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Country-Specific Determinants of Intra-Industry Trade - The Case of France

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Abstract

Theories lead to contradictory hypotheses regarding the determinants of vertical and horizontal IIT. Hence, in order to be able to investigate the country-specific determinants of VIIT and HIIT, it is important to empirically delimit the two from each other. This study employs the traditional Grubel and Lloyd measure of intra-industry trade, unadjusted for trade imbalance, and the method developed by Abd-el-Rahman to distinguish between vertical and horizontal IIT. Concerning HIIT, hypotheses derived from the CHOS model are tested, whereas the Falvey and Kierzkowski model is chosen for VIIT. Among other things, the regression results show that an increased average per capita income or an increased trade intensity has a positive, significant influence on the level of HIIT as predicted by theory. There are variables that are significant but have signs that are not in line with expectations: difference in human capital has a positive effect on HIIT and the average market size has a negative effect. Most explanatory variables have signs contrary to expectations. The overall explanatory power of the equations is nevertheless about 0,24. When it comes to vertical IIT, no explanatory variables are significant except for trade intensity, that has a positive effect on VIIT. The explanatory power is 0,008 at the most.

Another purpose of this paper is to examine France's total, vertical and horizontal IIT with the world between 1990 and 1998. Among other things, it is revealed that France increases its levels of vertical IIT in the period, whereas the levels of horizontal IIT remain roughly the same. France's vertical IIT is much more important than its horizontal IIT; France has more vertical than horizontal IIT with each country in almost every year in the period. France's horizontal IIT is most important with the industrialized countries, especially the ones close to France. However, when it comes to vertical IIT, France has high levels with both industrialized countries and with developing countries far away.

Keywords: vertical intra-industry trade, horizontal intra-industry trade, France, country-specific determinants, the Falvey and Kierzkowski model, the Chamberlin-Heckscher-Ohlin-Samuelson (CHOS) model.

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1 Introduction

1.1 Intra-Industry Trade - A Short Insight

Intra-industry trade (IIT) was discovered in the beginning of the 1960's. However, it was not until Grubel and Lloyd published their work in 1975, that a systematic and coherent investigation of intra-industry trade theory, measurement, empirical analysis and policy aspects started.[1] Since then, the IIT literature has grown apace. Intra-industry trade has been one of the major research foci, perhaps even the major research focus, for analysts of international trade over more than a quarter of a century.[2]

Until the mid-1980's, research was especially concerned with intra-industry trade theory; early empirical evidence of the existence of intra-industry trade challenged researchers to develop theories, that could explain it. Since then, there has been a change in focus from theory to measurement, empirical analysis and policy aspects.

It has been possible to theoretically disentangle vertical intra-industry trade (VIIT) and horizontal intra-industry trade (HIIT) since the early 1980's. This distinction is important, because the theories of vertical and horizontal IIT lead to contradictory hypotheses regarding the determinants of VIIT and HIIT.[3] In other words, different industry and country characteristics are likely to be associated with the two. For example, the monopolistically competitive model yields a *negative* relationship between the economic distance of two countries and HIIT, whereas the vertical differentiation scheme proposed by Falvey (1981) and Falvey and Kierzkowski (1987) nature yields a *positive* relationship between the economic distance and VIIT.[4]

Even though it was theoretically known, that the determinants of VIIT and HIIT differed, this was empirically underresearched for a long time due to a lack of methods to delimit VIIT and HIIT from each other.[5] Many empirical analyses had to use total IIT as the dependent

[1] Greenaway and Milner (1987)
[2] Greenaway and Torstensson (1997)
[3] Gullstrand (2002b)
[4] Fontagné and Freudenberg (1997)
[5] Greenaway, Hine and Milner (1994)

variable. Consequently, different econometric analyses resulted in different conclusions.[6] In other words, the difficulties of disentangling vertical and horizontal intra-industry trade, led to a lack of consensus regarding the determinants of intra-industry trade.

The gap between the theoretical models and empirical work started to lessen in the early 1990's. Abd-el-Rahman proposed a method to identify VIIT and HIIT.[7] The method splits total IIT into two parts: VIIT and HIIT. A fundamental assumption is that quality is reflected in price and price can be proxied by unit values.[8] When differences in unit values exceed an arbitrary range, for example ±0,15, this is taken as an expression of vertical intra-industry trade. When differences in unit values stay within the range, horizontal intra-industry trade is assumed. The methodology by Abd-el-Rahman has been deployed in empirical analyses by e.g. Greenaway et al.[9] and Aturupane et al[10]. However, further empirical analyses are still needed.

This paper focuses on France's vertical and horizontal IIT with the world in 1990-1998 and the relationship between VIIT and HIIT and various country characteristics. France is the country in focus because of my general interest in France and the fact that France is an important economy in the EU as well as in the world. Since I already have trade statistics for 1990-1998, these years are in focus for simplicity. Moreover, this is an interesting period of deepened European integration through e.g. the implementation of the Single Market in 1992, the enlargement of the EU and proposals for an economic and monetary union. Total intra-industry trade (TIIT) is calculated using the traditional, unadjusted Grubel-Lloyd index from 1975. To separate TIIT into vertical IIT and horizontal IIT, the method developed by Abd-el-Rahman is employed. VIIT and HIIT are calculated using four ranges: ±0,05; ±0,15; ±0,25; and ±0,35. The calculations are based on the OECD trade statistics, where exports and imports between countries are expressed in thousands of US Dollars and in tons. The level of aggregation is the five-digit level, adopting SITC (United Nation's Standard International Trade Classification). Only IIT indices for manufactured products are calculated (SITC group 5 to 8). This is because manufactures account for the major part of intra-industry trade, these products being differentiated and subject to economies of scale.

[6] Greenaway and Torstensson (1997)
[7] Abd-el-Rahman (1991)
[8] Greenaway and Torstensson (1997)
[9] Greenaway, Hine and Milner (1995)
[10] Aturupane et al (1997)

1.2 Purpose

The purpose of this paper is twofold. First, France's vertical and horizontal intra-industry trade with the world between 1990 and 1998 is studied. The second purpose is to investigate whether country-specific factors are important in explaining France's vertical and horizontal IIT. In other words, country-specific variables are tested as determinants of vertical and horizontal intra-industry trade.

1.3 Disposition

Chapter 2 treats intra-industry trade theory; an outline of the diverse models of intra-industry trade is put forward. A few of the theories are discussed somewhat closer. Hypotheses derived from the theories are presented and they will be tested econometrically in Chapter 5.

Chapter 3 focuses on the measurement of intra-industry trade. The widely used Grubel and Lloyd (1975) measure of intra-industry trade is presented as is the formula for distinguishing between horizontal and vertical intra-industry trade. Problems connected to the methods are discussed throughout the chapter.

Chapter 4 aims at replying to the first of the two goals, i.e. outlining France's horizontal and vertical intra-industry trade with the world in 1990 to 1998. Employing the formulas from Chapter 3, IIT indices (total, vertical and horizontal) are calculated. Having calculated the indices, the evolution of France's total, horizontal and vertical intra-industry trade between 1990 and 1998 is studied.

Chapter 5 deals with the second of the two goals of the paper: the determinants of horizontal and vertical intra-industry trade. This implies that an econometric attempt is made to settle the importance of various country characteristics in determining HIIT and VIIT. Variables included in the regressions are the dependent variables from Chapter 4, i.e. the IIT indices, and independent variables representing the hypotheses from the theories in Chapter 2.

The final chapter, Chapter 6, concludes the paper. The most important findings of the paper are summarized, discussed and compared with other studies.

2 Intra-Industry Trade Theory

This chapter focuses on theories of intra-industry trade. Hypotheses derived from the theories are put forward and these will be tested econometrically in Chapter 5.

2.1 The Discovery of Intra-Industry Trade

Until the beginning of the 1960's, trade between countries was considered to be simple and uncomplicated[11]: countries traded because of supply side differences, like differences in factor endowments or in technology. In other words, countries produced and exported products which matched the characteristics of the country, while importing the products least adapted to the national characteristics. The greater the *differences* in national endowments of production factors, the greater the trade volumes. Thus, traded goods were of different industries, i.e. trade *between* industries or *inter*-industry-trade. Trade was characterized by homogeneous products and perfect competition. The Ricardian and Hekscher-Ohlin-Samuelson (HOS) models are fundamental to understand inter-industry trade.

Since then, the view of international trade has changed. The revelation of intra-industry trade in the early 1960's may be seen as the commencement of the renewal of international trade theory. It was in 1961 that Burenstam-Linder observed a relationship: countries with high and similar per capita income have similar demand patterns, the result being an exchange of similar but differentiated goods, intra-industry trade. Thus, it was shown that *similar* countries engage in trade with *similar* products, i.e. products *within* the same industry, *intra*-industry trade, and not just products of different industries. This conflicted with the traditional theories.

The very existence of intra-industry trade was questioned for many years. Some reseachers considered intra-industry trade to be a "statistical artefact", basing this opinion on the fact that there is sometimes greater variation in factor intensity within than between industries, using official commodity classifications (Finger, 1975).[12] Irrespective of any doubts regarding intra-industry trade, there was growing empirical evidence in the 1960's of the importance of trade

[11] Lüthje (2001)
[12] Greenaway and Milner (1987)

in manufactures among high-income industrialised countries. Moreover, the classical trade theories did not involve important concepts like imperfect competition, diversity of taste and economies of scale among other things in explaining international trade. Thus, the need for alternative trade theories was substantial. Consequently, a search for new models began. Many new theories were put forward in the late 1970's and in the 1980's. Originally, the new trade theories were to replace the traditional ones, because the empirical evidence of intra-industry trade was understood as an invalidation of traditional theories of international trade founded on the principle of comparative advantages.[13] Moreover, inter-industry trade appeared to account for a residual share of international trade. Today, the need for both comparative advantage and preference-based theories of international trade is generally accepted.[14]

All models of inter- and intra-industry trade either belong to the "large numbers' models" of trade or to the "small numbers' models" of trade. Large numbers' models refer to a large number of firms in the market. Focusing on intra-industry trade, there is a large number of firms in equilibrium due to free entry and exit and scale economies, which are exhausted at relatively low levels of output. All of the large numbers' models can provide coherent explanations for intra-industry trade based on product differentiation and economies of scale, factors omitted from the traditional HOS theory. When it comes to the small numbers' models of intra-industry trade, there is only a small number of firms in equilibrium, because entry is often blocked. One block for instance is when a high level of output is needed to reap economies of scale. A 'natural' oligopoly or even a monopoly may then be generated. Since the assumptions underpinning oligopolistic market structures can vary, intra-industry trade in this small number setting renders possible a wide range of outcomes. Generalisation is not easy and the results are not as conclusive as that associated with large number cases.[15]

There are mainly two kinds of intra-industry trade: horizontal IIT (HIIT) and vertical IIT (VIIT). In the case of HIIT, products differ in their *attributes* while having the same quality or price. Producers in an industry are assumed to use the same production techniques. On the contrary, vertically differentiated products, giving rise to VIIT, differ in *quality*, which can be translated into differences in price. Since quality differs within industries, producers use

[13] Fontagné and Freudenberg (1997)
[14] Fontagné and Freudenberg (1997)
[15] Greenaway and Milner (1987)

different techniques for each variety, with high-quality products requiring more capital-intensive production techniques. Vertical intra-industry trade can be explained theoretically in various ways as can horizontal intra-industry trade. A few of the theories and their country-specific hypotheses are discussed below.

2.2 Horizontal Intra-Industry Trade

Large numbers models are usually viewed as the dominant form of horizontal IIT and such models give a fairly consistent set of predictions. Although Eaton and Kierzkowski (1984) show that a small number case with horizontal differentiation is possible, this is the exception.[16] Large numbers cases of HIIT are associated with monopolistic competition. There are two types of product differentiation, which can cause monopolistic competition; while Dixit and Stiglitz (1977) offer a 'love of variety' approach, Lancaster (1979) introduces a 'most preferred variety' approach.[17]

The concept 'love of variety' implies that consumers gains utility from variety rather than from a certain variety. In other words, assuming Dixit-Stiglitz utility functions, all varieties enter an individual's utility function *symmetrically* and all individuals have the same utility function. Hence, each individual consumes all available varieties and gains utility from variety (i.e. from the number of varieties consumed) rather from the choice of a particular variety. Thus, there is an incentive for intra-industry trade, even between two economies identical in every respect. Neither country has a comparative advantage in any variety and yet there is a basis for mutually beneficial trade – namely the demand for variety. Krugman (1979, 1980, 1982) and Dixit and Norman (1980) offer alternative 'neo-Chamberlinian' models, which apply this fundamental work on demand for variety by Dixit and Stiglitz.[18]

As for the 'most preferred variety' approach, varieties enter the individual's utility function in an *asymmetrical* fashion, i.e. each individual has a most preferred variety and individuals purchase only one variety. Therefore, an aggregate demand for a range of varieties can emerge by assuming that individuals' tastes and preferences vary. This is the essence of the

[16] Greenaway, Hine and Milner (1995)
[17] Greenaway, Hine and Milner (1994)
[18] Greenaway and Milner (1987)

models that build upon the Lancastrian analysis of consumer behaviour. Examples of models are Lancaster (1979, 1980) and Helpman (1981).[19]

2.2.1 The CHOS Model

It is a fact that numerous models explain the existence of intra-industry trade whereas other models explain that of inter-industry trade. However, what is interesting from an empirical standpoint, is the interaction of IIT with non-IIT and the factors that explain the importance of each. One key contribution to this is the Helpman and Krugman model of 1985.[20] The core concept of the model is the "integrated equilibrium", where both inter- and intra-industry trade is generated. Inter-industry trade in the model is based on the traditional concept of comparative advantage. As for intra-industry trade, it is a result of monopolistic competition and internal increasing returns (economies of scale), which cause every firm in a certain industry to specialise in the production of a variety, that is not produced by any other firm. The intra-industry trade is of a horizontal nature, more precisely a neo-Chamberlinian type of horizontal product differentiation. This is why the Helpman-Krugman model is thought of as the Chamberlin-Heckscher-Ohlin-Samuelson (CHOS) model. The CHOS model generates several testable hypotheses based on the deterministic role of country-specific factors. These hypotheses are described below.

The CHOS model can be illustrated by taking a 2*2*2 structure. Of the two products, one is differentiated and produced using relatively capital-intensive techniques and the other is homogenous and produced using relatively labour-intensive techniques. Assuming that the home country is relatively capital-abundant and that the foreign country is relatively labour-abundant, it is shown that only the foreign country will export the homogeneous good, but both countries will export differentiated products.[21] The export of differentiated products (i.e. intra-industry trade) is due to among other things free entry, small economies of scale, and identical consumers across countries, which implies that each firm will be specialised in a variety that is not produced anywhere else and for which there is a demand in both countries.[22] The number of differentiated products exported (i.e. the extent of IIT) is determined by comparative advantages. That is, the smaller the difference in initital factor

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[19] Greenaway and Milner (1987)
[20] Fontagné and Freudenberg (1997)
[21] Greenaway, Hine and Milner (1994)
[22] Gullstrand (2002b)

endowments, the more important IIT (horizontal) will be in the bilateral trade. Human as well as physical capital can be proxies of factor endowments, which generates the following hypotheses:

HKD: A greater relative dissimilarity in relative human capital decreases HIIT.
FKD: A greater relative dissimilarity in relative physical capital decreases HIIT.

Per capita income is another measure of relative factorial endowments. In the CHOS model, differences in per capita income are interpreted as a supply side phenomenon, i.e. as differences in capital-labour endowments. As explained above, the differentiated good is assumed to be capital intensive in production. A higher average income per capita may reflect a higher average ratio of capital-to-labour (human plus physical capital) of the bilateral partners. Therefore, a higher per capita income indicates a greater production of capital intensive goods and hence a higher share of intra-industry trade:

PCIA: The greater the average per capita income of the two countries, the greater the share of HIIT in their bilateral trade.

If two countries have identical factor endowments, all trade will be intra-industry trade. Therefore, greater differences in per capita income imply greater differences in capital-labour endowments, which in turn imply more inter-industry trade and less IIT:

PCID: The greater the difference in per capita income, the lower the share of HIIT.

In large markets, many goods can be produced under conditions of economies of scale:

GDPA: The greater the average market size of the countries (in terms of total income), the greater the share of HIIT in their total trade.

Total income differences or market size differences narrow the scope of product diversity and intra-industry trade:

GDPD: The greater the difference in market size (in terms of total income), the lower the share of HIIT.

Not accounted for in this paper, the CHOS model implicitly also embodies a number of testable hypotheses about industry-specific influences on intra-industry trade.

Today, the bulk of the literature relative to intra-industry trade presumes that it is the model of monopolistic competition that leads to IIT, i.e. horizontal IIT. In fact, it is thanks to Helpman and Krugman and their CHOS model that this "new classical view" has emerged, which associates IIT with monopolistic competition and economies of scale and inter-industry trade with comparative advantage.[23] However, the new classical view can be questioned on the basis of a few considerations[24]:

a) Inter-industry trade can occur without comparative advantage as a result of external economies of scale, leading to mono-location of industries or agglomeration effects if factors are mobile internationally.
b) Intra-industry trade can occur without product differentiation since highly concentrated market structures lead to two-way flows of homogenous products.
c) The model of Ricardo.
d) Products are not only differentiated by secondary attributes (horizontally), but also differ by quality/price; this is the case of vertically differentiated products.

2.3 Vertical Intra-Industry Trade

As stated above, the workhorse of the "new trade theory" is the monopolistically competitive model, giving raise to intra-industry trade of a horizontal nature. This model is nevertheless challenged on the ground of IIT in vertically differentiated products. In contrast to horizontal intra-industry trade, the relationship between vertical IIT and market structure is not clearly defined. Large numbers models of VIIT are expounded by among others Falvey (1981) and Falvey and Kierzkowski (1987). In their models, there is no role for scale economies and therefore, there is a large number of firms in the market. On the contrary, in the Shaked and Sutton (1984) model, IIT is driven by scale economies, which are significant relative to the total market, the result being the emergence of a 'natural oligopoly'.[25]

[23] Fontagné and Freudenberg (1997)
[24] Fontagné and Freudenberg (1997)
[25] Greenaway, Hine and Milner (1995)

2.3.1 The Falvey and Kierzkowski model

In the Falvey (1981) and Falvey and Kierzkowski (1987) models, differential factor proportions and factor endowments play a deterministic role in the opening of trade.[26] In these models, the differentiable commodity is differentiated in terms of the amount of capital relative to labour required to produce it: higher quality requires a larger amount of capital. Using a 2*2*2 structure, Falvey (1981) demonstrates how vertical IIT and inter-industry trade can exist simultaneously. The higher income, relatively capital-abundant country specialises in and exports relatively high-quality products, whereas the lower income, relatively labour-abundant country specialises in low-quality products, all in a traditional HOS fashion. Falvey's model (1981) does not have an explicit demand side, but this is added in Falvey and Kierzkowski (1987). All consumers have the same preferences. However, each individual only demands one quality, which depends on individual income. Given that the aggregate income is not equally distributed, there is an aggregate demand for a variety of differentiated products, giving rise to vertical intra-industry trade. In contrast to the CHOS model, the share of IIT (vertical) in the bilateral trade between two countries will be greater, the greater the differences in relative factorial endowments. Again, taking human as well as physical capital as proxies of relative factor endowments, the following hypotheses are generated:

HKD: A greater relative dissimilarity in relative human capital increases VIIT.
FKD: A greater relative dissimilarity in relative physical capital increases VIIT.

Taking per capita income as a measure of relative factorial endowments, i.e. as a supply side phenomenon, the Falvey and Kierzkowski model predicts a *positive* relationship between VIIT and per capita income difference. However, what has not been mentioned so far, is that per capita income can also be seen from a demand side: the more similar the per capita income, the greater the extent of IIT (VIIT and HIIT), given that similarity in income implies a greater similarity in demand patterns (Linder, 1961). In other words, following Linder, there is a *negative* relationship between IIT (VIIT and HIIT) and per capita income difference. In this paper, VIIT is considered to be mainly explained by differences in relative human and physical endowments. Therefore, *against* the Falvey and Kierzkowski model, per capita

[26] Greenaway, Hine and Milner (1994)

income is interpreted according to Linder's theory and is expected to have a negative effect on VIIT:

PCID: The greater the difference in per capita income, the lower the share of VIIT.

According to Falvey and Kierzkowski (1987), the share of vertical IIT is positively correlated with the average market size of the two countries. This is assumed in most empirical studies. However, this positive relationship between average market size and VIIT is often explained in different ways in different studies. In fact, the theoretical foundation of this is rather unclear.[27] According to Gullstrand, an increased average market size can increase or decrease the share of VIIT in total trade, because both VIIT and total trade are affected by the increased market size. More specifically, "the effects of an increased average economic size on the share of vertical IIT in total trade depend on the growth rate in both economies".[28] Should both economies grow at the same rate, the effect of an increased average economic size on the share of IIT fails to appear.

GDPA: an increased average market size of the two countries (in terms of total income) has an ambiguous effect on the share of VIIT in their total trade.

Income distribution is a factor that is often used in models to explain vertical intra-industry trade and it originates from the Falvey and Kierzkowski model of 1987. Gullstrand looks closely into the role of income distrubution and per capita income as determinants of vertical intra-industry trade. Briefly, distribution of income within countries as well as between countries is important, becuase it affects the overlap in demand between two countries. For example, if per capita incomes of two countries are very dissimilar, the demand patterns are also dissimilar, which may cause overlap in demand to be negligible. Assuming that consumer income-level determines the quality-level demanded and that total income is unequally distributed within countries, intra-industry trade between two countries exists, given that consumers demand varieties of the partner country. In order for IIT to increase, South's income distribution must become more unequal and/or North's more equal; in this way, South's demand for high-quality varieties increases, whereas North's demand for low-quality varieties increases. In other words, an increased difference in the two countries' income

[27] Gullstrand (2002a)
[28] Gullstrand (2002a), p. 435

distribution will increase the share of VIIT, as long as it is South's income distribution that becomes more unequal and North's more equal. If income distribution is proxied by Gini coefficients, this can be expressed as: DGINI = $GINI^S$-$GINI^N$.[29] However, for simplicity, absolute differences are chosen in this study. Unfortunately, this means that an increased difference in the two countries' income distribution may be due to a more unequal income distribution in North or a more equal one in South. Absolute differences are nevertheless chosen.

GINID: a greater absolute difference between two countries' income distribution has an ambiguous effect on the share of VIIT in their total trade.

Summing up this chapter so far, it can be concluded that different countries (in terms of per capita income) should engage in IIT in vertically differentiated products, whereas similar ones should engage in IIT of varieties within similar qualities, i.e. horizontally differentiated.[30] If this is true remains to be seen in Chapter 4, where France's intra-industry trade with the world between 1990 and 1998 is investigated.

2.4 Back to traditional trade theories?

In one sense, Falvey and Kierzkowski (1987) explain IIT in a neo-HOS fashion. But there are models, which actually explain IIT without modifying traditional trade theoretic models. Davis (1993), Bhagwati & Davis (1994) and Davis (1995) show that IIT can occur in traditional trade models as a consequence of technical differences within industries.[31, 32] Their papers belong to the recent counter-revolution, in which a number of researchers have presented models, where IIT can be explained by comparative advantage: since it is possible to identify variations in factor intensities within 'industries', countries can have comparative advantages within 'industries' due to relative factor abundance. This then yields trade. The question is whether this trade should be defined as intra-industry trade or inter-industry trade. Teit Lüthje[33] discusses this. He goes as far as questioning the importance of intra-industry trade, maintaining that foreign trade is mostly inter-industry trade. He bases his opinion on

[29] Gullstrand (2002a)
[30] Fontagné and Freudenberg (1997)
[31] Greenaway and Torstensson (1997)
[32] Torstensson (1996)
[33] Lüthje (2001)

two considerations. First, Lüthje refers to a number of researchers, e.g. Davis (1995), Glass (1997), Copeland and Kotwal (1996), Murphy and Shleifer (1997), in whose models the explanation of intra-industry trade in vertically differentiated products can be ascribed to differences in the countries' factor endowments; a country specialises in the production of the quality varieties which are intensive as regards the resources in which the country is abundant. Therefore, according to Lüthje, the vertical intra-industry trade in these models is in fact not intra-industry trade, but inter-industry trade: "Hence, the trade can be ascribed to comparative advantages in the production of these varieties, and accordingly we use the Heckscher-Ohlin model's way of thinking."[34] In other words, if trade is ascribed to differences in the countries' factor endowments, the trade can be characterized as inter-industry trade. Intra-industry trade only occurs between countries with identical factor endowments. Trade in vertically differentiated products can only be chararcterised as intra-industry trade if it takes place between identical economies; an exceptionality. Secondly, by refering to Greenaway et al (1995: 1510), Lüthje comes to the conclusion that differentiated product categories mainly consist of qualitatively different varieties, i.e. vertically differentiated products. Therefore, since the main part of the differentiated product categories can be seen as vertically differentiated, and the part of the foreign trade in vertically differentiated products ascribed to differences in the countries factor endowments can be characterized as inter-industry trade, Lüthje concludes that IIT plays a minor role in international trade. "Hence we do not have much room left for the intra-industry trade theory!"[35]

Crucial in the above discussion is the concept 'industry'. What is an 'industry'? To be able to distinguish between inter-industry trade and intra-industry trade, the definition of an industry is determining. Unfortunately, there is no exact definition of what an industry is. At all events, we expect an industry to contain products that are similar, i.e. have similar factor content. The question is how similar products must be to belong to the same industry. Carrying matters to extremes and letting any factor intensity variation define an industry, all trade becomes trade between industries, inter-industry trade. This is because no products have exactly same factor contents. The problem will be further discussed in the next chapter, where also the formulas for measuring IIT and delimiting horizontally and vertically differentiated products from each other will be presented.

[34] Lüthje (2001), p. 22
[35] Lüthje (2001), p. 25

To conclude this chapter, it can be established that a great number of trade theories have been expounded since the discovery of intra-industry trade in the 1960's. They are all needed; international trade is complex and there is no general model, that can explain all trade. Lack of generality is a common characteristic of trade models. Thus, the model diversity is in one sense a source of strength, since it offers a rich choice to apply as appropriate to reality.[36] But it is also a source of weakness. "The lack of generality poses difficulties for the search for robust policy prescriptions or for unambiguous operational equivalents of theoretical constructs."[37] Moreover, as already pointed out, the range of theory available offers little further insight into the difficulties of defining and measuring 'industries'.

To sum up, the empirical evidence of IIT in the 1960's led to a search for a new trade theory. Since then, the theoretical base in understanding IIT has been considerably enlarged. Today it is the theory which is in search of an appropriate empirical methodology.

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[36] Greenaway and Milner (1987)
[37] Greenaway and Milner (1987), p. 29

3 Measuring Intra-Industry Trade

This chapter deals with the two formulas used to calculate France's TIIT, VIIT and HIIT. The first formula is the traditional Grubel and Lloyd (GL) measure of intra-industry trade. The second formula is used to separate total IIT into vertical and horizontal IIT. Criticism against both measures is also put forward.

3.1 The Grubel and Lloyd Index, Unadjusted for Trade Imbalance

In this paper, the traditional Grubel and Lloyd (GL) measure of IIT is the index employed. It is the most common formula for measuring intra-industry trade and it dates back to Grubel and Lloyd (1975). They define intra-industry trade between two countries in product category *I* in a year as total trade, (X_i+M_i), minus inter-industry trade, (X_i-M_i): $IIT_i = (X_i+M_i) - |X_i-M_i|$, where X_i and M_i are exports and imports of product *i*. Normalising by dividing by total trade yields:

$$IIT_i = \frac{(X_i + M_i) - |X_i - M_i|}{(X_i + M_i)} = 1 - \frac{|X_i - M_i|}{(X_i + M_i)} \qquad (3.1)$$

The index takes values between 0 and 1: if exports equal imports in an industry, all trade is intra-industry trade and $IIT_i=1$; if the exports or the imports equal zero, all trade is inter-industry trade and $IIT_i=0$. According to this index, intra-industry trade is the proportion of total trade accounted for by 'overlapping' exports and imports. Suppose exports equal 60 and imports equal 40. The IIT coefficient then stands at 0.8, representing the overlap of 80.

The index above applies to IIT in a specific industry *i*. To aggregate across industries, one has to take account of the industries' different weights. This is estimated by the ratios of each industry's exports plus imports to the total value of exports plus imports of the whole sample of industries considered. Once again, high share of intra-industry trade gives an IIT index close to 1. The weighted average is defined by the following formula:

$$IIT = IIT_1 * \frac{(X_1 + M_1)}{\sum_{i=1}^{n}(X_i + M_i)} + IIT_2 * \frac{(X_2 + M_2)}{\sum_{i=1}^{n}(X_i + M_i)} + \ldots = \qquad (3.2)$$

$$= 1 - \frac{\sum_{i=1}^{n}|X_i - M_i|}{\sum_{i=1}^{n}(X_i + M_i)}$$

3.2 Criticism of the Grubel and Lloyd Index

3.2.1 Trade Imbalance

A country's total commodity trade is undoubtedly in imbalance, because of the fact that exports and imports are not equal in every industry. The imbalance is calculated as: ∑|X-M|/∑(X+M). Establishing that ∑|X-M| does not equal zero, it is a fact that the share of IIT is affected unevitably in a downward direction, using the Grubel and Lloyd weighted average formula (formula 3.2). Trade can never be completely of an intra-industry nature, when the overall trade is imbalanced. Trade imbalance thus understates the extent of intra-industry trade. Grubel and Lloyd (1975) themselves observed this and proposed a correction: they adjust for the imbalance by expressing intra-industry trade as a proportion of total exports plus total imports less the trade imbalance. This correction for total imbalance was however criticized by Aquino in 1978, who was in turn criticized by Greenaway and Milner in 1981.[38] Balassa (1979 and 1986) and Bergstrand (1983) propose alternative methods.[39] According to Kol and Mennes, the case for adjusting the original GL index is weak both on economic and on statistical grounds.[40] This view is shared by Vona, who maintains that there should be no correction for overall trade imbalance.[41] Vona uses arithmetic examples to establish the superiority of Grubel and Lloyd's uncorrected index over corrected indices, which appear in the literature. Lüthje also comes to the conclusion that the unadjusted GL index is the preferred index, especially when analysing the pattern of trade in the short run.[42] He argues

[38] Greenaway and Milner (1981)
[39] Lüthje (2001)
[40] Kol and Mennes (1986)
[41] Vona (1991)
[42] Lüthje (2001)

that it is inappropriate to adjust for a trade imbalance in the short run, because the trade imbalance may be an expression of a specialisation. In other words, the disequilibrium may be a consequence of the country having a high degree of specialisation e.g. the country's export is concentrated on a few products or countries.

Thus, despite many attempts trying to come to terms with the problem of trade imbalance, there is no agreement on how an adjustment ought to be made and whether an adjustment should be made at all. All proposed modifications have their disadvantages and none of them is capable of eliminating the failure of the unadjusted GL index to precisely reveal the level of intra-industry trade. The original Grubel and Lloyd index of IIT seems to be the best one available at present. Hence, unadjusted GL indices will be reported in this paper.

3.2.2 Aggregatation Problems

3.2.2.1 Industrial Bias

Measuring intra-industry trade using the Grubel and Lloyd measure of IIT, different aggregation problems appear. There is one industrial perspective of the problem and one geographical. Starting with the industrial dimension of the aggregation problem, it concerns the choice of the level of aggregation, i.e. the definition of an industry. In this study, the calculations are based on the classification of the Standard International Trade Classification (SITC). This classification is constituted by ten industry groups at the one-digit level. Each of the ten industries then contains products or industries at the two-digit level, which contains products at the three-digit level and so on. The final industry classification is at the six-digit level. Grubel and Lloyd found in their empirical analyses that a lower level of aggregation determines a smaller estimate of the share of intra-industry trade. This implies that the more products are lumped together into a single 'industry', the more trade becomes of an intra-industry nature; IIT becomes upward-biased. Consequently, the aggregation problem will be minimised when applying a very narrow industry definition by resorting to highly disaggregated trade data, like the six-digit level for example. However, if we consider trade flows at a very low level of aggregation, new aggregation problems may arise, so that the IIT index becomes downward-biased.[43] When it all comes down to it, what we really want is to group similar products with similar factor content, to be able to make a fair calculation of the

[43] Gullstrand (2002b)

share of intra-industry trade. Logically, the variation of factor content diminishes within industries as the aggregation level falls. If we regard any factor intensity variation as defining an industry, then each product would be an industry on its own, considering the fact that no products have exactly the same factor content. In that case, all trade would become trade between industries, inter-industry trade. Thus, on the one hand we do not want to aggregate final products with very diverse factor content; then the share of IIT will be overestimated. On the other hand, we should not use too refined product groups either. Once again, a reasonable level of aggregation, which group similar products with similar factor content, should be applied. The five-digit level of SITC seems fair and will be used to calculate the IIT indices in this paper.

3.2.2.2 Geographical Bias

Figure 3.1 is used to illustrate the geographical dimension of the aggregation problem. The industrialised country A is trading with three developing countries U and three industrialised countries I for two products, x and y. Measured on a product level, we have intra-industry trade in both product x and product y. Using a lower level of aggregation, splitting total trade into trade with the developing countries and trade with the industrialised countries, we only have IIT with the industrialised countries, whereas the trade with the developing countries is of a pure inter-industry nature. If we further split the total trade with the industrialised countries into trade with each of the three industrialised countries, we only have IIT in product y with country I_3 and in product x with country I_1 och I_2. The example shows that intra-industry trade by a bilateral estimation is smaller than by a multilateral estimation. Thus, to minimise the biases due to geographical aggregation, multilateral trade flows should be avoided in favour of bilateral trade flows.

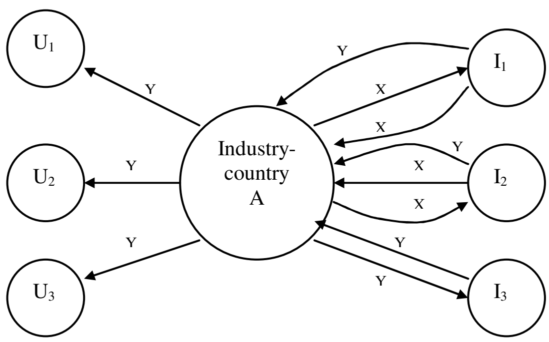

Figure 3.1. An Example of Intra-Industry Trade Flows. Source: Lüthje (2001)

3.2.3 Omission of the value of the IIT and the number of IIT products traded

The Grubel and Lloyd weighted average formula (formula 3.2) suffers from one more shortcoming, in that it ignores the actual value of IIT and also the number of industries in which IIT appears. The problem arises when comparing countries of unequal economic size. This is expounded by Nilsson.[44] The GL index of IIT opens up for the possibility of a small country, that has intra-industry trade in only a few industries and for a trifling amount of money, getting a higher IIT index than a large country, that has IIT in hundreds of industries worth billions of dollars. Suppose country X is trading with country Y and that there is intra-industry trade in only one industry, industry q. The IIT index may still be high, if the exports and imports of industry q constitutes a great *share* of the total exports and imports between country X and Y. At the same time, country X may have IIT in hundreds of industries and for billions of dollars with country Z, and still get an IIT index that is lower than that with country Y. Thus, the Grubel and Lloyd weighted average formula does not take into consideration the *value ($)* of the intra-industry trade; the GL index may be low, even though the actual value of intra-industry trade is high and vice versa. Nor is the *number of industries* in which IIT exists considered. Instead, the *share* of intra-industry trade in total trade is measured using the GL index of intra-industry trade.

3.3 Measuring Horizontal and Vertical Intra-Industry Trade

Even within industries at the five-digit level, products differ by quality. To disentangle horizontal and vertical IIT, total IIT flows will be divided into horizontal and vertical parts. This will be done by using unit value indices, which measure the average price of a bundle of items. Unit values are used as an indicator of quality, because it is assumed that relative prices reflect relative quality. "The rationale for using unit values as an indicator of quality is that, assuming perfect information, a variety sold at a higher price must be of a higher quality than a variety sold more cheaply. Even with imperfect competition, prices reflect quality (Stiglitz, 1987)."[45] In other words, differences in prices (unit values) reflect quality differences. Products whose unit values are close in a given year are considered to be similar (horizontal). Relative large differences are taken as an expression of vertical product differentiation. Unit values can be calculated in several ways, e.g. per tonne (UV=price/tonne), per square metre (UV=price/square metre) or per item (UV=price/item). Unfortunately, whatever denominator

[44] Nilsson (1999)
[45] Greenaway, Hine and Milner (1994)

chosen, there are problems connected to it. In this study, unit values will be calculated per tonne, because this is the quantity unit in the OECD trade statistics. Using unit values per tonne, problems arise. For example, if quality is reflected in material weight, so that a higher-quality product is assumed to weigh more than an inferior-quality product, it is possible that a higher-quality product (in the sense, say, of durability) gets a UV lower than an inferior-quality product.[46]

Formula 3.3 is employed to distinguish between horizontally and vertically differentiated products. Using unit values to separate horizontal and vertical IIT from each other has been done in several empirical analyses.

$$1-\alpha \leq \frac{UV^{X}_{ki}}{UV^{M}_{ki}} \leq 1+\alpha \qquad \boxed{3.3}$$

UV in formula 3.3 stands for unit value, superscripts *X* and *M* refer to exports and imports of product *I* between the country pair *k* and finally *α* is a dispersion factor: a spread of more than *α* is used to identify vertical IIT. For example, a threshold of 15% implies that traded products are considered to be vertically differentiated if the export and import unit values differ by more than this; if less than 15%, the products are considered to be horizontally differentiated. In this paper, HIIT and VIIT will be calculated using α=5%, α=15%, α=25% and α=35%. Logically, we would expect vertical IIT to decrease and horizontal IIT to increase, when we increase the price wedge.

Finally, some criticism against the method can be levelled. Gerstner (1985), Curry and Riesz (1988) and Chang and Wildt (1996) show empirically that the relationship between price and quality is not strong.[47] From their empirical analyses it can be concluded that price differences are only a rough indicator for quality differences. Thus, the above method is unprecise.

Moreover, as for the dispersion factor *α,* it is arbitrary. Where do we have to set the limit? In the extreme case, where we do not set any limit, almost all products can be characterized as vertically differentiated. On the whole, it is odd to have to set a limit for how big the

[46] Greenaway, Hine and Milner (1994)
[47] Lüthje (2001)

difference in the unit values has to be to reflect a quality difference. It shows that theory and practice are not compatible. [48]

The method is further problematic in that it is affected by the aggregation level, which is pointed out by Gullstrand.[49] For example, suppose an industry *I* is characterized as horizontally (vertically) differentiated, calculating unit values at the three-digit level. Calculating unit values at the four-digit level may, however, define all sub-industries to industry *I* as vertically (horizontally) differentiated. Given this, a country's IIT at a certain aggregation level may be characterized as horizontal (vertical), even though all two-way flows within sub-industries are defined as vertical (horizontal). In order to minimize this problem, when separating total IIT into a vertical and a horizontal part, highly disaggregated data shoud be used. As already mentioned, this paper uses the five-digit level of SITC.

[48] Lüthje (2001)
[49] Gullstrand (2002b)

4 France's Vertical and Horizontal IIT with the World in 1990-1998

Chapter 4 is an outline of France's total, vertical and horizontal intra-industry trade in 1990 to 1998. The results of Chapter 4 are discussed in Chapter 6 and comparisons with other studies will also be made in Chapter 6.

4.1 Methods

- The calculations are based on OECD trade statistics, 1990-1998.
- The level of aggregation is the five-digit level, adopting SITC.
- Only IIT indices for manufactures are calculated (SITC group 5 to 8), since most intra-industry trade takes place within these industries.
- The formula used to calculate total IIT is the Grubel and Lloyd (1975) measure of intra-industry trade unadjusted for trade imbalance (see formula 3.2)
- To identify vertical IIT and horizontal IIT, the method developed by Abd-el-Rahman (1991) is employed (see formula 3.3). VIIT and HIIT are calculated using four ranges: ±5%, ±15%, ±25%, ±35%. Unit values are calculated 'per tonne'.
- Cleansing of the data: excluded from the calculation of unit values are any trade flows for individual products less than $50 00. Moreover, when the sum of the values of such excluded trade for any country any year 1990-1998 amounts to more than ten per cent of that country's total value of exports and imports, the country is excluded from the sample used that year. Finally, a number of products are removed from the data because of problems in recording quantity, classification or the withholding of information, for example works of art and jewellery.[50]

A first examination of the trade data revealed that France had some kind of intra-industry trade with 102 countries between 1990 and 1998. Further calculations on these 102 countries were carried out. France's IIT, VIIT and HIIT with each of the 102 countries in each year 1990-1998 was calculated. VIIT and HIIT was calculated with each country in each year using all four ranges (±5%, ±15%, ±25%, ±35%). Also, the number of vertically and

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[50] Greenaway, Hine and Milner (1994)

horizontally differentiated products was calculated for each country in each year according to each range. Vertically differentiated products were additionally defined as either 'high-quality' vertical IIT or 'low-quality' vertical IIT.

The calculations showed that France had some kind of intra-industry trade in *each year* 1990 to 1998 with only 61 of the 102 countries. In accordance with this, the results presented in this chapter are only of the 61 countries. The results of the other 41 countries are not commented on in this chapter, but they are presented in two tables in the Appendix (see Table 4.1.1 and 4.1.2, p. 59-61).

4.2 France's IIT, VIIT and HIIT with the World in the 1990's

4.2.1 The Evolution of France's Total, Vertical and Horizontal Intra-Industry Trade with the EU, the OECD and 61 Countries, 1990-1998

Table 4.2.1 below presents France's vertical, horizontal and total intra-industry trade with three different groups of countries: the EU, the OECD and 61 countries. The GL index of IIT (formula 3.2) has been employed for each of the three groups separately and a range of α ±0,15 was chosen to divide total IIT into vertical IIT and horizontal IIT (formula 3.3). Table 4.2.1 is also presented as a graph in the Appendix (see Graph 4.2.1, p.62).

Studying Table 4.2.1 or Graph 4.2.1, it is evident that France's vertical IIT is much more important than its horizontal IIT in all three groups of countries. The GL levels of VIIT are about 0,4, whereas the HIIT-levels only reach about 0,1. Another observation is that France has most VIIT, HIIT and TIIT with the EU and least with the 61 countries, whereas the OECD holds a middle place.

The evolution of the IIT levels is best studied in Graph 4.2.1. To begin with the share of total intra-industry trade, TIIT, it is clear that it is increasing somewhat in the period with all three groups of countries. In 1990, all levels of total IIT are below 0,5 but until 1998, they have all risen above 0,5.

When it comes to the share of VIIT, there is a general increase between 1990 and 1996 with the EU, the OECD and the 61 countries. 1996 is the year when France's vertical intra-industry peaks; VIIT-levels with all three groups of countries are at a maximum this year. The levels then decrease somewhat.

Finally, studying France's horizontal IIT, there is a general decrease in France's horizontal intra-industry trade with all three groups of countries between 1990 and 1996. 1996 is the year when France's horizontal intra-industry is at a minimum with the EU, the OECD and with the 61 countries. After 1996, the levels of HIIT increase slightly and in 1998, they are back at about the same levels as in 1990.

Table 4.2.1 – France's VIIT, HIIT and TIIT with the EU, the OECD and 61 countries[1]

		1990	1991	1992	1993	1994	1995	1996	1997	1998
61 Countries[2]	**VIIT**	0,378	0,395	0,395	0,425	0,404	0,422	0,426	0,424	0,418
	HIIT	0,094	0,09	0,097	0,07	0,087	0,073	0,071	0,075	0,09
	TIIT	0,472	0,485	0,493	0,495	0,49	0,495	0,497	0,499	0,508
OECD[3]	**VIIT**	0,382	0,399	0,4	0,433	0,41	0,43	0,435	0,433	0,426
	HIIT	0,097	0,093	0,101	0,072	0,091	0,076	0,074	0,08	0,096
	TIIT	0,479	0,492	0,501	0,505	0,501	0,506	0,509	0,513	0,522
EU[4]	**VIIT**	0,389	0,415	0,408	0,431	0,417	0,437	0,447	0,442	0,425
	HIIT	0,105	0,096	0,105	0,085	0,098	0,088	0,084	0,091	0,115
	TIIT	0,493	0,511	0,513	0,515	0,515	0,525	0,531	0,533	0,54

1) α: ±0,15
2) The 61 countries are presented in Appendice e.g. Table 4.2.2.
3) Of the 30 OECD countries of today, the Czech Republic, the Slovak Republic and Iceland are not included in the calculations for different reasons. Hungary, Korea and Poland entered the OECD in 1996, but they are included in the calculations for the whole period, 1990-1998.
4) Austria, Sweden and Finland entered the EU in 1995, but they are included in the calculations for the whole period, 1990-1998.

4.2.2 France's Intra-Industry Trade

Table 4.2.2 (p. 63) presents France's total IIT, without distinguishing between VIIT and HIIT, with 61 countries in 1990 to 1998. The countries are ordered in accordance with their average level of total intra-industry trade between 1990 and 1998.

Surprisingly, after Germany, Malta is the country with which France has the greatest average level of intra-industry trade in the period. However, Malta has considerable fluctuations in its intra-industry trade; the IIT levels vary between 0,318 and 0,770 between 1990 and 1998. Likewise, New Zealand, Chile and Gabon, situated high up in Table 4.2.2, have great variations in their IIT levels. Chile's levels of intra-industry trade fluctuate between 0,004 and 0,762 and Gabon's between 0,058 and 0,861. Besides these countries, most top countries, like Germany and the UK, have IIT levels that are quite stable in the period. Examples of other countries with high and stable IIT-levels in the period are Benelux, the U.S., Spain, Romania, the Netherlands and Switzerland.

4.2.3 Countries with Highest and Lowest IIT in 1990 and in 1998

Table 4.2.3 below is made up of information gathered from Table 4.2.2. Accordingly, no distinction is made between vertical and horizontal IIT. Instead, total IIT is in focus and only the years 1990 and 1998.

Comparing the countries with the highest levels of IIT in 1990 with the countries with the highest levels of IIT in 1998, there are great similarities to be found; the tables have five countries in common. That is, Malta, Germany, the UK, the U.S. and New Zealand are part of the top ten list in both years. Chile, Côte d'Ivoire, Gabon, Bulgaria and Romania, that are included in the top ten list of 1990, have been replaced in 1998 by Singapore, Malaysia, Benelux, Spain, and the Netherlands. Comparing the countries with the lowest levels of IIT in 1990 with the countries with the lowest levels of IIT in 1998, they are quite different; the tables have only two countries in common, Senegal and Venezuela. Interestingly, Gabon and Côte d'Ivoire are part of the top ten list of 1990, but are two countries that France has the lowest levels of IIT with in 1998. Likewise, Malaysia is part of the top ten list in 1998, but in 1990 Malaysia is one of the countries with lowest IIT.

Table 4.2.3 - Countries with Highest and Lowest IIT in 1990 and in 1998

Countries with highest IIT in 1990	GL index	Countries with highest IIT in 1998	GL index
Malta	0,770	Malta	0,715
Chile	0,747	Germ	0,629
Ivo	0,735	UK	0,558
Gabon	0,663	B-Lux	0,551
Bulg	0,593	Malay	0,549
Germ	0,580	USA	0,532
Rom	0,570	Spa	0,529
New Z	0,549	Sing	0,517
UK	0,526	Neth	0,512
USA	0,467	New Z	0,481
Countries with lowest IIT in 1990	**GL index**	**Countries with lowest IIT in 1998**	**GL index**
Saudi	0,035	Alger	0,049
Sen	0,039	Gabon	0,072
Venez	0,092	Sen	0,092
Malay	0,105	Ivo	0,100
Mauri	0,115	Venez	0,101
Turk	0,128	Pak	0,101
Indo	0,159	Vietnam	0,102
Thai	0,160	Egypt	0,116
China	0,167	Sri	0,118
Kor	0,181	Iran	0,121

4.2.4 France's Vertical and Horizontal Intra-Industry Trade

Total intra-industry trade, reported in Table 4.2.2 (p. 63) and 4.2.3 (p. 30), is the sum of vertical and horizontal IIT. Table 4.2.4 (p. 64) reports each country's level of VIIT and HIIT in every year 1990 to 1998. A range of ±0,15 has been chosen to define VIIT and HIIT. The countries are ordered according to their average level of total IIT in the period.

Table 4.2.4 shows that countries with high HIIT-levels always have high levels of VIIT too, for example Germany, the UK, Benelux, the U.S. and Spain. However, the opposite is not true i.e. countries with high VIIT-levels do not necessarily have high HIIT-levels. Examples are Malta, New Zealand, Chile and Singapore. The last row in Table 4.2.4, "Average V/H", is France's average vertical and horizontal IIT with the 61 countries in each year 1990 to 1998. In line with Table 4.2.1, it shows that the major part of France's intra-industry trade with the world is vertical intra-industry trade. Moreover, studying each country's average level of VIIT and average level of HIIT in the period, it is revealed that all countries in fact have more VIIT than HIIT.

4.2.5 Countries with Most and Least VIIT and HIIT

Table 4.2.5 below is put together from Table 4.2.4 and it focuses on the countries with which France has the highest and the lowest levels of VIIT and HIIT in 1990, in 1998 and on average. Accordingly, Table 4.2.5 is composed of four main headings (Highest HIIT, Highest VIIT, Lowest HIIT and Lowest VIIT), and each of these contains three tables: average, 1990 and 1998. Hence, numerous comparisons can be made. However, only a few remarks are pointed out here.

Studying the 'Highest-HIIT-table', it can be concluded that in general, France has most horizontal IIT with the industrialized countries, located in Europe (with the exception of the U.S., Canada and Hong Kong). When it comes to the 'Highest-VIIT-table', there is a greater variation in countries. Generally, the countries with which France has its highest levels of vertical intra-industry trade are not as developed as those with the highest HIIT levels. Moreover, the countries are far away, not located in Europe in general.

Examining the 'Lowest-HIIT-' and the 'Lowest-VIIT-tables', it is mainly a question of less developed countries far away. Exceptions are to be found, like Japan and Finland.

Finally, comparing the countries with the highest average level of HIIT, with the countries with the highest average level of VIIT, it is only two countries that are common (Germany and the UK). A better similarity is reached when comparing the countries with the lowest average level of HIIT with the countries with the lowest average level of VIIT; five countries are common (Iran, Algeria, China, United Arab Emirates and Saudi Arabia).

Table 4.2.5 - Countries with Highest and Lowest VIIT and HIIT in 1990 and in 1998 and Their Average VIIT/HIIT Levels 1990-1998[1]

Highest HIIT: 1990, 1998 and average 1990-98						Highest VIIT: 1990, 1998 and average 1990-98					
Highest average HIIT 1990-98	**GL index**	**Highest HIIT 1990**	**GL index**	**Highest HIIT 1998**	**GL index**	**Highest average VIIT 1990-98**	**GL index**	**Highest VIIT 1990**	**GL index**	**Highest VIIT 1998**	**GL index**
Germ	0,220	Rom	0,361	Germ	0,265	Malta	0,609	Malta	0,768	Malta	0,715
B-Lux	0,163	Germ	0,232	And	0,176	New Z	0,501	Chile	0,747	Malay	0,526
UK	0,153	Bulg	0,219	B-Lux	0,169	Chile	0,479	Ivo	0,735	Sing	0,509
Spa	0,135	B-Lux	0,180	Ita	0,138	Gabon	0,457	Gabon	0,663	USA	0,478
Rom	0,135	Neth	0,163	UK	0,133	Malay	0,409	New Z	0,549	New Z	0,462
Neth	0,131	UK	0,153	Neth	0,121	Sing	0,405	Ind	0,403	Spa	0,428
Ita	0,126	Ita	0,145	HK China	0,118	Phi	0,403	Phi	0,393	UK	0,425
USA	0,115	Aus	0,133	Canada	0,114	Germ	0,398	Swi	0,381	Chile	0,408
And	0,112	Spa	0,126	Spa	0,101	UK	0,398	Bulg	0,375	Rom	0,392
Aut	0,099	Port	0,109	Aut	0,098	Sri	0,393	UK	0,374	Neth	0,391
Lowest HIIT: 1990, 1998 and average 1990-98						**Lowest VIIT: 1990, 1998 and average 1990-98**					
Lowest average HIIT 1990-98	**GL index**	**Lowest HIIT 1990**	**GL index**	**Lowest HIIT 1998**	**GL index**	**Lowest average VIIT 1990-98**	**GL index**	**Lowest VIIT 1990**	**GL index**	**Lowest VIIT 1998**	**GL index**
Iran	0,000	New Z	0	Iran	0,000	Sen	0,068	Sen	0,019	Alger	0,041
Sri	0,002	Chile	0	Venez	0,000	Iran	0,095	Venez	0,019	Sen	0,042
Malta	0,002	Gabon	0	Chile	0,000	Saudi	0,092	Saudi	0,033	Gabon	0,056
Chile	0,004	Sri	0	Malta	0,000	Alger	0,109	Malay	0,080	Pak	0,067
Alger	0,007	Vietnam	0	Egypt	0,003	Arg	0,143	Mauri	0,107	Ivo	0,073
Gabon	0,007	Fr Poly	0	Vietnam	0,004	Mauri	0,150	Turk	0,116	Arg	0,090
China	0,008	Col	0	UnArEm	0,005	China	0,164	Indo	0,155	Vietnam	0,098
UnArEm	0,010	Ivo	0	Ir	0,007	Turk	0,176	Thai	0,158	Venez	0,101
ChinTapei	0,010	UnArEm	0	Thai	0,007	Fin	0,185	Japan	0,164	Sri	0,103
Saudi	0,013	Alger	0	Safr	0,007	UnArEm	0,189	Kor	0,165	And	0,111
		Iran	0								

1) α: ±0,15

4.2.6 Distribution of Countries

Table 4.2.6 below uses four ranges (±5%, ±15%, ±25% and ±35%) to define VIIT and HIIT between France and the 61 countries. Only results for 1998 are included in the table.

Table 4.2.6 shows that even with the widest range examined, a large amount of VIIT is still observed. Defining horizontally differentiated products as having export unit values of 0.65 to 1.35 of import unit values, 97 per cent of the sample of 61 countries have vertical IIT of over 0,05 compared to only 66 per cent for horizontal IIT.

Table 4.2.6 should look like a triangle, considering that the VIIT side of the table should be ascending and the HIIT side should be descending. This is not the case (even though it is close), which is apparently because of the VIIT side of the table.

Table 4.2.6 - Distribution of Countries According to the Level of Vertical and Horizontal IIT with France 1998

Grubel-Lloyd	Vertical IIT 1998				All IIT	Horizontal IIT 1998			
index	α: ±0,35	α: ±0,25	α: ±0,15	α: ±0,05	1998	α: ±0,35	α: ±0,25	α: ±0,15	α: ±0,05
>0,54	1	1	1	1	5				
0,50-0,54	1	1	2	5	4				
0,45-0,49		1	2	4	3				
0,40-0,44	1		3	5	3	1			
0,35-0,39	4	5	8	5	8		1		
0,30-0,34	4	6	5	9	7	2	1		
0,25-0,29	5	10	17	11	11	3	1	1	
0,20-0,24	15	13	4	4	4	3	4		
0,15-0,19	10	8	5	5	5	7	5	2	
0,10-0,14	11	8	8	8	8	9	8	7	1
0,05-0,09	7	6	4	3	3	15	17	11	5
0,01-0,04	2	2	2	1		20	22	34	29
0-0,009						1	2	6	26
Tot no of countries	61	61	61	61	61	61	61	61	61

4.2.7 The Number of Vertically and Horizontally Differentiated Products

So far, GL indices have been reported to illustrate France's intra-industry trade. Another way to do this is to count the actual number of IIT products. This will be done for the rest of the chapter. The 61 countries in Table 4.2.7 (p. 65) are put in accordance with their average number of IIT products in 1990 to 1998. α is set to ±0,15 to disentangle vertical and horizontal IIT.

Studying the two bottom rows in Table 4.2.7 (total and average number of VIIT and HIIT products), it is evident that the number of vertically differentiated products by far exceeds the number of horizontally differentiated products. In 1998, 17989 products are vertically differentiated and only 3443 are horizontally differentiated. This was also clear from Table

4.2.1 (p. 29) and Table 4.2.4 (p. 64), where the share of VIIT was much more important than the share of HIIT.

There is a visible increase in the number of total VIIT products between 1990 and 1998; France has about 2000 VIIT products more in 1998 than in 1990. This is in accordance with Table 4.2.1, where the GL level of VIIT with the 61 countries was increasing in the period.

The evolution of the total number of HIIT products is also similar to that of Table 4.2.1. There is a drop in 1993, but after that, there is a general increase in the number of HIIT products for the rest of the period. By 1998, the number of HIIT products is almost back on the same level as in 1990-1991.

Studying the top countries of the table, they are all located in Europe except for Japan and the U.S. Germany dominates clearly and has almost 100 IIT products more on average every year than Italy, the second country. Benelux, the UK, Spain and the Netherlands come next. This shows that France has the greatest number of IIT products with Europe.

Interesting observations appear when comparing the results from Table 4.2.7 with Table 4.2.2 (p. 63), 4.2.3 (p. 30), 4.2.4 (p. 64) and 4.2.5 (p. 32). It is obvious that the countries with which France has most IIT, are different countries depending on which measurement method is chosen; the *level* of IIT according to the GL indice (Table 4.2.2, 4.2.3, 4.2.4 and 4.2.5) or the *number* of IIT products (Table 4.2.7). Malta is an example that clearly illustrates this. Malta has the second highest average level of IIT between 1990 and 1998 (see Table 4.2.2), and the highest average level of VIIT of all countries between 1990 and 1998 (see Table 4.2.5). However, Table 4.2.7 reveals that Malta on average only has seven IIT products with France per year, 1990-1998. This problem was discussed section 3.2.3. The GL index measures the share of IIT in total trade between two countries and does not reflect the actual value of IIT or the number of IIT products traded. In other words, the GL index of intra-industry trade between two countries may be high, even though there is intra-industry trade in only a few products. The GL index is thus somewhat deceptive, when comparing intra-industry trade between different countries.

Finally, Table 4.2.7 reveals that Sweden is actually the eleventh country in the world, when it comes to the number of IIT products traded with France. Sweden has IIT in more products with France than the other Nordic countries. However, assuming the GL level of IIT (Table 4.2.2), Sweden only holds a 22nd position, while Denmark the twentieth. In other words, Denmark has a greater share of IIT in its total trade with France, while Sweden has a greater actual number of IIT products with France.

4.2.8 Countries with Most and Least HIIT and VIIT Products in 1990 and in 1998

Table 4.2.8 below is based on information from Table 4.2.7. The table focuses on the countries with which France has the most and the least number of VIIT and HIIT products in 1990 and in 1998.

A first observation is that the countries with which France has the greatest number of VIIT products, the greatest number of HIIT products, the least number of VIIT products and the least number of HIIT products, are almost the same countries in 1998 as in 1990.

Another observation is that the countries with which France has the greatest number of VIIT products, are more or less the same countries with which France has the greatest number of HIIT products. In the same way, the countries with the least number of VIIT products, are generally also the countries with the least number of HIIT products. This is in contrast to Table 4.2.5 (p. 32) where the differences were important; the countries with which France had the highest levels of VIIT were not the countries with which France had the highest levels of HIIT, and the countries with the lowest levels of VIIT were not the countries with the lowest levels of HIIT.

Continuing the comparison with Table 4.2.5, an interesting observation is that the countries with which France has the greatest number of VIIT and HIIT products (which are thus about the same countries), are principally the countries with the highest *level* of HIIT, for example Germany, the UK, Italy, the Netherlands and Spain. However, countries like Malta, New Zealand, Malaysia, Chile, Gabon and the Philippines, which are part of the top ten list of countries with the highest level of VIIT (Table 4.2.5), are not on the top ten list of countries with the greatest number of VIIT or HIIT products (Table 4.2.8). Quite the opposite in fact. From Table 4.2.7, it is clear that these countries do not exchange many IIT products with France. Gabon, for example, is the country with which France has the least number of IIT products; only one IIT product on average per year between 1990 and 1998. Yet, in Table 4.2.5, Gabon is part of the top ten list of countries with the highest level of VIIT. Again, this has to do with the fact that the GL index measures the share of IIT in total trade and ignores the number of IIT products traded.

Finally, studying the percentage numbers in Table 4.2.8, it is clear that products that are vertically differentiated increase their share in the total number of IIT products in the period, whereas the share of horizontally differentiated products decrease. One example is Germany, where HIIT products represent 25% of all IIT products in 1990, but 22% in 1998. Vertically differentiated products on the other hand, correspond to 75% of all IIT products in 1990, but 78% in 1998.

Table 4.2.8 - Countries with Most and Least HIIT and VIIT Products in 1990 and in 1998[1]

Countries with most HIIT products 1990 and 1998						Countries with most VIIT products 1990 and 1998					
Most HIIT prod 1990	No of HIIT prod	% HIIT prod of total	Most HIIT prod 1998	No of HIIT prod	% HIIT prod of total	Most VIIT prod 1990	No of VIIT prod	% VIIT prod of total	Most VIIT prod 1998	No of VIIT prod	% VIIT prod of total
Germ	490	25%	Germ	401	22%	Germ	1453	75%	Germ	1422	78%
B-Lux	390	24%	Ita	302	18%	Ita	1410	80%	Ita	1343	82%
Ita	359	20%	B-Lux	368	22%	UK	1328	80%	B-Lux	1296	78%
UK	323	20%	UK	305	19%	B-Lux	1230	76%	UK	1272	81%
Neth	295	23%	Spa	271	18%	Spa	1102	80%	Spa	1202	82%
Spa	269	20%	Neth	248	19%	USA	1083	86%	Neth	1068	81%
Swi	196	16%	USA	182	14%	Neth	1007	77%	USA	1147	86%
USA	176	14%	Swi	176	16%	Swi	1001	84%	Swi	945	84%
Aut	125	18%	Aut	124	18%	Japan	635	89%	Japan	650	90%
Swe	113	16%	Port	108	18%	Swe	588	84%	Swe	587	85%

Countries with least HIIT products 1990 and 1998						Countries with least VIIT products 1990 and 1998					
Least HIIT prod 1990	No of HIIT prod	% HIIT prod of total	Least HIIT prod 1998	No of HIIT prod	% HIIT prod of total	Least VIIT prod 1990	No of VIIT prod	% VIIT prod of total	Least VIIT prod 1998	No of VIIT prod	% VIIT prod of total
Gabon	0	0%	Venez	0	0%	Gabon	1	100%	Gabon	2	67%
Sri	0	0%	Iran	0	0%	Sri	1	100%	Sri	4	80%
Fr Poly	0	0%	Chile	0	0%	Fr Poly	2	100%	Sen	4	80%
Chile	0	0%	Malta	0	0%	Iran	2	100%	Venez	5	100%
Iran	0	0%	Gabon	1	33%	Vietnam	2	100%	Fr Poly	6	86%
Ivo	0	0%	Sri	1	20%	Venez	3	75%	Chile	7	100%
Col	0	0%	Sen	1	20%	Chile	3	100%	Alger	7	88%
Vietnam	0	0%	Alger	1	13%	Ivo	3	100%	Pak	7	78%
Alger	0	0%	Fr Poly	1	14%	Sen	4	80%	Col	9	82%
New Z	0	0%	New Z	1	3%	Pak	6	86%	Iran	11	100%
UnArEm	0	0%									

1) α: ±0,15

4.2.9 Distribution of VIIT and HIIT Products

Table 4.2.9 (p. 66) uses the same four ranges as Table 4.2.6 (α ±0,05, α ±0,15, α ±0,25 and α ±0,35) to define France's VIIT and HIIT with 61 countries. Only results for 1998 are included in Table 4.2.9. The countries are ordered in accordance with their total number of IIT products with France in 1998.

It is clear that when enlarging the definition of horizontal IIT from ±5% to ±35%, the number of horizontally differentiated products increases, while the number of vertically differentiated products decreases correspondingly, as expected. However, even with the widest definition of HIIT (export unit values of 0.65 to 1.35 of import unit values), VIIT clearly dominates; two thirds of all IIT products are still vertically differentiated.

The greatest share of HIIT, that can be observed in Table 4.2.9, is 60 per cent, which belongs to Sri Lanka using the ranges ±25% and ±35%. However, Sri Lanka only has a total of five IIT products with France. Germany and Benelux come second, after Sri Lanka. They both have IIT products that are 46 per cent horizontally differentiated, when HIIT is defined using a range of ±35%. In fact, Germany and Benelux happen to be the two countries with which France has the greatest number of IIT products in 1998. France has 1823 IIT products with Germany and 1664 products with Benelux. Finally, it is noted that Sweden is the tenth country in the table. France has 688 IIT products with Sweden in 1998. However, only 26 per cent of these products are horizontally differentiated using a range of ±35% and 4 per cent using a range of ±5%.

4.2.10 High-quality VIIT versus Low-quality VIIT

Table 4.2.10 (p. 67) focuses on France's vertical intra-industry trade in 1998 with the 61 countries. α is set to ±0,15 to define vertical intra-industry trade. Moreover, VIIT is divided into high-quality VIIT and low-quality VIIT. Products for which the unit value is >1,05 (1,15/1,25/1,35) that of imports are defined as high quality (V1 in Table 4.2.10). Where the unit value of exports is <0,95 (0,85/0,75/0,65) that of imports, the quality is regarded as low (V2 in Table 4.2.10).

From the bottom rows of Table 4.2.10 (total number of VIIT products and % of VIIT in TIIT), it is evident that the number of VIIT products decreases as the definition of HIIT enlarges, as expected. This has already been showed in Table 4.2.8 and 4.2.9. It it is also clear that V1 (high quality) is always greater than V2 (low quality). Moreover, the percentage of high quality VIIT products increases whereas the percentage of low quality VIIT products decreases, when the definition of HIIT is increased. For example, setting a range of ±5%, V1 corresponds to 58 per cent and V2 to 42 per cent of the total number of VIIT products. When using a range of ±35%, V1 equals 64 per cent and V2 36 per cent.

5 Econometric Analysis

Chapter 5 aims at responding to the second of the two goals of the paper: establishing the importance of various country characteristics in determining vertical and horizontal IIT. Section 5.1 summarizes the hypotheses, that will be tested as determinants of VIIT and HIIT. Also, the sources of data are reported. Section 5.2 describes the methods and the regression model. Finally, section 5.3 presents the results of the econometric analysis.

5.1 Independent Variables

Below, a summary of the hypotheses from Chapter 2 and their expected signs.

	PCID	PCIA	GDPD	GDPA	FKD	HKD	TINT
HIIT = f (PCID, PCIA, GDPD, GDPA, FKD, HKD, TINT)	-	+	-	+	-	-	+

	PCID	GDPA	FKD	HKD	GINID	TINT
VIIT = f (PCID, GDPA, FKD, HKD, GINID, TINT)	-	+/-	+	+	+/-	+

	PCID	PCIA	GDPD	GDPA	FKD	HKD	GINID	TINT
TIIT = f (PCID, PCIA, GDPD, GDPA, FKD, HKD, GINID, TINT)	-	+	-	+/(-)	+/-	+/-	+/-	+

PCID (difference in per capita income). When it comes to differences in PCI (PCID), relative and not absolute differences are preferred. ”This measure is superior to utilising the absolute values of the differences, which are affected by the magnitudes of the particular country characteristics in the different countries”.[51]

$$PCID = 1 + [w*\ln w + (1-w) * \ln(1-w)] / \ln 2 \qquad (5.2)$$

where w refers to the ratio of France’s PCI to the sum of France’s PCI and the PCI of a partner country. The results will lie within the range of 0 to 1.

[51] Balassa and Bauwens (1987), p. 927

Figures on GDP per capita are from the Penn World Table 6.1, where GDP per capita is expressed in current US dollars[52].

PCIA (average per capita income). Per capita income average is the unweighted average of the two trade partners' per capita GDP. Again, the figures originate from the PWT 6.1.

GDPD (difference in market size). As with differences in per capita income (PCID), relative and not absolute differences are preferred:

$$GDPD = 1 + [w*\ln w + (1-w) * \ln(1-w)] / \ln 2 \qquad (5.3)$$

where w refers to the ratio of France's GDP to the sum of France's GDP and the GDP of a partner country. The results will lie within the range of 0 to 1.

Figures on GDP are calculated by multiplying GDP per capita by population. Figures on population and GDP per capita come from the PWT 6.1.

GDPA (average market size). Average GDP is the unweighted average of France's GDP and a partner country's GDP. GDP is calculated as just explained and the source of data is the same.

FKD (difference in physical capital). Capital stock per worker in 1985 international prices is the proxy for relative physical capital. Absolute differences are chosen. Figures originate from the Penn World Table 5.6.[53] However, only figures for the years 1990-1992 are available.

HKD (difference in human capital). The proxy for relative human capital is the percentage of the population aged 25 and over, whose highest educational attainment is post-secondary education. Absolute differences are chosen. The source of the data is the Barro-Lee database[54], where figures for the years 1990, 1995 and 2000 are reported. Figures for 1991-1994 and 1996-1998 have to be calculated. This is done by calculating trends for each country: the rate of change between 1990 and 1995 is calculated and from this, figures for 1991-1994 can be derived. Another trend is calculated between 1995 and 2000.

[52] http://pwt.econ.upenn.edu/php_site/pwt_index.php
[53] http://datacentre.chass.utoronto.ca/pwt56/
[54] www.cid.harvard.edu/ciddata/ciddata.html

GINID. Absolute difference in Gini coefficients is a proxy for income distribution difference. The Gini coefficients originate from UNDP's World Income Inequality Database (WIID 2).[55] The database is extensive, but the Gini coefficients for each country are extremely diverse, because different definitions have been applied in different surveys. To be able to establish whether the distribution of income affects VIIT, only Gini coefficients that are calculated from the same definitions are picked. I choose "household" as income share unit, "person" as unit of analysis and "income" as income definition. Unfortunately, this renders a small number of Gini coefficients.

TINT (trade intensity). The greater the trade intensity, the greater the share of intra-industry trade. Trade intensity, TINT, was not discussed in Chapter 2. Trade intensity is the ratio of France's trade volume with a particular country to its total trade volume. The share of IIT will be positively correlated with trade intensity, since there will be more chances for more differentiated products to be traded, as trade volume with a country increases.[56] Figures on exports and imports expressed in thousands of US Dollars are from the OECD trade statistics.

5.2 Regression Model and Methods

Are country-specific variables determinants of intra-industry trade? To investigate this, the GL indices of TIIT, VIIT and HIIT are taken as dependent variables and the country-specific variables above are taken as explanatory variables. GL indices when using a dispersion factor of ±0,25 to distinguish between VIIT and HIIT are chosen. GL indices for all years and all 102 countries are included in the regressions, as long as there is also data on the independent variables.

According to formula 3.2, the dependent variable lies somewhere within the range [0, 1], depending on the importance of IIT. Balassa and Bauwens explain that ”a linear or loglinear equation may give predicted values that lie outside the 0-1 range. While a logistic function does not have this shortcoming, its logit transformation cannot handle values of 0 or 1”.[57] A value of 0 using formula 3.2 means that either X or M is 0, i.e. there is complete inter-industry

[55] www.eldis.org/static/DOC16999.htm
[56] Lee and Lee (1993)
[57] Balassa and Bauwens (1987), p. 925

specialisation. To be able to handle possible values of 0, Balassa and Bauwens use the nonlinear least squares estimation of the logistic function. This is presented below:

$$TIIT = 1 / (1 + e^{(-\beta' X)}) + \mu \qquad (5.1)$$

where

$\beta' X = \beta_0 + \beta_1 * PCID + \beta_2 * PCIA/100000 + \beta_3 * GDPD + \beta_4 * GDPA/1*10\text{^}10 + \beta_5 * HKD/100 + \beta_6 * FKD/100000 + \beta_7 * GINID/100 + \beta_8 * TINT + \beta_9 * DEVC + \beta_{10} * YR90 + \beta_{11} * YR91 + \beta_1 * YR92 + \beta_1 * YR93 + \beta_1 * YR94 + \beta_{15} * YR95 + \beta_{16} * YR96 + \beta_{17} * YR97$

β is the vector of the regression coefficients of the independent variables, X is the vector of the independent variables and μ is a random disturbance term.

Dummy variables for developing countries (DEVC) are included in the regression. These variables capture differences in the GL levels between France's IIT with industrialized countries and France's IIT with developing countries. The differences may be due to various disparities between industrialized countries and developing countries The World Bank's definition of a developing country is taken: a maximum of $9265 in GDP per capita.

Other dummies included in the regressions are year dummies, YR90-YR97. A cross-country regression, i.e. including all countries but focusing on one year only, would give few observations. Therefore, the regression is estimated by combining time-series and cross-sectional data: all GL indices, for any year and country, for which there is also data on all the independent variables, are included in the regression. Dummy variables for the years are included in the regressions to control for year effects.

The dependent variable lies somewhere within the range [0, 1]. Therefore, the independent variables should do that too. Consequently, figures on GDPA, PCIA, HKD, FKD and GINID are divided by 10 000 000 000, 100 000, 100, 100 000 and 100 respectively.

In fact, estimation 5.1 is not the exact estimation; the estimation has to be modified and made in three different ways due to difficulties in finding data on FKD and GINID. Taking into account that every observation needs figures on every independent variable, 522 observations are accumulated, *without* FKD and GINID. Because of a lack of data concerning these two variables, only 102 observations is possible when FKD is included in the estimation, and only 202 observations when GINID is considered. Three types of estimations will be made: without FKD and GINID, with FKD but without GINID and with GINID but without FKD.

Estimation 5.1 concerns total intra-industry trade. Estimations for VIIT and HIIT are similar but with corresponding independent variables. Again, the problem of finding data on FKD and GINID is present. Consequently, different estimations, with and without FKD and GINID, will be made.

The existence of heteroskedasticity is often encountered when using cross-sectional data. Moreover, since I also have time-series data, there is a risk of autocorrelation. To deal with the problems of heteroskedasticity and autocorrelation, the estimate is corrected using the Newey-West HAC (Heteroskedasticity and Autocorrelation Consistent Covariances), which is consistent in the presence of both heteroskedasticity and autocorrelation of unknown form.

5.3 Regression Results

5.3.1 Total Intra-Industry Trade

Including all independent variables except for FKD and GINID, there are 522 observations in each regression (1) to (7) in Table 5.3.1 below. Regression (8) and (9) concern GINID and include 202 observations, whereas regression (10) and (11) focus on FKD and include 102 observations.

A first observation in Table 5.3.1 is that adjusted R^2 (the coefficient of determination) differs. More specifically, the predictive ability of (10) and (11) is better than that of (1) to (7), which is better than that of (8) and (9). Maybe this is because the variables in (10) and (11) vary within a smaller range and there are fewer outliers, whereas the opposite is true for (8) and (9), making R^2 lower. In any case, dealing with cross-sectional data, the results are satisfying.

Table 5.3.1. Estimated Regressions for Total IIT[1]

Indep. var.	1	2	3	4	5	6	7	8	9	10	11
Constant	-1,276	-1,369	-0,891	-1,051	-1,182	-1,173	-1,244	-0,753	-0,929	-1,227	-0,905
	(0,00)	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**	(0,23)	**(0,00)**	**(0,10)**	**(0,00)**
HKD	1,243	1,105	1,287	1,111	0,510	1,298	1,213	1,493	1,497	2,111	2,151
	(0,10)	(0,14)	**(0,00)**	(0,14)	(0,40)	**(0,10)**	(0,12)	(0,18)	**(0,10)**	(0,12)	**(0,09)**
PCIA	2,234	2,868		1,169	1,176	2,535	2,945	-1,779		1,998	
	(0,25)	**(0,03)**		(0,47)	(0,46)	**(0,09)**	**(0,02)**	(0,59)		(0,64)	
GDPA	-1,786	-1,823	-1,516	-1,590		-2,155	-2,170	-1,898	-1,944	-3,415	-3,228
	(0,03)	**(0,03)**	**(0,00)**	**(0,07)**		**(0,03)**	**(0,03)**	**(0,07)**	**(0,07)**	**(0,04)**	**(0,04)**
PCID	-0,291		-0,467	-0,136	-0,337	-0,178		-0,738	-0,545	2,447	2,299
	(0,59)		(0,18)	(0,77)	(0,51)	(0,72)		(0,28)	(0,34)	**(0,02)**	**(0,02)**
GDPD	0,255	0,236	0,272	0,248	0,328			0,381	0,387	0,424	0,430
	(0,14)	(0,17)	**(0,02)**	(0,15)	**(0,06)**			**(0,04)**	**(0,04)**	(0,24)	(0,22)
TINT	9,894	9,734	10,202	9,633	8,861	9,207	9,147	10,812	10,468	11,605	11,855
	(0,00)	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**	**(0,00)**
DEVC	0,160	0,112	0,075		0,099	0,144	0,116	0,104	0,135	-0,314	-0,382
	(0,27)	(0,35)	(0,48)		(0,49)	(0,29)	(0,33)	(0,66)	(0,51)	(0,47)	(0,40)
GINID								0,375	0,335		
								(0,63)	(0,66)		
FKD										-0,929	-0,934
										(0,41)	(0,44)
YR90	-0,004							0,011			
	(0,98)							(0,96)			
YR91	0,002							0,206			
	(0,99)							(0,36)			
YR92	0,017							0,217			
	(0,91)							(0,25)			
YR93	0,040							-0,042			
	(0,76)							(0,85)			
YR94	-0,011							0,207			
	(0,93)							(0,23)			
YR95	-0,036							0,161			
	(0,72)							(0,35)			
YR96	0,001							0,094			
	(0,99)							(0,65)			
YR97	0,034							0,292			
	(0,72)							(0,15)			
R2	0,182	0,180	0,178	0,178	0,171	0,174	0,173	0,181	0,158	0,301	0,299
Adj R2	0,158	0,170	0,169	0,169	0,162	0,164	0,165	0,111	0,128	0,241	0,247
N	522	522	522	522	522	522	522	202	202	102	102

1) The table presents the coefficients of the nonlinear least squares estimation. Values in brackets are p-values and bold figures indicate a significance at a 10% level at least.

A first estimation, (1), is made including all explanatory variables (except for FKD and GINID). Explanatory variables that are significant are HKD, GPDA and TINT. HKD is a variable that is included in models of both VIIT and HIIT but with opposite signs. However, the results of (1) support the Falvey and Kierzkowski model of VIIT, since HKD has a positive sign. GDPA has a negative sign, which is somewhat of a surprise and against the CHOS model and the Falvey and Kierzkowski model. However, as discussed in section 2.3.1, there can be a negative relationship between GPDA and IIT. TINT is another significant variable in (1) and it has a positive effect on TIIT as expected. Explanatory variables that are *not* significant are PCID, GDPD, PCIA, DEVC and the year dummies. Studying the signs, PCID has a negative effect on TIIT, which is against the Falvey and Kierzkowski model of VIIT. Instead, the negative sign of PCID supports Linder's thesis and the CHOS model of HIIT. GDPD is supposed to affect only HIIT and in a negative way according to the CHOS model. However, the results do not support this; the sign is positive. PCIA is expected to affect only HIIT. PCIA has a positive sign in (1) as expected according to the CHOS model. Finally, DEVC has a positive sign, whereas the year dummies have both positive and negative signs.

There is one problem with regression (1): the risk of multicollinearity is substantial. Collinearity arises when an explanatory variable exhibits little variation, i.e. the values of an explanatory variable do not vary or change much within the sample of data. This makes it difficult to isolate the impact of the explanatory variable.[58] Because I only have one reference country, France, there is indeed little variation in the explanatory variables, since variation only arises from variations in the partner countrys. Multicollinearity also exists when explanatory variables are correlated, so that they move together in systematic ways, making it more difficult to determine the individual contribution made by each explanatory variable. This problem arises when the data used are nonexperimental, i.e. data that are the result of an uncontrolled experiment. Most economic data are nonexperimental, simply collected for administrative or other purposes.[59] Multicollinearity can be detected by examining whether the explanatory variables are highly correlated or not. Calculating the correlation between all predictor variables, it is shown that the correlation between PCIA and DEVC is relatively high (R2=0,69). PCID and DEVC are also correlated (R2=0,61) as is PCIA and PCID (R2=0,62). Still, serious multicollinearity can not be detected this way, because there may be variables that are correlated, but their relationship is not linear. If two variables are correlated, removing one of them may reduce or eliminate multicollinearity. Accordingly, three

[58] Hill et al (1997), p. 189
[59] Hill et al (1997), p. 189

regressions are run, (2), (3) and (4), where PCIA, PCID and DEVC are excluded one at a time.

First, it can be noted that *all* signs in (2), (3) and (4) are exactly the same as in (1). Regression (2) shows that when PCID is excluded, PCIA is significant, which points to collinearity between the two variables. Moreover, removing PCID in (2), HKD is no longer significant. When PCIA is excluded, (3), significant variables are the same as in (1) with the exception of GDPD: excluding PCIA, GDPD is significant. This indicates collinearity. In (4), DEVC is removed. Except for HKD, that is not significant in (4), the results are the same as in (1).

Even though the calculations did not show that GDPA and GDPD are correlated, there is still a risk. This is investigated in (5), (6) and (7). A first observation is that the signs of all explanatory variables in (5), (6) and (7) are the same as in (1). Regression (5) confirms the suspicion of collinearity; excluding just GDPA, GDPD is significant. Moreover, HKD is not significant in (5). Otherwise, the results are the same as in (1). In (6), only GDPD is excluded. The results are the same as in (1), with the exception of PCIA, that is significant in (6). Since PCIA is significant when GDPD is excluded, they seem to be collinear. This collinearity also appeared in (3). In (7), GDPD and PCID are removed because of their collinearity with other variables. The results are the same as in (1) except for HKD, that is not significant in (7). Not presented in the table, other regressions suggest that the collinearity between DEVC and GDPA and GDPD is not high.

Regression (8) and (9) concern GINID, which is only expected to have an influence on VIIT. A first regression is run when all variables are included. GDPA, GDPD and TINT are significant in (8). They have the same effect on total IIT as earlier regressions have shown i.e. GDPA has a negative effect and GDPD and TINT a positive. In fact, all explanatory variables in (8) have the same signs as in estimation (1) except for PCIA, which has a negative sign in (8). Excluding PCIA in (9), HKD has a positive and significant effect on TIIT, indicating collinearity between the two variables. Otherwise, the results are the same as in (8). Many estimations are made (not presented in the table), but GINID is never a variable that is significant.

Finally, regression (10) and (11) focus on FKD. FKD should affect both VIIT and HIIT according to theories, although with opposite effect on the two. First, it can be noted that in

(10) and (11), two of the explanatory variables have other signs than in estimation (1) to (9): PCID has a positive sign and DEVC a negative sign. The fact that PCID has a positive effect on TIIT, supports the Falvey and Kierzkowski model of VIIT. Moreover, for the first time, PCID is actually significant. Other variables that are significant in (10) and (11) are GDPA and TINT, but they have the same effect on total IIT as before. The results of (10) and (11) are the same with one exception: HKD is significant when PCIA is excluded in (11). Many regressions are run, but FKD is never significant. The sign of FKD is negative, which supports the CHOS model. As already pointed out, estimation (10) and (11) have the best predictive abilities. They explain about 25% of the variation in France's total IIT.

In conclusion, the results are somewhat more supportive of the hypotheses arising from the Falvey and Kierkowski model. This is not a surprise, recognizing that VIIT accounts for the major part of France's total intra-industry trade. It can be expected that the regressions on VIIT will show similar results as the ones just presented concerning total IIT.

5.3.2 Vertical Intra-Industry Trade

The regression results are presented in Table 5.3.2 below. Many estimations are made, but no explanatory variables are significant except for TINT, that has a positive effect on VIIT. The coefficient of determination is very low; 0,008 at the most. Studying the signs of the variables, although they are not significant, HKD has a positive sign, which is in accordance with the Falvey and Kierzkowski model. The signs of GDPA and FKD are negative, which is against predictions. Similarly, the negative sign of PCID does not support the Falvey and Kierzkowski model but Linder's thesis. GINID has a positive sign as has DEVC in most estimations. The year dummies are not significant and are not reported in the table.

Maybe the results are due to outliers: many of the GL indices of vertical IIT stand out and are extremely high. Chapter 4 showed that a country's GL level of vertical intra-industry could change from 0 to almost 1 from one year to another. The levels of HIIT were more constant and robust and did not have the extreme variations within countries, that the VIIT levels had. In other words, the great span of VIIT levels and the sudden changes in the levels may be the reason for why there do not seem to be any relationships between VIIT and the explanatory variables. Many of the explanatory variables would probably have been significant, if the outliers had been removed.

Table 5.3.2. Estimated Regressions for Horizontal and Vertical IIT[1]

HIIT	Indep. var.	1	2	3	4	5	6	7	8
	Constant	-3,316	-3,189	-2,439	-3,096	-3,447	-3,221	-3,182	-2,612
		0,00	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,02**	**0,00**
	HKD	1,106	1,408	1,148	1,346	1,391	1,230	0,694	0,689
		0,10	**0,02**	**0,09**	**0,04**	**0,02**	**0,04**	0,63	0,67
	PCIA	5,455	4,604		3,781	5,650	4,820	3,829	
		0,02	**0,00**		**0,04**	**0,00**	**0,01**	0,62	
	GDPA	-2,517	-2,688	-1,843	-2,461	-2,750	-2,643	-2,314	-1,908
		0,00	**0,00**	**0,02**	**0,00**	**0,00**	**0,00**	0,16	0,22
	PCID	1,023		0,354		0,383	0,842	12,769	11,548
		0,29		0,67		0,58	0,33	**0,01**	**0,02**
	GDPD	0,077		0,157	0,131	0,081		0,315	0,439
		0,72		0,47	0,53	0,69		0,49	0,28
	TINT	11,883	11,961	12,289	12,171	12,298	11,843	16,135	16,989
		0,00	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**
	DEVC	-0,280		-0,446	-0,088		-0,273	-5,686	-5,156
		0,28		**0,07**	0,63		0,27	**0,05**	**0,05**
	FKD							0,000	0,000
								0,35	0,36
	R2	0,259	0,247	0,244	0,248	0,249	0,250	0,448	0,446
	Adj R2	0,237	0,242	0,235	0,239	0,240	0,242	0,400	0,405
	N	522	522	522	522	522	522	102	102
VIIT	Indep. var.	1	2	3	4	5	6	7	
	Constant	-1,152	-1,126	-1,121	-1,1544	-1,087	-1,005	-1,086	
		0,00	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	
	HKD	1,006	0,970	0,667	0,6477	0,772	0,531	2,162	
		0,26	0,27	0,47	0,30	0,39	0,66	0,20	
	GDPA	-0,855	-0,769	-0,669		-0,669	-1,943	-2,693	
		0,41	0,45	0,54		0,52	0,31	0,13	
	PCID	-0,551	-0,558		-0,5407	-0,266	-0,394	0,313	
		0,19	0,17		0,18	0,33	0,52	0,74	
	TINT	2,448	2,316	2,264	1,7132	1,875	1,590	1,981	
		0,00	**0,00**	**0,01**	**0,01**	**0,04**	0,26	0,28	
	DEVC	0,153	0,149	-0,018	0,1386		0,192	0,061	
		0,25	0,26	0,84	0,30		0,38	0,90	
	GINID						0,415		
							0,63		
	FKD							-0,284	
								0,78	
	R2	0,024	0,018	0,010	0,016	0,014	0,027	0,050	
	Adj R2	-0,001	0,008	0,002	0,008	0,006	-0,041	-0,010	
	N	522	522	522	522	522	202	102	

1) The table presents the coefficients of the nonlinear least squares estimation.
Values in brackets are p-values and bold figures indicate a significance at a 10% level at least.

5.3.3 Horizontal Intra-Industry Trade

A first observation from Table 5.3.2 above is that the coefficients of determination are generally higher than the ones of TIIT. In estimation (1) to (6), which concern all independent variables but FKD, the explanatory power of each equation is about 0,24. Estimation (7) and (8) focus on FKD and only 102 observations are included. The predictive ability of (7) and (8) is better than that of the other estimations; the equations explain about 40% of the variation in HIIT. Studying the table, another observation is that the signs never change; throughout, they remain as in regression (1).

In regression (1) all variables are included, even though the year dummies are not reported in the table. Obviously, quite a few of them are significant: HKD, GDPA, PCIA and TINT are significant. However, the signs of most variables are contrary to expectations: HKD has a positive sign, GDPA a negative sign and PCID and GDPD positive signs. Only PCIA and TINT have the expected signs (positive). DEVC has a negative sign and the year dummies both positive and negative signs. In (2), the insiginficant variables from (1) are excluded; the results remain the same.

Because of collinearity between the explanatory variables, different variables are excluded one at a time. In regression (3), PCIA is excluded. Since DEVC is significant in (3), PCIA and DEVC are collinear. Excluding PCID in (4), the results are exactly the same as in (1). In (5), DEVC is removed and in (6), GDPD is removed; in neither case, the results from (1) change. As already noted, the sign of each explanatory variable is the same in each estimation in the table.

Estimation (7) and (8) focus on FKD. Significant variables are PCID, TINT and DEVC. It is a surprise that PCID is significant, since this variable has been insignificant in the other regressions concerning HIIT. However, in line with the other regressions, the signs are the same: PCID has a positive effect on HIIT, which is against the predictions of the CHOS model, whereas TINT has a positive effect and DEVC a negative. Excluding PCIA in (8), the results are the same as in (7). In fact, many regressions are run, but the results are the same throughout. For example, when GDPA or GDPD is excluded, the results from (7) still hold. FKD is never a variable that is significant.

6 Summary and Discussion

Chapter 6 summarizes and discusses the results of Chapter 4 and Chapter 5. The results from Chapter 4 are treated first and this will be done in two sections: IIT with country groups and IIT with individual countries. The results concerning the country-specific determinants of intra-industry trade will be presented in three sections: determinants of total, vertical and horizontal intra-industry trade.

6.1 France's Intra-Industry Trade with the World in 1990-1998

6.1.1 IIT at a country group level

France's intra-industry trade in 1990 to 1998 with three different groups of countries was calculated: the EU, the OECD and 61 countries. Employing the GL index of intra-industry trade, it was found that France had the greatest level of TIIT (total IIT) with the EU and least with the 61 countries. However, the differences were small; the GL levels of TIIT with all three groups of countries were about 0,5. It is possible that this similarity in GL levels is partly caused by the similarities in the country groups: the EU countries are part of the OECD countries, which in turn are included in the 61 countries. Differences in GL indices would be greater if, for example, comparing GL indices of EU countries with non-EU countries or comparing OECD countries with non-OECD countries. One example of this is by Harfi and Montet, who examine the evolution of French trade over the period 1960-1990. Using GL indices, their results illustrate that between 1961 and 1990, France's IIT with the EU countries was much greater than with non-EU countries.[60]

Using a dispersion factor of ±0,15 to distinguish between VIIT and HIIT, my calculations showed that France's levels of both VIIT and HIIT were highest with the EU and lowest with the 61 countries. Again, the differences in GL indices were small. In fact, studying France's levels of HIIT with the three groups of countries, the levels were almost the same. Likewise, the levels of VIIT were very similar. This is a surprise; according to theories, different countries (in terms of per capita income) should engage in IIT in vertically differentiated products, whereas similar ones should engage in IIT of a horizontal nature. However, as just

[60] Harfi and Montet in Brülhart and Hine (1999)

mentioned, this may partly be due to the fact that many of the countries are included in all three groups of countries.

Besides the similarities in VIIT levels and HIIT levels between the three groups, another surprising result was the way in which VIIT dominated: with every group of countries, the GL level of VIIT was about 0,4, whereas the HIIT level only reached about 0,1. This is especially striking when it comes to France's intra-industry trade with the EU, since HIIT should dominate between countries of similar economic level. However, other studies have found similar results. Using GL indices, Fontagné and Freudenberg show that for each country in EC in 1994, VIIT is more important than HIIT with the EC.[61] Greenaway, Hine and Milner focus on UK's intra-industry trade with 62 countries in 1988. They conclude that in the UK, over two thirds of all IIT is vertical IIT, using a dispersion factor of ±0,15 to distinguish between VIIT and HIIT.[62] Martin and Blanes analyse intra-industry trade between Spain and 60 countries over the period 1988-1995. Using the GL index of IIT and a range of ±0,15 to disentangle IIT into VIIT and HIIT, they conclude that VIIT is more significant than HIIT with OECD and non-OECD countries.[63]

Studying the evolution of France's GL indices between 1990 and 1998, France increased its level of TIIT in the period with the EU, the OECD and the 61 countries. Various authors have suggested a general stagnation of IIT in the late 1970's and during the 1980's, also for France. However, it is possible that this reversal of IIT is not real, but a result of the revisions of the SITC classification in 1978 and in 1988.[64] In any case, my results illustrated a general upward trend in France's total IIT in the 1990's. In this period, the industry classification remained unaltered. A study by Brülhart and Elliott focusing on French intra-industry trade between 1961 and 1992, finds that France increased its GL indices with the EU and with the world between 1990 and 1992. In fact, Brülhart and Elliott illustrate a general upward trend in IIT in manufactures within the EU between 1988 and 1992, when GL levels rose consistently.[65] My results then demonstrate a continuation in this upward trend.

[61] Fontagné and Freudenberg (1997)
[62] Greenaway, Hine and Milner (1995)
[63] Blanes and Martin (1999)
[64] Brülhart and Elliott in Brülhart and Hine (1999)
[65] Brülhart and Elliott in Brülhart and Hine (1999)

Distinguishing between VIIT and HIIT, my calculations showed that France's evolution of VIIT and HIIT in the period was similar with the three groups of countries. Moreover, the calculations showed that the overall increase in total IIT with the three groups of countries was thanks to an increase in the level of VIIT with every group. The levels of HIIT were quite constant in the period. Fontagné and Freudenberg, who focus on intra-EC trade between 1980 and 1994, come to the same conclusion i.e. that the rise in IIT in intra-EC trade did not concern horizontally differentiated products, but vertically differentiated products. More specifically, they conclude that HIIT remained stable in the period and represented less than 20% of all intra-EC trade, whereas VIIT rose from less than 35% in 1980 to 1985 to more than 40% in 1994.[66]

That my results showed that France's total IIT with the 61 countries and with the OECD increased between 1990 and 1998 is in line with the predictions of some authors. However, that France's IIT with the EU also increased in the period is actually against predictions. Many authors anticipated a decrease in IIT levels, for example Torstensson[67] and Harfi and Montet[68]. The implementation of the Single Market Programme and further European integration and liberalisation of trade was expected to promote concentration and reallocation of activities in the EU, entailing an increase in inter-industry trade and a decrease in IIT. Therefore, the increase between 1990 and 1998 in France's total intra-industry trade with the EU seems odd. However, as my results suggested, the overall increase in total IIT with the three groups of countries was because of an increase in the level of VIIT with every group, whereas the levels of HIIT were quite constant. This is interesting. Refering to section 2.4 of this paper, there are authors that consider vertical intra-industry trade to be inter-industry trade. They argue that if VIIT can be ascribed to differences in the countries' factor endowments, the trade should be characterized as inter-industry trade. In other words, if trade is caused by countries having comparative advantages within industries due to relative factor abundance, this is inter-industry trade. And in fact, there are some recent models, where VIIT can be ascribed to differences in the countries' factor endowments. Hence, according to this reasoning, it is possible that France's intra-industry trade actually decreased during the 1990's, whereas the inter-industry trade increased, as predicted!

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[66] Fontagné and Freudenberg (1997)
[67] Torstensson (1996)
[68] Harfi and Montet in Brülhart and Hine (1999)

6.1.2 IIT at a country level

When it comes to GL levels with individual countries, my calculations revealed that France had more vertical IIT than horizontal IIT with each of the 61 countries in almost every year in the period 1990-1998.

Focusing on HIIT, the calculations showed that France's GL indices were more stable and higher with industrialized countries than with developing countries, especially with countries close to France like Germany, the UK, Benelux, the Netherlands and Spain. In other words, France had most HIIT with the industrialized countries located in Europe, even though these countries too had more VIIT than HIIT.

Focusing on VIIT, the countries with the highest levels of VIIT were generally not as developed as the countries with high HIIT levels and they were not as close geographically. Moreover, their levels of VIIT fluctuated considerably in the period. Examples were Malta, Chile and Gabon. However, it should be additioned that many industrialized countries also displayed high levels of VIIT, for example the UK, Germany, Spain and the US.

It is a surprise that France did not have more HIIT than VIIT with the industrialized countries. However, the result that France had more HIIT with the industrialized countries than with the developing countries is in line with theory. Other studies have reached similar results. An example is Greenaway, Hine and Milner, who focus on UK's intra-industry trade with 62 countries in 1988. They show that the incidence of horizontal IIT is highest where EC member states are concerned and lowest in the case of geographically distant trading partners.[69]

Studying the *number* of IIT products traded, again, it was evident that VIIT clearly dominated; France had about five times more trade in vertically differentiated products than in horizontally differentiated, using a dispersion factor of ±0,15 to distinguish between VIIT and HIIT. Even when enlarging the definition of HIIT to ±0,35, VIIT dominated; two thirds of all IIT products traded were still vertically differentiated.

[69] Greenaway, Hine and Milner (1995)

Another observation was that the countries, with which France had the greatest number of VIIT and HIIT products, were almost the same countries. These countries were all industrialized and most of them were European. This result contrasted with the results of the GL indices, which showed that France had high levels of VIIT with developing countries, often far away.

Studying the evolution of VIIT and HIIT, my calculations revealed that France increased its total number of VIIT products with the 61 countries in the period, whereas the number of HIIT products was almost exactly the same in 1990 as in 1998. This was in accordance with the evolution of VIIT and HIIT using GL indices.

Finally, it was shown that high-quality VIIT products exceeded low-quality vertical trade with most trading partners. In other words, France's exports generally seemed to be of a higher quality than France's imports. This result may be seen as matching the 'comparative advantage' explanation of vertical IIT, since France's economy is placed above the economies of most of the 61 countries. Likewise, in Greenaway, Hine and Milner, high-quality vertical IIT was greater than low-quality vertical trade between the UK and the great majority of trading partners.[70] Moreover, in a study by Martin and Blanes, it was found that Spain's low-quality VIIT exceeded its high-quality VIIT with OECD countries, whereas the opposite was true with non-OECD countries.[71]

6.2 Country-Specific Determinants of Intra-Industry Trade

6.2.1 Total Intra-Industry Trade

The original regression with all variables showed that HKD (absolute difference in human capital), GDPA (average market size) and TINT (trade intensity) were significant explanatory variables. However, further regressions pointed to the significance of other variables too; GDPD (relative difference in market size) and PCIA (average per capita income) were significant when variables were excluded. This sensitivity in the results indicated multicollinearity. One probable source of the collinearity was the fact that I only had one reference country, France, causing a lack of variation in the independent variables.

[70] Greenaway, Hine and Milner (1995)
[71] Blanes and Martin (1999)

Despite the multi-collinearity, the signs of the variables were the same in the regressions: HKD, PCIA, GDPD and TINT had positive signs whereas GDPA and PCID had negative signs. The positive sign of HKD then supported the Falvey and Kierzkowski model and not the CHOS model. The other way round, PCID spoke in favour of the CHOS model and Linder's thesis but against the Falvey and Kierzkowski model. The negative sign of GDPA did not support neither model. GDPD and PCIA concerned only horizontal IIT. Whereas the positive sign of PCIA supported the CHOS model, the positive sign of GDPD did not. The overall explanatory power of the regressions was about 0,17, which is satisfying considering the heterogeneity of the data and the countries included.

Due to problems in finding data on the explanatory variables FKD (absolute difference in physical capital) and GINID (absolute difference in income distribution), special regressions with these variables were made. All of the above explanatory variables were included, but because of FKD and GINID, fewer observations were included in these regressions. The overall explanatory power of the equations concerning FKD was about 0,25 and that of GINID, 0,12. Neither FKD nor GINID was significant. However, one interesting result appeared in the regressions concerning FKD: the explanatory variable PCID was significant for the first time and moreover, with a positive sign contrary to earlier estimations. This supported the Falvey and Kierzkowski model.

6.2.2 Vertical Intra-Industry Trade

No explanatory variables were significant except for TINT, that had a positive effect as expected. The coefficient of determination was 0,008 at the most. GINID and HKD had positive signs whereas GDPA and FKD had negative signs. The positive sign of HKD supported the Falvey and Kierzkowski model, whereas the negative signs of GDPA and FKD did not. The sign of PCID was mostly negative, supporting Linder's thesis and not the Falvey and Kierzkowski model.

The results may be due to the heterogeneity and the extreme variations of the VIIT indices; in contrast to the levels of HIIT, the variation of the GL indices of VIIT could be enormous for a a country and also very sudden, from one year to the next. This may be the reason for why there did not seem to be any relationships between VIIT and the explanatory variables.

6.2.3 Horizontal Intra-Industry Trade

Many of the independent variables were significant in the first regression, when all variables were included (except for FKD): HKD, PCIA, GDPA and TINT. Moreover, these results were robust; the same explanatory variables continued to be significant in further regressions and their signs did not change. The only exception was DEVC (developing country), that was significant when PCIA was excluded, indicating collinearity.

As already stated, the signs of the variables remained the same throughout. However, studying the signs, they did not present strong support for the hypotheses arising from the CHOS model. In fact, almost every explanatory variable had an unexpected sign: HKD, PCID, GDPD and FKD had positive signs, whereas the sign of GDPA was negative. This is possibly due to multicollinearity. The only variables with signs in line with theory were PCIA and TINT, that had positive signs. The coefficent of explanation was nevertheless about 0,24 in every estimation.

As for the regressions concerning FKD, the explanatory power of the models was high; the equations explained about 40% of the variation in France's HIIT. Interestingly, the variables that were significant in the regressions were PCID, DEVC and TINT. These variables remained significant in all regressions. The signs of the variables did not change but stayed the same as above. FKD was never a variable that was significant.

To conclude, the problem of multicollinerarity was substantial, partly because I only had one reference country. Hence, further work using more than one reference country would be fruitful. The way in which vertical IIT dominated, suggests that more studies of vertical IIT is important. Interestingly, my regression results did not present any support for the hypotheses relating to vertical IIT. The question is whether this is a result of a deficiency with the underlying theory of VIIT or a consequence of the measurement of VIIT. As discussed, it is probable that it has to do with the GL indices of VIIT. This implies that sharper measures of VIIT are needed. In fact, considering all other problems connected to the GL index, discussed in Chapter 3, maybe it is time to find new measures of vertical and horizontal IIT.

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Appendix

Table 4.1.1 - France's IIT with 41 Countries According to the Number of Years with IIT 1990-1998

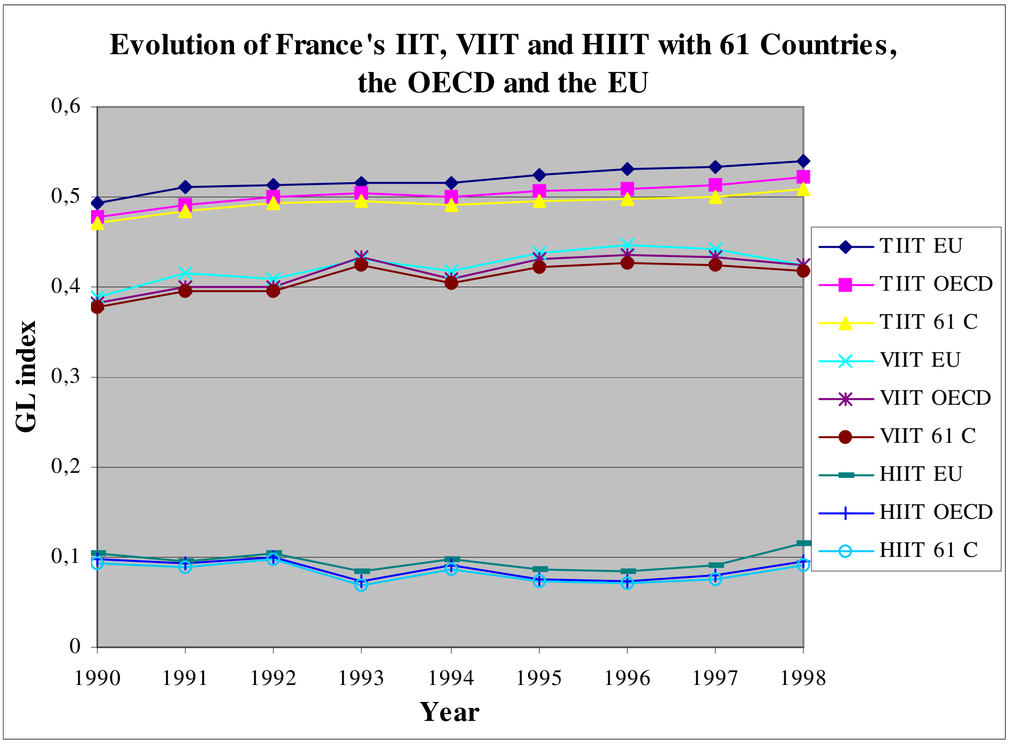
	Number of years with IIT	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average IIT
Cyp	8	0,405		0,305	0,266	0,486	0,721	0,432	0,600	0,269	0,435
Madag	8	0,586		0,636	0,230	0,142	0,215	0,146	0,224	0,241	0,302
Cam	8	0,333	0,573	0,285	0,287		0,212	0,136	0,328	0,123	0,285
DomRep	7			0,719	0,774	0,772	0,511	0,941	0,553	0,810	0,726
SyrArRep	7		0,391	0,937	0,541		0,756	0,985	0,983	0,246	0,691
Ukraine	7			0,557	0,484	0,154	0,214	0,662	0,279	0,322	0,382
Croatia	7			0,798	0,482	0,288	0,304	0,235	0,266	0,274	0,378
Sloven	7			0,383	0,301	0,253	0,342	0,239	0,210	0,256	0,283
Russ	7			0,358	0,248	0,138	0,294	0,176	0,155	0,139	0,215
Nigeria	7	0,048	0,006	0,657		0,044		0,037	0,086	0,192	0,153
Lit	7			0,035	0,399	0,090	0,090	0,131	0,084	0,063	0,127
Pana	6	0,282		0,536			0,274	0,812	0,202	0,784	0,482
Czech	6				0,325	0,321	0,355	0,348	0,481	0,522	0,392
Slovak	6				0,286	0,454	0,353	0,403	0,281	0,439	0,369
Guinea	6		0,784	0,241	0,866		0,199	0,065	0,053		0,368
Guadel	6	0,080	0,014	0,177	0,103	0,105	0,486				0,161
Mart	6	0,040	0,108	0,100	0,106	0,088	0,079				0,087
Fr Guiana	6	0,116	0,124	0,006	0,018	0,016	0,016				0,049
Jord	5	0,071		0,929	0,641				0,098	0,862	0,520
Ecu	5			0,281		0,617		0,429	0,573	0,405	0,461
Lib	5		0,089				0,495	0,394	0,305	0,080	0,273
Kuw	4		0,363					0,562	0,430	0,413	0,442
Ken	4	1,000		0,406	0,021			0,182			0,402
fYugRepofMac	4				0,456	0,173	0,197	0,185			0,253
Liecht	4						0,201	0,128	0,216	0,295	0,210
Urug	4		0,030					0,187	0,065	0,466	0,187
Kazak	3				0,947			0,878	0,839		0,888
Bang	3						0,636			0,787	0,543
Latv	3							0,444	0,491	0,628	0,521
Peru	3							0,224	0,821	0,353	0,466
Serb&Mont	3							0,482	0,410	0,396	0,429
fdUSSR	3	0,600	0,283	0,254							0,379
f Yugosl	3	0,325	0,325	0,362							0,337
Est	3							0,353	0,245	0,405	0,334
f Czech	3	0,330	0,368	0,291							0,329
Parag	3	0,399	0,101				0,444				0,314
Cost	3				0,061				0,487	0,099	0,216
Zaire	2	0,859	0,247								0,553
Ghana	2							0,497		0,404	0,451
Zim	2							0,049		0,263	0,156
BozHerz	1			0,200							0,200

Table 4.1.2 - France's VIIT and HIIT with 41 countries, 1990-1998

	No of years with IIT	V 90	V91	V 92	V 93	V 94	V 95	V 96	V 97	V 98	H 90	H 91	H 92	H 93	H 94	H 95	H 96	H 97	H 98
Cyp	8	0,405		0,27	0,258	0,418	0,068	0,432	0,6	0,269			0,035	0,008	0,067	0,653			
		2		5	6	4	8	5	5	9			1	2	1	4			
Madag	8	0,272		0,636	0,18	0,107	0,16	0,122	0,164	0,229	0,314			0,05	0,035	0,055	0,024	0,06	0,012
		4		4	8	9	10	14	21	21	1			2	1	1	3	5	3
Cam	8	0,333	0,573	0,285	0,287		0,138		0,328	0,084						0,074	0,136		0,039
		10	4	4	3		4		3	5						2	2		2
DomRep	7			0,719		0,772	0,511	0,941	0,553	0,81				0,774					
				1		1	1	1	3	1				1					
SyrArRep	7		0,391		0,541		0,756	0,985	0,983	0,101			0,937						0,145
			1		2		2	1	1	2			1						1
Ukraine	7			0,557	0,298	0,144	0,173	0,582	0,259	0,286			0	0,186	0,01	0,042	0,081	0,02	0,036
				2	7	6	14	12	24	22			0	4	1	2	2	3	6
Croatia	7			0,435	0,123	0,096	0,236	0,19	0,199	0,19			0,363	0,359	0,192	0,068	0,045	0,068	0,084
				4	17	24	34	26	17	27			1	5	4	3	1	7	4
Sloven	7			0,113	0,239	0,193	0,323	0,139	0,2	0,242			0,271	0,062	0,06	0,02	0,101	0,01	0,014
				33	72	77	99	98	120	131			5	13	10	18	17	17	18
Russ	7			0,355	0,24	0,12	0,288	0,166	0,147	0,135			0,003	0,008	0,017	0,006	0,009	0,008	0,004
				23	69	60	73	80	69	78			1	10	4	6	8	9	6
Nigeria	7	0,048	0,006	0,657		0,044		0,037	0,044	0,192								0,042	
		1	2	2		2		5	5	4								1	
Lit	7			0,035	0,399	0,066	0,033	0,131	0,067	0,055					0,024	0,057		0,017	0,008
				1	2	3	3	12	8	12					1	1		2	2
Pana	6	0,282		0,536			0,274		0,202	0,784							0,812		
		1		1			1		2	1							2		
Czech	6				0,298	0,288	0,308	0,327	0,41	0,494				0,027	0,033	0,047	0,021	0,071	0,028
					141	184	230	261	275	309				13	22	37	32	40	33
Slovak	6				0,261	0,387	0,274	0,312	0,239	0,422				0,025	0,067	0,079	0,091	0,042	0,017
					23	31	49	58	69	70				3	4	7	6	11	7
Guinea	6		0,784		0,866		0,199	0,048	0,053				0,241				0,016		
			1		1		1	2	1				1				1		
Guadel	6		0,014	0,17	0,103	0,105	0,486				0,08		0,007						
			6	4	6	10	4				1		1						
Mart	6	0,04	0,036	0,098	0,104	0,088	0,076					0,072	0,002	0,002		0,003			
		2	6	4	11	5	13					1	1	1		2			
Fr Guiana	6	0,116	0,106	0,006	0,015	0,016	0,014					0,018		0,003		0,002			
		4	8	8	13	9	11					2		2		3			
Jord	5	0,071		0,929	0,641				0,098	0,862									
		2		2	1				3	2									
Ecu	5			0,281		0,617		0,288	0,454	0,405							0,14	0,119	
				1		1		3	3	3							1	1	
Lib	5		0,089				0,495	0,394	0,305	0,08						0			
			1				1	4	1	1						0			
Kuw	4		0,363					0,562	0,43	0,363									0,05
			1					2	1	4									1
Ken	4			0,406	0,021			0,182			1								
				3	1			2			1								
fYugRepo	4				0,456	0,154	0,17	0,185							0,019	0,026			
					4	3	7	3							1	2			
Liecht	4						0,201	0,123	0,216	0,287							0,005		0,008
							6	5	7	2							1		1
Urug	4		0,013					0,187	0,02	0,466		0,017						0,044	
			2					3	1	1		1						1	
Kazak	3				0,947			0,878	0,839										
					1			1	1										
Bang	3	0,206					0,636			0,787									
		1					1			3									
Latv	3							0,444	0,491	0,613									0,016
								3	8	10									1
Peru	3							0,142	0,821	0,353							0,082		
								2	2	1							1		
Serb&Mor	3							0,467	0,41	0,27							0,015		0,127
								7	14	5							1		2
f USSR	3	0,524	0,254	0,25							0,076	0,029	0,004						
		72	57	26							3	6	3						
f Yugosl	3	0,311	0,315	0,353							0,014	0,01	0,009						
		215	186	103							14	14	5						
Est	3							0,353	0,245	0,405									
								3	6	10									

f Czech	3	0,312	0,352	0,257							0,017	0,016	0,033						
		94	136	179							8	11	23						
Parag	3	0,399	0,061				0,444					0,04							
		2	1				1					1							
Cost	3				0,061				0,487	0,099									
					2				4	5									
Zaire	2	0,859	0,247																
		1	1																
Gana	2							0,497		0,097									0,31
								1		1									1
Zim	2							0,049											0,26
								1											2
BozHerz	1			0,2															
				1															

Graph 4.2.1


Evolution of France's IIT, VIIT and HIIT with 61 Countries, the OECD and the EU
GL index
0,6
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1990
1991
1992
1993
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Year
TIIT EU
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TIIT 61 C
VIIT EU
VIIT OECD
VIIT 61 C
HIIT EU
HIIT OECD
HIIT 61 C

Table 4.2.2 - France's IIT with 61 Countries According to Their Average Level of IIT 1990-1998

	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average IIT 1990-98
Germ	0,580	0,622	0,620	0,620	0,617	0,626	0,629	0,624	0,629	0,619
Malta	0,770	0,318	0,387	0,511	0,665	0,739	0,647	0,747	0,715	0,611
UK	0,526	0,541	0,536	0,541	0,558	0,564	0,571	0,559	0,558	0,551
New Z	0,549	0,780	0,491	0,585	0,425	0,352	0,579	0,587	0,481	0,537
B-Lux	0,465	0,472	0,477	0,494	0,488	0,514	0,532	0,535	0,551	0,503
USA	0,467	0,444	0,521	0,537	0,516	0,493	0,481	0,499	0,532	0,499
Spa	0,458	0,485	0,475	0,474	0,488	0,500	0,517	0,506	0,529	0,493
Rom	0,570	0,500	0,530	0,499	0,549	0,457	0,483	0,414	0,435	0,493
Chile	0,747	0,762	0,706	0,004	0,172	0,532	0,558	0,460	0,408	0,483
Neth	0,440	0,445	0,454	0,463	0,448	0,456	0,478	0,503	0,512	0,467
Swi	0,459	0,443	0,440	0,512	0,476	0,475	0,472	0,468	0,447	0,466
Gabon	0,663	0,518	0,861	0,813	0,414	0,696	0,058	0,080	0,072	0,464
Ita	0,428	0,433	0,449	0,445	0,442	0,456	0,458	0,476	0,478	0,452
Sing	0,252	0,431	0,429	0,530	0,341	0,347	0,479	0,534	0,517	0,429
Malay	0,105	0,344	0,315	0,571	0,471	0,402	0,438	0,635	0,549	0,426
Phi	0,420	0,501	0,477	0,403	0,461	0,346	0,463	0,381	0,378	0,425
Aut	0,410	0,425	0,406	0,389	0,396	0,395	0,387	0,384	0,380	0,397
Sri	0,303	0,788	0,054	0,833	0,145	0,345	0,717	0,248	0,118	0,395
Bulg	0,593	0,250	0,297	0,368	0,519	0,447	0,482	0,264	0,316	0,393
Denm	0,357	0,397	0,391	0,385	0,373	0,378	0,402	0,393	0,388	0,385
Canada	0,325	0,358	0,354	0,355	0,352	0,374	0,344	0,411	0,437	0,368
Swe	0,379	0,390	0,355	0,364	0,345	0,334	0,341	0,338	0,336	0,354
Israel	0,324	0,351	0,330	0,334	0,347	0,324	0,327	0,293	0,330	0,329
Port	0,298	0,311	0,308	0,295	0,328	0,337	0,346	0,350	0,362	0,326
Hung	0,368	0,299	0,306	0,354	0,385	0,335	0,323	0,266	0,286	0,325
Ind	0,430	0,329	0,317	0,342	0,323	0,245	0,295	0,280	0,348	0,323
Vietnam	0,365	0,354	0,602	0,202	0,592	0,476	0,084	0,124	0,102	0,322
Tun	0,339	0,361	0,353	0,306	0,291	0,302	0,346	0,301	0,294	0,322
Poland	0,288	0,303	0,329	0,339	0,359	0,320	0,320	0,306	0,295	0,318
Maroc	0,247	0,256	0,240	0,278	0,322	0,352	0,363	0,365	0,382	0,312
Lebanon	0,389	0,439	0,420	0,335	0,219	0,216	0,239	0,262	0,281	0,311
Fr Poly	0,338	0,333	0,390	0,581	0,408	0,164	0,085	0,346	0,147	0,310
And	0,320	0,245	0,346	0,215	0,229	0,317	0,346	0,485	0,288	0,310
Aus	0,351	0,337	0,333	0,346	0,376	0,275	0,210	0,277	0,279	0,309
ChinTapei	0,246	0,301	0,320	0,300	0,319	0,294	0,340	0,340	0,328	0,310
Col	0,335	0,200	0,237	0,281	0,418	0,203	0,374	0,327	0,292	0,296
Nor	0,254	0,211	0,277	0,295	0,321	0,260	0,322	0,351	0,338	0,292
Gre	0,294	0,277	0,322	0,292	0,307	0,311	0,249	0,277	0,291	0,291
Kor	0,181	0,218	0,230	0,269	0,319	0,293	0,330	0,376	0,339	0,284
HK China	0,261	0,273	0,290	0,285	0,285	0,285	0,259	0,255	0,357	0,283
Ivo	0,735	0,641	0,240	0,155	0,161	0,168	0,214	0,073	0,100	0,276
Safr	0,268	0,291	0,312	0,224	0,283	0,327	0,264	0,296	0,190	0,273
Mex	0,220	0,300	0,236	0,275	0,296	0,303	0,249	0,246	0,289	0,268
Thai	0,160	0,252	0,192	0,311	0,324	0,285	0,261	0,311	0,293	0,265
Ir	0,239	0,243	0,258	0,217	0,226	0,247	0,248	0,271	0,256	0,245
Bra	0,262	0,262	0,261	0,273	0,226	0,259	0,188	0,189	0,210	0,237
Egypt	0,387	0,152	0,222	0,316	0,280	0,220	0,236	0,172	0,116	0,233
Venez	0,092	0,140	0,359	0,329	0,135	0,141	0,413	0,332	0,101	0,227
Fin	0,208	0,217	0,197	0,212	0,213	0,249	0,246	0,230	0,226	0,222
Japan	0,198	0,199	0,209	0,230	0,220	0,220	0,221	0,232	0,239	0,219
Pak	0,229	0,142	0,298	0,139	0,351	0,322	0,068	0,299	0,101	0,217
Indo	0,159	0,311	0,194	0,220	0,248	0,202	0,176	0,233	0,201	0,216
UnArEm	0,357	0,185	0,093	0,135	0,160	0,143	0,186	0,178	0,354	0,199
Turk	0,128	0,108	0,124	0,131	0,186	0,262	0,246	0,287	0,293	0,196
Arg	0,218	0,202	0,183	0,176	0,071	0,304	0,197	0,155	0,140	0,183
Mauri	0,115	0,149	0,210	0,191	0,203	0,190	0,158	0,190	0,184	0,177
China	0,167	0,278	0,193	0,156	0,149	0,135	0,157	0,142	0,172	0,172
Alger	0,337	0,225	0,022	0,062	0,241	0,044	0,024	0,034	0,049	0,115
Saudi	0,035	0,032	0,147	0,086	0,162	0,071	0,137	0,110	0,163	0,105
Iran	0,186	0,003	0,025	0,026	0,049	0,123	0,148	0,179	0,121	0,095
Sen	0,039	0,188	0,034	0,045	0,087	0,100	0,072	0,079	0,092	0,082
Average IIT	0,338	0,337	0,328	0,332	0,329	0,325	0,324	0,326	0,311	

Table 4.2.4 - France's Vertical and Horizontal IIT with 61 Countries According to Their Average Level of IIT 1990-98

	V 90	V 91	V 92	V 93	V 94	V 95	V 96	V 97	V 98	H 90	H 91	H 92	H 93	H 94	H 95	H 96	H 97	H 98	Av. VIIT 1990-98	Av. HIIT 1990-98
Germ	0,35	0,42	0,38	0,45	0,41	0,38	0,42	0,41	0,36	0,23	0,20	0,24	0,17	0,21	0,25	0,21	0,22	0,26	0,40	0,22
Malta	0,77	0,32	0,39	0,50	0,66	0,74	0,64	0,75	0,72	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,00	0,61	0,00
UK	0,37	0,39	0,37	0,40	0,39	0,39	0,41	0,42	0,43	0,15	0,15	0,16	0,14	0,17	0,17	0,16	0,13	0,13	0,40	0,15
New Z	0,55	0,71	0,43	0,59	0,42	0,23	0,56	0,55	0,46	0,00	0,07	0,06	0,00	0,01	0,12	0,02	0,03	0,02	0,50	0,04
B-Lux	0,29	0,32	0,33	0,35	0,32	0,36	0,37	0,36	0,38	0,18	0,16	0,15	0,14	0,17	0,16	0,16	0,17	0,17	0,34	0,16
USA	0,36	0,23	0,38	0,39	0,39	0,41	0,42	0,40	0,48	0,11	0,22	0,14	0,14	0,13	0,09	0,06	0,10	0,05	0,38	0,11
Spa	0,33	0,32	0,33	0,30	0,35	0,41	0,34	0,40	0,43	0,13	0,16	0,15	0,17	0,14	0,09	0,17	0,11	0,10	0,36	0,14
Rom	0,21	0,29	0,24	0,46	0,51	0,38	0,39	0,35	0,39	0,36	0,21	0,29	0,04	0,03	0,07	0,09	0,07	0,04	0,36	0,14
Chile	0,75	0,76	0,71	0,00	0,14	0,53	0,56	0,46	0,41	0,00	0,00	0,00	0,00	0,03	0,00	0,00	0,00	0,00	0,48	0,00
Neth	0,28	0,30	0,30	0,33	0,34	0,35	0,37	0,36	0,39	0,16	0,15	0,16	0,13	0,11	0,11	0,11	0,14	0,12	0,34	0,13
Swi	0,38	0,35	0,38	0,39	0,39	0,37	0,39	0,38	0,36	0,08	0,09	0,06	0,12	0,09	0,10	0,08	0,09	0,09	0,38	0,09
Gabon	0,66	0,52	0,86	0,81	0,41	0,70	0,06	0,03	0,06	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,05	0,02	0,46	0,01
Ita	0,28	0,30	0,32	0,35	0,33	0,32	0,34	0,35	0,34	0,15	0,14	0,13	0,10	0,11	0,13	0,12	0,12	0,14	0,33	0,13
Sing	0,25	0,42	0,42	0,50	0,31	0,32	0,41	0,51	0,51	0,00	0,01	0,01	0,03	0,03	0,03	0,07	0,02	0,01	0,41	0,02
Malay	0,08	0,31	0,30	0,56	0,47	0,39	0,43	0,62	0,53	0,03	0,03	0,01	0,01	0,01	0,02	0,01	0,01	0,02	0,41	0,02
Phi	0,39	0,47	0,47	0,40	0,42	0,33	0,43	0,36	0,35	0,03	0,03	0,01	0,00	0,04	0,02	0,03	0,02	0,02	0,40	0,02
Aut	0,32	0,35	0,30	0,30	0,29	0,29	0,28	0,27	0,28	0,09	0,08	0,10	0,09	0,11	0,10	0,10	0,12	0,10	0,30	0,10
Sri	0,30	0,79	0,05	0,83	0,14	0,35	0,72	0,25	0,10	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,39	0,00
Bulg	0,37	0,21	0,27	0,33	0,51	0,38	0,36	0,24	0,28	0,22	0,04	0,03	0,04	0,01	0,07	0,12	0,03	0,03	0,33	0,06
Denm	0,29	0,33	0,31	0,30	0,31	0,33	0,33	0,33	0,33	0,07	0,07	0,08	0,08	0,06	0,05	0,07	0,06	0,06	0,32	0,07
Canada	0,27	0,31	0,29	0,29	0,27	0,30	0,24	0,29	0,32	0,06	0,05	0,06	0,07	0,08	0,08	0,11	0,13	0,11	0,29	0,08
Swe	0,30	0,30	0,29	0,30	0,28	0,28	0,29	0,25	0,26	0,08	0,09	0,06	0,06	0,06	0,06	0,05	0,08	0,08	0,28	0,07
Israel	0,26	0,31	0,28	0,28	0,25	0,29	0,29	0,25	0,29	0,06	0,04	0,05	0,05	0,10	0,04	0,04	0,04	0,04	0,28	0,05
Port	0,19	0,25	0,25	0,23	0,22	0,28	0,21	0,25	0,27	0,11	0,06	0,06	0,07	0,11	0,06	0,13	0,10	0,09	0,24	0,09
Hung	0,30	0,27	0,27	0,32	0,29	0,26	0,26	0,21	0,26	0,06	0,03	0,04	0,04	0,10	0,08	0,06	0,05	0,03	0,27	0,05
Ind	0,40	0,23	0,23	0,25	0,29	0,21	0,26	0,25	0,28	0,03	0,10	0,08	0,09	0,03	0,03	0,04	0,02	0,06	0,27	0,05
Vietnam	0,37	0,35	0,60	0,17	0,52	0,33	0,08	0,11	0,10	0,00	0,00	0,00	0,03	0,07	0,15	0,00	0,01	0,00	0,29	0,03
Tun	0,30	0,32	0,32	0,25	0,27	0,28	0,33	0,25	0,26	0,04	0,04	0,03	0,06	0,02	0,03	0,02	0,05	0,04	0,29	0,04
Poland	0,27	0,26	0,32	0,32	0,35	0,26	0,25	0,24	0,26	0,02	0,04	0,01	0,02	0,01	0,06	0,07	0,07	0,04	0,28	0,04
Maroc	0,23	0,23	0,22	0,27	0,29	0,32	0,33	0,34	0,35	0,02	0,02	0,02	0,01	0,03	0,03	0,03	0,03	0,03	0,29	0,03
Lebanon	0,36	0,43	0,39	0,32	0,22	0,20	0,22	0,25	0,26	0,03	0,01	0,03	0,02	0,00	0,02	0,02	0,02	0,02	0,29	0,02
Fr Poly	0,34	0,33	0,39	0,45	0,41	0,16	0,09	0,35	0,13	0,00	0,00	0,00	0,13	0,00	0,00	0,00	0,00	0,01	0,29	0,02
And	0,29	0,21	0,35	0,19	0,21	0,11	0,11	0,21	0,11	0,03	0,03	0,00	0,03	0,02	0,21	0,23	0,27	0,18	0,20	0,11
ChinTape	0,24	0,29	0,31	0,29	0,31	0,29	0,33	0,33	0,31	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,02	0,30	0,01
Aus	0,22	0,31	0,31	0,32	0,36	0,26	0,20	0,26	0,27	0,13	0,03	0,03	0,03	0,02	0,01	0,01	0,02	0,01	0,28	0,03
Col	0,34	0,18	0,23	0,22	0,42	0,19	0,18	0,15	0,25	0,00	0,02	0,01	0,06	0,00	0,01	0,20	0,18	0,04	0,24	0,06
Nor	0,21	0,18	0,21	0,25	0,27	0,23	0,27	0,29	0,29	0,04	0,03	0,07	0,04	0,05	0,03	0,05	0,06	0,05	0,25	0,05
Gre	0,24	0,23	0,27	0,27	0,26	0,23	0,23	0,26	0,26	0,06	0,05	0,05	0,03	0,04	0,08	0,02	0,02	0,03	0,25	0,04
Kor	0,17	0,20	0,20	0,25	0,31	0,27	0,31	0,37	0,31	0,02	0,02	0,03	0,02	0,01	0,02	0,02	0,01	0,03	0,26	0,02
HK China	0,25	0,25	0,28	0,28	0,27	0,28	0,23	0,23	0,24	0,02	0,02	0,01	0,01	0,02	0,01	0,03	0,03	0,12	0,26	0,03
Ivo	0,73	0,64	0,24	0,15	0,16	0,15	0,07	0,06	0,07	0,00	0,00	0,00	0,00	0,00	0,02	0,15	0,02	0,03	0,25	0,02
Safr	0,22	0,28	0,30	0,22	0,24	0,30	0,25	0,26	0,18	0,05	0,02	0,01	0,01	0,04	0,02	0,02	0,04	0,01	0,25	0,02
Mex	0,18	0,27	0,23	0,26	0,25	0,28	0,24	0,23	0,22	0,04	0,03	0,01	0,02	0,04	0,02	0,01	0,01	0,07	0,24	0,03
Thai	0,16	0,19	0,16	0,29	0,28	0,24	0,25	0,29	0,29	0,00	0,06	0,03	0,02	0,04	0,05	0,01	0,02	0,01	0,24	0,03
Ir	0,22	0,22	0,24	0,18	0,21	0,23	0,23	0,23	0,25	0,02	0,02	0,02	0,04	0,01	0,02	0,01	0,04	0,01	0,22	0,02
Bra	0,25	0,23	0,23	0,24	0,21	0,23	0,14	0,15	0,16	0,01	0,03	0,03	0,03	0,01	0,03	0,05	0,04	0,05	0,20	0,03
Egypt	0,29	0,11	0,21	0,30	0,15	0,20	0,19	0,15	0,11	0,10	0,04	0,02	0,01	0,13	0,02	0,05	0,02	0,00	0,19	0,04
Venez	0,02	0,07	0,36	0,33	0,14	0,14	0,41	0,32	0,10	0,07	0,07	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,21	0,02
Fin	0,17	0,18	0,16	0,17	0,17	0,20	0,22	0,19	0,20	0,03	0,03	0,03	0,04	0,04	0,05	0,03	0,04	0,03	0,19	0,04
Japan	0,16	0,18	0,17	0,19	0,20	0,19	0,19	0,20	0,22	0,03	0,02	0,04	0,04	0,02	0,03	0,03	0,03	0,02	0,19	0,03
Pak	0,22	0,12	0,30	0,11	0,34	0,20	0,06	0,30	0,07	0,01	0,02	0,00	0,03	0,01	0,12	0,01	0,00	0,03	0,19	0,02
Indo	0,16	0,31	0,15	0,22	0,24	0,20	0,12	0,15	0,19	0,00	0,00	0,04	0,00	0,01	0,00	0,06	0,09	0,01	0,19	0,02
UnArEm	0,36	0,16	0,09	0,13	0,16	0,14	0,16	0,16	0,35	0,00	0,03	0,01	0,00	0,00	0,00	0,03	0,02	0,01	0,19	0,01
Turk	0,12	0,10	0,11	0,12	0,16	0,21	0,23	0,26	0,27	0,01	0,01	0,02	0,01	0,02	0,05	0,02	0,02	0,02	0,18	0,02
Arg	0,21	0,20	0,18	0,17	0,05	0,19	0,12	0,07	0,09	0,00	0,00	0,00	0,01	0,02	0,11	0,08	0,08	0,05	0,14	0,04
Mauri	0,11	0,14	0,18	0,15	0,19	0,14	0,12	0,15	0,16	0,01	0,01	0,03	0,04	0,01	0,05	0,04	0,04	0,02	0,15	0,03
China	0,17	0,26	0,19	0,15	0,14	0,13	0,14	0,14	0,16	0,00	0,02	0,01	0,00	0,01	0,00	0,01	0,01	0,01	0,16	0,01
Alger	0,34	0,22	0,02	0,06	0,21	0,04	0,02	0,03	0,04	0,00	0,01	0,01	0,00	0,03	0,00	0,00	0,00	0,01	0,11	0,01
Saudi	0,03	0,03	0,14	0,07	0,15	0,06	0,14	0,06	0,14	0,00	0,00	0,01	0,01	0,01	0,01	0,00	0,05	0,03	0,09	0,01
Iran	0,19	0,00	0,02	0,03	0,05	0,12	0,15	0,18	0,12	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,10	0,00
Sen	0,02	0,19	0,03	0,05	0,06	0,10	0,07	0,06	0,04	0,02	0,00	0,00	0,00	0,03	0,00	0,00	0,02	0,05	0,07	0,01
Average V/H	0,29	0,29	0,28	0,29	0,28	0,27	0,27	0,27	0,26	0,05	0,05	0,04	0,04	0,04	0,05	0,05	0,05	0,05		

Table 4.2.7 - The Number of Vertically and Horizontally Differentiated Products in France's IIT with the World, 1990-98

	V 90	V 91	V 92	V 93	V 94	V 95	V 96	V 97	V 98	H 90	H 91	H 92	H 93	H 94	H 95	H 96	H 97	H 98	Av no of IIT prod 1990-98
Germ	1453	1496	1486	1522	1468	1469	1434	1407	1422	490	471	469	343	370	393	375	406	401	938
Ita	1410	1411	1425	1368	1383	1401	1388	1363	1343	359	356	335	272	264	286	271	280	302	845
B-Lux	1230	1240	1271	1298	1322	1344	1338	1280	1296	390	377	372	312	315	334	313	357	368	820
UK	1328	1319	1336	1271	1286	1290	1282	1269	1272	323	337	322	275	271	308	279	302	305	799
Spa	1102	1102	1132	1110	1119	1172	1197	1177	1202	269	299	293	233	240	269	242	275	271	706
Neth	1007	1032	1010	1048	1068	1066	1067	1051	1068	295	278	307	217	227	232	238	259	248	651
USA	1083	1076	1093	1061	1077	1110	1149	1148	1147	176	186	160	161	168	166	160	176	182	638
Swi	1001	996	997	928	978	984	984	930	945	196	187	184	187	170	183	148	176	176	575
Japan	635	659	659	604	618	634	684	648	650	78	80	78	97	86	96	77	72	72	363
Aut	571	584	600	566	550	577	552	548	558	125	124	124	117	131	112	108	115	124	344
Swe	588	514	555	514	536	553	565	541	587	113	139	119	107	103	100	82	106	101	329
Port	430	426	435	439	431	475	464	486	496	81	89	93	72	77	71	77	102	108	270
Denm	431	439	449	422	422	471	461	441	455	105	102	91	70	68	82	74	92	93	265
Canada	283	280	298	281	284	304	313	326	334	34	36	33	42	40	32	44	41	44	169
ChinTape	237	261	299	274	319	333	328	363	337	16	15	13	28	23	24	31	30	29	164
Fin	268	227	260	228	251	280	292	286	296	51	61	48	39	46	42	33	49	47	156
Ir	228	232	242	226	232	242	262	260	299	36	41	35	36	31	37	37	36	36	142
Kor	189	186	187	193	225	289	278	278	229	23	23	22	21	21	28	23	21	24	126
China	117	142	145	155	201	290	292	351	371	1	10	9	5	16	13	35	28	38	123
HK China	217	211	223	226	223	244	223	220	228	20	15	27	17	22	17	24	26	27	123
Poland	126	165	191	160	188	221	268	269	319	14	24	14	22	13	30	33	46	47	119
Israel	158	170	201	191	189	225	242	216	226	27	25	27	31	37	27	26	36	33	116
Turk	100	110	129	142	135	186	282	293	316	13	11	17	16	26	25	24	33	29	105
Nor	176	170	180	164	173	192	195	185	191	24	27	34	25	24	26	19	24	28	103
Maroc	161	138	181	152	172	169	176	180	205	28	31	26	26	26	34	35	40	34	101
Tun	148	141	159	147	158	178	201	203	225	25	25	16	27	27	32	28	31	31	100
Hung	94	109	136	139	135	153	165	188	206	16	9	19	15	26	29	33	29	38	86
Gre	151	149	149	137	129	146	157	150	160	31	23	23	17	23	23	18	22	19	85
Sing	127	125	138	138	138	156	160	146	133	8	23	10	12	20	24	20	15	21	79
Bra	96	102	99	99	109	139	137	139	157	7	8	9	6	10	18	21	24	19	67
Ind	61	60	78	83	100	126	128	147	165	6	11	7	8	7	10	13	13	19	58
Thai	71	64	83	105	102	122	130	129	113	2	9	10	10	12	12	14	10	11	56
Mex	43	55	76	79	82	76	103	116	137	10	11	4	13	18	14	7	9	16	48
Aus	58	67	67	66	78	81	99	93	115	14	11	10	8	9	11	10	15	11	46
Malay	36	43	59	68	79	100	110	97	104	6	6	4	10	10	12	8	12	11	43
Safr	37	41	49	44	47	71	95	90	100	6	4	2	2	5	5	7	15	9	35
Rom	23	30	40	53	63	73	74	85	99	5	3	8	7	6	9	12	10	13	34
Phi	25	27	43	43	38	46	48	49	46	4	3	1	1	4	7	6	8	5	22
Indo	15	17	22	26	40	59	63	61	55	1	0	2	2	4	4	5	9	9	22
Egypt	20	25	24	33	35	42	35	44	48	3	3	2	1	3	5	6	7	3	19
Mauri	22	21	23	21	26	19	33	31	45	2	2	3	4	1	6	7	7	6	16
Arg	26	25	25	27	23	22	26	28	29	2	2	1	1	3	8	6	6	5	15
Lebanon	18	29	30	27	29	23	23	25	24	3	2	5	3	0	3	4	2	3	14
Bulg	7	10	17	23	18	29	28	33	37	1	3	2	3	1	3	7	2	6	13
UnArEm	9	19	21	22	15	19	24	34	27	0	1	1	0	0	0	3	5	2	11
New Z	15	7	11	13	19	20	22	22	28	0	2	1	0	1	6	2	4	1	10
Saudi	10	9	14	9	16	9	24	16	16	1	0	1	2	1	3	0	3	2	8
And	7	10	9	13	10	12	9	13	14	2	1	0	1	2	6	4	7	2	7
Malta	10	13	12	11	13	15	12	11	14	1	0	0	3	0	1	3	0	0	7
Alger	11	16	5	14	9	12	14	14	7	0	1	3	2	2	1	0	0	1	6
Vietnam	2	3	2	4	7	11	15	20	26	0	0	0	2	1	2	1	4	3	6
Col	8	7	8	4	6	10	6	7	9	0	1	1	2	0	1	4	2	2	4
Ivo	3	5	7	10	6	8	6	10	12	0	0	0	0	0	1	4	2	2	4
Pak	6	4	6	8	4	10	3	7	7	1	2	0	1	1	1	1	0	2	4
Iran	2	1	4	3	6	8	8	10	11	0	0	0	0	0	0	0	0	0	3
Chile	3	2	2	5	6	8	7	7	7	0	0	0	2	1	0	0	0	0	3
Sen	4	2	3	2	3	10	7	7	4	1	0	1	0	2	0	0	2	1	3
Venez	3	2	3	4	1	1	6	9	5	1	1	0	0	0	0	0	1	0	2
Fr Poly	2	4	2	2	3	1	2	7	6	0	0	0	1	0	0	0	0	1	2
Sri	1	1	4	1	3	3	3	4	4	0	0	0	0	0	0	0	0	1	1
Gabon	1	1	1	2	2	1	2	2	2	0	0	0	0	0	0	0	2	1	1
Total	15704	15832	16415	16028	16408	17340	17701	17570	17989	3446	3511	3398	2937	3015	3224	3062	3406	3443	
Average	257	260	269	263	269	284	290	288	295	56	58	56	48	49	53	50	56	56	

Table 4.2.9 - Distribution of VIIT and HIIT Products between France and 61 Countries at Different Definitions of VIIT/HIIT, 1998

	Tot no	0,05		0,15		0,25		0,35		0,05		0,15		0,25		0,35	
	of IIT prod 1998	No of V prod 1998	No of H prod 1998	No of V prod 1998	No of H prod 1998	No of V prod 1998	No of H prod 1998	No of V prod 1998	No of H prod 1998	% V of tot	% H of tot	% V of tot	% H of tot	% V of tot	% H of tot	% V of tot	% H of tot
Germ	1823	1666	157	1422	401	1166	657	991	832	91%	9%	78%	22%	64%	36%	54%	46%
B-Lux	1664	1524	140	1296	368	1067	597	894	770	92%	8%	78%	22%	64%	36%	54%	46%
Ita	1645	1548	97	1343	302	1144	501	983	662	94%	6%	82%	18%	70%	30%	60%	40%
UK	1577	1469	108	1272	305	1094	483	930	647	93%	7%	81%	19%	69%	31%	59%	41%
Spa	1473	1367	106	1202	271	1039	434	904	569	93%	7%	82%	18%	71%	29%	61%	39%
USA	1329	1254	75	1147	182	1029	300	915	414	94%	6%	86%	14%	77%	23%	69%	31%
Neth	1316	1222	94	1068	248	919	397	766	550	93%	7%	81%	19%	70%	30%	58%	42%
Swi	1121	1060	61	945	176	849	272	738	383	95%	5%	84%	16%	76%	24%	66%	34%
Japan	722	696	26	650	72	598	124	534	188	96%	4%	90%	10%	83%	17%	74%	26%
Swe	688	656	32	587	101	502	186	449	239	95%	5%	85%	15%	73%	27%	65%	35%
Aut	682	639	43	558	124	489	193	429	253	94%	6%	82%	18%	72%	28%	63%	37%
Port	604	566	38	496	108	419	185	372	232	94%	6%	82%	18%	69%	31%	62%	38%
Denm	548	514	34	455	93	400	148	351	197	94%	6%	83%	17%	73%	27%	64%	36%
China	409	399	10	371	38	347	62	323	86	98%	2%	91%	9%	85%	15%	79%	21%
Canada	378	366	12	334	44	297	81	270	108	97%	3%	88%	12%	79%	21%	71%	29%
Poland	366	357	9	319	47	285	81	267	99	98%	2%	87%	13%	78%	22%	73%	27%
ChinTapei	366	354	12	337	29	320	46	298	68	97%	3%	92%	8%	87%	13%	81%	19%
Turk	345	341	4	316	29	294	51	264	81	99%	1%	92%	8%	85%	15%	77%	23%
Fin	343	327	16	296	47	258	85	221	122	95%	5%	86%	14%	75%	25%	64%	36%
Ir	335	323	12	299	36	272	63	257	78	96%	4%	89%	11%	81%	19%	77%	23%
Israel	259	248	11	226	33	209	50	178	81	96%	4%	87%	13%	81%	19%	69%	31%
Tun	256	245	11	225	31	202	54	171	85	96%	4%	88%	12%	79%	21%	67%	33%
HK China	255	249	6	228	27	213	42	199	56	98%	2%	89%	11%	84%	16%	78%	22%
Kor	253	247	6	229	24	212	41	199	54	98%	2%	91%	9%	84%	16%	79%	21%
Hung	244	232	12	206	38	180	64	160	84	95%	5%	84%	16%	74%	26%	66%	34%
Maroc	239	231	8	205	34	176	63	159	80	97%	3%	86%	14%	74%	26%	67%	33%
Nor	219	210	9	191	28	168	51	150	69	96%	4%	87%	13%	77%	23%	68%	32%
Ind	184	176	8	165	19	148	36	143	41	96%	4%	90%	10%	80%	20%	78%	22%
Gre	179	171	8	160	19	145	34	127	52	96%	4%	89%	11%	81%	19%	71%	29%
Bra	176	167	9	157	19	150	26	135	41	95%	5%	89%	11%	85%	15%	77%	23%
Sing	154	146	8	133	21	119	35	111	43	95%	5%	86%	14%	77%	23%	72%	28%
Mex	153	145	8	137	16	125	28	117	36	95%	5%	90%	10%	82%	18%	76%	24%
Aus	126	121	5	115	11	106	20	94	32	96%	4%	91%	9%	84%	16%	75%	25%
Thai	124	119	5	113	11	106	18	96	28	96%	4%	91%	9%	85%	15%	77%	23%
Malay	115	111	4	104	11	100	15	94	21	97%	3%	90%	10%	87%	13%	82%	18%
Rom	112	109	3	99	13	88	24	77	35	97%	3%	88%	12%	79%	21%	69%	31%
Safr	109	106	3	100	9	95	14	87	22	97%	3%	92%	8%	87%	13%	80%	20%
Indo	64	61	3	55	9	52	12	51	13	95%	5%	86%	14%	81%	19%	80%	20%
Phi	51	49	2	46	5	45	6	44	7	96%	4%	90%	10%	88%	12%	86%	14%
Mauri	51	48	3	45	6	39	12	38	13	94%	6%	88%	12%	76%	24%	75%	25%
Egypt	51	49	2	48	3	45	6	44	7	96%	4%	94%	6%	88%	12%	86%	14%
Bulg	43	41	2	37	6	32	11	28	15	95%	5%	86%	14%	74%	26%	65%	35%
Arg	34	34	0	29	5	23	11	22	12	100%	0%	85%	15%	68%	32%	65%	35%
UnArEm	29	29	0	27	2	27	2	24	5	100%	0%	93%	7%	93%	7%	83%	17%
Vietnam	29	27	2	26	3	24	5	21	8	93%	7%	90%	10%	83%	17%	72%	28%
New Z	29	29	0	28	1	26	3	23	6	100%	0%	97%	3%	90%	10%	79%	21%
Lebanon	27	25	2	24	3	20	7	20	7	93%	7%	89%	11%	74%	26%	74%	26%
Saudi	18	17	1	16	2	14	4	13	5	94%	6%	89%	11%	78%	22%	72%	28%
And	16	15	1	14	2	12	4	12	4	94%	6%	88%	13%	75%	25%	75%	25%
Ivo	14	14	0	12	2	11	3	11	3	100%	0%	86%	14%	79%	21%	79%	21%
Malta	14	14	0	14	0	10	4	10	4	100%	0%	100%	0%	71%	29%	71%	29%
Iran	11	11	0	11	0	10	1	9	2	100%	0%	100%	0%	91%	9%	82%	18%
Col	11	11	0	9	2	8	3	6	5	100%	0%	82%	18%	73%	27%	55%	45%
Pak	9	8	1	7	2	6	3	6	3	89%	11%	78%	22%	67%	33%	67%	33%
Alger	8	7	1	7	1	7	1	7	1	88%	13%	88%	13%	88%	13%	88%	13%
Chile	7	7	0	7	0	5	2	5	2	100%	0%	100%	0%	71%	29%	71%	29%
Fr Poly	7	6	1	6	1	5	2	5	2	86%	14%	86%	14%	71%	29%	71%	29%
Sen	5	5	0	4	1	4	1	4	1	100%	0%	80%	20%	80%	20%	80%	20%
Sri	5	5	0	4	1	2	3	2	3	100%	0%	80%	20%	40%	60%	40%	60%
Venez	5	5	0	5	0	5	0	4	1	100%	0%	100%	0%	100%	0%	80%	20%
Gabon	3	3	0	2	1	2	1	2	1	100%	0%	67%	33%	67%	33%	67%	33%
Total	21432	20201	1231	17989	3443	15764	5668	13864	7568								
% of Tot IIT		94%	6%	84%	16%	74%	26%	65%	35%								

Table 4.2.10 - High-quality VIIT versus Low-Quality VIIT at Different Definitions of VIIT/HIIT between France and 61 Countries 1998

	Tot no	No. of VIIT products, 1998								Per cent VIIT of total no of IIT products, 1998							
	of IIT	5		15		25		35		5		15		25		35	
	prod	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2
Germ	1823	894	772	782	640	681	485	610	381	49%	42%	43%	35%	37%	27%	33%	21%
B-Lux	1664	957	567	844	452	712	355	631	263	58%	34%	51%	27%	43%	21%	38%	16%
Ita	1645	983	565	890	453	786	358	712	271	60%	34%	54%	28%	48%	22%	43%	16%
UK	1577	795	674	700	572	627	467	557	373	50%	43%	44%	36%	40%	30%	35%	24%
Spa	1473	897	470	822	380	732	307	674	230	61%	32%	56%	26%	50%	21%	46%	16%
USA	1329	656	598	602	545	550	479	516	399	49%	45%	45%	41%	41%	36%	39%	30%
Neth	1316	686	536	619	449	559	360	492	274	52%	41%	47%	34%	42%	27%	37%	21%
Swi	1121	376	684	324	621	290	559	263	475	34%	61%	29%	55%	26%	50%	23%	42%
Japan	722	349	347	325	325	306	292	279	255	48%	48%	45%	45%	42%	40%	39%	35%
Swe	688	334	322	309	278	276	226	254	195	49%	47%	45%	40%	40%	33%	37%	28%
Aut	682	318	321	282	276	249	240	225	204	47%	47%	41%	40%	37%	35%	33%	30%
Port	604	374	192	343	153	310	109	284	88	62%	32%	57%	25%	51%	18%	47%	15%
Denm	548	237	277	214	241	193	207	176	175	43%	51%	39%	44%	35%	38%	32%	32%
China	409	312	87	301	70	289	58	279	44	76%	21%	74%	17%	71%	14%	68%	11%
Canada	378	207	159	194	140	180	117	166	104	55%	42%	51%	37%	48%	31%	44%	28%
Poland	366	258	99	235	84	214	71	204	63	70%	27%	64%	23%	58%	19%	56%	17%
ChinTapei	366	283	71	273	64	267	53	256	42	77%	19%	75%	17%	73%	14%	70%	11%
Turk	345	281	60	267	49	253	41	231	33	81%	17%	77%	14%	73%	12%	67%	10%
Fin	343	182	145	168	128	157	101	141	80	53%	42%	49%	37%	46%	29%	41%	23%
Ir	335	140	183	132	167	121	151	115	142	42%	55%	39%	50%	36%	45%	34%	42%
Israel	259	116	132	104	122	98	111	83	95	45%	51%	40%	47%	38%	43%	32%	37%
Tun	256	128	117	123	102	117	85	104	67	50%	46%	48%	40%	46%	33%	41%	26%
HK China	255	161	88	152	76	147	66	142	57	63%	35%	60%	30%	58%	26%	56%	22%
Kor	253	198	49	190	39	178	34	171	28	78%	19%	75%	15%	70%	13%	68%	11%
Hung	244	127	105	117	89	105	75	98	62	52%	43%	48%	36%	43%	31%	40%	25%
Maroc	239	118	113	108	97	97	79	89	70	49%	47%	45%	41%	41%	33%	37%	29%
Nor	219	88	122	80	111	70	98	65	85	40%	56%	37%	51%	32%	45%	30%	39%
Ind	184	130	46	125	40	118	30	116	27	71%	25%	68%	22%	64%	16%	63%	15%
Gre	179	126	45	120	40	111	34	99	28	70%	25%	67%	22%	62%	19%	55%	16%
Bra	176	110	57	105	52	100	50	96	39	63%	32%	60%	30%	57%	28%	55%	22%
Sing	154	76	70	69	64	63	56	62	49	49%	45%	45%	42%	41%	36%	40%	32%
Mex	153	85	60	82	55	78	47	76	41	56%	39%	54%	36%	51%	31%	50%	27%
Aus	126	67	54	65	50	62	44	56	38	53%	43%	52%	40%	49%	35%	44%	30%
Thai	124	85	34	83	30	81	25	78	18	69%	27%	67%	24%	65%	20%	63%	15%
Malay	115	83	28	80	24	79	21	76	18	72%	24%	70%	21%	69%	18%	66%	16%
Rom	112	85	24	79	20	73	15	68	9	76%	21%	71%	18%	65%	13%	61%	8%
Safr	109	78	28	74	26	71	24	68	19	72%	26%	68%	24%	65%	22%	62%	17%
Indo	64	45	16	42	13	41	11	41	10	70%	25%	66%	20%	64%	17%	64%	16%
Phi	51	35	14	34	12	34	11	34	10	69%	27%	67%	24%	67%	22%	67%	20%
Mauri	51	23	25	22	23	19	20	19	19	45%	49%	43%	45%	37%	39%	37%	37%
Egypt	51	39	10	38	10	36	9	35	9	76%	20%	75%	20%	71%	18%	69%	18%
Bulg	43	29	12	26	11	23	9	21	7	67%	28%	60%	26%	53%	21%	49%	16%
Arg	34	18	16	16	13	12	11	12	10	53%	47%	47%	38%	35%	32%	35%	29%
UnArEm	29	18	11	17	10	17	10	16	8	62%	38%	59%	34%	59%	34%	55%	28%
Vietnam	29	15	12	14	12	13	11	13	8	52%	41%	48%	41%	45%	38%	45%	28%
New Z	29	13	16	12	16	11	15	10	13	45%	55%	41%	55%	38%	52%	34%	45%
Lebanon	27	18	7	17	7	16	4	16	4	67%	26%	63%	26%	59%	15%	59%	15%
Saudi	18	15	2	14	2	13	1	12	1	83%	11%	78%	11%	72%	6%	67%	6%
And	16	7	8	7	7	6	6	6	6	44%	50%	44%	44%	38%	38%	38%	38%
Ivo	14	6	8	6	6	6	5	6	5	43%	57%	43%	43%	43%	36%	43%	36%
Malta	14	7	7	7	7	4	6	4	6	50%	50%	50%	50%	29%	43%	29%	43%
Iran	11	11	0	11	0	10	0	9	0	100%	0%	100%	0%	91%	0%	82%	0%
Col	11	9	2	8	1	7	1	6	0	82%	18%	73%	9%	64%	9%	55%	0%
Pak	9	8	0	7	0	6	0	6	0	89%	0%	78%	0%	67%	0%	67%	0%
Alger	8	3	4	3	4	3	4	3	4	38%	50%	38%	50%	38%	50%	38%	50%
Chile	7	2	5	2	5	1	4	1	4	29%	71%	29%	71%	14%	57%	14%	57%
Fr Poly	7	3	3	3	3	3	2	3	2	43%	43%	43%	43%	43%	29%	43%	29%
Sen	5	3	2	2	2	2	2	2	2	60%	40%	40%	40%	40%	40%	40%	40%
Sri	5	2	3	2	2	1	1	1	1	40%	60%	40%	40%	20%	20%	20%	20%
Venez	5	4	1	4	1	4	1	4	0	80%	20%	80%	20%	80%	20%	80%	0%
Gabon	3	2	1	2	0	2	0	2	0	67%	33%	67%	0%	67%	0%	67%	0%
Total	21432	11715	8486	10698	7291	9690	6074	8894	4970								
% of tot IIT		55%	40%	50%	34%	45%	28%	41%	23%								
% of tot VIIT		58%	42%	59%	41%	61%	39%	64%	36%								