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Dutta, Sourish

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Sourish Dutta
Centre for Development Studies

Abstract

From a historical perspective, the development of research studies concerning the emergence of intra-industry trade is fruitful interaction between theoretical explanations and empirical methods to measure this phenomenon. The foundation of indicators to measure the intensity of intra-industry trading caused the rise of theoretical models explaining the determinants of these trade flows. It also contributed to the debate on the need to distinguish, in empirical analyses, intra-industry trade in horizontal differentiation from that in vertical differentiation.

Keywords: Intra-Industry Trade, Horizontal Differentiation, Vertical Differentiation

1 Introduction

Starting from the end of 1960s, the problem of measuring intra-industry trade lies at the very origin of the literature on intra-industry trade. A series of empirical works describe the intensive & extensive existence of this phenomenon through statistical indicators. Indeed, Greenaway and Milner (2003) asserts that the entire literature started with statistical measurement. Among the foundational works on intra-industry trade, the articles of Balassa (1965, 1966) and the book of Grubel and Lloyd (1975) are especially notable. Because the indicators developed by these authors have acquired a seminal status in the empirical analysis of international trade, these works preceded and triggered the development of different theoretical explanations of intra-industry trade.

The theoretical analyses of intra-industry trade explore the phenomenon by adopting disparate assumptions about the nature of returns to scale, the typology of markets, and the differentiation of products subject to this type of trade. Krugman (1979), Lancaster (1980) and Helpman (1981) explain the rise intra-industry trade in horizontally differentiated products within a framework of monopolistic competition. Falvey (1981) and Shaked and Sutton (1984) respectively study the trade of vertically differentiated products in the context of perfectly competitive and oligopolistic markets. Meanwhile, Brander (1981) models the intra-industry exchange of perfectly homogeneous (and therefore undifferentiated) goods in an oligopolistic market context.

2 Analyses

The determinants of intra-industry trade highlighted by these theoretical works are different and depend, in particular, on the type of differentiation taken into account in the various analyses. In monopolistic competition models of Krugman (1979), Lancaster (1980), and Helpman (1981), a necessary condition for the development of intra-industry trade in horizontal differentiation is the existence of economies scale in the production of different varieties. On the other hand, Falvey (1981) explains intra-industry trade in a vertical differentiation setting by the difference between the relative factor endowments of countries, where the production of all goods is in the assumption of constant returns to scale. The prediction of Falvey (1981) model depends crucially on the following assumption. The production of higher quality differentiated goods requires a greater amount of capital per unit of labour than the production of relatively low-quality ones. However, in the case of measuring intra-industry trade using very disaggregated product classifications,

the assumption about the products in that same level of disaggregation having different factorial contents is debatable. In fact, Vona (1990, 1991) indicate the similarity between factor contents of products belonging to the same statistical category is very high at the disaggregated product detail levels of international classifications.

The theoretical analyzes developed during the 1980s help to strengthen the impression that intra-industry trade is a complex phenomenon and multifaceted. Indeed, the Chamberlin-Heckscher-Ohlin (C-H-O) model proposed by Helpman and Krugman (1987) explains the simultaneous growth of intra-industry trade (in horizontal differentiation) and inter-industry trade between countries. In this framework of economies of scale in the production of differentiated goods, intra-industry trade is the most important if the endowment of relative factors of production of the countries are similar, while the share of inter-industry trade is an increasing function of the difference between these endowments.

The determinants of intra-industry trade highlighted by Falvey (1981) and Helpman and Krugman (1987) are not only different, but also irreconcilable. Indeed, Falvey (1981) predicts a positive relationship between the difference in factor endowments among countries and the rise of intra-industry trade (in vertical differentiation), while the authors Helpman and Krugman (1987) show a negative relationship between the difference in factor endowments and the development of intra-industry exchanges (in horizontal differentiation). At the same time, the econometric analyses of intra-industry trade were carried out during the 1980s. The works of Balassa and Bauwens (1987) and Helpman (1987) do not lead to conclusive results of the sign of the existing relationship between the similarity of the factor endowments of trading partners and the share of intra-industry trade in bilateral trade (measured by the index of Grubel and Lloyd (1975)). Greenaway and Torstensson (1997) express very clearly the lesson that can be drawn from this first wave of econometric analyzes aimed at testing intra-industry trade theories:

> "... the determinants for vertical and horizontal intra-industry trade seem to differ. This may explain why when using total intra-industry trade as the dependent variable different econometric results have led to different conclusions. In other words, if the dependent variable in a regression is heterogeneous, it is not surprising that the coefficient for the explanatory variables is somewhat unstable."

In other words, econometric models including an intra-industry trade index total (without distinction between horizontal and vertical differentiation) as an explained variable are probably poorly specified insofar as the theoretical analysis

highlighted different determinants for these two types of trade. Moreover, the theoretical models of Falvey (1981) & Helpman and Krugman (1987) suggest that the consequences of these two types of intra-industry trade are very different. In particular, adjustment costs (linked to the reallocation of resources from the importing to exporting sectors) generated by the exchanges of vertically differentiated products are greater than those generated through trade in horizontally differentiated products.

3 Conclusion

All these reasons give rise to the conviction that intra-industry trade in horizontal and vertical differentiation constitute two distinct phenomena, both in terms of determinants and consequences. From the end of the 1980s, this conviction is at the origin of developing methods and statistical indicators to separately measure the extent and evolution of these two types of trade. Thus, the development of research programs concerning intra-industry trade has been a fruitful interaction between theoretical analyses and empirical methods of measuring the importance of this phenomenon. Development of indicators to measure intra-industry trade preceded and triggered the rise of first theoretical explanations of this phenomenon. These in turn, have contributed to reviving the empirical debate on the measurement of intra-industry trade by suggesting the need to distinguish, in empirical analyses, intra-industry trade in vertical differentiation from that in horizontal one (Balboni, 2007).

References

Balassa, B. (1965). Trade liberalisation and "revealed" comparative advantage 1. *The manchester school*, 33(2):99–123.

Balassa, B. (1966). Tariff reductions and trade in manufacturers among the industrial countries. *The American Economic Review*, 56(3):466–473.

Balassa, B. and Bauwens, L. (1987). Intra-industry specialisation in a multi-country and multi-industry framework. *The Economic Journal*, 97(388):923–939.

Balboni, A. (2007). *Le commerce intra-branche en différenciation verticale: Modélisation et mesures empiriques*. PhD thesis, Paris 9.

Brander, J. A. (1981). Intra-industry trade in identical commodities. *Journal of international Economics*, 11(1):1–14.

Davis, D. R. (1995). Intra-industry trade: a heckscher-ohlin-ricardo approach. *Journal of international Economics*, 39(3-4):201–226.

Falvey, R. E. (1981). Commercial policy and intra-industry trade. *Journal of international economics*, 11(4):495–511.

Falvey, R. E. and Kierzkowski, H. (1987). Product quality, intra-industry trade and (im) perfect competition. Technical report.

Finger, J. M. (1975). Trade overlap and intra-industry trade. *Economic inquiry*, 13(4):581.

Greenaway, D. and Milner, C. (2003). What have we learned from a generation's research on intra-industry trade? GEP Research Paper 44, University of Nottingham.

Greenaway, D. and Torstensson, J. (1997). Back to the future: Taking stock on intra-industry trade. *Review of World Economics*, 133(2):249–269.

Grubel, H. G. and Lloyd, P. J. (1975). *Intra-industry trade: the theory and measurement of international trade in differentiated products*, volume 12. Macmillan London.

Gullstrand, J. (2002). Does the measurement of intra-industry trade matter? *Weltwirtschaftliches Archiv*, 138(2):317–339.

Helpman, E. (1981). International trade in the presence of product differentiation, economies of scale and monopolistic competition: A chamberlin-heckscher-ohlin approach. *Journal of international economics*, 11(3):305–340.

Helpman, E. (1987). Imperfect competition and international trade: Evidence from fourteen industrial countries. *Journal of the Japanese and international economies*, 1(1):62–81.

Helpman, E. and Krugman, P. (1987). *Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy*. MIT press.

Krugman, P. R. (1979). Increasing returns, monopolistic competition, and international trade. *Journal of international Economics*, 9(4):469–479.

Lancaster, K. (1980). Intra-industry trade under perfect monopolistic competition. *Journal of international Economics*, 10(2):151–175.

Shaked, A. and Sutton, J. (1984). Natural oligopolies and international trade. in. kierzkowsky, h.(ed.), monopolistic competition and competition in international trade.

Vona, S. (1990). Intra-industry trade: a statistical artefact or a real phenomenon? *PSL Quarterly Review*, 43(175).

Vona, S. (1991). On the measurement of intra-industry trade: some further thoughts. *Weltwirtschaftliches archiv*, 127(4):678–700.

4 Appendix: Issues of Industrial Disaggregation

A recurring problem in empirical analyses of intra-industry trade is that of the "right choice" of the level of disaggregation of the industrial classification used to define the empirical "industries". Finger (1975) initially noted, when the industrial categories retained in the empirical analysis to define the "industries" are not sufficiently disaggregated, they group together products characterized by different factor intensities. In this context, a high level of intra-industry trade, measured using the empirical methods described in the previous subsections, constitutes a "statistical illusion". As cross-flows of products with sufficiently different factor intensities are considered intra-industry trade, ultimately they indicate inter-industry trade. The problem highlighted by Finger (1975) is generally defined as the problem of categorical aggregation.

Criticism of Finger (1975) is addressed in particular to Grubel and Lloyd (1975), who use the 3-digit SITC classification to define "industries" in their empirical analysis. This criticism is based on the theoretical definition of the industry specific to the H-O-S (Heckscher-Ohlin-Samuelson)) theory of international trade. Finger (1975) shows that at this level of disaggregation of empirical "industries", the variability between ratios of the factors used in the production of goods inserted in the same category is greater than between the ratios of the factors used in the production of goods belonging to different categories. Thus, according to Finger (1975), the industry is defined as a group of products characterized by a similar factor intensity at a given level of the relative prices of the generic factors of production. The "industries" retained in the empirical analysis must then

be consistent with this definition, otherwise, the results of the analysis will be invalidated. In this regard, we make the following remarks.

The theoretical definition of the industry specific to the H-O-S model, also retained in the models of Helpman and Krugman (1987) and Davis (1995), is not the only possible theoretical definition of the industry (see Chapter I). For example, this definition is not retained in the theoretical model developed by Falvey and Kierzkowski (1987), according to which the same industry includes products characterized by different capital/labour ratios. For these authors, capital is not a generic factor (which can be used indifferently in all industries), but it is specific to each industry producing differentiated goods. Thus, in their model, the industry is defined as a group of goods whose production requires the implementation of the same factors of production (and not the same factor intensities).

From this paper's point of view, a preliminary step necessary for any empirical analysis measuring the level and evolution of intra-industry trade consists in specifying the theoretical model retained as the reference explanation of trade flows. The choice of the industrial classification and its level of disaggregation, used to define the empirical "industries", must then be justified with regard to the definition of the industry used in the theoretical reference model.

If the theoretical model retains the H-O-S definition of the industry, we need to look for the best level of disaggregation of the industrial classification. Gullstrand (2002) proceeds in the manner described above when seeking an industrial classification consistent with the theoretical model of Helpman and Krugman (1987), retaining the H-O-S definition of the industry. This author asserts that the 6-digit Combined Nomenclature and Harmonized System subheadings include products with similar factorial contents. Thus, he admits that the empirical "industries" corresponding to the 6-digit categories of these classifications respect, in general, the H-O-S definition of the industry. Furthermore, when the H-O-S definition of the industry is used, an excessive industrial disaggregation of the data analyzed can cause biased results about the measurement of inter-industry and intra-industry trade.