SOUTH AFRICA-US INTRA-INDUSTRY TRADE IN SERVICES

By

MOSES MUSE SICHEI

Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

PhD (ECONOMICS)

in the

Faculty of Economic and Management Sciences

at the

University of Pretoria

PRETORIA AUGUST 2005

ACKNOWLEDGEMENTS

In conceptualising and executing this study, I owe profound debt to a number of people and institutions. I cannot mention them all except those most immediately related to the study.

I gratefully acknowledge the contribution, support and commitment of my two promoters: Professor Chris Harmse from economics department and Dr.Frans Kanfer from statistics department. Both showed great enthusiasm and flexibility and offered inspiration and priceless insights during the process, from which the end product has benefited greatly.

Financial support from the African Economic Research Consortium (AERC) is greatly acknowledged as it played a significant role in ensuring that the research progressed smoothly.

A special tribute to my wife Anne for her support, encouragement and playing both roles of a mother and father to our two children (Purity and Kip). Thanks to my two children for persevering with an "absentee" father.

Furthermore, I would like to thank all my contemporary colleagues, notably Charles Abuka, from whom I benefited hugely from informal discussions, which generated immense insights.

Last, but not least, the lord was my shepherd and source of wisdom. He led me through the storms of emotions and sleepless nights as I laboured to correct errors in my SAS bootstrap codes.

Moses Muse Sichei

SUMMARY

SOUTH AFRICA-US INTRA-INDUSTRY TRADE IN SERVICES

by

MOSES MUSE SICHEI

PROMOTER: **PROF.CHRIS HARMSE**

CO-PROMOTER: **DR.FRANS KANFER**

DEPARTMENT: **ECONOMICS**

DEGREE: **PHD (ECONOMICS)**

The steady growth of services sector's contribution to national output (GDP) and employment is a characteristic feature of most modern economies. The increase in the contribution of services is attributed to revolution in information communication technology (ICT) and liberalisation under the General Agreement on Trade in Services (GATS) since 1994. Despite its dominance in economic growth and job creation, services account for less than a quarter of total trade in South Africa and the US due to its limited tradability and unrecorded transactions.

The enhanced internationalisation of services has two opposite economic welfare implications for South Africa. On one hand, the increase generates standard comparative advantage gains (specialisation and exchange) and non-comparative advantage gains (pro-competitive, exploitation of economies of scale, increased variety and lower factor market adjustment costs). Additionally, proper phasing in of liberalisation of trade for services could be consistent and complementary to sustainable development in the context of the Doha Development Agenda (DDA). On the other hand, the increased tradability may lead to higher factor market adjustment costs along the lines of Stolper-Samuelson theorem or vertical differentiation model of Flam and Helpman (1987). The negative effects of internationalisation of services are the causes of the anti-globalisation

sentiments in the world (Bhagwati, 2004, Salvatore, 2004a and 2004b) and South Africa (mainly by the confederation of South African trade unions, COSATU).

However, to understand the benefits and costs of South Africa's trade in services with the US (South Africa's leading exports destination of services in the OECD countries) calls for a need to disentangle inter-industry and intra-industry trade (IIT) flows since they have different causes and consequences. This is, however, frustrated by lack of appropriate data.

It is against this background that the study addresses two key issues about South Africa-US IIT in services. Firstly, what are the determinants of South Africa-US IIT in selected services during the period 1994-2002? Secondly, when trade expands/contracts, is factor adjustment lower in an environment characterised by IIT (Smooth Adjustment Hypothesis)? In answering these questions, other complementary issues are dealt with: the structure and trends of South Africa-US trade in selected services as well as nonparametric measures of barriers to trade in services for South Africa and the US.

Utilising both descriptive and bootstrapped panel data econometric analysis, a number of conclusions emerge from the study. Firstly, using the GATS commitment schedules in 1994, 1995, 1997 and 1998 and WTO trade policy reviews, South Africa has higher trade barriers in most services especially telecommunications and banking than the US. This is typical of low and middle-income economies.

Secondly, the study shows that South Africa-US IIT in selected services is determined by factors similar (except economic distance) to those identified in other "North-South" IIT studies. Specifically, it is determined by economic distance proxied by differences in per capita income, differences in market size, FDI by American companies in South Africa, service and time-specific effects. Additionally the study remotely suggests horizontal intra-industry trade (HIIT). This finding is inconsistent with the other "North-South" IIT on goods studies, which show vertic al (quality) differentiated intra-industry trade (VIIT) as the dominant form of trade.

Thirdly, the study shows that marginal intra-industry trade (MIIT) is low for most services. Given the consistency of the results with the CHO model of HIIT, the low MIIT implies potentially high trade-induced labour market adjustment costs.

There are a number of policy implications that emerge from the study. Firstly, there is an urgent need for Statistics South Africa (STATSSA) and South African Reserve Bank (SARB) to adopt the current manual on statistics of international trade in Services (MSITS) with a view to providing a comprehensive database for trade analysis as well as form a basis for identifying priority areas and strategies in future services trade negotiations.

Secondly, the fact that there is a significant negative relationship between IIT and per capita income difference (economic distance) means that South Africa-US IIT in services is inimical to intra-industry specialisation and trade in homogenous and horizontally differentiated services. South Africa should therefore view the services component of the SACU-US FTA with caution and use trade and industrial policy strategically to fashion the location of production in Southern Africa in the hope of deriving future scale advantages in services.

Thirdly, the study shows that there is a positive relationship between FDI and IIT implying that US multinationals in South Africa play a complementary rather than a supplementary role. Thus there is need for an intensification of initiatives to promote investment from the US e.g. the American Chamber of Commerce in South Africa (AMCHAM).

Finally, the low MIIT calls for the need for the government to cushion the adverse effects of South Africa-US trade in services. These include, among others, programs that assist on guidance in job searching and retraining of retrenched employees. Additionally, South Africa's trade negotiators could treat the MIIT indices as guesstimates of the extent of trade disruption in the services sector and use them in negotiating for market access and national treatment concessions from the US during future services trade negotiations.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

Acronym	Meaning
AU	African Union
BEA	United States of America Bureau for Economic Analysis
BMP5	IMF Balance of Payment Manual, fifth edition (1993)
Cell C	Cell C (Pty) Ltd, South Africa, licensed on 25th June 2001
COSATU	Confederation of South African Trade Unions
CPC	The United Nations Central Product Classification
DDA	Doha Development Agenda, signed in 2001
DGP	Data generating process
DTI	Department of Trade and Industry, South Africa
EDF	Empirical Distribution Function
E-commerce	Electronic commerce
Email	Electronic mail
et al.	et alii, which means and others
EU	European Union
FDI	Foreign direct investments
FCC	The Federal Communications Commission, US
FBSEA	Foreign Bank Supervision Enhancement Act of 1991, US
FPE	Factor price equalisation
FRB	Federal Reserve Board, US
FTA	Free Trade Agreement
GATS	General Agreement on Trade in Services
GDP	Gross domestic product
GL	Grubel and Lloyd (1975) intra-industry trade index
GLM	General linear model
HCCME	Heteroscedasticity consistent covariance matrix estimator
HIIT	Horizontally differentiated intra-industry trade (trade in Varieties)

HK	Hamilton and Kniest (1991) marginal intra-industry trade index
HOS	Heckscher-Ohlin-Samuelson model
HOV	Heckscher-Ohlin-Vanek model
HS	Harmonised Commodity Description and Coding System
ICASA	Independent Communications Authority of South Africa
ICT	Information communication technology
IE	Integrated equilibrium
IIT	Intra-industry trade
IMF	International Monetary Fund
ISIC	International standard industrial classification
LSDV	Least squares dummy variable estimation
MA	Market access
MIIT	Marginal intra-industry trade
MFN	Most favoured nation principle of the WTO
Mode 1	Supply of services through cross-border trade
Mode 2	Supply of services through consumption abroad
Mode 3	Supply of services through commercial presence (FDI)
Mode 4	Supply of services through presence of natural persons
MSITS	Manual on Statistics of International Trade in Services, 2002
MTN	Mobile Telephone Networks (Pty) Ltd, South Africa
NEPAD	New Partnership for Africa's Development
NT	National treatment
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PDF	Population Distribution Function
R & D	Research and Development
SA	South Africa
SAA	South African Airways
SACU	Southern African Customs Union
SAH	Smooth Adjustment Hypothesis

SARB	South African Reserve Bank
SEC	Securities Exchange Commission, US
SNA	System of National Accounts, 1993
STATSSA	Statistics South Africa
SITC	Standard international trade classification
TPR	Trade Policy Review by the WTO
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
US	United States of America
VANS	Value-Added-Network Service
VIIT	Vertically differentiated intra-industry trade (trade in quality)
VodaCom	VodaCom (Pty) Ltd, South Africa
WITHIN	Panel model using demeaned variables
WTO	World Trade Organisation

CHAPTER 1

INTRODUCTION

Hitherto, all empirical studies and analyses of intra-industry trade have been confined to trade in goods…. Yet, for the purpose of analysis of trade flows and their effects on the allocation of resources and the welfare of national residents, there is no reason to separate trade in goods from trade in services.
(Lee and Lloyd, 2002: 159)

1.1 INTRODUCTION

This chapter introduces different aspects of intra-industry trade (IIT) in services with particular reference to South Africa-US trade in services. The chapter is organized as follows. Section 1.2 briefly explains the emergence of services as the key sector in the globalising world. Section 1.3 defines services as opposed to goods. It also provides two definitions of international trade in services. The contribution of services to national output (GDP), employment and international trade is dealt with in Section 1.4. Section 1.5 presents a statement of the research problem that resonates throughout the study. Section 1.6 presents two main hypotheses of the study. Justification and objectives of the study are presented in Sections 1.7 and 1.8, respectively. Section 1.9 deals with research methodology while Section 1.10 focuses on the scope of the study. Section 1.11 presents the conclusions from this chapter while the last section highlights the outline of the study.

1.2 THE MOVE TOWARDS A "SERVICE-DORMINATED ECONOMY" AND INTRA-INDUSTRY TRADE

The services sector has witnessed a steady growth worldwide, generating more than half of gross domestic product and jobs, and although at a much lower level, is increasingly traded internationally. Indeed, according to United Nations Conference on Trade and Development (2004b), foreign direct investment (FDI) worldwide is increasingly shifting towards services.

Wong, Wu and Zhang (2001:1), Linders (2001:38-45) and Salvatore (2004a, 2004b) identify three reasons for the increase. Firstly, revolution in information communications technology (ICT) has increased the tradability (storability and transportability) of services and created new services such as Internet-based electronic commerce (e-commerce). Secondly, more services sectors continue to be liberalised through multilateral trade negotiations under the General Agreement on Trade in Services (GATS). According to Bowen, Hollander and Viaene (1998:67), the GATS encompass the most-favoured nation (MFN) and national treatment (NT) principles of the WTO with a few exceptions. GATS forbids, some market access (MA) restrictions such as limitations on the number of suppliers, total quantity of output service, value of transactions or assets, number of natural persons that may be employed, type of legal entity and the share of equity ownership of a foreign investor. Thirdly, services have become crucial to co-ordinate production process by creating and absorbing new innovations and increasing benefit extraction capacity in production and consumption. This has facilitated the global trend of fragmentation of production process.

Despite its dominance in GDP and employment, services account for less than a quarter of South Africa's total trade due to two factors. Firstly, most services are still non-tradable due to higher transaction costs that emanate from their unique characteristics of non-storability and perverse restrictions on MA and NT still maintained by many WTO members. Secondly, service trade data are generally understated due to inconsistencies in definition and many transactions, which are unrecorded. However, the revolution in ICT

and the multilateral trade negotiations underway are likely to increase the tradability of services over time.

The increase in the contribution of services to the national economy and, in particular, international trade, has two contradictory economic welfare implications for South Africa. On one hand, the increase in tradability of services, c*eteris paribus*, leads to gains from trade emanating from different sources. Firstly, there are comparative advantage gains that result from specialisation and exchange of services between nations. These are the standard goods-based comparative advantage gains highlighted in Markusen, Melvin, Kaempfer and Maskus (1995: 61-68). Secondly, there are non-comparative advantage gains from trade associated with new trade theories such as pro-competitive gains, exploitation of scale economies, increased service or input diversity instead of lower average costs for a fixed range of services. Thirdly, as initially pointed out by Balassa (1966), there could be lower factor market adjustment costs when factors of production move "within" instead of "between" sectors (i.e. smooth adjustment hypothesis or "non-disruptive trade growth"). Fourthly, liberalisation of trade in services is consistent and complementary to sustainable development in the context of the Doha Development Agenda (World Trade Organisation, 2001a, 2004). Finally, services are important components of trade facilitation[1] and international fragmentation of production (Deardoff, 2000).

On the other hand, the increased tradability/liberalisation of services has wider negative economic repercussions. Increased inter-industry tradability of services leads to reallocation of resources between industries, which may be detrimental to the factor of production engaged in services industries largely contested by imports along the lines of Stolper-Samuelson theorem (Markusen *et al.,* 1995: 116-118). This is "disruptive trade growth". Additionally, liberalisation that allows unrestricted access of Americans to some services (e.g. education and medical services) may inhibit attainment of some development objectives in South Africa, particularly when these services are subsidised.

[1] This is one of the controversial "Singapore issues" (World Trade Organisation, 1996a) agreed upon in the July 2004 post-Cancún agreement package (World Trade Organisation, 2004).

The separation of positive from negative welfare implications of trade in services calls for a need to disentangle inter-industry trade from IIT since they have different causes and consequences. Inter-industry trade is the export of services from one industry in exchange for services from a different industry and traditionally associated with the comparative advantage gains from trade. IIT is the two-way exchanges of services that belong to the same industry (Grubel and Lloyd, 1975) and mainly associated with non-comparative advantage gains from trade. IIT has become an important component of trade since the 1960s and Krugman and Obstfeld (2003) point out that it consists of about one-fourth of world trade.

Originally, the empirical evidence of the phenomenon of IIT by Verdoon (1960), Balassa (1966) and Grubel (1967) was understood as an invalidation of traditional theories of international trade based on Ricardo's comparative advantage. This spawned a lot of theoretical and empirical literature focussed on four (related) questions. Firstly, what are the determinants of IIT? Secondly, are the gains from trade different from those associated with Heckscher-Ohlin-Samuelson (HOS) model? Thirdly, with IIT should the thinking regarding the impact of intervention in markets dominated by trade in differentiated products/services be changed? Finally, when trade expands, is factor adjustment smoother in an environment characterised by IIT as compared to inter-industry trade?

Lee and Lloyd (2002:159) note that studies on IIT have concentrated on merchandise trade and contend that this approach is not appropriate since for a comprehensive analysis of the effects of trade flows on allocation of resources and welfare of national residents, trade in services should be included.

1.3 SERVICES

1.3.1 The definition and characteristics of services

Hill (1977:318) defined a service as "…a change in the condition of a person, or of a good belonging to some economic unit, which is brought about by the activity of some other economic unit, with the prior agreement of the former person or economic unit". This definition emanates from the specific nature of a service, traditionally considered to be non-storable and intangible. The non-storability means that a service has to be consumed at the same time as it is produced.

Bhagwati (1987) added two features to Hill's definition: services do not always require the movement of consumers or producers (as with tele-medicine) and that some services may be embodied in a good (e.g. music downloaded from Internet to compact disk), which can make it difficult to distinguish between goods and services.

Welsum (2003) points out that some non-storable services can be transported. A case in point is power generation, where production can take place in a different location from consumption. Additionally, Hill's non-storability definition of a service is also questionable for example in insurance or consultancy services where the consumption of certain aspect of the service may be spread over time. Welsum (2003) further suggests that owing to reputation, there is an incentive to go to other countries to maximise rents from proprietary service increases and thus an increase in FDI. This is further bolstered by the need for interaction between the service provider and the consumer, especially in the face of asymmetric information. The use of reputation may also be a barrier to entry for new firms, thus highlighting the likeliness of imperfect competition in services industries.

The new manual on statistics of international trade in services (United Nations, 2002:7) argues that the term "services" refers to a wide range of intangible products and activities that cannot be easily captured by a single definition. Moreover, it recognises, like the

International Monetary Fund (1993), that many services are bundled to goods, which make it difficult to identify them.

The United Nations system of national accounts (SNA) (the United Nations, 1993) defines services as a group of industries, generally qualified as services, that produce outputs, which have many characteristics of goods, i.e. those concerned with provision, storage, communication and dissemination of information, advice and entertainment; the production of general or specialised information, news, consultancy reports, computer programs, movies, music etc. The outputs of these industries over which ownership rights may be established are stored on physical objects such as paper, tapes, disks, etc-that can be traded like physical goods.

The SNA defined in the United Nations (1993) is translated to data as follows. Service industries or activities are classified under section G through Q of ISIC revision 3 (United Nations, 1990). The products or outputs of the service industries are classified from sections 5 through 9 of the United Nations Central Product Classification version 1.0 (United Nations, 1997).

Stern and Hoekman (1987) and Sampson and Snape (1985) distinguish between four different types of services. Firstly, separated services, where neither the consumer nor the producer needs to move. Examples include services embodied in goods (e.g. floppy disks, music CD) or services traded electronically. Secondly, demander-located services, where the producer moves to the consumer for example certain types of consultancy services. Thirdly, provider-located services, where the consumer moves to the producer for example education, tourism etc. Finally, footloose or non-separated services where both the producer and consumer move[2] to a third country. For example entertainment services such as the Olympic games.

Having defined services, the next issue is definitions of international trade in services.

[2] This was not recognized by GATS' definition of services and it is possible to label it as "mode 5".

1.3.2 Definition of international trade in services

Lee and Lloyd (2002: 160) point out that defining international trade in services is inherently troublesome. They argue that there are broadly two definitions for international trade in services. The first definition is attributed the International Monetary Fund's balance of payments manual known as "BMP5' (International Monetary Fund, 1993). BMP5 defines services as economic flows that take place between residents and non-residents of an economy. This corresponds to the concept of trade in services in "the rest of the world" account in the SNA (United Nations, 1993).

The second definition is given in the GATS. GATS Article 1(in World Trade Organisation, 2002:286-287) defines trade in service using four modes of supply. Firstly, cross-border supply (mode 1), which takes place when both the consumer and the supplier remain in their respective home territories while the service crosses national borders. Service delivery could take place through telephone, Internet, mail etc. Examples of this mode include freight transport services, correspondence courses, and tele-diagnostics in medicine. Secondly, consumption abroad (mode 2), which takes place when a consumer moves outside his or her home territory and consumes a service in another country. Examples include medical treatment of non-resident persons, language courses taken abroad, tourist activities, ship repairs abroad etc. Thirdly, commercial presence (mode 3), which occurs when a supplier establishes commercial presence abroad with a view to ensuring close contact with the consumer in his or her home territory at the various stages of production, during and after delivery. Examples include medical services provided by a foreign owned hospital, courses in foreign owned schools, services supplied by a domestic branch or subsidiary of a foreign bank etc. Finally, presence of natural persons (mode 4), occurs when an individual supplier moves temporarily into a territory of the consumer to provide a service, whether on his or her own behalf or on behalf of his or her employer. It covers two groups of natural persons: self-employed and employees. Examples include financial auditing services by an auditor sent by a foreign firm or provision of entertainment services of self-employed professional foreign entertainer who is temporarily on a tour in the host economy.

Presence of natural persons covers only non-permanent employment in the country of the consumer. However, GATS provides no definition of non-permanent employment.

Lee and Lloyd (2002: 161) argue that most trade economists currently think in terms of GATS modes of supply. However, no statistics of services trade by GATS modes is available in most countries since BMP5 is still the basis of data collection.

1.4 BACKROUND INFORMATION ON SERVICES IN SOUTH AFRICA

1.4.1 Contribution of services sector to GDP and employment in South Africa

Services sector plays an important role in South Africa's economy. Its contribution to GDP rose from 50 per cent in 1990 to 58 per cent in 2002(Table 1.1). During the same period the contribution of services to GDP in the US, the leading producer and exporter of services, rose from 70 per cent in 1990 to 79 per cent in 2002(Table 1.1). According to Maurer and Chauvet (2002:235), the contribution of services sector to GDP ranges from 38 per cent in low-income countries to more than 65 per cent in high-income countries. Similarly, its contribution to employment in South Africa rose from 56 per cent in 1990 to 64 per cent by 2002. This means that services have become increasingly crucial in the modern production systems and that South Africa is catching up with the US in embracing the modern service-dominated economy.

1.4.2 Contribution of services to total trade

The share of service trade in international transactions lags behind the contribution of services in the structure of production and employment in South Africa and the US. This is not surprising given the fact that services are not easily traded due to high transaction costs as well as the fact that a significant proportion of services trade is unrecorded.

Table 1.1 shows that in South Africa, imports of services contribute more to total imports trade (merchandise and services) with the rest of the world than exports. This means that

South Africa has higher import dependence in services than the US. Moreover, while the share of exports of service to total trade increased marginally during the period 1990-2003, its contribution to imports has declined. This is not surprising given the fact that South Africa's new political dispensation in 1994 and subsequent liberalisation of the economy opened more opportunities for trade in services.

A number of features emerge from Table 1.2. Firstly, the Organisation for economic co-operation and development (OECD) countries are the main trading partners for South Africa in services. In 2002, South Africa's services exports to the OECD countries as a percentage of services exports to the rest of the world was 63.8 per cent, which implies that 36.2 per cent of the trade is with non-OECD countries mainly in Africa, South America, Europe, Asia and Oceania. Similarly, South Africa's imports from OECD countries contributed 75.3 per cent of total imports trade in services with the rest of the world.

Secondly, South Africa's exports of commercial services to the US as a percentage of total services exports to the rest of the world rose from 6 per cent in 1992 to 18 per cent in 2001 but declined to 12.8 per cent by 2003. The contribution of South Africa's services imports from the US followed the same trend as exports. It rose from 11.5 per cent in 1992, peaking at 24.5 per cent in 2001 but declined substantially to 16 per cent in 2003.

1.4.3 The choice of the US

The study focuses on South Africa-US IIT in services. The choice of the US is motivated by three factors. Firstly, the US is the leading producer and exporter of services in the world (World Trade Organisation, 1996b: 168) and South Africa's leading exports destination of services to the OECD countries[3] (Table 1.3). Secondly, bilateral international trade in services data at sectoral level is available for the US (from the US Bureau of Economic Analysis, thereafter BEA). Finally, discussions are underway for a

[3] The totals in Tables 1.2 and 1.3 differ due to the different sources of data.

Free Trade Agreement (FTA) between the US and the SACU. Therefore the study may complement other research (such as Hodge and Nordas, 2001, Walley and Keith, 2003) in informing the services component of the SACU-US FTA negotiations.

1.4.4 Employment in services sector

Figure 1.1 shows percentage change in employment for various skill categories in South Africa's services sector over the period 1990 to 2003. It is apparent that semi-and unskilled labour category has shed jobs or generated modest growth in employment. At the same time the skilled and highly skilled recorded an increase in employment in most years.

These developments raise questions as to whether the loss in employment especially for the semi- and unskilled categories is attributed to lower IIT. Theoretically, high homogeneous and horizontally differentiated IIT in services entails lower labour market adjustment costs than inter-industry trade and vertically differentiated IIT. This is because the mobility of labour across firms and occupations is greater "within" industries than "between" industries or quality strata.

Table 1.1: Some indicators of South Africa and US trade in services

	1990	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Contribution of services sector to GDP in South Africa	50	55	55	55	56	57	58	59	60	60	59	58	N/A
Contribution of services sector to GDP in the US	70	72	72	72	73	73	73	75	75	76	77	79	N/A
Contribution of services sector to total employment in South Africa*	56	58	58	58	58	59	60	62	63	63	64	64	N/A
Contribution of services sector to total employment in the US	71	73	73	73	73	73	73	74	74	75	75		N/A
Contribution of services exports to total exports (merchandise and services) in South Africa	12	13	12	13	14	15	15	17	16	14	14	14	15
Contribution of services exports to total exports (merchandise and services) in the US	27	28	28	28	27	28	27	28	29	28	28	30	30
Contribution of services imports to total imports (merchandise and services) in South Africa	17	18	19	18	16	16	15	16	18	16	16	15	N/A
Contribution of services imports to total imports (merchandise and services) in the US	19	18	17	16	16	16	16	16	16	15	16	16	16

Source: Data from online UNCTAD Handbook of Statistics CD ROM 2004 (http://www.unctad.org)

Notes: * Computed Using data from Quantec Research (http://ts.easydata.co.za). N/A means the data not available as at the date of writing

Table 1.2: South Africa's total trade in services with the US, OECD and the rest of the World (nominal US $ millions)

	SA-US		SA-OECD		SA-Rest of the World			
	Exports	Imports	Exports	Imports	Exports		Imports	
Year	Commercial service		Total service		Total	Commercial	Total	Commercial
1992	202.00	462.00	N/A	N/A	3351.95	3310.78	4357.28	4201.75
1993	230.00	493.00	N/A	N/A	3276.00	3120.19	4705.78	4528.13
1994	294.00	624.00	N/A	N/A	3749.25	3555.46	5086.80	4886.33
1995	400.00	797.00	N/A	N/A	4618.69	4414.45	5970.73	5756.01
1996	543.00	842.00	N/A	N/A	5086.66	4847.90	5735.48	5508.01
1997	728.00	1003.00	N/A	N/A	5394.04	5209.91	6002.91	5809.21
1998	858.00	1068.00	N/A	N/A	5395.96	5212.94	5657.64	5464.97
1999	864.00	1317.00	3211.00	5100.00	5210.04	5040.80	5758.72	5580.64
2000	855.00	1425.00	3363.00	4595.00	5045.82	4888.32	5822.82	5656.98
2001	870.00	1304.00	2715.00	3989.00	4652.78	4535.44	5251.32	5127.76
2002	777.00	1183.00	2921.00	3945.00	4672.47	4577.21	5340.33	5240.13
2003	977.00	1188.00	N/A	N/A	6601.8	6414.44	7554.32	7347.99

Source: Different databases are used as follows; SA-US trade: US Bureau for Economic Analysis available from http://www.bea.gov/bea/di/1001serv/intlserv.htm
SA-OECD: Organisation for economic co-operation and development. 2004. Statistics on International Trade in Services: 1999/2000 to 2001/2002 available from http://www.oecd.org/dataoecd/56/35/1945964.xls
SA-Rest of the world: UNCTAD Handbook of Statistics CD ROM 2004 available from http://www.unctad.org.

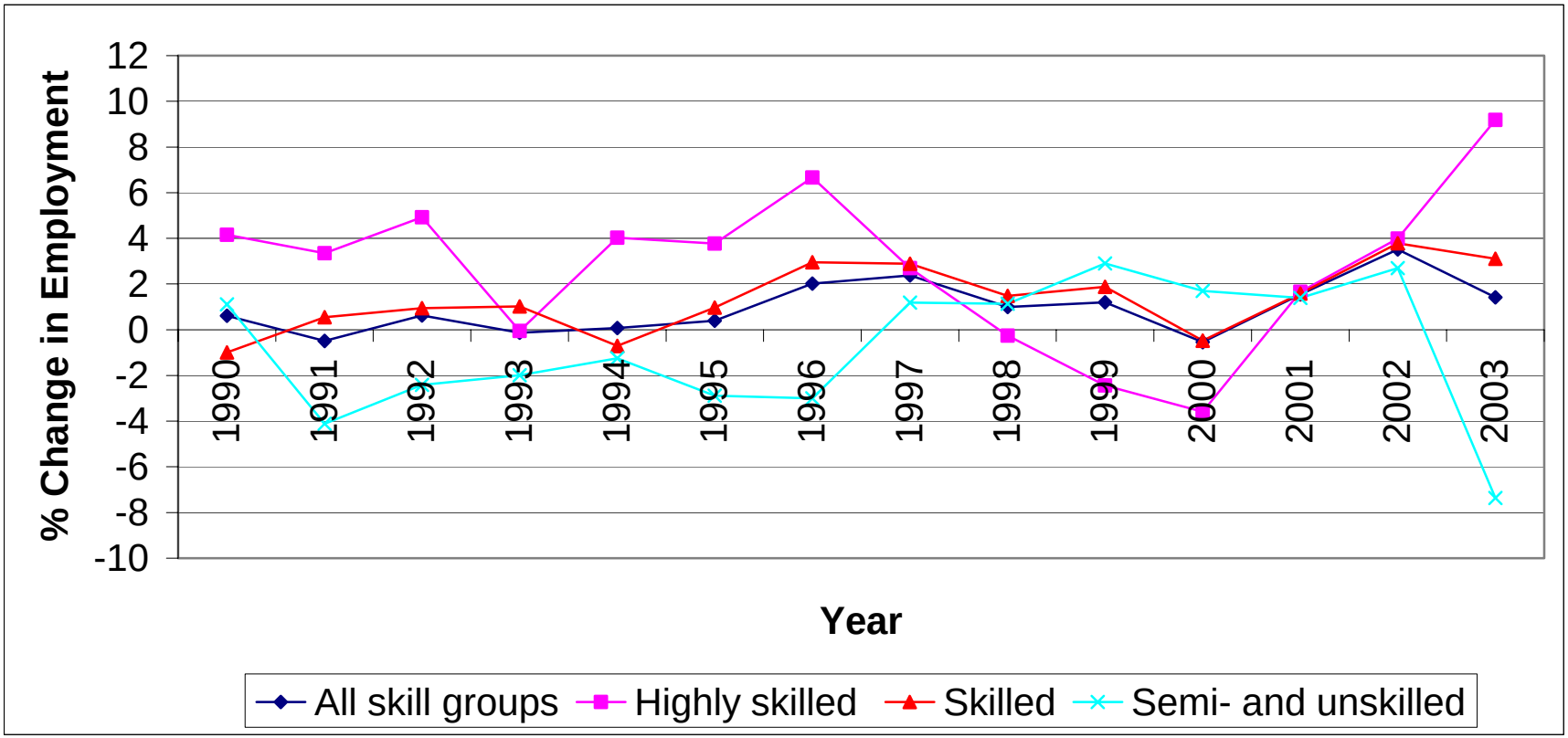
Notes: Commercial services exclude government services. N/A means data not available.

Table 1.3: South Africa-OECD trade in services (nominal US $ millions)

	Imports				Exports			
OECD countries	**1999**	**2000**	**2001**	**2002**	**1999**	**2000**	**2001**	**2002**
United States	***1323***	***1426***	***1288***	***1135***	***908***	***845***	***918***	***828***
United Kingdom	1778	1465	1530	1479	764	790	792	899
Germany	838	453	N/A	N/A	741	643	N/A	N/A
France	193	214	218	288	183	218	216	245
Japan	154	147	124	137	182	194	162	162
Italy	N/A	95	93	79	N/A	176	161	150
Netherlands	221	192	153	200	156	155	156	167
Belgium	N/A	N/A	N/A	65	N/A	N/A	N/A	134
Luxembourg	N/A	N/A	N/A	32	N/A	N/A	N/A	13
Australia	141	106	102	105	122	106	110	141
Canada	90	108	123	N/A	37	62	44	N/A
Austria	92	82	64	54	45	40	35	49
Portugal	41	40	31	39	28	26	22	26
Denmark	15	72	106	88	20	20	10	19
Czech Republic	N/A	1	1	1	N/A	3	5	6
Finland	0	0	0	0	2	3	3	3
Slovak Republic	N/A	0	0	N/A	N/A	2	2	N/A
Hungary	N/A	0	1	1	N/A	1	1	2
Sweden	N/A	32	26	57	N/A	36	23	22
Greece	N/A	N/A	13	35	N/A	N/A	13	18
Hong Kong, China	214	162	116	150	23	43	42	37
Ireland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Korea	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Norway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Spain	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total South Africa-OECD trade	**5100**	**4595**	**3989**	**3945**	**3211**	**3363**	**2715**	**2921**

Source: Organisation for Economic Co-operation and Development (OECD). 2004. Statistics on International Trade in Services: 1999/2000 to 2001/2002. http://www.oecd.org/dataoecd/56/35/1945964.xls.

Figure 1.1: Percentage change in South Africa's service sector employment in the period 1990-2003



Source: Data from Quantec Research http://ts.easydata.co.za

1.5 STATEMENT OF THE RESEARCH PROBLEM

The preceding sections have provided a basis upon which to conceptualise the research problem. Firstly, it was pointed out that the contribution of services to national output and employment has increased due to, among others, revolution in ICT. Secondly, despite its dominance in national output and employment, services account for less than a quarter of total trade in South Africa and the US due to non-tradability of most services and unreliable data. Thirdly, it was emphasized that the revolution in ICT and the multilateral trade negotiations underway are likely to increase the tradability of services in future.

Fourthly, the increase in the contribution of services has two opposite economic welfare implications for South Africa. On the positive front, the increase in tradability can lead to standard comparative advantage and non-comparative advantage gains from trade. On the negative front, the increased tradability may lead to reallocation of resources between industries, which may be quite disruptive to factors of production along the lines of Stolper-Samuelson theorem.

The disentanglement of the positive from negative economic welfare implications of South Africa-US trade in services calls for a need to separate inter-industry trade and IIT flows since they have different causes and consequences. Inter-industry trade is mainly associated with comparative advantage gains and "disruptive trade growth", while IIT is associated with non-comparative advantage gains coupled with "non-disruptive trade growth".

Since the phenomenon of IIT was identified in the 1960s, theoretical and empirical literature has focussed on four related questions: determinants of IIT; gains from trade characterised with IIT; impact of intervention in markets dominated by trade in differentiated products/services; smooth adjustment hypothesis. These are the same issues that are crucial in South Africa-US IIT in services.

However, the analysis is frustrated by lack of appropriate data. Services trade data from the South African Reserve Bank (SARB)[4] and the IMF Balance of Payments annual reports are compiled on the basis of the BMP5 (International Monetary Fund, 1993) and have a number of flaws. Firstly, the coverage and level of disaggregation makes the analysis based on this data subject to categorical aggregation. Secondly, the data are only available on nominal value basis (no volumes). Thirdly, the data is presented as South Africa with the "rest of the world", which means that it is impossible to determine how much South Africa exported to and imported from the US.

Although there is a more reliable database from the US Bureau of Economic Analysis (BEA) for the period 1992 to 2003, it has some flaws. Firstly, there is the problem of deflating this trade flows due to lack of service sector deflators. Secondly, the industrial classification used by BEA does not fully agree with the industrial classification used by Statistics South Africa (STATSSA), which makes it difficult to use South Africa's national accounts data to explain IIT as well as in testing the SAH. Additionally, trade in services (exports and imports) with the US contributes about 29 per cent of South Africa's total trade in services with the OECD countries and may not explain much of the dynamics of employment in the latter. This makes it impossible to rigorously test the SAH.

It is against this background that the thesis focuses on the causes and the labour market adjustment consequences of South Africa-US IIT in selected services. This research issue is broken into the following questions;

(a) What is the structure and trend of South Africa-US IIT in services?
(b) What are the existing barriers to South Africa-US IIT in services?
(c) What are the determinants of South Africa-US IIT in services?
(d) Does South Africa-US IIT in services entail lower labour market adjustments costs in terms of job losses?

[4] Data presented in SARB Quarterly Bulletins as well as online data at http://www.resbank.co.za .

1.6 HYPOTHESES OF THE STUDY

Since the study focuses on the causes and the labour market adjustments consequences of South Africa-US IIT in services, there are two main hypotheses.

***Hypothesis* 1**: South Africa-US IIT in services is consistent with the theoretical IIT models. Specifically it is determined by "country-specific" and "industry-specific" factors. This broad hypothesis can be broken down into the following propositions;

Proposition 1: There is either a negative or positive relationship between the differences in per capita income and the odds ratio of IIT in services.

Proposition 2: The differential between South Africa and US market sizes in the specific service is negatively related to the odds ratio of IIT in services.

Proposition 3:A depreciation of the South African rand relative to the US dollar increases the odds ratio of IIT in services

Proposition 4: The economic freedom in South Africa and the US is positively correlated to the odds ratio of IIT in services

Proposition 5: Barriers to trade on modes 1, 3 and 4 in the US and on mode 2 in South Africa is negatively related to the odds ratio of IIT in services

Proposition6: The US FDI in South Africa has a negative relationship with the odds ratio of IIT in unaffiliated services.

Hypothesis 2: In accordance with the smooth adjustment hypothesis (SAH), high marginal intra-industry trade in services leads to low labour-market adjustment costs (i.e. less job losses).

1.7 JUSTIFICATION OF THE STUDY

Services sector in South Africa has undergone significant structural changes in the last decade that have not only made it crucial in modern production systems but also

enhanced its international tradability. Currently, it is the leading contributor to GDP and employment creation.

These structural changes create opportunities and pose challenges for the South African economy. On one hand they generate comparative advantage and non-comparative advantage gains to trade. On the other hand, the structural changes present serious economic development problems in terms of shedding of labour in the lower cadres (semi and unskilled employees).

In the context of South Africa-US trade in services, one of the policy challenge faced by the department of trade and industry (DTI) is how to exploit the opportunities offered by the trade relationship while minimising the job losses associated with it. One solution to this quandary is to disentangle South Africa-US trade in services flows into IIT and inter-industry trade since they have different causes and consequences. The thesis follows this approach by separating South Africa-US trade in services flows into "genuine IIT" before attempting to find empirical determinants of the log-odds ratio of IIT. The labour market adjustment consequence issue is also addressed.

The study extends the frontiers of knowledge in IIT in services in a number of ways. Firstly, although there is currently no single model of IIT in services, the thesis adapts some of the models of IIT in goods to IIT in services. Secondly, nonparametric measures of trade barriers in services for South Africa and the US are constructed using a methodology developed by Hoekman (1995). Fourthly, the thesis highlights the uniqueness of mode 2 supply and its implication on the perverse mercantilist-like tendencies[5] in trade negotiations and trade policy. Fifthly, the thesis provides, for the first time, empirical determinants of South Africa-US IIT in selected services using panel data econometric techniques coupled with bootstrapping.

[5] The mercantilist view is that imports are bad while exports are good. In the context of services, negotiators assume that services are the same as merchandise. However, for mode 2 (consumption abroad), a country's restrictions inhibit its own exports of services to other countries.

Sixthly, the smooth adjustment hypothesis (SAH) in the services sector is addressed albeit at descriptive level due to data problems. Finally, policy recommendations are provided which are useful for future trade negotiations with the US, the leading producer and exporter of services in the World. For instance, notwithstanding the MFN principle of WTO, the measures of trade barriers, other determinants of trade and results from the SAH, may provide a basis for future trade negotiations. Moreover, the findings may inform pan African development initiatives such as New Partnerships for Africa's Development (NEPAD) when it comes to trade in services with the US.

1.8 OBJECTIVES OF THE RESEARCH

This thesis aims to achieve the following goals;

(a) Present the theoretical and empirical literature on IIT with an emphasis on services
(b) Provide a descriptive analysis of the structure and trends of South Africa-US IIT in services in the period 1992-2003.
(c) Construct measures of trade barriers in South Africa and US using the methodology developed by Hoekman (1995).
(d) Use the indices in (c) and other "country-specific" and "industry-specific" factors to estimate a model of the determinants of South Africa-US IIT in services
(e) Address the issue about the SAH in the services sector in South Africa
(f) Make policy recommendations

1.9 RESEARCH METHODOLOGY

Three layers of economic reasoning underpin the research methodology employed in the study: IIT in service trade issues, trade theory and data availability. In this regard, the analysis is conducted at two levels of statistical sophistication: descriptive analysis and econometric analysis using bootstrapping techniques.

Firstly, mirrored data from the BEA is sorted to identify "genuine IIT" using a methodology pioneered by Abd-el-Rahman (1991). IIT is a structural feature of trade in

a particular service sector if minority service flow is at least 12 per cent of the majority service flow. Descriptive analysis is done for the structure and trend of South Africa-US IIT in services during the period 1994-2003. A distinction between horizontally differentiated (variety) IIT and vertically differentiated (quality) IIT is not done due to lack of unit value data to proxy quality differences.

Secondly, in view of the perverse restrictions on market access and national treatment in services, non-parametric indices of these barriers is computed using a methodology developed by Hoekman (1995). This entails scoring GATS commitment schedules submitted by South Africa and the US to the WTO in 1994, 1995, 1997 and 1998 (World Trade Organisation, 1994b, 1994d, 1995a, 1995c, 1997a, 1997c, 1998a and 1998d). However, since the GATS commitment schedule is only a "wish list" submitted by a WTO member, a descriptive analysis of the "actual" restrictions reported in various trade policy reviews for South Africa and the US (World Trade Organisation, 1996b, 1998b, 1999, 2001b and 2003) is also done.

Thirdly, a dynamic panel data econometrics model for log odds of IIT containing the Hoekman indices, among other determinants, is specified. This is estimated within a general linear model (GLM) context and hypothesis 1 in Section 1.6 tested using two versions of bootstrapping that are robust to heteroscedasticity (pooled residuals and Davidson-Liu-Flachaire wild bootstrap).

Fourthly, issues relating to the SAH (hypothesis 2) in Section 1.6 are addressed using descriptive analysis of Brülart (1994) and Azhar and Elliot (2003) marginal intra-industry trade (MIIT) indices. A rigorous test of the SAH is not performed due to data limitations.

1.10 SCOPE OF THE STUDY

The study concentrated on two issues; the determinants of South Africa-US IIT in services and the role of IIT in labour market adjustment (Smooth Adjustment Hypothesis). Although the SAH could be addressed more appropriately by focusing on all the trading partners of South Africa, the lack of data for these countries makes such an analysis difficult. Nonetheless, the US is the leading importer of South Africa's services (Table 1.3). The study covers the period 1994-2003.

1.11 CONCLUSION

The purpose of the study is to understand South Africa-US IIT in services. This is motivated by three factors. Firstly, the high and increasing contribution of services sector to GDP and employment in South Africa has risen substantially in the last decade. This has implications on trade, especially with the US, the leading producer and exporter of services in the world. Secondly, it is widely accepted that with trade dominated by IIT, there exist additional potential gains from trade in terms of increased variety, exchange of economies of scale and pro-competitive gains. Thirdly, when trade is dominated by homogeneous services and HIIT, changes in trade flows will entail lower factor market adjustment as compared to inter-industry trade and VIIT. This emanates from the fact that IIT entails movement of factors of production "within" industries as opposed to "between" industries in inter-industry trade or "between" different qualities in the case of VIIT.

The thesis attempts to address these issues using descriptive analysis and panel data econometrics techniques in a GLM context. The hypothesis testing is done using bootstrapping methodology as opposed to the classical approach. The study is instructive in that it provides empirical analysis of South Africa-US IIT in services in terms of determinants and consequences. The study does not cover all the aspects of South Africa-US IIT in services due to data limitations. The empirical results of this study are instructive in South Africa's trade and industrial policy as well as future trade

negotiations in services with the US. The study is also relevant for pan-African development initiatives such as NEPAD.

1.12 OUTLINE OF THE STUDY

The rest of the thesis is organised as follows. Chapter 2 deals with an overview of the literature on IIT with special emphasis on services.

Chapter 3 describes the structure and trends in South Africa-US IIT in selected services. The emphasis here lies on the revealed evidence of IIT in services.

Chapter 4 deals with measures of barriers to trade in services for South Africa and the US. The liberalisation of trade in services, which has been initiated under the GATS framework, can be an auxiliary cause for further internationalisation of services.

Chapter 5 focuses on the empirical estimation of the determinants of South Africa-US IIT in selected services over the period 1994-2002 using GLM coupled with two versions of nonparametric bootstrapping.

Chapter 6 attempts to answer the question whether changes in South Africa-US IIT entail lower labour market adjustment costs in terms of job losses or not.

The main insights of the thesis are summarised in the last chapter with some concluding remarks on policy recommendations and possible areas for future research.

In each chapter, a research question is provided in the introduction to structure the analysis. The question may be either theoretical or empirical.

CHAPTER 2

FUNDAMENTAL LITERATURE ON INTRA-INDUSTRY TRADE

Only two empirical findings seem to have had a major impact on the way that economists think. The first was Leontief's (1953)…. The second major empirical finding was the extensive amount of "intra-industry" trade catalogued by Grubel and Lloyd (1975) of the importance of intra-industry trade

Edward E. Leamer (1992:5)

2.1 INTRODUCTION

This chapter highlights basic literature on IIT with special reference to international trade in services. The chapter surveys fundamental literature that informs the two research issues: determinants and the consequences of South Africa-US IIT in services.

The rest of the chapter is organised as follows. Section 2.2 provides a brief description of the unique characteristics of services and the link between these characteristics and the different modes of services (mode 1, mode 2, mode 3 and mode 4). Sections 2.3 through 2.6 address controversial issues in the literature on IIT highlighted in Lloyd (2002) and Greenaway and Milner (2003).

Section 2.3 addresses the specific horizontal intra-industry trade (HIIT) and vertical intra-industry trade (VIIT) models and implication to IIT. Section 2.4 deals with literature that attempt to incorporate IIT into the factor content of balanced trade. Specifically, the section analyses the standard Heckscher-Ohlin Vanek (HOV) model as well as the modified HOV model, with an assessment of the usefulness of these models to services.

Section 2.5 deals with aggregation issues at both theoretical as well as empirical levels. The key concern is how to map international trade statistics of exports and imports on to "industries" defined in an economically meaningful way. This entails an analysis of different aggregation approaches, relative factor intensity and industrial organisation definitions of an "industry".

Section 2.6 presents different measures of IIT with particular reference to static measures. The dynamic measures are dealt with in Chapter 6, where issues of trade-induced labour market adjustment costs are addressed. The chapter concludes with a summary of the main insights that emerge from the survey.

2.2 THE NATURE OF SERVICES AND ITS IMPLICATIONS ON IIT

2.2.1 The distinction between goods and services

Hill (1977:315) notes "the distinction between goods and services was emphasized by Adam Smith and regarded as a matter of great importance by classical economists". The neoclassical economists in the quest for internal consistency of their models argue that services can simply be considered as intangible products (Hill, 1977:315).
Hill (1977), Wong *et al.,* (2001:1) and Linders (2001:38-44) highlight some characteristics that are important when analysing services.

Firstly, services are intangible and transitory (non-storable or transportable). This emanates from the fact that a service is absorbed as it is produced implying that it is intangible and consequently non-storable. The fact that consumption and production of services take place simultaneously calls for service providers and consumers to be located near each other, either physically or through telecommunications networks. There are, however, some services that can be "embodied" in a physical object, like a computer diskette and videotape (IMF, 1993). In this case the non-separation condition does not hold since production and consumption can be separated.

The second characteristic is heterogeneity and high flexibility of production. The fact that services are intangible and non-storable increases the need for customisation. The close relationship between the producer and consumer implies that the latter is capable of providing immediate feedback to the former, who can continuously adjust quality of the service. Linders (2001:39) argues that the modern service economy capitalism, based on differentiation and customisation, is diametrically opposite of the industrial revolution whose credo was standardisation. The modern service economy is intertwined with services. Indeed, Salvatore (2004a: 421), opines that "…Globalisation is a revolution, which in scope and significance is comparable to industrial revolution, but while the industrial revolution took place over a century or so, the Globalisation revolution has taken place under our very eyes in one or two decades and is continuing unabated. We have globalisation in tastes, which is leading to products becoming more and more global in nature, and we have globalisation in production and labour markets, which is leading to increasing outsourcing of parts, components and services..."

Thirdly, services are characterised by imperfectly competitive market structure (monopolistic competition, oligopoly and monopoly). The actual market structure depends on the cost structure of a particular market. Technically induced economies of scale and scope are relatively unimportant in most services except for transport, telecommunications, commerce and some independent services such as entertainment and rental services.

Fourthly, markets in service sector are characterised by asymmetric information. Services are knowledge and experience-intensive. Many services are experienced goods similar to knowledge-based assets (Markusen *et al.,* 1995: 396-398) and once learned, a producer has an information advantage over consumers with respect to quality of the service and that of competitors. Imperfect information causes problems for the market mechanism because of the tendency for moral hazard, in which the quality of services change over time, and adverse selection in which low quality services drive out high quality services.

Melvin (1985) argues that services should be considered as a separate class of commodities with characteristics that distinguish them from what is generally thought of as a commodity. He suggests that services linked to goods and services should be disentangled.

2.2.2 Relationship between characteristics and the modes of supply used in international trade in services.

Sampson and Snape (1985) argue that services require close proximity between the producer and consumer. All services need joint production, but the mode of interaction differs substantially. Some services require physical proximity to achieve joint production (transport, surgery, construction etc.) while others do not require physical presence for joint production (consultancy services, data management, telecommunications, financial services etc.).

International trade in services can be classified on the basis of the constraints on physical location of the producer and consumer in realising the transaction. This classification was pioneered by Sampson and Snape (1985) and adopted in Article I of GATS (World Trade Organisation, 2002:286-287).

Firstly, there are service transactions, which do not involve the movement of both the consumer and the producer of the service. These services, like goods, are produced in one country and cross the borders of the importing and exporting countries. This is cross-border trade (i.e. mode 1 under GATS). Examples include consulting services, architectural designs handled through correspondence and produced in the exporting country, licensing, research and development, telecommunications and e-commerce. Sampson and Snape (1985:173) argue that this category is also called "separated" service since they are disembodied from both factors of production and consumers. Since they are separated, they may be incorporated into goods and identified uniquely as goods instead of services (floppy disks full of data, compact disk full of music, drawings of architectural plans of a bridge, etc.).

Secondly, there are service transactions for which the consumer travels across the borders to an immobile provider. GATS refer to this category as consumption abroad (mode 2). Examples include American patients temporarily moving to South Africa to be treated by a surgeon in Cape Town, South African tourists travelling to the Rocky Mountains in the US, South African students enrolling in full-time studies in an American university, American tourists move to South Africa to see the Table Mountains or Robben Islands in Cape Town. Sampson and Snape (1985) point out that, just as in "separated" services, there are still cases where the demarcation between goods and services is not clear. A case in point is a product send overseas for processing, which is then re-exported.

Thirdly, service transactions may entail permanent local establishment through a foreign affiliate (e.g. branches of multinational corporations in South Africa) of a firm originating from a different country. This is referred to as commercial presence (i.e. mode 3 under GATS). This is the dominant mode of international competition in service markets such as banking, insurance, legal services and consultancies.

Fourthly, service transactions may be supplied through temporary movement of natural persons while the consumer does not move. This is referred to as presence of natural persons (i.e. mode 4 under GATS). Examples include certain business services that send out consultancy teams, auditing teams and construction.

Finally, transactions may occur through movement of both factors of production and the consumer to a third country. Examples include, a South African patient meets with an American surgeon in a London hospital, an employee from Kenya Revenue Authority moves to Southern African Tax Institute (SATI)[6] to attend a course offered by a lecturer from Harvard University. Three countries will be transacting in this case, with the United Kingdom and South Africa selling the services of hospitals and education respectively. These service transactions, described in Sampson and Snape (1985:173), are not dealt with by GATS (World Trade Organisation, 2002: 286-287).

[6] Southern African Tax Institute is a pan African institution, based at the University of Pretoria, and offers training on various aspects of tax to government officials.

2.3 THE SPECIFIC HORIZONTAL AND VERTICALLY DIFFERENTIATED IIT MODELS

The traditional trade theory (HOS orthodoxy) takes it as a truism that countries trade in order to take advantage of their differences. The "new trade theory" admits that differences between countries is one reason for trade but differs with HOS in arguing that trade may result because of intrinsic advantages to specialisation (Krugman 1994:2). Thus, much trade (mainly for similar countries) represents specialization to take advantage of increasing returns than to capitalise on inherent differences between the countries.

The new trade theory models, based on industrial organisation, were developed towards the end of 1970s and in the early 1980s. The literature that incorporates industrial organisation has two main strands. The first branch is basically concerned with modelling the role of economies of scale as a source of trade. The introduction of economies of scale into the model requires that the impact of the increasing returns to scale on market structure be taken into account. However, as Krugman (1994) points out, in this literature, the approach has been to get the issue of market structure out of the way as soon as possible. This is done by assuming that markets are characterised by Chamberlinian monopolistic competition (the CHO model).

The second strand of literature views imperfect competition as the core of the story rather than an unavoidable nuisance. Thus models based on imperfect competition are constructed.

2.3.1 Horizontal differentiation

In "horizontal" product differentiation, there are two main approaches. The first is "love-of-variety" approach (Krugman, 1979 and Helpman, 1981) where all varieties of a product enter an individual's utility function symmetrically in a Dixit-Stiglitz (1977) framework. The second is "ideal-variety" approach attributed to Lancaster (1966, 1980),

which assumes that consumers do have preferences for an ideal variety and they demand goods not for their own sake but for the characteristics they possess.

2.3.1.1 Love-of-variety

Under this approach, it is assumed that there are commodities that individuals like to consume in many varieties, so that "variety" is valued in its own right. Helpman and Krugman (1985:116) argue that the "love-of-variety" may arise when for some products, an individual likes to have in many varieties. Thus a consumer may like to eat in a South African, Chinese, American and French restaurants, each time going to a different restaurant.

The main features of this approach can be illustrated by reference to Krugman (1979). The model borrows from the seminal works of Spence (1976), Dixit and Stiglitz (1977) where it is assumed that each country has only one industry, which produces a range of goods under increasing returns to scale. On the demand side, the model assumes that all consumers share the same utility function into which all goods enter symmetrically;

$$U = \sum_{i}^{n} v(c_i) \ , v' > 0 \text{ and } v'' < 0 \qquad (2.1)$$

Where c_i is the individual's consumption of variety i. This utility ensures that the individual's demand for variety determines all the trade between similar countries. It is assumed that the number of varieties, n, is very large, so that the cross-price elasticity is zero. The elasticity of demand facing an individual producer is;

$$\varepsilon_i = -\frac{v'(c_i)}{v''(c_i)c_i} \qquad (2.2)$$

Where $\frac{\partial \varepsilon_i}{\partial c_i} < 0$. Krugman (1980) introduced a different case where $v(c_i) = (c_i)^{\theta}$. In this case as n tends to infinity, the elasticity of demand is constant and equal to $\varepsilon_i = \frac{1}{1-\theta}$. This implies that a consumer is indifferent between any two varieties and also that there is no significant interaction between any two firms.

Dixit and Norman (1980), using a model incorporating two sectors, reached the same constant elasticity of substitution using a different utility function. On the supply side, Krugman (1979) assumed that there is only one factor of production (labour). He further assumed that the foreign country is identical to the domestic economy. Each consumer maximises;

$$U = \sum_{i}^{n} v(c_i) + \sum_{i=n+1}^{n+n^*} v(c_i) \qquad (2.3)$$

Where * denotes foreign country, with goods 1,2…n, being produced in the home country and goods n+1,…,n+n* being produced in the foreign country. Since every good enters the utility function symmetrically, welfare in both countries will increase because the number of varieties available to consumers increases to n+n*. Additionally, since the increase in market size implies larger economies of scale, there will be welfare gains in terms of lower unit costs.

In view of the fact that there are no incentives for firms to produce the same variety, each good will be produced in only one country. The model does not, however, determine which country produces which varieties.

When countries differ in size as in the case of US and South Africa, the larger country will produce more varieties. Thus South Africa will realize the larger gains from trade because the increase in the number of varieties available to her consumers will be larger than for the US.

2.3.1.2 The ideal-variety model

This model, based on the work of Lancaster (1966,1979, 1980), assumes that there is an ideal variety that consumers prefer[7]. The main difference between this approach and the "love-of-variety" approach is that, while in the latter all differentiated products enter the utility function symmetrically, the "ideal-variety" approach assumes asymmetry. Consumers perceive each product/service as having its own set of characteristics. A graduate program represents a bundle of characteristics such as instruction mode, type of specialisation, status in terms of ranking of universities etc., which will define its specification. Graduate programs that have the same characteristics (although in different proportions) will form a group of academic programs.

Product specifications are assumed to vary in a continuous manner. This can be presented either as a line (Lancaster 1979) or a circle (Helpman, 1981). The representation by Helpman (1981) assumes that there is a continuum of types of products and that there is a one-to-one correspondence between these types and points on a circumference of a variety specification circle. A point on the circle represents a product of a particular type. Individuals are perceived to have preferences (which are assumed uniform among consumers) over a certain specification rather than over a collection of goods. These characteristics are non-combinable, that is, consumers cannot obtain a certain specification by combining two or more goods. Each individual will have a "most-preferred good" or "ideal-product" in the circle. This means that in a given economy, different consumers will have different most-preferred varieties or ideal variety specifications. It is assumed for simplicity that there is uniform density of consumers over the spectrum so that the same aggregate demand exists for every variety.

When the number of varieties produced is less than the number demanded, some consumers will be able to consume their ideal varieties while others will be forced either to consume a variety which is not ideal or not to consume the product at all. If the consumer has to settle for a variety, which is not his/her ideal, the price he/she is willing

[7] A good example is a consumer who prefers a haircut from a specific salon.

to pay for that variety (for a given income) is negatively related to the distance of this variety from the ideal. This means that the further away is the variety available from his/her ideal, the lower the price.

On the supply side, Lancaster (1980) assumed increasing returns to scale in the production specification so that there is decreasing costs for some range of output. This model shows that IIT occurs as a consequence of preference variety and economies of scale, as in the "love-of-variety" approach. However, the gains from trade are different. In the "love-of-variety" approach, since all goods/services enter the utility function symmetrically, an increase in the number of varieties available increases welfare for all individual consumers. In the "ideal-variety" model, the fact that goods/services enter the utility function asymmetrically implies that an increase in variety will be beneficial for some consumers but harmful to others. This assertion is predicated on the fact that some consumers will, after trade, be able to consume products/services close to their ideal specifications than in autarky since the average distance between varieties on the spectrum is smaller with trade than without trade. However, for some consumers that were consuming their ideal variety before trade, opening trade may not increase their welfare.

It is important to note that this model implies that preference variety is the only reason for the existence of IIT. If preferences were equal for all individuals in each country, all consumers would have the same "most-preferred good/service" and thus, the output for this group of products/services would be homogeneously made for this specification.

The original model is flawed since it assumes that countries have equal sizes, which may not be appropriate for the South Africa-US IIT in services. Lancaster (1980) and Helpman (1981) extended the basic model by allowing countries to vary in size (measured by the number of consumers). Thus the larger country will, in autarky, produce a large number of varieties due to the existence of larger economies of scale. The upshot of the extension is that the smaller country (South Africa) will reap larger gains from trade (in terms of consumer welfare), since the increase in the number of

varieties available to consumers will be bigger for the smaller country than for the larger country (the US).

Furthermore, the basic model was extended by Lancaster (1980) and Helpman (1981) into the HOS framework where differences in factor endowments between the two countries exist. This leads to the conclusion that IIT will be higher the more similar (in terms of factor endowments and market size) are the trading economies.

Also, as in the "love-of-variety" approach, this model does not predict the direction of trade (unless extended to include differences in initial factor endowments). This model is useful for IIT in services. Firstly, services are highly differentiated and there are certain services that consumers have ideal varieties. A good example is education, where some people for instance prefer US universities while others prefer South African universities. Secondly, the extension to include differences in country sizes and factor endowments directly informs the modelling process whereby a variable for market size is included in the empirical South Africa-US IIT in services model.

2.3.2 Vertical differentiation: Differentiation by quality

The new classical view/CHO of international trade popularised in the mid-1980s ignored a vital issue: that products are not only differentiated horizontally but also vertically (Fontagnè and Freudenberg 2002:135). Vertical differentiation means differentiation along the quality spectrum and generates different determinants and consequences of IIT from those of horizontal differentiation. In horizontal differentiation, products/services sold at the same prices are perfect substitutes, while in vertical differentiation, a common ranking of consumer preferences can be associated with differences in quality, based on factor endowments (Falvey, 1981), on fixed costs in R & D (Gabszewicz, Shaked, Sutton and Thisse, 1981) or on the qualifications of the labour force (Gabszewicz and Turrini, 1997).

Falvey (1981) used a partial general equilibrium model based on two countries and two factors of production. As in the HOS framework, each country has different initial endowments of factors of production, which results in different factor prices in the two countries. There are, however, two differences with the HOS. Firstly, although there are two factors of production, capital is assumed to be industry-specific. Capital is assumed to be immobile between sectors but completely mobile within a given industry. Secondly, each industry will produce vertically differentiated goods (i.e. with different capital-labour ratios or different qualities). This model predicts the direction of trade where each country will export the qualities in which it has comparative advantage (product qualities that use the relative abundant factor more intensively).

This model predicts the pattern of trade in a way that is consistent with the traditional HOS theory with each country exporting the qualities in which it has comparative advantage. Thus home country exports those qualities below the marginal quality and the foreign country exporting those qualities above the marginal quality. The model further predicts that in the presence of tariffs, some qualities will be produced in both countries, with no trade occurring in those qualities. In this model, there is no gain from trade via economies of scale or via increase in product varieties. The benefits arise mainly from the usual reasons of comparative advantage; with free trade, consumers are able to buy the quality they want at cheaper prices. In this sense, the Falvey (1981) model as well as the Falvey and Kierzkowski (1987) is a natural extension of the HOS framework, taking into account product differentiation without completely discarding the fundamental premises of the HOS theory.

This model has implications on trade liberalisation and concomitant factor adjustments. On one hand, the model argues that trade restrictions are inimical to trade based on exchange of qualities. On the other hand, the model dismisses the approach advocated by CHO model of associating inter-industry trade with painful trade-induced factor market adjustment costs and IIT with less costly adjustments (as in Helpman and Krugman, 1985). The model argues that the CHO approach is at odds with the development of vertically differentiated IIT (VIIT). Gabszewicz and Turrini (1997)

suggest that specializing in top-quality varieties will be associated with adjustment costs if the qualification of labour employed intensively to produce low-quality varieties is specific. Thus it is possible that the portability of qualifications is limited across the quality range of products even within sectors. The implication of this is that the adjustment costs associated with VIIT (exchange of qualities) might be sizeable, as it may not be equivalent to specialize in high-or low-quality products/services in the same industry. Costly displacement of resources may take place as a result of specializing along the quality spectrum sustained by R&D expenses, endowments in human capital, or simply advertising.

2.3.3 Strategic IIT models

2.3.3.1 Homogeneous products/services

The basic model of IIT in the presence of strategic interaction goes back to Brander (1981). However, Brander and Krugman (1983) made generalisations and reformulations and the model's original focus on IIT was redirected to the phenomenon of "reciprocal dumping". The corollary of this is that the model has had a much greater influence on the dumping literature than on IIT literature.

The basic characteristic of the Brander's model is its emphasis on market power. In this model, IIT in homogeneous products/services is the result of firms' incentives to penetrate into each other's market in a reciprocal manner. Unlike the CHO models, where the issue of market structure is a nuisance and got rid of by assuming monopolistic competition, Brander builds his story using imperfect competition. He demonstrates that, in an industry characterized by Cournot competition, firms' exports are the results of their profit motives and consequently, trade increases competition.

2.3.3.2 Strategic IIT in vertically differentiated products/services

The role of vertical product differentiation has been neglected in the strategic trade policy literature. VIIT can explain the pattern of trade between the developed and developing countries (Clark and Stanley, 1999, Kunin and Zigic, 2003).

Zhou, Spence and Vertisky (2002) presented the first theoretical paper linking vertical product differentiation and strategic trade. The paper deals with endogenous quality choice by firms and strategic competition takes place in a "third country market" as opposed to the domestic market.

Kunin and Zigic (2003) attempt to construct a simple strategic trade duopoly model with product differentiation where the action takes place in the domestic market. The decision variable in the model is the selection of product qualities and duopoly as a market structure emerges endogenously from the nature of the competition and the size of the market. The model assumes that the different abilities of the firms from the developing world compared with their developed country counterparts leads to differences in quality cost efficiency. The generation of high quality varieties depends on R & D investment, learning by doing and the level of human capital. Kunin and Zigic argue that at the margin an increase in quality would require high effort and higher costs on the part of developing country firm than on the part of developed country firm.

They show that the incidence of quality reversal depends on the relative cost efficiency in producing quality and if the difference in the efficiencies is "large enough", there is no switch in quality ladder.

Overall, strategic trade literature in the context of industrial organisation offers some insight into the case for protection of industries. Firstly, trade policy can be used to extract foreign monopoly rents. Secondly, there could be a possible use of protectionist policies as a way to get firms lower their average costs curves. Lastly, protectionist policies can be used to promote additional entry, when this is desirable.

Figure 2.3 is a schematic representation of IIT theories. The figure shows the different theories that explain IIT for homogenous products, HIIT and VIIT. These theories encapsulate both the causes and the consequences of different types of IIT in merchandise trade. Although services are different from goods, the powerful logic of these theories transcends these differences.

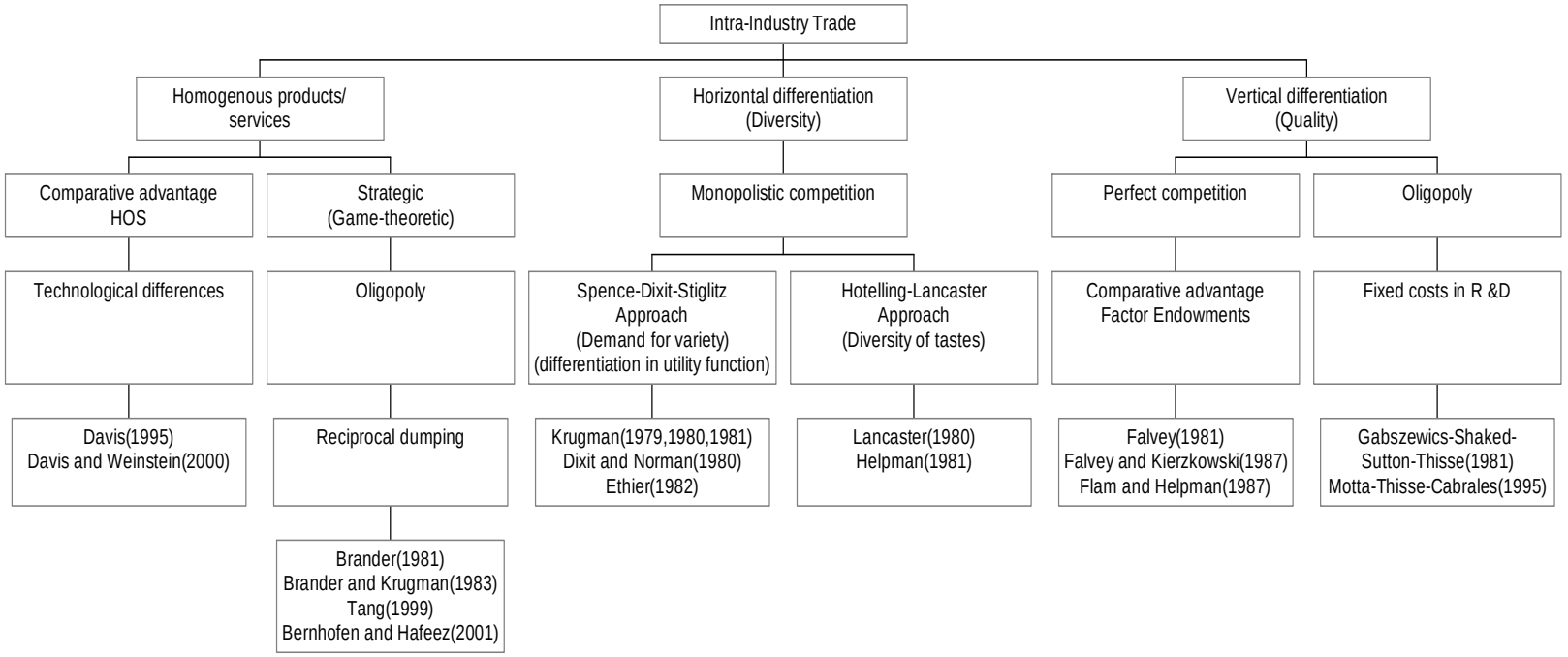
The literature survey so far provides a basis for the next section, which focuses on how to translate IIT trade theories (based on industries) to service trade data.

2.3.4 Applicability of goods-based IIT theories to services

The general view about applicability of comparative advantage theory to services is summed up in Hindley and Smith (1984:389) as follows "services are different from goods in ways that are significant and that deserve careful attention, but the powerful logic of comparative advantage transcends these differences". This view made sense prior to the onset of the GATS and the definition of services based on the four modes of delivery.

Lee and Lloyd (2002: 162) point out there is currently no model/models of IIT in services. They attribute this to the fact that services have different modes of delivery and technological requirements, which makes it very difficult to develop a single theory for all the modes of supply. In the case of mode 1, standard IIT trade theories, which assume international immobility of factors of production, apply. Hindley and Smith (1984) analyse whether theories of comparative advantage, aimed at explaining inter-industry trade in goods, can be applied to services or not. They contend that Ricardo's proof involving wine and cloth would still be valid even if he considered wine and insurance policies.

Figure 2.1: Schematic representation of IIT theories



Source: Adapted from Fontagné and Freudenberg (1997:17,2002:136)

Existing models of IIT (e.g. in Markusen and Maskus, 2002), which incorporate FDI might be applicable to services supplied under commercial presence (mode 3). However, as noted by Lee and Lloyd (2002: 162), the other theories of vertically and horizontally differentiated products cannot be applied to services supplied under modes 2,3 and 4 since the service products are differentiated on the basis of location of the producer and or consumer.

However, statistics used for analysis is based on BMP5, which tends to capture cross-border (mode 1) and mode 2.

2.4 INCORPORATING IIT INTO THE NET FACTOR CONTENT OF BALANCED TRADE

Originally, the empirical evidence of simultaneous exports and imports of similar products was perceived as an invalidation of the HOS model and its variants based on Ricardo's comparative advantage (Fontagné and Freudenberg, 1997).

The HOS model argues that trade reflects an interaction between the characteristics of countries and production technology of different goods/services. Specifically, it argues that a country will export goods/services whose production is intensive in the factors, which it is abundantly endowed with. This model predicts three things. Firstly, trade should typically be between complementary countries-labour abundant countries should trade with capital-abundant countries. Secondly, the sources of the comparative advantage should be seen in the composition of trade. Finally, trade should have a strong effect on income distribution since it is an indirect way of countries trading factors of production (factor content of trade).

In the late 1970s and early 1980s, new theories of international trade were constructed using the models of monopolistic competition designed by Spence-Dixit and Stiglitz and Lancaster and industrial organisation theory (small number market structures).

Consequently, a new orthodoxy emerged referred to as the "new classical view" or Chamberlin-Heckscher-Ohlin (CHO) model. This view underscores gains in variety, increasing returns to scale and competitive pressures that are related with international trade.

Helpman and Krugman (1985) provided a synthesis of the vast literature using two concepts; "integrated equilibrium" used to clarify the conditions for the factor price equalisation, and "net factor content", which is a central feature of higher dimensionality models.

At the same time there were models of vertical differentiation introduced by Falvey (1981) and Falvey and Kierzkowski (1987), in which specialisation takes place along the quality spectrum.

2.4.1 Net factor content of balanced trade: Mathematical presentation

The factor content of trade, propounded by Vanek (1968), is the amount of factor inputs embodied in the trade of a country. Feenstra (2004), Feenstra and Hanson (2000) provide an exposition of the structure of the Heckscher-Ohlin-Vanek (HOV) model. The standard HOV model rests on a number of assumptions. Firstly, there are n industries and m primary inputs. Secondly, each industry produces a single output and the primary inputs are mobile within countries but immobile between countries. Thirdly, there is free trade in all goods j=1,2…J. Fourthly, all final goods/services prices are equalised among the trading countries. Fifthly, there are identical technologies across countries *i*=1,2…I. Sixthly, consumer tastes are identical and homothetic across countries. Seventhly, trade leads to factor prize equalization (FPE) across countries for all factors of production, k=1,2…K. Finally, there is no factor intensity reversal.

The quantity of primary factor k used per unit output in industry j is denoted by matrix $A=\lfloor a_{kj} \rfloor$. According to Feenstra and Hanson (2000:155), this matrix represents "direct plus indirect" factor requirement. This can be decomposed into a $(K \times J)$ D matrix

containing direct factor requirements and a ($J \times J$) B input-output matrix. The matrix B describes how a given service is used in the production of itself and other services.

The total factor requirements matrix, A, is computed as;

$$A = D(I - B)^{-1} \tag{2.4}$$

Where I is an identity matrix. Owing to identical technologies and FPE in HOS model, this matrix is identical in all the trading partners. The net output vector for country i is denoted by a ($J \times 1$) matrix Y_i and the consumption vector C_i. The net exports (trade) vector is given by $T_i = Y_i - C_i$. The T_i can also be calculated as $T_i = X_i - M_i$. This is pre-multiplied by A to obtain the factor content of trade (i.e. the amount of labour, capital, land, etc.) embodied in the trade of country i.

The HOV theorem then relates the factor content of trade ($F = AT_i = AX_i - AM_i$) to the ($K \times 1$) vector of endowments for country i, E_i, as compared to world endowments E_w;

$$AT_i = E_i - \alpha_i E_w \tag{2.5}$$

Where $\alpha \equiv \dfrac{p'C_i}{p'C_w}$ is the total consumption of country i relative to the world consumption.

The Equation 2.5 states that the factor content of trade is equal to the net factor endowments of a country[8].

[8] This equation provides the basis for the "rank" and "sign test" of HOV due to Bowen, Leamer and Sveikauskas (1987). The rank test states that the ranking of the net factor endowments (right hand side) equals the ranking of factor content (left hand side). In other words if South Africa has more labour (right hand side), she should export products/services that embody more labour in the production process.

Although this standard HOV model is general in terms of the number of primary inputs and goods, most of the underlying assumptions are quite restrictive when applied to trade in services.

Firstly, the assumption of free identical technology does not make a lot of sense for most services since "technology" is the centrepiece of trade. Mode 3 (commercial presence) and mode 4 (movement of natural persons) entail trade of intellectual assets such as patents, copyrights, blueprints, trademarks etc. The assumption of identical technology implies that intra-industry trade has zero factor content by construction (Davis and Weinstein, 2000, Trefler and Zhu, 2000).

According to Feenstra (2004), there are two ways to incorporated differences in technology into the HOV. The first approach models productivity of factors in different countries while the second method models differences in the factor requirements matrix, A. With differences in production technology, the factor content of trade could be re-specified as;

$$F_{\text{mod}} = \begin{bmatrix} A & A^* \end{bmatrix} \circ \begin{bmatrix} X_i & -M_i \end{bmatrix} = AX_i - A^*M_i \qquad (2.6)$$

Where F_{mod} is modified factor content of trade, A and A^* are the domestic and foreign country technology matrices respectively, and $\circ$ is a Hadamard product operator (element-by-element product). These are partitioned matrices so that the right hand side is conformable for inner product.

The technology matrices A and A^* depend on technologies and the equilibrium factor prices in the home and foreign countries, respectively (Lloyd, 2002). Trefler and Zhu (2000) tried to incorporate differences in technological matrix in empirical testing of the factor content of trade.

Davis and Weinstein (2000:154), in their quest to explain the mystery of "missing trade", argue that errors in the measurement of factor content arise, among others, from the fact that the traditional tests using the standard HOV model assumed implicitly that the factor content of matched IIT has zero factor content. Lloyd (2002) succinctly explains this by rewriting the exports and imports as;

$$X = G + x$$
$$M = G + m \qquad (2.7)$$

Where G is the vector of matching trade (IIT) in the industries. In the above specifications, x and m are non-negative. The value of x_i (or m_i) is strictly positive if the country is a net exporter (or importer) of industry i's products/services, and zero if it is a net importer (exporter). Substituting the above equations into the modified HOV model yields;

$$F_{\text{mod}} = \left(A - A^*\right)G + \left(Ax - A^*m\right) \qquad (2.8)$$

The first component on the right hand side of Equation 2.8 is the factor content of matching IIT. Its contribution depends on the value of matching trade (G) and the differences in technology between the two trading partners. The second component is the contribution of net exports and imports (inter-industry trade). It is clear that with the assumptions of "integrated equilibrium" and identical technologies (i.e. $A = A^*$), the modified HOV reduces to the standard HOV;

$$F_{\text{mod}} = F = \left(A - A\right)G + Ax - Am = 0 + A\left(x - m\right) \qquad (2.9)$$

Secondly, the standard HOV does not take into consideration trade in intermediate inputs. Producer and co-ordination services such as insurance, banking, transport etc. are an important conduit of international exchange of factor services. Indeed, globalisation has been characterised by widespread trade in fragmentation of the production process. This entails an entire value chain being located in different countries on the basis of its

comparative advantage. Producer and co-ordination services play a significant role in facilitating this process[9].

Intermediate trade dilutes international differences in the combination of factors used in production. Imported intermediate services drive a wedge between a country's total factor usage profile and its endowments and thus dampening the net factor service trade. Indeed, Salvatore (2004b: 544) argues, " Globalisation in production has proceeded so far that it is now difficult to determine the nationality of many products/services" [emphasis added].

There have been attempts to incorporate intermediate inputs in the HOV model. Davis and Weinstein (2000) model, that incorporate differences in technology, impute the factor content of imported intermediate inputs using domestic factor intensities. They observe that some error arises from this assumption but it is not significant. Trefler and Zhu (2000) exclude the imported intermediate inputs by construction. Lloyd (2002) questions these approaches given the fact that more than half of total world trade is in intermediate inputs.

Reimer (2004) developed a framework, which reconciles global intermediate trade with general-equilibrium features of trade, production and factor endowments in the presence of technological differences across trading partners. The framework shows that global production sharing tends to separate the factor content of final goods/services from the country's factor endowment profile. A case in point is South Africa's exports of education services to the US, produced using expatriate lecturers from Europe, Australia, North America and other African countries. In this case South Africa's exports of education services to the US has very limited relationship with her endowments of skilled manpower (university lecturers) limiting the standard HOV model as a guide to industrial and services trade policy.

[9] A case in point is the "Just-in-Time" management of inventory as well as "value-for-money", whereby inventory is sourced from the most competitive supplier when required thus saving huge sums of money in storage costs. This is facilitated by producer services such as communication and transportation.

Finally, the assumption of FPE in the standard HOV model does not hold in most services supplied under modes 2, 3 and 4. This is because in these services, factors of production are mobile across countries. In this case countries specialise in distinct sets of traded services. A number of studies have shown that discarding the assumption of FPE is central to understanding Trefler's (1995) "missing trade"[10] and for developing factor proportions-based models of the world economy (Davis and Weinstein, 2000, Helpman, 1999:132).

2.4.2 The net factor content of balanced trade: "integrated equilibrium" approach

2.4.2.1 The "integrated equilibrium" under horizontal differentiation (HIIT)

The "integrated equilibrium" (IE) is a paradigm that has been used in international trade for a long time. The concept originated from Samuelson's (1949) work on FPE and was further refined by Dixit and Norman (1980). Helpman and Krugman (1985), in their quest to synthesise the burgeoning literature on IIT, placed IE at the centre of international trade analysis.

The essence of IE is that there is a resource allocation the world would have if goods and factors of production were both perfectly mobile. The analysis then poses a question as to whether it is possible to achieve the same resource allocation if factors of production are instead divided up among countries and there is no international factor mobility. The approach shows that in general, there is a set of allocation of factors of production to countries in which this is possible. In this case, factor endowments lie within this set (cone of diversification), factor prices are equalised through trade. This is the basis of Helpman and Krugman (1985) analysis that led to the new classical view/Chamberlin-Heckscher-Ohlin (CHO) model based on a horizontal differentiation framework in the context of monopolistic competition.

[10] The "missing trade" phenomenon refers to Trefler's (1995) finding that measured factor content of trade understates Vanek's (1968) prediction.

According to the IE, the net factor content of inter-industry trade is positively related to the difference in relative factor endowments between trading partners. The converse is that IIT is negatively related to the difference in relative factor endowments between trading partners.

Helpman and Krugman (1985) provide an exposition of the IE using F primary factors under perfect competition in all markets; a set $\overline{V}$ of m input vectors; v_j corresponding to the general producer equilibrium exist for each vector ω of factor prices. The IE is replicated by free trade between countries if $\overline{V}$ is compatible with the set $\ddot{V}$ of endowments in the perspective of uniqueness of ω.

Assuming a case of two industries (j=1,2), the two vectors define a cone of diversification and if the endowment vector belongs to it for all countries a solution can be found associating positive outputs to a unique ω_k (where k refers to countries).

With higher dimensionality (l countries, m final goods and 3 primary factors of production) the previous result only hold in the same triangle of diversification as explained in Leamer (1987).

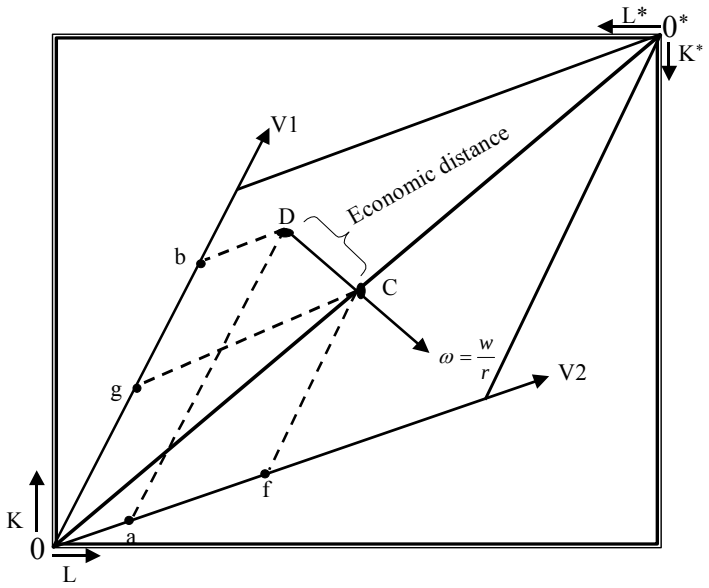
Fontagné and Freudenberg (1997) argue that internal economies of scale can be introduced into this theoretical framework without changing the basic principle of the factor content of net trade flows. Using this theoretical framework, the zero profit condition is met at equilibrium and horizontally differentiated products/services that belong to the same industry use the same production function (factor intensity).

Figure 2.2 illustrates a one period model of IE where income is used for consumption only. This is a two-country world (k=1,2), two products/services (j=1,2) with the more capital intensive good (1) being horizontally differentiated while good 2 is homogenous. IE reproduces situations in which trade of goods is only associated with a full

employment equilibrium where ω is identical in both countries. In this model, both income and consumption are given by Equation 2.10.

$$Y_k = rK_k + wL_k \tag{2.10}$$

Figure 2.2: Economic distance and IIT under horizontal differentiation



Source: Fontagné and Freudenberg (1997:14)

The length of the horizontal axis is the world labour endowment and the length of the vertical axis is the world capital endowment. The origin for country 1 is the lower left corner and for country 2 is the upper right corner. Any points on the world endowment box measures the endowments of the two countries.

Point C divides the world income/consumption given by line OO^* into the national share (OC) and foreign share (CO^*). The world-IE is based on the fact that the endowment point D lies within the FPE set defined by the vectors v_j;

$$v_j = \left[a_{Kj}(r), a_{Lj}(w)\right] \tag{2.11}$$

The factor contents of production and consumption can be defined for each country (k=1,2) and products (j=1,2) and then the net factor content of balanced trade. For the home country Og and Of are the factor contents of national consumption in horizontally differentiated and homogenous goods/services respectively. Similarly, Ob and Oa are the factor contents of national production in horizontally differentiated and homogenous goods/services respectively. The net factor content of balanced trade is given by the line DC (production less consumption). The home country exports the services of its abundant factor and imports the ones of its scarce factor along the lines of the HOV theorem.

The line segment gb measures the net factor content of exports of the horizontally differentiated product for the domestic economy. This country is engaged in IIT of good 1, which is not balanced. The line segment fa shows the net factor content of one-way flow of the homogenous good 2 (imports of the domestic economy).

The line DC also shows the economic distance that is the difference in national endowments between domestic and foreign country. The greater the economic distance, the greater the net factor content of balanced trade. This shows that inter-industry trade is related positively to the economic distance (comparative advantage of countries). In other words, IIT is negatively related to economic distance. At the extreme, international trade between countries having identical relative endowments in factors would be characterised by a net factor content of balanced trade equal to zero, with trade being exclusively of IIT.

The upshot is that the "new classical view" or CHO model associates inter-industry trade with comparative advantage (economic distance) and IIT with the monopolistic competition. The benefits and costs associated with trade are based on two postulations. Firstly, inter-industry trade leads to reallocation of resources between industries leading to efficiency and consumers react to a new set of relative commodity prices. These

benefits are associated with internal redistributive mechanism, which harms the factor largely engaged in industries that face competition from imports (Stolper-Samuelson theorem). Secondly, IIT leads to gains in variety of goods due to economies of scale, lower factor market adjustment costs since displaced factors of production move "within" industries instead of "between" industries, as is the case with inter-industry trade.

The central feature of the IE under horizontal differentiation makes sense for services traded under mode 1 (cross-border).

2.4.2.2 The "integrated equilibrium" under vertical differentiation (VIIT)

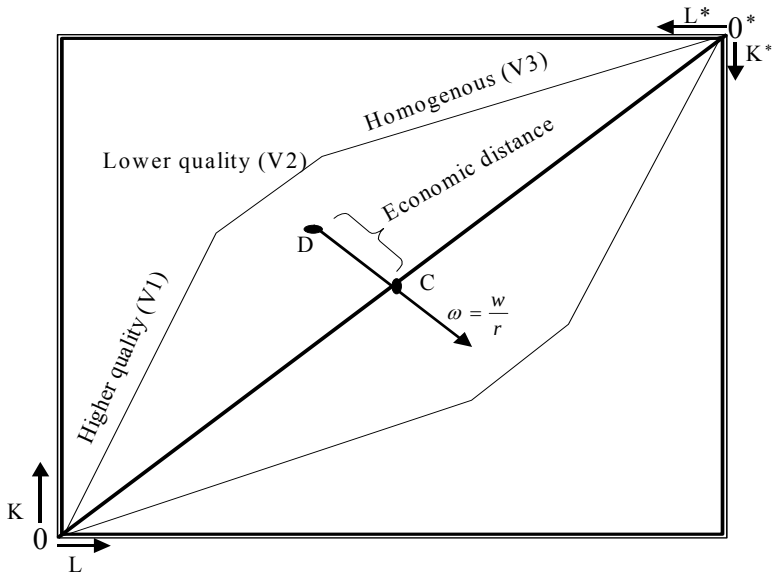
Under vertical differentiation, the factor content of a good/service described by trade data differs across countries. In this type of differentiation, a good/service is a continuum of goods/services distinguished in terms of factor content and if the endowments of countries are different, FPE does not hold for any pair of countries. A country may specialise in a unique section of this continuum for which it has comparative advantage.

Vertical differentiation, proposed by Falvey (1981), Falvey and Kierzkowski (1987) and Flam and Helpman (1987) suggests that differences in prices and quality are found in differences in the production function. They argue that a higher quality manifests in a higher capital-intensity implying that each variety is associated with a given vector of input.

Figure 2.3 shows the economic distance under vertical differentiation with two qualities (low and high). IIT in vertically differentiated products/services (VIIT) is a specialisation within industries along the quality spectrum. The HOV model ascertains that the line segment DC represents the net factor content of balanced trade. However, unlike the HIIT, IIT is associated with net factor content of balanced trade, which is not zero. In this situation, comparative advantage, which is captured within industries along ranges of quality explain IIT and induce a net factor content of balanced trade which is

different from the CHO model. In this case VIIT has internal redistributive pressures due to differing qualities exported and imported.

Figure 2.3: Economic distance and IIT under vertical differentiation



Source: Fontagné and Freudenberg (1997:16)

2.5 ECONOMICALLY MEANINGFUL DEFINITION OF AN "INDUSTRY"

This controversy relates to the aggregation of international trade statistics into exports and imports of "industries" defined in an economically meaningful manner. Lloyd (2002) points out that categorical aggregation impacts on the level of measured IIT, the empirical explanation of the trade flows and their policy implications. The definition is two-pronged; relative factor intensity definition and industrial organisation definition.

2.5.1 Relative factor intensity definition of an "industry" (HOS)

Any model for IIT must adopt a definition of an industry in an economically meaningful way. According to Bernhofen (2002), the HOS/HOV model emphasizes the boundaries between two industries and uses relative factor intensity. Thus only goods/services produced with the same factor intensity comprise an industry. Consequently, as long as the HOS assumptions hold, international trade is always inter-industry trade and IIT is precluded by definition. However, as pointed out in Section 2.4.1, the modified version of HOS model by Trefler and Zhu (2000) incorporates IIT in the factor content of trade.

2.5.2 The industrial organisation (I-O) definition of an "industry"

The IIT models of the new trade theory are one-sector I-O models where the concept of an "industry" flows directly from the market structure assumed. Historically, the I-O idea of an industry (or market) goes back to Robinson (1933) (in Bernhofen, 2002:65).

Although the single-sector nature of these models precludes any discussion about the boundary of the industry, it is assumed implicitly that the goods/services in the industry are confined by substitutability in consumption. In this way IIT is defined as a two-way trade in goods/services that are similar in consumption.

2.5.3 Implications of categorical aggregation to modelling of IIT

The basic issue is how well the statistical classifications map on to industries. Lloyd (1994), using formal aggregation theory, highlights a number of implications of the theory of categorical aggregation.

Firstly, the explanations of IIT vary among models. In the Dixit and Grossman model, factor proportions determine the patterns of inter-industry and IIT. This also holds true for models involving jointness in production due to a common industry input.

Secondly, factor proportions and other variables must be used simultaneously in all models to test the determinants of inter-and IIT. The rationale for this conclusion is that in general-equilibrium models neither inter-industry nor IIT is independent of the other.

At the empirical level, the actual classification of services traded recorded in trade statistics based on technical properties is still regarded as a rough guide to a meaningful definition of industries.

However, as pointed out by Welsum (2003), there are problems when it comes to defining services "industries" in an economically meaningful way. In contrast to goods trade, it is unlikely that there will be any, "packaged" services marked with an international code crossing national borders. If that was the case concordances could be used to relate traded services with industries where they originate. As a result of this, the information required to collect data on trade services (e.g. description of contents, quality information, origin and destination) may not necessarily be readily available.

Nonetheless there are attempts to classify service industries in an economically meaningful way. The SNA (United Nations Statistics Division, 1993) recommends the use of the United Nations Central Product Classification (CPC) (United Nations Statistics Division, 1997) for the classification of products and outputs of services. Services are classified using Sections 5 through 9 of CPC version 1.0. There are plans to update the SNA in 2008[11]. However, when it comes to industrial classification, the SNA recommends the use of ISIC Rev.3 (United Nations Statistics Division, 1990). The ISIC and CPC are to be revised in 2007.

Under the BMP5 (International Monetary Fund, 1993), the concept of services is fundamentally that of SNA, but for practical measurement reasons international trade in services between residents and non-residents includes some trade in goods, such as those

[11] Further information on the issues being considered for SNA update and progress is found at http://unstats.un.org/unsd/sna 1993/issues.asp

bought by travellers and those purchased by embassies. On the other hand, under certain cases international trade in goods may indistinguishably include some charges as insurance, maintenance contracts, transport charges, royalty payments and packaging which are treated as services under BMP5.

The BMP5's classification entail the following 11 standard service components: transportation; travel (tourism); communication services; construction services; insurance services; financial services; computer and information services; royalties and license fees; other business services; personal, cultural, and recreational services and government services, not included elsewhere (n.i.e). The BMP5 is due for revision in 2008.

The new Manual on Statistics of International Trade in Services (United Nations, 2002) notes that service industries (or activities) are those in Section G through Q of ISIC, Rev.3. However, in view of their fundamental nature, these revisions will have knock-on-effects on the new manual to be revised by 2009.

The statistics data on services in South Africa, like many other countries, is constructed on the basis of BMP5. While this framework seems to categorise service industries in a way that is more meaningful economically than the SNA, it does not show the origin and destination of services. An alternative classification is the US BEA, which is based on the BMP5 and is presented in the appendix (Tables A.13 through A.16).

2.6 EMPIRICAL MEASUREMENT OF IIT

The entire IIT research agenda began with measurement (Greenaway and Milner, 2003:1). Several papers investigating the effects of the establishment of then European Economic Community (EEC) on trade patterns (Verdoon, 1960, Drèze, 1961, and Balassa, 1966) stumbled on the phenomenon of IIT. The research was motivated by standard customs-union theory based on HOS, which predicted increased specialisation and consequently, serious factor market adjustments along the lines of Stolper-Samuelson

theorem. This research agenda found that in fact there was increased intra-industry specialisation instead of inter-industry specialisation predicted by HOS model.

This discovery set in motion a research agenda in terms of theoretical models as well as work on measurement of IIT that led to construction of static and later on dynamic indices of IIT.

2.6.1 Static IIT indices

2.6.1.1 Balassa index

Balassa (1966) proposed the first index of IIT that measured the degree of trade overlap (simultaneous import and export of goods within an industry);

$$B_i = \frac{|X_i - M_i|}{X_i + M_i} \tag{2.12}$$

Where *i*=Commodity within industry j. This index is a ratio of net trade to gross trade and ranges from 0 to 1, with 0 representing "perfect" trade overlap, and therefore pure IIT, while 1 represents pure inter-industry trade. In order to calculate the degree of IIT for all industries (the whole economy), Balassa took an unweighted average for each index as follows;

$$B = \frac{1}{n}\sum B_j \tag{2.13}$$

The weighted version is $B = \sum_j w_j B_j$. Where w_j is industry *j*'s share of total trade. Although the essence of this index has remained in international trade, an index that is more appealing and widely used is attributed to Grubel and Lloyd (1975).

2.6.1.2 Unadjusted Grubel and Lloyd (GL) index

In view of the fact that trade theory consists largely of static models, the static Grubel-Lloyd (1971,1975) (thereafter referred to as GL) index of IIT has been by far the most widely used measure. This index is constructed to capture the part of balanced trade in a given industry. Suppose there are n industries in South Africa that are indexed by *i*=1,2…n. For multiple-product industry, let X_i be the aggregate value of exports of industry *i* and M_i be the value of imports of industry *i*. Then the value of exports of an "industry" which is exactly matched by the imports of the same industry is;

$$R_i = (X_i + M_i) - |X_i - M_i| \tag{2.14}$$

The complement of IIT is inter-industry trade;

$$S_i = |X_i - M_i| \tag{2.15}$$

The value of IIT is then normalised by dividing by $X_i + M_i$ to give;

$$GL_i = 1 - \frac{|X_i - M_i|}{X_i + M_i} = 1 - B_i, GL_i \in [0,1] \tag{2.16}$$

It can also be computed as in Equation 2.17;

$$GL_i = \frac{2Min(X_i, M_i)}{X_i + M_i}, GL_i \in [0,1] \tag{2.17}$$

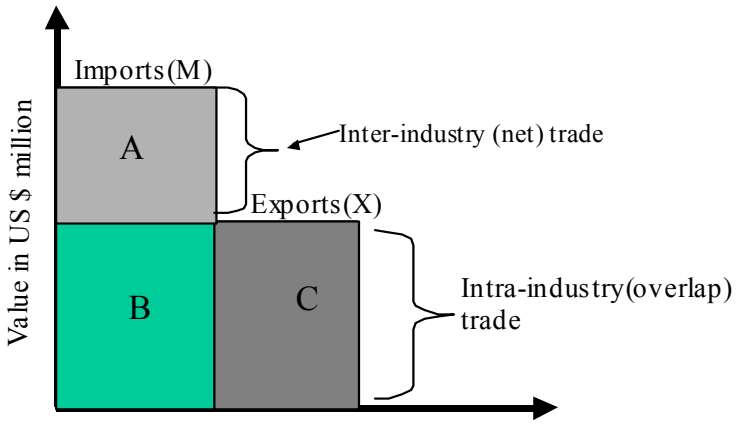
The GL index can be calculated over several industries as trade weighted average of the industry indices. It can also be calculated for a country's worldwide trade or for a subset of trade partners.

Figure 2.4 shows that IIT is the overlap trade (i.e. portions B and C). The inter-industry trade (A) has to be compensated for by a symmetric trade flow in another industry

(Fontagné and Freudenberg, 1997). This amounts to the fact that the notion of IIT for an industry only makes sense given the symmetric flow.

The limitations of the GL index have been scrutinized by, among others, Greenaway and Milner (1986), Fontagné and Freudenberg (1997), and Brülhart (2002). The main shortcomings in the literature (applied to services) are highlighted in Sections 2.6.1.2.1 through 2.6.1.2.7.

Figure 2.4: GL index as a measure of trade overlap



Source: Adapted from Fontagné and Freudenberg (1997:22)

2.6.1.3 Limitations of the static IIT measures

2.6.1.3.1 Sectoral bias (categorical aggregation)

This problem relates to insufficient disaggregation in the trade classifications. The lesser the detail of the categorization used, the more trade becomes of intra-industry type. Thus in computer and related services, the IIT at the industry level, is likely to be far much

more than at the sub-industry level such as consultancy services related to the installation of computer hardware (CPC 841), software implementation services (CPC 842) and data processing services (CPC 843).

An additional problem crops up when an exchange of intermediate/producer services for final services belonging to the same industry is considered as IIT. A case in point is financial services which has both intermediate services (lending of all types such as mortgage credit, factoring and financing of commercial transactions) as well as services that provide instant benefits (payments and money transmission services including debit, credit and charge cards, travellers cheques and bank drafts).

As a result of this, capturing IIT at the industry level may hide instead of disentangling two distinct analytical concepts; the international splitting of the value added chain and simultaneous exports and imports of "substitutable" services (IIT). Fontagné and Freudenberg (1997) argue that simultaneous exports and imports within an industry at different production stages should not be considered as IIT but as international splitting up of the production processes.

2.6.1.3.2 Geographical bias

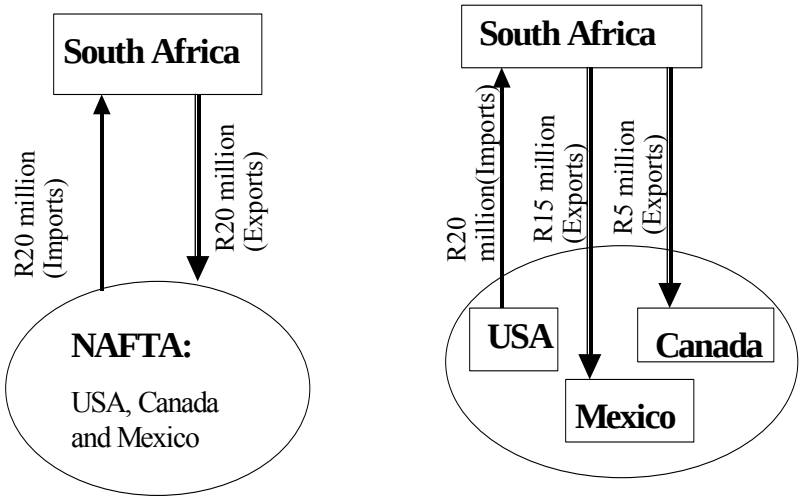
This takes place when different partner countries are put together before the computation of IIT. In fact in the extreme case only a country's trade relations with the "rest of the world" is examined. This is the case for the data on international trade in services constructed under the BMP5 framework[12]. This bias is predicated on the fact that the sign of the trade balance for a particular product/service may change from one partner to another, corresponding to the accumulation of various inter-industry flows for the same item of the service and will tend to show up as multilateral intra-industry flow.

A case in point is illustrated in Figure 2.5. Suppose South Africa's simultaneous exports and imports of financial services to and from the NAFTA (North American Free Trade

[12] Reported on the basis of South Africa with the "rest of the world"

Agreement) amounts to rands 20 million. However, a strict bilateral analysis, as suggested by Fontagné and Freudenberg (1997), may reveal that South Africa's trade with either of the three member countries (USA, Canada and Mexico) is one-way.

Figure 2.5: The case of geographical categorical aggregation bias



Source: Adapted from Fontagné and Freudenberg (1997:22)

2.6.1.2.3 Trade imbalance bias

In theory, GL index can take values between 0 and 1. However, imbalance in the trade account will tend to bias the GL index downwards towards 0. This led Grubel and Lloyd to come up with the following modified index;

$$GL_k^{Adjusted} = \frac{\sum_j \left(X_{jk} + M_{jk}\right) - \sum_j \left|X_{jk} - M_{jk}\right|}{\sum_j \left(X_{jk} + M_{jk}\right) - \left|\sum_j \left(X_{jk} - M_{jk}\right)\right|} \qquad (2.18)$$

This method entails subtracting country k's global trade imbalance from total trade, thus making IIT represent the total balanced trade instead of the share of overlap trade in total trade.

Aquino (1978) criticised Grubel and Lloyd (1975) correction and proposed the following measure;

$$Aquino_k = \frac{\sum_j \left(X_{jk} + M_{jk}\right) - \sum_j \left|X^e_{jk} - M^e_{jk}\right|}{\sum_j \left(X_{jk} + M_{jk}\right)} \tag{2.19}$$

$$\text{Where} \quad X^e_{jk} = \frac{\frac{1}{2}\sum_j \left(X_{jk} + M_{jk}\right)}{\sum_j X_{jk}}; M^e_{jk} = \frac{\frac{1}{2}\sum \left(X_{jk} + M_{jk}\right)}{\sum_j M_{jk}}$$

The problem with these measures is that they are so much focussed on dealing with trade imbalance and lose sight of the need to deal with the pattern of trade. It is precisely as a result of this reason that many economists prefer the unadjusted to adjusted GL or Aquino adjusted measures. This basically implies that considering trade imbalance as part of inter-industry trade flows decomposes trade flows to only two categories; inter- and IIT.

Lee and Lee (1993) suggest that, when modelling the unadjusted GL index, the set of explanatory variables should include a measure of the relative trade imbalance. However, the inclusion of trade imbalance is likely to lead to endogeneity problem since the error term will be correlated with some explanatory variables and hence bias the parameter estimates.

2.6.1.3.4 Double explanation of the majority flow

Generally, explanations of international trade are based on the decomposition of total trade into trade overlap (IIT) and net trade (inter-industry trade). In a CHO model, inter-industry is explained by differences in factor endowments while IIT is determined by economies of scaled and horizontal differentiation. The majority flow then has two different explanations: one explanation under perfect competition (HOS orthodoxy) and the other under imperfect competition (the new trade theory).

2.6.1.3.5 Double interpretation of Balassa and similar indicators

Fontagné and Freudenberg (1997) point out the fact that the Balassa index in Equation 2.17, which is the basis of the GL index, is used in the trade literature both as an indicator of IIT and of "revealed comparative advantage". This index is a modified version of an export-import ratio of an industry and does not give any additional information. This index allows two interpretations. Firstly, when the Balassa index is –1 or 1, there is no IIT and all trade is inter-industry based on comparative advantage (specialisation). Secondly, if the Balassa index is 0, all trade is intra-industry and there is no specialisation. In the intermediate cases, the Balassa index is confusing as there are situations where IIT can coexist with comparative advantage and inter-industry trade without such advantages.

2.6.1.3.6 Scale invariance

The GL index is neither related to the absolute size of imports and exports in a sector, nor to the size of the industry in terms of domestic production or consumption. This can be seen in Figure 2.6, where industries of different sizes can have the same IIT. The industry with higher relative trade flows will be a radial blow up of the smaller industry.

Since IIT conveys information about consumer welfare the larger industry should have a higher weight.

2.6.1.3.7 Static in nature

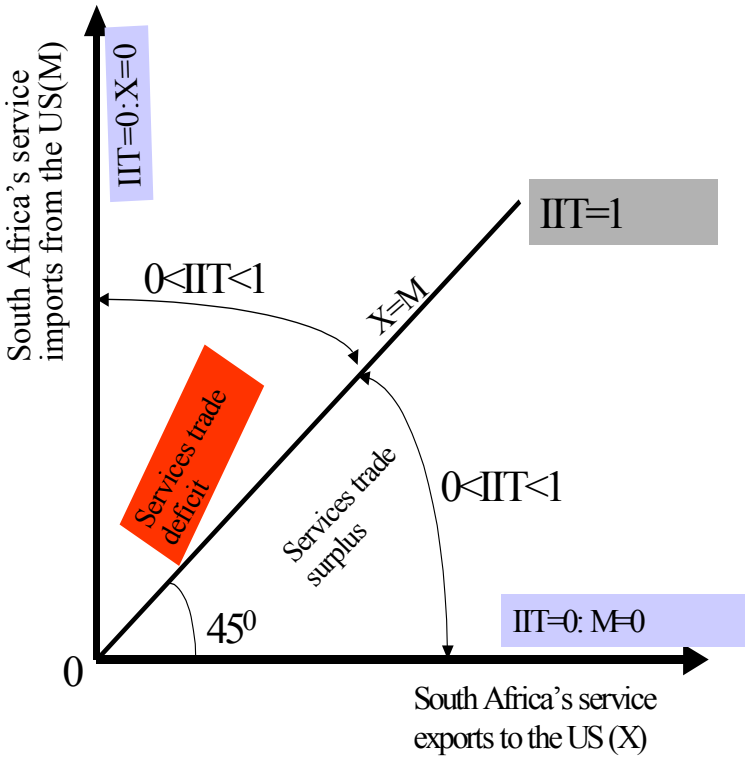
The GL index is not appropriate in explaining changes in trade flows over time. This motivated Hamilton and Kniest (1991) and others to develop measures of marginal intra-industry trade (MIIT).

2.6.4 Horizontal and vertical IIT measures

Products/services can be differentiated horizontally (different varieties) and vertically (different qualities of a given variety). The GL index aggregates the two as if the determinants are the same and this can result into measurement errors or wrong policy recommendations.

In view of this flaw, the GL index has been extended by Abd-el-Rahman (1991), Greenaway, Hine and Milner (1994, 1995) and Fontagné and Freudenberg (1997) to disentangle HIIT and VIIT. Starting from the presumption that differences in quality are reflected in differences in price, they use unit value data to separate the two. This is dealt with at greater detail in Chapter 6.

Figure 2.6: Schematic view of GL IIT index



Source: Adapted from Brülhart (2002:115)

2.6.5 "Extended" IIT

The simple GL index measure misses an important aspect of the globalisation in production. Greenaway, and Milner (1998) proposed a measure, which is based on the fact that arms-length IIT and cross-border production may be complements rather than substitutes. The measure has three components; two-way exchange of international trade in goods; two-way exchange of international production and two-way exchange of international trade for international production. The first component is IIT, the second is cross-border affiliate sales and the third the interaction between trade and affiliate sales. The principal constraint of this measure is data on affiliate production.

2.7 MAIN INSIGHTS AND CONCLUDING REMARKS

This chapter focused on the general IIT in services literature. Specifically, the chapter dealt with the specific IIT trade models; incorporation of IIT in the net factor content of balanced trade; the definition of an "industry" in an economically meaningful way (aggregation of trade and production statistics) and static measures of IIT. The main insights are presented in Sections 2.7.1 through 2.7.3.

2.7.1 Specific IIT models

This section presents the main insights from the specific trade models such as horizontal differentiation, vertical differentiation, strategic trade models etc.

2.7.1.1 Horizontal differentiation (HIIT)

The "love-of-variety" model for horizontally differentiated services assumes that individuals value variety in its own right. This is quite important for services like travel, where tourists would like variety of services (differentiated horizontally). The model predicts that South Africa will realise the larger gains from trade due to the fact that the increase in the number of varieties available to her consumers will be larger than in the US.

The "ideal-variety" model, based on the work of Lancaster (1966), assumes that every consumer has an "ideal"/ the "most-preferred" variety. The model also predicts that South Africa will reap larger gains from trade since the increase in the number of varieties available to consumers will be bigger for the smaller country than for the larger country (US). However the model predicts that the benefits from trade will not accrue to all consumers equally.

2.7.1.2 Vertical differentiation (VIIT)

These models are evaluated and the following are the main insights. Firstly, VIIT models are based on differentiation of services along the quality spectrum and are a natural extension of the HOS framework. In vertical differentiation a common ranking of consumer preferences is associated with differences in product/service quality based on factor endowments (Falvey, 1981), fixed costs emanating from R & D (Gabszewicz *et al.,* 1981) or the qualifications of the labour force (Gabszewicz and Turrini, 1997).

Secondly, VIIT models lead to new insights on factor adjustments and show that it is wrong to associate painful factor adjustment to inter-industry trade as done in the CHO/new classical view of trade. The adjustment costs associated with IIT in vertical differentiation (exchange of qualities) might be sizeable. Costly displacement of resources may take place as a result of specialising along the quality spectrum sustained by R & D expenses, endowments in human capital and advertising. This is quite relevant to services sector, which has witnessed liberalisation under GATS.

2.7.1.3 Strategic trade literature

The literature shows that relaxing the service homogeneity assumption in the standard strategic trade model developed by Brander (1981) is quite informative. For instance, in the same model driven by strategic interaction, firms become eager to trade as a result of relaxing the intensity of strategic interaction in the form of lowering the degree of service substitutability. The relaxation also shows that for a given degree of service substitutability, the incentives for international collusion are stronger in industries with a relatively low degree of market concentration.

2.7.2 Applicability of IIT theories developed for goods to services

The main insight is that the literature has not established major objections against using goods-based trade theories when analysing services as propounded by the classical

economists. This is predicated on the fact that although services have unique characteristics (intangibility and transitoriness; heterogeneity and high flexibility of production; imperfectly competitive market structure and asymmetric information and related adverse selection and moral hazard problems), the goods-based IIT theories are powerful enough to transcend these characteristics.

2.7.3 Incorporation of IIT in the factor content of trade

The standard HOV model based on factor price equalisation (FPE), integrated equilibrium (IE), single "cone of diversification" and identical technology between trading partners has played a central role in the field of international trade. However, its assumptions are quite restrictive when it comes to international trade in services.

Firstly, the assumption of free identical technology is flawed when applied to trade in most services where "technology" is the centrepiece of trade. Mode 3 (commercial presence) and mode 4 (movement of natural persons) entail trade of intellectual-based assets such as patents, copyrights, blueprints, trademarks etc. The assumption of identical technology implies that IIT has zero factor content by construction. This postulation contradicts recent theories, which incorporated differences in technology through modelling the productivity of factors in different countries and established that IIT is an important conduit of exchange of factor services.

Secondly, the standard HOV model does not take into consideration trade in intermediate inputs. Producer and co-ordination services such as insurance, banking, transport etc. are an important component of total services trade. Intermediate inputs trade dilutes international differences in the combination of factors used in production. Imported intermediate services drive a wedge between a country's total factor usage profile and its endowments and thus dampening the net factor service trade. Attempts to incorporate trade in intermediate inputs in HOV model entail imputing the factor content of imported intermediate using domestic factor intensities; excluding intermediate inputs in the analysis and integrating intermediate trade with general-equilibrium features of trade,

production and factor endowments while allowing technology to differ across countries. The last approach is the most comprehensive and shows that global production sharing tends to separate the factor content of final goods/services from the country's factor endowment profile.

Finally, the assumption of factor price equalisation (FPE) in the standard HOV model does not hold in services supplied under modes 3 and 4. In this case countries specialise in distinct sets of traded services. It is however, shown that international factor mobility can be incorporated in HOV model to generate complementarity between trade and factor services.

2.7.4 Economically meaningful definition of an "industry"

This is analysed at the level of categorical aggregation used by IIT models as well as how international trade statistics map on to "industries". The rationale for the analysis is that the definition of an "industry" impacts on the level of measured IIT, the empirical explanation of the trade flows and their policy implications.

Firstly aggregation theory shows that factor proportions and other variables must be used simultaneously in models to test the determinants of inter- and intra-industry trade because in general-equilibrium models, none of them is independent of each other.

Secondly, with regard to the aggregation of international trade statistics into exports and imports of "industries" defined in an economically meaningful manner, there are two approaches to the definition. The first approach is the relative factor intensity definition where goods/services produced with the same factor intensity comprise an industry and this is the definition adopted in HOV/HOS model. The second approach is the industrial organisation definition, which uses the industrial organisation theory of an industry (market) and is the basis of the new trade theories.

Finally, at the empirical level, the actual classification of services traded recorded in trade statistics based on technical properties, is still regarded as a rough guide to an economically meaningful definition of industries. This is manifested in the definitions of trade in services used by SNA, CPC version 1.0, BMP5, ISIC Revision 3 and MSIT. However, there are flaws in this approach that emanate from the characteristics of services such as intangibility, complementarity with factor movements (e.g. mode 3) and some services being embodied in goods.

2.7.5 Lessons from measurement

The following conclusion can be drawn with regard to measurement of IIT. Firstly, almost all of the useful and useable new measures of IIT build upon the unadjusted GL index. Secondly, IIT should be apprehended at the bilateral level to avoid geographical aggregation bias. Thirdly, when using the unadjusted GL index, the set of explanatory variables for IIT should include the relative trade imbalance. The analyst should, however, deal with endogeneity problem. Fourthly, any analysis of IIT should, if possible, first disentangle HIIT from VIIT because they have different determinants and labour market adjustment consequences. Finally, "extended" IIT is an important component since it recognises the fact that arms-length IIT and cross-border production may be complements rather than substitutes.

Chapter 3 provides an initial empirical analysis of the South Africa-US IIT in selected services during the period 1992-2003.

CHAPTER 3

STRUCTURE AND TRENDS IN SOUTH AFRICA-US INTRA-INDUSTRY TRADE IN SERVICES

Good data analysis…involves a theory-inspired dialogue in which data play an active role in the process of arriving at an appropriate specification of a model, and not just in testing.

Mukherjee, White and Wuyts (1998:3)

3.1 INTRODUCTION

This chapter provides a descriptive analysis of South Africa-US IIT in services with a view to identifying some stylised facts. The chapter is organised as follows. Section 3.2 briefly analyses problems in service trade data in the context of South Africa-US trade in services. Section 3.3 presents, a descriptive analysis of the structure and trends in South Africa-US trade in services over the period 1992-2003. Firstly, an analysis is done to reveal some trends in exports and imports flows in thirty sectors over the period 1992-2003. Secondly, the thirty sectors are sorted out using a methodology suggested by Abd-el-Rahman (1991) to identify service sectors with "genuine" IIT. In this process only thirteen sectors are identified for further analysis. Thirdly, Grubel and Lloyd (GL) IIT indices are computed for both unaffiliated and affiliated services. Finally, Section 3.4 presents the main insights and concluding remarks.

3.2 SERVICES TRADE DATA ISSUES

3.2.1 Overview of data problems

As pointed out by Hoekman (1995), data collection for international trade in services provides less detail and there is lack of consistency as compared to merchandise trade.

This can be attributed to a number of factors. Firstly, services were regarded as non-tradable intangible goods. Indeed, it is because of this that international trade theory (both the traditional school and new trade theory) largely neglected trade in services as a peripheral activity.

Secondly, international trade in services is difficult to measure. Services are intangible products that are produced and absorbed simultaneously. Consequently, international trade flows are difficult to capture in balance of payment statistics as no physical object crosses the customs points.

Thirdly, it is only recent with the advent of MSITS and extended BMP5 that detailed universal international standards on what should be classified as services came out and is not yet in use in many countries. Thus for a long time, services data have been collected on the basis of the BMP5, which has many limitations, notably the lack of bilateral trade flow data. The following problems are based on Hoekman (1995) analysis.

3.2.1.1 Aggregation, consistency and coverage

It is not very easy to know whether a particular classification is consistently applied across countries (e.g. classification used by SARB and the US Bureau for Economic Analysis). Moreover, the level of aggregation available in data on services is limited in comparison with merchandise, which makes the computation of IIT indices prone to sectoral aggregation bias.

3.2.1.2 Real vs. nominal international trade data

Data for international trade in services are available in nominal value terms (rands or US dollars). There are no quantities or prices, which makes it difficult to interpret growth of trade in services because the price effects cannot be factored out. Moreover, data on quality improvements in service products, a crucial element in technological improvement over time, is not available.

3.2.1.3 Concordance with sectoral GDP and employment data from national income accounts

The classification of service trade data is not concordant with that of domestic value-added (GDP) and employment. Although BMP5, which has been the basis of data collection for most countries since 1993, attempted to deal with the problem of inconsistency and aggregation, much still needs to be done. Firstly, trade data is not reported on an "origin" and "destination" basis and this makes it difficult to model IIT in services without suffering from geographical aggregation bias. Secondly, some items of service trade in BMP5 have no counterparts in the national accounts and employment produced by national data collecting agencies such as STATSSA in South Africa. This is true for the categories "travel"; "government services not included elsewhere" and "royalties and license fees", among others.

It is against this background that mirrored exports and imports data from the US Bureau for Economic Analysis for the period 1992-2003 is used in this study.

3.2.2 Data from the US Bureau for Economic Analysis (BEA)

BEA is the primary collector of data on US international transactions in private services. The BEA classification is based on broad "standard components" in BMP5. Many of the categories in the surveys also correspond to the categories in other classification system for trade in services e.g. MSITS. The BEA system includes all of the manuals' components for services, but with further breakdowns within some groups.

According to US department of commerce (1998), the definitions that underlie the transactions in private services covered by the BEA's surveys are the same as those that underlie the balance of payments accounts. Thus an international transaction is a transaction between a resident and a non-resident, or foreigner. Affiliates of multinational companies are regarded as residents of the countries where they are located

rather than the countries of the owners. For instance, Coca Cola South Africa is regarded as resident in South Africa and not the US.

This data is consistent and is more disaggregated than data from SARB or BMP5. However, there are some limitations, such as lack of price data and difficulties in relating with the national accounts data in South Africa. The detailed description of service industries is presented in Tables A.13 through A.16 in the appendix.

3.2.3 Nominal Vs real data

In the long run if prices of services are not distorted by government intervention, perfectly competitive markets will ensure that nominal exports indicate the minimal attainable resource costs of a service. However, in the short-run under conditions of imperfect competition, price differences that reflect international inter-sectoral differences in competitiveness may distort the picture of actual relative resource costs and specialisation. Similarly, high variability in nominal exchange rates and domestic inflation may make the nominal unit values not reflect the resource costs of production.

However, the calculation of real exports and imports data requires information on sectoral price indices. This data is not available for South Africa. Since using the overall price index would distort the data, the study uses nominal data.

3.3 SOUTH AFRICA-US TRADE IN SERVICES: STRUCTURE AND TRENDS

3.3.1 Trends in South Africa-US total exports and imports of services

Figure 3.1 shows a number of stylised facts about South Africa's trade in services with the US during the period 1992-2003. Firstly, South Africa has a negative trade balance in services with the US. Secondly, exports and imports of services exhibited the same trend in the period 1992-2003. There was a general rise in both nominal exports and

imports until 1999, reflecting the effects of South Africa's readmission into the world community following the new political dispensation in 1994. However, the rising trend was reversed during the period 2000-2002. In 2003, both exports and imports increased reflecting the recovery of the US economy.

3.3.2 Sectoral performance of South Africa-US exports of services

Table 3.1 shows the performance of South Africa's exports of services to the US in the period 1992-2003. Tourism (travel) sector is the leading industry and accounted for 44.1 per cent of unaffiliated exports in 2003. The sector grew from US $ 101 million in 1992 to US $ 360 million in 2003.

The transport sector is the second after tourism and accounted for 38 per cent of unaffiliated trade in 2003. Passenger fares dominate the transport sector, accounting for 79 per cent of transport exports to the US in 2003.

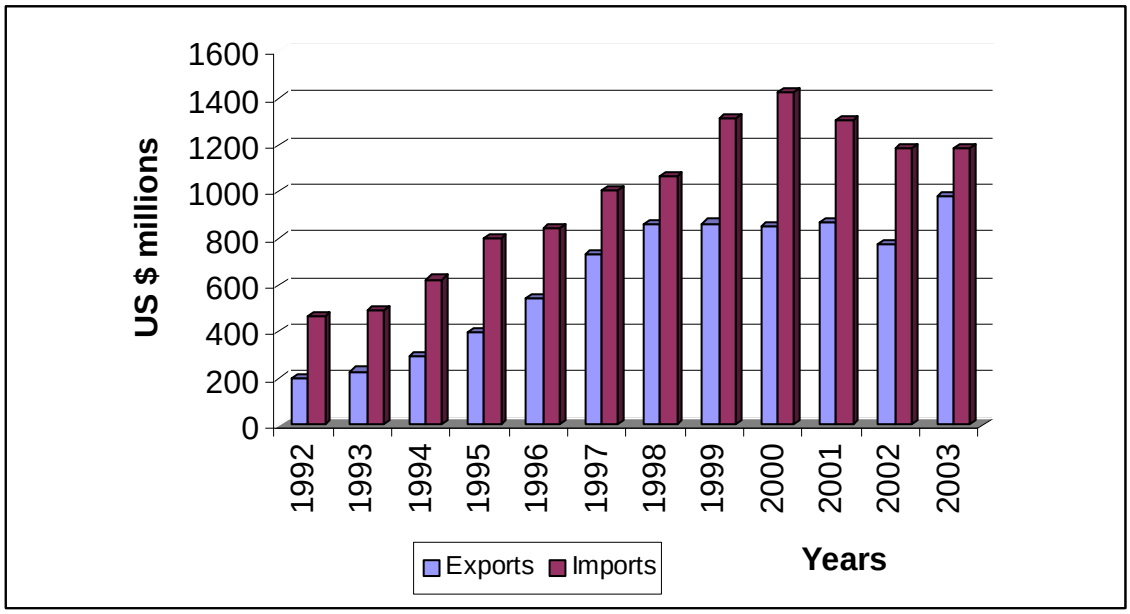
The other private services category is important for South Africa since it plays a development role in the economy. In this category, the leading service industries are business, professional, and technical services; financial services; education and training services; and telecommunication services.

There are services within this category, where South Africa had negligible or no exports to the US in the period 1992-2003: insurance services; database and other information services; industrial engineering; and operating leasing. This sector also had services in which data was not disclosed in order to avoid disclosure of specific company information e.g. database and other information and industrial engineering. These are indicated by (D).

Exports of services under the category royalties and fees are negligible. The only service sectors within this category where South Africa exported to the US are industrial

processes; books records and tapes (1994, 1995 and 1996) and general use computer software.

Figure 3.1: South Africa-US total exports and imports of services in the period 1992-2003



Source: US Bureau for Economic Analysis, http://www.bea.gov/bea/di/1001serv/intlserv.htm

The US BEA reported aggregated data on affiliated services in other private services and royalties and fees. Moreover in a number of years, the data is concealed (i.e. indicated with D) to avoid disclosure of individual companies. This is not surprising given the fact that affiliated services entail trade with related parties (American parents and affiliates located in South Africa). Nonetheless, it is apparent from Table 3.1 that South African affiliates receive more from their US parents than the South Africa's parents receive from the US affiliates.

Table 3.2 shows imports of services from the US in the period 1992-2003. The structure of imports is similar to the one of exports. The leading service industries are transport; travel; and other private services. In the period 1992-2003, South Africa's imports in

service industries witnessed growth in tourism; airport services; telecommunications; financial services; education and training etc. This could be the result of the readmission of South Africa into the international trading world. South Africa also reduced imports of services from the US in industrial processes; ocean freight services; construction, engineering, architectural and mining services; other intangibles; books, records and tapes etc.

Although it is problematic to discern trends on affiliated services due to unreported data, payments to US parents by South African affiliates are more than payments to US affiliates by South African parents. This means that there are more American affiliates in South Africa than the latter in the former.

Despite the fact that South Africa has trade deficits in most services with the US, passenger fares recorded a surplus.

3.3.3 Threshold of overlap trade (genuine IIT)

The GL index and its variants do not give an explicit methodology to separate inter-industry from IIT because the index basically focuses on trade overlap. This implies that any service that has a GL index greater than zero will be deemed two-way trade (IIT). Andresen (2003), following the work of Abd-el-Rahman (1991) and Fontagné and Freudenberg (1997), argues that trade within a commodity classification is considered IIT when the value of the minority trade flow represents at least some threshold percentage of the majority trade flows. Specifically, trade is considered IIT if;

$$\frac{Min(X,M)}{Max(X,M)} > \gamma\% \qquad (3.1)$$

Where X and M are exports and imports respectively, while γ is the threshold percentage. Most studies (for instance Fontagné and Freudenberg, 1997) use 10 per cent.

Table 3.1: South Africa's exports of services to the US in the period 1992-2003(nominal US $ millions)

Service sector	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Unaffiliated services												
Travel services	101.0	127.0	141.0	198.0	268.0	272.0	362.0	250.0	272.0	285.0	250.0	360.0
Transport services	**55.0**	**55.0**	**94.0**	**141.0**	**142.0**	**268.0**	**309.0**	**369.0**	**308.0**	**299.0**	**278.0**	**311.0**
Passenger fares	28.0	45.0	77.0	119.0	124.0	239.0	273.0	305.0	254.0	261.0	227.0	247.0
Ocean freight	0.0	0.0	6.0	8.0	5.0	14.0	21.0	45.0	35.0	18.0	27.0	30.0
Airfreight	2.0	4.0	4.0	5.0	5.0	8.0	8.0	9.0	9.0	8.0	8.0	11.0
Ocean port services	23.0	5.0	6.0	6.0	4.0	2.0	2.0	4.0	5.0	6.0	4.0	8.0
Airport services	2.0	1.0	1.0	3.0	4.0	5.0	5.0	6.0	5.0	6.0	12.0	15.0
Other private services	**41.6**	**48.6**	**49.8**	**56.5**	**(D)**	**(D)**	**99.5**	**101.8**	**(D)**	**(D)**	**(D)**	**144.0**
Education and training services	0.4	0.4	1.1	0.8	7.3	4.4	6.5	8.3	9.7	13.3	15.2	21.4
Financial services	1.6	2.0	3.1	4.6	7.0	9.0	9.0	12.0	16.0	14.0	19.0	23.0
Insurance services	0.0	0.0	0.0	-0.1	0.2	0.2	0.2	0.3	0.5	0.0	0.0	0.0
Telecommunications services	27.0	35.0	30.0	33.0	52.0	54.0	60.0	52.0	40.0	31.0	16.0	17.0
Business, professional and technical services:	11.0	10.0	14.0	17.0	19.0	20.0	23.0	28.0	31.0	59.0	109.0	80.0
(i)Advertising	0.0	1.0	1.0	1.0	3.0	3.0	5.0	3.0	4.0	5.0	3.0	5.0
(ii)Computer and data processing	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	(D)	15.0	5.0
(iii)Database and other information	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
(iv)Research, development, and testing	1.0	1.0	2.0	3.0	2.0	1.0	1.0	6.0	19.0	32.0	15.0	9.0
(v)Management, consulting, and public relations	2.0	0.0	1.0	1.0	1.0	2.0	1.0	2.0	5.0	3.0	6.0	7.0
(vi)Legal services	1.0	1.0	1.0	2.0	2.0	2.0	3.0	2.0	3.0	3.0	3.0	5.0
(vii)Construction, engineering, architectural and mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0
(viii)Industrial engineering	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(D)	(D)	0.0	0.0
(ix)Installation, maintenance, and repair of equipment	0.0	0.0	0.0	2.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	9.0
(x)Operating leasing										0.0	0.0	0.0
(xi)Other business, professional and testing services	7.0	7.0	9.0	8.0	11.0	10.0	11.0	15.0	(D)	16.0	66.0	38.0
Other	1.6	1.2	1.6	1.2	(D)	(D)	0.8	1.2	1.6	1.6	(D)	2.6
Royalties and fees	**0.0**	**0.0**	**2.0**	**1.0**	**5.0**	**9.0**	**0.0**	**(D)**	**0.0**	**1.0**	**2.0**	**2.0**
Industrial processes	0.0	0.0	1.0	0.0	4.0	5.0	0.0	0.0	0.0	0.0	1.0	1.0
Books, records, and tapes	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Broadcasting and recording of live events	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Franchise fees	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trademarks			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
General use computer software							0.0	(D)	0.0	1.0	1.0	1.0
Other intangibles	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Affiliated services												
Other private services	**1.0**	**0.0**	**7.0**	**5.0**	**(D)**	**(D)**	**85.0**	**137.0**	**134.0**	**107.0**	**(D)**	**(D)**
Receipts by South African affiliates from US parents	1.0	0.0	1.0	3.0	24.0	57.0	85.0	131.0	133.0	107.0	(D)	(D)
Receipts by South African parents from US affiliates	0.0	0.0	6.0	2.0	(D)	(D)	0.0	6.0	1.0	0.0	3.0	(D)
Royalties and fees	**1.0**	**0.0**	**3.0**	**0.0**	**1.0**	**1.0**	**1.0**	**(D)**	**2.0**	**2.0**	**2.0**	**3.0**
Receipts by South African affiliates from US parents	1.0	0.0	3.0	0.0	1.0	1.0	1.0	4.0	2.0	2.0	2.0	3.0
Receipts by South African parents from US affiliates	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(D)	0.0	0.0	0.0	0.0
Summary												
Total unaffiliated trade	**197.6**	**230.6**	**286.8**	**396.5**	**(D)**	**(D)**	**770.5**	**(D)**	**(D)**	**(D)**	**(D)**	**817.0**
Total affiliated trade	**2.0**	**0.0**	**10.0**	**5.0**	**(D)**	**(D)**	**86.0**	**(D)**	**136.0**	**109.0**	**(D)**	**(D)**
Grand total*	**202.0**	**230.0**	**294.0**	**400.0**	**543.0**	**728.0**	**858.0**	**864.0**	**855.0**	**870.0**	**777.0**	**977.0**

Source: Data from the US BEA, http://www.bea.gov/bea/di/1001serv/intlserv.htm

Notes: (i) (D) means that the US BEA suppressed the data to avoid disclosure of individual companies
(ii) Exports flows of less than US $ 500,000 is rounded downwards to US $ 0 million
(iii) The column totals do not necessarily sum to the grand total. The grand total is taken directly from the US BEA web site.

Table 3.2: South Africa's imports of services from the US in the period 1992-2003

Service sector	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Unaffiliated services												
Travel services	151.0	203.0	288.0	344.0	285.0	370.0	386.0	386.0	429.0	342.0	248.0	252.0
Transport Services	**98.0**	**33.0**	**48.0**	**84.0**	**91.0**	**132.0**	**77.0**	**107.0**	**138.0**	**138.0**	**130.0**	**170.0**
Passenger fares		1.0	14.0	1.0	7.0			9.0	11.0	10.0	9.0	20.0
Ocean freight	75.0	7.0	6.0	5.0	8.0	4.0	5.0	8.0	5.0	8.0	8.0	8.0
Airfreight	3.0	3.0	3.0	4.0	3.0	3.0	5.0	6.0	4.0	5.0	4.0	4.0
Other freight	1.0	2.0	3.0	7.0	7.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0
Ocean port services	0.0	0.0	2.0	2.0	3.0	6.0	7.0	21.0	16.0	6.0	10.0	11.0
Airport services	19.0	20.0	20.0	65.0	63.0	110.0	52.0	55.0	94.0	101.0	91.0	119.0
Other private services	**129.2**	**155.4**	**169.8**	**198.7**	**(D)**	**290.7**	**343.3**	**463.0**	**(D)**	**(D)**	**486.8**	**474.7**
Education and training Services	1.0	29.9	31.4	33.9	35.2	35.9	37.1	39.5	43.7	49.6	54.6	52.4
Financial services	15.0	15.3	13.9	20.0	26.0	27.0	40.0	39.0	48.0	53.0	58.0	43.0
Insurance services	0.3	0.1	0.0	0.2	1.0	1.8	2.6	1.4	2.1	3.0	2.8	7.6
Telecommunications services	16.0	18.0	17.0	28.0	51.0	60.0	69.0	78.0	73.0	109.0	57.0	68.0
Business, professional and technical services:	68.0	72.0	77.0	81.0	(D)	118.0	129.0	209.0	(D)	(D)	178.0	213.0
(i)Advertising	1.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	2.0	1.0
(ii)Computer and data processing	9.0	7.0	16.0	18.0	12.0	23.0	16.0	85.0	80.0	85.0	82.0	97.0
(iii)Database and other information	4.0	2.0	14.0	25.0	(D)	30.0	44.0	49.0	55.0	(D)	8.0	20.0
(iv)Research, development, and testing	0.0	1.0	0.0	3.0	5.0	4.0	3.0	5.0	(D)	42.0	9.0	11.0
(v)Management, consulting, and public relations	3.0	5.0	5.0	9.0	8.0	12.0	15.0	25.0	21.0	19.0	20.0	26.0
(vi)Legal services	2.0	2.0	3.0	3.0	8.0	4.0	5.0	6.0	16.0	9.0	9.0	10.0
(vii)Construction,engineering,architectural and mining	28.0	36.0	15.0	3.0	10.0	9.0	7.0	4.0	(D)	9.0	10.0	3.0
(viii)Industrial engineering	0.0	0.0	0.0	0.0	(D)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(ix)Installation, maintenance, and repair of equipment	14.0	11.0	16.0	9.0	8.0	16.0	12.0	16.0	13.0	18.0	18.0	13.0
(x)Operating leasing										1.0	0.0	0.0
(xi)Other	7.0	7.0	7.0	10.0	(D)	19.0	26.0	19.0	15.0	(D)	20.0	32.0
Other	28.9	20.1	30.5	35.6	(D)	48.0	65.6	96.1	88.1	98.0	136.4	90.7
Royalties and fees	**62.0**	**56.0**	**55.0**	**66.0**	**60.0**	**(D)**	**(D)**	**(D)**	**(D)**	**70.0**	**(D)**	**(D)**
Industrial processes	22.0	32.0	23.0	28.0	23.0	11.0	14.0	16.0	7.0	7.0	10.0	13.0
Books, records, and tapes	22.0	4.0	6.0	8.0	4.0	3.0	4.0	5.0	5.0	5.0	4.0	3.0
Broadcasting and recording of live events	0.0	4.0	1.0	1.0	1.0	2.0	1.0	3.0	1.0	0.0	3.0	(D)
Franchise fees	3.0	3.0	2.0	2.0	3.0	(D)	5.0	4.0	5.0	5.0	(D)	5.0
Trademarks			12.0	13.0	11.0	9.0	(D)	(D)	(D)	4.0	5.0	8.0
General use computer software							39.0	43.0	45.0	49.0	30.0	28.0
Other intangibles	15.0	13.0	11.0	14.0	18.0	(D)	0.0	0.0	0.0	0.0	0.0	0.0
Affiliated services												
Other private services	**14.0**	**13.0**	**16.0**	**19.0**	**(D)**	**50.0**	**73.0**	**88.0**	**83.0**	**83.0**	**69.0**	**70.0**
Payments to US parents by South African affiliates	14.0	13.0	16.0	16.0	17.0	47.0	72.0	82.0	81.0	75.0	67.0	62.0
Payments to US affiliates by South African parents	0.0	0.0	0.0	3.0	(D)	3.0	1.0	6.0	2.0	8.0	2.0	8.0
Royalties and fees	**30.0**	**32.0**	**46.0**	**85.0**	**102.0**	**97.0**	**(D)**	**(D)**	**(D)**	**129.0**	**(D)**	**(D)**
Payments to US parents by South African affiliates	30.0	31.0	45.0	84.0	102.0	97.0	98.0	158.0	127.0	125.0	105.0	156.0
Payments to US affiliates by South African parents	0.0	1.0	1.0	1.0	0.0	0.0	(D)	(D)	(D)	4.0	(D)	(D)
Summary												
Total Unaffiliated services	**440.2**	**447.4**	**560.8**	**692.7**	**(D)**	**(D)**	**(D)**	**(D)**	**(D)**	**(D)**	**(D)**	**(D)**
Total affiliated services	**44.0**	**45.0**	**62.0**	**104.0**	**(D)**	**147.0**	**(D)**	**(D)**	**(D)**	**212.0**	**(D)**	**(D)**
Grand total*	**462**	**493**	**624**	**797**	**842**	**1003**	**1068**	**1317**	**1425**	**1304**	**1183**	**1188**

(nominal US $ millions)

Source: Data from the US BEA, http://www.bea.gov/bea/di/1001serv/intlserv.htm

Notes:(i) (D) means that the US BEA suppressed the data to avoid disclosure of individual companies
(ii) Imports flows of less than US $ 500,000 is rounded downwards to US $ 0 million
(iii) The column totals do not necessarily sum to the grand total. The grand total is taken directly from the US BEA web site.

A threshold level of 12 per cent is used in this study to cut off borderline cases. Below this threshold level, the minority flow would not be considered significant since it does not represent a structural feature of trade.

Table 3.3 shows unaffiliated minority service trade flow as a percentage of majority services flow. The last column shows the average for each service industry over the period 1992-2003 (excluding those years marked N/A or D).

Those service sectors where minority flow, as a percentage of majority flow is greater than 12 per cent have the average value shaded and it shows that IIT is a structural feature of South Africa-US trade.

The rest of the services have the contribution of minority flow to majority flow below the threshold value of 12 per cent. For these services, IIT is not a structural feature of trade and they are excluded from the subsequent analysis of IIT.

Table 3.4 shows affiliated minority service flow as a percentage of majority service. Although the other private service flows meet the threshold criterion of 12 per cent, the high figure is attributed to categorical aggregation bias.

Table 3.3: Unaffiliated minority service flow as a percentage of majority service flow

Service sector	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Aver.
Travel services	66.9	62.6	49.0	57.6	94.0	73.5	93.8	64.8	63.4	83.3	99.2	70.0	73.2
Transport services													
Passenger fares	100.0	2.2	18.2	0.8	5.6	100.0	100.0	3.0	4.3	3.8	4.0	8.1	29.2
Ocean freight	0.0	0.0	100.0	62.5	62.5	28.6	23.8	17.8	14.3	44.4	29.6	26.7	34.2
Air freight	66.7	75.0	75.0	80.0	60.0	37.5	62.5	66.7	44.4	62.5	50.0	36.4	59.7
Other freight	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ocean port services	0.0	0.0	33.3	33.3	75.0	33.3	28.6	19.0	31.3	100.0	40.0	72.7	38.9
Airport services	10.5	5.0	5.0	4.6	6.3	4.5	9.6	10.9	5.3	5.9	13.2	12.6	7.8
Other private services													
Education and training Services	40.0	1.3	3.5	2.4	20.7	12.3	17.5	21.0	22.2	26.8	27.8	40.8	19.7
Financial services	10.7	13.1	22.3	23.0	26.9	33.3	22.5	30.8	33.3	26.4	32.8	53.5	27.4
Insurance services	0.0	0.0	N/A	-50.0	20.0	11.1	7.7	21.4	23.8	0.0	0.0	0.0	3.1
Telecommunications services	59.3	51.4	56.7	84.8	98.1	90.0	87.0	66.7	54.8	28.4	28.1	25.0	60.9
Business, professional and technical services:													
(i) Advertising	0.0	100.0	100.0	100.0	0.0	33.3	20.0	0.0	25.0	20.0	66.7	20.0	40.4
(ii)Computer and data processing	0.0	0.0	0.0	0.0	0.0	4.3	6.3	0.0	0.0	100.0	18.3	5.2	11.2
(iii)Database and other information	0.0	0.0	0.0	0.0	(D)	3.3	0.0	0.0	0.0	(D)	0.0	0.0	0.3
(iv)Research, development, and testing	0.0	100.0	0.0	100.0	40.0	25.0	33.3	83.3	100.0	76.2	60.0	81.8	58.3
(v)Management, consulting, and public relations	66.7	0.0	20.0	11.1	12.5	16.7	6.7	8.0	23.8	15.8	30.0	26.9	19.8
(vi)Legal services	50.0	50.0	33.3	66.7	25.0	50.0	60.0	33.3	18.8	33.3	33.3	50.0	42.0
(vii)Construction, engineering, architectural and mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(D)	0.0	10.0	66.7	N/A
(viii)Industrial engineering	N/A	N/A	N/A	N/A	(D)	N/A	N/A	N/A	(D)	(D)	N/A	N/A	N/A
(ix)Installation, maintenance, and repair of equipment	0.0	0.0	0.0	22.2	0.0	0.0	8.3	0.0	0.0	0.0	0.0	69.2	8.3
(x)Operating leasing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(xi)Other business, professional and technical services	100.0	100.0	77.8	80.0	(D)	52.6	42.3	78.9	(D)	(D)	30.3	84.2	71.8
Other private services	5.5	6.0	5.2	3.4	(D)	100.0	1.2	1.2	1.8	1.6	100.0	2.9	20.8
Royalties and fees													
Industrial processes	0.0	0.0	4.3	0.0	17.4	45.5	0.0	0.0	0.0	0.0	10.0	7.7	7.1
Books, records, and tapes	0.0	0.0	16.7	12.5	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5
Broadcasting and recording of live events	N/A	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	N/A	0.0	N/A	N/A
Franchise fees	0.0	0.0	0.0	0.0	0.0	(D)	0.0	0.0	0.0	0.0	(D)	0.0	0.0
Trademarks	N/A	N/A	0.0	0.0	0.0	0.0	(D)	(D)	(D)	0.0	0.0	0.0	N/A
General use computer software	N/A	N/A	N/A	N/A	N/A	N/A	0.0	(D)	0.0	2.0	3.3	3.6	N/A
Other intangibles	0.0	0.0	0.0	0.0	0.0	(D)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: Data from the US BEA, http://www.bea.gov/bea/di/1001serv/intlserv.htm

Notes:(i) "D" means that the US BEA suppressed the data to avoid disclosure of individual companies
(i) "N/A" means that minority flows, as a percentage of majority flows could not be computed due to situations where it requires division by 0
(iii) Shaded cells show that the service sector in question meet the threshold requirement of 12 per cent

Table 3.4: Affiliated minority service flow as a percentage of majority service flow

Service sector	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Aver.
Other private services													
Payments to US parents by South African affiliates	7.1	0.0	6.3	18.8	70.8	82.5	84.7	62.6	60.9	70.1	100.0	100.0	55.3
Payments to US affiliates by South African parents	N/A	N/A	0.0	66.7	(D)	100.0	0.0	100.0	50.0	0.0	66.7	100.0	53.7
Royalties and fees													
Payments to US parents by South African affiliates	3.3	0.0	6.7	0.0	1.0	1.0	1.0	2.5	1.6	1.6	1.9	1.9	1.9
Payments to US affiliates by South African parents	N/A	0.0	0.0	0.0	N/A	N/A	(D)	(D)	(D)	0.0	(D)	(D)	N/A

Source: Data from the US BEA, http://www.bea.gov/bea/di/1001serv/intlserv.htm

Notes:(i) "D" means that the US BEA suppressed the data to avoid disclosure of individual companies
(i) "N/A" means that minority flows, as a percentage of majority flows could not be computed due to situations where it requires division by 0
(iii) Shaded cells show that the service sector in question meets the threshold requirement of 12 per cent

3.3.4 South Africa-US IIT in services

Having selected service sectors where IIT is a significant feature of trade, it is imperative to adjust the data for two features. Firstly, it is important to disentangle HIIT from VIIT since they have different determinants and consequences. Secondly, it is important to separate "extended" IIT so as to take into account the fact that arms-length IIT and cross-border production may be complements rather than substitutes.

However, these two concerns are not explicitly addressed in this study due to lack of data. Consequently, total IIT in unaffiliated services is computed using unadjusted GL index in Equation 2.21. The GL indices in Table 3.5 have been calculated while being cognisant of the need to minimise potential biases. Firstly, the indices are computed on a strict bilateral basis thus avoiding geographical aggregation bias highlighted in Section 2.6.1.2.2. Secondly, sectoral aggregation bias is minimised in most service sectors except travel, where IIT is calculated at the most aggregated level. It is assumed that the classification used by US BEA defines an "industry" in an economically meaningful way and does not artificially lump together services.

Table 3.5: Unadjusted GL index of South Africa-US IIT in unaffiliated services in the period 1992-2003

Service sector	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Average
Travel(tourism) services	0.80	0.77	0.66	0.73	0.97	0.85	0.97	0.79	0.78	0.91	1.00	0.82	**0.84**
Other business, professional and technical services	1.00	1.00	0.88	0.89	(D)	0.69	0.59	0.88	(D)	(D)	0.47	0.91	**0.81**
Airfreight services	0.80	0.86	0.86	0.89	0.75	0.55	0.77	0.80	0.62	0.77	0.67	0.53	**0.74**
Telecommunications services	0.74	0.68	0.72	0.92	0.99	0.95	0.93	0.80	0.71	0.44	0.44	0.40	**0.73**
Research, development, and testing services	0.00	1.00	0.67	1.00	0.57	0.40	0.50	0.91	(D)	0.86	0.75	0.90	**0.69**
Legal services	0.67	0.67	0.50	0.80	0.40	0.67	0.75	0.50	0.32	0.50	0.50	0.67	**0.58**
Ocean port services	0.00	0.00	0.50	0.50	0.86	0.50	0.44	0.32	0.48	1.00	0.57	0.84	**0.50**
Advertising	0.00	1.00	1.00	1.00	0.00	0.50	0.33	0.00	0.40	0.33	0.80	0.33	**0.47**
Ocean freight Services	0.00	0.00	1.00	0.77	0.77	0.44	0.38	0.30	0.25	0.62	0.46	0.42	**0.45**
Financial services	0.19	0.23	0.36	0.37	0.42	0.50	0.37	0.47	0.50	0.42	0.49	0.70	**0.42**
Education and training services	0.57	0.03	0.07	0.05	0.34	0.22	0.30	0.35	0.36	0.42	0.44	0.58	**0.31**
Management, consulting, and public relations services	0.80	0.00	0.33	0.20	0.22	0.29	0.13	0.15	0.38	0.27	0.46	0.42	**0.30**
Passenger fares	0.00	0.04	0.31	0.02	0.11	0.00	0.00	0.06	0.08	0.07	0.08	0.15	**0.08**

Source: Data from the US BEA, http://www.bea.gov/bea/di/1001serv/intlserv.htm

Notes: "D" means that the IIT could not be computed due to missing data

The last column shows the unweighted average IIT over the period 1992-2003, excluding those years where the US Bureau for Economic Analysis did not disclose data (indicated by D).

The service industries are ranked in decreasing order using the last column. There is considerable difference among industries. Tourism sector is the leading in terms of IIT followed by "other business, professional and testing services". Passenger fares has the lowest level of IIT. The high IIT in travel services shows that South Africa has some competitive advantage relative to the US and this is a structural feature of most middle-income countries.

It is, however, imperative to note some GL index limitations when comparing trade over time. The GL index is homogeneous of degree zero. Caves (1981) and Hamilton and Kniest (1991), underscore this characteristic by arguing that an equal increase in service

exports and imports within an industry owing to trade liberalisation, would raise the quantity of IIT, but its proportion measured by the GL index would remain the same.

If the changes in exports and imports are different, the GL index may give results, which are counterintuitive. For instance, as pointed out by Andresen (2003), the GL index may increase following an imposition of a trade barrier. This does not mean that the GL index is flawed; rather it should be interpreted cautiously.

3.4 MAIN INSIGHTS AND CONCLUDING REMARKS

This chapter sought to provide some descriptive analysis of South Africa-US trade in services. The following facts emerge from the analyses. Firstly, international trade in services data from SARB or BMP5 are unreliable due to lack of bilateral trade flows and insufficient aggregation. In view of this, the study uses mirrored exports and imports data from US BEA. The data is consistent and disaggregated at a higher level than the SARB and BMP5 but there are still problems with lack of unit values and difficulty in concordance with national accounts data from STATSSA.

Secondly, South has an unfavourable trade balance in services with the US. There are however, sectors whose deficits have increased substantially in the recent past. A case in point is telecommunications sector. Thirdly, in terms of the ranking, tourism, transport and other private services are the leading exports and imports service sectors. Fourthly, although it is difficulty to discern trends in affiliated services due to unreported data, it is possible to see that there are more American affiliates in South Africa than South African affiliates in the US. Specifically, South African affiliates receive more from their US parents than the former receive from the latter's affiliates. In the same vein, payments to US parents by South African affiliates are more than payments to US affiliates by South African parents.

Fifthly, although there are thirty service sectors, only thirteen of them meet the 12 per cent threshold of minority as a percentage of majority flows. IIT analysis is conducted on these thirteen sectors only.

Sixthly, it is important to disentangle HIIT from VIIT and "extended IIT" because theoretically they have different determinants and labour market adjustment consequences. However, this process is frustrated by the lack of appropriate data and it is because of this that the thesis constructs "total" South Africa-US IIT in services indices. These indices do not show the extent of horizontally (variety) differentiated, vertically (quality) differentiated and extended intra-industry trade flows. An attempt is made in Chapter 5 to infer whether HIIT or VIIT is the dominant form of differentiation by using IIT theories such as the CHO.

Seventhly, despite the data problems, IIT indices are computed while being cognisant of the need to minimise potential biases. In this regard, the indices are computed on a strict bilateral basis (South Africa Vs US) thus avoiding geographical aggregation bias. Moreover, sectoral aggregation bias is minimised in most service sectors except travel, where IIT is calculated at the most aggregated level. It is assumed that the classification used by US BEA defines an "industry" in an economically meaningful way and does not artificially lump together services. It is also noted that real and nominal data leads to the same GL index since this index is homogenous of degree zero.

Chapter 4 basically builds on the descriptive analysis in Chapter 3 and analyses barriers to trade in services in South Africa and the US. This is important because services face a lot of market access (MA) and national treatment (NT) restrictions in most countries. Although the study is concerned with barriers that inhibit South Africa-US IIT in services, the most favoured nation (MFN) principle implies that they affect all WTO members[13].

[13] Unless South Africa or the US has scheduled it as exempted under annex to Article II of the GATS (World Trade Organization, 2002:308)

CHAPTER 4

BARRIERS TO INTERNATIONAL TRADE IN SERVICES IN SOUTH AFRICA AND THE US

It is incumbent on both trade theorists and trade policy practitioners to understand the nature of services, trade in services and services trade barriers. The aim should… be to identify negotiating priorities, so as to maximise net benefits and reduce unintended consequences…

Philippa Dee (2003:1)

4.1 INTRODUCTION

This chapter focuses on barriers to trade in services. This is predicated on the fact that given the nature of services, traditional instruments of trade policy such as tariffs applied by customs authorities at the border are not applicable. Instead, the barriers in international trade in services are typically behind-the border, direct controls on market access (MA) and discrimination of foreign providers (NT). Dee (2003) argues that one of the main reasons for the regulations in services is market failure. In South Africa, natural monopoly characterizes a range of network services e.g.Telkom, SAA and Sasol. Similarly, asymmetric information and adverse selection characterize professional, health and education services.

In view of the nature of trade in services and impediments to such trade, measuring the barriers to trade is a complicated task. Attempts to measure restrictions on MA have centred on descriptive statistics and construction of "indices" of restrictions of services for various sectors and countries.

The rest of the chapter is organised as follows. Section 4.2 presents some basic facts about the General Agreement on Trade in Services (GATS) to provide a basis for the subsequent sections. Section 4.3 surveys theoretical and empirical literature on the measurements of barriers to trade in services. Specifically, literature on frequency measures (Hoekman and Australian approaches), quantity-based measures and price-based measures are analysed. Trade restrictiveness indices and cost and price effect measures for many countries, including South Africa and the US, constructed by a group of researchers at Australia's productivity institute, are also presented. Section 4.4 deals with some fundamental issues on the computation of the Hoekman (1995) openness indices for South Africa and the US. Section 4.5 and 4.6 present the Hoekman (1995) frequency-based openness indices for South Africa and the US, respectively. The final section highlights the main insights and concluding remarks.

4.2 OVERVIEW OF SOME ISSUES UNDER THE GATS

The GATS came into force in January 1995 and is the first and the only set of multilateral rules covering international trade in services. It covers all internationally-traded services with two exceptions: services provided to the public in the exercise of governmental authority, and, in the air transport sector, traffic rights and all services directly related to the exercise of traffic rights.

Individual countries' commitments to open markets in specific sectors and how open the markets operate are determined by the outcome of negotiations. These commitments appear in "schedules" that list the sectors being opened, the extent of the MA and any limitations on national treatment (e.g. whether some rights granted to South African companies will be granted to foreign companies).

It is also important to take cognisance of the most-favoured-nation (MFN) principle. According to the World Trade Organisation (2002:287), MFN principle with regard to GATS means that, "each member shall accord immediately and unconditionally to

services and service suppliers of any other member treatment no less favourable treatment than it accords to like services and service suppliers of any other country…"

The MFN principle applies to all services, but annex on Article II of GATS allows special temporary exemptions to some services. When GATS came into force in 1995, a number of countries already had preferential agreements in services that they had signed with trading partners, either bilaterally or in small groups. The WTO members maintained these preferences and this effectively gave countries the right to continue according more favourable treatment to particular countries in particular services activities by listing "MFN exemptions" alongside their first sets of commitments.

The limitations and commitments are described as follows;
Bound: Means can only be modified after negotiations with affected countries. Thus "unbinding" is difficult since they are virtually guaranteed conditions for foreign exporters and importers of services and investors in the sector to do business.
Unbound: Means that the country has not undertaken to provide MA or equal treatment to foreign suppliers.
None: Means that there are no MA and NT limitations in the sector.

The WTO has a trade policy review mechanism (TPR), which facilitates adherence by member states to rules, disciplines and commitments made under multilateral trading agreements (World Trade Organisation, 2002: 380). The results are reported in TPR for various years (World Trade Organisation, 1996b, 1998c, 1999, 2001b and 2003).

Negotiations to further liberalize trade in services were launched in 2000, but have been rolled into the current multilateral trade round, referred to as the Doha Development Agenda (DDA), and they form part of the so-called "single undertaking".

After the deadlock in Cancún Ministerial Conference in September 2003, various efforts were undertaken to put the negotiations and the rest of the work programme back on track. These efforts resulted in the conclusion of "July 2004 package" (World Trade

Organisation, 2004) and while this decision brought renewed momentum to the negotiations, services are still at risk of falling behind the other negotiating areas. Under the terms of the July package, revised offers were due to be tabled in May 2005.

4.3 THEORETICAL AND EMPIRICAL LITERATURE

Research in measurement of trade in services is quite recent. Chen and Schembri (2003) provide a detailed review of the literature on measurement of barriers to trade. They argue that the measurement of barriers to trade in services is quite close to those that were previously constructed to measure non-tariff barriers (NTBs) in goods trade: quantity-based measures and price-based measures.

There are four types of barriers. Firstly, quantitative restrictions (QRs) or prohibitions on the provisions of services by foreign residents and apply to all four modes of supply of services. Secondly, price-based measures may be applied through differential taxes on the transactions of foreign providers, or through additional charges on the regulatory process that they engage in. Thirdly, licensing or certification requirements for providers of business or professional services. Finally, discriminatory access to distribution (retail) and communication networks.

4.3.1 Frequency measures

There are two different approaches to calculating frequency indices: the Hoekman (1995) and the Australian approach.

4.3.1.1 The Hoekman (1995) approach

This is the easiest to construct and the most widely used frequency measure. The index uses the GATS commitment schedules of WTO member states. Hoekman classified the commitments into three groups and assigned a numerical score to each category. Firstly, a value 1 is assigned if no restrictions are applied for a given mode of supply in a given

sector. This would apply for cells in the commitment schedule showing "none". Secondly, a value 0.5 is assigned if restrictions are listed for a given mode of supply in a given sector. Finally, a value of 0 is assigned if the country has not bound itself. This applies for a cell labelled "unbound".

These scores are the openness/binding factors. In view of the fact that there are 155 non-overlapping service categories in the GATS classification list and each category has four possible modes of supply, there are a total of 620 (155×4) openness/binding factors for each member country.

Hoekman then calculates a number of indices. Firstly, he calculates the number of commitments made by a country in its GATS schedule divided by 620. Secondly, he calculates an "average coverage ratio", which is equal to the sectors/modes listed as a share of maximum possible, weighted by the openness/binding factors. The third index is the share of "no restriction commitments" in either a member's total commitments or relative to the 155 possible sectors.

Hoekman (1995) argues that the GATS commitments provide information on the relative restrictiveness of the policy regimes pertaining to service industries since the coverage in each country's schedule is an indicator of its policy stance.

Hoekman used this methodology to construct frequency indices for high-income countries, middle-income countries and low-income countries. He finds that high-income countries made significantly more GATS commitments than did low and middle income countries.

4.3.1.2 The Australian approach

This approach uses information drawn from a variety of sources over and above the GATS commitment schedules to construct trade restrictiveness indices. A team of

researchers from Australia's Productivity Commission, the University of Adelaide, and the Australian National University pioneered this approach.

These indices are constructed as follows. The actual restrictions on trade and investment in a given service industry are compiled from a number of sources. The restrictions are then assigned scores and grouped into categories, each of which is assigned a numeric weight. The scores and weights are based on subjective assessment of the costs of restrictions to economic efficiency. Indices are then computed using these weights and scores.

The Australian researchers constructed trade restrictiveness indices for a number of service industries: education (Kemp, 2001 and Kalijaran, 2000), telecommunications (Warren 2001), banking (McGuire and Shuele, 2001), maritime transport (McGuire, Shuele and Smith, 2001), and professional services (Nguyen-Hong 2000).

Tables 4.1 through 4.5 show the results for South Africa and the US. Domestic index represents restrictions that are applied to domestic firms and cover non-discriminatory restrictions only. Foreign index measures all the restrictions that hinder foreign firms from entering and operating in an economy. It covers both discriminatory and non-discriminatory restrictions. These are the restrictions that are relevant for IIT in services. The difference between the foreign and domestic index is a measure of discrimination against foreigners.

The index methodology also distinguishes between restrictions applied to establishments and ongoing operations. Establishment refers to the ability of service suppliers to establish a physical outlet in a territory and supply a service through those outlets (mode 3 supply under GATS).

Restrictions on establishments differ from service to service but often include requirements for new firms, restrictions for permanent movement of people, restrictions on direct investment in existing firms. Restrictions on ongoing operations may include

restrictions on firms conducting their core business, the pricing of services and temporary movement of people.

Table 4.1 shows restrictiveness index scores for the telecommunications sector reported by Warren (2000). The results show that South Africa has a higher domestic and foreign restrictiveness index than the US. Moreover, the foreign restrictiveness index is higher than the domestic index. This implies that South Africa discriminates against foreign suppliers of telecommunication services. Warren argues that this is typical of a number of low and middle-income economies.

Table 4.2 shows trade restrictiveness indices for banking services reported in McGuire and Shuele (2000). The results show that South Africa and the US have no restrictions applied to domestic firms but there are more restrictions that hinder foreign firms in the former than the latter.

Restrictiveness indices for architectural services, constructed by Nguyen-Hong (2000), are reported in Table 4.3. Unlike the other services, the US has more restrictions than South Africa. The same applies to engineering services in Table 4.4 and distribution services in Table 4.5. South Africa should therefore focus on those sectors during services trade negotiations with the US.

Table 4.1: Restrictiveness index scores for telecommunications service sector

	Domestic index						Foreign index				
	Restrictions on establishment			Restrictions on ongoing operations			Restrictions on establishment		Restrictions on ongoing operations		
Economy	Restrictions on direct investment in fixed network services	Restrictions on direct investment in cellular mobile phone services	Restrictions on establishment total	Restrictions on cross-border trade	Restrictions on ongoing operations total	**Domestic index total**	Restrictions on direct investment in fixed and mobile network services	Restrictions on establishment total	Restrictions on cross-border trade	Restrictions on ongoing operations total	**Foreign index total**
South Africa	0.1300	0.0567	0.1867	0.2000	0.2000	**0.3867**	0.1867	0.1867	0.4000	0.4000	**0.5867**
United States	0.0000	0.0000	0.0000	0.0333	0.0333	**0.0333**	0.0000	0.0000	0.0333	0.0333	**0.0333**

Source: Warren, T.2000. The identification of impediments to trade and investment in telecommunications services. In: Findlay, C. and Warren, T. (eds) *Impediments to trade in services: Measurement and policy implications*. London and New York: Routledge: 71-84.

Notes: The domestic and foreign restrictiveness index scores range from 0 to 1. The higher the score, the greater the restrictiveness of an economy

Table 4.2: Restrictiveness index scores for banking services

	Restrictions on establishment					Restrictions on ongoing operations							
Economy	Licensing of banks	Direct investment	Joint venture arrangements	Permanent movement of people	**Restrictions on establishment total**	Raising funds by banks	Lending funds by banks	Other business of banks - insurance and securities services	Expanding the number of banking outlets	Compositition of the board of directors	Temporary movement of people	**Restrictions on ongoing operations total**	**Total restrictions on establishments and ongoing operations**
	Domestic Index												
South Africa	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	**0.0000**
United States	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	**0.0000**
	Foreign Index												
South Africa	0.0100	0.0100	0.0050	0.0086	0.0336	0.1144	0.0075	0.0050	0.0144	0.0120	0.0029	0.1561	**0.1897**
United States	0.0100	0.0100	0.0050	0.0010	0.0260	0.0075	0.0075	0.0050	0.0025	0.0120	0.0029	0.0374	**0.0634**

Source: McGuire. and Shuele, M.2001. Restrictiveness of international trade in banking services. In: Findlay, C. and Warren, T. (eds) *Impediments to trade in services: Measurement and policy implications*. London and New York: Routledge: 201-214.

Notes: The domestic and foreign restrictiveness index scores range from 0 to 1. The higher the score, the greater the restrictiveness of an economy

Table 4.3: Restrictiveness index scores for architectural services

	Restrictions on establishment												
Economy	Form of establishment	Investment and ownership by non-professional investors	Licensing and accreditation of local professionals	Foreign partnership or joint venture	Investment and ownership by foreign professionals	Nationality or citizenship requirements	Residency and local presence	Quotas or economic needs tests on the number of foreign professionals and firms	Licensing and accreditation of foreign professionals	Investment and ownership by non-professional investors	Licensing and accreditation of local professionals	Permanent movement of people	**Restrictions on establishment total**
	Domestic index												
South Africa	0.000	0.000	0.000							0.000	0.000		**0.000**
United States	0.040	0.050	0.000							0.050	0.000		**0.140**
	Foreign index												
South Africa	0.000	0.000		0.000	0.017	0.000	0.000	0.000	0.000			0.020	**0.037**
United States	0.040	0.050		0.000	0.000	0.000	0.000	0.050	0.000			0.020	**0.070**

	Restrictions on ongoing operations								
	Activities reserved by law to the profession	**Multi-disciplinary practices**	**Advertising, marketing and solicitation**	**Fee setting**	**Licensing requirements on management**	**Other restrictions**	**Temporary movement of people**	**Restrictions on ongoing operations total**	**Total restrictions on establishments and ongoing operations**
	Domestic index								
South Africa	0.000	0.000	0.000	0.000				0.000	**0.000**
United States	0.038	0.000	0.000	0.000				0.038	**0.178**
	Foreign index								
South Africa	0.013	0.017	0.025	0.013	0.005	0.000	0.003	0.074	**0.111**
United States	0.038	0.000	0.000	0.013	0.015	0.007	0.003	0.074	**0.144**

Source: Nguyen-Hong, D. 2000. Restrictions on trade in professional services. [Online] Available from: http://www.pc.gov.au/research/staffres/rotips/rotips.pdf [Downloaded: 2004-10-02].

Notes: The domestic and foreign restrictiveness index scores range from 0 to 1. The higher the score, the greater the restrictiveness of an economy

Table 4.4: Restrictiveness index scores for engineering services

	Restrictions on establishment											Restrictions on ongoing operations								
Economy	Form of establishment	Foreign partnership or joint venture	Investment and ownership by non-professional investors	Investment and ownership by foreign professionals	Licensing and accreditation of local professionals	Nationality or citizenship requirements	Residency and local presence	Quotas or economic needs tests on the number of foreign professionals and firms	Licensing and accreditation of foreign professionals	Permanent movement of people	**Restrictions on establishment total**	Activities reserved by law to the profession	Multi-disciplinary practices	Advertising, marketing and solicitation	Fee setting	Licensing requirements on management	Other restrictions	Temporary movement of people	**Restrictions on ongoing operations total**	**Total restricitons on establishments and ongoing operations**
	Domestic index																			
South Africa	0.0000		0.0000		0.0125						0.0125	0.0000	0.0000	0.0000	0.0000				0.0000	**0.0125**
United States	0.0000		0.0500		0.0125						0.0625	0.0500	0.0000	0.0000	0.0029				0.0529	**0.1154**
	Foreign index																			
South Africa	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0800	0.0080	0.0880	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0075	0.0075	**0.0955**
United States	0.0000	0.0000	0.0500	0.0000		0.0000	0.0312	0.0000	0.0400	0.0000	0.1212	0.0500	0.0000	0.0000	0.0029	0.0100	0.0000	0.0075	0.0704	**0.1915**

Source: Nguyen-Hong, D. 2000. Restrictions on trade in professional services. [Online] Available from: http://www.pc.gov.au/research/staffres/rotips/rotips.pdf [Downloaded: 2004-10-02].

Notes: The domestic and foreign restrictiveness index scores range from 0 to 1. The higher the score, the greater the restrictiveness of an economy

Table 4.5: Restrictiveness index scores for distribution services

Economy	Restrictions on establishment							Restrictions on ongoing operations							
	Restrictions on commercial land	Direct investment in distribution firms	Restrictions on large-scale stores	Factors affecting investment	Local government requirements	Permanent movement of people	**Restrictions on establishment total**	Wholesale import licensing	Limits on promotion of retail products	Statutory government monopolies	Protection of intellectual property rights	Licensing requirements on management	Temporary movement of people	**Restrictions on ongoing operations total**	**Total restrictions on establishments and ongoing operations**
	Domestic index														
South Africa	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0250			0.0250	**0.0250**
United States	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	**0.0000**
	Foreign index														
South Africa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0215	0.0215	0.0000	0.0000	0.0000	0.0250	0.0143	0.0072	0.0465	**0.0680**
United States	0.1000	0.0000	0.0000	0.0000	0.0000	0.0025	0.1025	0.0000	0.0000	0.0000	0.0000	0.0499	0.0072	0.0571	**0.1596**

Source: Kalijaran, K.2000. Restrictions on trade in distribution services. [Online] Available from: http://www.pc.gov.au/research/staffres/rotids/rotids.pdf [Downloaded: 2004:09:02].

Notes: The domestic and foreign restrictiveness index scores range from 0 to 1. The higher the score, the greater the restrictiveness of an economy

4.3.2 Quantity-based measures

These are derived using econometric models. They are based on the standard models of trade e.g. HOS, where trade is motivated by comparative advantage/factor endowment, new trade theories (differentiation, economies of scale etc) and gravity models where an important part of trade is determined by the relative size and proximity of trading partners (in terms of distance, language, culture etc.).

The size of non-trade barriers are measured either by residuals from the estimated regression (difference between the level of actual trade and the level of predicted trade) or by using various dummy variables.

Fancois and Hoekman (1999) fit a gravity model of bilateral trade in services between the US and her major trading partners. The independent variables are per-capita income, gross domestic product, and Western Hemisphere dummy variable. The difference between actual and predicted imports (residuals) is taken as the size of the barriers to trade.

4.3.3 Price-based measures

Price-based measures derive estimates of barriers to trade from differences in domestic and foreign prices ("price wedges"). Deardorff and Stern (1998) show that measures can be constructed directly by comparing the domestic price of the imported service with reference to foreign price. In this approach, the difference between the domestic price and foreign price is analogous to a tariff, provided the price differentials are not due to factors such as sunk costs and entry deterrence strategies by incumbent service suppliers.

Most price-based measures for services have been constructed by the Australian team at the productivity commission using econometric models. These include Kalijaran *et al.,* (2001) for banking, Kang (2001) for maritime transport, Trevin (2001) for

telecommunications, Kalijaran (2000) for food distribution and Nguyen-Hong (2000) for engineering services.

The studies use the following procedure. Firstly, a proxy of the domestic price is identified for the industry in question. Secondly, a model is formulated, with trade barriers (using trade restrictiveness indices) being one explanatory variable and a number of other control factors. Thirdly, the model is estimated using regression analysis. Fourthly, the estimated coefficients and trade restrictiveness index is used to determine the size of price wedges for individual economies, including South Africa and the US.

In measuring trade impediments, Trevin (2001) used the indices developed by Marko (1998) and Warren (2001). Kalijaran *et al.,* (2001) estimated price wedges caused by restrictions on banking services. The study focuses on banks' core business of financial intermediation services between depositors and lenders. Bank's interest margin is used to measure the price of intermediation. Kalijaran *et al.,* (2001) argue that bank's interest margin depends on prudential regulations such as capital and liquidity requirements, net non-interest expenses, market structure, interest rate volatility, and non-prudential restrictions. Domestic and foreign restrictiveness indices developed by McGuire and Schuele (2001) are used as proxies for non-prudential restrictions. The estimated coefficients are then used to construct price wedges for individual countries.

Kang (2001) estimated the price impact of barriers to trade in maritime transport services. The model used in the study assumes that the price of shipping is a function of barriers to trade in maritime services, distance between trading partners, scale of bilateral trade and stage of economic development of trading partners. Shipping margin (shipping expenses) is used as the price of maritime services. Kang used the indices developed by McGuire, Shuele and Smith (2001). Although she estimated her model, no price wedges were calculated from the results.

The impact of barriers to trade in food distribution is estimated by Kalijaran (2000). Price-cost margin is used as a proxy for price wedge. He postulated that the price cost

margin of a food distribution firm depends on firm-specific variables such as location, the assortment of goods available, the ability to deliver goods in the desired form on time, the level of information provided, the ambience of the establishment, as well as the economy-wide variables such as industry concentration and barriers to entry. The estimation results are then used to compute the impact on individual economies.

Nguyen-Hong (2000) computed trade restrictiveness indices for four types of professional services but estimates price wedges for engineering services only. The model used assumes that firm profitability is a function of its market share, market concentration, the extent of product differentiation and other factors.

The results for the South Africa and the US are reported in Tables 4.6 to 4.9. Kalijaran (2000) estimates "cost impact indicators" in the food-distribution service sector and finds that restrictions on establishments of foreign firms raised the costs of distribution in the US by 2.3 per cent compared to 0.5 per cent in South Africa (Table 4.6).

In banking services, the results from Kalijaran *et al.*, (2000) shows that restrictions are estimated to have raised prices by about 6 per cent in South Africa and 4 per cent in the US (Table 4.7). Such price increases inhibit IIT in banking services.

Estimates of price wedges for engineering services from Nguyen-Hong (2000) are presented in Table 4.8. The results show that discriminatory barriers to foreign entry could create economic rents for local firms thus raising the prices of engineering services (e.g. price wedge of 5.3 per cent for South Africa and 7.4 per cent for the US).

Estimates of price effect for telecommunications from Warren (2000) are presented in Table 4.9. The results show that the restrictions on foreign firms in South Africa create economic rent for Telkom and thus raise prices by 20.9 per cent compared to 0.2 per cent in the US. This means that substantial benefits can accrue from liberalisation of the sector in terms of lower prices, increased variety and thus high intra-industry trade.

Table 4.6: Cost effect measures for distribution services

Economy	Restrictions on commercial land	Direct investment in distribution firms	Restrictions on large scale stores	Factors affecting investment	Local government requirements	Permanent movement of people	**Restrictions on establishment total**	**Domestic cost effect total**
	Domestic cost effect							
South Africa	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%		0.0000%	**0.0000%**
United States	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%		0.0000%	**0.0000%**
	Foreign cost effect							
South Africa	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.4712%	0.4712%	**0.4712%**
United States	2.2069%	0.0000%	0.0000%	0.0000%	0.0000%	0.0551%	2.2619%	**2.2619%**

Source: Kalijaran, K.2000. Restrictions on trade in distribution services. [Online] Available from: http://www.pc.gov.au/research/staffres/rotids/rotids.pdf [Downloaded: 2004:09:02].

Table 4.7: Price effect measures for banking services

Economy	Licensing of banks	Direct investment	Joint venture arrangements	Permanent movement of people	**Restrictions on establishment total**	Raising funds by banks	Lending funds by banks	Other business of banks - insurance and securities services	Expanding the number of banking outlets	Compositition of the board of directors	Temporary movement of people	**Restrictions on ongoing operations total**	**Total effect of restrictions on establishments and ongoing operations**
	Restrictions on establishment					**Restrictions on ongoing operations**							
	Domestic price effect												
South Africa	0.0000%	0.0000%			0.0000%	0.0000%	0.0000%	0.0000%	0.0000%			0.0000%	**0.0000%**
United States	0.0000%	0.0000%			0.0000%	0.0000%	0.0000%	0.0000%	0.0000%			0.0000%	**0.0000%**
	Foreign price effect												
South Africa	0.7855%	0.7855%	0.3927%	0.6755%	2.6392%	8.9840%	0.5891%	0.3927%	1.1291%	0.9442%	0.2258%	3.2810%	**5.9202%**
United States	0.7495%	0.7495%	0.3747%	0.0749%	1.9486%	0.5621%	0.5621%	0.3747%	0.1874%	0.9009%	0.2155%	2.2405%	**4.1891%**

Source: Kalijaran, K. Kaleeswaran, McGuire, G., Nguyen-Hong, D, and Schuele, M.2001.The price impact of restrictions on banking services. In: Findlay, C. and Warren, T. (eds.) *Impediments to trade in services: Measurement and policy implications.* New York: Routledge: 215-230.

Table 4.8: Price effect measures for engineering services

	Restrictions on establishment											
Economy	Form of establishment	Foreign partnership or joint venture	Investment and ownership by non-professional investors	Licensing and accreditation of local professionals	Investment and ownership by foreign professionals	Investment and ownership by non-professional investors	Nationality or citizenship requirements	Residency and local presence	Quotas or economic needs tests on the number of foreign professionals and firms	Licensing and accreditation of foreign professionals	Permanent movement of people	**Restrictions on establishment total**
	Domestic price effect											
South Africa	0.0000%		0.0000%	0.6902%								0.6902%
United States	0.0000%		3.0290%	0.7572%								3.7862%
	Foreign price effect											
South Africa	0.0000%	0.0000%			0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	3.1906%	0.3191%	3.5097%
United States	0.0000%	0.0000%			0.0000%	2.1225%	0.0000%	1.3225%	0.0000%	1.6980%	0.0000%	5.1430%

	Restrictions on ongoing operations								
Economy	Activities reserved by law to the profession	Multi-disciplinary practices	Advertising, marketing and solicitation	Fee setting	Licensing requirements on management	Other restrictions	Temporary movement of people	**Foreign price effects of restrictions on ongoing operations**	**Effects of foreign restrictions on prices**
	Foreign price effect								
South Africa	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.2243%	0.2243%	3.7340%
United States	1.5919%	0.0000%	0.0000%	0.0918%	0.3184%	0.0000%	0.2388%	2.2409%	7.3839%

Source: Nguyen-Hong, D. 2000. Restrictions on trade in professional services. [Online] Available from: http://www.pc.gov.au/research/staffres/rotips/rotips.pdf [Downloaded: 2004-10-02].

Table 4.9: Price effect measures for telecommunication services

	Domestic price effect						Foreign price effect				
	Restrictions on establishment			Restrictions on ongoing operations			Restrictions on establishment		Restrictions on ongoing operations		
Economy	Restrictions on direct investment in fixed network services	Restrictions on direct investment in cellular mobile phone services	Restrictions on establishment total	Restrictions on cross-border trade	Restrictions on ongoing operations total	**Domestic price total**	Restrictions on direct investment in fixed and mobile network services	Restrictions on establishment total	Restrictions on cross-border trade	Restrictions on ongoing operations total	**Foreign price total**
South Africa	4.6294%	2.0179%	6.6473%	7.1221%	7.1221%	**13.7694%**	6.6473%	6.6473%	14.2442%	14.2442%	**20.8915%**
United States	0.0000%	0.0000%	0.0000%	0.2001%	0.2001%	**0.2001%**	0.0000%	0.0000%	0.2001%	0.2001%	**0.2001%**

Source: Warren, T.2000. The identification of impediments to trade and investment in telecommunications services. In: Findlay, C. and Warren, T. (eds) Impediments to trade in services: Measurement and policy implications. London and New York: Routledge: 71-84.

4.4 FUNDAMENTAL ISSUES IN COMPUTATION OF HOEKMAN (1995) FREQUENCY RESTRICTIVENESS INDICES FOR SOUTH AFRICA AND THE US

As pointed out by Schembri and Chen (2003) and Walley (2004), there is no perfect method to measure barriers to trade in services. The choice of the method depends on limitations imposed by state of knowledge on how the service sectors operate as well as availability of data. Each method has its own strengths and weaknesses and trade offs have to be made in selection.

The thesis uses the Hoekman (1995) approach for two reasons. Firstly, the Hoekman's list of barriers is drawn from an international agreement (GATS commitment schedules) and there is limited room for subjective selection. Secondly, given the limitation in data, it uses same scoring system for all sectors and countries. Thus it has a higher degree of

comparability across sectors and countries than the Australian approach. However, since GATS commitment schedules for South Africa and the US are only available for the period 1994-1998, the indices can only be calculated for that period. It is, however, hoped that the current round of service trade negotiations, which commenced in 2000, will yield more GATS commitments to facilitate updating of the indices.

4.4.1 Sectoral weights

The Hoekman (1995) scoring system highlighted in Section 4.3.1.1 is used but the sectoral weights in Table 4.10 are inferred from WTO trade policy reviews (TPR) for South Africa and the US (World Trade Organisation, 1996b, 1998b, 1999, 2001b and 2003). These weights reflect the most important mode of supply in that sector. For instance the World Trade Organisation (1999: 197), while discussing telecommunication services, states "…the dominant mode of trade is cross-border transactions, which involve the placement of a call in the home market and the termination of the call in a foreign market (and vice versa)". Consequently, model 1 is given a weight of 0.85 while the other modes are each given a weight of 0.05.

Table 4.10: Sectoral weights for the services trade in South Africa and the US

Service sector	Mode 1	Mode 2	Mode 3	Mode 4
Business services	0.50	0.05	0.40	0.05
Communication services	0.85	0.05	0.05	0.05
Construction and related engineering services	0.05	0.05	0.50	0.40
Distribution services	0.05	0.05	0.50	0.40
Environmental services	0.05	0.05	0.50	0.40
Financial services	0.5	0.05	0.40	0.05
Tourism and travel related services	0.05	0.85	0.05	0.05
Educational services	0.05	0.85	0.05	0.05
Transport sectors	0.05	0.05	0.85	0.05
Other services not included elsewhere	0.05	0.05	0.85	0.05

Source: Subjective weights from various TPR for South Africa and the US (World Trade Organisation, 1996b, 1998c, 1999, 2001b and 2003).

4.4.2 Uniqueness of mode 2 (consumption abroad) of supply

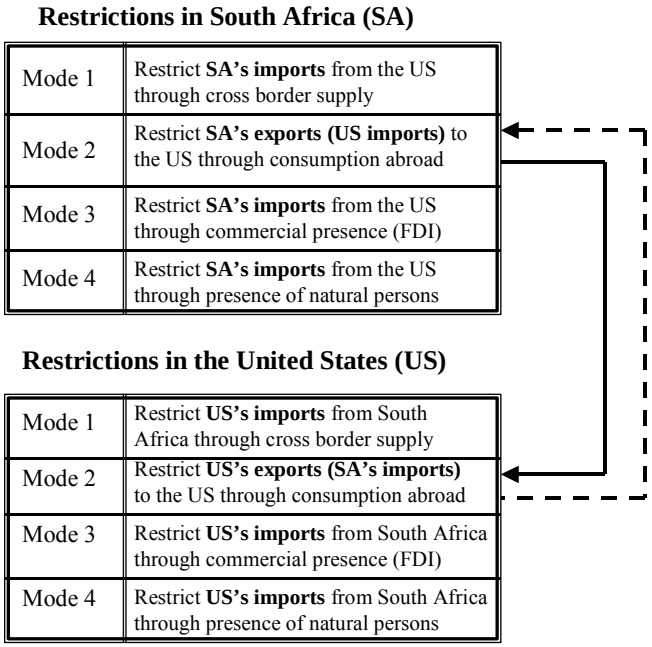
Walley (2004:1239) points out that one limitation with measurement of service trade barriers is the assumption of homogeneity in their quantitative significance. The frequency measures aggregate the restrictions as if all have equi-proportional impact on trade.

A case in point is the supply of services through mode 2, which is quite different from the other modes. The restrictions in South Africa on mode 2 hamper her own exports of services to the US. Thus in education services, restrictions in South Africa on US students applying for study permits will simply reduce the exports of education services from the former to the latter. The same applies to all other services commonly supplied through mode 2 such as tourism, medical services, etc. This is not the case with modes 1, 3 and 4 where restrictions in South Africa reduce imports from the US.

Figure 4.1 demonstrates this fact. The top panel shows the restrictions in South Africa on modes 1, 2, 3 and 4 while the bottom panel shows the same restrictions in the US. Restrictions on mode 2 in South Africa discourage South Africa's exports of services (US imports) through consumption abroad. Since the restrictions on modes 1, 3 and 4 discourage South Africa's imports; restrictions on mode 2 supply have the opposite effects. The same arguments can be made for restrictions on mode 2 in the US.

There are two issues that emerge from the uniqueness of mode 2. Firstly, any trade analysis using weighted indices but does not take the uniqueness of mode 2 into account is flawed. The appropriate approach is to switch the indices as shown with the arrows in Figure 4.1. Thus mode 2 in South Africa is replaced with mode 2 for the US and vice versa as shown by the arrows. This adjustment would ensure that the restrictions on all modes of supply in South Africa convey the same message (restrict South Africa's imports from the US). Similarly, the restrictions on all modes of supply in the US restrict US imports from South Africa. This adjustment is not done in this study due to inconsistency in services that South Africa and US scheduled commitments.

Figure 4.1: The effects of mode-based restrictions on exports and imports of services



Source: Author's own illustration

Secondly, a country's trade restrictions on mode 2 only serve to restrict her exports of the service in question to other countries. Consequently, to promote exports, South Africa should try to harmonise her migration and trade policies with a view to substantially reducing barriers to services supplied through mode 2. In terms of trade negotiations, South Africa (and other SACU members) should focus on barriers in the US on modes 1, 3 and 4 during the SACU-US FTA.

4.5 SERVICES TRADE BARRIERS IN SOUTH AFRICA

South Africa scheduled commitments in several service categories but her list of Article II (MFN) exemptions to the WTO in 1994 (World Trade Organisation, 1994a) does not affect the US. The analysis in this section uses both TPR and GATS commitments for South Africa and weights discussed in Section 4.4.1.

4.5.1 Coverage and restrictiveness indices for South Africa

Using the Hoekman (1995) methodology, two indices are computed; coverage index and Hoekman restrictiveness index. The coverage index is calculated as follows;

$$CI_{SA} = \frac{N_{SA}}{M} \times 100 \qquad (4.1)$$

Where CI_{SA} is the coverage index, N_{SA} is the number of commitments made by South Africa and M is the maximum number possible (620)[14]. Since South Africa made commitments in 62 sectors out of 155 possible, the coverage index is;

$$100 \times \left(\frac{248}{620} \right) = 40\%$$

This index summarises the policy stance of South Africa with regard to opening service sectors/modes. It shows that South Africa was willing to negotiate on 40 per cent of her service sectors/modes with other WTO member states.

Another important index is Hoekman restrictiveness index, which is a complement of the coverage index and shows the proportion of service sectors/modes that South Africa did not table any commitments/exemption to the WTO in 1994. It is computed as;

$$RI_{SA} = 100 - CI_{SA} \qquad (4.2)$$

Using the coverage index of 40 per cent, the restrictiveness index is 60 per cent. This means that 60 percent of South Africa's sector/modes are closed. This is however, an overstatement since this methodology assumes that all the sectors/modes where South Africa has not made commitments are closed.

[14] There are 155 sectors each with 4 modes of supply. This implies that the maximum possible negotiating modes are $155 \times 4 = 620$

4.5.2 Horizontal commitments in South Africa: Limitations on market access (MA)

These are commitments on MA that affect all services. According to the schedule of commitments submitted by South Africa in 1994 (World Trade Organisation, 1994b), there are no horizontal limitations on MA for modes 1, 2 and 4. However, mode 4 is "unbound" except for temporary presence of up to three years in South Africa, without requiring compliance with economic needs. This applies to certain categories of natural persons providing services. Firstly, for salespersons, temporary presence in South Africa is limited to a ninety-day period. Secondly, there are limitations, which affect intra-corporate transferees (executives, managers and specialists) and professionals. For the executives, managers and specialists, they should have been in employment of the juridical person for a period of not less than one year immediately preceding the date of application for admission. In case of professionals the person must possess the necessary academic credentials and professional qualifications, which have been duly recognized, where appropriate, by the professional association in South Africa. Thirdly, personnel engaged in an establishment are required to have been employed by a juridical person for a period of longer than one year immediately preceding the date of application for admission.

4.5.3 Horizontal commitments in South Africa: Limitations on national treatment (NT)

These are commitments on NT that affect all services in South Africa. According to the schedule of commitments submitted by South Africa in 1994 (World Trade Organisation, 1994b), there are no horizontal limitations on NT for modes 1 and 2. However, in mode 3, local borrowing by South African registered companies with a non-resident shareholding of 25 per cent or more is limited. Additionally, mode 4 is "unbound", except for measures concerning categories of natural persons referred to in the MA in Section 4.5.2.

Having discussed the economy-wide coverage index as well as horizontal commitments, the subsequent sections present descriptions and Hoekman (1995) frequency measures of

restrictions in various service sectors. Specifically, Tables A.1 to A.4 show the Hoekman frequency indices for the various service sectors in South Africa. The columns 1994, 1995, 1997 and 1998 correspond to the years when South Africa submitted GATS commitments or amendments to WTO. The columns labelled "average" refer to weighted average of the indices. The weighted average figures suffer from the aggregation bias shown in Figure 4.1 emanating from mode 2 effects. It was not possible to do the adjustment due to an inconsistency in services that South Africa and US scheduled commitments.

4.5.4 Professional services

South Africa's GATS commitments in professional services cover the services listed in Table A.1 (appendix). South Africa did not make commitments in accounting and bookkeeping services in her 1994 GATS schedule. Mode 4 is "unbound" for all professional categories except as indicated in the horizontal section of the schedule.

In legal services, modes 1 and 2 are generally "unbound". In advisory services in foreign and international law, there are no MA and NT limitations on mode 3. In domestic law, there are NT limitations on mode 3 supply but in terms of MA an advocate is not allowed to form a partnership or company. The "unbound" nature of mode 2 for both MA and NT effectively means that South Africa's trade restrictions are inimical to her exports of legal services to the US.

4.5.5 Telecommunications services

Historically, telecommunications services were provided by the South African Posts & Telecommunication (SAPT), which was a post, telephone and telegraph monopoly. In 1991, the posts and telecommunications functions of SAPT were transferred to a new entity Telkom SA limited, with the state as the sole shareholder. On 29 October 1993, the government granted two mobile cellular licences, operating on GSM standard to Vodacom (in which Telkom had 50 per cent state) and to MTN (a consortium made of M-Net Cable and Wireless, Trantel and a group of black business people. In the same

year an Independent Broadcasting Authority (IBA) was formed and became part of the new constitution. The IBA Act introduced a number of changes including community broadcasting, a competitive private broadcasting sector, prohibitions on party political control of broadcasters, various categories of signal distribution licences, local content quotas for radio and television.

These developments are reflected in South Africa's 1994 GATS schedule (World Trade Organisation, 1994b). South Africa did not make commitments in voice telephone services; packed-switched data transmission services; circuit-switched data transmission services; telex services; telegraph services; facsimile services and private leased circuit services.

In the 1994 schedule, MA for modes 1 to 3 in electronic mail (email); voice mail; on-line information and database retrieval; electronic data interchange; enhanced/value-added facsimile including store and forward, store and retrieve; code and protocol conversion; on-line information and/or data processing (including transaction processing) have limitations on the bypass of South African facilities for routing of domestic and international traffic. Telkom is a de facto regulator by means of agreements entered with value-added network services (VAN) suppliers in South Africa. VANS providers can only provide international services with the consent of Telkom.

In 1996, the Telecommunications Act was passed. This Act introduced far-reaching changes, notably the establishment of the South African Telecommunications Regulatory Authority (SATRA), an independent body to regulate telecommunications in the public interest.

In the 1997 GATS schedules (World Trade organisation, 1997a), additional limitations were included. In NT, the only limitation was in mode 4, which was "unbound" except

as indicated in the horizontal section. However, MA through mode 1 for facilities-based and Public Switched Telecommunications Services (PSTS) can only be provided through the network of Telkom monopoly or subsequent duopoly (once second network operator is licensed) on international traffic. The schedule also stipulated that Telkom monopoly was to end not later than 31.12.2003. There were no limitations on mode 2 but in mode 3, foreign ownership is permitted up to a cumulative maximum of 30 per cent. During the transition period, Telkom was to hold exclusive rights over basic PSTS. However, various telecommunication market segments would progressively be open to competition.[15]

In 2000, the IBA and SATRA were merged to form the Independent Communications Authority of South Africa (ICASA). ICASA's mandate is to regulate broadcasting and telecommunications. On 25 June 2001, a third national cellular operator (Cell-C) was licensed. In the same year the Telecommunications Act was amended, which provided for the licensing of a Second Network Operator (SNO) by 2002 to compete in the provision of PSTS with Telkom.

In July 31 2002, South Africa passed an electronic commerce bill designed to encourage use of the Internet in business transactions. However, this law, designed to facilitate electronic commerce may increase regulatory burdens and introduce uncertainty in electronic commerce in South Africa. For instance, the law requires government accreditation for certain electronic signatures, takes government control of the ".za domain name, and requires government access to private databases.

[15]During the period, Telkom has the "primary" role in universal access/service provision. National long-distance services, local access telecommunications services and public pay-telephone services, international services, as well as switching networks are exclusively be provided by Telkom.

The Hoekman openness indices for telecommunication services are presented in Table A.3 and shows that the 1997 and 1998 commitment schedules were quite restrictive, especially on mode 1. However, these indices do not take cognisance of the post 1998 developments in the telecommunications sector because South Africa has not made new GATS commitments containing them.

4.5.6 Insurance services

South Africa scheduled GATS commitments in 1994 in most insurance categories except services auxiliary to insurance (including broking and agency services). The main limitation in insurance applies to MA through commercial presence (mode 3). To transact business in South Africa, insurers (foreign and domestically controlled) must be incorporated as public company in terms of the companies Act. Any person, whether South African or foreign, may control an insurance company in South Africa. However, for transfer of shareholdings exceeding 25 per cent of the capital of the company, approval by the Financial Services Board is needed and shareholders must be "fit and proper". South African government provides reinsurance facilities and is the reinsurer of the last resort.

In terms of mode 4, MA is “unbound” except as indicated in the horizontal section and the chairman, public officer and majority of directors must be resident in South Africa. Since July 1995, insurance companies were allowed to invest a portion of their assets abroad through swap arrangements with foreign investors.

South Africa’s 1998 GATS schedule (World Trade Organisation, 1998a) added commitments in services auxiliary to insurance services. The MA limitations in mode 3 were amended. All insurers/reinsurers (and insurers on whose behalf policies are sold) need to be incorporated as public company in South Africa and registered with the

supervisory authority to carry on business in South Africa. Additionally, life insurance actuaries must be resident in South Africa. The Hoekman openness indices for insurance services are presented in Table A.4.

4.5.7 Banking services

In the 1994 GATS schedules, South Africa made commitments in many banking service categories. The main limitation applies to mode 3. In terms of MA, the following limitations apply.

Firstly, corporate membership of financial exchange is unrestricted except in the case of Johannesburg Securities Exchange (JSE). Secondly, no bank, or controlling company (domestically or foreign controlled) may allot or issue its shares to a person to the extent that the total nominal value of such shares exceeds in total 49 per cent of the total nominal value of all the issued vote-bearing shares in the bank or the controlling company. The Minister of Finance has the powers to grant permission to a bank of controlling company to issue more than 49 per cent of its shares to such a person provided that competition is not impaired. This restriction does not apply to allotment or issuing of shares in a bank or controlling company registered in respect of that bank or an institution which the Registrar has approved and which conducts business of a bank in a country other than South Africa.

Thirdly, foreign banks wishing to obtain controlling interest in a local bank are required to establish a domestic public company. In the same vein, no person (domestic or foreign) can conduct the business of a bank unless such a person is a public company and is registered in terms of the Banks Act.

The GATS schedule in 1998 (World Trade Organisation, 1998a) added some services to the list submitted in 1994. These are asset management; settlement and clearing services for financial assets; advisory and other auxiliary services. The following limitations apply to mode 3. Firstly, authorized dealers by the South African Reserve Bank (SARB) are the only ones allowed to carry out the business of foreign exchange in South Africa. Banks registered to operate in South Africa with the required minimum capital base are eligible to seek authorization as foreign exchange dealers.

Secondly, companies involved in asset management, collective investment schemes and custodial services for securities and financial instruments (including equities and bonds) need to be incorporated as public companies in South Africa and registered with supervisory authority to carry on business in South Africa.

Thirdly, trading for the account of customers on a licensed exchange requires a separately capitalized incorporation in South Africa as public or private company and registration with relevant supervisory authority.

In terms of NT, there are limitations in mode 3. Foreign banks applying for authorization to open a branch in South Africa must have certified net assets in excess of US$1 billion, and an investment-grade debt rating. A representative office is not allowed to conduct the business of a bank. Table A.4 presents Hoekman openness indices for the banking services.

4.5.8 Maritime transport services

South Africa did not make commitments in maritime transport and consequently, no Hoekman frequency openness indices are computed. However, according to the TPR

(World Trade Organisation, 1998c), both local and foreign owned vessels on the international trade-routes to and from South Africa may carry South African coastal cargoes and purchase fuel free of duties or other charges.

4.5.9 Air transport services

This sector was negotiated under the Uruguay Round, but WTO members agreed to exclude most air transport services except aircraft repair and maintenance services, computer reservation services, selling and marketing of air transport services. South Africa did not make commitments in 1994. However, according to the TPR (World Trade Organisation, 1998c), a number of regulatory issues exist. The Civil Aviation Authority (CAA) negotiates bilateral air transport agreements, controls and manages South Africa's obligations in terms of ratified aviation conventions with international organizations.

The South Africa's air transport market was deregulated in 1991 and South African Airways (SAA) has since then operated in competition with private airlines such as Airlink, Comair and Sun Air. In April 1997, the government started the phased privatisation of SAA.

SAA has a code-sharing agreement with Delta Airlines and Atlantic Southeast Airlines and Comair international signed in 2001.

4.6 SERVICES TRADE BARRIERS IN THE US

The US scheduled commitments in several service categories in 1994, 1995, 1997 and 1998 (World Trade Organisation, 1994d, 1995c, 1997c and 1998d). The extent to which the US committed to negotiate in services can be seen in her coverage and restrictiveness indices.

4.6.1 Coverage and restrictiveness indices for the US

The coverage and restrictiveness indices are computed using Equations 4.1 and 4.2.
The coverage index shows that the US negotiated with other WTO members on 50.3 per cent of her service sectors/modes, which is greater than South Africa's 40 per cent. Similarly, The Hoekman restrictiveness index shows that 49.3 percent of the US's service sector/modes are closed compared to South Africa's 60 per cent. This implies that US is more open than South Africa in service sectors/modes.

4.6.2 Article II (MFN) exemptions for the US

The US submitted an extensive list of Article II (MFN) exemptions in 1994, 1995, 1997 and 1998 (World Trade Organisation, 1994c, 1995b, 1997b and 1998c), many of which affect South Africa.

The list of Article II (MFN) exemptions in 1994 (World Trade Organisation, 1994c) scheduled a number of measures that affect all countries including South Africa. These measures relate to differential treatment in taxation, acquisition of land in the US, banking and other financial services, air transport services, pipeline transport, and space transportation. Most of these exemptions require reciprocity of other countries.

In 1995 the US submitted an amendment to Article II (MFN) exemptions of 1994 (World Trade Organisation, 1995b). The 1995 amendments affect financial services sector. The amendments were necessitated by the need to protect existing activities of US service suppliers abroad and ensure substantial full MA and NT in international financial markets.
The US submitted an amendment to Article II (MFN) exemptions of 1994 in 1997 (World Trade Organisation, 1997b), which affects telecommunication services sector. In this amendment, differential treatment would be applied to countries on account of reciprocity on telecommunication services. This measure was necessitated by the need to ensure substantial full MA and NT in international telecommunications markets.

In 1998 the US submitted a further amendments to those submitted in 1995 on financial services. The 1998 amendments (World Trade Organisation, 1998c) deal with differential measures on insurance services, permission to establish state-licensed branches of banking and other financial institutions, authority to act as a sole trustee of an indenture for a bond offering in the US, and designation as a primary dealer in US government debt securities.

4.6.3 Horizontal market access and national treatment commitments in the US

The US horizontal commitments on both MA and NT apply to mode 4 of supply. The commitments include the provision that intra-corporate transferees, such as managers, executives, and specialists (including licensed professionals), may provide services through a branch, subsidiary or affiliated established in the US for a period of three years, with the possibility of an extension for a maximum of two additional years.

4.6.4 Professional services

The US GATS commitments in professional services cover the following areas: legal; accounting, auditing and bookkeeping; taxation; architectural; engineering; integrated engineering; urban planning and landscape architectural services. Generally, the US commitments contain only a limited number of MA or NT restrictions for modes 1, 2 and 3, except in legal services.

The most common limitations are the requirement that partnerships are limited to licensed persons (legal services; accounting, auditing and bookkeeping services); in-state office requirements (legal services; accounting, auditing and bookkeeping services); residency requirements (legal services; accounting, auditing and bookkeeping services; engineering and integrated engineering services); citizenship requirements in some cases (legal services with respect to practice before the US Patents and Trademarks Office; accounting, auditing and bookkeeping services in North Carolina; engineering and

integrated engineering services in the District of Columbia); and the requirement in Michigan that two thirds of the officers, partners, and/or directors in an architectural firm be licensed professionals. Mode 4 is unbound for all professional categories except as indicated in the horizontal section of the schedule.

4.6.5 Education services

Under both NT and MA, modes 1 to 4 have the following limitation. Scholarship or grants may be limited to US citizens and /or residents of particular states and may in some cases, only be used at certain state institutions or within certain US jurisdictions.

4.6.6 Telecommunications services

According to the US TPR of 1996 (World Trade Organisation, 1996b: 170), the US government regulates inter-State and foreign communications and provision of all radio-based services. The US TPR of 1996 states that the Federal Communications Commission (FCC) administers the Communications Act of 1934, as amended by the Telecommunications Act of 1996. The Acts regulates all domestic and international electronic communications provided by wire or radio.

According to US commitments to WTO of 1997 (World Trade Organisation, 1997c), foreign firms are granted access to local, long-distance, and international services, using any means of technology, including wire line, terrestrial wireless (i.e. cellular) and satellite facilities, on either a facilities-based or resale basis. However, the US maintains some restrictions on foreign ownership. Specifically, direct ownership of a common carrier radio licence may not be granted to or held by a foreign government or its representative; a non-US citizen or the representative of any non-US citizen; any corporation not organized under the laws of the US or any US corporation of which more than 20 per cent of the capital stock is owned or voted by a foreign government or its representative, non-US citizens, or their representatives, or a corporation not organized under the laws of the US. However, there are no restrictions on indirect ownership of a

common carrier radio licence, nor on direct ownership of firms holding non-radio FCC licences, as reflected in the US GATS commitments.

The US inscribed MA restrictions on satellite-based services in her GATS Schedule of 1997. These restrictions involve the exclusive right of the Communications Satellite Corporation (Comsat) to provide link-ups with the International Telecommunications Satellite Organisation (Intelsat) and the International Maritime Satellite System (Inmarsat). Comsat's exclusive access to Inmarsat ended when Inmarsat, was privatised in April 1999. The computed Hoekman openness indices for telecommunications are presented in Tables A.7 and A.8 in the appendix and show that the US is more open than South Africa.

4.6.7 Banking services

According to US TPR of 1996 (World Trade Organisation, 1996b: 178), the "dual" US banking system allows banks to operate under either a federal or State licence. This means that foreign banks could enter the US market either by establishing federal or State-licensed branches or agencies/representative offices, or by acquiring a national or State subsidiary bank. Although establishment of branches or agencies of foreign banks is prohibited by law in some States, there are other States with major financial centres such as New York, California, Illinois, Texas, Florida, and Georgia, which permit foreign bank branches or agencies.

The US TPR of 1996 states that foreign banks with US branches or agencies became subject to federal regulation under the International Banking Act (IBA) of 1978, which applied same restrictions on foreign bank federally-licensed branches and agencies as well as a national bank operating at the same location. According to IBA, foreign banks with operating offices in the US were required to maintain reserves against deposit liabilities and their activities and geographic expansion in the US were limited in accordance with the comparable limitations applicable to US banking organizations in foreign countries. This

was an application of NT. However, the enactment of the Riegle-Niel Interstate Banking and Branching Act, removed restrictions on inter-State banking activities of foreign banks.

According to the World Trade Organisation (1996b: 180), a new act was enacted in 1991 called the Foreign Bank Supervision Enhancement Act (FBSEA). This act made foreign banks maintaining a branch, agency or commercial lending company in the US subject to a new requirement that a bank holding company obtain the prior approval of the Federal Reserve Board (FRB) when acquiring more than 5 per cent of the voting shares of a US bank or bank holding company. The FBSEA also permits the FRB to order a foreign bank that operates a State-licensed branch or agency, or a commercial lending company subsidiary in the US, to terminate its activities if the FRB believes that the foreign bank has committed a violation of law or engaged in an unsafe or unsound banking practice in the US.

According to US TPR of 1999 (World Trade Organisation, 1999), the Economic Growth and Regulatory Paperwork Reduction Act (EGRPRA) of 1996 relaxed the requirement contained in the IBA that foreign banks be subject to Consolidated Comprehensive Supervision (CCS) by home country supervisory authorities in order for the FRB to approve the establishment of a branch or agency in the US.

Additionally, in the 1997 GATS schedules (World Trade Organisation, 1997b), the US "bound" the provision of NT with regard to the fees for FRB's examinations of foreign banks. She also made commitments to provide MA and NT to foreign banks with respect to interstate branching by merger in all US jurisdictions except in Montana and Texas. US residents were also allowed to deposit funds with foreign institutions that do not maintain a commercial presence in the US. Cross-border supply of banking services is generally not prohibited by federal regulations, and foreign banks without commercial presence may solicit and transact business with customers in the US. The computed Hoekman openness indices are presented in Table A.10.

4.6.8 Financial securities services

According to US TPR of 1996 (World Trade Organisation, 1996b: 181), NT is granted to foreign brokers and dealers regarding registration with the Securities and Exchange Commission (SEC). The US federal securities laws generally require broker-dealers, whether foreign or domestic, to register with the SEC if they seek to do business with (i.e., solicit) US persons. Foreign and US broker-dealers are subject to the same requirements. US law exempts foreign broker-dealers from the registration requirements under limited circumstances. Most States require broker-dealers to register with the State regulatory authorities for business conducted within the particular state.

Foreign-owned dealers are accorded essentially the same treatment as domestically owned dealers, as long as US firms operating in the government debt markets of the foreign country are accorded "the same competitive opportunities" as domestic companies operating in those markets.

4.6.9 Insurance services

According to US TPR of 1996 (World Trade Organisation, 1996b: 181), majority of directors and/or incorporators of an insurer should be US citizens. However, some States do not have a mechanism for initial entry by non-US insurers as branches and/or subsidiaries, due to a perceived lack of resources necessary to effectively supervise non-US insurers, especially branches.

According to US TPR of 2003 (World Trade Organisation, 2003), a special federal excise tax of 1 per cent on life and 4 per cent on non-life insurance premiums is imposed for US risks paid to companies not incorporated under US law. A large number of States prohibit the conduct of business by government-owned or government-controlled insurance companies, based on concerns about unfair competition by subsidized insurers from abroad. The computed Hoekman openness indices for insurance services are presented in Table A.10.

4.6.10 Futures and option services

According to US TPR of 2003 (World Trade Organisation, 2003), the Commodity Exchange Act (CEA) grants the Commodity Futures Trading Commission (CFTC) regulatory authority over futures and options trading in the US. Persons who transact business on designated domestic contract markets for either US or foreign customers must register with the CFTC as Futures Commission Merchants (FCMs) and must comply with all of the CFTC's regulatory requirements applicable to registrants, or must obtain appropriate exemptive relief.[16]

Foreign FCMs are treated no less advantageously than domestic firms. Persons located either within or outside the US who transact business for US customers on foreign markets either must register with the CFTC as FCMs or must obtain appropriate exemptions.

In general, properly registered or exempt persons may offer or sell most foreign exchange-traded futures and option products to US persons without additional approvals.

4.6.10 Air transport services

According to US TPR of 1996 (World Trade Organisation, 1996b: 185), the Federal Aviation Administration (FAA), is responsible for approval of new air carriers as well as conducting supervision and inspection of existing carriers. On the basis of safety standards, the FAA can prohibit a foreign carrier from flying to the US.

The US has signed a number of "open skies" agreements with other countries.[17] These agreements allow free access for airlines of both parties to the agreement from any point in

[16] An FCM is defined as any person who solicits or accepts orders to buy or sell futures or option contracts and who, in connection with an order, accepts any money or other property (or extends credit) to margin, guarantee, or secure the contracts resulting from the order.

[17] Such bilateral "open-skies" agreements typically provide open entry into each other's markets, allow unrestricted capacity and frequency on all routes and freedom in setting fares.

one country to any point in another country through any point in either country. The only remaining restriction is on cabotage (air transport within a country) and on the so-called "seventh freedom"; i.e. routes without any link to the airline's homeland. The US signed a bilateral agreement for open skies with South Africa in March 1996 (World Trade Organisation, 1999).

The Fly America Act requires US government-financed transportation of passengers and cargo to be carried on US-flag air carriers. There are some exceptions to the requirements, such as when service by a US-flag carrier is not available, or when an agreement between the US and a foreign partner provides for carriage of such traffic by airlines of that partner.

According to US TPR of 2003 (World Trade Organisation, 2003), all code-sharing relationships between foreign air carriers and US require Department of Transport regulatory approval.

4.6.11 Airport services

The US made full commitments for aircraft repair and maintenance services in mode 2 and mode 3; mode 1 is “unbound” for reasons of technical feasibility and the horizontal provisions of her GATS Schedule bind mode 4 (World Trade organisation, 1994d).

The US maintains MFN exemptions with regard to the selling and marketing of air transport services and the operation and regulation of computer reservation systems (CRS) services, as these services are covered by bilateral or other air services agreements to which the United States is a party.

Aircraft repair and maintenance services are subject to FAA safety requirements. An amendment to the Federal Aviation Regulations in 1988 permits the FAA to certify foreign repair stations as long as they meet all certification and personnel requirements of

domestic repair stations. Before this amendment, foreign repairs of US aircraft had been permitted only in emergencies.

Different standards are still applied for the certification of domestic and foreign stations; for instance, while certificates for foreign repair stations (which are under continued FAA scrutiny) are subject to annual and biennial renewals, domestic stations' certificates are valid until surrendered, suspended, or revoked. According to US TPR of 2001 (World Trade Organisation, 2001b), the US does not support subscribing to a GATS ground-handling provision. However, foreign firms can provide ground-handling services at US airports that are covered by bilateral air services agreements. The computed Hoekman openness indices for air transport are presented in Table A.12 and shows that the US is closed for mode 1.

4.6.12 Maritime transport services

The Federal Maritime Commission (FMC), an independent regulatory agency, regulates ocean-borne transport, including actions to correct or counterbalance unfair or discriminatory foreign practices that adversely affect US shipping in international commerce.

The US did not table any offer in the WTO negotiations on maritime transport services in 1994 on account that offers tabled by other members did not constitute sufficient liberalization in the sector.

The US international maritime transport market is generally open to foreign competition (World Trade Organisation, 2001b: 183). However, the Merchant Marine Act of 1920 (Jones Act) requires that all goods transported by water between US ports be carried in US-flag ships, constructed in the US, owned by US citizens and crewed wholly by US citizens (World Trade Organisation, 2001b: 185). The Jones Act further limits the delegation of vessel inspection and plan-review functions by the Coast Guard to the American Bureau of Shipping (ABS) or a similar US classification society.

Under "cargo preference" measures, certain types of government-owned or -financed cargoes must be carried on US flag commercial vessels. Specifically, only vessels of US registry or vessels belonging to the US may be used in the transportation by sea of supplies bought for US military agencies. Fifty per cent of non-military government cargoes (75 per cent in the case of certain agricultural commodities) are reserved for privately owned US registered ships. Cargoes generated in connection with loans made by instrumentalities of the US Government in connection with the export of US products (such as project cargoes resulting from loans made by the Export-Import Bank of the US) are to be carried in US vessels, although the Secretary of Transportation may permit up to 50 per cent of such cargoes to be carried in vessels of the recipient country if that country does not discriminate against US vessels.

Vessels operating under foreign flags are exempted from corporate income tax on revenues in foreign commerce and the crews do not pay income tax to any country. According to US TPR of 2003 (World Trade Organisation, 2003), under the Foreign Shipping Practices Act of 1988 (FSPA), the Federal Maritime Commission may investigate and address conditions adversely affecting US carriers in foreign trade, when such conditions do not exist for foreign carriers in the US.

4.6.13 Ocean port services

There are no measures limiting the provision of maritime transport auxiliary services except for the provision of customs brokerage services, which is listed in the GATS schedule (World Trade Organisation, 1994d) as a service auxiliary to all modes of transportation. A corporation, association or partnership can supply customs brokerage services, and one person in the business entity must hold a customs broker's licence, which is issued by the US Customs Service only to US citizens.

According to US TPR of 2003 (World Trade Organisation, 2003), the US does not grant preferential treatment to any country with respect to the use of port and harbour facilities.

However, vessels of from Cambodia, Cuba, Iran, Iraq, Libya, North Korea, and Syria are prohibited from entering US ports on national security grounds.

The US maintains an MFN exemption covering restrictions on performance of long-shore work when making US port calls by crews of foreign vessels owned and flagged in countries that similarly restrict US crews on US-flag vessels from long-shore work.

4.7 MAIN INSIGHTS AND CONCLUDING REMARKS

The chapter focused on barriers to international trade in services for South Africa and the US. Barriers to trade in services are significant and differ substantially from traditional tariffs and quotas. Since the Uruguay round in 1994, these barriers are subject to negotiations under GATS. In this regard services are part of the Doha round of negotiations and form an integral part of the DDA. It is against this background that the chapter deals with the state of play of barriers to services trade in the two economies. A number of insights do emerge from the analysis.

Firstly, research in the area of barriers to trade in services began with Hoekman's (1995) pioneering work on frequency-based measures. Since then researchers at Australia's productivity institute have done substantial research to come up with restrictiveness indices. Thus, the use of existing work from the Australian researchers and construction of frequency-based measures using Hoekman (1995) methodology in this study should be viewed as preliminary attempt to measure barriers to trade with a view to informing South Africa-US IIT in services.

Secondly, each service has a predominant mode of supply and any analysis or trade negotiations should take this aspect into account. For instance, education and tourism services are predominantly supplied through mode 2 (consumption abroad) while telecommunications are mainly supplied through mode 1 (cross-border). In this regard, supply of services through mode 2 is quite unique since it involves the consumer crossing the border to consume a service abroad. This has two implications for trade modelling as

well as policy. From a trade modelling point of view, the uniqueness of mode 2 supply implies that analyses using weighted indices without taking into account this characteristic, are flawed. The appropriate approach is to switch the indices by replacing mode 2 in one country with mode 2 index for the trading partner and vice versa. This would ensure that the restrictions on all modes of supply in each country convey the same message (e.g. all restrict imports of services).

From a policy perspective, a country's trade restrictions on mode 2 only serve to restrict its own exports of the service in question to other countries. Consequently, to promote exports, South Africa should try to harmonise her migration and trade policies with a view to substantially reducing barriers to services supplied through mode 2. In terms of trade negotiations, South Africa (and other SACU members) should focus on barriers in the US on modes 1, 3 and 4 during the SACU-US FTA.

Thirdly, South Africa's policy stance on services is less open than the US. This can be seen in the fact that she submitted GATS commitments in 1994 on 40 per cent of the service modes/sectors compared to 50 per cent for the US. Similarly, South Africa has more trade barriers in most services (telecommunications, banking) than the US, which is typical of a number of low and middle-income economies. There are however, some services where the US has more restrictions such as engineering services, distribution services, and architectural services.

Fourthly, results from the Australian research group show that restrictions have substantially increased prices or costs of many services e.g. banking (price increase of 6 per cent in South Africa and 4 per cent in the US), food-distribution (0.5 per cent in South Africa and 2.3 per cent in the US), telecommunication (20.9 per cent in South Africa and 0.2 per cent in the US). This means that there are potential benefits from reform in terms of high IIT and lower prices.

The nonparametric measures of barriers to trade in services in this chapter are useful as a starting point in trade negotiations and trade modelling. The next chapter, which deals

with the determinants of South Africa-US IIT in services, uses, among others, the constructed Hoekman indices as explanatory variables.

CHAPTER 5

EMPIRICAL DETERMINANTS OF SOUTH AFRICA-US INTRA-INDUSTRY TRADE IN SERVICES

We can see the past but not influence it; we can influence the future but not see it.

Stewart Brand (in Toastmasters International, 2002)

5.1 INTRODUCTION

This chapter builds on Chapter 2 and focuses on the empirical determinants of South Africa-US IIT in services. Empirical work on the measurement of IIT began in the 1960s with the work of Verdoon (1960), Balassa (1966) and Grubel and Lloyd (1975). These empirical researches galvanised trade economists to come up with various theoretical models of IIT extensively discussed in Chapter 2.

However, most theoretical and empirical investigations of these models of IIT have been confined to trade in goods. The anti-services bias of theoretical and empirical literature is succinctly articulated by Lee and Lloyd (2002:159) who point out that "…. the only discussion of intra-industry trade in services, to our knowledge, are those of the transportation services by Kierzkowski (1989) and the international telephone industry by Tang (1999)…"

The modelling process in this chapter is driven by two objectives. The first objective is to estimate an IIT model that adequately allows for differences in behaviour over service sectors as well as any differences in behaviour over time for a given service. Indeed, Gray (1988) argues for a model that allows for heterogeneity in behaviour when dealing

with the phenomenon of IIT. The second objective is to use the most efficient estimation procedure given the short sample period. In view of the structural break owing to sanctions on South Africa before 1992, the analysis is done for the period 1994-2002[18].

The rest of the chapter is organised as follows. Under the backdrop of Chapter 2, Sections 5.2 and 5.3 survey theoretical and empirical literature relating to the determinants of IIT. Section 5.4 presents the specification of a dynamic logit model of South Africa-US IIT in unaffiliated services containing "country-specific", "industry-specific" factors and Hoekman openness indices constructed in Chapter 4. Sections 5.5 and 5.6 highlight data issues and estimation methodology. Section 5.7 describes statistical inference using first-order asymptotic theory (classical approach). Statistical inference using bootstrap techniques is explained in Section 5.8. Section 5.9 presents panel data unit root tests. Section 5.10 presents results of diagnostic tests of the residuals from the regression equation. Specifically, these entail tests of influential observations and heteroscedasticity. Sections 5.11 and 5.12 present the estimation and interpretation of the results. Main insights and concluding remarks are highlighted in Section 5.14.

5.2 THEORETICAL LITERATURE ON THE DETERMINANTS OF IIT

There is a great diversity of models in homogenous, horizontally and vertically differentiated IIT (HIIT and VIIT) extensively discussed in Chapter 2. The determinants and predictions of some these models are different and in some cases it is quite difficult to discriminate between them (Andresen, 2003). Despite these inherent problems, many empirical studies of IIT have tried to identify those features that are common to all, or most of these models. However, identification of these features is plagued with lack of appropriate data resulting to measurement errors since proxy variables are used in most

[18] This is an attempt to specify a regime-invariant model that avoids the Lucas (1976) policy critique. The lifting of sanctions in 1991, the new political dispensation in 1994, the readmission of South Africa in the World Trade Organisation (especially the participation in the General Agreement on Trade in Services in 1995) and general economic liberalization in the 1990s altered the "deep" structural parameters that characterize the fundamental behaviour of producers and consumers of services in South Africa.

cases. Greenaway and Milner (1989) broadly classify determinants of IIT as "country-specific" and "industry-specific".

5.2.1 Country-specific determinants

The country-specific determinants are divided into five broad categories: economic development, market size, geographic proximity, economic integration and barriers to trade.

5.2.1.1 Economic distance/development

According to economic geography and "new economic geography" models launched by Krugman (1991) and Neary (2001) respectively, high levels of economic development are conducive to IIT because highly developed economies have the capacity to develop, produce and demand differentiated products.

There are two sides to this proposition; supply and demand. On the supply side, the extent of IIT in services is positively related to South Africa's per capita income. This proposition is consistent with models of IIT in goods, which can be extended to services of cross-border type (Lee and Lloyd, 2002:168).

Applying Falvey (1981) model to services, the higher-quality varieties of differentiated services are produced using relatively capital-intensive techniques. Similarly, adapting the Helpman and Krugman (1985) model to services, a differentiated service is assumed to be capital-intensive. The US, which is a higher-income country, is capital-abundant relative to South Africa and hence she specialises in the production of horizontally and vertically differentiated services.

On the demand side, the extent of IIT in services is positively correlated with South Africa's per capita income, through a more diversified pattern of demand for services. Linder's (1961) overlapping demand hypothesis, Drèze (1960), Helpman (1981), Balassa

and Bauwens (1987) propose that the difference in per capita income represents a difference in the demand structure.

At the extreme, IIT will be highest when the two trading countries are identical in terms of economic development. The general expectation is that there is a negative relationship between IIT and the inequality of the levels of economic development of two countries. The most common measure of the inequality is the absolute value difference between GDP per capita of the two countries. This measure is affected by size bias. This can be seen when GDP for South Africa (country with small size) and the US (country with large size) are compared. However, Balassa (1986) formulated the following alternative index of relative inequality, which is robust to size bias;

$$ID = 1 + \frac{w\ln(w) + (1-w)\ln(1-w)}{\ln(2)}, ID \in (0,1) \qquad (5.1)$$

Where;

ID=Relative measure which takes a value 0 to 1

$$w = \frac{(South\ \ Africa\ \ characteristic\ \ )}{(US\ \ characteristic\ \ + \ \ South\ \ Africa\ \ characteristic\ \ )}$$

This index exhibits a number of characteristics. Firstly, as w approaches ½, ID approaches 0 while as w tends towards either 1 or 0, ID will take the value close to 1. Secondly, this variable is symmetrical with respect to country characteristics; it is not affected by a change in the unit of measurement and is a convex function of w.

5.2.1.2 Market size

Market size is positively related to the intensity of IIT. Both models of "love of variety"(Krugman, 1979) or "the ideal-variety" (Lancaster, 1980), discussed in Chapter 2, suggest that larger markets have the potential to allow for greater differentiation in products/services. Larger markets also have the potential for exploitation of economies

of scale. Most studies use GDP as a proxy for market size. The Balassa (1986) inequality in Equation 5.1 is modified to capture relative market size differentials.

5.2.1.3 Geographical proximity (space)

This is based on the gravity model of trade and there are three determinants. Firstly, two geographically close countries have lower transport costs and therefore have greater IIT intensity. Secondly, two geographically close countries would have similar culture and tastes, which increases the potential for IIT (demand similarity hypothesis). Thirdly, countries, which are close geographically, are likely to have similar resource base and therefore high specialisation within similar industries. The globalisation process and the creation of a "global village" have reduced the importance of geographical proximity.

Most studies of IIT use dummy variables, which takes a value of 1 if the two countries share a common border or a measure of the distance between the capital cities of the two countries (kilometres or miles) to capture geographic proximity. The expectation is that shorter distances and a common border increase the intensity of IIT. The problem with this approach is that it is only useful for cross-country studies (where the analysis tries to identify contemporaneous cross-country variations). In bilateral studies, these variables for each country would be constant over time.

5.2.1.4 Economic integration

Economic integration is deemed to increase the potential for IIT. Any form of integration (e.g., customs union or monetary union) lowers or eliminates barriers to trade thus lowering transaction costs of the trade. Moreover, economic integration, if for a long time, can be a proxy for culturally similar countries, which increases IIT. In most studies, the economic integration variable is represented by a dummy variable taking on the value of 1 if two countries are in an economic integration of any sort. For the case of South Africa and the US the economic integration variable would start playing some role once the SACU-US FTA is in place.

5.2.1.5 Barriers to trade

Falvey (1981) demonstrates that countries with lower trade barriers have higher levels of IIT. Balassa (1986), in a bid to capture non-tariff barriers, calculated trade orientation variable that measures deviations from a hypothetical level of per capita exports. Countries that have higher than the hypothetical value have low non-tariff barriers to trade, while countries with lower than hypothetical values have high non-tariff barriers to trade.

Although there have been many trade barriers and restrictive national regulations, a new era of free trade in services following the successful conclusion of the Uruguay Round in 1994, has seen growth in the importance of service liberalization and deregulation in the whole world.

5.2.1.6 Exchange rate

Although IIT models do not include nominal exchange rate, there are attempts in general trade literature to link exchange rate to international trade. These models are dealt with in Bowen *et al.* (1998:537-561). Exporting firms respond incompletely to exchange rate movements by adjusting their export prices and mark-up over marginal costs. Consequently, the relationship between exchange rate and IIT is an empirical question.

5.2.2 Industry-specific determinants

These determinants cover the categories of product differentiation, economies of scale, market structure, product life cycle and the role of multinational corporations.

5.2.2.1 Product/service differentiation

One measure for product differentiation within an industry is the number of product/service categories within an industry. Andresen (2003) argues that this counting of categories may not capture the product differentiation appropriately. Indeed, there are other indices that capture product differentiation.

The first and the commonly used measure is an index formulated by Hufbauer (1970);

$$H = \frac{\sigma_{ij}}{M_{ij}} \tag{5.2}$$

Where σ_{ij} represents the standard deviation of export unit values for shipments of good *i* to country *j* and M_{ij} is the unweighted mean of those unit values. An increase in the variance of the export unit values reflects an increase in product differentiation.

The second index by Fontagńe and Freudenberg (1997), which is also used to differentiate between horizontal (variety) and vertical (quality) differentiation, utilises industry-weighted average of unit value ratios:

$$Differentiation = \sum_{i=1}^{n}\left[\frac{value_{ij}}{value_{j}}\left(\frac{Max(UV_{ij})}{Min(UV_{ij})}\right)\right] \tag{5.3}$$

Where $value_{ij} \equiv$ value of trade for good *i* in industry *j*, $value_{j} \equiv$ value of trade in industry *j*, $Max(UV_{ij}) \equiv$ the higher unit value (export or import) of good *i* in industry j, $Min(UV_{ij}) \equiv$ the lower unit value (export or import) of good *i* in industry j and ranges from 1 to infinity. This measures the dispersion of unit value ratios for an industry.

For horizontal differentiation, the expected sign is negative whereas for vertical differentiation, the sign should be positive. The rationale is that a greater dispersion in unit value ratios within an industry should be associated with greater potential for product differentiation. The limitation with this measure in services is that unit values are not available.

The third measure of product differentiation is the intensity in research and development and sales techniques in different industries. New varieties of products/services must be developed through R & D and be marketed so that consumers are aware of them. The following proxies are used for differentiation: ratio of R& D, purchased advertising, marketing and sales costs to total sales. It is assumed that IIT varies positively with these variables.

The fourth measure used is the proportion of non-manufacturing, professional, or technical staff in total employment of an industry. Generally, the lower the manufacturing employment relative to total employment, the higher the product/service differentiation since these staff are deemed necessary to differentiate their products/services from those of competitor firms.

5.2.2.2 Economies of scale

This is the basis of most theories of IIT and measures the degree of decreasing costs in an industry/firm. In most trade models, price differentials between countries in intra-industry product lines are used to proxy scale economies. It is assumed that there is a positive relationship between IIT and the size of the firm/industry.

There are two measures of economies of scale. The first measure is the minimum efficient scale of production commonly proxied by the average firm size or the value-added in the industry. The second measure is the degree of capital in production. The third measure is the share of employment in firms with greater than 500 employees and

finally the relative productivity of large firms. Other studies use combinations of these measures.

5.2.2.3 Market structure

Industrial organisation literature (e.g. Spence, 1976) emphasized that product differentiation is likely to be at maximum under conditions, which approximate monopolistic competition. Lancaster (1980) argues that IIT will be at a maximum under conditions of "perfect monopolistic competition". Perfect competition and oligopolistic market structures also play some role.

The number of firms in an industry or the concentration ratio, the market share of the top j firms in the industry is quite important. The market share can be measured using a Herfindal index, which is obtained by squaring the market share of the various players and then summing those shares.

5.2.2.4 Product/service life cycle

The longer a product/service has been manufactured, the higher the potential for differentiation and hence IIT. Differentiation can take two forms; differentiation by attributes and technology/quality. The life cycle emanates from three sources. Firstly, it takes time to develop varieties of a product/service before differentiation can take place. Secondly, product cycle leads to the potential for import and export of various vintages of the same product/service. Finally, there can be trade in vertically (quality) differentiated products/services. The product life cycle is measured as the age of a product/service multiplied by the number of patents in the industry.

5.2.2.5 Multinational corporations

The relationship between the role of multinational corporations and IIT is a controversial issue. On one hand, the activities of multinational corporations may be associated with

high-unaffiliated IIT. Markusen (1994), Markusen and Venables (1998, 2000) extended the trade theories of IIT in the presence of FDI developed by Helpman and Krugman in the 1980s. They argue that FDI positively contributes to the volume of IIT and therefore any IIT model should take into account the positive contribution of FDI. Markusen and Venables (1998,2000) note that MNC overcome the costs of trade barriers by establishing themselves in the host countries and then generating arms-length trade with the source country.

On the other hand there can be a negative relationship between IIT and the activities of the multinational corporations. This is predicated on the fact that since firms may serve foreign markets directly rather than through trade, FDI may be a substitute for unaffiliated IIT.

The intensity of multinational corporation activity is measured by the percentage of sales accounted for by multinational corporations or FDI at the industry level.

5.2.3 Econometric modeling of IIT

Most econometric studies of the determinants of IIT employ the ordinary least squares (OLS) or its variants. The Grubel and Lloyd index, most commonly used in empirical studies, varies between 0 and 1 and OLS may provide forecasts, which are not within the 0 to 1 interval. This problem, is corrected by the following logistics transformation:

$$\ln\left(\frac{IIT}{1-IIT}\right) \tag{5.4}$$

This difficulty is also faced in studies that attempt to disentangle IIT into horizontal and vertical product differentiation and use the share that these classifications take in total trade. Balassa and Bauwens (1987: 1426) point out that the specification in Equation 5.4 cannot handle cases where IIT is either 0 or 1 since the natural logarithms of these values do not exist. In order to incorporate these values into the estimation, they recommend a nonlinear logistics transformation of the form;

$$IIT = \frac{1}{1+e^{-\beta' z}} + \varepsilon \qquad (5.5)$$

Where z is a matrix of explanatory variables. This estimation procedure preserves the valuable information provided by the 0 and 1. It is, however, important to note that Equation 5.5 is the inverse of Equation 5.4.

5.3 EMPIRICAL LITERATURE ON THE DETERMINANTS OF IIT IN SERVICES

Most of the empirical studies of IIT have been restricted to trade in goods. However, there are a few studies dealing with services trade. Tang (1999), using game-theoretic approach, shows that the GL index and industry characteristics hold under the assumption of Bertrand-Nash competition. The study employs panel data to explain bilateral telephone traffic between the US and 146 foreign destinations during the period 1990-97.

The study finds that there is decreasing share of IIT in telephone traffic between the US and foreign destinations and this trend is explained by larger country-specific differentials in cost, tele-density, market concentration and other control factors.

Lee and Lloyd (2002) conduct an empirical analysis of inter-country differences in IIT in services in the OECD. They examined the effect of the inclusion of trade in services on observed level of IIT in goods and services combined. The study found that IIT was uniformly high in twenty OECD countries and nine service industries, and also stable over time. However, for seventeen out of the twenty countries, combining goods and services trade reduces the magnitude of trade imbalance. This in turn raises the level of IIT because of the negative empirical relationship between the level of IIT and trade imbalance.

Li, Moshirian and Shim (2003) measured the extent of IIT for insurance services for the US with her trading partners in 1995 and 1996. The study took into account the role of

FDI as well as openness in generating IIT. Furthermore it improved the previous methodology employed in the IIT literature by using two-stage least squares (2SLS) and two-stage non-linear logit (2SNL) model as opposed to the use of either the OLS or the simple logit model, which create simultaneity and measurement errors.

The study found that the IIT model of insurance services captured the key factors that are important in increasing the volume of IIT in insurance services. Firstly, there is a positive role of FDI in contributing to an increase in the volume of IIT. This supports the new trade theories that emphasise the role of multinational corporations (MNC) in complementing the increase in the volume of trade rather than as a substitute for trade. Secondly, the paper found that trade intensity between the US and her trading partners contributes to the existence of product differentiation in insurance services and hence an increase in consumer welfare. Thirdly, the difference in the openness of domestic market between the US and her trading partners negatively influences the degree of IIT. The authors argue that this is because of the greater number of opportunities of the insurance companies' products leading to a higher degree of IIT.

To the best of our knowledge there is no study on IIT in services in South Africa. Indeed, in South Africa, the few studies on IIT have focussed on merchandise trade (e.g. Isemonger, 2000 and Peterson, 2002).

5.4 MODEL SPECIFICATION FOR THE SOUTH AFRICA-US IIT IN UNAFFILIATED SERVICES

In constructing the model, "country-specific" and "industry specific" determinants of bilateral IIT in services are combined in one equation. The basic equation (with predicted signs) is;

$$IIT_{it} = f(\overset{+}{IIT}_{it-1}, \overset{-}{P}_t, \overset{-}{S}_{it}, \overset{+}{\Delta E}_t, \overset{+}{D}SA_{it}, \overset{-}{TSA}_{it}, \overset{+}{TUS}_{it}, \overset{-}{FI}_{it},) \qquad (5.6)$$

IIT_{it} is the unadjusted GL index for IIT in unaffiliated[19] services calculated as in Equation 5.7.

$$IIT_{it} = 1 - \frac{|X_{it} - M_{it}|}{X_{it} + M_{it}} \text{ or } IIT_{it} = \frac{2Min(X_{it}, M_{it})}{X_{it} + M_{it}}, IIT_{it} \in [0,1], \forall_{i,t} \quad (5.7)$$

Where X_{it} and M_{it} are nominal value of exports and imports (US $) of unaffiliated services, respectively. P_t is an index of difference in per capita income between South Africa and US (used as a proxy for dissimilarities in demand structure/economic distance). S_{it} is an index of difference in market size between the US and South Africa and is used as a proxy for economies of scale. ΔE_t is the change in nominal rand-US dollar exchange rate (rand/ US$). DSA_{it} is an index of the degree of economic freedom (deregulation) in South Africa. TSA_{it} and TUS_{it} are Hoekman (1995)-type services trade openness indices in terms of market access and national treatment for all modes of supply in South Africa and the US respectively. They are computed in Chapter 4. FI_{it} is the US foreign direct investment (FDI) in South Africa.

The subscript *i* denotes the *i*th service sector [*i*=airfreight services; education services; financial services; legal services; management, consulting and public relations services; ocean freight services; ocean port services; research & development, and testing services (royalties and fees); telecommunication services and travel (tourism) services]. The subscript t denotes the *t*th year (*t*=1994, 1995,…,2002).

Model 5.6 is estimated in the form of Equation 5.4 as follows;

$$y_{it} = \alpha + \beta_1 y_{it-1} + \beta_2 P_t + \beta_3 S_{it} + \beta_4 \Delta E_t + \beta_{i5} DSA_{it} + \beta_6 TSA_{it} + \beta_7 TUS_{it} + \beta_8 FI_{it} + \varepsilon_{it} \quad (5.8)$$

[19] This is trade flow, which does not involve related parties. For instance service trade between Coca Cola South Africa and its parent company in the US is excluded.

Where $y_{it} = \log\left(\frac{IIT_{it}}{1 - IIT_{it}}\right)$. This specification makes it possible to conduct hypotheses tests using bootstrapping. Specifying the model in form of Equation 5.5 would entail estimating non-linear equations, which makes bootstrapping a difficult process since non converge terminates the resampling. The different postulations of hypothesis 1 in Section 1.6 of Chapter 1 are specified in Equation 5.9.

$$\beta_1 > 0, \beta_2 < 0 / B_2 > 0, \beta_3 < 0, \beta_4 >, \beta_{i5} > 0, \beta_6 < 0, \beta_7 > 0, \beta_8 < 0 \tag{5.9}$$

The disturbance term is specified as a two-way error component model;

$$\varepsilon_{it} = \mu_i + \lambda_t + \nu_{it} \tag{5.10}$$

Where μ_i denotes service-specific effects, λ_t denotes year-specific effects, and ν_{it} is idiosyncratic disturbance, which varies across services and time. No normality assumption is made about this error term in finite samples since nonparametric bootstrapping techniques are used in statistical inference[20].

The service-specific effects and time-specific effects can either be treated as fixed or random. There are two approaches to distinguishing these two effects. The first approach is the randomness of the unobserved effects. In this regard, "random effect" is treated as random variables while "fixed effect" is considered non-stochastic parameters to be estimated for each cross-section, using dummy variables.

[20] Asymptotic normality assumption still holds since the Edgeworth expansion as presented for instance in Hall (1992:83), uses the cumulative normal distribution as the first term;
$G(x) = P(T \le x) = \Phi(x) + n^{-\frac{1}{2}} q(x)\phi(x) + O(n^{-1})$. Where $T = n^{1/2}\left(\hat{\beta} - \beta\right)/\hat{\sigma}$ is a pivotal statistic, which is asymptotically normally distributed, q is an even quadratic polynomial and Φ, ϕ are standard cumulative normal distribution and density functions respectively. The notation "$O\left(n^{-1}\right)$" denotes a random variable that is of order n^{-1}.

The second approach is to use the correlation of the unobserved effects with observed explanatory variables, a method suggested by Mundlak (1978) and underscored by Wooldridge (2002). In this regard, "random effect" is assumed if there is zero correlation between the observed explanatory variables and the unobserved effects;

$$Cov(z_{it}, \mu_i) = 0, Cov(z_{it}, \lambda_t) = 0 \qquad (5.11)$$

Where z_{it} is a matrix of explanatory variables in Equation 5.8. On the contrary, fixed effects paned data model allows for arbitrary correlation between the unobserved effects (μ_i and λ_t) and the observed explanatory variables (z_{it}).

A fixed effect model is used in the study because the focus is on specific set of service sectors and inferences are restricted to the behaviour of these service sectors. Moreover, correlation between unobserved effects and observed explanatory variables is allowed.

The service-specific effects (μ_i) are assumed fixed parameters to be estimated and they represent any *unobservable* service-specific characteristics that do not vary over time. These characteristics relate to the nature of specific services such as non-storability, heterogeneity and high flexibility/customisation, imperfect competition, and asymmetric information (coupled with adverse section and moral hazards). Specifically, these may include the following;

(i) The different modes of supply. For instance, education and travel services are mainly supplied through mode 2 (consumption abroad) as opposed to telecommunications services basically supplied through mode 1 (cross-border trade)

(ii) Degree of service differentiation/service delivery

(iii) The level of information asymmetry in the service sector

(iv) Other service-specific issues such as unobservable management capabilities/styles, level of trust, politics/government influences etc., which apply to specific service sectors

The time-period effects (λ_t) are also assumed fixed parameters to be estimated as coefficients of time dummies for each year in the sample. These effects are service-sector invariant and can be justified given the numerous policy interventions as well as events in South Africa and the US. The service sector invariant events may include, among others, the following;

(i) South Africa's new political dispensation in 1994, which created new trading conditions that cut across all the services

(ii) The effects of the East Asian crisis in 1997 and Russian financial crisis in 1998

(iii) The September 11 bomb blast in the US

5.5 DATA DESCRIPTIONS

The following data are used for estimation. IIT_{it} : Mirrored[21] unaffiliated services trade data are used to compute South Africa-US unadjusted GL index. The data is taken from the United States Bureau of Economic Analysis (http://www.bea.gov/bea/di/1001serv/intlserv.htm). The IIT is computed using Equation 5.7. The data is in nominal US dollars (millions) and is not deflated due to lack of sectoral deflators. Additionally, since the GL index is homogenous of degree zero, there is no difference between the index computed using nominal and real data.

In view of the fact that there are some observations with IIT exactly equal to 0 or 1, these were adjusted by adding US dollars 0.00001 millions to the sectoral exports and imports.

[21] Mirrored refers to the fact that data is collected from the trading partner's side. This means that US imports are treated as South Africa's exports and vice versa. There are limitations in this approach such as under–invoicing. However, it is hoped that the US has an efficient system of recording international transactions.

In some services, the US BEA does not disclose data for some years. In these instances, interpolation is used.

P_t : Nominal GDP per capita (US $) for South Africa and US is collected from the IMF's International Financial Statistics. Instead of taking absolute values of inter-country differences in per capita incomes, Balassa (1986) index shown in Equation 5.1 is used to calculate relative differences that take values between 0 and 1.

S_{it} : Data used to calculate differences in market size was collected from different sources. Proxies for market size variable differ from service to service as shown in Table 5.1.

Table 5.1: Proxies for market size

Service	Proxy of market size	Source
Air freight	Air transport freight (million tons per KM)	World Development Indicators
Education	South African students enrolled in US tertiary institutions and vice versa	Open Doors. **http://opendoors.iienetwork.org/**
Financial services	Foreign assets of banking and financial institutions	IMF International Financial Statistics
Legal services	Civil cases of debt	STATSSA and US Federal Court
Management, Consulting and public relations	Data on other services in UNCTAD services trade data	UCTAD
Ocean freight	Merchant shipping fleets: total (000 gross registered tons)	UN Statistical Yearbook
Ocean port services	Merchant shipping fleets: total (000 gross registered tons)	UN Statistical Yearbook
Research & Development, and Testing services	Trademarks and patents granted	World Intellectual Property Organisation (WIPO) **http://www.wipo.int**
Telecommunications	Fixed telephone lines and mobile subscribers per 1000 people	World Development Indicators
Travel	Number of tourist arrivals	World Development Indicators

Source: Different sources as indicated in the last column

Instead of taking absolute values of inter-country differences in market size, Equation 5.1 is used to calculate a measure indicating relative differences that takes values between 0 and 1. The use of this index solves two problems. Firstly, it is not affected by

magnitudes of particular country characteristics. This is indeed very important when comparing US (large country) with South Africa (small country). Secondly, this index circumvents the problem of differences in units of measurements for the proxies of market size across the service sectors.

ΔE_{it} : The change in rand-US dollar exchange rate (rand/$). The data is collected from the IMF International Financial Statistics.

DSA_{it} : Index of economic freedom published by the Fraser Institute (**http://www.freetheworld.com/**) is used as a proxy to measure the degree of deregulation in a particular service sector in South Africa.

The index measures the degree of economic freedom present in five major areas;
(i) Size of government: Government consumption, transfers and subsidies, government enterprises and investment, top marginal tax rate (income tax and payroll tax).
(ii) Legal structure and security of property rights: Judicial independence; impartial courts; protection of intellectual property; military interference; and integrity of the legal system.
(iii) Access to sound money: Growth of money supply; inflation variability; freedom to own foreign currency.
(iv) Freedom to exchange with foreigners: Taxes on international trade (as percentage of exports and imports, mean tariff rate and variability of tariff rates); regulatory trade barriers (hidden import barriers, cost of importing); size of trade sector; restrictions on capital markets (access to foreign capital, restrictions on foreign capital transactions)
(v) Regulation of credit, labour and business: Regulation of credit markets (private ownership of banks, competition from foreign banks, extension of credit to private sector, avoidance of negative real interest rates); regulation of labour markets (impact of minimum wage, flexibility in hiring and firing, collective bargaining, incentives for unemployment benefits, military conscription); regulation of business (price controls, administrative obstacles to new businesses, time spent with government bureaucracy, ease of starting a new business, irregular payments to government officials).

On a scale of 0 to 10, the measure gives a higher value to the country where there is limited state regulation on economic activity.

TSA_{it} *and* TUS_{it} : Indices of trade openness in the services sector and are constructed using the Hoekman approach (Chapter 4). This is to some extent related to the economic freedom index. However, these indices are more specific to international trade in services.

Table 5.2: Degree of deregulation (economic freedom)

Service sector	Proxy for the degree of deregulation
Air freight services	Regulatory trade barriers
Advertising	Restrictions to exchange with foreigners
Education and training services	Country overall rating of economic freedom by the Fraser institute
Financial services	Access to sound money
Legal services	Integrity of the legal system
Management consulting and public relations Services	Freedom to exchange with foreigners
Other business, professional and technical services	Restriction on foreign capital transactions
Ocean freight services	Regulatory trade barriers
Ocean port services	Regulatory trade barriers
Research & development and testing services	Protection of intellectual property rights
Telecommunication services	Freedom to exchange with foreigners
Travel services	Country overall rating of economic freedom by Fraser institute, Canada

Source: Fraser Institute, **http://www.freetheworld.com/**

FI_{it} : Mirrored sectoral FDI (US $ millions) is collected from the US Bureau of Economic Analysis. FDI includes the initial transaction between two entities and all subsequent financial transactions between them and among affiliated enterprises, both incorporated and unincorporated. Position of total and sectoral US FDI abroad is used to compute a ratio as follows;

$$FI_{it} = \frac{FDI_i}{FDI_t} \tag{5.12}$$

Where FDI_i is the position of US FDI in South Africa in sector *i*, FDI_t is the position of US total foreign direct investment in South Africa.

5.6 THE ESTIMATION METHODS

5.6.1 The Estimation of the dynamic panel data model

The panel data model in Equation 5.8 is estimated within a general linear model (GLM) framework. GLM is an extension of the multivariate regression model in a number of ways. Firstly, the GLM allows for linear transformation or linear combinations of multiple dependent variables. This provides the ability to analyse effects or repeated measures and thus encapsulate panel data model. Secondly, since GLM uses generalised inverse, it can provide solution to normal equations when the regressors are linearly dependent. The following assumptions are made.

Firstly, there is strict exogeneity of explanatory variables conditional on unobserved effects;

$$E\left(v_{it}\left|z_{it},\mu_i,\lambda_t\right.\right)=0 \tag{5.13}$$

Secondly, the fixed effects estimator is well behaved asymptotically if the standard rank condition on a matrix of time-demeaned explanatory variables holds;

$$rank\left(\sum_{t=1}^{T}E\left(\ddot{z}_{it}'\ddot{z}_{it}\right)\right)=rank\left[E\left(\ddot{z}_i\ddot{z}_i\right)\right]=K \tag{5.14}$$

Where $\ddot{z}_{it}=z_{it}-\bar{z}_i$ and K is the number of regressors. This assumption shows that time-constant variables such as distance should not be used in fixed effects analysis unless they are interacted with time varying variables (Wooldridge, 2002).

The fixed effects estimator is;

$$\hat{\beta} = \left(\sum_{i=1}^{N} \ddot{z}_i' \ddot{z}_i \right)^{-1} \left(\sum \ddot{z}_i' \ddot{y}_i \right) = \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \ddot{z}_{it}' \ddot{z}_{it} \right)^{-1} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \ddot{z}_{it}' \ddot{y}_{it} \right) \tag{5.15}$$

Where $\ddot{y}_{it} = y_{it} - \bar{y}_i$

Equation 5.15 is a WITHIN estimator because it uses the time variation within each service-sector. However, it provides the same results as a least squares dummy variable (*LSDV*) model where demeaning is not done first.

The third assumption is that the fixed effects estimator has a constant variance

$$E\left(v_i' v_i \middle| z_i, \mu_i\right) = \sigma_v^2 I_T \tag{5.16}$$

This assumption in effect implies that the idiosyncratic errors have constant variance across t and serially uncorrelated. It then follows that $\sqrt{N}\left(\hat{\beta} - \beta\right) \sim N\left(0, \sigma_v^2 \left[\ddot{z}_i' \ddot{z}_i\right]^{-1}\right)$.

The asymptotic variance is $A\text{var}(\hat{\beta}) = \hat{\sigma}_v^2 \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \ddot{z}_{it}' \ddot{z}_{it} \right)^{-1}$ (5.17)

In this case $\hat{\sigma}_v^2 = \dfrac{SSR}{\left[N(T-1) - K\right]}$ (5.18)

Where $\hat{\sigma}_v^2 = \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{v}_{it}^2$

The problem is that the usual standard errors from the regression in Equation 5.8 are too small on average because they use an incorrect estimate of σ_v^2. To correct for this problem, Wooldridge (2002) recommends that each standard error be multiplied by the factor;

$$\left\{ \frac{(NT - K)}{(N(T-1) - K)} \right\}^{1/2} \tag{5.19}$$

Since y_{it} in Equation 5.8 is a function of μ_i and λ_t in several ways, y_{it-1} is also a function of these variables. This implies that the assumption of exogeneity in Equation 5.13 is violated. Baltagi (2001) argues that the endogeneity problem renders the OLS estimator biased and inconsistent even if ν_{it} are not serially correlated.

With moderate time dimension, the bias of LSDV estimator can be substantial. Nickell (1981) analytically derives three different possibilities of bias on the coefficient of the lagged dependent variable. Firstly, it is negative if the population value of this coefficient is positive. Secondly, it is increasing in the value of the population parameter and finally the bias does not disappear when the cross-section dimension (N) grows large.

Alternative dynamic panel estimators are the first differenced generalised method of moments (GMM) estimator of Arellano and Bond (1991) and the system GMM estimator of Arellano and Bover (1995). These estimators are conceived for panel data models when the time dimension is large relative to N. i.e. $N \to \infty$.

Kiviet (1995) derived an approximation of the bias of the WITHIN estimator in a dynamic panel data model with serially uncorrelated disturbances and strongly exogenous regressors. This method subtracts consistent estimator of the bias from the original WITHIN estimators.

Everaert and Pozzi (2004) attempted to introduce an iterative bootstrap algorithm as an alternative for the analytical bias correction proposed by Kiviet (1995). Starting from the biased LSDV estimates, their method entailed searching over the parameter space for the unknown population parameters. These coefficients can then be considered to be unbiased estimates for the true parameters.

The study uses bootstrap-based bias correction to deal with the problems of endogeneity as well as heteroscedasticity. The bootstrap-based approach is in the spirit of Everaert and Pozzi (2004) in dealing with endogeneity.

5.6.2 The design matrix

5.6.2.1 Overparameterised model

This is also referred to as the "indicator variable" approach. In this method a separate predictor variable is coded for each group identified by a categorical predictor variable. This method will almost always lead to $X'X$ matrices with redundant columns, thus require generalized inverse for solving the normal equations. It is as a result of this characteristic that this method is called overparameterised model for representing categorical predictor variables.

5.6.2.2 Sigma-restricted model

This model uses the convention that the effects must sum to zero. This constraint is imposed by coding the variables using combinations of –1, and 1s or any other numbers which in combination will sum up to 0. A reference category must be chosen. Rather than fix the effect of the reference class to 0, the effects will equal 1 minus the sum of the remainder categories, thus ensuring that the effects sum to 0. The sigma-restricted model is used in the thesis.

5.7 STATISTICAL INFERENCE USING CLASSICAL APPROACH

This approach uses first-order asymptotic distribution of the test statistic under the null to approximate Type I critical values[22]. The rationale for this approximation is the fact that most test statistics in econometrics are asymptotically pivotal because their asymptotic distributions do not depend on unknown population parameters when the null hypothesis being tested is true. On the basis of this, an approximate Type I critical value can be obtained from asymptotic distribution theory without knowledge of where the true data generating process (DGP) is in the set specified by the null hypothesis.

[22] This is Type I error, which is committed when one rejects a true null hypothesis.

Classical statistical inference entails the following procedure. Firstly, an assumption is made that the estimated statistic's sampling distribution has a shape with known probability properties (e.g. normal distribution in most regression models). In regression analysis, the OLS estimates will be normally distributed if the model's error is normally distributed i.e. $\hat{\beta}|X \sim N\left(\beta, \sigma_{\varepsilon}{}^{2}\left(X'X\right)^{-1}\right)$ (Green, 2003:50).

Secondly, the parameters of the model are estimated analytically using Equation 5.20.

$$\hat{\beta} = \left(X'X\right)^{-1}\left(X'Y\right),\ \hat{\sigma}_{e}^{2} = \frac{e'e}{N-K} \tag{5.20}$$

Once $\hat{\beta}$'s sampling distribution is deduced using the parametric assumption and the analytic formulas associated with it, statistical inferences can be drawn about β.

The hypothesis testing in the classical procedure seeks evidence in the sample to refute the "null" hypothesis. This is done using the Neyman-Pearson methodology (Green, 2003:153-154). In this methodology, the null is usually cast as the narrowest model in the set under consideration. The problem with the Neyman-Pearson methodology is that a sharp conclusion cannot be reached. Unless the significance level of the testing procedure is made so high as to exclude all alternatives, there will always remain the possibility of a Type I error. Consequently, the null is never rejected with certainty, but only with a stated degree of confidence.

However, as pointed out by Horowitz and Savin (2000) and Horowitz (2001), Monte Carlo experiments show that first-order asymptotic theory often gives a poor approximation to the distribution of test statistics with the samples used in most econometrics applications. Consequently, the true nominal probabilities that a test makes a Type I error can be very different when an asymptotic critical value is used (Error rate probability/coverage error).

5.8 STATISTICAL INFERENCE USING BOOTSTRAPPING

Bootstrap methodology, introduced by Efron (1979), provides a good estimator of the true Type I critical values that are more accurate than the approximation of first-order asymptotic theory (Horowitz and Savin, 2000, Horowitz, 2001). According to Mooney and Duval (1993: 1), bootstrapping uses the analogy between the sample and the population from which the sample was drawn. It involves "resampling" either the data or the error term with replacement many times in order to generate an empirical estimate of the entire sampling distribution of the parameters.

The bootstrap allows inferences to be made without making strong distributional assumptions and without the need for analytic formulas for the sampling distributions of parameters. Instead of imposing a shape on $\hat{\beta}$'s sampling distribution by assumption, bootstrapping entails empirically estimating its entire sampling distribution by examining the variation of the statistic in the bootstrap sample.

Bootstrapping uses the same model structure as the classical approach and the only difference is the inferential foundation. The corollary of this is that bootstrapping is not useful in improving the estimation of a parameter, but rather in testing its statistical properties.

The basic bootstrap approach is to treat the sample as if it is the population and apply Monte Carlo sampling to generate an empirical estimate of the statistic's sampling distribution. This is done by drawing a large number of resamples of size n from the original sample of size n randomly with replacement[23]. Despite the fact that each resample would have the same number of elements as the original sample, through resampling with replacement each resample could have some of the original data points represented in it more than once and some not represented at all. Consequently, each of this resamples will likely be slightly and randomly different from the original sample.

[23] The Jackknife method entails sampling without replacement.

Since the elements in each resample vary slightly, a statistic $\hat{\beta}^*$ calculated from one of this resamples will likely take on a slightly different value from each of the other $\hat{\beta}^*$'s and from the original $\hat{\beta}$. The central point in bootstrap is that a relative frequency distribution of these $\hat{\beta}^*$'s calculated from the resamples is an estimate of the sampling distribution of $\hat{\beta}$.

5.8.1 Theoretical justification of bootstrapping

Mooney and Duval (1993) provide a non-technical justification of bootstrapping. They argue that the bootstrapping procedure is based on two analogies. Firstly, the analogy of the sample empirical distribution function (EDF) and the population distribution function (PDF) that generated the data. Secondly, the analogy between the random resampling mechanism with the stochastic component of the model. In the regression framework, the error term should not have serial correlation and heteroscedasticity.

These two analogies are predicated on two levels of asymptotic theory. Firstly, as the original sample size (n) approaches the population sample size (N), the EDF $\hat{F}(x)$ approaches the true distribution, F(X). This simply reiterates the point that as a sample increases in size, it contains more and more information about the population until n=N, in which case $\hat{F}(x) = F(X)$. Secondly, the bootstrapped sampling distribution $\hat{F}^*(\hat{\beta}^*)$, approximates $F(\hat{\beta})$ in a given sample when n is large enough to allow $\hat{F}(x)$ to approach F(X). Under these conditions, as the number of resamples (B) increases to infinity, $\hat{F}^*(\hat{\beta}^*) \approx F(\hat{\beta})$.

A more detailed asymptotic theory of bootstrap is presented in Hall (1992), and Hall (1994) and relies on Edgeworth and Cornish-Fisher expansions in order to prove the existence of asymptotic refinements.

5.8.2 Factors that hamper the performance of bootstrap methodology

There are situations when bootstrap methodology performs worse than the classical approach. These situations emanate from the theoretical justification of bootstrapping.

Firstly, when the EDF is not a good approximation of the PDF. In this case the bootstrapped estimate of the sampling distribution of $\hat{\beta}$ will be inaccurate. Mooney and Duval (1993) point out that this lack of congruence between the EDF and PDF could emanate from a small sample, a biased sample design or merely random bad lack.

Secondly, there is a limitation in using EDF as an estimate of density of PDF, which could affect the accuracy of the bootstrap results. This problem, pointed out by Mooney and Duval (1993), relates to the fact that the PDF is continuous while the EDF is always a discrete function. The effect of this is that between the steps of the EDF are values of the PDF that cannot be included in the analysis. If those values included and left out of the EDF are evenly and randomly distributed, this should not affect the accuracy of the results. However, if this is not the case (e.g. with small and biased sample), the accuracy of the bootstrap could be impaired.

Thirdly, the presence of serial correlation could affect the accuracy of bootstrapping. If the bootstrap is to work well, the bootstrap error terms should display the same sort of serial correlation as the structural errors (Mackinnon, 2002, Efron and Tibshirani, 1993). The problem is that in applications, it may not be clear how the real error terms are generated. Mackinnon (2002) points out that there are two approaches followed. The first approach, which is semi-parametric in nature, is "sieve bootstrap". A unit root null is first imposed and an autoregressive model of order p is estimated. In this case p is chosen in a way that it increases with the sample size. Resampling the rescaled residuals from the autoregressive model then generates new innovations. The serially correlated bootstrap error terms are constructed from the model and the innovations. The second approach, which is fully nonparametric, is to resample groups of residuals. One of the

simplest of such methods is the "block bootstrap", proposed in various forms by Carlstein (1986), Efron and Tibshirani (1993), and Politis and Romano (1994), among others.

Fourthly, models with heteroscedasticity reduce the power of bootstrapping (Davison and Hinkley, 1998, Mackinnon, 2002, and Flachaire, 2003). This is a serious problem in this study since the different service sectors are likely to have different error variances. Davison and Hinkley (1998) note that if heteroscedasticity can be modelled, then bootstrap simulation by resampling errors is still possible. Since heteroscedasticity is a potential problem in this thesis, Section 5.8.3 presents a detailed discussion about it.

5.8.3 Heteroscedasticity and bootstrapping

The standard error components model given in Equation 5.8 assumes that the regression disturbances are homoscedastic with the same variance across time and individual service sectors. This is a restrictive assumption in South Africa-US IIT in services, which covers diverse service sectors.

Baltagi (2001) points out that assuming homoscedastic disturbances when heteroscedasticity exists will result in consistent estimates of the regression coefficients but the estimates will not be efficient. Additionally, the standard errors of these estimates will be biased unless a robust standard error is computed, which corrects for the possible presence of heteroscedasticity.

White (1980) proposed heteroscedasticity consistent covariance matrix estimator, (HCCME), which permits asymptotically correct inference on the parameter estimates in the presence of heteroscedasticity of unknown form. Mackinnon and White (1985) considered a number of possible forms of HCCME, and showed that, in small samples, the t and F statistics based on them can be seriously biased. Chester and Jewitt (1987) showed that the extent of the bias is related to the structure of the regressors, and specifically the presence of observations with high leverage.

Within a panel data framework, heteroscedasticity can be present in the service-specific effects [$\mu_i \sim iid(0, \sigma_\mu^2)$ in Equation 5.10) as first suggested by Mazodier and Trognon (1978), the remainder error term [$v_{it} \sim iid(0, w^2)$ in Equation 5.10] or both. This study uses fixed effects model and it is assumed that the service-specific effects are homoscedastic.

The problem with these corrections is that they suffer from small size bias distortions and bootstrap methods could be used to approximate the finite-sample distribution of test statistics under the null hypotheses. In order for bootstrap methods to be reasonably accurate, it is important that the data generating process (DGP) used for drawing samples should be as close as possible to the true DGP that generated the observed data, while making the assumption that the DGP satisfies the null hypothesis. However, presence of heteroscedasticity reduces the power of bootstrapping (Davison and Hinkley, 1998, Mackinnon, 2002 and Flachaire, 2003). Davison and Hinkley (1998) note that if heteroscedasticity can be modelled, then bootstrap simulation by resampling errors is still possible.

The problem is when the form of heteroscedasticity is unknown. In this case bootstrap samples must be generated in such a way that the relationship between the variance of each error term and the corresponding regressors is retained. The simplest way of dealing with heteroscedastic errors, which was originally proposed by Freedman (1981), is called "pairs bootstrap". The idea of bootstrapping pairs is to resample the regressand and regressors together. In this approach the assumption of nonstochastic regressors in Equation 5.13 is dropped. The problem with this methodology is that it could mess up the design matrix.

The second way to deal with heteroscedasticity of unknown nature is to use "wild bootstrap", which was proposed by Liu (1988) following the work of Wu (1986) and Beran (1986). Wild bootstrap estimates variances from the individual residuals (Davison and Hinkley 1998: 272). Liu established the ability of the wild bootstrap to provide refinements for the linear regression model with heteroscedastic errors and further

evidence was provided by Mammen (1993), Davidson and Flachaire (2001) and Flachaire (2003). Mammen showed that under some regularity conditions, wild bootstrap is asymptotically justified in the sense that the asymptotic distributions of the various statistics are the same as the asymptotic distributions of their wild counterparts. To perform wild bootstrap, the following algorithm is used.

(i) For ε_{it}, where i is the service sector and $t = 1994,1995,....,2002$

(ii) Modify the residuals using any of the methods in Equations 5.21,15.22 and 5.23.

(iii) Generate one of the two-point (lattice) distributions in Equation 5.24 or 5.25.

(iv) Resample from the distribution in (iii) with replacement to generate t_{it}

(v) Multiply the modified residual with resampled two-point distributed variable to $v_{it}^{*} = a_{it} e_{it} t_{it}$

(vi) Generate response function as follows $y_{it}^{*} = X_{it}\hat{\beta} + v_{it}^{*}$

(vii) Fit least squares to $(x_{i1}, y_{i1}^{*}),.....(x_{in}, y_{in}^{*})$ giving estimates of parameters and standard errors.

(viii) Repeat steps (i) to (vii) B times.

(ix) Get empirical distribution function for parameter estimates by placing a probability of 1/B at each value. Construct confidence intervals using percentile, Bias Corrected, etc methods.

Mackinnon and White (1985) showed the possible forms of a_t;

$HC_{i0} : a_{it} = 1$ i.e. no transformation of errors

$$HC_{i1} : a_{it} = \sqrt{\frac{n}{n-k}} \qquad (5.21)$$

Where n is the sample size and k is number of parameters estimated. The rationale for this heteroscedastic consistent transformation is the fact that OLS residuals have smaller

variance than the error terms on which they are based. In a panel framework, the equivalent version is Equation 5.19.

$$HC_{i2} : a_{it} = \frac{1}{\sqrt{1-h_{it}}} \tag{5.22}$$

Where $h_{it} = X_{it}\left(X'X\right)^{-1}X'_{it}$, the leverage is the jth element of the orthogonal projection matrix on to the span of the columns of X.

$$HC_{i3} : a_{it} = \frac{1}{1-h_{it}} \tag{5.23}$$

The popular method is the two-point distribution suggested by Mammen (1993);

$$F_1 : t_{it} = \begin{cases} -(\sqrt{5}-1)/2, with \quad probability \quad \dfrac{\left(\sqrt{5}+1\right)}{2\sqrt{5}} \\ (\sqrt{5}+1)/2, with \quad probability \quad \dfrac{\left(\sqrt{5}-1\right)}{\left(2\sqrt{5}\right)} \end{cases} \tag{5.24}$$

Another simpler two-point distribution is called the Rademacher distribution

$$F_2 : t_i = \begin{cases} -1, with \quad probability \quad \dfrac{1}{2} \\ 1, with \quad probability \quad \dfrac{1}{2} \end{cases} \tag{5.25}$$

Davidson and Flachaire (2001) show that, on the basis of theoretical analysis and simulation experiments, wild bootstrap tests based on the Rademacher distribution, F_2, will usually perform better in finite samples than ones based on the F_1.

5.8.4 Estimation of bias in bootstrap methodology

The bootstrapped sampling distribution $\hat{F}^*(\hat{\beta}^*)$ can be used to assess the bias of $\hat{\beta}$ (Mooney and Duval, 1993: 30-33).

$$Bias(\hat{\beta}) = \hat{\beta} - \hat{\beta}_{(.)}^{\ *} \tag{5.26}$$

Where $\hat{\beta}^*_{(.)} = \dfrac{\sum_{b=1}^{B} \hat{\beta}^*_b}{B}$

Mooney and Duval (1993:33) warn against subtracting the bootstrap estimate of the bias from the sample $\hat{\beta}$ in an attempt to achieve an unbiased estimate of β. The bootstrap bias estimator from a single sample contains an indeterminate amount of random variability along with bias and this may artificially inflate the mean square error (MSE) of $\hat{\beta}$. The point is that bootstrap is useful for developing inferences about populations using sample data and not necessarily for developing point estimates of parameters. If the standard deviation is much greater than the bias, the latter can be disregarded since the random error will overwhelm it. Efron (1982:8) suggests that when the ratio of the estimated bias to the standard error is less than 0.25, the bias of $\hat{\beta}$ is not a serious problem. The bootstrap methodology provides a general method of estimating this ratio, which is not available under the first-order asymptotic-theory based methods.

5.8.5 Bootstrap confidence intervals

The bootstrap confidence interval methods are based on "modified" Neyman-Pearson methodology. These methods include normal approximation, the percentile method, the bias corrected (BC) and the Percentile-t method, among others.

5.8.5.1 The normal approximation method

This method is analogous to the classical approach to constructing confidence intervals. It is highlighted in Mooney and Duval (1993:34-36) and Davison and Hinkley (1998:198-200). This is based on the fact that whenever it is plausible to assume that a statistic is normally distributed, but no analytic standard error formula exists for it, the bootstrapped sampling distribution can be used to estimate the standard error.

Just as in the classical case, end points are identified on the z or Student's t distribution associated with $\alpha/2$ and $1-\alpha/2$. Standard errors are then used to transform these z and t scores into the metric of the sample by inserting into the classical confidence interval formula:

$$p\left(\hat{\beta}-t_{\alpha/2}\hat{\sigma}^{*}_{\hat{\beta}}<\beta<\hat{\beta}+t_{\alpha/2}\hat{\sigma}^{*}_{\hat{\beta}}\right)=1-\alpha \tag{5.27}$$

The normal approximation method typically requires fewer bootstrap replications than the other bootstrap confidence interval techniques. The main problem with this method is that it fails to take full advantage of the property that $\hat{F}^{*}(\hat{\beta}^{*})$ estimates the whole sampling distribution of $\hat{\beta}$, not just its second moment[24]. The other problem with this method is that confidence interval developed in this way are no better than those developed with classical approach when the normality assumption is violated.

5.8.5.2 Percentile method

This is a nonparametric method and is highlighted in Mooney and Duval (1993: 36-37) and Davison and Hinkley (1998:202-206). This approach takes literally the notion that $\hat{F}^{*}(\hat{\beta}^{*})$ approximates $F(\hat{\beta})$. The method also uses the Neyman-Pearson approach by first selecting a significance level, α. The α -level confidence intervals includes all the values of $\hat{\beta}^{*}$ between the $\alpha/2$ and $1-\alpha/2$ percentiles of the $\hat{F}^{*}(\hat{\beta}^{*})$ distribution. For instance, the endpoints of $\alpha=0.05$ for $\hat{\beta}$ would be the values of $\hat{\beta}^{*}$ at the 2.5^{th} and 97.5^{th} percentiles of $\hat{F}^{*}(\hat{\beta}^{*})$. To get this, the vector $\hat{\beta}^{*}$ is sorted in an ascending order and pick the appropriate percentile. For instance, with 1000 resamples, a count up to the 25^{th} value (0.025 times 1000) and count down to the 25^{th} highest value is done.

[24] A normally distributed variable can be described fully by its two moments only (mean and variance).

The percentile method circumvents the need for the parametric assumption of the classical approach. If the statistic is distributed asymmetrically, it does not adversely affect the accuracy of the percentile method's confidence interval. The percentile method also has the advantage of being simple to execute. Complex formulas are not needed to estimate the parameter $\hat{\beta}$'s assumed sampling distribution, and no critical values for the probabilities of end points on the standardized sampling distribution. The work is simply to calculate $\hat{\beta}^*$, sort them in ascending order and count up and down to appropriate percentiles. It is as a result of this that it is the most widely used method.

There are some limitations of the percentile method. Firstly, as pointed out by DiCiccio and Romano (1988), it may perform poorly with small samples, primarily because of the importance of the tails of the sampling distribution. It may be that large samples are needed to iron out the tails. The second problem with the percentile method is that an assumption that the bootstrapped sampling distribution is an unbiased estimate of $F(\hat{\beta})$ must be made.

5.8.5.3 Bias corrected (BC) method

This method, suggest by Efron (1982), deals with the last problem of the percentile method in Section 5.8.5.2. The details of this method are highlighted in Mooney and Duval (1993:37-40), Efron and Tibshirani (1993: 184), Davison and Hinkley 1998: 203). Instead of assuming that $\hat{\beta}^* - \hat{\beta}$ and $\hat{\beta} - \beta$ are centred on zero (i.e. $\hat{\beta}^*$ is an unbiased estimate of $\hat{\beta}$ and $\hat{\beta}$ is an unbiased estimate of β), the BC method assumes that these quantities are distributed around a constant, $z_0\sigma$. Where σ is the standard deviation of the respective distribution. The quantity z_0 is the biasing constant to be used to adjust the bootstrapped distribution of $\hat{\beta}$.

The main problem with the BC method is that certain parametric assumptions have to be resorted to. Firstly, it must be assumed that there exists some monotonic transformation of $\hat{\beta}$ and β whose difference has a known distribution, such as normality. Secondly, it assumes that $\hat{\beta}$ is an unbiased estimator of β. This may not make sense in some cases.

5.8.5.4 The Percentile-t method

The details of this method are presented in Mooney and Duval (1993: 40-41). In this approach, the $\hat{\beta}^*$ is transformed into a standardized variable t^*

$$t_b^* = \frac{\left(\hat{\beta}_b^* - \hat{\beta}\right)}{\hat{\sigma}_{\hat{\beta}}} \tag{5.28}$$

The t^*'s are distributed as $\hat{\beta}$ but on a standardized scale. This standardized bootstrap distribution of the estimator is used to develop the critical points in the sampling distribution of $\hat{\beta}$ in a way similar to the Student's t distribution in classical inference. The problem is how to estimate $\hat{\sigma}_{\hat{\beta}}$ so as to convert the $\hat{\beta}^*$'s to t^*'s. The most general approach is "double bootstrap" (Davison and Hinkley, 1998: 223-230).

5.8.5.5 Comparison between bootstrap and classical statistical inference

Table 5.3 shows the difference between bootstrap and classical estimation procedures. The main difference lies on the fact that in bootstrap, the distribution of the parameter is estimated through empirical distribution function (EDF) as opposed to assuming normality. Thus the interpretation of confidence intervals in bootstrap is basically the same as in classical. For instance in a 95 per cent confidence interval, the classical interpretation (i.e.frequentist definition of probability) is that 95 per cent of the confidence intervals will contain the true value while 5 per cent will not.

There is nothing in classical approach that says that the confidence interval calculated contains the true parameter (Iversen, 1984). It is only hoped that it does. The same interpretation holds for bootstrap. The only difference is that the bootstrap methodology tends to be consistent with frequentist definition of probability since many resamples are done. The Bayesian approach with its bootstrap/resampling versions (such as Gibbs sampling) interprets the same confidence interval differently. The 95 per cent confidence interval means that there is 95 per cent probability that the confidence interval contains the true parameter.

Table 5.3: Bootstrap vs classical inference procedures

Estimation framework	Estimation of parameters	Distributional assumptions	Hypothesis testing
Classical	Any econometric estimation method e.g.GLM	**First-order asymptotic theory** -Central Limit theorem -Normality -Pivotal quantities	**Neyman-Pearson** -Rejection and acceptance regions -Use tabled critical values -Interpretation of confidence intervals consistent with "frequentist" definition of probability as opposed to Bayesian interpretation
Bootstrap	Same as classical. The aim of bootstrap is not to provide point estimates but rather statistical inference	(a)Parametric (b)Nonparametric -EDF approximates PDF -Sample is representative -Use sample to get EDF	**Modified Neyman-Pearson** -Use methods such as Percentile, Normal approximation, Bias corrected(BC), Bias Corrected and Accelerated(Bca), and Percentile t - -Interpretation of confidence intervals consistent with classical

Source: Authors' illustration

5.9 PANEL UNIT ROOT TESTS

The need to test for unit root in panel data emanates from the fact that a regression equation with integrated variables is likely to be spurious (unless there is cointegration).

Panel-based unit root tests have higher power than unit root tests based on individual time series.

Panel-based unit root tests have been advanced by, among others, Qua (1994), Levin and Lin (1993), Maddala and Wu (1999), Hadri (2000), Breitung (2000), Im, Pesaran and Shin (1995, 2003) hereafter referred to as IPS.

The panel unit root tests spring from the following autoregressive process for panel data;

$$y_{it} = \rho_i y_{it-1} + \delta_i x_{it} + \varepsilon_{it} \qquad (5.29)$$

Where $i = 1,2,...,10$ service sectors observed over periods $t = 1994,1995,...,2002$. The variable x_{it} represent the exogenous variables in the model, including any fixed effects or individual trends, ρ_i are the autoregressive coefficients, ε_{it} is identically and independently distributed disturbance term. If $|\rho_i| < 1$ then y_{it} is stationary and if $|\rho_i| = 1$, then y_{it} is nonstationary.

The tests for panel unit roots can be classified into two groups. Firstly, there is a group of tests, which assume that the autoregressive parameters are common across services so that $\rho_i = \rho$ for all i. The Levin, Lin, and Chu (2002), Breitung (2000), and Hadri (2000) tests all employ this assumption. The first two tests employ a null hypothesis of a unit root while the Hadri test uses a null of no unit root.

Secondly, there is a class of tests, which allows ρ_i to vary across the cross-sections (services). The IPS (1995,2003), and the Fisher-ADF and Phillips Perron-based tests (Maddala and Wu (1999) and Choi (2001) all allow for individual unit root processes so that ρ_i may vary across cross-sections. The tests are all constructed by combining individual unit root tests to derive a panel-specific result.

A number of conclusions can be drawn from the unit root tests in Table 5.4. Firstly, the dependent variable, y_{it}, is integrated of order zero implying that the explanatory variables should be I(0). Secondly, a rejection of the null hypothesis by at least one test is used to return a verdict as to whether a variable is I(0) or not. Consequently, all the variables are stationary (except exchange rate) implying that there is no need to proceed to test for panel cointegration.

Table 5.4: Summary of panel unit root test results

	Null: Unit root (homogeneous)		**Null: Unit root (heterogeneous)**			**Null: No unit root (homogenous)**
Variable	*LLC t-stat*	*Breitung t-stat*	*IPS w-stat*	*ADF-Fisher chi square*	*PP- Fisher chi square*	*Hadri z-test*
y_{it-1}	-11.7316 (0.000)**	-1.644 (0.050)	-2.620 (0.004)*	55.361 (0.000)**	70.535 (0.000)*	10.958 (0.000)**
P_t	-71.642 (0.000)**	-1.540 (0.062)*	-15.238 (0.000)*	55.042 (0.000)**	55.042 (0.000)*	2.221 (0.013)**
S_{it}	-187.602 (0.000)**	-0.782 (0.2172)	-52.093 (0.000)**	92.852 (0.000)**	90.7822 (0.000)**	8.105 (0.000)**
FI_{it}	-4.399 (0.000)**	-0.843 (0.199)	0.130 (0.552)	17.922 (0.593)	47.050 (0.001)	7.509 (0.000)**
DSA_{it}	-4.012 (0.000)**	0.883 (0.814)	-0.097 (0.461)	21.044 (0.395)	37.032 (0.012)*	6.281 (0.000)**
ΔE_t	-9.717 (0.000)**	-5.410 (0.000)*	-3.781 (0.000)**	80.258 (0.000)**	163.949 (0.000)*	4.288 (0.000)**
TSA_{it}	-2.529 (0.006)*	-1.741 (0.041)*		6.787 (0.034)*	18.029 (0.586)	
TUS_{it}	-3.594 (0.000)**	-0.471 (0.319)	-0.460 (0.323)	4.215 (0.122)	15.137 (0.001)*	213.220 (0.000)**

Notes:

1.* and ** denotes rejection of null at 5% and 1% significance levels.
2. Sample: 10 cross-sections, period 1994-2002
3. Regression equation contains individual effects, constant and time trend
4. Probabilities for Fisher tests are computed using asymptotic chi-square distribution. The other tests assume asymptotic normality
5. Eviews 5 econometrics software used

5.10 DIAGNOSTIC TESTS OF FIRST-ORDER ASYMPTOTIC THEORY ESTIMATION RESULTS

Equation 5.8 is estimated using GLM procedure in SAS statistical software and the results are presented in Table 5.6. In view of the fact that these results form the basis of bootstrapping, a number of diagnostic tests were performed. These include test of equality of variance and detection of influential observations.

5.10.1 Test of equality of residual variance across service sectors

The test of equality of variances is done using Levene's test (Levene 1960). Levene's test checks whether the variances of two or more populations are equal.

The null hypothesis is as follows;

$H_0 : \sigma_1 = \sigma_2 = ... = \sigma_{10}$ i.e. the standard deviations of the residuals from the ten different service sectors are equal.

$H_1 : \sigma_i \neq \sigma_j$ for at least one pair(i,j)

Given the residual e with sample size of N divided into k subgroups, where N_i is the sample size of the ith subgroup, the Levene's test is defined as;

$$W = \frac{(N-k)}{(k-1)} \frac{\sum_{i=1}^{k} N_i (\overline{Z}_{ij} - \overline{Z})^2}{\sum_{j=1}^{k} (\overline{Z}_{ij} - \overline{Z})^2} \qquad (5.30)$$

$$Z_{ij} = |e_{ij} - \overline{e}|$$

Where $\bar{e}$ is the mean of the ith service sector. $\bar{Z}_{ij}$ are the group means of the Z_{ij} and Z is the overall mean of Z_{ij}. In this case N=90, k=10 and $N_i = 9$. The results are presented in Table 5.5.

Table 5.5: Tests of equality of residual variances

Service sector	Mean	Standard deviation
Airfreight	6.957398e-14	0.69441000
Education and training	4.322468e-14	1.38869791
Financial services	5.034553e-14	0.73569849
Legal services	4.706420e-14	0.85443271
Management consulting and public relations services	3.862959e-14	0.74640308
Ocean freight services	8.091059e-14	2.53313427
Ocean port services	-2.13656e-14	3.44243172
Research development and testing services	6.291264e-14	0.95871912
Telecommunications	6.906821e-14	1.43027313
Travel (tourism services	5.018208e-14	1.38965465
Levene's F -test statistic	2.54(0.013)	

Source: SAS statistical software output

Notes: Type I error probability in brackets.

The Levene's test shows that the variances of the residuals from the different service sectors are statistically different (i.e. there is heteroscedasticity).

5.10.2 Diagnostics for influential data observations

Influential observations are those whose presence in the data can have distorting effect on the parameter estimates and possibly the entire analysis. Outliers are data points that contain unusual dependent values (Mukherjee, White and Wuyts, 1998).

5.10.2.1 Leverage: The Hat-values

The hat-value (h_{ii}) measures the leverage of the regression. These values are so named because it is possible to express the fitted values $\hat{Y}_j$ (Y-hat) in terms of the observed values Y_i. The leverage is specified as follows;

$$h_{ii} = x_i \left(X'X \right)^{-1} x_i \tag{5.31}$$

The average value of h_{ii} should be k/n where k is the number of parameters and n is the number of observations. The standard criterion is to consider any data point for which $h_{ii} > 2k/n$ a high leverage. In this study, the cut off is 0.8 (i.e. $2 \times 36/90$). On the basis of this, the data point 1994 for financial services is influential (Table A.17). This implies that if this point is moved up or down, the regression surface will tend to follow it.

5.10.2.2 Dffits statistic

The Dffits statistic is a scaled measure of the change in the predicted value for the *i*th observation. It is calculated as follows;

$$DFFITS_i = \frac{\hat{y}_i - \hat{y}_{i(i)}}{s_{(i)} \sqrt{h_{ii}}} \tag{5.32}$$

Where $\hat{y}_{i(i)}$ is the *i*th value predicted without using the *i*th observation. $s_{(i)}$ is the standard error with the ith observation deleted. Large absolute values of Dffits indicate influential observations. The rule of thumb is that if DFFITS is greater than 1 in the case of small data sets, or $2\sqrt{\frac{k}{n}}$ for large data, then the data point is influential. In this study the cut off is 1.26. The results in Table A.18 in the appendix show that the following data points are influential; ocean freight (1994, 1995); ocean port services (1995, 2000, 2001 and 2002); research development and testing services (1995); telecommunications (1996) and travel (2001). These observations have very high residual values and leverage.

5.10.2.3 CookD statistic

The CookD statistic is an overall measure of the influence of the ith observation on all the parameter estimates. In other words, it measures the change in the parameter estimates caused by deleting each observation.

$$D_i = \frac{(\hat{\beta} - \hat{\beta}'_{(i)})(X'X)(\hat{\beta} - \hat{\beta}_{(i)})}{ks^2} \sim F_{(k,n-k)} \tag{5.33}$$

Where $\hat{\beta}_{(i)}$ is the vector of parameter estimates after deleting the ith observation. Observations whose CookD statistic is greater than 10 per cent point of the F distribution are influential while observations with CookD statistics more than 50 per cent of F distribution are highly influential. At the 95 per cent confidence interval the F-statistic is 1.65. The results in Tables A.17 and A.18 show that none of the observation is influential on the parameter estimates.

5.10.2.4 Covratio statistic

This measures the effect of observations on the covariance matrix of the parameter estimates. It is computed as follows;

$$C_i = \frac{\left| s_{(i)}{}^2 (X'_{(i)} X_{(i)})^{-1} \right|}{\left| s^2 (X'X)^{-1} \right|} \tag{5.34}$$

Where $X_{(i)}$ is the X matrix without the ith observation. A value near 1 indicates that the observation has little effect on the precision of the estimates. The cut-off criterion is; $(C_i - 1) > \frac{3k}{n}$. In this study k=36, n=90. Therefore the cut off criterion is 1.2.

The results in Tables A.17 and A.18 in the appendix show that most of the regressors are influential on the precision of the estimates.

5.10.2.5 The fate of influential data observations

The problematic data points were investigated and found that the influential observations are not due to flaws in data. Thus the influential data points were retained since they inform the bootstrapping process. Firstly, the covratio statistic shows that pairs

resampling cannot be used because regressors are not interchangeable as they affect the precision of the estimates. Secondly, the DFFITS and leverage statistics show that pooling of residuals from different sectors in the residual resampling process may not be appropriate. Instead, stratified resampling or wild bootstrap should be used.

5.11 IMPLEMENATION OF THE BOOTSTRAP METHOD

Two approaches to weighted error resampling are used to deal with the problem of heteroscedasticity and potential bias emanating from endogeneity of the regressors. The first approach, explained in Davison and Hinkley (1998: 270), assumes that the non-constant variance is known and this is build into the resampling procedure. In this approach, it is assumed that the residual variance is the true unknown variance. The second approach is the Liu-Davidson-Flachaire wild bootstrap, which is a more sophisticated method of estimating variances from individual residuals.

Two bootstrap macros in SAS statistical software were written to execute the bootstrap algorithms. The SAS bootstrap macro uses data step (i.e. procedures or *procs*) to execute standard procedures such as GLM and interactive matrix language (IML) for more complex algorithms such as resampling.

5.11.1 Algorithm for residual variance equals population variance by assumption

Firstly, Equation 5.8 is estimated using GLM procedure in SAS and residuals, v_{it}, generated. Secondly, the residuals are transformed through a standardization procedure involving subtracting the mean and dividing by sector variance as shown in Equation 5.35.

$$v_{it}^{s} = \frac{v_{it} - \bar{v}_i}{\hat{\sigma}_i} \tag{5.35}$$

Where $\hat{\sigma}_i$ and $\bar{v}_i$ are the standard error and the mean of the residuals for specific service sector, respectively. The assumption is that the standardization in Equation 5.35 makes the residuals exchangeable and thus poolable.

Thirdly, resampling with replacement is done for the residuals in Equation 5.35 to generate v_{it}^{*} [25]. Fourthly, a bootstrap vector of response variable, $\left(y_{it}^{*}\right)_b$, is generated by adding the resampled vector of residuals multiplied by the variance for that sector to the vector of fitted response as follows;

$$\left(y_{it}^{*}\right)_b = \hat{y}_{it} + v^{*}{}_{it}\hat{\sigma}_i \tag{5.36}$$

Fifthly, these bootstrapped response variables are then regressed using GLM on the fixed explanatory variables to estimate a bootstrapped vector of coefficients, $\hat{\beta}_b^{*}$, as in Equation 5.37;

$$\left(y_{it}^{*}\right)_b = \hat{\beta}_b^{*'} z_{it} + \eta_{it} \tag{5.37}$$

Sixthly, this procedure from the first to the fifth is repeated B times (in this case, B=3000). The bootstrapped regression coefficients for each resample are placed in a (3000×36) matrix. Each column in this matrix is converted into an estimate of the sampling distribution of the $\hat{\beta}$ by placing a probability of $1/3000$ on each value of $\hat{\beta}_b^{*}$.

Seventhly, the bias of the estimated coefficients is computed using Equation 5.26. This step does not only determine whether endogeneity is a serious problem but it also informs the decision of which method in Section 5.8.5 to use in constructing confidence intervals.

[25] Stratified resampling is not used because there is not much variability within the service sector on account of the short time dimension 1994-2002.

Eighthly, confidence intervals are constructed using the percentile method. This entails sorting the bootstrap parameters in ascending order and then selecting the appropriate percentiles. For instance, with 3000 replications and using the 95 per cent confidence interval, the bootstrapped parameter number 75 is selected as the lower confidence limit value and number 2925 as the upper confidence limit value in the empirical distribution function (EDF). Hypothesis tests can then be performed.

5.11.2 Liu-Davidson-Flachaire wild bootstrap algorithm

The first step is the same as the previous algorithm but the second step entails transforming the residuals using the second form of Mackinnon and White (1985) HCCME in Equation 5.22 is used to transform the residuals;

$$a_{it}v_{it} = \left(\frac{1}{\sqrt{1-h_{it}}}\right)v_{it} \tag{5.38}$$

This adjustment compensates for the fact that the OLS residuals (and thus GLM) tend to understate the true errors.

In the third step, since the SAS software does not have a customised Rademacher distribution in Equation 5.25, this was done manually. This entailed generating a series, which is a sequence that alternate between 1 and –1. Since there are 90 observations in total, there were 45 observations with 1 and 45 observations with –1 effectively constructing a Rademacher distribution in Equation 5.25.

Fourthly, resampling with replacement is done for the generated variable that follows the Rademacher distribution. As pointed out in Liu (1988), this lattice distribution satisfies three requirements;

$$E(t_{it}) = 0, E(t_{it}^2) = 1 \text{ and } E(t_{it}^3) = 1 \tag{5.39}$$

The first condition shows that the Rademacher distribution centres the bootstrap statistic around zero. The second condition states that the Rademacher distribution centres the variance around 1 while the last condition corrects for skewness in the Edgeworth expansion of the sampling distribution of the parameter estimates.

Fifthly, this is multiplied with the modified residuals in Equation 5.38 as follows;

$$v_{it}^{*} = a_{it} e_{it} t_{it} \tag{5.40}$$

The rest of the steps are the same as the previous approach in Section 5.11.1. It is imperative to note that since the macros use the computer clock as the seed, one may not get exactly the same results unless the program is re-run at exactly the same time. Table 5.6 presents first-order asymptotic theory results while Tables 5.7 and 5.8 present the two bootstrap versions.

The overall explanatory power of the model (in terms of adjusted R^2) shows that the regressors explain about 50 per cent of the variation in log odds of IIT. The F-statistic shows that the regressors are jointly significant in explaining the dependent variable. The Durbin h statistic shows that the model does not suffer from serial correlation problem.

The fourth column in the bootstrap results (Tables 5.7 and 5.8) presents the standardised bias and shows that the estimates in Equation 5.8 are unbiased and therefore endogeneity in the dynamic panel model is not a serious problem.

One other diagnostic test is the fact that the model should predict IIT within the 0 and 1 range. This requirement is tested by using the relationship;

$$\ln\left(\frac{\hat{IIT}}{1-\hat{IIT}}\right) = pred \tag{5.41}$$

Where $\hat{IIT}$ is the predicted IIT index and *pred* is the predicted log odds ratio of IIT and 1-IIT. This can be rewritten as;

$$\hat{IIT} = \frac{1}{1+e^{-\Pr ed}} \tag{5.42}$$

Figure 5.1 shows the EDF for the predicted IIT in financial services. A normal distribution line is superimposed to see how the EDF approximates the latter. IIT=0 and IIT=1 are the lower and upper bounds of the GL IIT index. The figure shows that the model predicts IIT within the 0 and 1 range. The EDF for IIT in other services also meet the same criterion (Figure A.1 through Figure A.9 in the appendix). Although the thesis follows a classical approach to probability interpretation as opposed to Bayesian view, the EDFs can provide an approximation of the underlying distribution that generates South Africa-US IIT in the selected unaffiliated services. In other words, a subjective probability interpretation is used. This is not strictly Bayesian since neither prior information regarding the underlying distribution F nor population parameters generated from joint posterior densities as explained in Davison and Hinkley (1998:512-514).

Hypothesis testing in bootstrap is done by checking whether $\beta = 0$ is contained in the confidence interval of the bootstrap results. For example for the case of the difference in market size, the bootstrap confidence intervals do not contain the element zero implying that it is statistically significant. This can be seen in Figure 5.2, which shows the EDF of this coefficient with its 99 per cent bootstrap confidence intervals. This conclusion also agrees with the first-order asymptotic results in Table 5.6.

The LCL and UCL refer to 99 per cent lower and upper confidence intervals, respectively. Since $\beta = 0$ is not contained in the interval, the difference in market size is statistically different from zero. The same can be done for all the other coefficients.

Table 5.6: First-order asymptotic theory panel data estimation results

	First-order asymptotic theory results		
Independent variables and service sector	**Estimate**	**Std error**	**p-value**
Intercept	73.496***	19.278	0.000
y_{it-1}	-0.385***	0.078	0.000
Difference in per capita income	-126.738**	42.887	0.004
Difference in market size	-16.428**	6.528	0.015
US foreign direct investment in SA	29.593**	14.562	0.047
Nominal exchange rate (Rand/$)	67.154*	36.059	0.068
Openness to services trade in SA	-6.679	4.999	0.187
Openness to services trade in the US	-1.128	3.644	0.758
Deregulation in South Africa:			
Air freight services	-2.063	1.425	0.154
Education and training services	2.322*	1.376	0.097
Financial services	1.505	1.376	0.279
Legal services	-0.391	2.984	0.896
Management, consulting and public relation services	4.337*	2.288	0.063
Ocean freight services	-4.647**	1.425	0.002
Ocean port services	8.802**	2.447	0.001
Research development and testing services	3.153	2.513	0.215
Telecommunications services	-8.474**	3.356	0.015
Travel (tourism) services	1.287	1.415	0.367
Service-specific fixed effects:			
Air freight services	24.214*	8.685	0.007
Education and training services	-11.549	8.383	0.174
Financial services	-3.949	9.046	0.664
Legal services	-6.708	14.712	0.650
Management, consulting and public relation services	-22.740*	12.295	0.070
Ocean freight services	40.920***	8.558	0.000
Ocean port services	-56.507***	14.388	0.000
Research development and testing services	-15.230	17.654	0.392
Telecommunication services	54.305**	17.818	0.004
Travel (tourism) services[a]	-2.756		
Time-specific effects:			
1994	-4.383**	1.777	0.017
1995	-2.152	2.560	0.404
1996	-8.805**	3.590	0.017
1997	-0.866	1.514	0.570
1998	-4.648**	2.085	0.030
1999	4.314*	2.316	0.068
2000	6.114**	2.070	0.005
2001	4.731 **	2.098	0.028
2002[a]	5.695		
Diagnostic statistics			
Rsquare	0.684095		
Adjusted R-square	0.502806		
F-statistic	3.50(0.000)		
Durbin-h	1.0008		
First order autocorrelation coefficient	-0.0707		

Notes: Sample period: 1994-2002

[a]The effects of travel service-effects are estimated as minus the sum of other service effects. The same applies to the time specific effects of 2002.

*, **, and *** implies significance at 10 per cent, 5 per cent and 1 per cent, respectively.

Table 5.7: Pooled residual bootstrap results

Independent variables and service sector	Bootstrap (3000 replications)				
	Estimate	Std error	Bias	Confidence (percentile method)	
				Interval	%
Intercept	71.698***	19.146	0.093	21.215, 115.085	99
y_{it-1}	-0.389***	0.087	0.046	-0.638, -0.155	99
Difference in per capita income	-122.282***	44.613	-0.099	-221.076, -7.170	99
Difference in market size	-16.563***	5.591	0.024	-28.648, -3.434	99
US foreign direct investment in SA	29.639***	11.928	-0.004	2.483, 60.835	99
Nominal exchange rate (Rand/$)	63.045	43.624	0.094	-7.196, 138.793	90
Openness to services trade in SA	-6.574**	3.413	-0.031	-12.326, -0.358	95
Openness to services trade in the US	-1.166	1.592	0.024	-3.809, 1.364	90
Deregulation in South Africa:					
Air freight services	-2.086***	0.691	0.033	-3.993, -0.167	99
Education and training services	2.347**	0.963	-0.026	0.417, 4.156	95
Financial services	1.492**	0.805	0.016	0.057, 3.178	95
Legal services	-0.415	1.664	0.014	-3.153, 2.365	90
Management, consulting and public relation services	4.353***	1.268	-0.013	1.023, 7.462	99
Ocean freight services	-4.687***	1.455	0.027	-7.934, -1.425	99
Ocean port services	8.756***	2.985	0.015	1.427, 15.084	99
Research development and testing services	3.104*	1.848	0.027	0.009, 6.007	90
Telecommunications services	-8.409***	2.409	-0.031	-15.366, -2.893	99
Travel (tourism) services	1.269	0.945	0.019	-0.219, 2.801	90
Service-specific fixed effects:					
Air freight services	24.301***	5.032	-0.017	12.253, 36.677	99
Education and training services	-11.849*	6.102	0.049	-22.769, -1.568	90
Financial services	-3.856	6.054	-0.015	-13.650, 6.094	90
Legal services	-6.753	9.126	0.005	-23.087, 8.722	90
Management, consulting and public relation services	-22.910***	6.890	0.025	-40.325, -4.224	99
Ocean freight services	41.109***	9.102	-0.021	17.456, 61.606	99
Ocean port services	-56.255***	18.193	-0.014	-97.319, -8.288	99
Research development and testing services	-14.837	13.177	-0.030	-36.994, 6.377	90
Telecommunication services	53.816***	13.233	0.037	24.155, 89.478	99
Travel (tourism) services[a]	-2.766				
Time-specific effects:					
1994	-4.296**	2.025	-0.043	-7.775, -0.204	95
1995	-2.242	3.299	0.027	-7.454, 3.424	90
1996	-8.443**	4.071	-0.089	-16.370, -0.826	95
1997	-0.976	1.893	0.058	-4.009, 2.124	90
1998	-4.410*	2.477	-0.096	-8.409, -0.446	90
1999	4.058	2.586	0.099	-0.399, 8.454	90
2000	5.893**	2.340	0.094	1.362, 10.377	95
2001	4.785*	2.662	-0.020	0.253, 8.983	90
2002[a]	5.631				

Notes: Sample period: 1994-2002

[a]The effects of travel service-effects are estimated as minus the sum of other service effects. The same applies to the time specific effects of 2002.

*, **, and *** implies significance at 10 per cent, 5 per cent and 1 per cent, respectively.

Table 5.8: Liu-Davidson-Flachaire wild bootstrap results

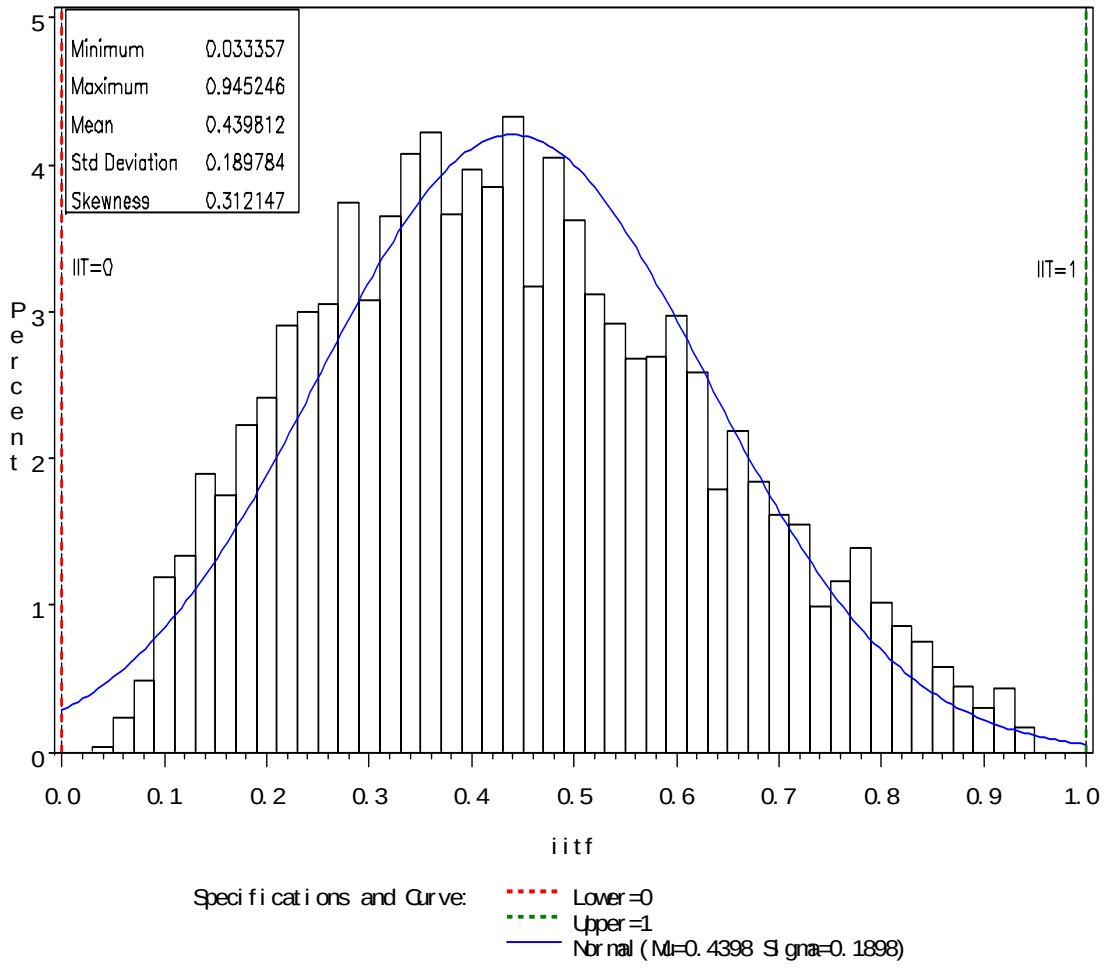
	Bootstrap (3000 Replications)				
Independent variables and service sector	**Estimate**	**Std error**	**Bias**	**Confidence (percentile method)**	
				Interval	**%**
Intercept	74.744***	19.039	-0.066	31.579, 124.273	99
y_{it-1}	-0.386***	0.148	0.007	-0.729, -0.062	99
Difference in per capita income	-129.108***	40.751	0.058	-220.852, -41.813	99
Difference in market size	-16.678***	4.915	0.051	-29.183, -4.332	99
US foreign direct investment in SA	29.455*	18.239	0.008	1.284, 58.098	90
Nominal exchange rate (Rand/$)	68.606**	34.245	-0.042	3.721, 134.201	95
Openness to services trade in SA	-6.627	4.345	-0.012	-13.323, 0.308	90
Openness to services trade in the US	-1.051	1.644	-0.047	-3.909, 1.730	90
Deregulation in South Africa:					
Air freight services	-2.077*	1.159	0.012	-4.026, -0.205	90
Education and training services	2.189**	1.187	0.112	0.024, 4.521	95
Financial services	1.466	1.053	0.037	-0.285, 3.167	90
Legal services	-0.324	2.310	-0.029	-4.020, 3.344	90
Management, consulting and public relation services	4.351***	2.060	-0.007	0.130, 9.301	99
Ocean freight services	-4.693***	1.899	0.024	-9.446, -0.547	99
Ocean port services	8.839**	4.065	-0.009	1.146, 16.462	95
Research development and testing services	3.24**	1.644	-0.053	0.115, 6.483	95
Telecommunications services	-8.484***	2.248	0.004	-13.927, -3.288	99
Travel (tourism) services	1.249	1.057	0.036	-0.589, 2.937	90
Service-specific fixed effects:					
Air freight services	24.280***	8.084	-0.008	5.631, 44.193	99
Education and training services	-10.676*	6.129	-0.142	-20.955, -0.994	90
Financial services	-3.654	5.839	-0.050	-12.887, 6.452	90
Legal services	-7.167*	12.795	0.036	-28.433, -1.352	90
Management, consulting and public relation services	-22.878***	10.180	0.014	-46.733, -1.352	99
Ocean freight services	41.231***	15.010	-0.021	9.363, 73.926	99
Ocean port services	-56.715***	24.558	0.008	-114.372, -0.412	99
Research development and testing services	-16.014	10.447	0.075	-33.909, 1.438	90
Telecommunication services	54.232***	12.095	0.006	24.689, 83.467	99
Travel (tourism) services[a]	-2.639				
Time-specific effects:					
1994	-4.495***	1.419	0.079	-8.569, -1.387	99
1995	-2.224	2.274	0.032	-5.991, 1.739	90
1996	-9.005***	3.474	0.058	-16.993, -1.806	99
1997	-0.803	1.353	-0.047	-3.056, 1.224	90
1998	-4.733**	2.090	0.041	-8.626, -0.466	95
1999	4.437**	2.238	-0.055	0.128, 8.618	95
2000	6.242***	2.081	-0.062	1.542, 11.419	99
2001	4.771***	1.643	-0.024	0.968, 8.690	99
2002[a]	5.81				

Notes: Sample period: 1994-2002

[a]The effects of travel service-effects are estimated as minus the sum of other service effects. The same applies to the time specific effects of 2002.

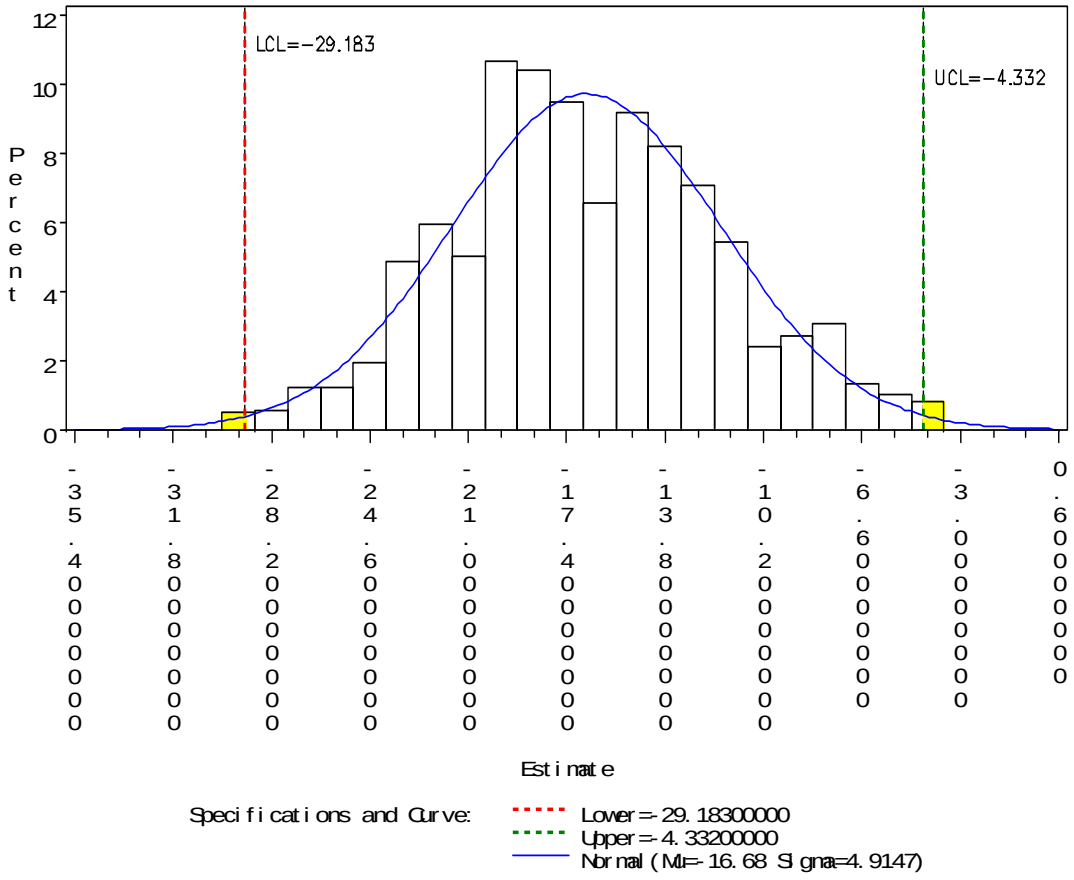
*, **, and *** implies significance at 10 per cent, 5 per cent and 1 per cent, respectively.

Figure 5.1: EDF of the predicted IIT in financial services



Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Figure 5.2: EDF of the coefficient for the difference in market size between South Africa and the US (99 per cent confidence interval)



Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

5.12 INTERPRETATION OF THE ESTIMATION RESULTS

Firstly, the intercept is interpreted as the global mean since effects coding is used in constructing fixed effects. The service-specific effects are deviations from this grand mean as opposed to regression coding, where the effects would be deviations from the reference class.

Secondly, using the classical statistical inference and the bootstrap approaches, the coefficient for the lagged dependent variable (y_{it-1}) is negative and statistically significant. The fact that there is a positive bias in the two bootstrap methods (column 4 in Tables 5.7 and 5.8) confirms the theoretical postulation of Nickell (l981) that if the population parameter is negative, then the bias is positive and vice versa.

Thirdly, differences in demand structure, proxied by differential in capita income, has a negative sign as anticipated and is statistically significant at 1 per cent level. This is in line with the Chamberlin-Heckscher-Ohlin (CHO) model of horizontally differentiated IIT (HIIT) and agrees with many "North-South" studies on IIT in goods presented in Table 10.1 of Greenaway and Milner (2002: 184). The results are similar to those in Li *et al.,* (2003, 2005). However, the results are inconsistent with vertically differentiated IIT (VIIT) theoretical model of Flam and Helpman (1987) and the empirical findings by Stanley and Clark (1999) dealing with goods and Lee and Lloyd (2002) study on services. These studies postulate a positive relationship between per capita income and IIT. Additionally, despite this study's inability to disentangle HIIT from VIIT, the consistency with CHO model remotely suggests that the former dominates South Africa-US IIT in services.

Fourthly, the classical and the two bootstrap approaches show that the difference in market size is negatively related to odds ratio of IIT. The difference in market size represents differences in the existence of economies of scale and the different ability of South Africa and US to provide differentiated services. The results agree with both models of "love-of-variety"(Krugman, 1979) or "the ideal-variety" (Lancaster, 1980), which suggest that larger markets have the potential to allow for greater differentiation in services. The results are also consistent with the finding in Li *et al.,* (2003, 2005).

Fifthly, the coefficient for US FDI in South Africa has a positive relationship with log odds of unaffiliated IIT in services. The positive relationship is consistent with the theoretical trade models of Helpman and Krugman (1985) and Markusen and Venables (1998, 2000). This means that presence of US multinationals complement rather than

substitute exports of services by South African firms. The finding agrees with the results in Li *et al.,* (2003, 2005). This is however, inconsistent with the original hypothesis that US FDI in South Africa should substitute South Africa-US IIT in unaffiliated services. The results show that US MNC overcome the costs of trade barriers in services (highlighted in Chapter 4) by establishing themselves in South Africa (host country) and then generate arms-length trade with the US (home country).

Sixthly, the classical and the two bootstrap results conflict when it comes to the coefficient for the change in nominal exchange rate. The first-order asymptotic theory approach shows that the coefficient is positive and statistical significant at 10 per cent level. Although the wild bootstrap supports this conclusion albeit at 5 per cent level, the other bootstrap approach suggests that nominal exchange rate does not affect the odds ratio of IIT. Given this conflict, the thesis concludes that the rand-dollar nominal exchange rate has limited positive effect on the odds ratio of IIT. This implies that although a depreciation of the rand makes South Africa's exports competitive and imports dearer, such effect is not statistically significant.

Seventhly, the coefficients for trade openness to all the four modes of supply in South Africa and the US are inimical to IIT in services. However, the classical and wild bootstrap shows that the coefficient is not statistically significant. In terms of the sign, the results are in line with Falvey's (1981) model of VIIT, which demonstrates that countries with lower tariff barriers have higher levels of IIT. The results are contrary to the study by Lee and Lloyd (2002: 170) who find a positive and insignificant relationship. The difference in the finding with Lee and Lloyd (2002) may emanate from the method used to define a proxy for trade orientation. Their trade orientation is proxied by residuals from a regression of the log of per capita services trade on the log of per capita income and log of population. The thesis uses the Hoekman (1995) trade barriers indices constructed using GATS schedules (Chapter 4) and suffers from the following measurement errors. Firstly, the openness indices only cover the period 1994-1998. Secondly, the indices are not adjusted to take into consideration the uniqueness of mode 2 supply.

Eighthly, the coefficient for the degree of deregulation in South Africa has the expected sign in most services except airfreight; legal services; ocean freight and telecommunication services. However, in terms of statistical significance, the relationship is strong in airfreight; educational and training services; management and consulting services; ocean freight; ocean port services; research development and testing services and telecommunication. This finding is in line with the results in *Li et al.* (2003).

Ninthly, the service-specific effects are deviations from global mean. Using the wild bootstrap, the value of 24.30 for airfreight means that the air freight-specific effects cause the odds ratio of IIT in this sector to be above the grand mean of 74.744 by 24.30 units. The coefficient for the travel services is calculated as minus the sum of the other effects. This emanates from the effects coding approach where this class is coded –1 instead of 0 in regression coding approach. The service-specific effects are positive in airfreight; ocean freight and telecommunication services. This means that there are time-invariant service-specific characteristics which bolter South Africa-US IIT in the service sectors. On the other hand there are negative service-specific effects in education services; financial services; legal services; management, consulting and public relations; ocean port services; research development and testing services and travel. This means that there are time-invariant unique characteristics in these services that tend to discourage South Africa's exports and instead promote imports of services from the US and should be identified using sector-specific surveys.

The time-specific effects are also interpreted with reference to the grand mean (intercept). The time-specific effects pick up the effects of any variables affecting South Africa-US IIT in selected services that vary over time, are constant across sectors (sector-invariant) and have not been included in the list of explanatory variables. The coefficients for the period 1994-1998 are negative but positive thereafter. However, in terms of statistical significance, the two bootstrap approaches show that the coefficients for the period 1994, 1996, 1998, 2000, and 2001 are significant. This pattern confirms the fact that following

South Africa's new political dispensation in 1994, there was a high affinity for imports of services from the US and this changed from 1999 onwards.

5.13 POLICY IMPLICATIONS

Firstly, some policy implications do emerge from the negative relationship. The CHO monopolistic competition trade model argues that regional integration and trade liberalisation involving trade between relatively similar economies would bolster disproportionately intra-industry specialisation and trade in horizontally differentiated products (Greenaway and Milner 2002: 192). Applying this to services, there are two policy options for South Africa.

On one hand, South Africa could use the policy implications of CHO, described in Greenaway and Milner 2002: 192, in arguing that since there is dissimilarity in demand with the US, such trade does not satisfy industrialisation aims (technology transfer, greater economies of scale etc.) and would involve higher factor adjustment costs in terms of job losses[26]. This would suggest that South Africa should view the services component of the SACU-US FTA with caution and in fact use trade and industrial policy strategically to fashion the location of production in Southern Africa in the hope of deriving future scale advantages in services. Following this line of argument, South Africa should promote narrower regional integration and trade liberalisation involving trade between close and economically similar economies like those in NEPAD, where IIT is likely to be higher.

On the other hand, there are other factors, which militate against this kind of approach. The CHO story precludes the role of globalisation and the GATS initiatives, which will eventually make consumer preferences for services converge between the US and South Africa (Salvatore, 2004b: 544). Additionally, the CHO does not deal with vertically (quality) differentiated services based on the model of Flam and Helpman (1987), which

[26] In other words, most firms supplying services would be located in the US to supply services in South Africa.

has been found to be the main type of IIT in goods between the US and developing countries (Stanley and Clark, 1999, Kunin and Zigic, 2003). In this regard broader regional groupings are desirable (Greenaway and Milner, 2002:193). This supports the SACU-US FTA.

Secondly, the finding that limited market size in service sectors constrains innovation and production of differentiated services calls for a need to expand the market size for services sector in South Africa so that firms can reap economies of scale.

Thirdly, the finding that US MNCs overcome the costs of trade barriers in services (highlighted in Chapter 4) by establishing themselves in South Africa (host country) and then generate arms-length trade with the US (home country) calls for initiatives in South Africa to promote FDI from the US.

Fourthly, there is need for sector-specific surveys to identify unique characteristics in services with negative service-specific effects (education and training; financial services; legal services; management, consulting and public relation services; ocean port services; research development and testing services and travel services). These characteristics tend to discourage South Africa's exports and instead promote imports of services from the US.

5.14 MAIN INSIGHTS AND CONCLUDING REMARKS

The aim of this chapter is to expand the existing literature and, for the first time, test whether South Africa-US IIT in selected services is caused by the same factors in the studies of manufacturing industries. Based on modern trade theories, a number of hypotheses are specified as the major determinants of unaffiliated IIT in the selected services. Dynamic panel data techniques within a GLM framework are used to model log odds of IIT. However, hypothesis tests are performed using bootstrapping techniques that are robust to heteroscedasticity. The bootstrap approach showed that the dynamic panel data estimates are unbiased and the model forecasts IIT within the 0 and 1 range.

The empirical results show that, in principle, South Africa-US IIT in services is determined by factors similar to those in other "North-South" IIT studies (such as Clark and Stanley, 1999). Specifically, IIT is determined by differences in per capita income, US foreign direct investment in South Africa, degree of economic freedom in South Africa, and service-specific and time-specific effects. The results also show that HIIT dominates VIIT in South Africa-US IIT in services.

A number of policy implications are also drawn from the study. Firstly, South Africa should view the services component of the SACU-US FTA with caution and in fact should use trade and industrial policy strategically to fashion the location of production in Southern Africa in the hope of deriving future scale advantages in services. Indeed, South Africa should promote narrower regional integration and trade liberalisation involving trade between close and economically similar economies.

Secondly, there is need to expand the market size for services sector in South Africa so that exporters can reap economies of scale. This can be done through programs that increase the purchasing power of South Africans as well as regional economic integration like SACU.

Thirdly, there is a positive relationship between FDI and IIT implying that US multinationals in South Africa play a complementary role rather than displacing exports by South Africans. This calls for the need to promote investment from the US to facilitate service exports.

Fourthly, there is need for sector-specific surveys to identify unique characteristics in services with negative service-specific effects (education and training; financial services; legal services; management, consulting and public relation services; ocean port services; research development and testing services and travel services). These characteristics tend to discourage South Africa's exports and instead promote imports of services from the US.

Having looked at the causes of South Africa-US IIT in services, the next chapter focuses on the consequences of this trade on labour market adjustment costs in terms of job losses.

CHAPTER 6

SOUTH AFRICA-US MARGINAL INTRA-INDUSTRY TRADE AND LABOUR MARKET ADJUSTMENTS

…distribution problems from opening trade will not be serious if countries are sufficiently similar in factor proportions that the trade, which result, is primarily intra-industry.

Paul, R.Krugman (1979:968)

6.1 INTRODUCTION

This chapter deals with the role of marginal intra-industry trade (MIIT) on labour market adjustment in the services sector of South Africa. Specifically, the adjustment costs entail welfare losses that arise in the labour markets from temporary unemployment resulting from factor-price rigidity or from costs incurred through job search, retraining and relocation (Brülhart, 2002:110). The smooth adjustment hypothesis (SAH) postulates that HIIT entails lower factor-market adjustments than inter-industry. In view of data limitations, the analysis is descriptive in nature.

The rest of the chapter is organized as follows. Theoretical literature on the SAH is presented in Section 6.2. Section 6.3 describes various MIIT indices while Section 6.4 is devoted to issues on the empirical testing of SAH. The trade-induced labour market adjustment costs in South Africa are discussed in Section 6.5. This entails computation of MIIT indices as well as a discussion on the difficulties of linking these indices to employment data. The final section presents the main insights and concluding remarks.

6.2 THEORETICAL LITERATURE ON THE SMOOTH ADJUSTMENT HYPOTHESIS (SAH)

Balassa (1966) first made the postulation that IIT entails lower factor-market adjustments costs than inter-industry. The rationale of this assertion is that according to HOS model, reallocation of resources from import competing to export producing industries would improve productive efficiency and result in redistributions of incomes from the former to the latter. However, if trade is of intra-industry type, the income redistribution of trade liberalisation is likely to be smaller than in the standard Stolper-Samuelson theorem. This point is underscored by Balassa (1966: 472) argument that "…It would appear that the difficulties of adjustment to freer trade have been generally overstated. It is apparent that the increased exchange of consumer goods is compatible with unchanged production in every country…These considerations may explain why the fears expressed in various member countries about the demise of particular industries have not been realised…"

Brülhart (2002:110) points out that the adjustment costs are shaped by the underlying factor endowments, demand patterns, technologies, income levels and policy regimes of the trading countries.

Since Balassa's (1966) seminal work, the SAH has become firmly established as conventional trade wisdom. The new models of trade based on monopolistic competition and assuming horizontal differentiation of products as in Krugman (1979, 1981) and Lancaster (1979) underpin the SAH. Helpman and Krugman (1985) further established this view using the integrated equilibrium approach.

One problem with CHO-based models, which explain IIT through scale economies and monopolistic competition, is that they assume the products of an industry to be perfectly homogeneous in terms of factor intensity. This means that intra-industry adjustment

costs are eliminated simply by assumption (Brülhart, 2002:111). However, empirical studies on IIT contain goods/services with differing technologies as well.

Brülhart (2002:111) argues that in applied work, there are two reasons why IIT may entail smaller adjustment costs than inter-industry trade. Firstly, production factors (labour, capital, land, entrepreneurship) are more mobile across firms (within one industry) than between industries. In the context of labour, skills acquired by the workers and managers of a contracting firm can be utilised without much retraining in an expanding firm of the same industry. For instance, in South Africa's telecommunications sector, skills acquired by labour in firms dealing with telex and telegram services (a contracting telecommunication industry firm) can be applied to value-added services such as email, voice mail and video-teleconferencing services (expanding telecommunication industry firm). Similarly, if specialisation occurs within a multi-product/service firm, workers can be transferred from one department to another instead of a typical corporate "downsizing/rightsizing" strategy in response to globalisation.

Secondly, there is more flexibility of relative wages within industries than between industries. As pointed out by Brülhart (2002:111), this assertion relates to the intra-industry, specific-factors or Ricardo-Viner model. In this model, asymmetric trade shocks across producers in one industry coupled with immobility of workers in the short-run, results in temporary unemployment if wages are not flexible across producers. This is caused by minimum-wage legislation and contractual wage agreements at the industry level.

Lovely and Nelson (2002) note that there is substantial direct evidence from research by labour economists on the question of the relative costs of inter-versus intra-industry adjustment. Specifically, there is a substantial body of research work, which finds that the costs of being unemployed in terms of lower wages is higher under inter-industry adjustment (Neal, 1995, Kletzer, 1996). They argue that workers accumulate human capital, which is portable between firms in the same sector, but is not portable between sectors. When a sector contracts (for the importable sector in HOS model), labour is

forced to move to the expanding exportable producing sector. In the case of IIT, some firms may go out of business, but liberalisation does not generate high costs (in terms of job loss), as is the case with inter-industry adjustment.

Using Ethier's (1982) general-equilibrium framework, Lovely and Nelson (2000) show that changes in domestic absorption, which influence trade flows but which are distinct from production changes, make MIIT an unreliable guide to labour market pressure.

Although the CHO model underpins the SAH under HIIT, it cannot explain VIIT, which is the most common type of "North-South" trade (Clark and Stanley, 1999). Models such as Falvey and Kierzkowski (1987), Flam and Helpman (1987), Shaked and Sutton (1984) can explain VIIT and factor market adjustments. Since vertically differentiated (quality) products/services have different factor intensities and countries specialisation will depend on relative factor endowments, the nature of IIT (in terms of VIIT and HIIT) is quite important in testing SAH, especially in South Africa-US IIT in services.

The upshot of these models is that associating inter-industry trade with painful adjustment and IIT with less costly adjustment is flawed if products/services are differentiated vertically (Fontagné and Freudenberg, 2002). The point is that adjustment costs associated with VIIT might be substantial due to the fact that specialising along the quality spectrum bolstered by R& D expenses, endowment in human capital and advertising may be associated with costly displacement of resources. However, the results from Chapter 5 remotely show that HIIT dominates South Africa-US IIT in services.

6.3 MARGINAL INTRA-INDUSTRY TRADE (MIIT) MEASURES

The GL index is a static measure since it is based on trade data for one period only. Hamilton and Kniest (1991) argue that the observation of a high proportion of IIT in one particular time period does not justify a priori any prediction of the likely pattern of change in trade flows. Brülhart (2000) reiterates the same point by arguing that even an

observed increase in static IIT levels between two periods, as computed by quasi-dynamic measures such as Greenaway *et al.,* (1994) and Dixon and Menon, 1997 could conceal a very uneven change in trade flows similar to inter-rather than intra-industry adjustment. Motivated by this concern, a number of alternative measures have been developed to capture the MIIT concept empirically.

6.3.1 Hamilton and Kniest (HK) index

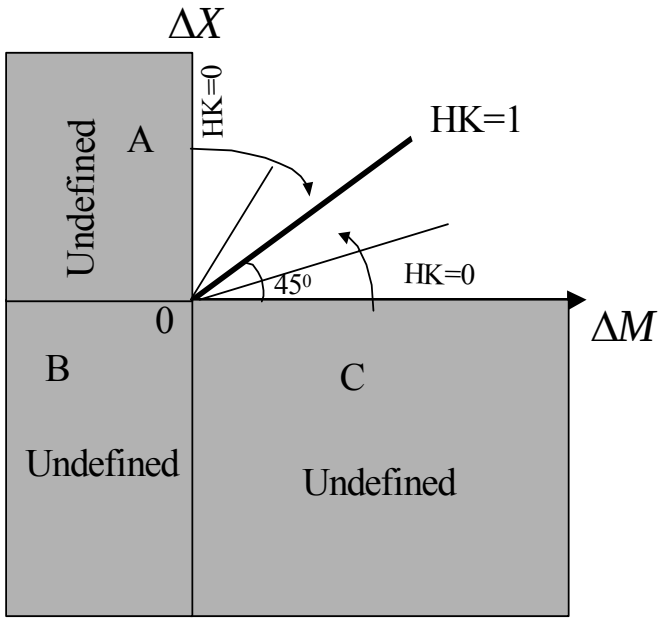
Hamilton and Kniest (1991) were the first to construct an index of MIIT. They argue that evaluating the consequences of trade expansion requires a focus on how IIT changes at the margin. Their index in Equation 6.1 effectively computes the proportion of the changes in exports or imports, which is matched.

$$HK = \begin{cases} \dfrac{\Delta X}{\Delta M}, \textit{for} & \Delta M > \Delta X \geq 0 \\ \dfrac{\Delta M}{\Delta X}, \textit{for} & \Delta X > \Delta M \geq 0 \\ 1, \textit{for} & \Delta X = \Delta M > 0 \\ \textit{Undefined}, \textit{for} & \Delta M < 0, \textit{or}, \Delta X < 0 \end{cases} \tag{6.1}$$

The composition of the change in trading patterns is the main determinant and information on levels of exports or imports is not essential. The HK index can be mapped on to a two-dimensional Euclidean space as shown in Figure 6.1.

This index has a number of flaws. Firstly, HK interpreted any situation where the index is undefined as indicating an increase in exports and a decrease in imports (or vice versa), which shows inter-industry trade (shaded regions A and C). However, the HK index is also undefined where both imports and exports decrease, a condition in which the matched decreases should be documented as MIIT (shaded region B).

Figure 6.1: The graphical representation of HK MIIT index



Source: Brülhart (2002:119)

Notes: ΔX and ΔM are the changes in exports and imports, respectively

Secondly, as pointed out by Greenaway *et al.*, (1994), the fact that HK index is undefined when exports (X) or imports (M) decrease leads to a non-random omission of a significant number of statistical observations and hence to potentially unreliable results.

However, Greenaway and Milner (2003) note that despite the shortcomings, the fundamental insight from the HK index lies in underscoring, for the first time, the importance of MIIT measures for adjustment effects of IIT.

6.3.2 Brülhart (B) indices

Brülhart (1994) suggest three different MIIT indices that attempt to address the problems encountered in HK index. All these indices are defined and do not suffer from the trade imbalance bias discussed in Section 2.6.1.2.3 (Chapter 2). The first index is Brülhart A;

$$B^A = 1 - \frac{|\Delta X - \Delta M|}{|\Delta X| + |\Delta M|} \tag{6.2}$$

This index varies from 0 to 1, where 0 indicates marginal trade in the specific industry is completely of inter-industry type, while 1 corresponds to marginal trade that is entirely of intra-industry type. The main strength of this index is that unlike the HK index, it is defined in all cases and shares many properties of GL index.

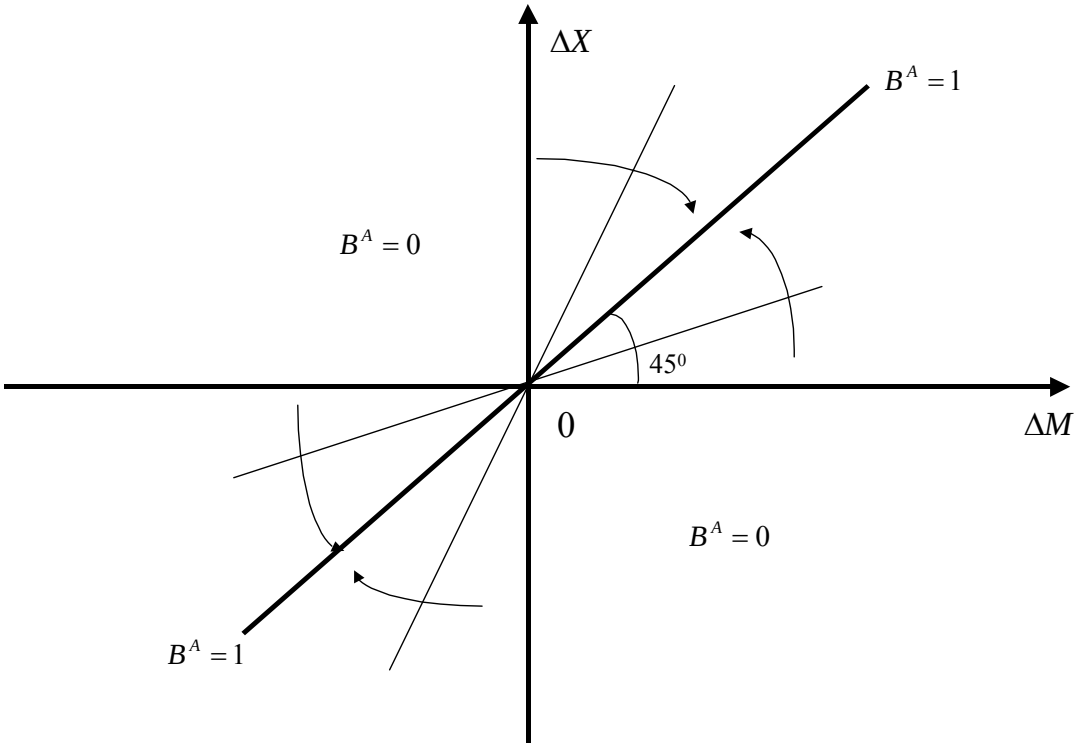
However, it differs in two ways from the GL index (Olivera and Terra, 1997). Firstly, it does not suffer from downward bias as a result of disaggregation. Secondly, there is no mathematical relationship between the index for a particular period and the indices of its sub-periods. This index can be mapped onto a $\Delta X, \Delta M$ Cartesian plane as shown in Figure 6.2.

The second index is Brülhart B measure of MIIT, which allows for an investigation into the distribution of trade-induced gains (losses) between countries;

$$B^B = \frac{\Delta X - \Delta M}{|\Delta X| + |\Delta M|} \tag{6.3}$$

This index is related to B^A i.e. $B^B = 1 - B^A$. The index contains information about about both the proportion of MIIT and country-specific sectoral performance. Unlike the GL-type indices, B^B ranges from –1 to 1. The closer the index is to 0, the higher the MIIT, whereas values close to –1 and 1 represent higher marginal inter-industry trade.

Figure 6.2: Brülhart A MIIT index



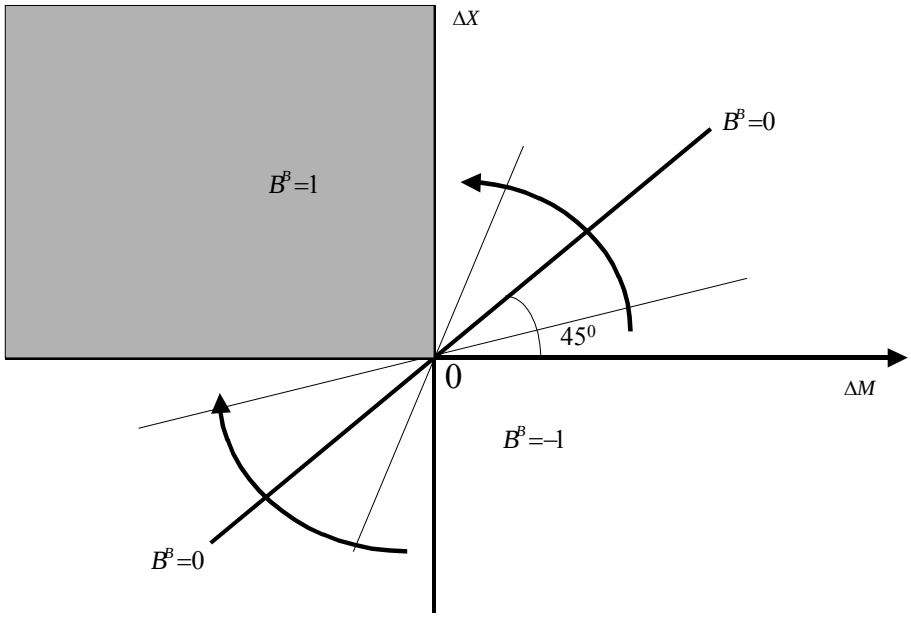
Source: Brülhart (2002:119)

Notes: ΔX and ΔM are the changes in exports and imports, respectively

There are two conditions used to determine whether the index is positive or negative. Firstly, B^B index is positive if changes in exports (ΔX) are greater than changes in imports (ΔM). Positive values of B^B indicate that exports are expanding at the expense of imports (strong domestic industry performance). Secondly, B^B index is negative if changes in exports (ΔX) are less than changes in imports (ΔM). Negative values of B^B indicate weak domestic industry performance. The index is shown in Figure 6.3.

One problem with this index is that unlike the GL-type indices, it cannot have a (un) weighted average taken to assess MIIT at the country level due to the fact that an average of –1 and 1 is zero.

Figure 6.3: Brülhart B MIIT index



Source: Brülhart (2002:125)

Notes: ΔX and ΔM are the changes in exports and imports, respectively

The final index constructed by Brülhart (1994) is the C measure of MIIT, which is unscaled;

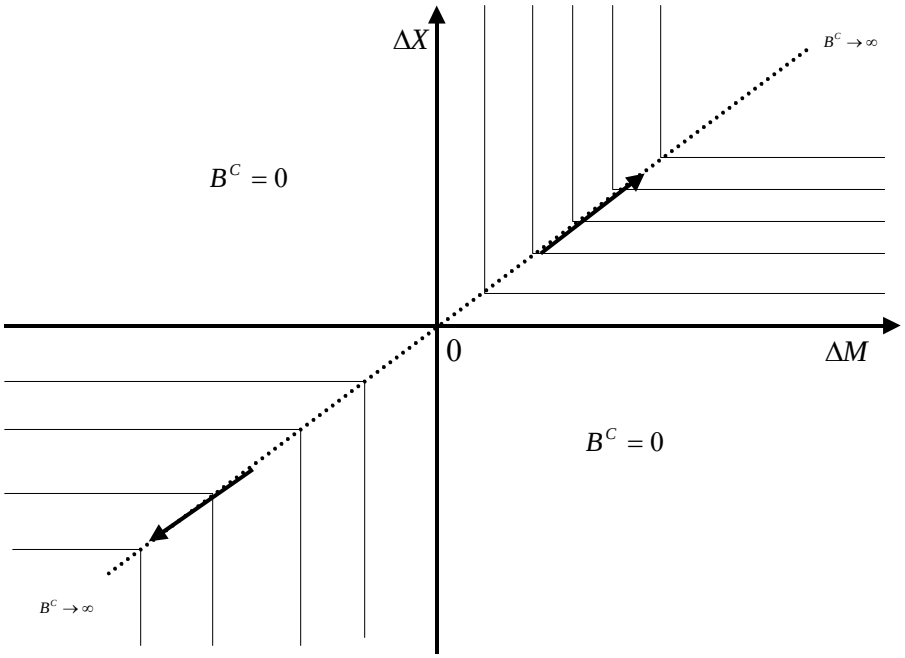
$$B^C = \left(|\Delta X| + |\Delta M|\right) - |\Delta X - \Delta M| \qquad (6.4)$$

This index is strictly non-negative and can be scaled even at the disaggregated industry level. Figure 6.4 shows a graphical representation of this index.

Thom and McDowell (1999) and Andresen (2003) argue that the Brülhart indices cannot distinguish between inter-industry trade and vertical intra-industry trade, and therefore overstate the costs of adjustment. This is predicated on the fact that changes in trade composition although the costs of adjustment for VIIT (quality differentiated

goods/services) may be higher than HIIT (variety differentiated goods/services), both would have lower adjustment costs than inter-industry trade.

Figure 6.4: Brülhart C MIIT index



Source: Brülhart (2002:119)

Notes: ΔX and ΔM are the changes in exports and imports, respectively

6.3.3 Azhar and Elliot index

Using the specific factors model, Azhar and Elliot (2001, 2003) propose a measure of trade-induced adjustment that meets a number of SAH criteria; monotonicity, consistency and country-specificity. Firstly, the greater the sectoral disparity in trade flows the higher the factor market disruption and therefore the greater the adjustment costs. This means that the index is an increasing function of the net change in trade (monotonicity).

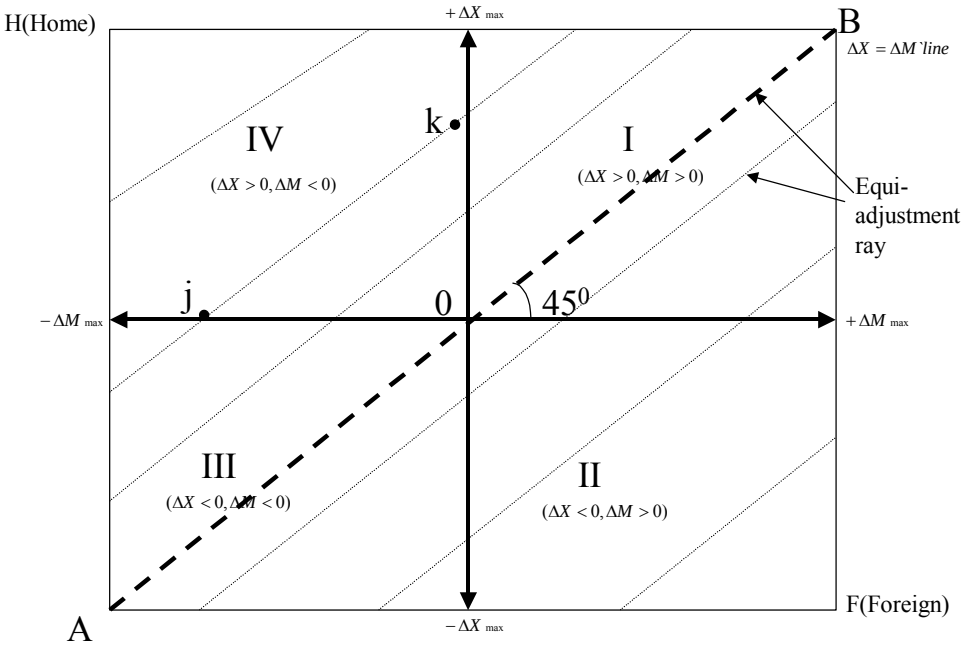
Secondly, the factor reallocation requirements associated with a given level of unmatched trade changes are the same as for the bilateral trade partners. This means that adjustment costs associated with an industry expansion are equal to those associated with an industry contraction (consistency).

Thirdly, the index provides a measure of whether a country is specialising "into" or "out of" an industry. This provides information on whether subsequent adjustment costs are associated with an industry expansion or contraction. This information has further implications for policymakers looking at industrial and competition policy or reacting to the pleas of lobby groups in the country such as COSATU in South Africa (country specificity).

Finally, if firms have identical factor requirements then matched trade changes will have no resource reallocation costs. This is predicated on the fact that matched increases or decreases in exports and imports means that an industry's total demand is unaffected and hence no resource reallocation is required.

Figure 6.5 presents Azhar and Elliot's geometric device that allows visualisation of the evolution of trade flows and shed light on the potential adjustment pressure associated with trade pattern change. Figure 6.5 is a trade adjustment space (TAS). The length of any side of the TAS is two times the maximum of the largest absolute value of whichever is bigger from the import and export values in the study period. The upper and lower triangles (AHB) and AFB) define the net exporter and net importer planes respectively. The origin (0) represents the unique ($\Delta X = 0, \Delta M = 0$) case. Quadrant I contains all positive and quadrant III all negative changes. The 45-degree AOB line is that of perfectly matched trade changes and hence zero adjustment. Lines parallel to AOB are termed equi-adjustment rays. Any two points, such as j and k on an equi-adjustment line share equal adjustment pressures.

Figure 6.5: Industry trade adjustment space (TAS)



Source: Azhar and Elliot (2003:6)

Notes: ΔX and ΔM are the changes in exports and imports, respectively

The further a point is away from the AOB line, the greater is the adjustment pressure. Points to the right of AOB line have different implications for the home country. In this case exports will be falling relative to imports so adjustment might require firms to lay off workers that will result in an increase in temporary unemployment. This is called contractionary associated adjustment costs. Azhar and Elliot (2003) point out that if the assumption of symmetry across expanding and contracting sectors is weakened so that it is easier for an economy to adapt to expansion rather than contractions then the lines of equi-adjustment become non-linear and asymmetric.

They suggested the following measure of adjustment costs, which satisfies the four criteria of monotonicity, consistency and country-specificity.

$$S = \frac{\Delta X_t - \Delta M_t}{2\left(\max\left(\left|\Delta X_t\right|,\left|\Delta M_t\right|\right)\right)} \text{ for } t = 1,2,..n \qquad (6.5)$$

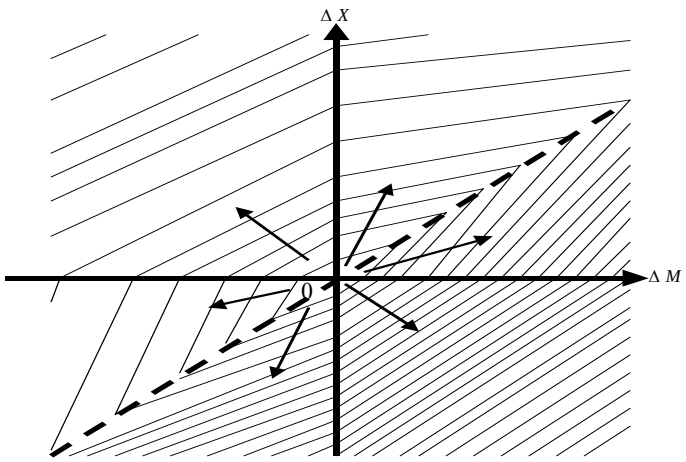
The index has a range of $-1 \leq S \leq 1$.

6.4 EMPIRICAL TESTING OF THE SAH

The SAH is a generally accepted canon of international economics. However, its empirical testing has not been straightforward due to a number of reasons (Brülhart, 2002). Firstly, no one-dimensional measure of MIIT can fully describe the three dimensions of adjustment costs over the trade-change plane. Secondly, there is still no exhaustive theoretical model that can generate marginal intra-and inter-industry trade and thus serve as a basis for specification of empirical models.

Brülhart (2002) illustrates the first problem using a hypothetical mapping of trade-induced adjustment costs (Figure 6.6), which is akin to Azhar and Elliot (2003).

Figure 6.6: Hypothetical map of adjustment costs and trade changes



Source: Brülhart (2002:126)

Notes: ΔX and ΔM are the changes in exports and imports, respectively

Figure 6.6 is a map of iso-adjustment contours, which assumes that adjustment costs rise monotonically as one moves away from the origin of the Cartesian plane. However, this rise occurs at different rates depending on the direction taken. Therefore the debate on the appropriate measure of MIIT boils down to the question about which is the most important direction of skewness in the distribution (with the initial point being the one that is symmetric about the origin). Equation 6.6 can represent the information in Figure 6.6.

$$AC_i = \alpha\left|\Delta X_i - \Delta M_i\right| + \beta\left(\Delta X_i - \Delta M_i\right) + \gamma\left(\left|\Delta X_i\right| + \left|\Delta M_i\right|\right) \qquad (6.6)$$

Where AC_i is adjustment costs in service sector i. Brülhart (2002) suggests that four restrictions, rooted in assumptions implicit in MIIT literature, can be placed on this model to generate the mapping in Figure 6.6. Equation 6.6 encapsulates the second hypothesis of this study in Section 1.6 (Chapter 1).

Hypothesis 1: Adjustment costs increase in absolute amount of unmatched trade change i.e. $\alpha > 0$

The relevance of MIIT would be confirmed if the estimated α is statistically significant. This would indicate that the degree of "matchedness" of trade changes within sectors actually matters for adjustment costs.

Hypothesis 2: Export expansion (contraction) causes lower (higher) adjustment costs than import expansion (contraction) i.e. $\beta < 0$

This would indicate that sectoral trade performance matters for adjustment costs and that indices such as Brülhart's B^B or Azhar-Elliot (2001) are important.

Hypothesis 3: For given volumes of trade change, adjustment costs are minimised where changes in imports and exports are of equal size i.e. $|\alpha| > |\beta|$

This hypothesis would confirm the GL type measures of MIIT such as Brülhart's B^A index.

Hypothesis 4: Adjustment costs increase in absolute amount of total trade change i.e. $\gamma > 0$

Most empirical evidence that support the SAH uses specifications akin to Equation 6.6. These studies use econometric analysis to evaluate the claim that IIT is "non-disruptive" and some of them apply simple correlation between various MIIT measures and some measure of adjustments costs (Table 1 in Lovely and Nelson, 2002:36). Murphy and Stobl (2004) warn that such bivariate analysis have to be interpreted with causation due the methodological limitations. A few studies attempt to control for a small set of other factors in an OLS setting. Brülhart (2000) study conducted on Irish data proxies adjustment costs by plant-level job turnover rates and includes, among the independent variables, the Brülhart's B index and a measure of trade-intensity.

There are other approaches to modelling the SAH in literature. One approach examines whether factor intensities are less heterogeneous within than between industries. Greenaway and Milner (2003) note that considerable heterogeneity has been found within industries but differentials between industries are also significant.

The second empirical approach models SAH via political-economy considerations. The work of Lundberg and Hanson (1986) and Marvel and Ray (1987) suggest that the fast trade liberalisation in sectors subject to high initial IIT levels result from a lower demand for protection in these sectors. This means that IIT has modest welfare effects. However, in a bid to find the direction between IIT and liberalisation in Australia, Ratnayake and Jayasuria (1991) suggest that previous single equation estimations suffered from

simultaneity bias and they found no effect of tariff reductions when estimated through a system of simultaneous equations. Their study shows a reversed direction of causation, from trade liberalisation to IIT.

Lovely and Nelson (2002) argue that regardless of the method or the measure of adjustment, the results show that there is little evidence of a systematic relationship between MIIT and adjustment costs. Lovely and Nelson (2000, 2002) argue that the reason for this disappointing results is that there is a fundamental problem in the theory underlying the asserted link between the measures of MIIT in use and any plausible measure of labour adjustment costs. They add that the fundamental problem emanates from the fact that changes in labour allocation reflects changes in production structure while changes in trade patterns reflect changes in production and demand.

However, all these studies focussed on trade in goods with very few studies on services. Moshirian (1998) used Hamilton and Kniest (1991) MIIT index to measure the significance of IIT in additional trade in financial services generated by financial deregulation and hence trade liberalisation in Japan over the period 1980-1995. The study computed MIIT indices and found that it was moderate.

There is no study on MIIT in services sector in South Africa. This thesis therefore attempts to fill this gap.

6.5 LABOUR MARKET- INDUCED ADJUSTMENT COSTS IN SOUTH AFRICA

6.5.1 South Africa-US MIIT in services

The SAH maintains that the two types of IIT (HIIT and VIIT) have different factor market adjustment costs. It would be lower (nil in theory) for HIIT and different from zero (both positive or negative) for VIIT and inter-industry trade. This basically means that using measures of total IIT or total MIIT in testing SAH could lead to misleading

results because they encompass two effects of IIT on adjustment costs that are of different sign.

An appropriate modelling strategy of the SAH entails considering a number of characteristics. Firstly, exports or imports should be properly identified as being part of either IIT or inter-industry trade. Secondly, the analysis of MIIT should minimise geographical aggregation bias by using bilateral trade flows. Thirdly, the calculated IIT indices should minimise the bias arising from sectoral aggregation by using as much disaggregation as possible. Fourthly, the model should distinguish between VIIT and HIIT using the methodology proposed by Abd-el-Rahman (1991) or Greenaway, Hine and Milner (1994), which incorporate price (unit value) differences. The assumption is that prices properly reflect quality differences. Finally, the analysis should use an appropriate proxy for adjustment costs.

The thesis addresses some of these concerns. Firstly, the SAH is considered for those services sectors containing a significant IIT component. This was done in Chapter 3 using the criterion that significant IIT only exists if minority flows are at least 12 per cent of majority flows. Secondly, geographical aggregation bias is minimised by considering South Africa and the US. Thirdly, sectoral aggregation bias is minimised by considering trade flow classification of the US BEA. However, the travel sector is not disaggregated at the same level as the other sectors.

There are factors that make it difficult to address all the concerns. Firstly, disentangling HIIT from VIIT is not possible due to lack of prices (unit value) data. Secondly, data on employment from STATSSA, commonly used as a proxy for labour market adjustment costs, are not available at the same level of aggregation as the trade data from US BEA.

Thirdly, South Africa-US trade in services is about 20 per cent of total trade in services (Table 1.2 in Chapter 1), which implies that the labour market dynamics in South Africa's service sector cannot be attributed to her trade with the US per se. The appropriate approach is to have a trade weighted MIIT index for all major trading

partners disentangled into HIIT and VIIT. However, this is frustrated by lack of bilateral trade data with many countries.

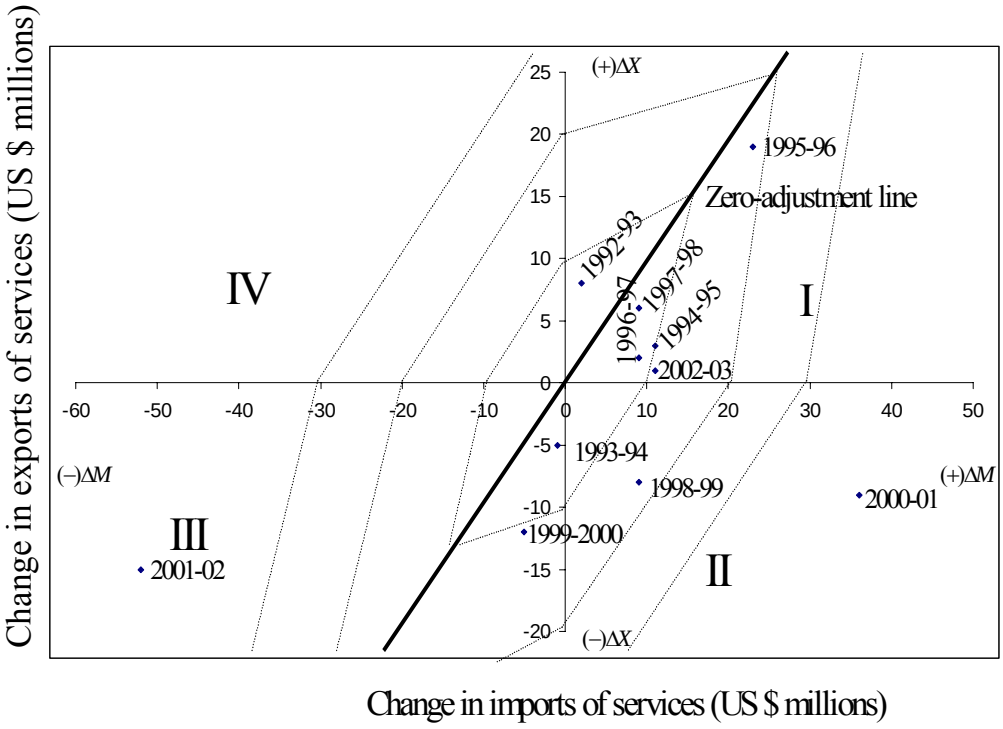
Fourthly, as pointed out by Lovely and Nelson (2002), it is inappropriate to try to explain labour-market adjustment using MIIT indices because changes in labour allocation reflect changes in production structure while changes in trade patterns reflect changes in production and demand. This therefore means that information on changes in domestic final-services demand and changes in input usage is required. Moreover, there is need to get information on price changes induced by the liberalisation.

It is against this background that the thesis does not provide a rigorous test of the SAH. The thesis uses MIIT indices to draw inferences about the SAH and the results should be treated as suggestive and not conclusive. Brülhart (1994) and Azhar and Elliot (2003) indices are used because they are subject to fewer limitations than other measures of MIIT.

Figure 6.7 shows TAS for South Africa's telecommunications services sector. The co-ordinates to the right of zero-adjustment line record negative S index and the further a co-ordinate is away from this line, the greater the adjustment pressure. For the majority of the year-on-year nominal changes, both ΔX and ΔM were positive (quadrant I) and on the right of the central zero-adjustment line.

The most volatile years are towards the end of the period (1998-99, 2000-01 and 2001-02) and seem to reflect the macroeconomic turmoil associated with the events in South Africa and the US around this period (e.g. the depreciation of the rand in 2001 and the September 11 bomb blast in the US). The largest positive value (measured as the greatest perpendicular distance from the right of the central zero-adjustment line) was 2001-02 (corresponding to S index of 0.36). Similarly, the largest negative value was 2000-01 (corresponding to S index of -0.43). *Ceteris paribus*, a contraction of South Africa's telecommunication sector and an increase in worker displacement in the period 2000-01 is expected.

Figure 6.7: Trade adjustment space (TAS) for South Africa-US IIT in telecommunication services in the period 1992-2003



Source: Authors' own construction. Data from the US BEA. It is available at (http://www.bea.gov/bea/di/1001serv/intlserv.htm

Notes: The Azhar and Elliot's (2003) trade adjustment space applied to South Africa's telecommunications services sector.

Trade adjustment space graphs could be drawn for all the service sectors but since the same information is incorporated in the S index, Table 6.1 presents this index for the various service industries.

Table 6.1: Trade-induced adjustment (S index) for South Africa-US IIT in services for the period 1992-2003

Service industry	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	Average
Travel(tourism) services	-0.12	-0.32	0.00	0.58	-0.36	0.33	-0.50	-0.09	0.45	0.26	0.47	0.06
Other business, professional and technical services	0.00	0.02	-0.04	-0.02	-0.06	-0.06	0.11	0.05	-0.02	0.48	-0.40	0.01
Telecommunications services	0.06	-0.04	-0.08	-0.04	-0.07	-0.03	-0.16	-0.07	-0.43	0.36	-0.10	-0.05
Airfreight services	0.33	0.00	0.00	0.17	0.50	-0.33	0.00	0.33	-0.33	0.17	0.50	0.12
Research, development, and testing services	-0.02	0.02	-0.02	-0.05	0.00	0.02	0.05	-0.08	-0.08	0.24	-0.12	0.00
Advertising services	0.25	0.00	0.00	0.75	-0.25	0.50	-0.25	0.00	0.25	-0.75	0.75	0.11
Legal services	0.00	-0.05	0.05	-0.25	0.20	0.00	-0.10	-0.45	0.35	0.00	0.05	-0.02
Ocean port services	-0.50	-0.03	0.00	-0.08	-0.14	-0.03	-0.33	0.17	0.31	-0.17	0.08	-0.07
Ocean freight services	0.50	0.05	0.02	-0.04	0.10	0.04	0.15	-0.05	-0.15	0.07	0.02	0.06
Financial services	0.00	0.08	-0.15	-0.12	0.03	-0.43	0.13	-0.17	-0.23	0.00	0.63	-0.02
Management, consulting, and public relations services	-0.20	0.05	-0.20	0.05	-0.15	-0.20	-0.45	0.35	0.00	0.10	-0.25	-0.08
Education and training services	-0.50	-0.01	-0.05	0.09	-0.06	0.02	-0.01	-0.05	-0.04	-0.05	0.15	-0.05

Source: Data from the US BEA. It is available at (http://www.bea.gov/bea/di/1001serv/intlserv.htm

Notes: The shaded cells show years with negative S index (deteriorated sectoral trade balance).

Columns 2 through 10 show the Azhar and Elliot (2003) MIIT index (trade-induced adjustment) for the different periods. The final column shows the average over the period 1992-2003. A number of trends emerge from the table. Firstly, on average, 50 per cent of the unaffiliated trade industries have negative S index (shaded cells). This means that sectoral trade balance has deteriorated over the period. In order of magnitude, the most severe (contracting) trade-induced adjustment pressures were experienced in management consulting and public relations management consulting and public relations; ocean port services; education and training services; telecommunication services; financial services and legal services.

Secondly, the largest adjustment costs associated with expanding sectors are for air freight; advertising; ocean freight services; travel (tourism); other business, professional and technical services; and research, development and testing services.

The findings from the S index are augmented with the Brülhart A and B MIIT indices.

Table 6.2: Brülhart A MIIT index for South Africa-US IIT in services (1992-2003)

Service industry	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	Average
Travel(tourism) services	0.67	0.28	0.99	0.00	0.09	0.30	0.00	0.68	0.00	0.54	0.07	0.33
Other business, professional and technical services	N/A	0.00	0.00	0.80	0.00	0.25	0.00	0.00	0.33	0.10	0.00	0.15
Telecommunications services	0.40	0.33	0.43	0.90	0.36	0.80	0.00	0.59	0.00	0.45	0.17	0.40
Airfreight services	0.00	N/A	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.20
Research, development, and testing services	0.00	0.00	0.67	0.00	1.00	0.00	0.57	0.83	0.83	0.68	0.00	0.42
Advertising services	0.00	N/A	N/A	0.00	0.00	0.00	0.67	1.00	0.00	0.00	0.00	0.19
Legal services	N/A	0.00	0.00	0.00	0.00	1.00	0.00	0.18	0.00	N/A	0.67	0.21
Ocean port services	0.00	0.67	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.40	0.12
Ocean freight services	0.00	0.00	0.00	0.00	0.00	0.25	0.22	0.46	0.00	0.00	0.00	0.08
Financial services	0.86	0.00	0.39	0.57	0.67	0.00	0.00	0.62	0.00	1.00	0.00	0.37
Management, consulting, and public relations services	0.00	0.00	0.00	0.00	0.40	0.00	0.18	0.00	1.00	0.50	0.29	0.22
Education and training services	0.00	0.64	0.00	0.33	0.00	0.73	0.86	0.50	0.76	0.55	0.00	0.40

Source: Data from the US BEA. It is available at (http://www.bea.gov/bea/di/1001serv/intlserv.htm

Notes: The shaded cells show years where marginal trade is completely of inter-industry type.
N/A means the MIIT index could not be computed due to situations of division by 0. The average excludes the periods marked with N/A.

Table 6.2 shows the Brülhart A MIIT index, which like the GL index varies between 0 and 1. MIIT of 0 indicates marginal trade in particular service sector to be completely of inter-industry type and 1 represents marginal trade to be entirely of intra-industry type. The index shows that, on average, new trade was mainly of intra-industry type. In terms of magnitude, the leading sector was research, development and testing services. The shaded cells show cases where there is 0 MIIT implying high adjustment costs.

Table 6.3: Brülhart B MIIT index for South Africa-US IIT in services (1992-2003)

Service industry	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Travel(tourism) services	-0.33	-0.72	0.01	1.00	-0.91	0.70	-1.00	-0.32	1.00	0.46	0.07
Other business, professional and technical services	N/A	1.00	-1.00	-0.20	-1.00	-0.75	1.00	1.00	-0.67	0.90	0.00
Telecommunications services	0.60	-0.67	-0.57	-0.10	-0.64	-0.20	-1.00	-0.41	-1.00	0.55	0.17
Airfreight services	1.00	N/A	0.00	1.00	1.00	-1.00	0.00	1.00	-1.00	1.00	0.00
Research, development, and testing services	-1.00	1.00	-0.33	-1.00	0.00	1.00	0.43	-0.17	-0.17	0.32	0.00
Advertising services	1.00	N/A	N/A	1.00	-1.00	1.00	-0.33	0.00	1.00	-1.00	0.00
Legal services	N/A	-1.00	1.00	-1.00	1.00	0.00	-1.00	-0.82	1.00	N/A	0.67
Ocean port services	-1.00	-0.33	-1.00	-1.00	-1.00	-1.00	-0.75	1.00	1.00	-1.00	0.40
Ocean freight services	1.00	1.00	1.00	-1.00	1.00	0.75	0.78	-0.54	-1.00	1.00	0.00
Financial services	0.14	1.00	-0.61	-0.43	0.33	-1.00	1.00	-0.38	-1.00	0.00	0.00
Management, consulting, and public relations services	-1.00	1.00	-1.00	1.00	-0.60	-1.00	-0.82	1.00	0.00	0.50	0.29
Education and training services	-1.00	-0.36	-1.00	0.67	-1.00	0.27	-0.14	-0.50	-0.24	-0.45	0.00

Source: Data from the US BEA. It is available at (http://www.bea.gov/bea/di/1001serv/intlserv.htm

Notes: The shaded cells show years where marginal trade is completely of inter-industry type.
N/A means the MIIT index could not be computed due to situations of division by 0. The average excludes the periods marked with N/A.

Table 6.3 shows Brülhart B MIIT index. The closer the B index is to 0 the higher the MIIT. When B is equal to 0, marginal trade in services between the South Africa and the US in that particular sector is entirely of intra-industry type. This is the case for legal services in 1997-1998. Both –1 and 1 represent marginal trade to be entirely of inter-industry type. This is the case with most of the services. The shaded cells show the industry and the period when South Africa specialised *"out"* of the sector. The same interpretation can be done for the cells with positive B index where South Africa specialised "*into*" the sector.

It is, however, imperative to note that, as Brülhart (1994) points out, the interpretation is mercantilist in nature. The relation between a particular sector's export performance and its import penetration does not convey the full information on competitiveness and

adjustment costs (Lovely and Nelson, 2002). Nevertheless, this analysis provides some indication of service sectors that South Africa specialised "*into*" and those where she specialised "out of" and what sectors the pattern of specialisation remained unaffected by increased (or reduced) service trade flows between South Africa and the US.

Comparing the results from Table 6.1 with Table 6.3, there is close resemblance. This can be seen from the fact that the shaded cells (severe adjustment costs) are the same.

6.5.2 MIIT and employment in the services sector

This section tries to see whether there is a link between the MIIT indices (Tables 6.1, 6.2 and 6.3) and adjustment costs proxied by changes in employment. However, in addressing this issue it is imperative that the MIIT indices reported on the basis of US BEA service classification (Tables A.1 to A.4) be concordant with South Africa standardised industry employment data collected by STATSSA reported on the basis of standard industrial classification (SIC).

Table 6.4 presents the structure of South Africa's standardised industry employment classification used by STATSSA. The first column in this table reports the classification at 2-digit level while the second column shows the service industries included in that category. The change in employment reported in Table 6.5 is based on column one of Table 6.4.

The US BEA classification is concordant with STATSSA classification for travel services only. For the other services the STATSSA classification lumps together too many service categories. A case in point is STATSSA communication sector, which includes telecommunication, national postal activities and courier activities other than postal activities. It is difficult to isolate telecommunications sector's employment figures to be compared with the MIIT indices for telecommunication.

This means that the change in employment data in Table 6.5 can only be compared with MIIT indices for the case of catering and accommodation sector. This sector lost jobs significantly over the period 1992 to 2003. The most affected labour category is the semi-and unskilled. This agrees with the MIIT S indices in Table 6.1.

Table 6.4: South Africa standardised industry employment classification

industry classification (2-digit level)	Services included
Catering and accommodation services	Hotels, camping sites and other provision of short-stay accommodation; restaurants, bars and canteens
Transport and storage	Railway transport; other land transport; other scheduled passenger land transport; other non-scheduled land transport; freight transport by road; transport via pilelines; water transport; sea and coastal water transport; inland water transport; air transport; cargo handling; storage and warehousing; othe supporting transport activities; travel agency and related activities; activities of other transport agencies
Communication	National postal activities; courier activities other than national postal activities; telecommunications
Finance and insurance	Monetary intermediation; central banking; other monetary intermediation;other financial intermediation n.e.c; lease financing; other credit granting; insurance and pension funding, except compulsory social security; life insurance; pension funding; medical aid funding; othe insurance n.e.c.
Business services	Renting of air transport equipment;hardware consultancy; research and development;legal services; technical testing and analysis;advertising (Other activities left out due to space limitations)
Other services	Education; hospital activities; sewerage and refuse disposal, sanitation, and similar activities; motion picture and video production and distribution; news agency activities; museum activities and preservation of historical sites and buildings; sporting activities (Other activities left out due to space limitations)
Other producers	Washing and (dry-) cleaning of textiles and fur products; hairdressing and other beauty treatment; funeral and related activities; other service activities n.e.c.
Wholesale and retail trade	Wholesale trade and commission trade, except of motor vehicles and motor cycles; retail trade; sale, maintenance and repair of motor vehicles and motor cyles, retail trade in automotive fuel
General government services	General government services

Source: Quantec Research (http://ts.easydata.co.za/TableViewer/summary.aspx)

Table 6.5: Percentage change in South Africa's employment in selected service sectors

Service industry	Labour category	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Average
Business services	Highly skilled	15.90	7.03	11.48	6.95	12.75	7.38	7.38	11.84	6.64	-0.81	2.01	10.23	18.52	6.35	8.83
	Skilled	6.75	6.71	6.37	8.90	4.92	6.96	6.27	11.75	7.46	2.77	2.82	10.20	17.82	1.80	7.25
	Semi-and unskilled	12.76	-1.60	2.42	5.55	4.67	-0.95	-0.45	8.64	6.28	6.36	5.44	8.97	17.15	-5.94	4.95
Catering and accommodation services	Highly skilled	15.59	-13.13	2.64	4.88	0.15	3.97	-2.32	1.62	-6.67	-12.83	-7.41	-4.81	-2.73	4.73	-1.16
	Skilled	9.95	-9.72	0.04	-6.53	-1.66	0.73	-4.78	1.28	-5.48	-10.96	-5.21	-5.36	-3.29	4.10	-2.63
	Semi-and unskilled	3.98	-5.84	-7.82	2.76	-6.22	2.08	-2.95	0.19	-8.44	-14.67	-9.37	-6.32	-4.28	3.01	-3.85
Communication	Highly skilled	11.52	-2.76	-12.98	-8.75	46.76	-2.16	-9.11	2.14	-18.29	17.26	13.96	3.84	10.42	-5.74	3.29
	Skilled	20.55	9.68	-1.60	-6.15	3.73	3.91	0.08	-1.18	-27.15	2.07	0.25	-0.05	6.18	-9.45	0.06
	Semi-and unskilled	-18.09	-8.18	-1.61	-5.13	-18.51	-3.73	1.36	-0.31	-26.75	2.39	0.44	-1.85	4.23	-11.15	-6.21
Finance and insurance	Highly skilled	13.52	0.70	15.28	3.05	9.03	8.21	8.78	6.78	5.26	0.02	2.19	3.34	1.48	5.06	5.91
	Skilled	4.20	4.26	5.23	2.00	4.12	8.29	8.42	4.34	1.73	-3.75	-1.58	1.09	-0.82	2.63	2.87
	Semi-and unskilled	49.54	5.48	-33.69	62.65	-22.48	6.90	22.16	12.70	7.18	-0.07	1.36	2.71	0.75	4.22	8.53
Transport and storage	Highly skilled	13.80	-12.13	13.61	-26.86	-9.32	8.16	1.41	-0.69	-10.03	-4.04	-6.70	-6.55	-0.01	4.85	-2.47
	Skilled	-9.43	-10.81	-10.21	-10.89	-12.95	-0.11	-3.01	-3.01	-10.73	-3.92	-6.25	-8.15	-1.74	2.99	-6.30
	Semi-and unskilled	-0.65	-3.44	-0.27	-10.97	-5.34	1.57	-5.35	-6.65	-14.60	-8.08	-9.99	-8.59	-2.21	2.48	-5.15
General government services	Highly skilled	-1.54	4.85	3.91	-0.41	1.80	0.81	7.58	0.40	-3.05	-5.95	-7.05	-1.25	0.96	14.68	1.13
	Skilled	0.47	5.46	2.94	2.01	0.91	-5.26	3.93	0.51	-0.61	-2.19	-2.75	-1.14	1.08	5.59	0.78
	Semi-and unskilled	0.09	-9.41	-4.71	-2.88	1.51	-14.41	-4.99	-2.68	0.50	1.36	1.55	-3.16	-1.02	-36.71	-5.35
Other producers	Highly skilled	18.21	2.94	-6.82	-13.52	-2.31	21.36	14.31	5.52	-4.03	-14.55	-22.81	-3.60	-1.23	1.95	-0.33
	Skilled	-5.59	-4.40	-0.59	1.71	-1.16	-2.62	-1.93	0.51	0.17	-0.80	-0.35	-3.45	-1.15	3.34	-1.16
	Semi-and unskilled	-0.87	-1.80	-1.62	-2.20	-1.57	0.28	-2.97	2.76	2.69	2.61	2.58	2.72	2.78	-2.49	0.21
Other services	Highly skilled	10.06	1.91	4.40	6.55	6.84	7.95	5.19	4.68	2.15	1.82	1.87	4.50	5.92	3.34	4.80
	Skilled	-4.63	-3.37	0.96	4.44	3.22	2.61	2.78	5.65	5.43	6.38	6.80	4.27	5.70	3.12	3.10
	Semi-and unskilled	21.27	-9.95	-14.39	27.06	-15.52	-0.13	5.31	3.09	-0.62	-1.76	-2.17	1.55	2.81	0.20	1.20
Wholesale and retail trade	Highly skilled	14.32	3.20	4.81	-2.77	5.89	6.40	2.74	2.24	6.84	12.14	0.76	3.76	2.62	3.33	4.73
	Skilled	-5.37	1.22	-0.29	1.44	-4.64	4.64	3.88	2.69	6.80	11.77	0.32	3.02	1.89	2.57	2.14
	Semi-and unskilled	11.04	-3.26	-0.48	-3.14	1.89	-0.65	-2.74	-0.38	6.55	13.42	2.44	2.00	0.88	1.56	2.08

Source: Data from Quantec Research (http://ts.easydata.co.za)
Notes: Shaded cells are those service sectors and years with job losses

In view of the concordance difficulties and the fact that the changes in employment reported in Table 6.5 cannot be attributed to South Africa's trade with the US alone, no further attempt is made to relate employment data with MIIT indices. Instead, inferences are drawn directly from the MIIT indices. Specifically, the results show that South Africa-US MIIT in services is low in many services.

6.6 MAIN INSIGHTS AND CONCLUDING REMARKS

This chapter focused on identifying whether there are some trade-induced labour market adjustment costs in terms of job losses. This research question emanates from the postulation that HIIT entails lower factor-market adjustment costs than inter-industry or VIIT. This means that using measures of total IIT or total MIIT in testing SAH could lead to misleading conclusions because they encompass two effects of IIT on adjustment costs that are of different sign. The problem in the South Africa-US IIT in services is that available trade data does not have the prices components to facilitate disentangling HIIT from VIIT. Nonetheless, the results from Chapter 5 remotely suggests that HIIT dominates South Africa-US IIT in services.

The following are the other factors that limit the testing of SAH for South Africa-US IIT in services. Firstly, South Africa's standardised industry employment data reported by STATSSA, commonly used as a proxy for labour adjustment costs, is not available at the same level of aggregation as the trade data from US BEA. Secondly, South Africa-US trade in services constitutes about 18.5 per cent of total trade in services implying that the labour market dynamics in South Africa's service sector cannot be attributed to her trade with the US per se. The remaining 81.5 per cent of the trade should be incorporated in the analysis. Thirdly, it is inappropriate to try to explain labour-market adjustment using MIIT indices within a bivariate setting because changes in labour allocation reflect adjustments in production structure while changes in trade patterns reflect changes in production and demand. This therefore means that information on changes in domestic final-services demand and changes in input usage is required. Moreover, there is need to

get information and price changes induced by the liberalisation. All these pieces of information are not readily available for South Africa.

Despite these shortcomings, the thesis attempts to make inferences about SAH using descriptive analysis of the total MIIT indices. The descriptive analysis, using Brülhart (1994) and Azhar and Elliot (2003) indices, provides some indications of the sectors that South Africa seems to have specialised "into" and "out of". The results show that MIIT is low for most service sectors remotely suggesting that since South Africa-US trade is dominated by HIIT (Chapter 5), it entails high labour adjustment costs.

The next chapter presents the summary of the main insights and policy implications from Chapters 1 to 6.

CHAPTER 7

SUMMARY AND POLICY IMPLICATIONS

We need to have a balance between the three layers of economic reasoning- issues, theory and data…. An influential piece of work would take the theory just seriously enough and would make a clear reference to issues.

Edward E. Leamer (1992:49)

7.1 INTRODUCTION

This chapter provides a summary of the study, covering its purpose and the problem statement, theoretical issues, methodology, empirical results obtained and policy recommendations. The rest of the chapter is organised as follows. Section 7.2 restates the key objectives of the study. Section 7.3 presents the main insights on the general literature about IIT analysed in Chapter 2. This section is organised in parts, each presenting the key issue discussed. Section 7.4 recasts the stylised facts about South Africa-US IIT in services analysed in Chapter 3. The conclusions about barriers to trade in services, discussed in Chapter 4, are presented in Section 7.5. Section 7.6 presents the main insights about the determinants of South Africa-US IIT in services analysed in Chapter 5. The results from the testing of SAH, done in Chapter 6, are presented in Section 7.7. A summary of policy recommendations from all the chapters is presented in Section 7.8 while Section 7.9 deals with limitations of the study. The final section highlights suggestions on areas for further research.

7.2 RESTATING THE STATEMENT OF THE RESEARCH PROBLEM

The key issue that informs the study emanates from the fact that the increased internationalisation (globalisation) of services with the US, the leading producer and exporter of services in the world, has both gains of trade as well as costs on the South

African economy. The implication of globalisation has been addressed succinctly by a Special Issue of the *Journal of Policy Modelling* on "Globalisation, Growth and Poverty" edited by Salvatore (2004a). However, to reap the benefits of the globalisation of services (especially sustainable development in the context of DDA), there is need to disentangle IIT from inter-industry trade flows since they have different causes and consequences. Inter-industry trade is mainly associated with comparative advantage gains and "disruptive trade growth", while IIT is associated with non-comparative advantage gains coupled with "non-disruptive trade growth".

The study focuses on the causes and the trade-induced labour market adjustment consequences of South Africa-US IIT in services. To tackle this question, the following sub problems are dealt with;

(a) What do the existing theories of IIT say?
(b) What is the structure and trend of South Africa-US IIT in services?
(b) What are the existing barriers to South Africa-US IIT in services?
(c) What are the empirical determinants of South Africa-US IIT in services?
(d) Does the IIT in services with the US entail lower factor market adjustments in the services sector in South Africa?

7.3 GENERAL LITERATURE ON INTRA-INDUSTRY TRADE

Chapter 2 presents general literature aimed at laying a foundation for the subsequent chapters. The review concentrates on the controversies that have been addressed in the IIT literature and the main insights are presented in Section 7.3.1 through Section 7.3.5.

7.3.1 Specific IIT models

This section presents the main insights from the specific trade models such as horizontal differentiation, vertical differentiation, strategic trade models etc. The results are presented in Section 7.3.1.1 to Section 7.3.1.3.

7.3.1.1 Horizontal differentiation (HIIT)

The "love-of-variety" model for horizontally differentiated services assumes that consumers value variety in its own right. This is quite important for services like travel, where tourists would like variety of services (differentiated horizontally). The model predicts that South Africa (smaller country) will realise the larger gains from trade due to the fact that the increase in the number of varieties available to her consumers will be larger than in the US (larger country).

The "ideal-variety" model, based on the work of Lancaster (1966), assumes that every consumer has an "ideal"/ the "most-preferred" variety. The model also predicts that South Africa will reap larger gains from trade, since the increase in the number of varieties available to consumers will be bigger for the smaller country than for the larger country (US) but the benefits from trade will not accrue to all consumers equally.

7.3.1.2 Vertical differentiation (VIIT)

The following are the main insights that emerge from the analysis. Firstly, VIIT models are based on differentiation of services along the quality spectrum and are a natural extension of the HOS framework. In vertical differentiation, a common ranking of consumer preferences is associated with differences in product/service quality based on factor endowments (Falvey, 1981), fixed costs emanating from R & D (Gabszewicz *et al.,* 1981) or on the qualifications of the labour force (Gabszewicz and Turrini, 1997).

Secondly, VIIT models lead to new insights on factor adjustments and show that it is wrong to associate painful factor adjustment to inter-industry trade as done in the CHO/new classical view of trade. The adjustment costs associated with IIT in vertical differentiation (exchange of qualities) might be sizeable. Costly displacement of resources may take place as a result of specialising along the quality spectrum sustained by R & D expenses, endowments in human capital and advertising. This may help understand the anti-globalisation sentiments discussed in Bhagwati (2004) and Gomory and Baumol (2004).

7.3.1.3 Strategic trade literature

The literature on strategic trade shows that relaxing the service homogeneity assumption in the standard strategic trade model developed by Brander (1981) is quite informative. For instance, in the same model driven by strategic interaction, firms become eager to trade as a result of relaxing the intensity of strategic interaction in the form of lowering the degree of service substitutability. The relaxation also shows that for a given degree of service substitutability, the incentives for international collusion are stronger in industries with a relatively low degree of market concentration.

7.3.2 Applicability of IIT theories developed for goods to services

The section addresses the question as to whether goods-based IIT theories can be applied to IIT in services. Services have unique characteristics that differentiate them from goods: intangibility and transitoriness (non-storable or transportable); heterogeneity and high flexibility of production; imperfectly competitive market structure (monopolistic competition, oligopoly and monopoly) and asymmetric information and related adverse selection and moral hazard problems. However, the goods-based trade-theories are powerful enough to transcend these characteristics. Consequently the existing literature has not established major objections against using goods-based trade theories when analysing services.

7.3.3 Factor content of trade and IIT

The standard HOV model based on factor price equalisation (FPE), integrated equilibrium (IE), single "cone of diversification" and identical technology between trading partners has played a central role in the field of international trade. However, its assumptions are quite restrictive when it comes to international trade in services.

Firstly, the assumption of free identical technology does not make sense in the context of trade in most services where "technology" is the centrepiece of the interaction. Mode 3 (commercial presence) and mode 4 (movement of natural persons) entail trade of intellectual-based assets such as patents, copyrights, blueprints, trademarks etc. The assumption of identical technology implies that IIT has zero factor content by construction. As pointed out by Gomory and Baumol (2004), Salvatore (2004a, 2004b) and Bhagwati (2004), globalisation entails a substantial direct exchange of factor services. Later trade theories have incorporated differences in technology through modelling the productivity of factors in different countries and yield IIT in the factor content of trade.

Secondly, the standard HOV does not take into consideration trade in intermediate inputs. Producer and co-ordination services such as insurance, banking, transport etc. are an important component of total services trade. Intermediate inputs trade dilutes international differences in the combination of factors used in production. Imported intermediate services drive a wedge between a country's total factor usage profile and its endowments and thus dampening the net factor service trade. Attempts to incorporate trade in intermediate inputs in HOV model entail imputing the factor content of imported intermediate inputs using domestic factor intensities; excluding intermediate inputs in the analysis and integrating intermediate trade with general-equilibrium features of trade, production and factor endowments while allowing technology to differ across countries. The last approach is the most comprehensive and shows that global production sharing

tends to separate the factor content of final goods/services from the country's factor endowment profile.

Finally, the assumption of FPE in the standard HOV model does not hold in services supplied under modes 3 and 4.

7.3.4 Economically meaningful definition of an "industry"

This is analysed at the level of categorical aggregation used by IIT models as well as the aggregation of international trade statistics into exports and imports from an "industry". The rationale for the analysis is that the definition of an "industry" impacts on the level of measured IIT, the empirical explanation of the trade flows and their policy implications.

Firstly, the aggregation theory shows that factor proportions and other variables must be used simultaneously in models to test the determinants of inter- and intra-industry trade because in general-equilibrium models, none of them is independent of each other.

Secondly, with regard to the aggregation of international trade statistics into exports and imports of "industries" defined in an economically meaningful manner, several conclusions can be drawn. Firstly, there are two approaches to the definition. The first approach is the relative factor intensity definition. In this approach only goods/services produced with the same factor intensity comprise an "industry" and this is the definition adopted in HOV/HOS model. The second approach is the industrial organisation definition, which uses the industrial organisation theory of an industry (market) and is the basis of the new trade theories.

Finally, at the empirical level, the actual classification of services traded recorded in trade statistics based on technical properties, is still regarded as a rough guide to an economically meaningful definition of industries. This is manifested in the definitions of trade in services used by 1993 SNA, CPC version 1.0, BMP5, ISIC Revision 3 and MSIT (2002). However, there are flaws in this approach that emanate from the characteristics

of services such as intangibility, complementarity with factor movements (e.g. mode 3) and some services being embodied in goods.

7.3.5 Lessons from measurement

The following conclusion can be drawn with regard to measurement of IIT. Firstly, almost all of the useful and useable new measures of IIT build upon the unadjusted GL. Secondly, IIT should be apprehended at the bilateral level to avoid geographical aggregation bias. Thirdly, the GL index is homogenous of degree zero hence its computation remains the same whether real or nominal data are used. Fourthly, when using the unadjusted GL index, the set of explanatory variables for IIT should include the relative trade imbalance. The analyst should, however, deal with endogeneity problem. Fifthly, MIIT are appropriate to capture the trade-induced labour market adjustment costs. Sixthly, any analysis of IIT should, if possible, first disentangle HIIT from VIIT because they have different determinants and labour market adjustment consequences. Finally, "extended" IIT is also an important component since it recognises the fact that arms-length IIT and cross-border production may be complements rather than substitutes.

7.4 THE STRUCTURE AND TRENDS IN SOUTH AFRICA-US IIT IN SERVICES

Chapter 3 sought to provide some descriptive analysis of South Africa-US trade in services. The following facts emerge from the analyses. Firstly, international trade data from the SARB or BMP5 are unreliable due to lack of bilateral trade flows and insufficient aggregation. Consequently, the study uses mirrored exports and imports data from the US BEA. This data is consistent and disaggregated at a higher level than the SARB and BMP5. However there are still problems with unit values and difficulty in cording with the national accounts data from STATSSA.

Secondly, South has an unfavourable trade balance in services with the US. There are however, sectors whose deficits have increased substantially in the recent past. A case in point is telecommunications sector.

Thirdly, in terms of the ranking in sectors, tourism, transport and other private services are the leading exports and imports service sectors.

Fourthly, although it is difficulty to discern trends in affiliated services due to unreported data, it is possible to see that there are more American affiliates in South Africa than South African affiliates in the US. Specifically, South African affiliates receive more from their US parents than the former receive from the latter's affiliates. In the same vein, payments to US parents by South African affiliates are more than payments to US affiliates by South African parents.

Fifthly, although there are thirty service sectors, only thirteen of them meet the 12 per cent threshold of minority as a percentage of majority flows. Consequently, IIT analysis is conducted on these thirteen sectors only.

Sixthly, it is important to disentangle HIIT from VIIT and "extended IIT" because theoretically they have different determinants and labour market adjustment consequences. However, this process is frustrated by the lack of appropriate data and it is because of this that the thesis constructs "total" South Africa-US IIT in services indices. These indices do not show the extent of horizontally (variety) differentiated, vertically (quality) differentiated and extended intra-industry trade flows. An attempt is made in Chapter 5 to infer whether HIIT or VIIT is the dominant form of differentiation by using IIT theories such as the CHO.

Seventhly, despite the data problems, IIT indices are computed while being cognisant of the need to minimise potential biases. In this regard, the indices are computed on a strict bilateral basis (South Africa Vs US) thus avoiding geographical aggregation bias. Moreover, sectoral aggregation bias is minimised in most service sectors except travel, where IIT is calculated at the most aggregated level. It is assumed that the classification used by US BEA defines an "industry" in an economically meaningful way and does not artificially lump together services.

7.5 BARRIERS TO TRADE IN SERVICES

International trade in services is affected by barriers, which are primarily regulatory, and differ substantially from traditional tariffs and quotas. Since the Uruguay round in 1994, these barriers are subject to negotiations in the context of GATS. Indeed, they are an integral part of the DDA signed in 2001. Consequently, an analysis of South Africa-US IIT in services would be incomplete without understanding the current state of play of barriers to services trade in the two economies.

Research in this area began only with Hoekman's (1995) pioneering work and since then a team of researchers from Australia's Productivity Commission, University of Adelaide and the Australian National University has constructed trade restrictiveness indices covering many countries including South Africa and the US. Thus, the use of existing work from the Australian researchers and construction of frequency-based measures using Hoekman (1995) methodology in this study should be viewed as a preliminary attempt at measuring barriers to trade with a view to informing South Africa-US IIT in services. The methodology of measurement and actual estimates of barriers will be improved as more research is done in this area. The following are the main conclusions and insights.

Firstly, results from the Australian research group show that restrictions have substantially increased prices or costs of many services e.g. banking (price increase of 6 per cent in South Africa and 4 per cent in the US), food-distribution (0.5 per cent in South Africa and 2.3 per cent in the US), telecommunication (20.9 per cent in South Africa and 0.2 per cent in the US). This means that there are potential benefits from reform in terms of high IIT and lower prices.

Secondly, supply of services through mode 2 is quite unique since it involves the consumer crossing the border to consume a service abroad. This has two implications for trade modelling as well as policy. From a trade modelling point of view, the uniqueness of mode 2 supply implies that analyses using weighted indices without taking into

account this characteristic, are flawed. The appropriate approach is to switch the indices by replacing mode 2 in one country with mode 2 index for the trading partner and vice versa. This would ensure that the restrictions on all modes of supply in each country convey the same message (e.g. all restrict imports of services).

From a policy perspective, a country's trade restrictions on mode 2 only serve to restrict her own exports of the service in question to other countries. Thus, to promote exports, South Africa should try to harmonise her migration and trade policies with a view to substantially reducing barriers to services supplied through mode 2. In terms of trade negotiations, South Africa should focus on barriers in the US on modes 1, 3 and 4 during the SACU-US FTA. This policy recommendation is also useful for NEPAD or AU initiatives on international trade in services.

Finally, using the GATS schedules (1994-1998), South Africa has higher trade barriers in most services (telecommunications, banking) than the US, which is typical of a number of low and middle-income economies. There are, however, some services where the US has more restrictions such as engineering services, distribution services, and architectural services.

Overall, the thesis was successful in answering the research question regarding the nature of barriers to South Africa-US trade in services.

7.6 DETERMINANTS OF SOUTH AFRICA-US IIT IN SERVICES

Chapter 5 focused on the fourth research question regarding the empirical determinants of South Africa-US unaffiliated IIT in selected services over the period 1994-2002. Despite data limitations, the thesis successfully answered this research question. Dynamic panel data techniques within a GLM framework is used to model log odds of IIT but bootstrapping techniques (pooled standardised error approach and Liu-Davidson-Flachaire wild bootstrap approach) that are robust to heteroscedasticity are employed to supplement the classical approach of statistical inference. The bootstrap approach

showed that the dynamic panel data parameter estimates are unbiased and the model forecasts IIT within the 0 and 1 range as required by the Grubel and Lloyd (1975) index. The study found that, in principle, South Africa-US IIT in the selected services is determined by factors similar to those in other "North-South" IIT studies (see Table 10.1 in Greenaway and Milner, 2002: 184).

Firstly, there is a significant negative relationship between log odds ratio of IIT and per capita income difference (economic distance). The negative relationship means that South Africa-US IIT in services, which involves relatively dissimilar economies, is inimical to intra-industry specialisation and trade in homogenous and horizontally differentiated services. Additionally, since the finding is consistent with CHO model, it implies that although the study does not disentangle HIIT and VIIT, the former seems to dominate the latter in South Africa-US IIT in services. This results is inconsistent with the work of Stanley and Clark (1999) on merchandise trade which show that the US IIT with developing countries is essentially VIIT

Secondly, the difference in market size is significant and negatively related to odds ratio of IIT. Thus the limited market size in South Africa reduces the opportunities for firms to innovate and produce differentiated and competitive services as compared to the US.

Thirdly, there is a positive relationship between FDI and IIT implying that the US multinationals in South Africa play a complementary role rather than displacing exports by South Africans. This calls for the need to promote investment from the US to facilitate service exports.

Fourthly, the rand-dollar nominal exchange rate has limited positive effect on the South Africa-US IIT in the selected services. This only holds if export and import contracts are denominated in US dollar terms. In cases where this is not true for instance in case of American students studying in South African universities, where the fees are quoted in rands, this conclusion may not hold.

Fifthly, trade openness for services in South Africa and the US did not play much role for IIT during the period 1994-2002. This highlight the fact that the reason for the limited penetration of the US market by South African exporters of services does emanate from trade restrictions but rather economic distance and other factors.

The study shows that there are negative service-specific effects in education and training services; legal services; management consulting and public relations services; ocean port services; research development and testing services and tourism services. The negative relationship for these services means that there are some unique characteristics, which, hamper South Africa-US IIT in services and should be identified using firm level surveys.

The time-specific effects are negative during the period 1994-1998 and positive thereafter. This is consistent with trade liberalisation in South Africa.

7.7 FACTOR MARKET ADJUSTMENT EFFECT OF IIT

The final research question focuses on the South Africa-US IIT-induced labour market adjustment costs (SAH). In other words, is the expansion/contraction of this trade disruptive to labour markets in South Africa? This research question emanates from the postulation that HIIT entails lower factor-market adjustments than inter-industry or VIIT. The tricky issue with this research question is how to isolate the contribution of US trade to job losses in South Africa's globalising services sector. In effect the research question touches on growth, trade and poverty in a globalising South African economy (Salvatore, 2004a, 2004b). Salvatore (2004b: 545) underscores this issue by arguing that ".. service industries are not immune to global job competition".

The study had limited success in answering this research question due to lack of appropriate data. Nonetheless, it attempts to make inferences about SAH using descriptive analysis of the total MIIIT indices. The descriptive analysis, using Brülhart

(1994) and Azhar and Elliot (2003) indices, provides some indications of the sectors that South Africa seems to have specialised "into" and "out of".

The study shows that MIIT is low for most service sectors remotely suggesting that since South Africa-US trade is dominated by HIIT (Chapter 5), it potentially entails high labour adjustment costs. Although it is not possible to test whether the trade led to high labour-market adjustment costs, the finding can inform negotiating priorities and strategies for South Africa. For instance the results may be used by South Africa to press for concessions during trade negotiations with the US on services.

7.8 POLICY RECOMMENDATIONS

Firstly, there is an urgent need for STATSSA and SARB to discard the use of the BMP5 in collecting services trade data and adopt MSITS (United Nations: 2002). The importance of such data is underscored by the United Nations (2002:10) as follows "..aid in evaluation of market access opportunities; inform decisions on negotiating priorities and strategy; support the comparison of commitments; facilitate the assessment of the extent of liberalisation achieved in specific services and markets; and provide statistical background for the settling of disputes." Similarly, the services sector is one of the priority sectors of NEPAD[27] and one pan African initiative is to encourage all member countries to compile a comprehensive database of services by adopting the MSITS (United Nations, 2002).

Secondly, South Africa's trade restrictions on mode 2 (consumption abroad) serve to restrict her own exports of the service in question to the US and other countries. Consequently, in her quest to promote exports, South Africa should harmonise her migration and trade policies with a view to substantially reducing barriers to services supplied through mode 2. In terms of trade negotiations, South Africa should focus on barriers in the US on modes 1, 3 and 4. This policy recommendation is also useful for the NEPAD initiatives on international trade in services.

[27] http://www.nepad.org/en.html

Thirdly, the fact that there is a significant negative relationship between IIT and per capita income difference (economic distance) means that South Africa-US IIT in services is inimical to intra-industry specialisation and trade in homogenous and horizontally differentiated services. This shows that South Africa-US trade in services does not satisfy industrialisation aims (technology transfer, greater economies of scale etc.) and would involve higher factor adjustment costs in terms of job losses. The policy implication of this scenario is that South Africa should view the services component of the SACU-US FTA with caution and use trade and industrial policy strategically to fashion the location of production in Southern Africa in the hope of deriving future scale advantages in services. Indeed, South Africa could promote narrower regional integration and trade liberalisation involving trade between close and economically similar economies such as the AU countries.

Fourthly, the study shows that the limited market size in South Africa reduces the opportunities for firms to innovate and produce differentiated and competitive services as compared to the US.

Fifthly, the study shows that there is a positive relationship between FDI and IIT implying that US multinationals in South Africa play a complementary rather than a supplementary role. Thus there is need for an intensification of initiatives to promote investment from the US such as the American Chamber of Commerce in South Africa (AMCHAM)[28].

Sixthly, the study shows that there are negative service-specific effects in education and training services; legal services; management consulting and public relations services; ocean port services; research development and testing services and tourism services. This means that there are some unique characteristics, which hamper South Africa-US IIT in services and should be identified using firm level surveys.

[28] A detailed list of AMCHAM members is presented on their website http://www.amcham.co.za/

7.9 LIMITATIONS OF THE RESEARCH

Although the thesis attained most of its objectives, there are some problems related to lack of data. To be able to successfully perform such empirical research, there is need for availability of quality- and quantity-based data on trade in services as well as and proximate determinants of IIT. Such data are lacking and the thesis used proxies for some variables.

Firstly, in view of lack of exports and imports data in South Africa, the study uses mirrored data (US exports treated as South Africa's imports and vice versa). While this is an approximation, an analysis using trade flows from South Africa's perspective is more reliable.

Secondly, the available GATS schedules used to construct the Hoekman (1995)-type indices are based on the period 1994-1998. It is assumed that the same restrictions remained up to 2002. Such assumption may not be true and could bias the estimation results.

Thirdly, the lack of sectoral deflators led to the analysis using nominal trade data, which may not be appropriate since price effects are not factored out. It is, however, imperative to note that the GL index is homogenous of degree zero and thus not affected by this limitation.

Fourthly, the data on employment from STATSSA commonly used, as a proxy for labour adjustment costs, is not available at the same level of aggregation as the trade data from BEA.

Fifthly, the South Africa-US trade in services is about 18.5 per cent of total trade in services implying that the labour market dynamics in South Africa's service sector cannot be attributed to her trade with the US per se. There is need to incorporate the remaining 81.5 per cent of the trade. Unfortunately there is no readily available trade data on

services between South Africa and the remaining countries. Additionally, in a globalising world, service industries face global job competition, which makes it difficult to isolate the role of the US trade.

Finally, it is inappropriate to try to explain labour-market adjustment using MIIT indices within a bivariate setting because changes in labour allocation reflect adjustments in production structure while changes in trade patterns reflect changes in production and demand. This therefore means that information on changes in domestic final-services demand and changes in input usage is required. Moreover, there is need to get information and price changes induced by the liberalisation. All these pieces of information are not readily available.

It is, however, hoped that these limitations are not so severe as to limit the usefulness of the study.

7.10 SUGGESTIONS FOR FURTHER RESEARCH

Once data is available, the following research could be performed. Firstly, if data on volumes and prices are available, a similar analysis could be done for HIIT and VIIT separately.

Secondly, there is need to use the Australian researchers approach to construct trade restrictiveness indices for services, which can then be used as a determinant of South Africa-US IIT in services. The thesis uses frequency-based measures based on GATS schedules, which are a "wish list" and not the actual restrictions.

Thirdly, at the econometrics front, the hypothesis tests could be done employing bootstrapping within a Bayesian framework using Rubin's (1981) method as opposed to the Efron's (1979) bootstrap approach used in this thesis.

Fourthly, an analysis could be done to identify the factor content of South Africa-US IIT while being cognisant of the unique characteristics of services e.g. movement of factors of production across borders in some cases (modes 2, 3 and 4). This should then be followed with a thorough test of the SAH.

REFERENCES

Abd-el-Rahman, K. 1991. Firms and competitive and national comparative advantage as joint determinants of trade composition. *Weltwirtschaftliches Archiv,* 127:83-97.

Andresen, M.A. 2003. Empirical intra-industry trade: What we know and what we need to know. [Online] Available from: http://www.geog.ubc.ca/~andresen/Papers/Empirical_IIT_Lit_Review.pdf [Downloaded: 2004-08-25].

Arellano, M. & Bond, S. 1991. Some tests of specification for panel data: Monte Carlo evidence and application to employment equations. *Review of Economic Studies,* 58:227-297.

Arellano, M. & Bover, O.1995. Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68:29-51.

Balassa, B. 1966. Tariff reductions and trade in manufactures among the industrial Countries. *American Economic Review,* 56:466-473.

Balassa, B. 1979. Intra-industry trade and integration of developing countries in the world economy. In: Giersch, (eds.) *On the economics of intra-industry trade.* Paper Presented at Symposium, Tubingen.

Balassa, B. 1986. Intra-industry trade among exporters of manufactured goods. In: Greenaway, D.G. & Tharakan, P.K.M. (eds.) *Imperfect competition and international trade: The policy aspects of intra-industry trade.* Sussex: Wheatheaf.

Balassa, B.& Bauwens, L.1987. Intra-industry specialisation in a multi-industry framework. *Economic Journal,* 97:923-939.

Baltagi, B.H. 2001. *Econometric analysis of panel data.* New York: John Wiley.

Beran, R. 1986. Discussion of "jacknife bootstrap and other resampling methods in regression analysis" by Wu, C.F.J. *Annals of Statistics*, 14:1295-1298.

Bernhofen, D.M. 1999.Intra-industry trade and strategic interaction: Theory and evidence. *Journal of International Economics,* 47:225-244.

Bernhofen, D.M. 2002. Intra-industry trade in homogeneous products. In: Lloyd, P.J. & Lee.H. -H (eds.) *Frontiers of research in intra-industry trade.* London: Palgrave Macmillan, 49-66.

Bernhofen, D.M. and Hafeez, Z. 2001. Oligopolistic competition and intra-industry trade: Evidence for the OECD. *Australian Economic Papers,* 40:77-90.

Bhagwati, J. 1987. Trade in services and multilateral trade negotiations. *The World Bank Economic Review,* 1:549-569.

Bhagwati, J. 2004. Anti-globalisation: why? *Journal of Policy Modeling,* 26:439-463.

Bowen, H.P., Leamer, E.E. & Sveikauskas, L. 1987. Multicountry, multifactor tests of factor abundance theory. *American Economic Review*, 77:791-809.

Bowen, H.P., Hollander, A. & Viaene, J. M. 1998.*Applied international trade Analysis.* London: Macmillan Press.

Brander, J.A. 1981. Intra-industry trade in identical commodities. *Journal of International Economics,* 11:1-14.

Brander, J.A., & Krugman, P. 1983. A reciprocal dumping model of international trade. *Journal of International Economics,* 15(3-4): 313-321.

Breitung, J. 2000. The local power of some unit root tests for panel data. In: Baltagi, B. (eds.) *Advances in econometrics: Nonstationary panels, panel cointegration, and dynamic panels*, *Vol. 15:161-178.* Amsterdam: JAI Press.

Brülhart, M. 1994. Marginal intra-industry trade: Measurement and relevance for the pattern of industrial adjustment. *Weltwirtschaftliches Archiv,* 130:600-613.

Brülhart, M. 2000. Dynamics of intra-industry trade and labour market adjustment. *Review of International Economics*, 8(3): 420-435.

Brülhart, M. 2002.Marginal intra-industry trade. In: Lloyd, P.J. & Lee.H. -H (eds.) *Frontiers of research in intra-industry trade.* London: Palgrave Macmillan, 109-130.

Brülhart, M., Murphy, A. & Strobl, E. 2004. Intra-industry trade and job turnover. [Online] Available from:http://www.hec.unil.ch/mbrulhar/papers/bms45.pdf [Downloaded: 2005-01-12].

Carlstein, E. 1986. The use of subseries methods for estimating the variance of a general statistic from a stationary time series. *Annals of Statistics,* 14:1171-79.

Caves, R.E. 1981. Intra-industry trade and market structure in industrial countries. *Oxford Economic Papers*, 33:203-223.

Chen, Z. & Schembri, L. 2003. Measuring the barriers to trade in services: Literature and methodologies. [Online] Available from:http://www.dfait-maeci.gc.ca/eet/research/TPR_2002/17-en.asp [Downloaded: 2004-09-05].

Chester, A. & Jewitt, I.1987. The bias of a heteroscedasticity consistent covariance matrix estimator. *Econometrica, 55:1217*-1222.

Choi, I. 2001. Unit root tests for panel data. *Journal of International Money and Finance*, 20:249-272.

Clark, D.P. & Stanley, D.L. 1999.Determinants of intra-industry trade between developing countries and the United States. *Journal of Economic Development,*24: 79-95.

Davidson, R & Flachaire, E. 2001. The wild bootstrap, tamed at last. [Online] Available from: http://sticerd.lse.ac.uk/dps/darp/DARP58.pdf [Downloaded: 2004:09-04].

Davis, R.D. 1995. Intra-industry trade: A Heckscher-Ohlin-Ricardo approach. *Journal of International Economics,* 39:201-26.

Davis, R.D. & Weinstein, E.D. 2000. Integrated trade as an 'integrated equilibrium': New perspectives. *American Economic Review*, 90:150-154.

Davison, A.C. & Hinkley, D.V. 1998. *Bootstrap methods and their application.* New York: Cambridge University Press.

Deardorff, A.V. 1985. Comparative advantage and international trade and investment in Services. In: Stern, R.M. (eds.) *Trade and Investment in Services: Canada/US Perspectives.* Toronto: Ontario Economic Council.

Deardorff, A.V. & Stern, R.M. 1998. *Measurement of nontariff barriers.* Ann Arbor: University of Michigan Press.

Deardorff, A.V. 1998. Determinants of bilateral trade: Does gravity work in a neoclassical world? In: Frankel, J. (eds.), *The regionalisation of the world economy.* Chicago: The University of Chicago Press, 7-28.

Deardorff, A.V. 2000. International provision of trade services, trade, and fragmentation. [Online] Available from: http://www.sice.oas.org/geograph/services/deard.pdf [Downloaded: 2004-12-01].

Dee, P. 2003. Measuring and modelling barriers to services trade: Australia's experience. [Online] Available from: http://www.pc.gov.au/publications [Accessed: 2004-07-01].

DiCiccio, T.J., & Romano, J.P. 1988. A review of bootstrap confidence intervals (with discussion). *Journal of the Royal Statistical Society*, 50:338-370.

Dixit, A.K. & Stiglitz, J. 1977. Monopolistic competition and optimum product diversity. *American Economic Review,* 67:297-308.

Dixit, A.K.& Grossman, G.M. 1982. Trade and protection with multistage production. *Review of Economic Studies,* 43:583-94.

Dixit, A.K. & Norman, V. 1980. *The Theory of International Trade.* Cambridge: Cambridge University Press.

Dixon, P.B. & Menon, J. 1997.Measures of intra-industry trade as indicators of factor market disruption. *Economic Record*, 73:233-237.

Drèze, J. 1960. Quelques réflexions sereins sur L'adaptation de travaux de L'industrie Belge au marché commun".*Comptes Rendues des Société Royale d'Economie Politique de Belgique*, 275.

Dunning, J. 1977. Trade, location of economic activity and MNE: A search for an eclectic approach. In:Ohlin, H. & Wijkman (eds.) *The international allocation of economic activity.* London: Macmillan.

Efron, B. 1979. Bootstrap methods: Another look at the jacknife. *Annals of Statistics*, 7:1-26.

Efron, B. 1982. *The jacknife, the bootstrap and other resampling plans*. Philadelphia: Society for industrial and applied Statistics.

Efron, B. & Tishirani, R.1993. *An introduction to the bootstrap.* New York: Chapman & Hall.

Ekhom, K. 2002. Factor endowments and intra-industry affiliate production by multinational enterprises. In: Lloyd, P.J. & Lee.H. -H (eds.) *Frontiers of research in intra-industry trade.* London: Palgrave Macmillan. 221-236.

Ethier, W. 1982.National and international returns to scale in modern theory of international trade. *American Economic Review,* 72:389-405.

Everaert, G. & Pozzi, L. 2004. Bootstrap based bias correction for homogenous dynamic panels. Ghent University, Working Paper no.2004/263.

Falvey, R.E. 1981.Commercial policy and intra-Industry trade. *Journal of International Economics,* 11:495-511.

Falvey, R.E. & Kierzkowski, H. 1987. Product quality intra-industry trade and (im) perfect competition. In: Kierzkowski, H. (eds.) *Protection and Competition in International Trade*. Oxford: Basil Blackwell.

Feenstra, R.C. 2004. *Advanced international trade: Theory and evidence*, Princeton: Princeton University Press.

Feenstra, R.C. & Hanson, G. 2000. Aggregation bias in the factor content of trade: Evidence from U.S.manufacturing. *American Economic Review,* 90(2):155-160.

Feenstra, R.C., Markusen, J.R. & Rose, A.K.2001. Using the gravity equation to differentiate among alternative theories of trade. *Canadian Journal of Economics*, 34:430-47.

Finger, J.M. 1975. Trade overlap and intra-industry trade. *Economic Inquiry*, 8:581-589.

Flachaire, E. 2003. Bootstrapping heteroscedastic regression models: Wild bootstrap vs. pairs bootstrap. [Online] Available from: http://eurequa.univ-paris1.fr/membres/flachaire/research/Flachaire_03a.pdf [2004-10-12].

Flam, H. & Helpman, H. 1987. Vertical product differentiation and the north-south trade. *American Economic Review,* 77:810-22.

Fontagné L. & Freudenberg, M. 1997. Intra-industry trade methodological issues reconsidered. *CEPII, document de travail,* 97:13-53.

Fontagné L. & Freudenberg, M. 2002. Long-term trends in intra-industry trade. In: Lloyd, P.J. & Lee.H.-H (eds.) *Frontiers of research in intra-industry trade.* London: Palgrave Macmillan). 131-158.

Francois, J.F. & Hoekman, B. 1999. Market access in the service sectors manuscript, Tinbergen Institute.

Freedman, D.A. 1981. Bootstrapping regression models. *Annals of Statistics,* 9:1218-28.

Gabszewicz, J., Shaked, A., Sutton, J. & Thisse, J.F. 1981. International trade in differentiated products. *International Economic Review,* 22:527-534.

Gabszewicz, J. & Turrini, A. 1997. Workers skills, product quality and industry equilibrium. *CORE Discussion Paper* No. 9755.

Gomory, R.E. & Baumol, W. 2004. Globalisation: prospects, promise and problems. *Journal of Policy Modelling*, 26:425-438.

Gray, H.P. 1979. Intra-industry trade: The effects of different levels of data aggregation. In: Giersch, H. (eds.) *On the economics of intra-industry trade.* Tübingen: J.C.B.Mohr.

Gray, H.P. 1988. Intra-industry trade: An untidy phenomenon. *Weltwirtschaftliches Archiv*, 116:211-229.

Green, W.H. 2003. *Econometric analysis.* 5th Ed. New Jersey: Prentice Hall.

Greenaway, D.G. & Milner, R.C. 1984. A cross-section analysis of intra-industry trade in the U.K. *European Economic Review,* 25:319-344.

Greenaway, D.G. & Milner, R.C. 1986.The *economics of intra-Industry trade.* Oxford: Basil Blackwell.

Greenaway, D.G. & Milner, R.C. 1989. The growth and significance of intra-industry trade. In: Black, J. & McBean, A.I. (eds.) *Causes and changes in the structure of international trade.* London: MacMillan.1960-1985.

Greenaway, D.G., Hine, R.C., Milner, C. & Elliot, R.1994. Adjustment and measurement of marginal intra-industry trade. *Weltwirtschaftliches Archiv*, 130:418-427.

Greenaway, D.G., Hine, R.C., & Milner, C. 1994. Country-specific factors and the pattern of horizontal and vertical intra-industry trade in the UK. *Weltwirtschaftliches Archiv,* 130(1):77-100.

Greenaway, D.G. & Milner, R.C. 1995. Vertical and horizontal intra-industry trade: A cross-industry analysis of the United Kingdom. *Economic Journal*, 105:1505-1519.

Greenaway, D.G. & Milner, R.C. 1998. Intra-industry FDI and trade flows: New measures of globalization of production. Centre for research for globalization, labour Markets. University of Nottingham, Research Paper 98/5

Greenaway, D.G. & Milner, R.C. 2002. Intra-industry trade and the C-H-O model: Evidence and implications for adjustments. In: Lloyd, P.J. & Lee.H. -H (eds.) *Frontiers of research in intra-industry trade.* London: Palgrave Macmillan.180-196.

Greenaway, D.G. and Milner, R.C.2003.What have we learned from a generations research on intra-industry trade? GEP Leverhume Centre, University of Nottingham, Research Paper 2003/44.

Grossman, G. 1998. Comment. In: Frankel, J.A. (eds.) *The regionalisation of the world economy.* Chicago: University of Chicago Press.29-31.

Grubel, H.G. 1967. Intra-industry specialisation and the pattern of trade. *Canadian Journal of Economics and Political Science,* 33:374-88.

Grubel, H.G. & Lloyd, P.J. 1971. The empirical measurement of intra-industry trade. *Economic Record,* 47:494-517.

Grubel, H.G. & Lloyd, P.J. 1975. *Intra-industry trade: The theory and measurement of international trade in differentiated products*. New York: Wiley.

Grubel, H.G. & Lloyd, P.J. 2003. Intra-industry trade. In: Lloyd, P.J. & Grubel, H.G. (eds) *Intra-industry trade.* Cheltenham, UK: Edward Elgar.

Hadri, K. 2000. Testing for stationarity in heterogeneous panel data. *Econometric Journal*, 3(2):148-161.

Hafbauer, G.C. 1970. The impact of national characteristics and technology on the commodity composition of trade in manufactured products. In: Vernon, R. (eds.) *The technology factor in international trade*. New York: National Bureau of Economic Research.

Hall, P. 1992. *The bootstrap and Edgeworth expansion.* New York: Springer- Verlag

Hall, P. 1994. Methodology and theory for the bootstrap. In: Engle, R.F. & McFadden, D.L. (eds) *Handbook of econometrics.* Amsterdam: Elsevier science.

Hamilton, C. & Kniest, P. 1991. Trade liberalization, structural adjustment and intra-industry trade: A note. *Weltwirtschaftliches Archiv*, 12:356-367

Helpman, E. 1981. International trade in the presence of product differentiation, economies of scale, and monopolistic competition: A Chamberlin-Heckscher-Ohlin approach. *Journal of International Economics,* 11:305-340.

Helpman, E. 1999. The structure of foreign trade. *Journal of Economic Perspectives*, 13 (2):121-144.

Helpman, E. & Krugman, P.R. 1985. *Market structure and foreign trade*. Wheatsheef Boods: Harvester Press, MIT.

Hill, T.P. 1977. On goods and services. *Review of Income and Wealth*, 23:315-338.

Hindley, B. & Smith, A. 1984. Comparative advantage and trade in services. *The World Economy*, 7:369-390.

Hira, A. 2003. The brave new world of international education. *The World Economy*, 26:912-931.

Hirsch, S. 1989. Services and service intensity in international trade. *Weltwirtschaftliches Archiv,* 19:45-59.

Hodge, J. & Nordas, H. 2001. Liberalization of trade in producer services-The impact on developing countries. *The South African Journal of Economics*, 69:93-122.

Hoekman, B. 1995. Assessing the general agreement on trade in services. In: Martin, W. & Winters, L.A. (eds.) *The Uruguay round and the developing economies*, World Bank Discussion Paper No. 307. Washington.

Horowitz, J.L. & Savin, N.E. 2000. Empirically relevant critical values for hypothesis tests: A bootstrap approach. *Journal of Econometrics*, 95:375-389..

Horowitz, J.L. 2001. The bootstrap and hypothesis tests in econometrics. *Journal of Econometrics*, 100:37-40.

Im, K.S., Pesaran, M.H. & Shin, Y. 1995. Testing for unit roots in panel data. Manuscript, Department of Applied Economics, University of Cambridge.

Im, K.S., Pesaran, M.H. & Shin, Y. 2003. Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115:53-74.

International Monetary Fund. 1993. *Balance of Payments Manual.* 5th Edition.Washington DC.

Isemonger, A.G. 2000.The estimation of intra-industry trade in South Alfrica. *Development Southern Africa,* 17(1):53-63.

Iversen, G.R. 1984. Bayesian statistical inference. Sage University Paper Series on *Quantitative applications in the social Sciences*, 07-043. Beverly Hills and London: Sage Publications.

Jones, R.W. 1956. Factor proportions and the Heckscher-Ohlin theorem. *Review of Economic Studies*, 24:1-10.

Jones, R.W. & Kierzkowski, H. 1990. The role of services in production and international trade: A theoretical framework. In: Jones, R.W. & Krueger, A. (eds.) *The political economy of international trade.* Oxford: Basil Blackwell: 31-48.

Judge, G.G., Hill, R.C., Griffith, W.E., Lütkepohl, H. & Lee, C. 1985. *The theory and practice of econometrics.* 2nd Ed. New York: John Wiley.

Judge, G.G., Hill, R.C., Griffith, W.E., Lütkepohl, H. & Lee, C. 1988. *Introduction to the theory and practice of econometrics.* New York: John Wiley.

Kalijaran, K. 2000. Restrictions on trade in distribution services. [Online] Available from: http://www.pc.gov.au/research/staffres/rotids/rotids.pdf [Downloaded: 2004:09:02].

Kalijaran, K., McGuire, G., Nguyen-Hong, D., & Schuele, M. 2001. The price impact of restrictions on banking services. In: Findlay, C. and Warren, T. (eds.) *Impediments to trade in services: Measurement and policy implications.* New York: Routledge:215-230.

Kang, J. 2001. The price impact of restrictions on maritime services. In: Findlay, C. & Warren, T. (eds.), *Impediments to trade in services: Measurement and policy implications.* New York: Routledge: 189-200.

Kemp, S. 2001. Trade in education services and the impact of barriers to trade. In: Findlay, C. and Warrens, T. (eds.) *Impediments to trade in services: Measurement and policy implications.* New York: Routledge:231-244.

Kierzkowski, H. 1989. Intra-industry trade in transportation services. In: Tharakan, P.K.M. & Kol, J. (eds.) *Intra-industry trade: Theory evidence and extensions.* London*:* McMillan: 92-120.

Kiviet, J.F. 1995. On bias, inconsistency and efficiency of some estimators in dynamic panel data models. *Journal of Econometrics*, 68:53-78.

Kletzer, L. 1996. The role of sector-specific skills in post-displacement earnings. *Industrial Relations,* 35:473-490.

Krugman, P. 1979. Increasing returns, monopolistic competition, and international trade. *Journal of International Economics,* 9:469-479.

Krugman, P. 1980. Scale economies, product differentiation, and pattern of trade. *American Economic Review,* 70:950-959.

Krugman, P. 1981. Intra-industry specialisation and gains from trade. *Journal of Political Economy,* 89:959-973.

Krugman, P. 1991. Increasing returns and economic geography. *Journal of Political Economy*, 99:483-499.

Krugman, P.1994. *Rethinking international trade.* London: MIT Press.

Krugman, P.R. & Obstfeld, M. 2003. *International economics: Theory and policy*. New York: Addison-Wesley.

Kunin, M.and Zigic, K. 2003. Strategic trade policy and product differentiation: Intra-industry trade between developed and developing countries. [Online] Available from: http://www.cerge-ei.cz/pdf/wp/Wp230.pdf [Accessed: 2004-07-16].

Lancaster, K. 1966. A new approach to consumer theory. *Journal of Political Economy,* 74:132-157.

Lancaster, K. 1979. *Variety, equity and efficiency.* Oxford: Basil Blackwell.

Lancaster, K. 1980. Intra-industry trade under perfect competition. *Journal of International Economics,* 10:151-175.

Leamer, E.D. 1987. Path of development in the three-factor-n-good general equilibrium model. *Journal of Political Economy*, 95(5):961-999.

Leamer, E.D. 1992. Testing trade theory. [Online] Available from: http://papers.nber.org/papers/w3957.pdf [Downloaded: 2005-01-08].

Lee, H-H & Lee, Y-Y. 1993. Intra-industry trade in manufactures: The case of Korea. *Weltwirtschaftliches Archiv,* 129:159-171.

Lee, H -H & Lloyd, P.J. 2002. Intra-industry trade in services. In: Lloyd, P.J. & Lee, H-H (eds.) *Frontiers of research in intra-industry trade.* London: Palgrave Macmillan:159-179.

Leontief, W.W. 1953. Domestic production and foreign trade: The American capital position re-examined. *Proceedings of the American Philosophical Society*, 332-349.

Levene, H. 1960. In contributions to probability and statistics: Essays in honour of Harold Hotelling. In: Olkin,I. et al. (eds.). Stanford: Stanford University Press:278-292.

Levin, A. & Lin, C.F. 1993. Unit root tests in panel data: Asymptotic and finite sample properties. Discussion Paper No.93-56. University of California at San Diego.

Levin, A., Lin, C. F. & Chu, C. 2002. Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108:1-24.

Li, D., Moshirian, F. & Shim, A. 2003. The determinants of intra-industry trade in insurance services. *The Journal of Risk and Insurance,* 70:269-287.

Li, D., Moshirian, F. & Shim, A. 2005. Intra-industry trade in financial services. [Online] Available from: http://wwwdocs.fce.unsw.edu.au/banking/staff/profiles/dli/iit%20in%20banking%20Final.doc [Accessed: 2005-03-08].

Linder, S.B. 1961. *An essay on trade and transformation*. New York: John Wiley.

Linders, G. 2001. Theory, methodology and descriptive statistics on services and services trade. Unpublished masters thesis, Tilburg University. [Online] Available from:http://www.home-1.12move.nl/~sh894487/index10.html [Accessed: 2003-10-23].

Lipsey, R.E. 1976. Review of Grubel, H.G. and Lloyd, P.J., "Intra-Industry Trade". *Journal of International Economics*, 6:312-14.

Liu, R.Y. 1988. Bootstrap procedures under some non-i.i.d.models. *Annals of Statistics,* 16:1996-1708.

Lloyd,P.J. 1994. Aggregation by industry in high-dimensional models. *Review of International Economics*, 2:97-111.

Lloyd, P.J. 2002. Controversies concerning intra-industry trade. In: Lloyd, P.J. & Lee.H-H (eds.) *Frontiers of research in intra-industry trade.* London: Palgrave Macmillan.159-179.

Lovely, M.E. & Nelson, D.R. 2000. Marginal intra-industry trade and labour adjustment. *Review of International Economics*, 8:436-447.

Lovely, M.E. & Nelson, D.R. 2002. Intra-industry trade as an indicator of labour market adjustment. *Weltwirstchaftliches Archiv*, 138:179-206.

Lucas, R.E. 1976. Econometric policy evaluation: A critique. *Carnegie-Rochester conference Series on Public Policy:*7-33.

Lundberg, L. & Hanson, P. 1986. Intra-industry trade and its consequences for adjustment. In: Greenaway, D. & Tharakan, P.K., (eds.) *Imperfect competition and international trade.* Brighton:Wheatsheaf:129-147.

Mackinnon, J.G. & White, H. 1985. Some heteroscedasticity consistent covariance matrix estimators with improved finite sample properties. *Journal of Econometrics*, 29:305-325.

Mackinnon, J.G. 2002. Bootstrap inference in econometrics. [Online] Available from: http://qed.econ.queensu.ca/pub/faculty/mackinnon/papers/cea-presadd-2002.pdf [Accessed: 2004-10-12].

Maddala, G. S. & Wu, S. 1999. A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, 61:631-52.

Malmgren, H.B. 1985. Negotiating international rules for trade in services. *The World Economy*, 8:11-26.

Mammen, E. 1993. Bootstrap and wild bootstrap for high dimensional linear models. *Annals of Statistics,* 21:255-285.

Marko, M. 1998. An evaluation of the basic telecommunications service agreement. [Online] Available from: http://www.adelaide.edu.au/cies/9809.pdf [Downloaded: 2004-09-01].

Markusen, J.R. 1994. Multinationals, multi-plant economies, and gains from trade. *Journal of International Economics,* 16:205-226.

Markusen, J.R., Melvin, J.R., Kaempfer, W.H. & Maskus, K.E. 1995. *International trade: Theory and evidence*. New York: McGraw-Hill.

Markusen, J.R. & Venables, A.J. 1998. Multinational firms and the theory of international trade. *Journal of International Economics,* 46:183-203.

Markusen, J.R. & Venables, A.J. 2000. The theory of endowment, intra-industry and multinational trade. *Journal of International Economics,* 52:209-234.

Markusen, J.R. & Maskus, K.E. 2002. A unified approach to intra-industry trade and foreign direct investment. In: Lloyd, P.J. & Lee, H-H (eds.) *Frontiers of research in intra-industry trade.* London: Palgrave Macmillan:199-219.

Marvel, H.P. & Ray, E.J. 1987. Intra-industry trade: Sources and effects on protection. *Journal of Political Economy*, 95:1278-1291.

Maurer, A. & Chauvet, C. 2002. The magnitude of flows of global trade in services. In: Hoekman, B., Mattoo, A. & English, P. (eds.) *Development, trade and the WTO*. Washington D.C.: The World Bank:235-246.

Mazodier, P. & Trognon, A. 1978. Heteroscedasticity and stratification in error component models. *Annales de l'INSEE*, 30(51): 451-482.

McGuire, G. and Shuele, M. 2001. Restrictiveness of international trade in banking services. In: Findlay, C. and Warrens, T. (eds.) *Impediments to trade in services: measurement and policy implications.* New York: Routledge: 201-214

McGuire, G., Shuele, M. & Smith, T. 2001. Restrictiveness of international trade in maritime services. In: Findlay, C. & Warrens, T. (eds.) *Impediments to trade in services: Measurement and policy implications.* New York: Routledge: 172-188.

Melvin, J.R.1985. Comments on "comparative advantage and international trade and investment in services" by Deardorff, A.V. (1985). In: Stern, R.M. (eds.) *Trade and investment in services: Canada/US perspectives.* Toronto: Ontario Economic Council.

Milner, C., Lloyd, P.J. & Greenway, D. 2001. New concepts and measures of the globalisation of production. *Economic Letters,* 73:57-63.

Mooney, C.Z. & Duval, R.D. 1993. Bootstrapping: A nonparametric approach to statistical inference. Sage University Paper Series on Quantitative Applications in the Social Sciences, 07-095. London: Sage Publications.

Moshirian, F. 1998. Japan's non-interest rates related international financial services. *Japan and the World Economy*, 10:33-47.

Motta, M., Thisse, J.F. & Cabrales, A. 1995. On the persistence of leadership or leapfrogging in international trade. *CEPR Discussion Paper* No.1106.

Mukherjee, C., White, H. & Wuytz, M. 1998. *Econometrics and data analysis for developing countries.* London: Routledge.

Mundlak, Y. 1978. On the pooling of time series and cross section data. *Econometrica,* 46:69-85.

Organisation for Economic Co-operation and Development. 2004. *Statistics on International Trade in Services: 1999/2000 to 2001/2002*. [Online] Available from: http://www.oecd.org/dataoecd/56/35/1945964.xls [Accessed: 2005-03-08].

Neal, D. 1995. Industry-specific human capital: Evidence from displaced workers. *Journal of Labour Economics*, 13(4):653-677.

Neary, P.J. 2001. Of hype and hyperbolas: Introducing the new economic geography. *Journal of Economic Literature*, 39:536-561.

Nickell, S. 1981. Biases in dynamic models with fixed effects. *Econometrica*, 49:1417-1426.

Nguyen-Hong, D. 2000. Restrictions on trade in professional services. [Online] Available from: http://www.pc.gov.au/research/staffres/rotips/rotips.pdf [Downloaded: 2004-10-02].

Peterson, L. 2002. Integration and intra-industry trade in South Africa. *Development Southern Africa*, 19(2): 239-259.

Phillips, P.C.B. & Moon, H. 1999. Linear regression limits theory for nonstationary panel data, *Econometrica*, 67:1057-1111.

Politis, D.N. & Romano, J.P. 1994. Large sample confidence regions based on subsamples under minimal assumptions. *Journal of the American Statistical Association*, 22:2031-50.

Posner, M.V. 1961. International trade and technical change. *Oxford Economic Papers*, New Series, 13(3):323-341.

Qua, D. 1994. Exploiting cross-section variation for unit root inference in dynamic data. *Economic Letters,* 44:9-19.

Ratnayake, R. & Jayasuriya, S. 1991. Intra-industry trade and protection: Which way does the causation go? *Economic Letters*, 35:71-76.

Rayment, P.B.W. 1983. Intra-industry specialisation and the foreign trade of industrial countries. In: Frowen, S.F. (eds.) *Controlling industrial economies, essays in honour of C.T.Saunders*. London: Macmillan:1-28.

Reimer, J.J. 2004. Global production sharing and trade in the services of factors. [Online] Available from: http://www.aae.wisc.edu/reimer/DOCUMENT/Intermediates%20and%20FCT%20paper%208.pdf [Downloaded: 2004-10-10].

Robinson. 1933. *The economics of imperfect competition.* London: Macmillan.

Rubin, D.B. 1981. The Bayesian bootstrap. *Annals of Statistics*, 9:130-134.

Salvatore, D. 2004a. Globalisation, growth and poverty: editor's introduction. *Journal of Policy Modelling*, 26:421-424.

Salvatore, D. 2004b. Growth and poverty in a globalising world. *Journal of Policy Modelling*, 26:543-551.

Samuelson, P.A. 1949. International factor price equalisation once again. *Economic Journal*, 59 (234):181-197.

Sampson, G. & Snape, R. 1985. Identifying the issues in trade in services. *The World Economy*, 8:170-182.

Sapir, A.1985. North-South issues in trade in services. *The World Economy*, 8:27-42.

Shaked, A. & Sutton, J. 1984. Natural oligopolies and international trade. In: Kierzkowski, H. (eds.) *Monopolistic competition and international trade*. London: Claredon

South Africa. Department of Labour. 1995. *Skills Development Act*. [Online] Available from: http://www.labour.gov.za/ [Accessed: 2004-11-01]

South Africa. Department of Labour.1995. *Unemployment Insurance Fund Act*. [Online] Available from: http://www.labour.gov.za/ [Accessed: 2004-11-01]

South Africa. South African Tourism. 2002. *Tourism Growth Strategy*. [Online] Available from:http://www.southafrica.net/ [Accessed: 2004-09-15].

Spence, A.M. 1976. Product differentiation and welfare. *American Eonomic Review*, 66:407-414.

Stern, R.M. & Hoekman, B.M. 1987. Issues and data needs for GATT negotiations on services. *The World Economy*, 10:39-60.

Stolper, W.F. & Samuelson, P.A. 1941. Protection and real wages. *Review of Economic Studies,* 9:58-73.

Tang, L. 1999. Intra-industry trade in services: A case study of the international telephone industry. Mimeo, Drexel University, Philadelphia, PA.

Thom, R. & McDowell, M. 1999. Measuring marginal intra-industry trade. *Weltwirtschaftliches Archiv.* 135:48-61.

Toastmasters International. 2002. Being a master of ceremonies. [Online] Available from http://www.ecn.ab.ca/toast/mc.html [Accessed: 2004-09-20].

Trefler, D. 1995. The case of missing trade and other mysteries. *American Economic Review*, 85:1029-1046.

Trefler, D. & Zhu, S.C. 2000. Beyond the algebra of explanation: HOV for the technology age. *American Economic Review, 90:145*-149.

Trevin, R. 2000. A price impact of measure of impediments in telecommunications. In: Findlay, C. and Warren, T. (eds.) I*mpediments to trade in services: Measurement and policy implications*. New York: Routledge: 101-118.

United Nations Statistics Division. 1990. *International Standard Industrial Classification of All*
Economic Activities. [Online] Available from: http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17&Lg=1 [Accessed: 2004-10-02].

United Nations Statistics Division. 1993. *System of National Accounts*. [Online] Available from: http://unstats.un.org/unsd/sna1993/toctop.asp [Accessed: 2004-10-02].

United Nations Statistics Division. 1997. *Central Product Classification Version 1.0.* [Online] Available from: http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=3 [Accessed: 2004-10-02].

United Nations. 2002. *Manual on Statistics of International Trade in Services*. Washington DC: Department of Economic and Social Affairs, Statistics Division, United Nations, Statistical Papers series M No.86.

United Nations Conference on Trade and Development. 2004a. *Handbook of Statistics CD ROM 2004*. [Online] Available from: http://www.unctad.org [Accessed: 2005-01-10].

United Nations Conference on Trade and Development. 2004b. *World Investment Report: The Shift Towards Services*. [Online] Available from: http://www.unctad.org/en/docs/wir2004_en.pdf [Accessed: 2005-01-08].

United States. Department of Commerce. 1998. U.S. international transactions in private services: A guide to the surveys conducted by the Bureau of economic analysis. [Online] Available from: http://www.bea.gov/bea/articles/INTERNAT/INTSERV/Meth/itguide.pdf [Accessed: 2003:09:01].

Vanek, J. 1968. The factor proportions theory: The N-factor case. *Kyklos*, 21:749-56.

Verdoon, P.J. 1960. The intra-bloc trade of Benelux. In: Lloyd, P.J. and Grubel, H.G. (eds) *Intra-industry trade*. Cheltenhan: Edward elgar:4-6.

Vernon, R. 1966. International investment and international trade in product cycle. *Quarterly Journal of Economics*, 80(2): 190-207.

Walley, J. & Keith, J.C. 2003. Competitive liberalisation and a US-SACU FTA. *NBER Working Paper Series* 10168.

Walley, H. 2004. Assessing the benefits to developing countries of liberalisation in services trade. *The World Economy*, 27(8):1223-1253.

Warren, T. 2000. The identification of impediments to trade and investment in telecommunication services. In: Findlay, C. & Warrens, T. (eds.), *Impediments to trade in services: Measurement and policy implications.* New York: Routledge:71-84.

Wengel, J.T. 1995. International trade in banking services. *Journal of Money and Finance*, 14:47-64.

Welsum, D. 2003. International trade in services: issues and concepts. [Online] Available from http://www.econ.bbk.ac.uk/wp/ewp/DvWTradein**services**.pdf [Downloaded: 2004-08-21].

White, H.1980. A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. *Econometrica*, 48:817-838.

Wong, C.Y.P., Wu, J.U. & Zhang, A. 2001. A matching model of liberalization of trade in services. [Online] Available from: http://faculty.Washington.edu/karyiu/confer/sea01/papers/wong-match.pdf [Accessed: 2003-10-23].

Wooldridge, M.J. 2002. *Econometric analysis of cross-section and panel data.* London: MIT Press.

World Trade Organisation. 1991. *Services Sectoral Classification List (MTN.GNS/W/120).* [Online] Available from:http://www.wto.org/english/tratop_e/serv_e/mtn_gns_w_120_e.doc [Accessed: 2004-10-23].

World Trade Organisation. 1994a. *South Africa: Final List of Article II (MFN) Exemptions*. GATS/EL/78, 15 April 1994. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1994b. *South Africa: Schedule of Specific Commitments*. GATS/SC/78, 15 April 1994. [Online] Available from:

http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1994c. *Unites States of America: Final List of Article II (MFN) Exemptions*. GATS/EL/90, 15 April 1994. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1994d. *United States of America: Schedule of Specific Commitments*. GATS/SC/90, 15 April 1994. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1995a. *South Africa: Schedule of Specific Commitments, Supplement1*. GATS/SC/78/Suppl.1, 28 July. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1995b. *Unites States of America: List of Article II (MFN) Exemptions, Supplement 1*. GATS/EL/90/Suppl.1, 28 July 1995. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1995c. *United States of America: Schedule of Specific Commitments, Supplement1*. GATS/SC/90/Suppl.1, 28 July. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation.1996a. *Singapore Ministerial Declaration*. [Online] Available from:http://www.wto.org/english/thewto_e/minist_e/min96_e/wtodec_e.htm [Accessed: 2005-03-13].

World Trade Organisation.1996b.*Trade Policy Review: United States.* WT/TPR/S/16, 21 October 1996. [Online] Available from: http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm [Accessed: 2004-10-13].

World Trade Organisation. 1997a. *South Africa: Schedule of Specific Commitments, Supplement 2.* GATS/SC/78/Suppl.2, 11 April 1997. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1997b. *Unites States of America: List of Article II (MFN) Exemptions, Supplement 2*. GATS/EL/90/Suppl.1, 11 April 1997. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1997c. *United States of America: Schedule of Specific Commitments, Supplement 2.* GATS/SC/90/Suppl.2, 11 April 1997. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1998a. *South Africa: Schedule of Specific Commitments, Supplement 3.* GATS/SC/78/Suppl.3, 26 February 1998. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1998b. *Trade Policy Review: Republic of South Africa.* WT/TPR/S/34, 26 April 1998. [Online] Available from: http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm [Accessed: 2004:10-02].

World Trade Organisation. 1998c. *Unites States of America: List of Article II (MFN) Exemptions, Supplement 3*. GATS/EL/90/Suppl.1, 26 February 1998. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation. 1998d. *United States of America: Schedule of Specific Commitments, Supplement 3.* GATS/SC/90/Suppl.3, 26 February 1998. [Online] Available from: http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm [Accessed: 2003:10-02].

World Trade Organisation.1999. *Trade Policy Review: United States.* WT/TPR/S/56, 1 June 1999. [Online] Available from: http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm [Accessed: 2004-10-13].

World Trade Organisation. 2001a. *Doha Ministerial Declaration*. [Online] Available from:http://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_e.htm [Accessed: 2005-03-13].

World Trade Organisation. 2001b. *Trade Policy Review: United States.* WT/TPR/S/88, 15 August 2001. [Online] Available from: http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm [Accessed: 2004-10-13].

World Trade Organisation. 2002. *The Legal Texts: The Results of the Uruquay Round of Multilateral Trade negotiations.* Geneva: WTO Secretariat.

World Trade Organisation. 2003. *Trade Policy Review: United States.* WT/TPR/S/126, 17 December 2003. [Online] Available from: http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm [Accessed: 2005-01-07].

World Trade Organisation. 2004. *The July 2004 Package*. [Online] Available from: http://www.wto.org/english/tratop_e/dda_e/draft_text_gc_dg_31july04_e.htm [Accessed: 2004-10-03].

Wu, C.F.J. 1986. Jacknife bootstrap and other resampling methods in regression analysis. *Annals of Statistics*, 14:1261-1295.

Zhou, D., Spence, B. & Vertisky, I. 2002. Strategic trade policy with endogenous choice of quality and asymmetric costs. *Journal of International Economics,* 56:205-232

APPENDICES

Table A.1: Hoekman (1995) openness indices for some business services in South Africa

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
1. BUSINESS SERVICES	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.
A. Professional services																																							
(a) (i) Legal services(advisory services in foreign and international law only)	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**
(ii) Legal services(domestic law only)	0.0	0.0	0.5	0.5	**0.2**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	0.5	0.5	**0.2**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	0.5	0.5	**0.2**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	0.5	0.5	**0.2**	0.0	0.0	1.0	0.5	**0.4**
(b) Auditing	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	0.5	0.5	**0.2**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	0.5	0.5	**0.2**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	0.5	0.5	**0.2**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	0.5	0.5	**0.2**
(c) Taxation services (excluding legal services)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(d) Architectural services	0.5	0.1	1.0	0.5	**0.7**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.1	1.0	0.5	**0.7**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.1	1.0	0.5	**0.7**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.1	1.0	0.5	**0.7**	1.0	1.0	1.0	0.5	**1.0**
(e) Engineering services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(f) Integrated engineering services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(g) (i) Urban planning services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(ii) Landscape architectural services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(h) Medical and dental services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(i) Veterinary services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(j) Services provided by:																																							
(i) Midwives and nurses	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**
(ii) Physiotherapists and paramedical personnel	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**
B. Computer and related services																																							
(a) Consultancy services related to the installation of computer hardware	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(b) Software implementation services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(c) Data processing services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(d) Data base services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(e) Maintenance and repair services of office machinery and equipment including computers	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
D. Real estate services																																							
(a) Involving own or leased property	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(b) On a fee or contracting basis	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**

Source: Data from GATS commitment schedules for South Africa (World Trade Organisation, 1994b, 1995a, 1997a and 1998a), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Table A.2: Hoekman (1995) openness indices for rental/leasing services and other business services in South Africa

1. BUSINESS SERVICES	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.
E. Rental/leasing services without operators																																	**0.0**					**0.0**
(a) Relating to ships	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(b) Relating to aircraft	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(c) Relating to other transport equipment	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
d) Relating to other machinery and equipment	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
F. Other business services																																								
(b) Market research and public opinion polling services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(c) Management consulting services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(d) Services related to management consulting	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(e) Technical testing and analysis services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(f) Services incidental to agriculture, hunting and forestry	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**
(g) Services incidental to fishing	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**
(h) Services incidental to mining	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**
(i) Services incidental to manufacturing	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**
(k) Placement and supply services of personnel	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(l) Investigation and security	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(m) Engineering related scientific and technical consulting services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(n) Maintenance and repair of equipment	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(o) Building-cleaning services	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**	0.0	1.0	1.0	0.5	**0.5**
(p) Photographic services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(s) Convention services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**

Source: Data from GATS commitment schedules for South Africa (World Trade Organisation, 1994b, 1995a, 1997a and 1998a), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Table A.3: Hoekman (1995) openness indices for communications services; construction and related engineering services; distribution and environmental services in South Africa

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.
2. COMMUNICATION SERVICES																																							
B. Courier services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
C. Telecommunication services																																							
(a)-(n) Facilities based and public switched telecommunication services(telex, facsimile services, voice services,packed-switched transmission, etc)	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	0.0	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	0.0	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**
(o) Other: (i) Paging, personal radio communication services and trunked radio system services	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	0.5	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	0.5	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**
(ii) Mobile cellular, including mobile data	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	0.5	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	0.5	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**
(iii) Satellite-based services	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	0.5	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	0.5	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**
3. CONSTRUCTION AND RELATED ENGINEERING SERVICES																																							
A. General construction work for buildings	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	0.5	0.5	**0.1**	1.0	1.0	1.0	0.5	**1.0**
B. General construction work for civil engineering	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**
C. Installation and assembly work	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**
D. Building completion and finishing work	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**
4. DISTRIBUTION SERVICES																																							
B. Wholesale trade services	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**
C. Retailing services	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**
D. Franchising	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**
6. ENVIRONMENTAL SERVICES (Consultancy services only)																																							
A. Sewage services	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**
B. Refuse disposal services	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**
C. Sanitation and similar services	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**
exhaust gases, noise abatement services and landscape protection	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**	0.0	1.0	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**0.8**

Source: Data from GATS commitment schedules for South Africa (World Trade Organisation, 1994b, 1995a, 1997a and 1998a), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Table A.4: openness indices for financial Services; tourism and travel related Services; transport services and other services not classified elsewhere in South Africa

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**
7. FINANCIAL SERVICES																																								
A. All insurance and insurance related services	0.0	1.0	0.5	0.5	**0.3**	0.0	1.0	1.0	0.5	**0.5**	0.5	0.0	0.5	0.5	**0.5**	0.5	0.0	1.0	0.5	**0.7**	0.5	0.0	0.5	0.5	**0.5**	0.5	0.0	1.0	0.5	**0.7**	0.0	1.0	0.5	0.5	**0.3**	0.0	1.0	1.0	0.5	**0.5**
B. Banking and other financial services (excluding insurance)	0.0	0.0	0.5	0.5	**0.2**	0.0	0.0	1.0	0.5	**0.4**	0	0.5	0.5	0.5	**0.3**	0	0.5	0.5	0.5	**0.3**	0	0.5	0.5	0.5	**0.3**	0	0.5	0.5	0.5	**0.3**	0.0	0.5	0.5	0.5	**0.3**	0.0	0.0	0.5	0.5	**0.2**
(h) Money broking	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.0	0.0	1.0	0.5	**0.4**	0.5	0.0	1.0	0.5	**0.7**	0.0	0.0	1.0	0.5	**0.4**
9. TOURISM AND TRAVEL RELATED SERVICES																																								
A. Hotels and restaurants (including catering)	0.0	1.0	1.0	0.5	**0.9**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	1.0	0.5	**0.9**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	1.0	0.5	**0.9**	1.0	1.0	1.0	0.5	**1.0**	0.0	1.0	1.0	0.5	**0.9**	1.0	1.0	1.0	0.5	**1.0**
B. Travel agencies and tour operators services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
C. Tourist guide services	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**
11. TRANSPORT SERVICES																																								
F. Road transport services																																								
(a) Passenger transportation	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**
(b) Freight transportation	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**	0.0	0.0	1.0	0.5	**0.9**
(d) Maintenance and repair of road transport equipment	0.0	0.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**
12. OTHER SERVICES NOT INCLUDED ELSEWHERE	0.0	0.0	1.0	0.5																																				
Washing, cleaning and dyeing services	0.0	0.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**
Hairdressing and other services	0.0	0.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	0.5	**0.9**

Source: Data from GATS commitment schedules for South Africa (World Trade Organisation, 1994b, 1995a, 1997a and 1998a), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Table A.5: Hoekman (1995) openness indices for professional services and computer and related services in the US

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.
1. BUSINESS SERVICES																																							
A. Professional services																																							
(a) Legal services:Practice as or through qualified US lawyer																																							
(i) All states in the United States	0.5	0.5	0.5	0.5	**0.5**	0.5	0.5	1.0	0.5	**0.7**	0.5	0.5	0.5	0.5	**0.5**	0.5	0.5	1.0	0.5	**0.7**	0.5	0.5	0.5	0.5	**0.5**	0.5	0.5	1.0	0.5	**0.7**	0.5	0.5	0.5	0.5	**0.5**	0.5	0.5	1.0	0.5	**0.7**
(ii) Alaska	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(iii) California	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(iv) Connecticut	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(v) District	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(vi) Florida	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(vii) Georgia	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(viii) Hawaii	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(ix) Illinois	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(x) Michigan	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**
(xi) Minnesota	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(xii) New Jersey	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(xiii) New York	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(xiii) Ohio	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(xiii) Oregon	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(xiv) Texas	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**
(xv) Washington	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**
(xvi) Other states	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(b) Accounting,Auditing and bookkeeping services	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**
(c) Taxation services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(d) Architectural services	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**
(e) Engineering services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(f) Integrated engineering services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(g) (i) Urban planning services	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**
B. Computer and related services(except airline computer reservation systems)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**

Source: Data from GATS commitment schedules for the US (World Trade Organisation, 1994d, 1995c, 1997c and 1998d), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10

Table A.6: Hoekman (1995) openness indices for real estate services; rental and leasing services, and other business services in the US

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**
1. BUSINESS SERVICES																																								
D. Real estate services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**0.8**
E. Rental/leasing services without operators																																								
(c) Relating to other transport equipment	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(d) Relating to other machinery and equipment	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(e) Other (except harbour dredges)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
F. Other business services																																								
(a)Advertising(except aerial advertising and skywriting)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(b) Market research and public opinion polling services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(c) Management consulting services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(d) Services related to management consulting	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(f) Services incidental to agriculture, hunting and forestry	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(g) Services incidental to fishing	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(h) Services incidental to mining	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(j) Services incidental to energy distribution	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(k) Placement and supply services of personnel	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**
(l) Investigation and security	1.0	1.0	0.0	0.5	**0.6**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.0	0.5	**0.6**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.0	0.5	**0.6**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.0	0.5	**0.6**	1.0	1.0	1.0	0.5	**1.0**

Source: Data from GATS commitment schedules for the US (World Trade Organisation, 1994d, 1995c, 1997c and 1998d), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Table A.7: Hoekman (1995) openness indices for other business and some communication services in the US

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**	Mode 1	Mode 2	Mode 3	Mode 4	**W.Aver.**
1. BUSINESS SERVICES																																								
(m) Related scientific and technical consulting services(except land surveying for purposes of establishing legal boundaries, aerial surveying, aerial map making)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(n) Maintenance and repair of equipment(except maritime vessels, aircraft and other transport equipment)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(o) Building & cleaning services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(p) Photographic services(except aerial photographic services)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(q) Packaging services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(r)Printing and publishing	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(s) Convention services	1.0	1.0	1.0	0.5	**1.0**	1.0	0.5	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	0.5	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	0.5	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	0.5	1.0	1.0	**1.0**
2. COMMUNICATION SERVICES																																								
B. Land-based courier services(except any courier services involving any prior or subsequent movement by air)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
C. Telecommunication services																																								
(a)-(n) Facilities based and public switched telecommunication services(telex, facsimile services, voice services,packed-switched transmission, etc)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**

Source: Data from GATS commitment schedules for the US (World Trade Organisation, 1994d, 1995c, 1997c and 1998d), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Table 4.8: Hoekman (1995) openness indices for some communications services; construction and related engineering services in the US

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.
2. COMMUNICATION SERVICES																																							
C. Telecommunication services																																							
(o) Other: (i) Paging, personal radio communication services and trunked radio system services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(ii) Mobile cellular, including mobile data	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
(iii) Satellite-based services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	0.5	**1.0**
D. Audiovisual services																																							
(a) Motion picture & video tape Production & distribution services	1.0	1.0	1.0	0.5	**1.0**	0.5	1.0	0.5	1.0	**0.6**	1.0	1.0	1.0	0.5	**1.0**	0.5	1.0	0.5	1.0	**0.6**	1.0	1.0	1.0	0.5	**1.0**	0.5	1.0	0.5	1.0	**0.6**	1.0	1.0	1.0	0.5	**1.0**	0.5	1.0	0.5	1.0	**0.6**
(b) Motion picture projection service	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(c) Radio & television services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(d) Radio & television transmission services	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**
(e) Sound recording services	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
(f) Other audiovisual services	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
3.CONSTRUCTION AND RELATED ENGINEERING SERVICES(Except dredging)	0.5	1.0	1.0	0.5	**0.7**	0.5	1.0	1.0	1.0	**0.8**	0.5	1.0	1.0	0.5	**0.7**	0.5	1.0	1.0	1.0	**0.8**	0.5	1.0	1.0	0.5	**0.7**	0.5	1.0	1.0	1.0	**0.8**	0.5	1.0	1.0	0.5	**0.7**	1.0	1.0	1.0	1.0	**1.0**

Source: Data from GATS commitment schedules for the US (World Trade Organisation, 1994d, 1995c, 1997c and 1998d), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Table A.9: Hoekman (1995) openness indices for distribution services, education services, environmental services in the US

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.
4. DISTRIBUTION SERVICES																																		1.0	1.0	1.0	1.0	
A.Commission agents' services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
B. Wholesal trade (except wholesale trade of alcoholic beverages, firearms and military equipment)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
B. Wholesale trade of alcoholic beverages	0.0	0.0	0.0	0.5	**0.0**	1.0	1.0	1.0	1.0	**1.0**	0.0	0.0	0.0	0.5	**0.0**	1.0	1.0	1.0	1.0	**1.0**	0.0	0.0	0.0	0.5	**0.0**	1.0	1.0	1.0	1.0	**1.0**	0.0	0.0	0.0	0.5	**0.0**	1.0	1.0	1.0	1.0	**1.0**
C. Retailing (except retail sale of alcoholic beverages, firearms and military equipment)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
D. Franchising	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
5. EDUCATIONAL SERVICES																																						
D. Adult education (except flying instruction)	1.0	1.0	0.5	0.6	**1.0**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	0.5	0.6	**1.0**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	0.5	0.5	**0.8**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	0.5	0.5	**0.8**	0.5	0.5	0.5	0.5	**0.5**
E. Other education services	1.0	1.0	1.0	0.5	**1.0**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	1.0	0.5	**1.0**	0.5	0.5	0.5	0.5	**0.5**
6. ENVIRONMENTAL SERVICES																																						
A. Sewage services (contracted by private industry)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
B. Refuse disposal services (contracted by private industry)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
C. Sanitation and similar services	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
D. Other (cleaning services of exhaust gases; noise abatement services; nature and landscape protection services; other environmental services, n.e.c.)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**

Source: Data from GATS commitment schedules for the US (World Trade Organisation, 1994d, 1995c, 1997c and 1998d), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Table A.10: Hoekman (1995) openness indices for financial services, health related and social services in the US

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.
7. FINANCIAL SERVICES																																							
A.Insurance																																							
a) Life, accident, and health insurance services (except workers compensation insurance)	1.0	1.0	0.5	0.5	**0.8**	0.5	0.5	1.0	1.0	**0.7**	0.5	1.0	0.0	0.5	**0.3**	0.5	1.0	1.0	0.5	**0.7**	0.5	1.0	0.0	0.5	**0.3**	0.5	1.0	1.0	0.5	**0.7**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	1.0	1.0	**0.8**
b) Non-life insurance services	1.0	1.0	0.5	0.5	**0.8**	0.5	0.5	1.0	1.0	**0.7**	0.5	1.0	0.0	0.5	**0.3**	0.5	1.0	1.0	0.5	**0.7**	0.5	1.0	0.0	0.5	**0.3**	0.5	1.0	1.0	0.5	**0.7**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	1.0	1.0	**0.8**
c) Reinsurance & retrocession	0.5	0.5	0.5	0.5	**0.5**	0.5	0.0	1.0	1.0	**0.7**	0.5	0.5	0.5	0.5	**0.5**	0.5	1.0	1.0	0.5	**0.7**	0.5	0.5	0.5	0.5	**0.5**	0.5	1.0	1.0	0.5	**0.7**	0.5	0.5	0.5	0.5	**0.5**	0.5	1.0	1.0	0.5	**0.7**
d) Services auxiliary to insurance:																																							
(i) Brokerage services	1.0	1.0	0.5	0.5	**0.8**	1.0	0.0	0.5	0.5	**0.7**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**
(ii) Agency services	1.0	1.0	1.0	0.5	**1.0**	1.0	0.0	0.5	1.0	**0.8**	0.5	0.5	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**	0.5	0.5	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**
(iii) Consultancy, actuarial, risk assessment, and claim settlement services	1.0	1.0	1.0	0.5	**1.0**	1.0	0.0	0.5	1.0	**0.8**	0.0	1.0	0.0	0.5	**0.1**	0.0	1.0	0.0	0.5	**0.1**	0.0	1.0	0.0	0.5	**0.1**	0.0	1.0	0.0	0.5	**0.1**	0.5	1.0	0.5	0.5	**0.5**	0.5	1.0	0.5	0.5	**0.5**
B.Banking and all financial services excluding insurance																																							
(i) All subsectors	1.0	1.0	0.5	0.5	**0.8**	1.0	0.0	0.5	1.0	**0.8**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	0.5	0.5	**0.8**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	0.5	0.5	**0.8**	0.5	0.5	0.5	0.5	**0.5**	1.0	1.0	0.5	0.5	**0.8**
(ii)Trading of securities and derivative products and services related thereto; participation in securities issues	0.0	0.0	0.0	0.5	**0.0**	0.5	0.5	0.0	1.0	**0.3**	0.0	0.0	0.0	0.5	**0.0**	0.0	0.0	0.0	0.5	**0.0**	0.0	0.0	0.0	0.5	**0.0**	0.0	0.0	0.0	0.5	**0.0**	0.0	0.0	0.0	0.5	**0.0**	1.0	1.0	1.0	0.5	**1.0**
(iii)Participation in issues of government debt securities	1.0	1.0	0.0	0.5	**0.6**	1.0	1.0	0.5	1.0	**0.8**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	0.5	0.5	**0.8**	1.0	1.0	0.5	0.5	**0.8**	1	1	0	1	**0.6**	1	1	1	1	**1.0**
8. HEALTH RELATED & SOCIAL SERVICES																																							
A. Hospital and other health care facilities-direct ownership and management and operation by contract of such facilities on a "for fee" basis	0.0	1.0	0.5	0.5	**0.5**	0.0	0.5	1.0	1.0	**0.9**	0.0	1.0	0.5	0.5	**0.5**	0.0	0.5	1.0	1.0	**0.9**	0.0	1.0	0.5	0.5	**0.5**	0.0	0.5	1.0	1.0	**0.9**	0.0	1.0	0.5	0.5	**0.5**	0.0	0.5	1.0	1.0	**0.9**

Source: Data from GATS commitment schedules for the US (World Trade Organisation, 1994d, 1995c, 1997c and 1998d), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Table A.11: Hoekman (1995) openness indices for tourism and travel related services, cultural and sporting services in the US

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.
9. TOURISM AND TRAVEL RELATED SERVICES																																							
A. Hotels and restaurants (including catering)	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
B. Travel agents and tour operators	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
C. Tour guide services	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
D. Other	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**1.0**	1.0	1.0	1.0	1.0	**1.0**
10. RECREATIONAL, CULTURAL, & SPORTING SERVICES																																							
A. Entertainment services (including theatre, live bands and circus services)	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**
B. News agency services	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**
C. Libraries, archives, museums and other cultural services	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	1.0	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**
D. Other recreational services (except sporting)	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**

Source: Data from GATS commitment schedules for the US (World Trade Organisation, 1994d, 1995c, 1997c and 1998d), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

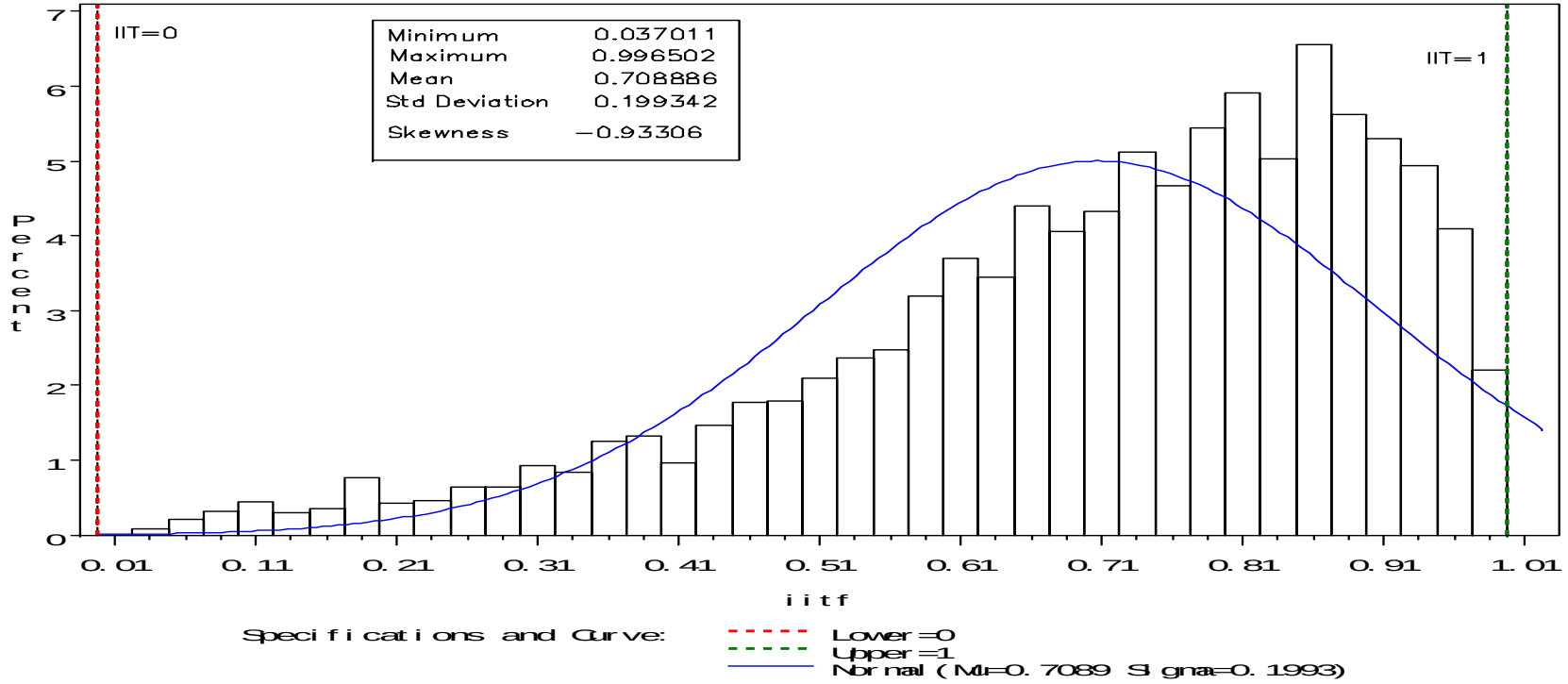
Table A.12: Hoekman (1995) openness indices for transport services in the US

	1994										1995										1997										1998									
	Market access					National treatment					Market access					National treatment					Market access					National treatment					Market access					National treatment				
	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.	Mode 1	Mode 2	Mode 3	Mode 4	W.Aver.
11. TRANSPORT SERVICES																																							
C. Air Transport services: aircraft repair and maintenance. (aircraft repair and maintenance activities, when undertaken on an aircraft or a part thereof, while it is withdrawn from service. Does not include line maintenance or other repair or maintenance activities undertaken by an air carrier (includes its agents or contractors) on aircraft it owns, leases, or operates.)	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	1.0	**1.0**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	1.0	**1.0**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	1.0	**1.0**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	1.0	**1.0**
E. Rail transport																																							
(a) Passenger transportation, excluding high speed rail	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**
(b) Freight transportation	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**
(d) Maintenance and repair of rail transport equipment	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**	1.0	1.0	0.5	0.5	**0.6**	1.0	1.0	1.0	1.0	**1.0**
F. Road Transport																																							
(a) Passenger transport: interurban regular transport	0.0	1.0	0.0	0.5	**0.1**	0.0	1.0	0.0	1.0	**0.1**	0.0	1.0	0.0	0.5	**0.1**	0.0	1.0	0.0	1.0	**0.1**	0.0	1.0	0.0	0.5	**0.1**	0.0	1.0	0.0	1.0	**0.1**	0.0	1.0	0.0	0.5	**0.1**	0.0	1.0	0.0	1.0	**0.1**
(b) Freight transport (commitment limited to transportation of cargo that has either an origin or a destination outside the US)	0.0	1.0	0.0	0.5	**0.1**	1.0	1.0	1.0	1.0	**1.0**	0.0	1.0	0.0	0.5	**0.1**	1.0	1.0	1.0	1.0	**1.0**	0.0	1.0	0.0	0.5	**0.1**	1.0	1.0	1.0	1.0	**1.0**	0.0	1.0	0.0	0.5	**0.1**	1.0	1.0	1.0	1.0	**1.0**
(d) Maintenance and repair of road transport equipment	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	1.0	**1.0**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	1.0	**1.0**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	1.0	**1.0**	0.0	1.0	1.0	0.5	**0.9**	0.0	1.0	1.0	1.0	**1.0**
H. Services auxiliary to all modes of transport																																							
(d) Other supporting and auxiliary transport services: customs house brokers	0.0	1.0	0.5	0.5	**0.5**	0.0	1.0	1.0	1.0	**1.0**	0.0	1.0	0.5	0.5	**0.5**	0.0	1.0	1.0	1.0	**1.0**	0.0	1.0	0.5	0.5	**0.5**	0.0	1.0	1.0	1.0	**1.0**	0.0	1.0	0.5	0.5	**0.5**	0.0	1.0	1.0	1.0	**1.0**

Source: Data from GATS commitment schedules for the US (World Trade Organisation, 1994d, 1995c, 1997c and 1998d), available from http://www.wto.org/english/tratop_e/serv_e/serv_commitments_e.htm

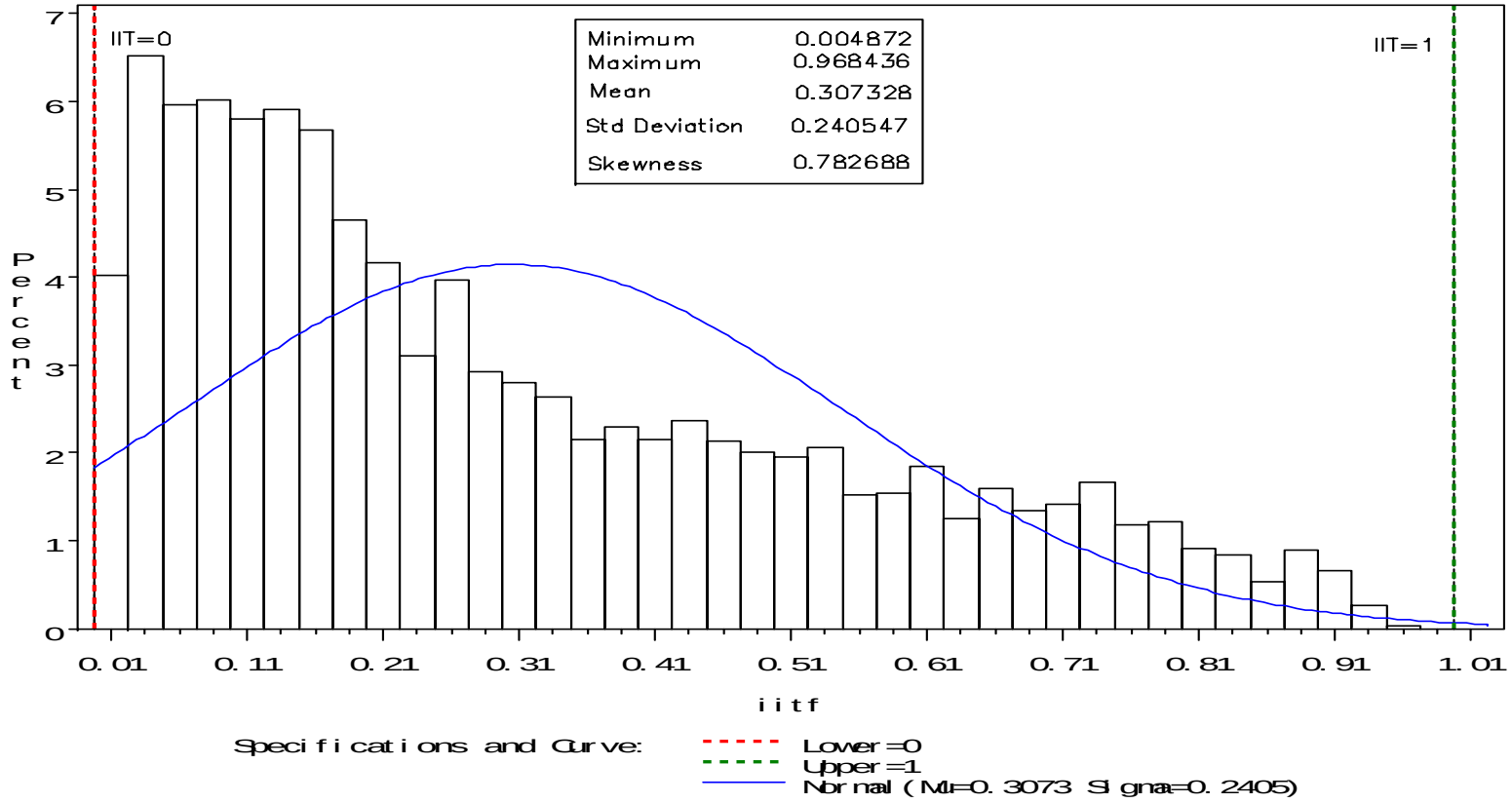
Notes: Mode 1 (cross-border trade), mode 2 (consumption abroad), mode 3 (commercial presence) and mode 4 (presence of natural persons). The scoring scheme is as follows: 1 (no restrictions applied), 0.5 (restrictions exist) and 0 (policies are unbound). The columns labelled "W.Aver." are weighted average of the scores for the 4 modes. The weights are taken from Table 4.10.

Figure A.1: EDF of predicted IIT in airfreight services



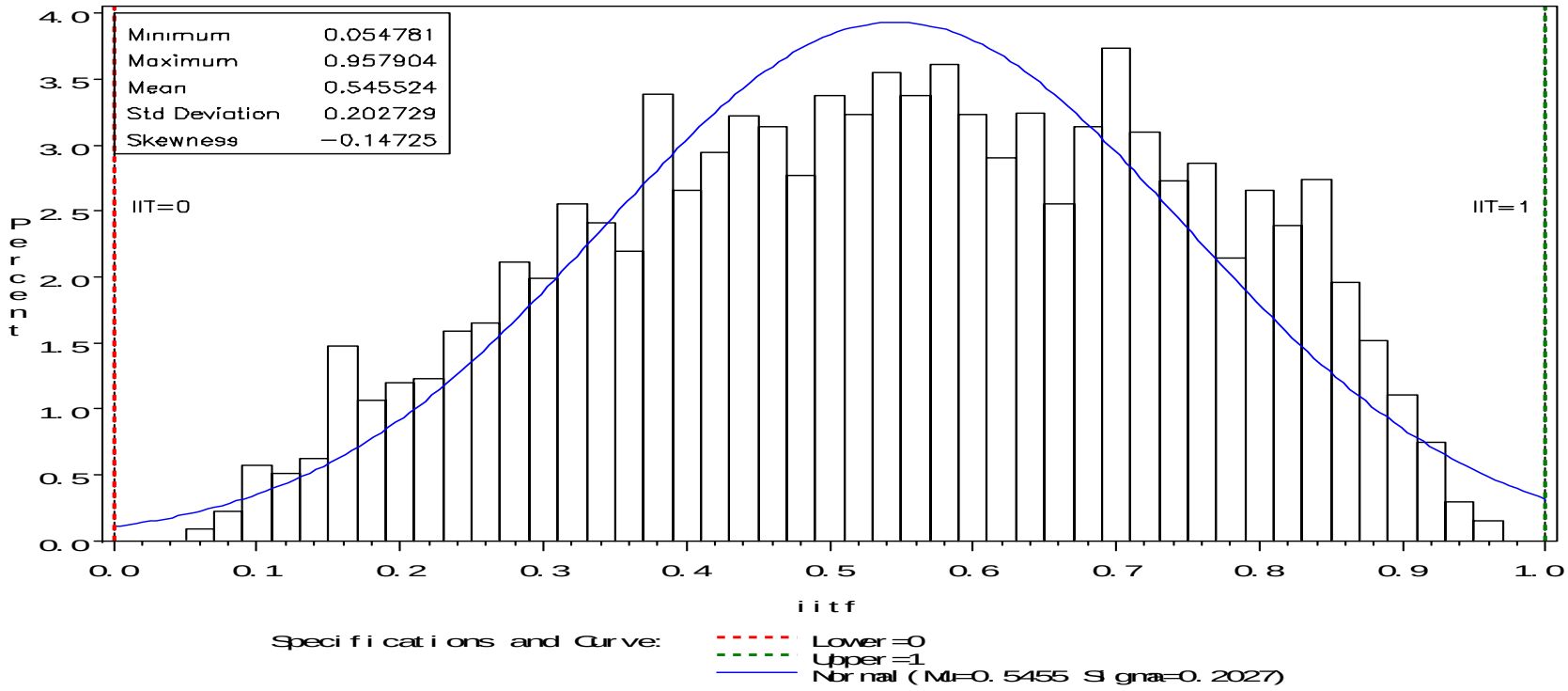
Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Figure A.2: EDF of predicted IIT in education and training services



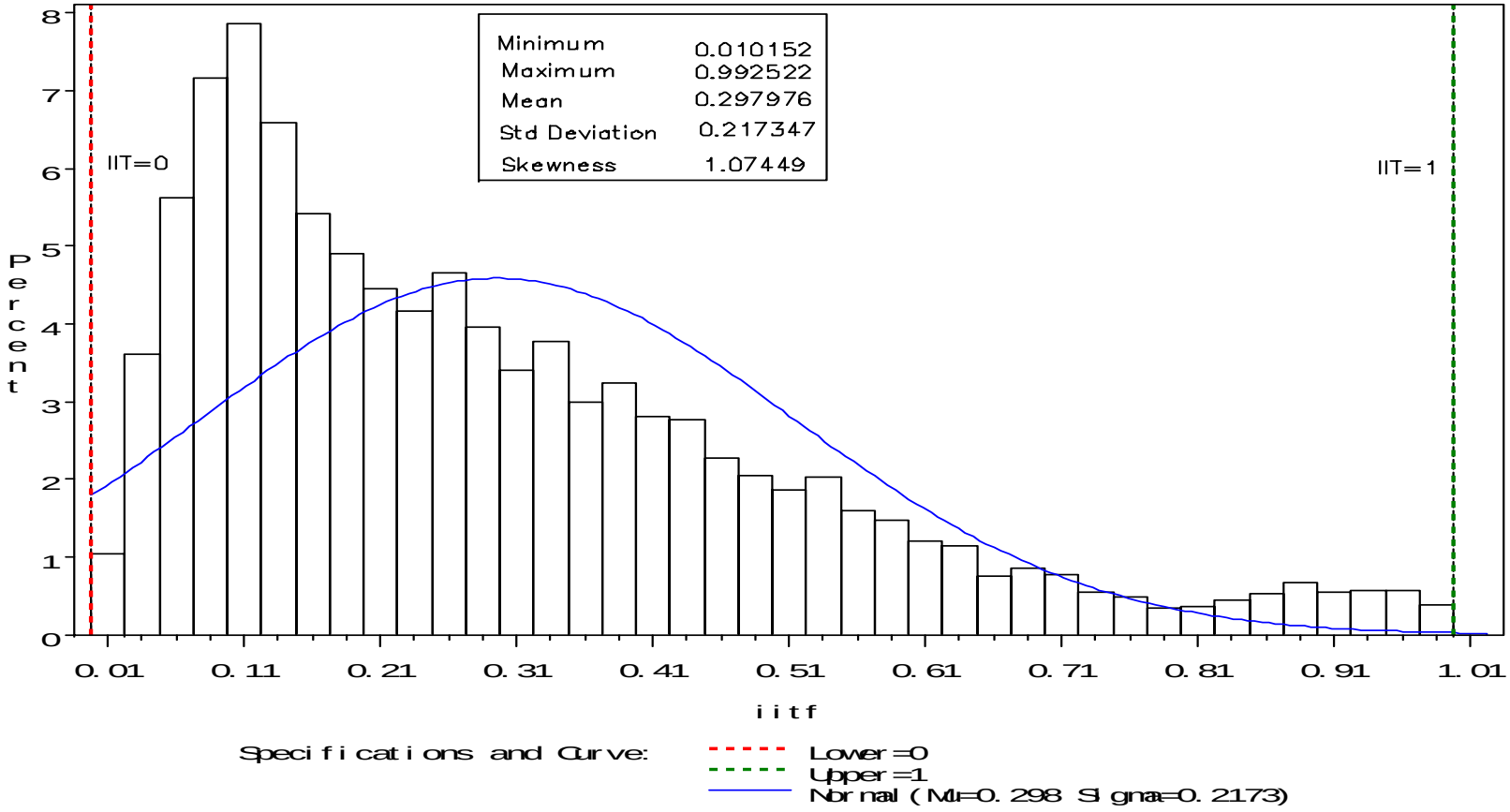
Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Figure A.3: EDF of predicted IIT in legal services



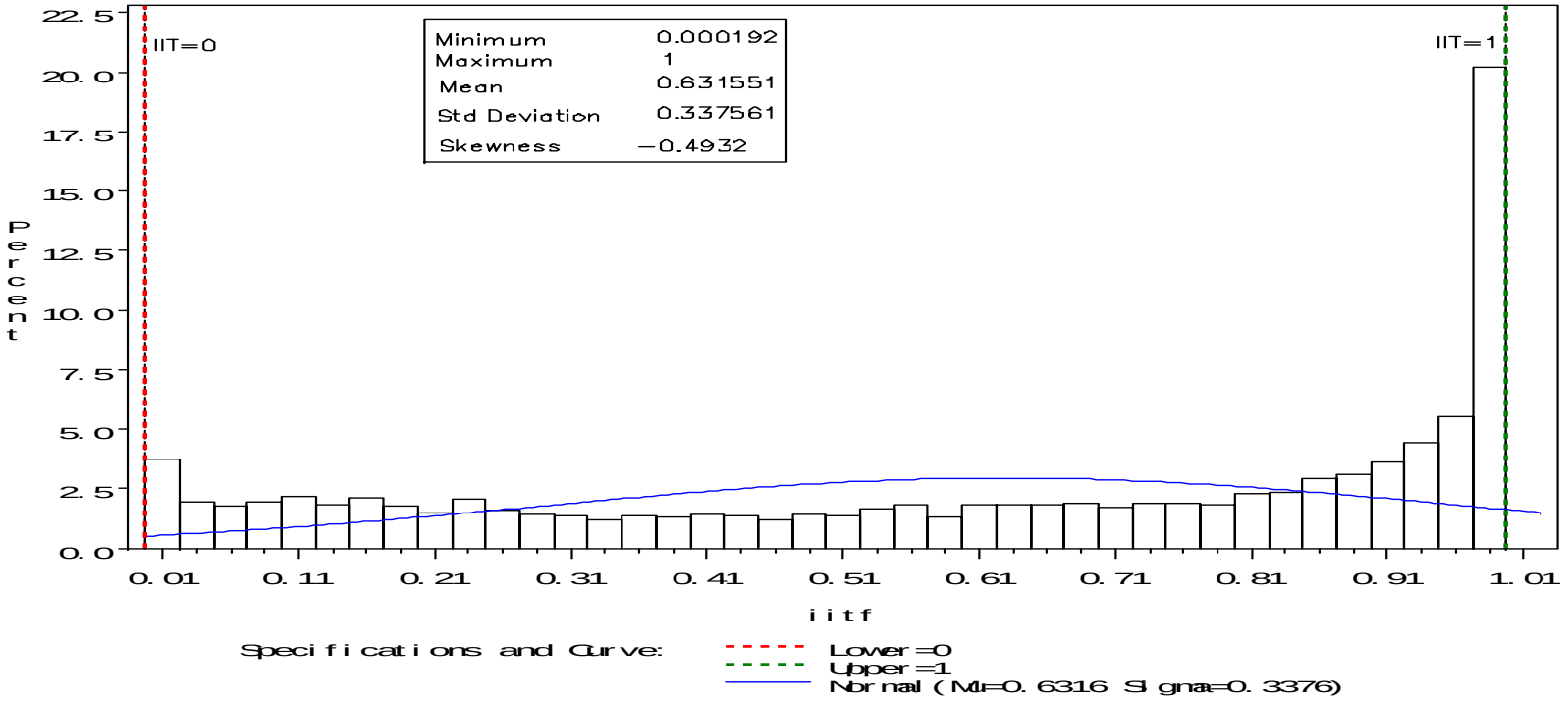
Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Figure A.4: EDF of Predicted IIT in management consulting and public relations services



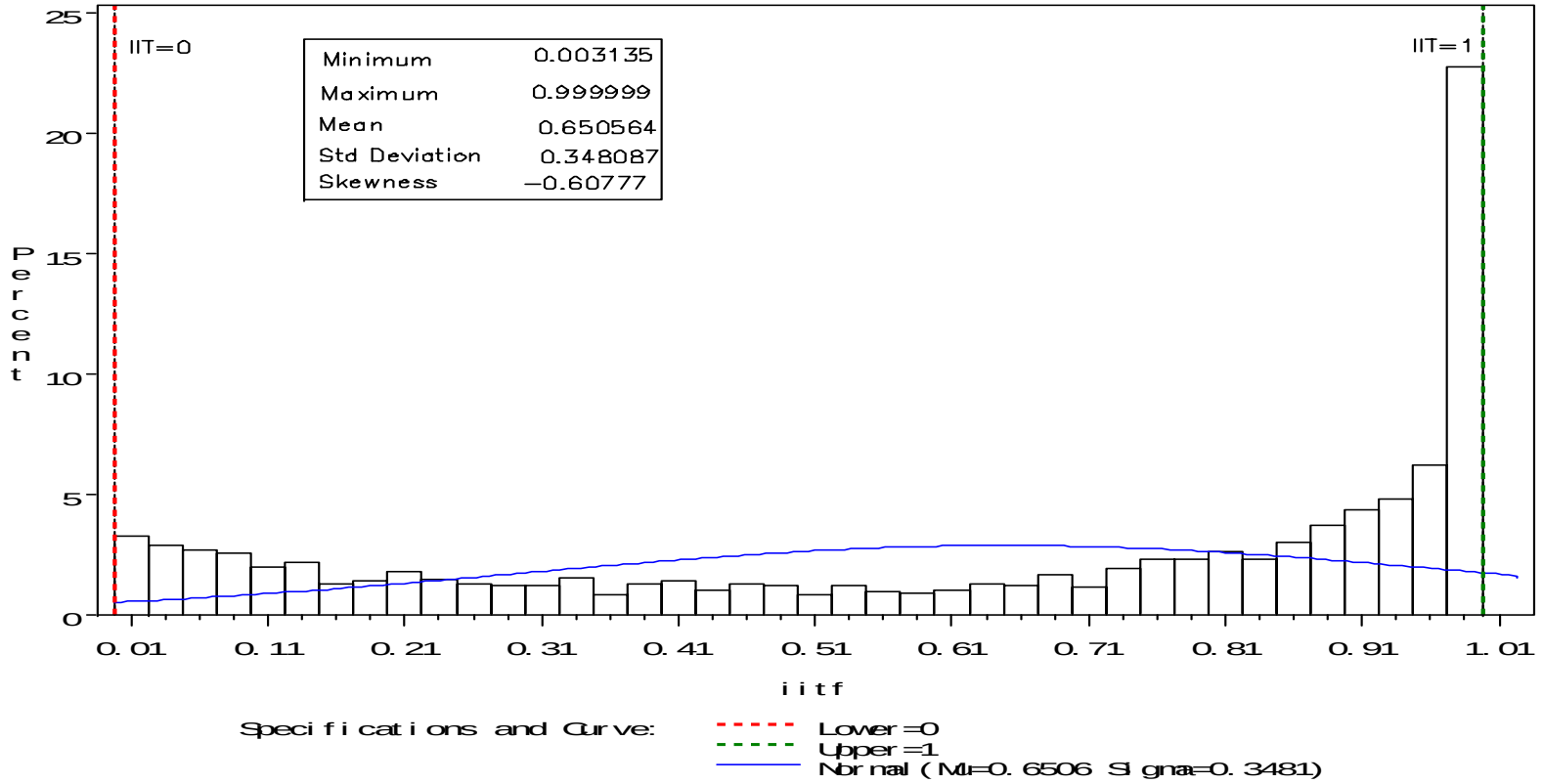
Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Figure A.5: EDF of Predicted IIT in ocean freight services



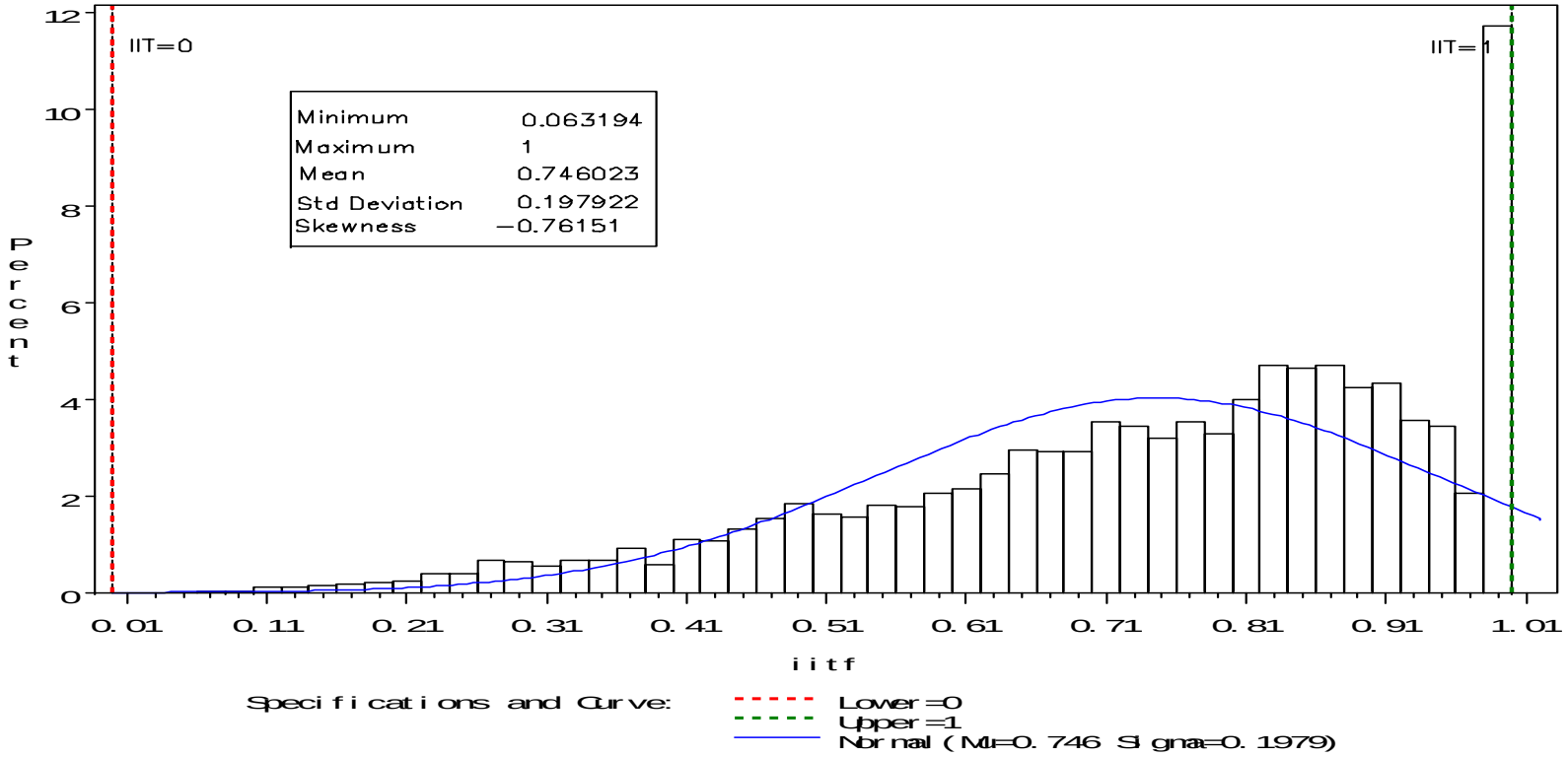
Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Figure A.6: EDF of predicted IIT in ocean port services



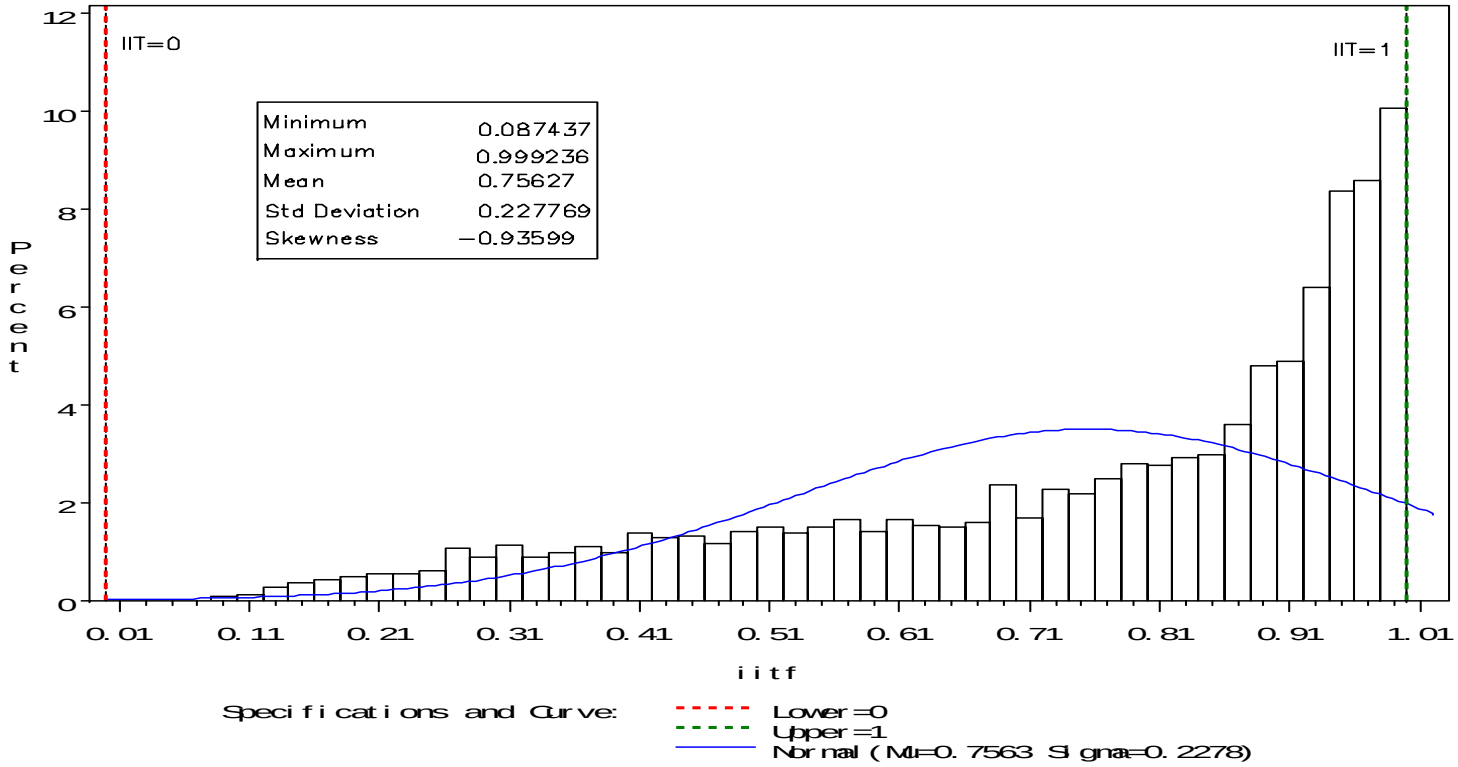
Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Figure A.7: EDF of Predicted IIT in research, development and testing services



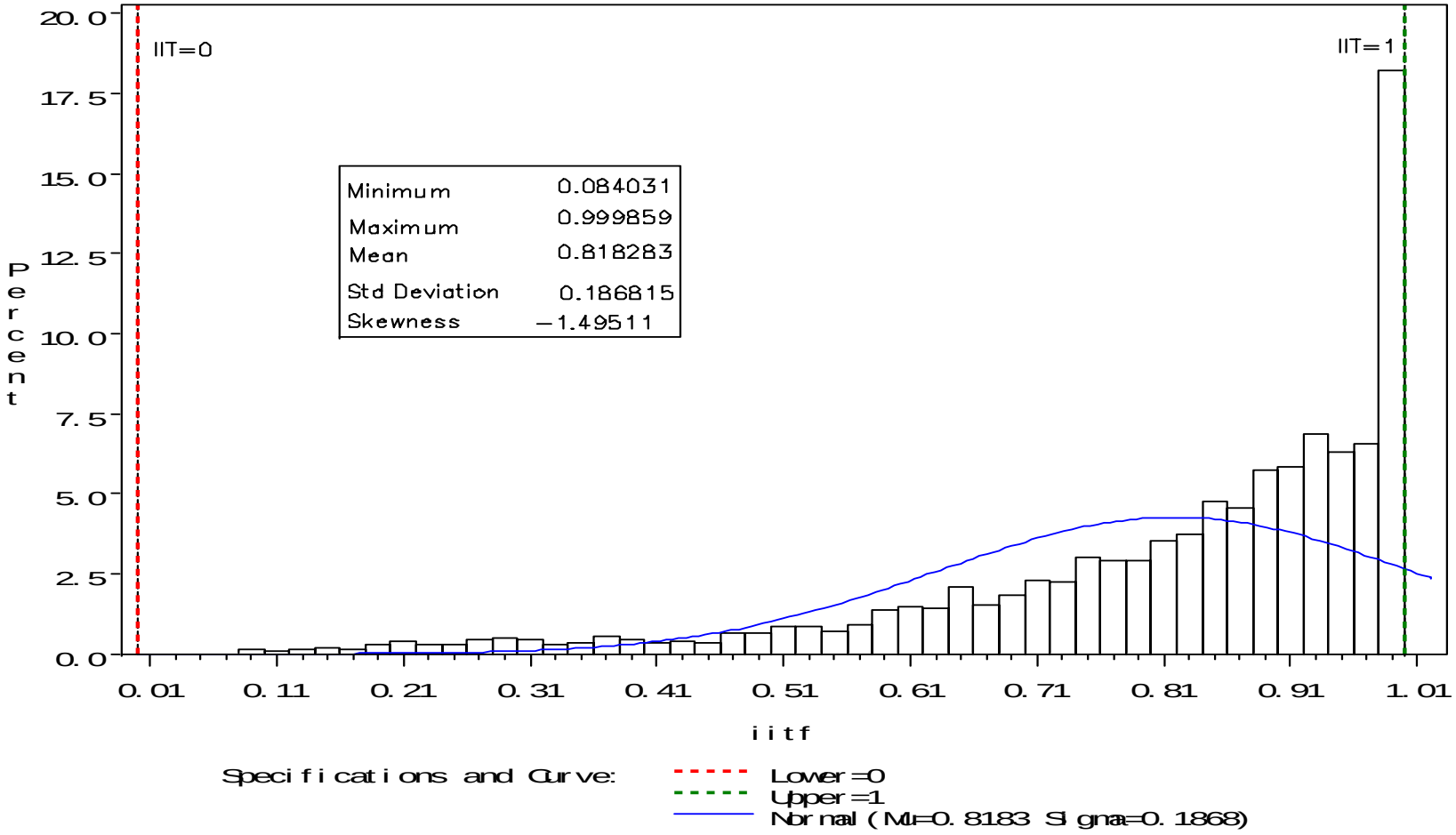
Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Figure A.8: EDF of predicted IIT in telecommunication services



Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Figure A.9: EDF of Predicted IIT in travel (tourism) services



Source: SAS statistical software output from Liu-Davidson-Flachaire wild bootstrap algorithm

Table A.13: Description of transport service industries using the BEA classification

Transport service industries	Services included
Passenger fares	Consists of (i) ***revenue derived from carriage of passengers originating from, and destined to, points outside the US***. This is revenue from purchase of tickets for trips between foreign cities (ii) ***Interline settlements*** consists of revenues from foreign airline operators for transporting passengers and payments to foreign airline operators for transporting passengers.
Ocean freight	Consists of revenues related to transactions in ocean freight services provided by South African and United States carriers: (i) ***Revenue on cargo outbound from the US ports,*** which is revenue from charters (both collect and prepaid and net of any special discounts allowed the shippers) and from in-transit or transhipment cargoes, (ii) ***Revenue on cross-trade cargoes,*** which comes from transporting cargo from one foreign port to another, and it include revenue from charters, outbound cargo that is in transit through the United States and revenue from transhipment cargo,(iii) ***Charter hire and space leasing paid to foreign residents***, which consist of payments to foreign residents for chartered vessels that are operated by United States and South African carriers and payments for space leased on foreign operated vessels, (iv) ***Charter hire and space leasing received from foreign residents***, which consist of revenues received from foreign residents for vessels chartered and operated by them and revenues for space leased to foreign residents.
Ocean port services	(i) ***Port call expenses*** which includes payments for pilotage, for towing and tugboat services, for lines, for surveys and other documentation, for harbour fees and for berth fees, (ii) ***Cargo expenses*** which are payments for loading, unloading, and storing cargo at South African and United States ports. These expenses include expenses for stevedoring cargo, bulk cargo, and container barges, for lighterage, for container and barge rentals, and warehouse and terminal rentals, (iii) ***Fuel expenses***, for fuel and oil purchased in South African and United States ports.
Airfreight	(i) ***Revenue derived from the carriage of American exports from the US to points outside the US***. It includes carter contracts. (ii) ***Revenue derived from transporting freight into the United States***. (iii) ***Revenue derived from transporting air cargo between foreign countries***.
Airport services	(i) ***Expenses incurred by South African air carriers in the United States and American carriers in South Africa from transporting freight and passengers***. The following expenses are covered: fuel and oil expenditure, expenditures for aircraft-handling and terminal services. Aircraft-handling and terminal services include expenses for aircraft repair, maintenance, storage and cleaning; handling services for freight and passengers; and other airport terminal services. Other expenses include airport and landing fees, aircraft modification and factory-type aircraft overhauls. (ii) ***Aircraft-leasing expenses*** are expenses of aircrafts that are leased by South Africans from United States residents and vice versa.
Other freight services	These are freight services provided by other modes of transport e.g. road, railway etc.

Source: Information from the US BEA (http://www.bea.gov/bea/di/1001serv/intlserv.htm)

Table A.14: Description of education and training services; and financial services using the BEA classification

Other private services industries	Services included
Education and training services	Consists of primary education services; secondary education services; higher (tertiary) education services education services; adult education services and other education services. In terms of data collection by US Bureau for Economic Analysis, this sector consists of education and training services provided on contract or fee basis. Excludes training done by a manufacturer in connection with the sale of a good.
Financial services	(i) ***Brokerage services except foreign-exchange brokerage services***: Execution of orders to purchase or sell securities, options, futures and other financial instruments excluding foreign currencies; (ii) ***Private Placement services***: Arranging the sale of securities for another party means other than an exchange. These services exclude buying and selling securities for the account of the person doing the placement. (iii) ***Underwriting services***: Buying and reselling all, or substantial portion of a new issue of securities. If an intermediary who does not own the securities executes the sale, the service is included in brokerage services;(iv) ***Financial management services***: Management of financial portfolios through commodity pools, mutual funds, hedge funds, and trusts when the person who provides the service has the authority to direct the use or the investment of the assets;(v) ***Credit-related services (except credit card services)***: Renegotiating debt terms; establishing, originating, maintaining, or arranging standby letters of credit and commercial or similar letters of credit, letters of indemnity, lines of credit, participation in acceptances, mortgages, and credit facilities; factoring services; issuing financial guarantees and loan commitments (to make or purchase loans); arranging or entering into financial lease agreements; (vi) ***Credit card services***: Processing and servicing credit card transactions; reimbursements for telecommunications from or to foreign acquirers and issuers; protection from losses from a default in the processing network; credit authorization; listing lost or stolen credit card numbers in warning bulletins or on electronic files; resignation assessment or membership fees; and multicurrency conversions;(vii) ***Financial advisory and custody services***: Advisory services on mergers and acquisitions when the provider is not at risk of incurring a loss; investment newsletters or investment advice; advisory services on commodities trading and proxy voting; custody services (including payments and settlements services, such as mortgage servicing); and other advisory and custodial services;(viii) ***Securities-lending services***: Lending or borrowing securities; arranging loan terms and conditions; monitoring the value of collateral; providing guarantees against default; and providing other securities-lending services;(ix) ***Foreign-exchange brokerage services***: Execution of orders to exchange foreign currencies except by a person who is acting as a dealer or other principal and who is at risk of incurring losses. Excludes multicurrency conversion by credit card companies, which is included in credit card services. (x) ***Other financial services***: Account maintenance and service; asset pricing; securities rating; electronic funds transfer; mutual-fund related services, such as liquidating shares (exit fees), selling shares to investors (load charges), and marketing and advertising; securities redemption and transfers; network services for automatic teller machines (ATM); security clearing and settling; and miscellaneous brokerage services, such as arranging joint ventures (excluding real estate service, business services, and commodity or merchandise brokerage services).

Source: Information from the US BEA (http://www.bea.gov/bea/di/1001serv/intlserv.htm)

Table A.15: Description of other private services; royalties and fees using the BEA classification

Other private service industries	Services included
Insurance services	Consists of (i) ***Direct insurance*** (including co-insurance), which is divided into (a) Life, accident and health insurance services (b) Non-life insurance services; (ii) ***Reinsurance and retrocession***; (iii) ***Insurance intermediation***, such as brokerage and agency; (iv) Services auxiliary to insurance, such as consultancy, actuarial, risk assessment and claim settlement services.
Telecommunication services	Consists of (i) ***Message telephone services*** provided by communications common carrier; (ii) ***Private, leased channel services***; (iii) ***Telex and telegram services*** and other jointly provided basic services; (iv) ***Value-added, or enhanced services*** such as electronic mail, voice mail, code and protocol conversion, management of data networks, facsimile services and video-conferencing services; (v) ***Support services*** such as the maintenance and repair of telecommunications equipment, ground station services, capacity leasing for transiting and the launching of communications satellites.
Business, professional and technical services	Research, development and testing services Industry; management, consulting and public relations services; advertising services; legal services; computer and data processing services; installation, maintenance and repair of equipment; construction, engineering, architectural, and mining services; database and other information services; industrial engineering services; other business, professional and technical services: language translation services; security services; collection services; actuarial services; salvage services; satellite photography services; oil and spill and toxic waste cleanup services.
Other private services	This include film and television rentals plus other private services not included elsewhere
Royalties and fees	
Industrial processes	Consists of (i) ***License fees, royalties, and other fees*** that are paid and received for the right to use patented industrial processes and products, trade secrets, and other proprietary rights and other intangible assets that are used in the production of goods; (ii) ***Maintenance fees*** paid to foreign governments for the continuation of patent rights.
Books, records and audio tapes	Consists of royalties and other fees that are received or paid for the right to perform, broadcast, reproduce, sell, or otherwise use copyrighted material or other intellectual property, such as books, records and audio tapes.
Broadcasting and recording of live performances	This covers receipts and payments for the rights to record and to broadcast artistic performances, sports events, and other performances and events.
Franchises	Covers the fees that are received and paid for the right to an ongoing business relationship that includes an entire business format. In addition to market a product or service or to use a trademark, the business format may include marketing strategy and plan, operating manuals and standards, quality control procedures, and continuing communications.

Source: Information from the US BEA (http://www.bea.gov/bea/di/1001serv/intlserv.htm)

Table A.16: Description of trademarks; general-use computer software and other intangibles

Royalties and fees	Services included
Trademarks	Covers the receipts and payments for the rights to sell products under a particular trademark, brand name, or signature.
General-use computer software	Covers receipts and payments for the rights to distribute general-use software and the rights to reproduce or use general-use computer software that was electronically transmitted or made from a master copy. It includes negotiated licensing fees for reproducing copies of general-use software for Local Area Network (LAN) computer systems. It excludes the value of pre-packaged general-use software that was physically shipped from South Africa to or from the United States and included in the Merchandise trade statistics.
Other intangibles	Covers receipts and payments for any intangible rights that are not included in the other categories. This category includes the rights of communication carriers to secure capacity by indefeasible right of users.

Source: Information from the US BEA (http://www.bea.gov/bea/di/1001serv/intlserv.htm)

Table A.17: Influential data observations

Obs	Service industry	Year	Residual	h	Covratio	Dffits	CookD
1	Afre	1994	-0.1549	0.4360	3.4494	-0.0913	0.0002
2	Afre	1995	0.4168	0.3163	0.7439	0.1726	0.0008
3	Afre	1996	-0.5183	0.2939	0.2600	-0.2004	0.0011
4	Afre	1997	-0.6496	0.2649	2.4153	-0.2292	0.0015
5	Afre	1998	0.3264	0.2988	2.7230	0.1281	0.0005
6	Afre	1999	0.5437	0.2767	2.5257	0.1992	0.0011
7	Afre	2000	1.4562	0.3771	1.7438	0.7283	0.0148
8	Afre	2001	-1.2277	0.4081	2.1313	-0.6707	0.0126
9	Afre	2002	-0.1927	0.4458	3.4963	-0.1169	0.0004
10	Educ	1994	0.1018	0.7199	6.9540	0.1552	0.0007
11	Educ	1995	-1.9138	0.3541	1.1291	-0.8993	0.0223
12	Educ	1996	0.1442	0.3182	2.8596	0.0601	0.0001
13	Educ	1997	-1.3290	0.4430	2.0311	-0.8051	0.0181
14	Educ	1998	-0.9063	0.3411	2.3992	-0.4054	0.0046
15	Educ	1999	0.6370	0.2621	2.4163	0.2227	0.0014
16	Educ	2000	1.6102	0.2613	1.4434	0.5653	0.0089
17	Educ	2001	0.3860	0.3354	2.8374	0.1693	0.0008
18	Educ	2002	1.2698	0.3251	1.9211	0.5429	0.0083
19	Fins	1994	-0.0429	0.8014	9.8519	-0.0974	0.0003
20	Fins	1995	-0.1820	0.4434	3.4856	-0.1096	0.0003
21	Fins	1996	-0.3490	0.4211	3.2651	-0.1969	0.0011
22	Fins	1997	0.5310	0.4480	3.2518	0.3244	0.0030
23	Fins	1998	-0.2998	0.3703	3.0368	-0.1458	0.0006
24	Fins	1999	0.6388	0.2744	2.4519	0.2324	0.0015
25	Fins	2000	0.5812	0.2885	2.5384	0.2210	0.0014
26	Fins	2001	-1.0346	0.3487	2.6600	-0.4739	0.0063
27	Fins	2002	0.1572	0.4730	3.6890	0.1033	0.0003
28	Legs	1994	0.0188	0.4095	3.3185	0.0103	0.0000
29	Legs	1995	-0.0074	0.4738	3.7249	-0.0048	0.0000
30	Legs	1996	-1.2105	0.2994	1.9488	-0.4781	0.0064
31	Legs	1997	0.2318	0.2551	2.5987	0.0791	0.0002
32	Legs	1998	1.3716	0.2316	1.6700	0.4347	0.0053
33	Legs	1999	0.6744	0.2497	2.3533	0.2263	0.0015
34	Legs	2000	-0.7813	0.3644	2.6132	-0.3743	0.0040
35	Legs	2001	-0.8651	0.3640	2.5157	-0.4141	0.0048
36	Legs	2002	0.5677	0.3232	2.6680	0.2402	0.0016
37	Mcps	1994	-1.4628	0.4544	1.8183	-0.9179	0.0234
38	Mcps	1995	0.7010	0.4129	2.8899	0.3868	0.0042
39	Mcps	1996	0.0250	0.3054	2.8214	0.0100	0.0000
40	Mcps	1997	1.0807	0.2753	2.0478	0.3953	0.0044
41	Mcps	1998	-0.1674	0.2330	2.5394	-0.0530	0.0001
42	Mcps	1999	-0.0748	0.2215	2.5143	-0.0228	0.0000
43	Mcps	2000	-0.1222	0.3418	2.9662	-0.0546	0.0001
44	Mcps	2001	-0.5277	0.3431	2.7736	-0.2370	0.0016
45	Mcps	2002	0.5482	0.4083	3.0350	0.2982	0.0025
Critical values				0.8000	1.2000	1.2600	1.6500

Source: Influential observations output from SAS statistical software

Notes: **Afre**-Airfreight services, **Educ**-Education and training services, **Fins**-Financial services, **Legs**-Legal services, **Mcps**-Management, consulting and public relations services, **Ocfr**-Ocean freight services, **Ocps**-Ocean port services, **Rdts**-Research, development and testing services, **Tels**-Telecommunications services, **Trav**-Travel (tourism) services. Shaded observations are influential since they are above the critical values.

Table A.18: Influential data observations (continued)

Obs	Service industry	Year	Residual	h	Covratio	Dffits	CookD
46	Ocfr	1994	3.7277	0.5692	0.0110	3.5717	0.3054
47	Ocfr	1995	3.1329	0.5252	0.0978	2.5347	0.1639
48	Ocfr	1996	-2.4655	0.3039	0.6073	-1.0035	0.0273
49	Ocfr	1997	-2.3298	0.2718	0.7297	-0.8546	0.0199
50	Ocfr	1998	-1.7209	0.2936	1.3393	-0.6709	0.0125
51	Ocfr	1999	-1.5918	0.4154	1.5786	-0.8924	0.0221
52	Ocfr	2000	0.7876	0.3688	2.6211	0.3822	0.0041
53	Ocfr	2001	0.6253	0.4355	3.0815	0.3684	0.0038
54	Ocfr	2002	-0.1655	0.5553	4.3608	-0.1395	0.0006
55	Ocps	1994	-0.9923	0.5722	3.0771	-0.8878	0.0221
56	Ocps	1995	-1.0123	0.7784	3.9579	-2.0511	0.1164
57	Ocps	1996	-0.2879	0.7530	7.4909	-0.5094	0.0073
58	Ocps	1997	2.5202	0.3058	0.5650	1.0331	0.0289
59	Ocps	1998	0.8941	0.2854	2.2617	0.3373	0.0032
60	Ocps	1999	-1.3829	0.3301	1.7847	-0.6010	0.0101
61	Ocps	2000	-4.5410	0.3348	0.0092	-2.1532	0.1118
62	Ocps	2001	7.7628	0.3498	0.0000	4.7595	0.3573
63	Ocps	2002	-2.9607	0.5883	0.1002	-2.9281	0.2180
64	Rdts	1994	-0.3583	0.7977	8.6862	-0.7972	0.0179
65	Rdts	1995	1.0123	0.7784	3.9579	2.0511	0.1164
66	Rdts	1996	0.2879	0.7530	7.4909	0.5094	0.0073
67	Rdts	1997	-0.9204	0.4509	2.7347	-0.5684	0.0091
68	Rdts	1998	-1.4023	0.2818	1.6989	-0.5250	0.0077
69	Rdts	1999	1.0214	0.2658	2.0891	0.3621	0.0037
70	Rdts	2000	0.8011	0.3620	2.5830	0.3811	0.0041
71	Rdts	2001	-0.2546	0.3563	2.9923	-0.1188	0.0004
72	Rdts	2002	-0.1870	0.3760	3.1105	-0.0925	0.0002
73	Tels	1994	-1.2225	0.4474	2.2208	-0.7493	0.1569
74	Tels	1995	-1.4464	0.4533	1.8452	-0.9046	0.0227
75	Tels	1996	2.6689	0.4453	0.3618	1.6673	0.0739
76	Tels	1997	0.2044	0.6251	5.1285	0.2170	0.0013
77	Tels	1998	0.5002	0.3775	2.9379	0.2486	0.0018
78	Tels	1999	0.0639	0.2811	2.7236	0.0237	0.0000
79	Tels	2000	1.1055	0.3518	2.1832	0.5113	0.0073
80	Tels	2001	-1.8824	0.3564	1.1666	-0.8903	0.0218
81	Tels	2002	0.0083	0.4553	3.5981	0.0052	0.0000
82	Trav	1994	0.3854	0.7249	6.4922	0.6010	0.0102
83	Trav	1995	-0.7012	0.3467	2.6352	-0.3185	0.0029
84	Trav	1996	1.7051	0.3138	1.3681	0.7077	0.0139
85	Trav	1997	0.6607	0.4372	3.0470	0.3914	0.0043
86	Trav	1998	1.4045	0.3803	1.8218	0.7088	0.0140
87	Trav	1999	-0.5297	0.2594	2.4793	-0.1835	0.0010
88	Trav	2000	-0.8974	0.2608	2.1973	-0.3127	0.0028
89	Trav	2001	-2.9821	0.3348	0.2738	-1.3491	0.0482
90	Trav	2002	0.9546	0.3777	2.4462	0.4760	0.0064
Critical values				0.8000	1.2000	1.2600	1.6500

Source: Influential observations output from SAS statistical software

Notes: **Afre**-Airfreight services, **Educ**-Education and training services, **Fins**-Financial services, **Legs**-Legal services, **Mcps**-Management, consulting and public relations services, **Ocfr**-Ocean freight services, **Ocps**-Ocean port services, **Rdts**-Research, development and testing services, **Tels**-Telecommunications services, **Trav**-Travel (tourism) services. Shaded observations are influential since they are above the critical values.