

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;

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

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;

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

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;

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

Where $*$ denotes foreign country, with goods $1,2,\dots,n$, being produced in the home country and goods $n+1,\dots,n+n^*$ 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 prefer⁷. 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.

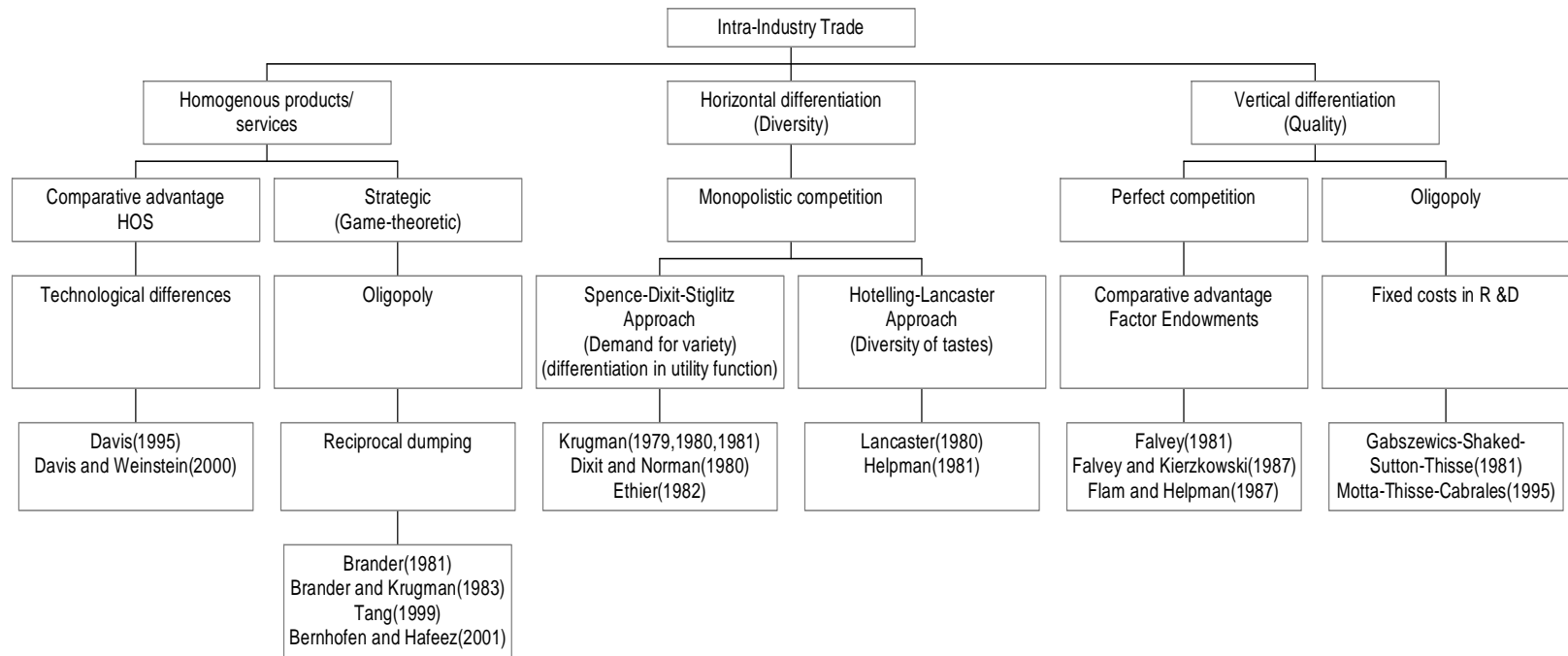
The literature survey so far provides a basis for the next section, which focuses on how to translate IIT trade theories (based on industries) to service trade data.

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 $j=1,2,\dots,J$. Fourthly, all final goods/services prices are equalised among the trading countries. Fifthly, there are identical technologies across countries $i=1,2,\dots,I$. Sixthly, consumer tastes are identical and homothetic across countries. Seventhly, trade leads to factor price equalization (FPE) across countries for all factors of production, $k=1,2,\dots,K$. Finally, there is no factor intensity reversal.

The quantity of primary factor k used per unit output in industry j is denoted by matrix $A = [a_{kj}]$. 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;

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

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 ;

$$AT_i = E_i - \alpha_i E_w \quad (2.5)$$

Where $\alpha \equiv \frac{p'C_i}{p'C_w}$ 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 country⁸.

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 incorporate 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;

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

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;

$$\begin{aligned} X &= G + x \\ M &= G + m \end{aligned} \tag{2.7}$$

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;

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

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;

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

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 process⁹.

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 \bar{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 \bar{V} is compatible with the set \check{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 (1 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).

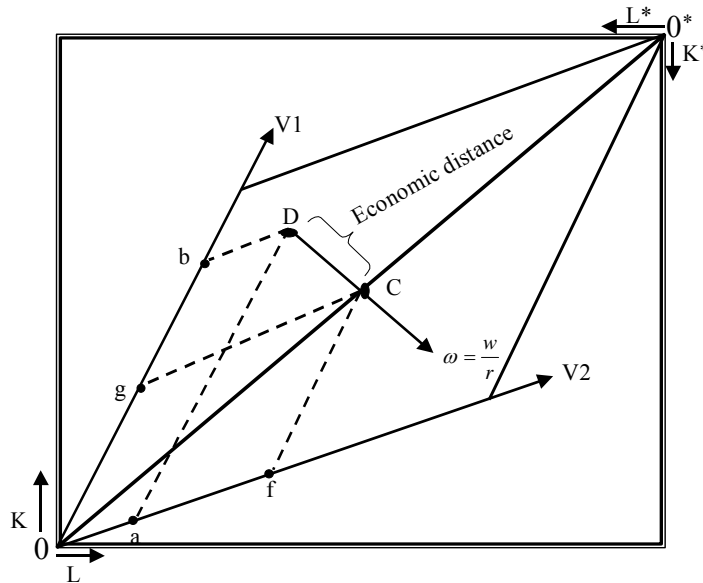
Fontagné and Freudenberg (1997) argue that internal economies of scale can be introduced into this theoretical framework without changing the basic principle of the factor content of net trade flows. Using this theoretical framework, the zero profit condition is met at equilibrium and horizontally differentiated 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.

$$Y_k = rK_k + wL_k \quad (2.10)$$

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 ;

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

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 O_g and O_f are the factor contents of national consumption in horizontally differentiated and homogenous goods/services respectively. Similarly, O_b and O_a 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)

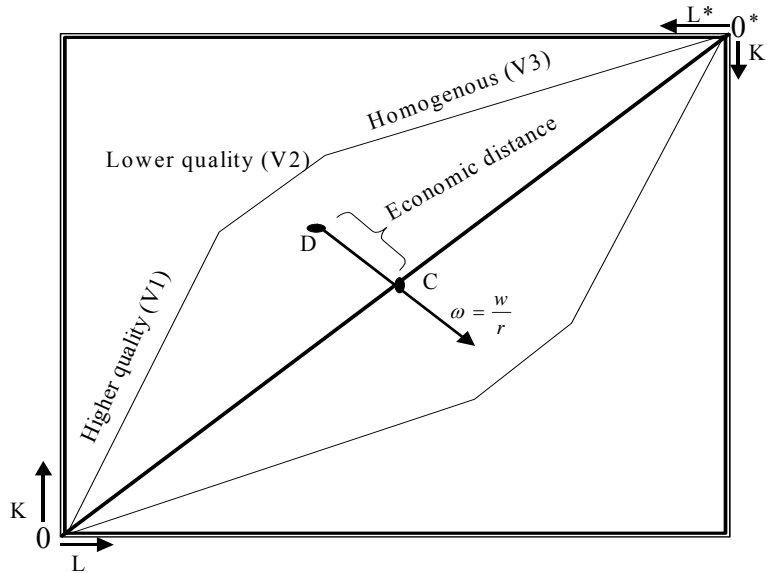
Under vertical differentiation, the factor content of a good/service described by trade data differs across countries. In this type of differentiation, a good/service is a continuum of goods/services distinguished in terms of factor content and if the endowments of countries are different, FPE does not 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 2008¹¹. 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);

$$B_i = \frac{|X_i - M_i|}{X_i + M_i} \quad (2.12)$$

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;

$$B = \frac{1}{n} \sum B_j \quad (2.13)$$

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 $i=1,2,\dots,n$. 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;

$$R_i = (X_i + M_i) - |X_i - M_i| \quad (2.14)$$

The complement of IIT is inter-industry trade;

$$S_i = |X_i - M_i| \quad (2.15)$$

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

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

It can also be computed as in Equation 2.17;

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

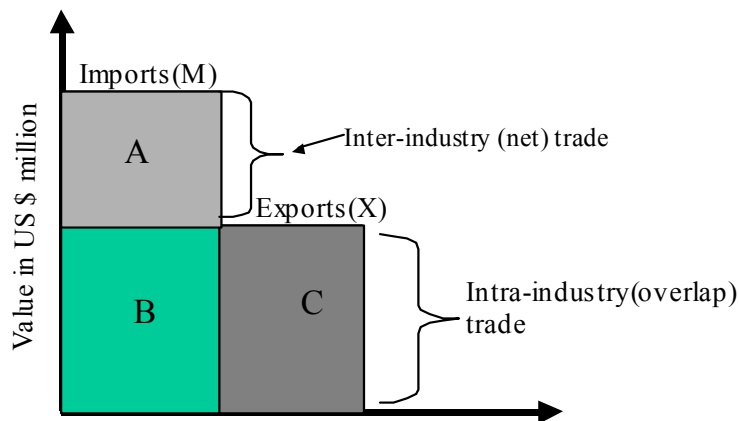
The GL index can be calculated over several industries as trade weighted average of the industry indices. It can also be calculated for a country’s worldwide trade or for a subset of trade partners.

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 Brühlhart (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

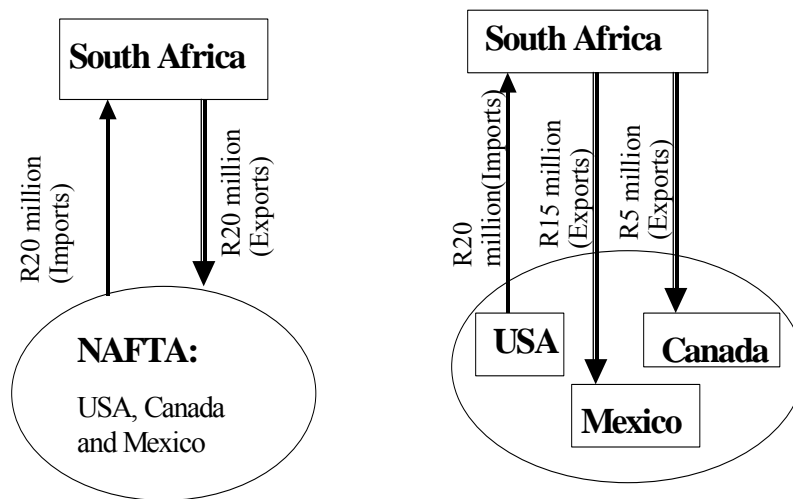
This takes place when different partner countries are put together before the computation of IIT. In fact in the extreme case only a country’s trade relations with the “rest of the world” is examined. This is the case for the data on international trade in services constructed under the BMP5 framework¹². 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;

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

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;

$$Aquino_k = \frac{\sum_j (X_{jk} + M_{jk}) - \sum_j |X_{jk}^e - M_{jk}^e|}{\sum_j (X_{jk} + M_{jk})} \quad (2.19)$$

$$\text{Where } X_{jk}^e = \frac{\frac{1}{2} \sum_j (X_{jk} + M_{jk})}{\sum_j X_{jk}}; M_{jk}^e = \frac{\frac{1}{2} \sum_j (X_{jk} + M_{jk})}{\sum_j M_{jk}}$$

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

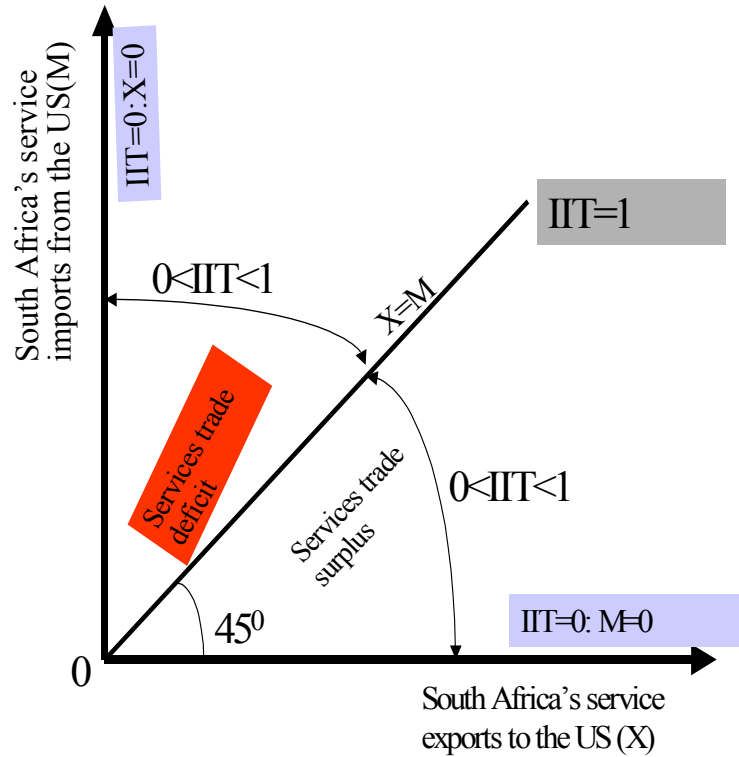
The GL index is not appropriate in explaining changes in trade flows over time. This motivated Hamilton and Kniest (1991) and others to develop measures of marginal intra-industry trade (MIIT).

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 Brühlhart (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.