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ABSTRACT

This paper aims to measure the level of intra-industry trade with special focus on vertical and horizontal intra-industry trade (IIT) in United State's foreign trade with Caribbean countries. One of the main findings is that the observed increase in intra-industry trade between the United States and Caribbean is almost entirely due to two-way trade in vertical differentiation. The second important finding is that the level of per capita income, trade intensity, product differentiation, industry size, and product quality differences are found to affect the shares of all three types of IIT positively.

INTRODUCTION

Intra-industry trade is defined as the simultaneous export and import of commodities of the same industry group. Intra-industry trade describes trade in similar, but slightly differentiated products based on imperfect competition, or trade in close substitutes demanded by consumers in different countries who may have distinct tastes or preferences. Intra-industry trade thus implies the simultaneous existence of exports and imports coming from a given industry group (for example, automobiles industry). It is frequently found in trade flows between similar countries, particularly if they are tied by some kind of preferential arrangement. Since the introduction of the concept of intra-industry trade (IIT) in the 1960s, a large number of theoretical and empirical studies have investigated the determinants of this trade. As Greenway and Milner (1986) and Greenway and Torstensson (1997) point out, the interest in IIT arose mainly because the traditional theory of comparative costs, dealing with homogenous products, is incapable of explaining the simultaneous exports and imports to a country of the same statistical category. The theoretical studies focused mainly on providing explanations for the existence and development of IIT while empirical studies mainly focused on investigating determinants of IIT, with a small number of studies focusing on IIT aggregation and measurement issues.

The majority of empirical studies have tried to explain the IIT of developed countries due to the availability of detailed trade data for these countries. Some recent studies have also attempted to estimate the extent of horizontal and vertical intra-industry trade as well as identify their determinants. Most of these studies are concentrated on IIT in European countries and only a few are on the U.S. IIT. Some of the previous studies on the U.S. IIT include Clark (2006, 2007), Clark and Stanley (2003), Clark and Stanley (1999), Gonzalez and Valez (1993, 1995), Hart and McDonald (1992), and Manrique (1987). Despite the diversity of approaches used by

these studies, some consistent results and common features regarding the types of factors influencing IIT have emerged. Studies of bilateral trading arrangements have found that similarity in industrial structure, demand patterns, and size of countries are important country-specific factors while the characteristics of product differentiation and scale economies are important industry-specific factors.

This paper attempts to (a) measure the level of intra-industry trade with special focus on the vertical and horizontal intra-industry trade in the United State's foreign trade with the Caribbean, and (b) identify the country- and industry-specific determinants of vertical and horizontal intra-industry trade. Trade patterns are identified by breaking up total trade into three trade types: one-way (i.e., inter-industry) trade, two-way (i.e., intra-industry) trade in horizontally differentiated products, and two-way trade in vertically differentiated products. Unlike most other studies on intra-industry trade, this study uses detailed trade data at the 10-digit Harmonized System (HS) industry level and covers a longer and more recent period, 1990-2005. Other studies use far fewer observations and a much higher level of industry aggregation. Greater industry disaggregation will provide a more detailed and accurate analysis of IIT. These empirical findings are of value not only for the study of the U.S.-Caribbean trading relationship, but they also contain several important conclusions applicable more generally to the study of the theoretical basis for intra-industry trade and its empirical estimation.

This paper attempts to fill the gap in empirical literature focusing on a region that consists of relatively small, developing countries. As is evident from the findings of this study, the level of intra-industry trade between the U.S. and the Caribbean is very low and inter-industry trade is the dominant type of trade. Nonetheless, the contribution of the study comes mainly from the detailed data used. To our knowledge, there are no previous studies done on the U.S.-Caribbean trade that disaggregates the intra-industry trade into quality-driven vertical trade and non-quality driven horizontal trade as is done here.

The remainder of the paper is organized as follows: Section two provides a brief discussion of the general performance of international trade of the U.S. with the Caribbean during the past sixteen years. A brief survey of literature is presented in section three. Alternative measures of intra-industry trade and the estimated model are discussed in section four while section five presents a discussion of the estimated IIT indices. Section six presents and discusses the empirical results of the estimated regression models. Section seven summarizes the main findings.

GENERAL PERFORMANCE OF U.S. TRADE WITH THE CARIBBEAN

In this section, we describe the extent, nature and dynamics of trade between the United States and Latin America. Although the Caribbean region covers nearly 30 island nations, available trade data indicate that this region accounts for a very small share of the U.S. merchandise trade. Of the 24 trading partners in the Caribbean, the Dominican Republic, Trinidad and Tobago, Jamaica, and the Netherlands Antilles are the largest trading partners of the United States, accounting for about 0.9% of total United States merchandise trade with the other 20 trading partners accounting for only about 0.4% of total trade (see Table 1). The share of U.S. trade with the Caribbean increased marginally from 1.25% in 1990 to 1.31% in 2005 (see Table 1). The United States' total merchandise trade (exports + imports) with the Caribbean increased significantly from $11.2 billion in 1990 to $33.6 billion in 2005, an annual

average increase of about 7.9%. The share of U.S. exports to the Caribbean increased from 1.6% in 1990 to 1.7% in 2005 while the corresponding share of imports increased marginally from 1.0% to 1.1% during this period (see Table 1).

Of the 24 trading partners in the Caribbean, 5 countries experienced growth rates of total trade exceeding 10% during the 1990-2005 period. The U.S. trade with the Caribbean grew at a faster rate relative to its trade with all other countries. However, the U.S. trade with the Caribbean trading partners as well as with the rest of the world slowed down significantly during 2000-2005 period, especially after September 11, 2001. It should also be noticed that some of the smaller trading partners, each accounting for less than 1% of the U.S. total merchandise trade, experienced rapid growth rates in both merchandise exports and imports.

Table 1. Average Growth and Share of the U.S. Trade with the Caribbean, 1990-2005

(Average share and annual average growth rate for 1990-2005, %)

	Total Trade Share			Exports Share			Imports Share			Average Annual Growth Rate		
Country	1990	2005	Avg.	1990	2005	Avg.	1990	2005	Avg.	Total Trade	Exports	Imports
Anguilla	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.7	8.1	38.0
Antigua and Barbuda	0.01	0.01	0.01	0.02	0.02	0.02	0.00	0.00	0.00	9.9	10.1	19.3
Aruba	0.02	0.13	0.06	0.05	0.06	0.05	0.00	0.17	0.07	25.0	9.4	30.7
Bahamas	0.15	0.10	0.09	0.20	0.20	0.14	0.10	0.04	0.04	5.3	6.3	5.9
Barbados	0.02	0.02	0.02	0.04	0.04	0.04	0.01	0.00	0.00	6.0	6.8	2.2
Belize	0.02	0.01	0.01	0.03	0.02	0.02	0.01	0.01	0.01	6.4	7.3	6.3
Cayman Islands	0.02	0.03	0.02	0.05	0.07	0.04	0.00	0.00	0.00	15.0	16.1	11.1
Dominica	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	6.3	8.3	8.9
Dominican Republic	0.38	0.36	0.46	0.42	0.52	0.53	0.35	0.28	0.40	7.2	7.5	7.0
Grenada	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	6.9	7.6	7.5
Guadeloupe	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	2.9	3.3	20.2
Guyana	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.01	6.5	6.7	7.0
Haiti	0.09	0.04	0.05	0.12	0.08	0.08	0.07	0.03	0.03	-1.9	8.5	11.2
Jamaica	0.17	0.08	0.13	0.24	0.19	0.21	0.11	0.02	0.08	2.5	4.4	-1.7
Martinique	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	6.5	1.9	19.7
Montserrat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.4	12.5	24.0
Netherlands Antilles	0.11	0.08	0.08	0.14	0.13	0.10	0.08	0.06	0.06	8.1	6.9	18.1
St. Kitts and Nevis	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	6.1	6.1	8.8
St. Lucia	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.00	0.00	3.7	4.2	8.4
St. Vincent & the Grenadines	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	-3.4	-3.8	7.2
Suriname	0.02	0.02	0.02	0.04	0.03	0.03	0.01	0.01	0.01	6.6	5.7	12.0
Trinidad and Tobago	0.16	0.36	0.18	0.11	0.16	0.13	0.21	0.47	0.21	15.2	10.2	17.8
Turks and Caicos Islands	0.00	0.01	0.00	0.01	0.03	0.01	0.00	0.00	0.00	17.3	18.2	9.4
Virgin Islands (British)	0.01	0.01	0.01	0.02	0.01	0.01	0.00	0.00	0.00	7.7	5.9	7.4
Total Caribbean	**1.25**	**1.31**	**1.18**	**1.59**	**1.67**	**1.51**	**0.99**	**1.11**	**0.95**	**7.9**	**6.3**	**9.9**
Total All Countries (World)	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**7.5**	**5.9**	**8.6**

Source: Authors' calculations based on data from World Trade Atlas Database.

SURVEY OF LITERATURE

Although there are many studies dealing with intra-industry trade, there are only a few studies done on the U.S. intra-industry trade. The previous studies on the U.S. IIT include Clark (2006, 2007), Clark and Stanley (2003), Shelburne (2001), Clark and Stanley (1999), Gonzalez and Valez (1993, 1995), Hart and McDonald (1992), and Manrique (1987).

Clark (2007) examines changes in intra-industry specialization indicators over the 1992–2004 period to assess the potential for structural adjustment problems that may arise in the United States with growth in trade resulting from the United States–Central America–Dominican Republic Free Trade Agreement (CAFTA-DR) between the United States and six Central American countries—Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, and the Dominican Republic. Clark finds that CAFTA-DR will expand market access for US exporters. Few US industries are likely to encounter structural adjustment problems. Given the relatively large size of the US economy, and the small number of industries that face potential adjustment pressures, the United States should have liberalized all trade immediately. When potential adjustment pressures are indicated, long tariff phase-outs, complex rules of origin, and import safeguards are used to delay factor adjustments in import-sensitive industries.

In another study, Clark (2006) investigates country and industry-level determinants of vertical specialization-based trade. Industries that engage in this pattern of trade are identified through their use of offshore assembly provisions in the US tariff code. The study's findings explain why industries engage in vertical specialization-based trade and shed light on factors that enter production location decisions. Identifying factors that encourage vertical specialization-based production and trade will enhance our understanding of industry strategy and how trade patterns will evolve as the process of globalization continues. Results also suggest vertical specialization-based trade will continue to grow relative to total trade.

Clark and Stanley (2003) investigated determinants of intra-industry trade between the United States and twenty-two industrial nations. They analyzed the country-level characteristics suggested by modern models of monopolistic competition and trade and industry-level variables relating to imperfect competition, scale economies, and product differentiation. Country-level determinants of intra-industry trade used in the study include relative factor endowment differences, relative country size differences, distance, trade orientation, and the trade balance. Measures of factor intensity, scale economies, market structure, and product differentiation are included as country-level variables. Findings generally support predictions of modern trade theories.

Shelburne (2001) investigates how U.S.-Mexican intra-industry trade has evolved since the creation of the NAFTA beginning in 1994. The basic conclusions of this study are that (a) unlike the European experience after the creation of the European Common Market, and most other regional trade arrangements, trade between the U.S. and Mexico has remained mostly inter- industry trade, and the growth of trade has been largely inter-industry as measured by both IIT indexes and marginal intra-industry trade (MIIT) indexes; (b) unlike most studies of IIT using European countries, the IIT and the MIIT indexes are highly correlated across sectors; (c) the fall in the IIT indexes since NAFTA is due significantly to Mexico's trade surplus with the U.S.; (d) the IIT and MIIT indexes at a sectoral level are significantly related to the duty treatment of U.S. imports; the higher the percentage

of imports entering duty-free, the higher the IIT and MIIT indexes, and the higher the actual ad valorem duty rate, the lower the IIT and MIIT indexes; and (e) there is significant "smoking gun" evidence that the U.S.- Mexico IIT that does exist is not typical IIT but is significantly composed of the U.S. re-import of U.S. components within the same sector; the percentage of U.S. components in the value of U.S. imports by product, is significantly related to the IIT and MIIT indexes even at the most extensive level of product disaggregation. In addition, a new graphical measure for IIT is proposed which is better able to describe the level of IIT.

The study by Clark and Stanley (1999) investigates country- and industry-level determinants of North-South IIT between the United States and the 30 largest developing countries. The study used data on trade flows pertaining to 1992 for 30 developing countries and 300 four-digit U.S. SIC industries. The study found that IIT to fall with greater differences in relative factor endowments (proxied by differences in per capita GDP) between the North and South. Size of the trading partner influences IIT in a positive way. These findings are consistent with predictions of Helpman and Krugman's (1985) theoretical model. Distance influences IIT in a negative way. Trade orientation of the developing country exerts a positive effect on IIT.

Gonzalez and Valez (1995) presents estimates for the level of intra-industry trade in the 1994 bilateral commerce between the United States and Argentina, Brazil, Chile, Colombia, Mexico, Paraguay, Uruguay, and Venezuela. The findings of the study suggest that intra-industry trade is positively correlated with income and with foreign investment. Furthermore, Mexico and the United States present high levels of intra-industry trade, while the other Latin American countries analyzed have relatively low levels. The paper concludes that Mexico should experience much less difficulty in adjusting to free trade with the United States than the other countries.

In another study, Gonzalez and Valez (1993) present an evaluation of the level of intra-industry trade between Mexico and the United States. The calculated indexes of intra-industry trade indicate a rapid increase in this type of trade during the 1982-1990 time period. Additionally, the current level of intra-industry trade between these nations is quite high when it is compared to similar indexes of other nations. These results help to explain the apparent ease of adjustment to expanded Mexican exports to the U.S. during the 1980s. Furthermore, the high level of intra-industry trade indicates that after the NAFTA is implemented, there should be no major dislocation of productive activities in these countries as a result of the expansion in trade.

This study differs from the previous studies in a number of aspects: First, unlike most other studies on intra-industry trade, this study uses detailed trade data at the 10-digit Harmonized System (HS) industry level and covers a longer and more recent period, 1990-2005. Other studies use far fewer observations and a much higher level of industry aggregation. Second, this study separates intra-industry trade into two types, namely, horizontal intra-industry trade and vertical intra-industry trade. Finally, to our knowledge, this is the first study that attempts to measure the level of intra-industry trade between the U.S. and the Caribbean.

MEASUREMENT OF INTRA-INDUSTRY TRADE

The most widely used measure of intra-industry trade is the Grubel-Lloyd (G-L) index (see Grubel and Lloyd (1975) and Lloyd and Grubel (2003)). While

several alternative measures of IIT have been proposed in the literature, perhaps the most widely adopted has been the G-L index. It is considered to be the most appropriate measure for documenting an industry's trade pattern in a single period of time. The G-L index measures the share of IIT of industry i for a given country j as

$$IIT_{ij} = 1 - \frac{\left|X_{ij} - M_{ij}\right|}{(X_{ij} + M_{ij})} \tag{1}$$

where X_{ij} and M_{ij} are home country's exports of industry i to country j and home country's imports of industry i from country j, respectively. Thus, IIT_{ij} index in (1) measures the intensity or proportion of intra-industry trade in industry i with country j. If all trade in industry i is intra-industry trade, i.e., $X_{ij} = M_{ij}$, then $IIT_{ij} = 1$. Similarly, if all trade in industry i is inter-industry trade, i.e., either $X_{ij} = 0$ or $M_{ij} = 0$, then $IIT_{ij} = 0$. Thus, the index of intra-industry trade takes values from 0 to 1 as the extent of intra-industry trade increases, i.e., $0 \leq IIT_{ij} \leq 1$.

The IIT index in (1) can be modified to measure the intra-industry trade in all products with country j as a weighted measure of the IIT_{ij}'s and can be written as

$$IIT_j = \sum_{i=1}^{n} w_{ij}\left[1 - \frac{\left|X_{ij} - M_{ij}\right|}{(X_{ij} + M_{ij})}\right] \quad \textit{where} \quad w_{ij} = \left[\frac{(X_{ij} + M_{ij})}{\sum_{i=1}^{n}(X_{ij} + M_{ij})}\right]$$

i.e.,
$$IIT_j = \frac{\sum_{i=1}^{n}(X_{ij} + M_{ij}) - \sum_{i=1}^{n}\left|X_{ij} - M_{ij}\right|}{\sum_{i=1}^{n}(X_{ij} + M_{ij})} \tag{2}$$

where n is the number of industries at a chosen level of aggregation.

The literature on intra-industry trade increasingly emphasizes the importance of differentiating between horizontal and vertical intra-industry trade. Horizontal intra-industry trade (HIIT) is generally defined as the exchange of commodities differentiated by different attributes excluding quality, while vertical intra-industry trade (VIIT) is the exchange of commodities characterized by different qualities. This explains why the presence of one or the other has different implications for the trading partners. Horizontal intra-industry trade (HIIT) is considered to be of greater relevance to trade among developed countries with high and similar per capita incomes while VIIT is considered to be particularly relevant to trade among unequal trading partners with different income levels. Recent empirical studies, however, show that even among developed countries, vertical IIT are predominant as compared to horizontal IIT (see for example, Greenway et al. (1994) and Athurupane et al. (1999)).

In the evaluation of trade flows, quality analysis is undertaken mainly with the use of unit value indices, which measure the average price of a bundle of items from the same general product grouping. In this study we use unit values as a quality indicator, a rather common approach (see, for example, Abd-el-Rahman (1991); Greenaway, Hine and Milner (1994, 1995); and Athurupane et al. (1999)), which implicitly assumes that the price (or the unit value) of a product reveals its quality and that consumers have full information. Caves and Greene (1996) show that there is a positive correlation between price and quality, and vertically differentiated products show a higher correlation than other products. The rationale for using unit value as an indicator of quality is that, assuming perfect information, a variety sold at a higher price must be of higher quality than a variety sold more cheaply. According to Stiglitz (1987), prices will reflect quality even with imperfect information.

In disentangling total IIT into horizontal IIT (HIIT) and vertical IIT (VIIT), we use unit value information at the 10-digit HS industry level as follows:

$$IIT_i = HIIT_i + VIIT_i \tag{3}$$

where $HIIT_i$ is given by (2) for those products (k) in industry i where unit values of imports (UV_{ki}^m) and exports (UV_{ki}^x) for a particular dispersion factor (α) satisfy the condition,

$$1-\alpha \;\le\; \frac{UV_{ki}^x}{UV_{ki}^m} \;\le\; 1+\alpha$$

and $VIIT_i$ is given by (2) for those products (k) in industry i where,

$$\frac{UV_{ki}^x}{UV_{ki}^m} < 1-\alpha \qquad \text{or} \qquad \frac{UV_{ki}^x}{UV_{ki}^m} > 1+\alpha$$

where α = 0.15. Typically, trade flows are defined as horizontally differentiated where the spread in the unit value of exports relative to the unit value of imports is less than 15% at the 10-digit HS level. Where relative unit values are outside this range products are considered as vertically differentiated. The presumption is that transport and other freight costs do not cause a difference in export and import unit values by more than this percentage. Although we used three levels of dispersion factor (namely, α = 0.15, 0.20, and 0.25) to calculate the horizontal and vertical IIT, due to the limitation of space we are reporting the results only for α = 0.15. Both Abd-el-Rahman (1991) and Greenaway, Hine and Milner (1994, 1995) demonstrate that increasing the range from 15% to 25% does not radically alter the division of trade into horizontally and vertically differentiated products.

MODEL SPECIFICATION: COUNTRY- AND INDUSTRY-SPECIFIC ANALYSIS

Following Greenway and Milner (1994), Hine, Greenway and Milner (1999), and others, a number of country-specific and industry-specific determinants of the U.S. intra-industry trade are identified as main determinants, drawn from the available theoretical and empirical literature. The determinants identified can be listed as follows:

(a) *Country-Specific Determinants*:

Per Capita Income (PCI **)**: Intra-industry trade with any given trading partner may tend to be higher as per capita income (PCI) of the partner country is higher. According to Greenway and Milner (1994), customer demand at low levels of PCI is generally small and standardized with respect to product characteristics, but with higher PCI , demand will become more complex and differentiated. This will lead to greater demand for differentiated products. On the other hand, if the stage of development can be measured by PCI , a higher PCI then leads to higher intra-industry trade. The effect of this variable, measured as per capita GDP in U.S. dollars on the extent of intra-industry trade, is anticipated to be positive, reflecting enhanced demand for differentiated goods.

Difference in Per Capita Income ($DPCI$ **)**: Intra-industry trade will be negatively correlated with differences in per capita income, indicating differences in demand structures and/or differences in resource endowments. If PCI is interpreted as an indicator of demand structure, a greater difference in PCI implies that demand structures have become more dissimilar. This indicates that the potential for intra-industry trade decreases. For trade to exist between two countries, there must in each country be a demand for products of high quality produced by the other. Therefore, when the difference between the per capita incomes of two trading partners is greater, the scope for intra-industry trade tends to be smaller. Following Balassa (1986), Balassa and Bauwens (1987), and Durkin and Krygier (2000), the relative difference in PCI in U.S. dollars, between the U.S. and a given country j , is measured as

$$DPCI_j = 1 + \frac{[w_j \ln w_j + (1 - w_j)\ln(1 - w_j)]}{\ln 2} \qquad (4)$$

where $$w_j = \frac{PCI_{US}}{PCI_{US} + PCI_j}$$

Distance ($DIST$ **)**: Intra-industry trade is negatively correlated with the trade barriers between trading partners, representing the availability and cost of information necessary for trading differentiated products. To account for barriers to trade, this study uses transportation cost. Following Balassa (1986) and Nilsson (1999), since no information is available on transportation cost, the direct-line distance between the U.S. and a given trading partner was used as a proxy.

Difference in Factor Endowment ($DFEND$ **)**: Following Martin and Orts (2002), we define the factor endowment differences as $DFEND = \left| \frac{Y_i}{L_i} - \frac{Y_j}{L_j} \right|$, where $Y_{i(j)}$ is the level of GDP in country i (j) and $L_{i(j)}$ is the total employment of country i (j). It can be expected that the smaller the factor endowment difference, the more likely for countries to specialize in horizontally differentiated goods and less likely to specialize in vertically differentiated goods. Thus, we can expect the factor endowment difference to affect horizontal intra-industry trade negatively and vertical intra-industry trade positively.

Trade Orientation (*TO*): Intra-industry trade will be positively correlated with the country's trade orientation. Following Balassa and Bauwens (1987) and others, *TO* is defined as the residuals from a regression of per capita trade (*PCT*) on per capita income (*PCI*) and population (*POP*).

$$PCT = (Exports + Imports) / Popolation$$

where exports and imports are measured in millions of U.S. dollars and population is measured in thousands. *TO* is measured as the residuals from the following regression equation:

$$\ln PCT = \beta_0 + \beta_1 \ln PCI + \beta_2 \ln POP + \varepsilon$$

Trade Intensity (*TINT*): According to Greenway and Milner (1995), the extent of intra-industry trade will be positively correlated with the trade intensity (*TINT*) of the U.S. with a trading partner. As the trade volume with a country increases, there will be more chances for more differentiated products to be traded. *TINT* is defined as the ratio of the U.S.'s trade volume with a country to its total trade volume.

Trade Imbalance (*TIMB*): Trade imbalance is expected to be negatively correlated with the intra-industry trade. Some recent studies (for example, Lee and Lee (1993), Stone and Lee (1995), and Havrylyshyn and Kuznel (1997)) have also used trade imbalance (*TIMB*) as an additional explanatory variable.

Trade imbalance is measured by $TIMB_j = \dfrac{\left|X_j - M_j\right|}{X_j + M_j}$, where X_j and M_j are exports and imports of the U.S. to and from country j, and $TIMB_j$ is the measure of trade imbalance with country j.

(b) *Industry-Specific Determinants*:

Product Differentiation (*PD*): It is expected that industries with a higher degree of product differentiation tend to have higher intra-industry trade shares, as more product variety broadens the basis for intra-industry trade. Following Greenway, Hine and Milner (1994, 1995), we define product differentiation as the number of 10-digit HS industries across 2-digit HS industries for the U.S. trading partners. This measure is expected to affect intra-industry shares positively.

Vertical Product Differentiation (*VPD*): It is expected that industries with a higher degree of vertical product differentiation tend to have higher intra-industry trade shares. Following Clark and Stanley (1999), we use the advertising-to-sales ratio at 2-digit HS industry level to measure vertical product differentiation. This measure is expected to affect intra-industry shares positively.

Industry Concentration (*ICON*): Following Crespo and Fontoura (2005), we use the share of sales of the 4 largest firms in the total sales of the sector as a measure of industry concentration. This is the traditional variable to capture the level of concentration of the market. It can be hypothesized that the possibilities for

concentration can be expected to decline with the differentiation of the product. Thus, intra-industry trade will be negatively associated with industry concentration.

Industry Size (*INDSIZE*): The size of the industry is measured as the number of products traded with any given country. It may be presumed that as the number of products traded increases, the volume of trade as well as intra-industry trade will increase. Therefore, we expect a positive coefficient for this variable.

Product Quality Differences (*PRQD*): Following Torstensson (1991), Greenaway, Hine, and Milner (1994), Ballance, Forstner and Sawyer (1992), and Blanes and Martin (2000), we measure product quality differences in product i by the ratio between the unit value of U.S. exports and the unit value of U.S. imports. Product quality is expected to have a positive effect on both horizontal and vertical intra-industry trade.
The estimated model is as follows:

$$SIIT_{ij} = \beta_0 + \beta_1 PCI_j + \beta_2 DPCI_j + \beta_3 DIST_j + \beta_4 DFEND_j + \beta_5 TO_j + \beta_6 TINT_j + \beta_7 TIMB_j + \beta_8 PD_{ij} + \beta_9 VPD_{ij} + \beta_{10} ICON_{ij} + \beta_{11} INDSIZE_{ij} + \beta_{12} PRQD_{ij} + u_{ij} \quad (5)$$

where $SIIT_{ij}$ is the share of total IIT in gross trade (exports + imports) of industry i with country j and all the explanatory variables are defined above. We also estimated two other models with the share of horizontal intra-industry trade ($SHIIT_{ij}$) and the share of vertical intra-industry trade ($SVIIT_{ij}$) as the dependent variable. Since these shares take values from 0 to 1, the regression equation may have predicted values for the dependent variable that lie outside the feasible interval. So, to restrict the predicted values between 0 and 1, following Stone and Lee (1995), Caves (1981), Bergstrand (1983), and Loertscher and Wolter (1980), we have used a Logit transformation of the dependent variable. In this case, we estimate the following model:

$$\ln\left[\frac{SIIT_j}{1 - SIIT_j}\right] = \beta Z + u \quad (6)$$

where Z is the vector of explanatory variables including a constant, β is the corresponding vector of coefficients, and u is the random error term.

DATA

This study is based on detailed trade data desegregated at 10-digit Harmonized System (HS) industries, covering the period from 1990 to 2005. The 24 countries in the Caribbean include Anguilla, Antigua and Barbuda, Aruba, the Bahamas, Barbados, Belize, Cayman Islands, Dominica, the Dominican Republic, Grenada, Guadeloupe, Guyana, Haiti, Jamaica, Martinique, Montserrat, the Netherlands Antilles, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Turks and Caicos Islands, and Virgin Islands (British). The trade data were obtained from the Global Trade Information Services

(GTIS)'s *World Trade Atlas Database* that uses primary data provided by the U.S. Department of Commerce's Foreign Trade Division.

Data on PCI are from the International Monetary Fund's *World Economic Outlook Database*. The data on geographic distance ($DIST$) is obtained from the CEPII's distance measures database available at http://www.cepii.fr/anglaisgraph/bdd/distances.htm. Data on industry concentration ($ICON$) is from the *2002 Economic Census*. Data on trade intensity ($TINT$), trade imbalance ($TIMB$), and product quality differences ($PRQD$) are from the Global Trade Information Services (GTIS)'s *World Trade Atlas Database*. Data on vertical product differentiation (VPD), as measured by advertising-to-sales ratio, is from Schonfeld & Assiciates, Inc., *Advertising Ratios and Budgets 2004*. Additional information on trade was taken from the International Monetary Fund's, *Direction of Trade Statistics Yearbook* and U.S. Department of Commerce's International Trade Administration. The data on other relevant variables were taken from the International Monetary Fund's, *International Financial Statistics Yearbook 2005* and the World Bank, *World Development Report 2005*.

ESTIMATION OF INTRA-INDUSTRY TRADE INDICES

In this section, we describe the extent of intra-industry trade between the United States and the Caribbean trading partners. A specific problem measuring IIT is the level of desegregation. The scope of IIT and its main components heavily depend on the level of disaggregating. We have estimated the shares of intra-industry trade in United States total trade of detailed products for years 1990-2005, at the 10-digit level of the Harmonized System (HS). The data used in this study is not limited to manufactured products as is common in most other studies of IIT. The shares of IIT in the U.S. trade with the Caribbean trading partners are presented in Table 2.

The share of IIT is relatively high only for a handful of countries. Of the 24 countries, only 4 countries had a share exceeding 10% in both 1990 and 2005. This finding is not surprising given the smaller size and the level of development of the majority of these trading partners. Larger trading partners such as the Dominican Republic and the Netherlands Antilles have relatively larger share of IIT. Although the IIT share increased between 1990 and 2005 for majority of these trading partners, the inter-industry trade continued to be the dominant type of trade. For instance, the Dominican Republic's IIT share increased from 15.0% in 1990 to 22.3% in 2005 but the inter-industry share was 77.7% in 2005.

In order to get a full understanding of the level of IIT, it is important to know how common this type of trade is in terms of the number of products traded. The number of products traded and the number of products with IIT are presented in Table 3.

Table 2. Share of the U.S. Intra-Industry Trade with the Caribbean, 1990-2005
(Intra-Industry Trade as Percentage of Total Merchandise Trade, %)

Country	1990	1992	1994	1996	1998	2000	2002	2004	2005
Anguilla	0.1	0.0	0.0	0.0	0.1	0.6	0.1	0.8	0.2
Antigua and Barbuda	1.4	0.8	1.2	1.7	0.4	1.4	1.6	1.2	0.7
Aruba	0.1	1.1	18.2	16.4	7.4	14.9	1.7	2.5	2.6
Bahamas	2.6	4.0	8.8	4.0	6.0	4.5	17.9	3.7	9.8
Barbados	3.2	3.4	8.0	3.0	4.9	6.6	4.0	6.4	5.0
Belize	0.2	0.6	0.5	3.7	6.6	1.1	5.1	1.2	6.2
Cayman Islands	0.1	0.1	14.5	5.4	1.4	1.5	1.1	1.7	0.9
Dominica	0.9	1.1	0.8	1.8	0.5	1.4	0.1	1.1	1.2
Dominican Republic	15.0	14.3	13.6	15.5	14.1	15.7	16.5	20.2	22.3
Grenada	2.0	0.1	1.0	0.4	14.4	19.6	0.0	1.5	0.2
Guadeloupe	0.2	2.1	2.2	1.9	0.4	0.6	0.3	3.4	0.7
Guyana	0.4	2.4	0.1	0.3	0.8	1.9	3.4	0.6	8.9
Haiti	11.5	5.0	3.5	3.9	11.8	19.0	9.4	10.3	9.4
Jamaica	7.8	9.5	14.8	14.6	15.5	11.3	11.8	8.4	9.4
Martinique	0.0	0.9	0.6	0.3	0.1	0.0	0.1	0.7	0.4
Montserrat	0.0	0.0	0.0	3.2	0.0	0.2	1.2	0.0	1.9
Netherlands Antilles	21.6	23.4	15.6	15.6	12.7	23.4	3.7	7.4	16.3
St. Kitts and Nevis	2.5	4.6	3.1	3.6	25.2	21.9	4.5	19.7	5.1
St. Lucia	2.1	1.7	2.7	1.5	2.6	6.5	1.1	3.8	1.1
St. Vincent and the Grenadines	0.3	0.1	0.2	1.9	0.0	0.3	0.2	0.4	0.1
Suriname	22.0	20.9	15.9	24.3	29.7	39.8	43.4	39.9	34.6
Trinidad and Tobago	1.5	4.1	2.7	7.5	5.5	26.7	3.3	4.5	39.2
Turks and Caicos Islands	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.1	7.3
Virgin Islands (British)	1.5	1.0	1.8	1.3	2.1	0.8	7.2	10.3	2.6
Total Caribbean	**8.8**	**9.6**	**10.7**	**12.3**	**12.0**	**16.0**	**12.6**	**11.8**	**24.5**

Source: Authors' calculations based on data from World Trade Atlas Database.

The number of products traded varies widely across the Caribbean trading partners, as evident in Table 3. Generally, these numbers are larger for larger trading partners, such as the Dominican Republic. For example, in 1990, U.S. – Dominican Republic trade activities took place in 4,742 10-digit level industries, of which nearly 4.8% of industries (or 228 industries) had some intra-industry trade. By 2005, trade activities increased to some 6,666 10-digit level industries, of which nearly 7.8% of industries (or 523 industries) had some intra-industry trade. Although the countries with higher share of IIT tend to have a higher share of products with IIT, product shares are relatively lower than the IIT shares.

The weighted average of the Grubel-Lloyd IIT indices computed using (2) for the years 1990 to 2005, for all Caribbean trading partners are presented in Table 4. Although the IIT index in United States' trade with the Caribbean increased marginally during the period 1990-2005, it is not easy identify any trend for any given country. The IIT indices are not much different when we compare larger trading partners with smaller trading partners. The intensity of intra-industry has remained relatively constant during the period from 1990 to 2005.

Table 3. Number of Products in U.S. Intra-Industry Trade with Caribbean, 1990-2005

Country	1990			2005		
	Total Number of Products Traded	Number of Products with IIT	Percent of Products with IIT	Total Number of Products Traded	Number of Products with IIT	Percent of Products with IIT
Anguilla	466	1	0.2	708	3	0.4
Antigua and Barbuda	1,324	7	0.5	1,711	12	0.7
Aruba	2,038	2	0.1	2,695	17	0.6
Bahamas	3,437	40	1.2	4,476	80	1.8
Barbados	2,356	39	1.7	3,109	56	1.8
Belize	1,482	4	0.3	1,941	27	1.4
Cayman Islands	1,309	5	0.4	2,550	15	0.6
Dominica	734	10	1.4	885	3	0.3
Dominican Republic	4,742	228	4.8	6,666	523	7.8
Grenada	762	3	0.4	1,143	3	0.3
Guadeloupe	747	3	0.4	731	11	1.5
Guyana	1,017	4	0.4	1,710	19	1.1
Haiti	2,729	88	3.2	2,202	31	1.4
Jamaica	3,966	83	2.1	4,420	123	2.8
Martinique	622	0	0.0	420	4	1.0
Montserrat	376	0	0.0	212	3	1.4
Netherlands Antilles	2,949	43	1.5	2,958	82	2.8
St. Kitts and Nevis	763	8	1.0	1,352	30	2.2
St. Lucia	1,421	13	0.9	1,601	14	0.9
St. Vincent and the Grenadines	657	3	0.5	824	2	0.2
Suriname	1,132	2	0.2	1,802	21	1.2
Trinidad and Tobago	2,966	49	1.7	4,417	159	3.6
Turks and Caicos Islands	497	0	0.0	1,649	9	0.5
Virgin Islands (British)	1,004	6	0.6	1,465	23	1.6
Total Caribbean	**37,529**	**634**	**1.7**	**47,825**	**1,235**	**2.6**

Source: Authors' calculations based on data from World Trade Atlas Database.

Having discussed the general trends in IIT, let us now discuss the extent of horizontal and vertical IIT in U.S. – Caribbean trade. The shares of vertical IIT (HIIT) are presented in Table 5. While we used three dispersion factors (α = 15%, α = 20%, and α = 25%) to calculate these shares, due to the limitation of space only the shares for the dispersion factor α = 15% are presented in these tables. While most other studies use only one dispersion factor, we used three dispersion factors to check the accuracy of estimates.

Table 4. Grubel-Lloyd Intra-Industry Trade Index for U.S. Trade with Caribbean, 1990-2005

Country	1990	1992	1994	1996	1998	2000	2002	2004	2005
Anguilla	0.714	0.000	0.000	0.000	0.250	0.498	0.296	0.384	0.280
Antigua and Barbuda	0.526	0.368	0.391	0.201	0.509	0.349	0.445	0.385	0.366
Aruba	0.053	0.468	0.253	0.292	0.436	0.309	0.159	0.313	0.214
Bahamas	0.170	0.195	0.225	0.276	0.260	0.253	0.268	0.362	0.225
Barbados	0.441	0.460	0.324	0.290	0.328	0.388	0.296	0.361	0.381
Belize	0.356	0.430	0.385	0.420	0.247	0.544	0.432	0.283	0.442
Cayman Islands	0.384	0.305	0.278	0.223	0.324	0.344	0.350	0.250	0.210
Dominica	0.442	0.459	0.394	0.495	0.666	0.534	0.786	0.435	0.789
Dominican Republic	0.344	0.331	0.307	0.322	0.313	0.316	0.326	0.283	0.303
Grenada	0.282	0.429	0.457	0.392	0.235	0.369	0.750	0.273	0.326
Guadeloupe	0.650	0.392	0.185	0.118	0.534	0.374	0.441	0.400	0.520
Guyana	0.359	0.422	0.443	0.455	0.465	0.430	0.352	0.531	0.272
Haiti	0.340	0.419	0.377	0.415	0.394	0.459	0.499	0.360	0.445
Jamaica	0.315	0.350	0.297	0.346	0.263	0.316	0.295	0.320	0.301
Martinique	0.000	0.019	0.448	0.571	0.786	0.667	0.200	0.209	0.633
Montserrat	0.000	0.000	0.000	0.525	0.000	0.909	0.209	0.000	0.304
Netherlands Antilles	0.235	0.290	0.289	0.361	0.338	0.334	0.366	0.270	0.226
St. Kitts and Nevis	0.423	0.405	0.340	0.382	0.387	0.423	0.322	0.509	0.420
St. Lucia	0.310	0.460	0.386	0.318	0.486	0.371	0.543	0.330	0.412
St. Vincent and the Grenadines	0.379	0.300	0.128	0.337	0.568	0.363	0.378	0.681	0.726
Suriname	0.201	0.196	0.276	0.218	0.419	0.428	0.423	0.424	0.471
Trinidad and Tobago	0.375	0.335	0.326	0.320	0.306	0.357	0.308	0.264	0.247
Turks and Caicos Islands	0.000	0.000	0.000	0.000	0.000	0.000	0.379	0.614	0.231
Virgin Islands (British)	0.459	0.338	0.256	0.360	0.448	0.356	0.380	0.327	0.312
Total Caribbean	**0.351**	**0.371**	**0.337**	**0.346**	**0.390**	**0.393**	**0.428**	**0.387**	**0.409**

Source: Authors' calculations based on data from World Trade Atlas Database.

In the process of calculating these shares, we faced a major obstacle; the unit prices of about 5% of products with IIT were not available making it difficult to identify the product as vertically or horizontally differentiated. As a result, the actual shares of HIIT presented in Tables 5 could be slightly underestimated. Despite this limitation, our first finding is that IIT is overwhelmingly vertical (Table 5). The average share of vertical IIT for the entire the Caribbean region ranged from 65% to 100% during the period 1990-2005. The results also show that the share of vertical IIT is relatively lower for larger trading partners such as the Dominican Republic and the Netherlands Antilles. However, most of the total intra-industry trade is vertical. This finding is not surprising; it is consistent with the findings of some recent studies (see, for example, Clark (2006), Clark and Stanley (2003)).

Table 5. Share of Vertical Intra-Industry Trade with the Caribbean, 1990-2005
(Vertical Intra-Industry Trade as Percentage of Intra-Industry Trade, %)

Country	1990	1992	1994	1996	1998	2000	2002	2004	2005
Anguilla	100.0	–	–	–	100.0	100.0	100.0	100.0	100.0
Antigua and Barbuda	100.0	100.0	100.0	99.2	100.0	100.0	99.0	100.0	89.7
Aruba	91.1	100.0	99.8	99.9	94.9	91.4	89.0	95.1	99.0
Bahamas	90.4	83.8	84.1	99.0	71.2	97.3	66.6	85.9	99.7
Barbados	93.2	94.9	96.3	91.3	87.4	96.4	100.0	99.6	90.8
Belize	100.0	100.0	88.4	100.0	100.0	78.7	96.6	97.4	96.3
Cayman Islands	100.0	100.0	85.7	94.7	100.0	100.0	99.7	100.0	100.0
Dominica	83.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Dominican Republic	77.5	96.4	97.3	90.0	87.6	85.3	88.4	95.3	87.0
Grenada	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Guadeloupe	99.8	97.9	97.8	98.2	99.6	99.4	99.7	96.6	99.3
Guyana	100.0	100.0	94.6	100.0	99.1	97.9	99.2	74.6	99.3
Haiti	92.6	99.1	93.4	99.9	94.9	88.5	92.3	98.3	99.8
Jamaica	85.3	87.6	96.9	99.5	98.8	99.4	97.1	95.2	96.6
Martinique	100.0	100.0	98.1	87.2	100.0	100.0	100.0	100.0	91.8
Montserrat	–	–	–	100.0	–	–	100.0	–	100.0
Netherlands Antilles	99.7	74.8	75.3	65.3	94.2	71.2	99.7	71.8	80.6
St. Kitts and Nevis	100.0	100.0	100.0	100.0	92.5	89.7	100.0	100.0	99.6
St. Lucia	100.0	93.9	100.0	100.0	100.0	100.0	100.0	100.0	89.7
St. Vincent and the Grenadines	100.0	100.0	78.0	100.0	100.0	100.0	100.0	100.0	100.0
Suriname	100.0	100.0	100.0	100.0	99.9	99.9	99.9	100.0	99.9
Trinidad and Tobago	99.0	85.3	88.5	72.5	76.7	90.9	67.8	94.5	99.4
Turks and Caicos Islands	–	–	–	–	–	–	100.0	100.0	99.9
Virgin Islands (British)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Caribbean	**71.1**	**76.4**	**68.8**	**71.7**	**73.5**	**68.7**	**75.8**	**69.7**	**67.4**

Note: These shares are based on a dispersion factor (α) of 15 percent; – indicates no intra-industry trade.

Source: Authors' calculations based on data from World Trade Atlas Database.

EMPIRICAL RESULTS

We estimate three equations, using as the dependent variable the share of IIT, share of horizontal IIT, and the share of vertical IIT. The models are estimated using country- and industry-specific data for 2004. All the relevant industry-specific variables are measured at the 2-digit HS industry level. Regression results are reported in Table 6. All the variables, with the exception of TO, are expressed in logarithmic form. The first seven independent variables are country-specific variables while the last five independent variables are industry-specific variables.

The results presented in Table 6 confirm the theoretical expectations but some coefficients are not statistically significant. The adjusted R^2 values for the three models are relatively low, ranging from 0.14 to 0.30. However, they are similar to the results of previous studies. Among the country-specific determinants, the level of per capita income is found to affect the shares of all three types of IIT positively but

statistically insignificant. The positive coefficient for per capita income indicates that the share of IIT will be higher in trade with high income countries than countries with a lower level of per capita income. These findings are similar to those of earlier empirical studies of total IIT (see, for example, Greenway and Milner, 1995; Clark and Stanley, 2003; Clark, 2006).

Table 6.
Determinants of the U.S.-Caribbean Intra-Industry Trade (2004)
(Heteroskedasticity-corrected t-statistics in Parentheses)

Independent Variable	(1) Dependent Variable: *SIIT*	(2) Dependent Variable: *SHIIT*	(3) Dependent Variable: *SVIIT*
Constant	-12.804 (-0.38)	-23.487 (-1.41)	-10.451 (-1.05)
PCI	0.341 (1.21)	0.415 (0.96)	0.176 (0.36)
DPCI	-1.156 (-0.26)	-2.486 (-1.41)	-7.281*** (-1.91)
DIST	-0.157 (-1.21)	-0.185*** (-1.80)	-0.265 (-1.35)
DFEND	-0.721 (-0.20)	-0.847 (-1.44)	-0.677 (-1.27)
TO	0.626* (2.70)	0.209 (0.50)	0.358** (2.70)
TINT	0.004 (0.15)	0.876 (1.41)	0.250 (0.55)
TIMB	-0.104 (-1.00)	-0.749 (-1.44)	-0.054 (-0.51)
PD	0.211 (1.36)	0.477 (1.37)	0.554* (4.19)
VPD	0.562* (4.04)	0.718 (0.90)	0.063 (0.41)
ICON	-0.642 (-1.31)	-0.209 (-0.50)	-0.760 (-1.55)
INDSIZE	0.042 (0.24)	0.345 (1.17)	0.078 (0.44)
PRQD	0.196* (3.56)	0.096 (1.24)	0.184* (3.76)
Adjusted R^2	0.15	0.31	0.14
n	250	127	238

Note: * significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level.

Difference in per capita income has a negative effect on all three types of IIT shares; however, only one of the coefficients is statistically significant. The geographic distance from the U.S. to a given trading partner is also found to have the expected negative effect on intra-industry trade shares. However, it is statistically significant only for horizontal IIT share. This could be due to the relatively close proximity of all trading partners.

The rest of the country-specific variables, namely, difference in factor endowment, trade orientation, trade intensity, and trade imbalance, also display

anticipated signs. However, only the trade orientation variable is statistically significant.

Among the industry-specific variables, product differentiation is found to have a positive and statistically significant effect on vertical IIT share. Similarly, the vertical product differentiation is also found to have a positive effect. Industry concentration is found to have a negative but statistically insignificant effect on all three types of IIT shares. The industry size has the expected positive effect but it is statistically insignificant. The results for the variable measuring quality differences support the hypothesis that the more differentiated products are in terms of quality, the larger the share of bilateral IIT will be. The coefficient has the expected positive sign and is statistically significant for total IIT share and vertical IIT share at the 1% level.

The findings of this study are subject to inevitable limitations. The main difficulty arises from the limitation of data; the industry based statistics are only published at the 2-digit SIC (Standard Industry Classification) or NAICS (North American Industry Classification System) levels in the U.S., so this limits the scope of empirical studies. For more reliable results, this exercise should be repeated for different time intervals and the change in the calculated IIT levels should be analyzed. However, despite these considerations, we have identified some important country- and industry-specific determinants of U.S.- Caribbean intra-industry trade.

SUMMARY AND CONCLUSIONS

This study analyzes the development of intra-industry and inter-industry trade between the United States and the Caribbean countries during the period 1990 to 2005. The main objectives of this paper are to (a) explain the extent of vertical and horizontal intra-industry trade in the United State's foreign trade with the Caribbean countries, and (b) identify the country- and industry-specific determinants of vertical and horizontal intra-industry trade. For this purpose, trade patterns are identified by breaking up total trade into three trade types: one-way trade (i.e. inter-industry trade), two-way trade (i.e. intra-industry trade) in horizontally differentiated products, and two-way trade in vertically differentiated products. Unlike most other studies on intra-industry trade, this study uses detailed trade data at the 10-digit Harmonized System (HS) industry level and covers a longer and more recent period, 1990 through 2005. The Grubel-Lloyd intra-industry trade index is used to calculate the intensity of these two types of intra-industry trade.

One of the main findings is that the share of IIT is relatively high only for a handful of countries. Of the 24 countries, only 4 countries had a share exceeding 10% in both 1990 and 2005. This finding is not surprising given the smaller size and the level of development of the majority of these trading partners. Larger trading partners such as the Dominican Republic and the Netherlands Antilles have relatively larger share of IIT. Although the IIT share increased between 1990 and 2005 for the majority of these trading partners, inter-industry trade continued to be the dominant type of trade. The low levels of intra-industry trade between the U.S. and the Caribbean nations signal that increased trade between these areas could bring about significant dislocation of resources and high adjustment costs.

Another main finding is that the observed increase in intra-industry trade between the U.S. and the Caribbean is almost entirely due to two-way trade in vertical differentiation. The results also suggest that bilateral trade flows between the United

States and the Caribbean have become more intense indicating that trade relations are strengthening.

Among the country-specific determinants, the level of per capita income and trade intensity are found to affect the shares of all three types of IIT positively, while difference in per capita income, distance, difference in factor endowment, and trade imbalances are found to affect the share of all three types of IIT negatively.

Among the industry-specific variables, product differentiation, vertical product differentiation, industry size, and product quality differences are found to have a positive effect on all three types of IIT shares. Industry concentration variable is found to have a negative effect on all three types of IIT share.

Several findings of this study support conclusions of theoretical models of intra-industry trade that IIT is a consequence of vertical product differentiation based on quality differences rather than a result of scale economies or horizontal product differentiation. Our finding of a positive relationship between IIT and advertising intensity supports the role of vertical product differentiation. Scale economies, as measured by industry size, are not found to play a role in determining the extent of IIT. This could be due to the fact that low-technology products assembled in the Caribbean countries are not easily produced using automated processes in large scale production facilities. Factor intensity of an industry will influence the range of qualities produced. The scope for vertical product differentiation will be greater when goods can be produced with labor-intensive production techniques. The U.S. will export high quality capital intensive products to the Caribbean in exchange for lower quality labor-intensive products falling under the same industry classification.

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