Intra-industry trade: Revisiting theory and literature survey

By Sakshi AGGARWAL †

Abstract. Early references to intra-industry trade were mostly ignored for many years. It was only in the past two decades that intra-industry trade has received significant attention and has become a leading area for international economists. It has become increasingly common in recent decades due to the growth of international trade, globalization, and the integration of economies. Intra-industry trade can benefit countries by allowing them to specialize in their areas of comparative advantage and to access a wider range of products and services at lower prices. However, it can also pose challenges for some industries and workers who may face increased competition from foreign producers. The purpose of this paper is to review the extensive literature on intra-industry trade, assess the accomplishments of researchers in this area and predict future research directions. The paper evaluates intra-industry trade as a research program and assesses whether it can continue to advance in the future. To organize the paper, the authors evaluate current perspectives in four distinct areas: theory, measurement, empirical evidence, and policy aspects.

Keywords. Intra-industry trade; Imperfect competition; Classical theories of trade.

JEL. F11; F12; F13.

1. Introduction

The concept of trade between industries was first mentioned by Hilgerdt (1935) and Ohlin (1933). However, the focus of trade theorists after the war was on refining the Heckscher-Ohlin-Samuelson (H-O-S) model, and there was a lack of evidence for intra-industry trade, which led to these early references being largely ignored for many years. It wasn't until the last two decades that intra-industry trade received significant attention and became a frontier area for international economists. The aim of this paper is to review the extensive literature on intra-industry trade, assess the achievements of researchers in this field, identify unresolved issues, and predict future research focus. This paper evaluates intra-industry trade as a research program and considers whether it can continue to progress in the future.

The literature on intra-industry trade has developed in various directions, often leading to disjointed strands of research. To add structure to this paper, we will evaluate current perspectives in four distinct areas: theory, measurement, empirical evidence, and policy aspects. By doing so, we aim to provide a more focused assessment of the current perspectives and a comprehensive review of the entire literature.

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2. Historical perspective

The focus on intra-industry trade may have been accidental, as it stemmed from early research in the 1960s by economists interested in the effects of the European Economic Community’s formation on trade patterns. The conventional wisdom suggested that inter-industry specialization would follow trade liberalization, but the early studies by Dreze (1961), Verdoorn (1960), and Balassa (1965) found evidence of increasing intra-industry specialization instead. This led to a lot of documentary work aimed at establishing the extent of the phenomenon in different countries at different points in time. The documentary work culminated in the publication of Grubel & Lloyd (1975) detailed evidence of intra-industry trade at the third digit of the Standard International Trade Classification for all major industrialized countries. Despite this publication, Blair’s description of administered prices as “a phenomenon in search of a theory” could still apply to intra-industry trade. The decade since Grubel and Lloyd’s publication has seen a vast literature on the subject, with theoretical work becoming especially fashionable due to influential publications in the late 1970s. Interest in econometric investigation has also increased, but the methodological difficulties of testing particular models and the exacting data requirements associated with cross-section analysis have limited its proliferation. An econometric literature has emerged, as has a literature on “measurement,” but several fundamental measurement problems remain unresolved. Finally, as models of intra-industry trade proliferated and evidence of its existence accumulated, many analysts turned to questions regarding the policy significance of the phenomenon. The gains from trade and the impact of commercial policy intervention have been extensively explored in recent years.

3. Current perspectives

3.1. On theories of intra-industry trade

There has been significant advancement in the modeling of intra-industry trade beyond the basic models of Gray (1973) and Grubel & Lloyd (1975), which were considered primitive. Intra-industry trade is generally associated with imperfectly competitive product markets where there are diverse consumer preferences, increasing returns, and/or segmented markets. This extension of the analysis of imperfectly competitive product markets from a closed-economy to an open-economy setting has led to a plethora of models of intra-industry trade. These models can be divided into two categories based on large number cases and small number cases. Large number cases assume free entry into the market and diverse consumer preferences, while small number cases deal with oligopolistic competition. While the models differ in their treatment of conjectural variation, product type, and entry conditions, there is some agreement that preference diversity and decreasing production costs are crucial factors in the emergence of intra-industry trade. Moreover, these models have provided a rigorous theoretical foundation for the intuition that scale economies and preference diversity are related to the explanation of intra-industry trade, and these factors can be embedded in both general and partial equilibrium models.
3.2. On the measurement of intra-industry trade

Over the past 25 years, research on intra-industry trade measurement has been ongoing, while theories on the subject have only gained significant attention in the last 6-7 years. Various measures of intra-industry trade and inter-industry specialization have been proposed and refined, with the Grubel-Lloyd index being the most widely used measure of intra-industry trade. However, there is no clear favorite index for measuring intra-industry specialization. Two specific issues related to measurement have received academic interest: (i) whether and how to adjust for aggregate payments imbalance, and (ii) the identification and adjustment for categorical aggregation. Adjusting for aggregate payments imbalance is not universally accepted, and adjusting for categorical aggregation is the more significant problem. There is no single level of aggregation that corresponds ideally to the industry level, and grouping activities within a particular statistical category inaccurately can result in misleading indications of actual intra-industry trade. Despite this, some progress has been made in exploring the properties of popular indices and resolving some of their shortcomings, including attempts to regroup industrial data and proposing an adjusted Grubel-Lloyd measure to deal with categorical aggregation.

4. On the empirical analysis of intra-industry trade

The literature on empirical analysis can be categorized into two types: documentary studies and explanatory studies (Caves, 1981; Lundberg, 1982; Manrique, 1987; Clark, 1993; Veeramani, 2001, 2002, 2007, 2009; Aggarwal & Chakraborty, 2017, 2019, 2020a). Documentary studies report intra-industry trade results for a given country or countries at a particular time while explanatory studies try to explain the observed country or industry differences in intra-industry trade using an econometric approach (Clark, 2010; Dennis & Shepherd, 2011; Yoshida, 2013; Banik & Das, 2014; Aggarwal & Chakraborty, 2020b, 2020c, 2021, 2022). Although documentary studies are relatively straightforward, measurement difficulties still exist. However, they provide a vast data bank of evidence on recorded intra-industry trade and information on the features of the phenomenon that allow for the identification of “stylized facts.” These include the direct relationship between the growth of per capita income and intra-industry trade, higher levels of intra-industry trade in developed market economies, and the prevalence of intra-industry trade in manufactures compared to non-manufactures. Econometric analysis of this issue is challenging because of methodological and practical difficulties. Nonetheless, a few studies have been published that test hypotheses related to industry and country characteristics, which consistently indicate that taste similarity, product differentiation, decreasing costs, and market concentration are deterministically related to intra-industry trade (Bano, 2014; Singh, 2014; Doruk, 2015; Aggarwal, 2016, 2017a, 2017b, 2020, 2023a, 2023b, 2023c, 2023d). The literature now provides a more complete comprehension of the factors that explain intra-industry trade than it did a decade ago (Roy, 2017; Feng, 2018; Hoang, 2019; Aggarwal et al., 2021, 2022, 2023a, 2023b). The major empirical papers on intra-industry trade are summarized in Table 1.
### Table 1. Literature on Intra-Industry Trade

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Objective</th>
<th>Dataset</th>
<th>Dependent Variable</th>
<th>Explanatory Variable</th>
<th>Estimation Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>R. Loertscher &amp; F. Wolter</td>
<td>Analyze the country and industry-specific determinants of intra-industry trade in OECD countries</td>
<td>Dataset: 1971 – 1973</td>
<td>IIT</td>
<td>Product differentiation, Scale economies, Transaction costs, Level of aggregation, Distance, Product group, Development stage differential, Average Market size, Market size differential, Custom union dummy, Language group dummy, Border trade dummy</td>
<td>OLS</td>
</tr>
<tr>
<td>1981</td>
<td>R.E. Caves</td>
<td>Analyze the determinants of IIT in USA</td>
<td>Dataset: 1953 – 1970</td>
<td>IIT</td>
<td>Product heterogeneity, Standard deviation of rates of profit, R&amp;D, Ratio of market planning to total costs, Ratio of selling-related costs to total costs, Advertisement expenditure, FDI, Cost disadvantage ratio, Scale economies, Distance, Average trade weighted tariff, Minimum efficient plant scale</td>
<td>PCA, OLS, Logit</td>
</tr>
<tr>
<td>1987</td>
<td>G.G. Manrique</td>
<td>Examine pattern of trade between US and 7 NICs</td>
<td>Dataset: 1965-1976</td>
<td>IIT</td>
<td>Tariff, Product heterogeneity, Four-firm concentration ratio, Product differentiation, Scale economies, R&amp;D, Average wage</td>
<td>OLS,</td>
</tr>
<tr>
<td>1989</td>
<td>Y.S. Lee</td>
<td>Identify the determinants of IIT among the Pacific Basin countries</td>
<td>Dataset: 1970, 1980</td>
<td>IIT, HIIT, VIIT</td>
<td>Difference in per capital income, Difference of capital-labour ratio, Effective tariff rates, Distance, FDI, Product differentiation, Economies of scale, R&amp;D</td>
<td>Logit</td>
</tr>
<tr>
<td>1990</td>
<td>J.H. Bergstrand</td>
<td>Identify the determinants of IIT in select SITC industry groups of OECD countries</td>
<td>Dataset: 1976</td>
<td>IIT</td>
<td>Average GDP, Average per capita GDP, Average tariff level, Capital-labour endowment ratio, Adjacency dummy Minimum efficient scale, Advertising-to-sales ratio, Consumer goods ratio, Capital-to-labour ratio, Sectoral dispersion index, Inventory ratio, Number of tariff-line level products, Value of industry shipments, Four-firm concentration ratio, Ad-valorem tariff rate, Non-tariff barrier</td>
<td>WLS, Logit</td>
</tr>
<tr>
<td>1993</td>
<td>K.S. Hughes</td>
<td>Identify key determinants of IIT for the largest OECD economies</td>
<td>Dataset: 1980-1987 at 4 digit data based on ISIC</td>
<td>IIT, LIIT</td>
<td>Product heterogeneity, Five-firm concentration ratio, R&amp;D, Product differentiation, Economies of scale, R&amp;D</td>
<td>OLS, Fixed-effects</td>
</tr>
<tr>
<td>1994</td>
<td>P. Chow, M. Kellman &amp; Y. Shachmurove</td>
<td>Examines the intra-industry trade of the four East Asian Newly Industrialized Countries (Hong Kong, Singapore, South Korea and Taiwan) with European markets, Japan and the United States</td>
<td>Dataset: 1965-1990</td>
<td>IIT</td>
<td>Product differentiation, Scale economies, GNP, Influence of MNCs, Income similarity</td>
<td>OLS</td>
</tr>
<tr>
<td>1994</td>
<td>J.G. Hirschberg, I.M. Sheldon &amp; J.R. Dayton</td>
<td>Analyze the determinants of IIT in food processing sector for a sample of 30 countries</td>
<td>Dataset: 1964-1985</td>
<td>IIT</td>
<td>GDP per capita, GDP Size, Exchange Rate, Distance, Border, FTA</td>
<td>Tobit</td>
</tr>
<tr>
<td>1995</td>
<td>P.K.M. Tharakan &amp; B. Kerstens</td>
<td>Analyse the nature of IIT in toy industry in EC countries</td>
<td>Dataset: 1970-1987</td>
<td>IIT</td>
<td>FDI, Average weighted tariff, Similarity of income distribution in the countries, Propensity of product to be vertically differentiated, Propensity of product to be horizontally differentiated, Country dummy</td>
<td>Logit</td>
</tr>
<tr>
<td>1999</td>
<td>L. Nilsson</td>
<td>Examines country determinants of the EU countries IIT with the developing countries</td>
<td>Dataset: 1980-1992 at the</td>
<td>IIT</td>
<td>Absolute difference in GNP per capita, Average GNP per capita, Absolute difference in GNP, Average GNP, Distance, Binary variable for NIC countries</td>
<td>OLS, Non-linear least squares</td>
</tr>
</tbody>
</table>

S. Aggarwal, JEB, 10(1-2), 2023, p.1-12.
<table>
<thead>
<tr>
<th>Year</th>
<th>Author(s)</th>
<th>Title and Summary</th>
<th>Dataset/Period</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>C. Veeramani</td>
<td>Analyze intensity of IIT across countries and sections to understand trade liberalization on IIT&lt;br&gt;IIT: Per capita income difference, Technology gap, Human capital endowment difference, Income distribution similarity, Market size, Market size difference, level of trade restriction, Inward FDI</td>
<td>1987-98, 1994-95, 1998-99</td>
<td>Probit and Tobit regression</td>
</tr>
<tr>
<td>2002</td>
<td>C. Veeramani</td>
<td>Analyze trends and country-specific factors affecting India's IIT&lt;br&gt;IIT: Per capita income difference, Differences in the pattern of income distribution, Market size, Distance, Categorical aggregation&lt;br&gt;Difference of capital-labour ratio, Difference of fertile land-to-labour ratio, Difference in per capital income, Stringency of environment regulations, Border dummy</td>
<td>1988, 1995, 2000</td>
<td>OLS, Tobit</td>
</tr>
<tr>
<td>2003</td>
<td>M.A. Cole &amp; R.J.R. Elliott</td>
<td>Examine the impact of environmental regulations on trade patterns&lt;br&gt;IIT: Size of manufacturing sector, Capital-labour ratio, GNP per capita, Tariffs, FDI</td>
<td>1995</td>
<td>Panel regression, Two stage least-squares, OLS, Fixed-effects, OLS, Granger causality</td>
</tr>
<tr>
<td>2005</td>
<td>D. Chakraborty &amp; P. Bhattacharyya</td>
<td>Assess India's export performance and attempts to analyze various features of India's export basket&lt;br&gt;IIT: GDP, Index of industrial production, Competitiveness of Indian exports</td>
<td>1994-2002</td>
<td>Granger causality</td>
</tr>
<tr>
<td>2006</td>
<td>J.H. Bergstrand &amp; P. Egger</td>
<td>Analyze the determinants of IIT in the explicit presence of trade costs&lt;br&gt;IIT: GDP, Manufacturing as a proportion of GDP, Capital-output ratio, Final consumption expenditure of households, Total trade volume, Foreign investment, Custom's duty as a proportion of import value</td>
<td>1990-2000</td>
<td>OLS</td>
</tr>
<tr>
<td>2007</td>
<td>C. Veeramani</td>
<td>Analyze the industry-specific determinants of IIT in Indian manufacturing industries&lt;br&gt;IIT: Similarity in GDP, Bilateral sum of GDP, Difference in bilateral labour ratio, Bilateral homogeneous transport costs, Difference in differentiated and homogeneous goods transport costs</td>
<td>1994-95, 1998-99, 2005-06</td>
<td>Tobit</td>
</tr>
<tr>
<td>2007</td>
<td>Y. Xing</td>
<td>Analyze the dynamic changes of China's IIT with Sino-US countries&lt;br&gt;IIT: Product differentiation, Minimum efficient plant scale, Industrial concentration, FDI, Ratio of gross value added to value of output, Industry group dummies</td>
<td>1990-2004</td>
<td>OLS</td>
</tr>
<tr>
<td>2009</td>
<td>C. Veeramani</td>
<td>Analyze the effects of trade barriers and multinationals on the intensity of IIT in a panel of Indian manufacturing&lt;br&gt;IIT: Trade barrier, Product differentiation, Involvement of multinationals in the domestic industry, Minimum efficient scale, Sector dummy</td>
<td>1988 - 1999</td>
<td>Random-effects</td>
</tr>
<tr>
<td>2010</td>
<td>K. Türkcan &amp; A. Ates</td>
<td>To examine patterns of trade in US auto industry&lt;br&gt;IIT: Average market size, Difference in market size, Difference in per capita GDP, FDI, Weighted Distance, Exchange Rate</td>
<td>1989-2006</td>
<td>Random-effects, PCSE</td>
</tr>
<tr>
<td>2010</td>
<td>W.C. Sawyer, R.L. Sprinkle &amp; K. Tochkov</td>
<td>Examine the level of IIT for 22 countries in Ease, Southeast, South and Central Asia</td>
<td>2003</td>
<td>Tobit</td>
</tr>
<tr>
<td>2010</td>
<td>D.P. Clark</td>
<td>Trade association between scale economies and IIT levels in US&lt;br&gt;IIT: Minimum efficient scale</td>
<td>2002</td>
<td>Chi-square test of independence</td>
</tr>
</tbody>
</table>

Journal of Economics Bibliography

2011
A. Dennis & B. Shepherd
Analyze the impact of trade facilitation on export diversification
Dataset: 2005
Export Diversification
Entry Cost, Export Cost, Tariff, Distance, GDP per capita
OLS, Tobit, Fixed-effects, Negative binomial model

2011
R. Baldwin & D. Tagliioni
Analyze the determinants factors explaining trade in the advanced countries
IIT
GDP, Trade costs, Distance, Contiguity, Common Language, Time dummies
Descriptive analysis

2011
T. Ito & T. Okubo
New aspects of IIT in EU Countries
Dataset: 1988-2010
IIT
Exports and Imports
Poisson and gamma pseudo-maximum likelihood estimation, OLS

2011
D. Saslavsky & B. Shepherd
Analyze the importance of LPI on terms of trade in developing countries
Dataset: 2007
Trade Costs
LPI, Distance, Language, Contiguity, Colony, GDP

2012
M. Shahbaz, N.C. Leitão & M.S. Butt
Analyze the determinants of IIT between Pakistan and its trading partners
Dataset: 1980-2006
Log IIT
Difference in GDP, Lowest value of GDP per capita, Highest value of GDP per capita, Average GDP per capita, Distance, FDI, Trade Imbalance
OLS

2012
V. Botrić
Analyze the determinants of IIT between Western Balkan countries and old European Union Member States
Dataset: 2005-2010
IIT
Border, Distance, Export cost, Exporttime, GDP per capita, Gross fixed capital, Employment
OLS

2012
Y. Yoshida
International fragmentation and Vertical Specialization in Asia
Dataset: 1988-2006
IIT
GDP, prefecture GDP, difference in GDP per capita, prefecture intensive margin, prefecture extensive margin
Fixed-effects, Random-effects

2012
N. Banik & K.C. Das
Examine the effect of IIT on location substitution effect in China
Dataset: 2000-2009
Total value of final manufactured goods
Primary, intermediate and machinery imports, GDP
GMM, Two stage least-squares

2013
R. Puertas, L. Marti & L. Garcia
Examine the relative importance of logistic performance in export competitiveness in EU
Dataset: 2005 – 2010
Exports
LPI, Product competitiveness, Tariff
Two – Stage Heckman model

2013
P. Varma & A. Ramakrishnan
Analyze the structure and determinants of trade in agri-food products between India and members of its FTA
Dataset: 2003-2011 at 4 digit level of HS
Classificati
on
Exports and Imports
Trade Reciprocity Index

2014
S. Bano
Investigate trade intensities between New Zealand and China
Dataset: 1980-2012
Export Intensity Index and Import Intensity Index
Exports, Imports, World exports, World imports
OLS, Tobit, Log likelihood

2014
S. Kumar & S. Ahmed
Deeper trade integration between India and Bangladesh
Dataset: 1975-2010
IIT
Exports and Imports
Description analysis

2014
M.L. Singh
Relationship of IIT between India and ASEAN
Dataset: 1997-2010
IIT
Institution proxied by OMI, lag(OMI)
PCA, VECM, Cointegration

2015
Ö.T. Doruk
Analyze the effect of R&D expenditure on IIT in Turkey
Dataset: 1990 - 2010
IIT
R&D

2015
S. Kumar & S. Ahmed
Examine the determinants of export and import flows of countries in the South Asia
Dataset: 1985-2011
IIT
GDP, Population, Tariff, Distance, Relative factor endowments, SAFTA dummy, Border Dummy, Language dummy
OLS, Random-effects

2015
S. Marius-Răzvan & S. Camelia
Examine the determinants of IIT in the motor vehicle parts and accessories sector from Romania
Dataset: 1995 - 2012
IIT
GDP per capita, Relative country size, R&D, Difference in physical capital endowments, lagged (IIT)
Panel GMM

2016
J. Lapinska
Country specific determinants of intra – industry exchange between Poland and its EU trading partners
Dataset: 2002-2011
IIT
Difference in GDP, FDI, Share of processed products in total trade volume, Degree of trade imbalance, Language, Distance, GDP
Pooled OLS, Fixed-effects, Random-effects

2016
G. Kaur, J.K. Dhami, & V. Sarin
To study the impact of BIMSTEC on India and Thailand trade relations
Time Series Data: 1997-2014
IIT
Exports and Imports
Percentage share of imports and exports

S. Aggarwal, JEB, 10(1-2), 2023, p.1-12.
5. Policy-Issues

Intra-industry trade presents intriguing policy questions, as discussed in Giersch (1979). Three questions in particular arise: what are the gains from intra-industry trade, and how do they differ from those of inter-industry trade? Is adjustment to trade expansion smoother in intra-industry trade than in inter-industry trade? And if trade flows are restricted using tariffs or subsidies, how do price-output effects compare to those in inter-industry trade? The gains from intra-industry trade differ from those of inter-industry trade, with the former relying heavily on increased product variety and the latter on exploitation of scale economies. The magnitude of gains depends on various factors, including product variety, transport costs, and the procompetitive effects of domestic markets. While some argue that

S. Aggarwal, JEB, 10(1-2), 2023, p.1-12.
adjustment to trade expansion is smoother in intra-industry trade due to
greater similarity in factor input ratios, empirical support for this proposition
is limited. Most research on policy issues has focused on examining the impact
of commercial policy interventions, but results are highly sensitive to model-
specific assumptions. Nonetheless, the theory of optimal intervention remains
useful in evaluating policy interventions. Despite the complexities involved,
progress has been made in understanding the impact of policy intervention in
markets with characteristics frequently observed in the real world.

Progress in resolving policy issues related to trade and industrial
interventions is largely dependent on advancements in theory, measurement,
and empirical analysis. The development of theoretical models will lead the
way in further examining the effects of trade and industrial interventions. This
will result in the distillation of general principles, rather than analyzing
intermediate cases that do not rely on fully segmented or integrated markets.
Since arguments for intervention often rely on explicit asymmetries, analyzing
the nature of these asymmetries would help in developing a comprehensive
policy framework. The question of adjustment is also a significant policy issue
that requires further theoretical and empirical analysis. The gains from trade
and costs of protection question need more clarification, and both partial and
general equilibrium analysis could be deployed to comment on this. The
structure of protection is also an important issue that needs exploration,
especially with regards to the effective protection concept in the context of
intra-industry trade.
References


### Journal of Economics Bibliography


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S. Aggarwal, JEB, 10(1-2), 2023, p.1-12.
Journal of Economics Bibliography


S. Aggarwal, JEB, 10(1-2), 2023, p.1-12.

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