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What Have We Learned from a Generation's Research on Intra-Industry Trade?

by

David Greenaway and Chris Milner

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The Authors

David Greenaway is Professor of Economics and Director of the Leverhulme Centre for Research on Globalisation and Economic Policy (GEP). Chris Milner is Professor of International Economics and an Internal Research Fellow of GEP.

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Abstract

This paper evaluates the research that has taken place on intra-industry trade (IIT) since the publication of Grubel and Lloyd's pioneering volume on the subject in 1975. The evaluation of the development of the literature is organised around the themes of measurement, explanation and policy. The paper identifies significant progress on all these themes. We now have a robust theoretical framework for explaining IIT and better measurement and econometric tools for documenting alternative types of IIT and for testing alternative models of IIT. Finally, although the welfare and adjustment effects of IIT may be different or more complex than in the case of inter-industry trade and there may be new specific arguments for protection, they do not provide a general case for interventionist trade policies.

JEL classification: F12, F14

Keywords: Intra-Industry trade, trade measures, trade theory, trade policy.

Outline

Non-Technical Summary

In 1975 Grubel and Lloyd published a book on intra-industry trade (IIT) that pioneered a generation of research on IIT's empirical, theoretical and policy implications. The idea of simultaneous importing and exporting of similar products by a country is now formally and robustly embodied in the international trade literature. As a contribution to a *Festschrift* in honour of Peter Lloyd, this paper evaluates the research that has taken place in the period since 1975. It does not seek to provide a comprehensive review of what is the enormous research agenda and literature that followed Grubel and Lloyd (1975). Rather the paper offers an evaluation of the development of the literature and of the state of our understanding of how to measure and decompose IIT, how to model IIT theoretically and empirically and what the trade policy implications of the presence of IIT are. Under the broad themes of measurement, explanation and policy, the paper tracks the main research developments and offers an evaluation of the lessons that can be learned from the development of this research. It establishes that there has been substantial progress on all fronts. No longer is IIT viewed with scepticism, a possible 'statistical artefact' without theoretical underpinning. We now have robust and general models where inter-industry trade in homogenous goods and intra-industry trade in differentiated products are simultaneously determined. We have a better understanding of how data aggregation and classifications bias the measurement of IIT but of how to allow for such influences and of how to decompose aggregate IIT indices. This has allowed the empirical literature to evolve from description or correlation towards more rigorous testing of theory. Finally, the evaluation of the policy implications of IIT argues that, although the benefits and adjustment effects of IIT expansion are more complex in a world of product differentiation, scale economies and imperfect competition than that of intra-industry trade and neo-classical conditions, we should not fundamentally revise the general rules of trade policy. The presence of IIT may provide new specific arguments for protection but not a general case for interventionist trade policies.

1. INTRODUCTION

Peter Lloyd has enjoyed a long and distinguished career, over which he has made a great many contributions to the international economics literature. Moreover, his contributions have been to theory, empirical analysis and policy evaluation. In deciding upon an appropriate topic for a *Festschrift* in his honour, one is therefore potentially spoiled for choice. But for us, the choice was straightforward: intra-industry trade.

We chose this for two reasons. First, despite the fact that in terms of number of publications, Peter's contributions on this subject are relatively modest (4 articles, 3 chapters, 2 edited volumes and 1 book)[1] their impact and especially that of the book (Grubel and Lloyd 1975) has been enormous. So much so in fact that intra-industry trade (IIT) would be the first topic that comes to mind for most of us when we think of Peter's work. Grubel and Lloyd (1975) is his most widely cited work, not only because it develops the famous Grubel and Lloyd index of IIT, but also because it was the first systematic and comprehensive analysis of IIT and became a major stimulus to a large number of young scholars to work in the area. That is the second reason why the topic is a natural for us, we were among those (then) young researchers who were stimulated by the book to develop a research agenda from it.

Since the publication of Grubel and Lloyd (1975) an entire generation's work has been completed. In this paper we will take the book as our starting point and evaluate the development of this literature around three themes – measurement, explanation and policy – which essentially map onto the three substantive parts of the volume. For each theme we will aim to set out 'what we have learned' as well as commenting, as appropriate, where the literature is headed. These three themes comprise Sections 2 through 4, whilst Section 5 concludes.[2]

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[1] The articles are: Grubel and Lloyd (1971), Lloyd (1989), Lloyd (1994) and Greenaway, Lloyd and Milner (2001); the chapters, Grubel and Lloyd (1979), Lloyd (1989) and Greenaway, Lloyd and Milner (2001); the edited volumes, Lloyd and Hyun Lee (2002) and Grubel and Lloyd (2003) and the book Grubel and Lloyd (1975).

[2] The authors have been involved with two earlier syntheses and reviews of the literature, namely Greenaway and Milner (1987) and Greenaway and Torstensson (1997). Although this paper does not directly draw upon either, it has been influenced by both and the contributions of the late Johan Torstensson is gratefully acknowledged.

2. THE MEASUREMENT OF INTRA-INDUSTRY TRADE

In some respects, measurement may seem like the wrong starting point. As economists, we generally start with theory, then when we think we have something to explain, take it to the data. But in this instance it is actually quite a sensible place to start, because the entire literature started with 'measurement'. Essentially the IIT research programme was initiated by several papers probing for the effects of the establishment of the (then) European Economic Community on trade patterns, most notably Dreze (1961), Verdoorn (1960) and Balassa (1965). Standard customs-union theory as articulated by Viner (1950) predicted increased inter-industry specialisation and in its wake, serious adjustment frictions. What the early documentation pointed to however was in fact increased intra-industry specialisation.

This surprising discovery had two effects. First, it led to the prediction (first set out in Balassa, 1965) that adjustment to European integration would be smoother than expected, because frictions associated with reallocating resources within as opposed to between industries would be less. This so-called 'smooth adjustment' hypothesis has enjoyed remarkable longevity and we will return to it in Section 4. The other effect was to stimulate further research into the extent of IIT, which in turn stimulated work on its measurement. Peter Lloyd's first and ultimately most lasting contribution to the literature was on measurement, with the development of the Grubel and Lloyd index, set out in Grubel and Lloyd (1971) (1975).

At its most basic, the Grubel and Lloyd (GL) index can be written as:

$$Bj = \frac{(Xj + Mj) - 1Xj - Mj1}{(Xj + Mj)}$$

or

$$\mathrm{Bj} = 1 - \frac{1\mathrm{Xj} - \mathrm{Mj1}}{(\mathrm{Xj} + \mathrm{Mj})}$$

In other words, for a given industry j, the index measures the extent to which exports and imports are matched, relative to total trade in the commodity grouping in question. Clearly Bj lies in the interval of zero to one: in the case of the latter all trade is intra-industry, whilst at its lower bound there is no IIT[3].

This index, or to be more accurate, what it purported to measure, was far from being uncontroversial as Lloyd (2002) reminds us. The two main issues were *categorical aggregation* and *adjustment for aggregate payments imbalance*. We do not propose to spend any time on the latter as we have never regarded it as a very substantive issue. In essence it refers to the argument that when aggregate goods trade is unbalanced, IIT indices may be biased downwards. Grubel and Lloyd (1975) suggested a 'correction' for aggregate trade imbalance as have Aquino (1978) and Bergstrand (1983). Quite apart from the technical shortcomings of particular corrections, we argued some time ago that there were no strong a priori arguments for adjustment since at the end of the day we have no *ex ante* knowledge of what constitutes a particular set of 'equilibrium' transactions. At a given point in time the balance of transactions across industries is presumably fashioned largely by underlying drivers of comparative advantage, (see Greenaway and Milner, 1981).

Categorical aggregation on the other hand is much more fundamental and goes to the very heart of what the GL index (and of course variants thereof) actually measures. The core of the issue is how well statistical classifications map on to industries. Most researchers tend to equate an industry with the 3rd digit of the SITC or equivalent. Some critics, most notably Finger (1975) and Rayment (1976) have argued that at this level of aggregation, there is greater variability in factor ratios within than between (3rd digit) industries. Indeed, Finger (1975) went so far as to assert that this problem was so fundamental as to render measured IIT largely a 'statistical artifact'.

[3] There are commentators who prefer to distinguish between one-way and two-way trade (eg Fontagne and Freudenberg 2002) rather than the share of trade overlap in an industry's gross trade. The GL index has however the attractive attribute of providing a decomposition which helps to reconcile traditional trade theory explanations of net trade and new trade theories of overlapping trade.

There is no doubt that at any chosen level of aggregation there will be some measurement error because of the inexact mapping of statistical categories onto groups of activities with similar factor ratios that we can think of as industries. But, as Greenaway and Milner (1983) demonstrated using UK data, there are relatively straightforward adjustments that one can make to the GL index to give one greater confidence that what one is looking at is trade in similar products rather than vagaries of a particular aggregation system. Moreover the fact that the GL index is still being routinely used a generation later tells its own story (Evenett and Keller, 2001 and Brulhart and Elliott, 2002 being a couple of recent examples). Besides which, the literature has moved on in other ways, most notably in respect of the measurement of marginal intra-industry trade (MIIT) in disentangling horizontal and vertical intra-industry trade (HIIT and VIIT) and in constructing indexes of international trade and production.

Marginal Intra-Industry Trade: The limitations of using *changes* in the standard GL index to capture the *dynamics* of changes in IIT are widely recognised. The first attempt to construct an index of MIIT is Hamilton and Kneist (1991). They argued that for purposes of evaluating the adjustment consequences of trade expansion it was important to focus on how IIT changes at the margin. They offered an index which effectively calculated the proportion of the *changes* in exports or imports which is matched. Although there are a range of shortcomings associated with the Hamilton-Kneist index, as set out in Greenaway, Hine, Milner and Elliott (1994) and Brulhart (1994) (both of which offer alternatives), their fundamental insight is an important one – if we are interested in adjustment, appropriate measures of MIIT are essential. A number of recent studies have incorporated MIIT indices, including Dixon and Menon (1997) and Brulhart and Elliott (2002), albeit with mixed results. Work is ongoing on this issue and a recent paper by Lovely and Nelson (2002) is the first to look carefully at the theoretical underpinnings to MIIT indices and their link to labour market adjustment.

Horizontal and Vertical IIT: The standard definition of IIT is the simultaneous import and export of differentiated products. But of course products can be differentiated horizontally (different varieties of a given good) and vertically (different qualities of a given variety). Moreover, as we shall see in the next Section, theory has developed to provide underpinnings to trade in both. But the GL index aggregates the two and if their determinants vary as indeed

they do, that can result in measurement error. In recognition of this, over the last decade extensions of the GL index have been developed and applied by Abd-el-Rahman (1991), Greenaway, Hine and Milner (1994), (1995) and Fontagne and Freudenberg (1997) which disentangle HIIT and VIIT. Starting from the presumption that differences in quality are reflected in differences in price, they use unit value data to separate the two. This particular method is now being extensively applied in the empirical literature. Among other things it is facilitating a shift in emphasis in empirical work away from estimation towards testing[4].

Extended Intra-Industry Trade: The development of measures of HIIT and VIIT is a nice example of feedback from theory to measurement. Another example of this is the more recent development of a measure of *extended intra-industry trade* by Greenaway, Lloyd and Milner (2001). Since Agmon (1979) it has been recognised that armslength IIT and cross-border production may be complements rather than substitutes. That being so, the simple GL measure misses an important aspect of the globalisation of production. To provide a more complete picture, Greenaway, Lloyd and Milner (2001) propose a measure which has three components: the two way exchange of international trade in goods; two way exchange of international production; two way exchange of international trade for international production. The first component is obviously IIT; the second cross-border affiliate sales and the third, the interaction between trade and affiliate sales. Independently Hummels, Ishii and Wei (2001) have developed a measure with a similar purpose in mind. The principal constraint to the wider application of these measures is data on affiliate production. As this data improves however, one can expect to see them more widely deployed.

Lessons From Measurement: What can we conclude about work on measurement since Grubel and Lloyd (1975)? The first point to make is that it was relatively slow to take off, in part because of the preoccupation with explanation in general and theoretical explanation in particular; and in part because IIT was controversial. Over the last 10 years however a great deal of work has been done. As a consequence the starting point when looking at data on IIT is

[4] The second-best nature of their approach, even when decomposing IIT across all industries must be acknowledged. Recent work by Nielson and Luthje (2002) points to some instability of the decomposition across countries in particular. The proliferation of firm level datasets should lead to further refinements in decomposition.

no longer 'does IIT exist?' but 'what kind of IIT are we looking at?' which is our second conclusion. Third, as a consequence of having a richer menu of measures, empirical analysis has progressed from a literature which was essentially about estimation, to one which is increasingly about testing. The final conclusion is that almost all of the useful and useable new measures build upon the GL index. None are radical departures. So, in a very fundamental sense, the GL index remains the bedrock share measure of IIT[5].

3. EXPLANATION OF INTRA-INDUSTRY TRADE

We use the term 'explanation' to encompass both theoretical modelling geared to generating insights about the determinants of IIT and econometric evaluation of those models.

Theoretical Modelling

Grubel and Lloyd (1975) was very influential in stimulating theoretical work as Leamer (1994) acknowledges:

> *"……. the extensive amount of intra-industry trade catalogued by Grubel and Lloyd (1975) …. is also regarded as a blow against the generality of the H-O model and is at least partly responsible for the large theoretical literature on models with increasing returns to scale and monopolistic competition. Other than these…. (i.e. IIT and the Leontief paradox), beliefs about the sources of international comparative advantage have not been greatly affected by any observations".*

Grubel and Lloyd (1975) did not ignore theory, far from it. In fact they discussed three different categories of explanation: *functionally homogenous products*; *differentiated products and economies of scale*; *technology, product cycles and foreign processing*. For a long time the first of these was widely thought of as a catch-all for idiosyncratic drivers of trade, with some justification, though the recent literature on trade costs has placed a renewed emphasis on these factors. The second and third stimulated enormous literatures.

[5] There is a recurring tendency in empirical studies to imply, incorrectly, that the GL index measures the amount of IIT.. It is in fact a measure of the composition of trade, specifically of matched to way trade.

Grubel and Lloyd's (1975) discussion of product differentiation and scale economies was important in that some of the key insights underpinned by subsequent theoretical work are there to be found in an intuitive rather than formal way. The theoretical work which it stimulated developed rapidly, with early key contributions from Krugman (1979), Lancaster (1980), Falvey (1981) and Brander (1980). Krugman picked up on a specific technical innovation, Dixit-Stiglitz preferences, and applied them in an open economy setting. In this model consumers have a love of variety and want to benefit from every variety available, which generates an aggregate demand for goods of varying specification. If a single firm produces a single variety and there is free entry there will be a large number of varieties, but decreasing costs ensure that that number is finite. Even two identical economies will have an incentive to trade, with gains deriving from the exchange of scale economies. Lancaster (1980) starts from the more plausible, but more difficult to model, assumption that consumers have preferred varieties and want more of their preferred variety rather than some of all varieties. So long as consumers have different preferences we still have an aggregate demand for goods of varying specifications and with free entry and decreasing costs, there are still incentives to engage in and gains from trade.

Falvey (1981) is really quite different to Krugman (1979) and Lancaster (1980). Whereas the last two relied upon imperfect competition, Falvey does not. Moreover his consumers are interested in vertically rather than horizontally differentiated products, demand for which is determined by relative income. Quality is determined by relative capital intensity, products with a higher capital-labour ratio being of a higher quality. If countries have different factor endowments, the relatively capital abundant country will export high quality products whilst the relatively labour abundant county exports lower quality products. For obvious reasons this is sometimes referred to a neo-Hechscher-Ohlin model and it helps provide a theoretical underpinning to the empirical literature on vertical and horizontal IIT.

All of the foregoing are 'large numbers' models. Brander (1981) was the first to model 'small numbers' of firms. His was a duopoly model with the two firms playing a Cournot game. He succeeded in demonstrating that even identical firms producing a homogenous product could

engage in cross-hauling. Moreover, although resources are used up in this cross-hauling it could still be socially beneficial as a consequence of pro-competition effects.

These four papers were very influential in underpinning the intuition in Grubel and Lloyd (1975). In terms of the determinants of trade they demonstrated that scale economies may be an important driver, that trade may be stimulated by strategic interaction and that differences in factor endowments might stimulate trade in vertically differentiated goods rather than just inter-industry trade. With a few exceptions (e.g. Falvey, 1981) however, these models told us nothing about the direction of trade. With regard to the gains from trade, these early models showed formally the role of gains from greater product variety, the exchange of scale economies and pro-competitive effects. They stimulated an enormous literature, among the highlights of which are Helpman and Krugman (1985) which effectively signed off the general equilibrium framework for simultaneously determining Heckscher-Ohlin trade and trade in horizontally differentiated goods; Krugman (1989) which extends the Dixit-Stiglitz 'trick' to bring trade costs and location into the picture and Davis (1995), which re-focussed attention on the scope for explaining IIT within the neo-classical trade framework.

Grubel and Lloyd's third class of 'models' was focussed on technology, product cycles and foreign processing. This essentially started form the technology gap and product cycle models of Posner (1961) and Vernon (1966). This work was the precursor to large literatures on changing comparative advantage and the relationship between FDI and trade and more recently on links between trade and the international fragmentation of production. It is now widely recognised and documented that globalisation has encouraged outsourcing and the international fragmentation of production, with a consequent increase in trade in intermediates. In turn this has stimulated considerable interest on the part of theorists to integrate fragmentation into trade models (eg. Jones and Kierzkowski, 1990; Deardorff, 1998). As reported earlier, it also motivated the development of measures of extended IIT.

Econometric Analysis

Econometric analysis is one area of the literature where Grubel and Lloyd (1975) is essentially silent, or perhaps more accurately, muted. In the final part of the book they speculate on possible tests for intra-industry trade, but do not report on any studies, for the simple reason that there were none! What most people regard as the first systematic econometric analysis of the determinants of IIT was in fact published in the same year as Grubel and Lloyd, namely Pagoulatos and Sorenson (1975). Things have changed, partly because of Grubel and Lloyd, partly moreso because of the rapid developments in theory we have reviewed. The latter provided applied economists with a road map which did not exist beforehand.

Econometric analysis of IIT did expand quite rapidly with a proliferation of country specific and multi-country studies in the late 1970s and 1980s. Initially these were largely cross-section, they were largely concerned with estimation rather than testing and results were rather inconsistent, especially where cross-industry variables were concerned.[6] Cross-country variables were more robust. Indeed as Torstensson (1996) demonstrated very effectively using extreme bounds analysis, results were also generally rather fragile.

There seem to be a number of possible explanations for these outcomes. First, although the proliferation of theory did yield testable predictions, aggregate measures of IIT did not offer opportunities to discriminate clearly between the predictions of alternative theories. As a consequence, most empirical models were essentially ad hoc and geared to coefficient estimation. Second, most information was highly aggregated industry specific and country specific data. Not only did this increase the likelihood of errors in measurement, it also placed natural limits on what could and could not be devined from the data.

In the mid-to late 1990s there was a revival of interest in econometric analyses of IIT. In part this was data driven, with the growing availability of micro-level industry and trade data. In part it has also been driven by refinements in the measurement of IIT (as discussed earlier)

[6] Helpman (1987) was the first to direct his empirical testing explicitly towards a specific model (the monopolistic competition model of IIT) using cross-country information only.

which have facilitated a change in strategy away from coefficient estimation towards testing specific theories. Thus, for example, Hummels and Levinsohn (1995) used panels of time series and cross section data to test simultaneously for H-0 and monopolistic competition factors whilst Greenaway, Hine and Milner (1994) (1995) use disaggregated data to test models predicting horizontal and vertical IIT. Even more recent work is beginning to use firm level data to evaluate not only the determinants of trade patterns, but also firm level adjustment to changes in trading arrangements (see Schott, 2001).

Lessons From Explanation: Explanation was at the core of Grubel and Lloyd (1975). However the theoretical analysis was largely intuitive and the statistcal analysis mainly documentary. This was sufficient to stimulate others to follow-up. So here too the literature has moved on a long way. Theoretical work has offered us more solid and robust underpinnings for Grubel and Lloyd's insights, clarified the explanation of vertical and horizontal IIT and provided general equilibrium models which integrate Heckscher-Ohlin trade and IIT. The econometric literature has moved us on from searching from searching for correlations to testing models. In the process we have learned more about the determinants of IIT and also how to search for specific determinants more effectively.

4. POLICY ASPECTS OF INTRA-INDUSTRY TRADE

One of the main purposes of theorizing about the determinants of trade and testing theories is to inform policy. This is no less true of IIT than of other areas. In the case of IIT, the literature has essentially focussed on three (related) questions. First, are the gains from trade different to those associated with Heckscher-Ohlin trade? Second, do we need to revise our thinking regarding the impact of intervention in markets dominated by trade in differentiated products? Third, when trade expands, is adjustment smoother in an environment characterised by IIT as compared to inter-industry trade?

Gains From Trade: We have already alluded to gains from trade. With IIT there exist additional potential sources of gain – increased variety, the exchange of scale economies and

pro-competition effects. Moreover, there has been some formal modelling of these potential gains, for example Krugman (1981). This is an area where empirical analysis has progressed considerably following the important paper by Cox and Harris (1985). What they did was to build a CGE model of Canadian trade, incorporating decreasing costs. The most important finding from this was that once you allow for scale economies, the gains from trade are larger, by an order of magnitude, than the gains computed by 'adding up triangles'. This has stimulated a large literature across a large number of countries that essentially confirms this finding. Moreover, the work has manifestly influenced the policy debate on issues such as the European Union's Single Market programme, NAFTA and APEC.

Adjustment to Trade Expansion: By contrast the issue of adjustment to trade expansion has remained under-researched. Which is superficially anyway, surprising since the initial stimulus to the study of IIT was motivated by the intuition that adjustment would bring fewer frictions if trade flows were largely IIT. The reasons for limited progress are not hard to find: dynamic adjustment paths are not straightforward to model; most economists instinctively think of adjustment costs as the price we pay for change and the evidence we have suggests that they are small relative to the present value of the gains from trade (see Matusz and Tarr, 1999). But, it remains an interesting issue to probe. As argued above, the early literature emphasising greater factor intensity differentials within than between industries seemed to contradict the smooth adjustment hypothesis (eg Finger 1975; Rayment 1976). More recently however, Lundberg and Hansson (1986) and Elliott, Greenaway and Hine (2000) have reported evidence of greater homogeneity within than between industries. There is also evidence that the costs of unemployment in terms of forsaken wages and lower expected lifetime earnings is higher in inter- than intra-industry adjustment (Haynes, Upward and Wright, 2002). Nevertheless, this may not constitute a convincing basis for presuming as some analysts do that marginal IIT indicators merely measure the degree of disruptive trade (eg Dixon and Menon, 1997 and Brulhart and Elliott, 2002).

Effects of Intervention: The area of the policy related literature that stimulated the largest volume of work was that on the effects of intervention. This post-dates Grubel and Lloyd and indeed the initial work on models of trade and monopolistic competition. Perhaps the most

important early contribution here was Krugman's (1984) paper on 'import protection as export promotion'. This certainly excited academic attention. It appeared to be a new second best argument for intervention, even if it sounded a little like the old infant industry case and even if it avoided any welfare analysis (demonstrating only that with decreasing costs, segmented markets and Cournot competition, an import tariff could result in export expansion, but that would not necessarily make the home country better off). It goes without saying that the argument excited even more interest on the part of lobbies and policy makers ever on the lookout for new justifications or intervention!

This literature grew rapidly with some focus on what happens when you introduce tariffs (or subsides) in a monopolistic competition framework but with most attention being paid to small number cases where strategic trade policy seemed possible. Brander and Spencer (1984) is the best known paper here showing how under certain conditions an export subsidy can shift rents from foreign producers and leave the home economy better off. There have been a number of very good surveys of this literature including Helpman and Krugman (1989) and Corden (1991). What have we learned from it? Two things essentially, neither that surprising. First, results tend to be very model specific and very sensitive to initial conditions. Second, as a consequence of this, there are *".... no new general principles and certainly no new paradigm ....."* Corden (1991).

Lessons From Policy: The key points here seem to be threefold. First, the 'old' view of gains from trade almost certainly understates potential benefits because it ignores preference diversity, scale economies and pro-competition effects. Second, although we can show in theory that adjustment to trade expansion should be easier in an IIT environment, we have no robust evidence as yet to support that proposition. Third, although we can find new arguments for protection in an IIT setting, they tend not to be general.

5. CONCLUSIONS

This paper did not set out to survey the literature on IIT as such. Rather its objective was to take the pioneering work of Grubel and Lloyd on IIT and evaluate both how the scientific agenda has moved on and what we have learned in the process.

Peter Lloyd may not view Grubel and Lloyd (1975) as his most original nor his most substantive piece of work, but we suspect it has been his most influential. In the evolution of work on the determinants of trade patterns the book is an important one. It brought together emerging work on the identification of what seemed to be a novel phenomenon at the time and a phenomenon which did not appear to be consistent with the predictions of the standard explanation of international trade, the H-O theorem. In that respect it was a much needed synthesis. However, it went further in providing the most extensive documentation of the phenomenon available to that point. In addition it set an agenda for future work. Grubel and Lloyd (1975) offered explanations. Those explanations were unashamedly informal but in common with other important agenda setting volumes in international trade where explanation was also informal (in the sense of being non-mathematical) like Viner (1951), Meade (1955) and Corden (1974) it was very intuitive and replete with ideas for others to follow-up. And that is exactly what happened. IIT has been one of the liveliest areas of research in international trade for a generation and we have learned quite a lot from the literature.

Firstly, it is fair to say that some of the initial hostility that greeted work on IIT 25 years ago was triggered by it being seen as a competitor and threat to the dominant paradigm, the Heckscher-Ohlin model. A generation later we have learned that classical and neo-classical explanations of the determinants of trade and modern explanations, many of which rely upon imperfect competition and which result in IIT, are complements rather than substitutes. We now have robust and general models where trade in homogenous and differentiated products are simultaneously determined.

Second, a generation ago many viewed measured IIT as a ‘statistical artifact’. Rather than being something real and in need of explanation, it was a by-product of data aggregation

systems. Categorical aggregation is undoubtedly a real problem. But a generation later we have developed metrics that allow us to disentangle aggregation influences more intelligently to give us greater confidence in what we are documenting.

Third, when Grubel and Lloyd wrote their book no theory or theories of IIT had been taken to the data systematically and early work was essentially targeted at searching for correlations between particular features of industrial structure or country characteristics and IIT indices. The development of theory and measurement combined with the growing availability of micro data has facilitated a step change in econometric analysis and a migration from estimations to testing. As a consequence we have learned more about the determinants of IIT.

Fourth, we have learned that although the determinants of IIT may be different from the determinants of inter-industry trade, we do not need to dramatically revise our thinking on the welfare aspects of international trade. There are additional possible sources of benefit which we are now more certain of but there are few new arguments for sacrificing these to protect particular groups in society.

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