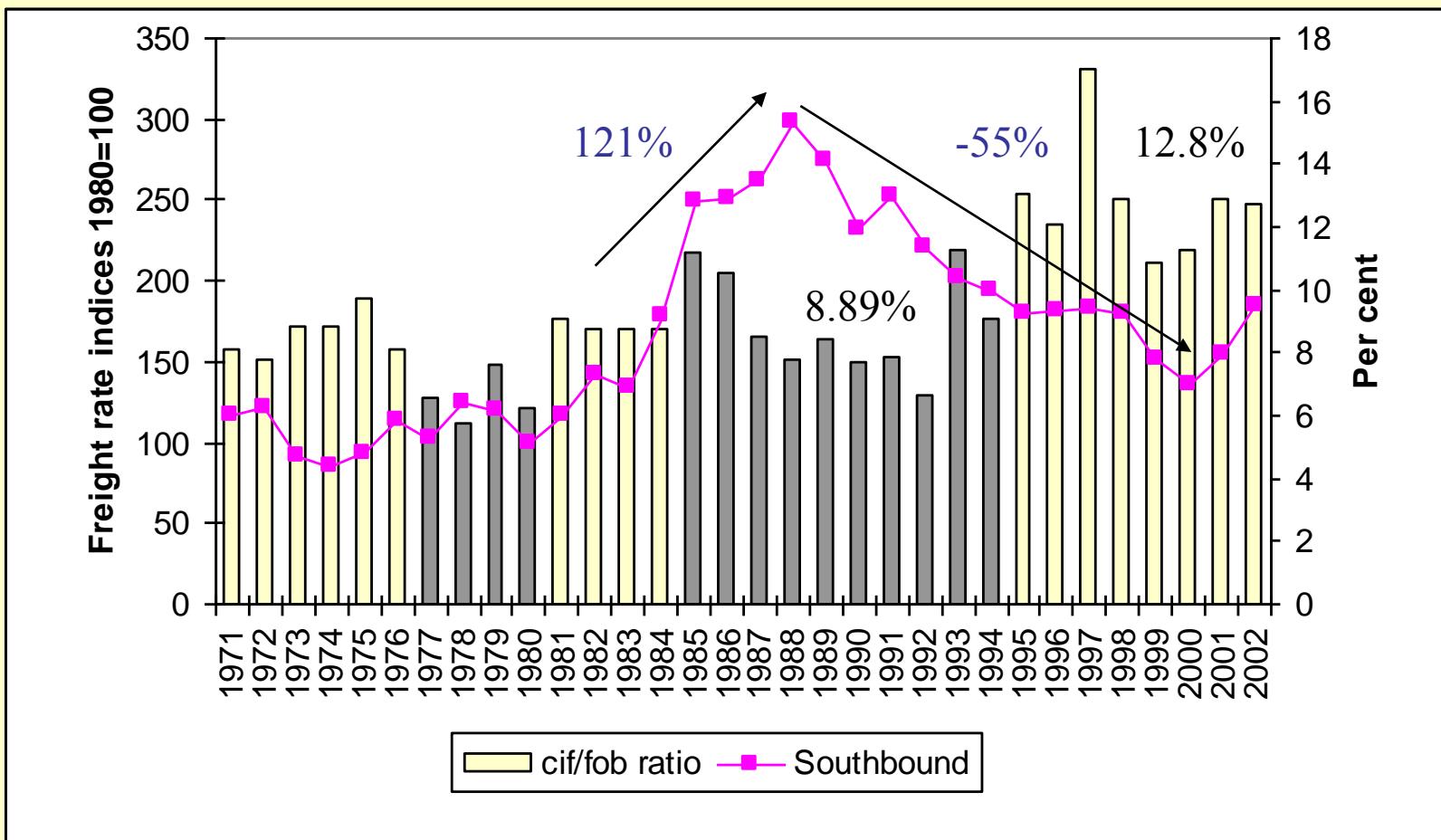
Source: UNCTAD, 2000 and *International Financial Statistics*, 2001 in Chasomeris, 2003: 139.

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



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

FIGURE 10. SOUTH AFRICA'S CIF/FOB RATIO AND EUROPE-SOUTH AFRICA LINER FREIGHT RATES (1971-2002)



Source: Chasomeris, 2005b: 141.



- SA's post sanctions cif/fob ratio (92-2002) are **45% higher** than the mean during sanctions (86-91)

In contrast:

- SA's post sanctions mean freight rates are **32% lower** than the sanctions average

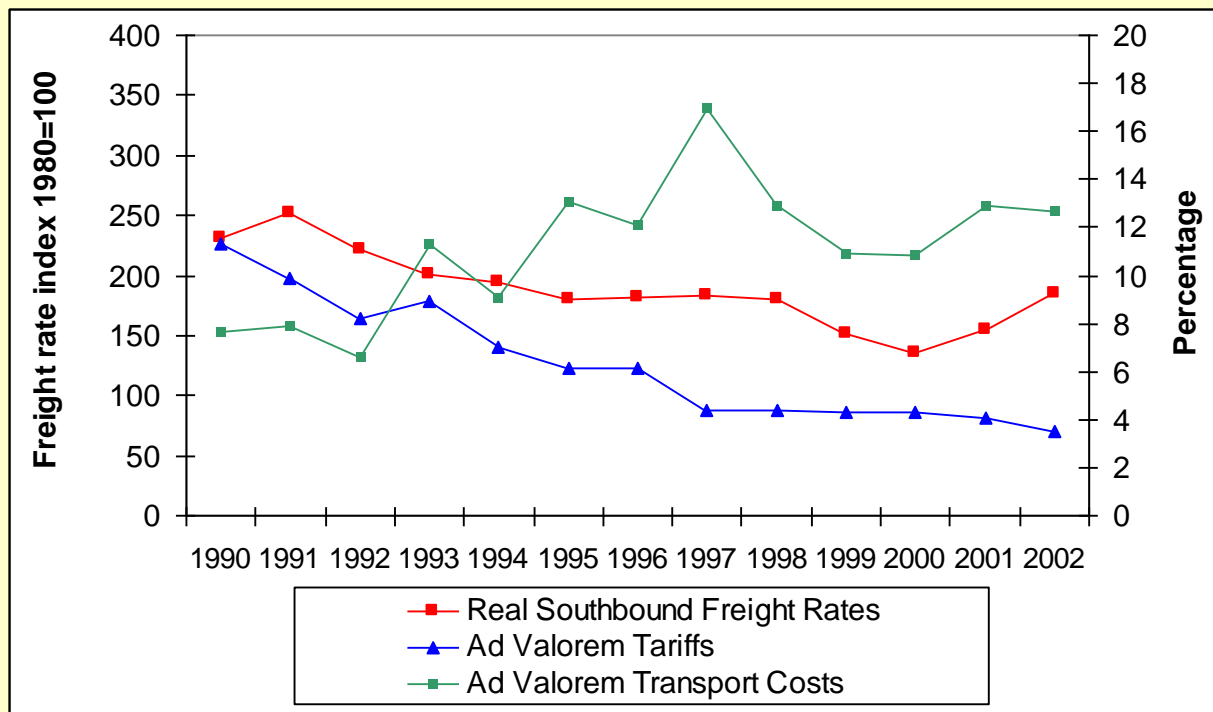
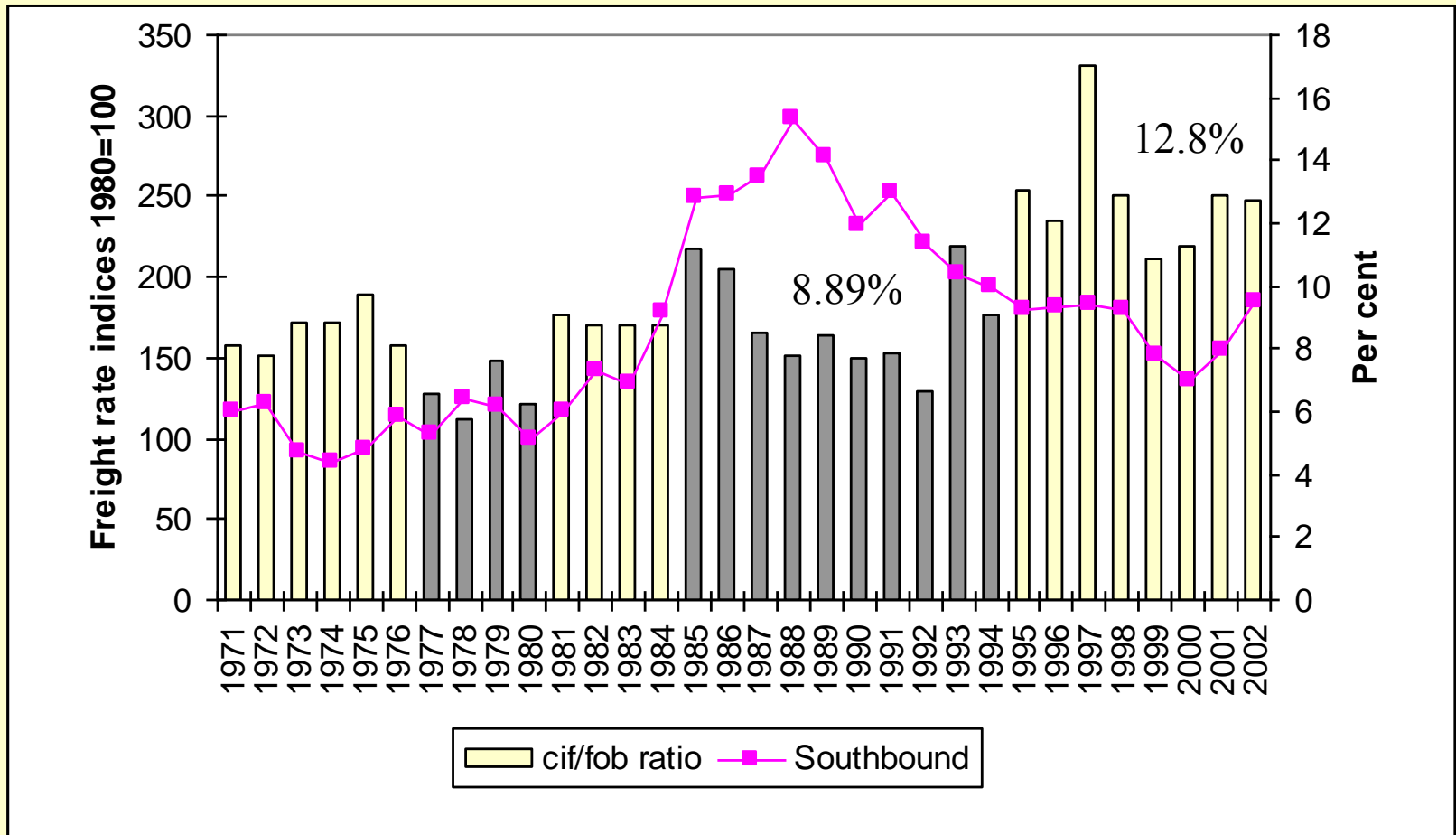


Figure 11:

- SA's *ad valorem* tariffs decreased from 11.3% in 1990 to 3.5% in 2002.
- SA's cif/fob ratios (*ad valorem* TC) had increased from 7.7% in 1990 to 12.7% in 2002, a rise of 65%. In contrast, real Europe-SA liner freight rates had declined by 20%.

FIGURE 8. SOUTH AFRICA'S CIF/FOB RATIO AND EUROPE-SOUTH AFRICA LINER FREIGHT RATES (1971-2002)



Source: Chasomeris, 2005b: 141.



- South Africa's cif/fob ratios are composite indicators that are determined by changes in both the level of transportation costs and changes in the composition of imports.
 - high-value imports, like manufactured imports, will have very low cif/fob ratios
 - low-value agricultural/oil imports may have high ratios
 - If South Africa's recorded trade data were reliable, then South Africa's evolving composition of imports should have a substantial and significant effect on the country's cif/fob ratios
 - SA's trade data are not reliable...



- South Africa's *ad valorem* transportation costs implied by IMF cif/fob ratios are significantly different from the explicitly collected data on SA's direct shipping costs.
- 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, SA's inaccurate trade data generate inaccurate and unreliable country cif/fob ratios that are neither able to show SA's actual *ad valorem* shipping costs nor direct costs of transportation.
- Researchers cannot and should not use the cif/fob ratio as a reliable indicator (proxy) for South Africa's direct shipping costs.



- If SA were included, potential investors may be confused as SA's mean cif/fob ratio was 8.87% for the period that included economic sanctions (1985-1993), significantly lower than the post-sanctions (1995-2002) mean of 12.9%.
- 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.

Conclusions (4)

- Researchers should be wary of substituting country cif/fob ratios for direct measures of international transport costs.
- 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
 - where possible, compared to other more direct indicators of international transport costs like ocean freight rates.