

Intra-industry trade arises if a country simultaneously imports *and* exports similar types of goods or services. Similarity is identified here by the goods or services being classified in the same “sector”. Suppose, for the sake of argument, that we focus on the sector “cars”. Intra-industry trade then occurs, for example, if Germany exports cars to France and simultaneously imports cars from Italy. On the one hand this raises the question why Germany is (at least partially) exporting cars in exchange for importing cars instead of focusing exclusively on so-called *inter*-industry trade, namely exporting cars in exchange for importing different types of goods (such as food or airplanes). On the other hand, this raises the question why different goods are lumped together in the same sector, as the exported Volkswagen Golfs differ from the imported Ferraris. We address these two basic questions below.

Although in hindsight various antecedents can be traced, the phenomenon of intra-industry trade as such first received attention in the 1960s in studies by Pieter Verdoorn and Bela Balassa on the increased trade flows among European countries. Herbert Grubel and Peter Lloyd (1975) provided the definitive empirical study on the importance of intra-industry trade and how to measure it. Solid theoretical foundations for explaining intra-industry trade came later (in the 1980s and 1990s) with the new trade literature, to a large extent based on a monopolistic competition framework.

### **Types of Intra-Industry Trade**

It is customary to distinguish between two different types of intra-industry trade, each warranting a different type of explanation, namely

- *horizontal intra-industry trade*; this refers to the simultaneous exports and imports of goods classified in the same sector and at the *same stage of processing*. This is likely based on product differentiation, for example South Korea's simultaneous import and export of mobile telephones in the final processing stage. As these mobile phones are produced using similar technology and provide similar functions they are classified in the same sector. Nonetheless, the exported Samsung telephones differ in appearance and product characteristics slightly from the imported Nokia telephones, catering to the desires of different types of consumers.
- *vertical intra-industry trade*; this refers to the simultaneous exports and imports of goods classified in the same sector but at *different stages of processing*. This is likely based on the increasing ability to organize "fragmentation" of the production process into different stages, each performed at different locations by taking advantage of the local conditions. China, for example, imports technology-intensive computer components and uses its abundantly available labor force to assemble these components in the labor-intensive final production stage, before the components (as part of a finished computer) are exported again to Europe or the USA.

### **Measuring Intra-Industry Trade: The Grubel-Lloyd Index**

The most often used method for determining the extent of intra-industry trade was proposed by Grubel and Lloyd (1975). This measure, now known as the Grubel–Lloyd

index, is simple to calculate and intuitively appealing. Once a country's export and import value for a particular sector and period are known, it is calculated as:

$$(1) \quad GL_{\text{sector } i} = 1 - \left( \frac{| \text{export}_{\text{sector } i} - \text{import}_{\text{sector } i} |}{\text{export}_{\text{sector } i} + \text{import}_{\text{sector } i}} \right).$$

If the country only imports or only exports goods or services within the same sector, such that there is no intra-industry trade, the second term on the right-hand side of equation (1) is equal to one, such that the whole expression reduces to zero. Similarly, if the export value is exactly equal to the import value ( $\text{export}_{\text{sector } i} = \text{import}_{\text{sector } i}$ ), the second term on the right-hand side of equation (1) is equal to zero, such that the whole expression reduces to one. The Grubel–Lloyd index therefore varies between zero (indicating pure *inter*-industry trade) and one (indicating pure *intra*-industry trade).

### Data Aggregation

As already indicated above, to some extent intra-industry trade can be considered a classification problem as different types of goods and services are lumped together in the same sector. In practice, international trade flows are classified in various ways. Using the SITC (standard international trade classification) we can distinguish ten different broad sectors (the so-called 1-digit level). Each of these 1-digit sectors can, in principle, be subdivided into ten more detailed 2-digit sectors. Each of the 2-digit sectors can in turn, in principle, be subdivided into ten even more detailed 3-digit sectors, and so forth. Sector 6 at the 1-digit level, for example, consists of “manufactured goods.” One of the sub-sectors at the 2-digit level is sector 61 “leather manufactures” while another is sector

63 “cork/wood manufactures.” Analyzing intra-industry trade at the very broad 1-digit level therefore classifies trade of leather manufactures in exchange for cork/wood manufactures as intra-industry trade, which seems unwarranted. Looking at the more detailed 2-digit level this problem partially disappears and a smaller extent of trade is therefore classified as intra-industry trade. A further reduction occurs if we look at even more detailed levels of aggregation. The 3-digit level, for example, distinguishes between cork manufacturers (sector 633) and different types of wood manufacturers (sectors 634 and 635) separately.

*Table 1 Intra-industry trade and aggregation; China, selected years*

Trade-weighted average Grubel-Lloyd index, different levels of aggregation

year	China		
	3-digit 237 sectors	2-digit 67 sectors	1-digit 10 sectors
1980	0.20	0.30	0.63
1985	0.20	0.29	0.44
1990	0.36	0.45	0.60
1995	0.38	0.48	0.67
2000	0.39	0.48	0.57
2005	0.42	0.49	0.58

Source: Author’s calculations based on United Nations (2006) COMTRADE data from World Integrated Trade Solution (WITS), Geneva.

Table 1 illustrates the data aggregation problem for China for three different levels of aggregation (consisting of 10, 67, and 237 different sectors) by reporting a trade-weighted average Grubel-Lloyd index for a selection of years. We report the 1-digit level only for the sake of argument as it is generally considered a too crude classification in practice. Three things are clear from the table. First, as we distinguish between more sectors a smaller fraction of trade is classified as intra-industry trade, for example reducing it from 58 per cent to 49 per cent to 42 per cent of total trade in China in 2005. Second, even though intra-industry trade reduces as we identify more sectors, it does not disappear. It is, for example, still 42 per cent of total trade at the 3-digit level in China in 2005. This is a general characteristic of current trade flows as intra-industry trade exists for very detailed sector classifications. Third, and most importantly, intra-industry trade seems to become more important over time, for example increasing at the 3-digit level in China from 20 per cent in 1980 to 42 per cent in 2005. We now turn to this issue.

### **Empirical Characteristics of Intra-Industry Trade**

There are structural differences across sectors regarding the extent of intra-industry trade. To demonstrate this, we use the factor intensity classification of the International Trade Center, the joint UNCTAD/WTO organization, which distinguishes between five broad factor intensity categories at the 3-digit level, namely (within brackets the number of sector belonging to the particular category):

- A. *Primary products* (83); e.g. meat, dairy, cereals, fruit, coffee, minerals, and oil.
- B. *Natural-resource intensive products* (21); e.g. leather, wood, pig iron, and copper.
- C. *Unskilled-labor intensive products* (26); e.g. textiles, clothing, ships, and footwear.

D. *Human-capital intensive products* (43); e.g. perfumes, cosmetics, cars, and watches.

E. *Technology intensive products* (62); e.g. chemicals, electronics, tools, and aircraft.

*Table 2 Intra-industry trade and composition of trade flows; China, selected years*

Trade-weighted average Grubel-Lloyd index (3-digit level) and per cent of total trade

	Type of products				
	Primary products	Natural-resource int.	Unskilled-labor int.	Technology intensive	Human-capital int.
Weighted average Grubel-Lloyd summary statistics for product type, 1980-2005					
average	0.27	0.38	0.16	0.56	0.36
st dev*	0.11	0.07	0.04	0.04	0.08
Share of product type in total trade (per cent)					
1980	51.4	3.4	27.8	8.1	9.2
1985	49.5	2.0	33.7	7.1	7.7
1990	19.4	2.9	46.5	15.6	15.5
1995	10.1	4.0	45.4	24.9	15.6
2000	7.5	3.2	39.2	35.5	14.6
2005	4.6	3.3	28.9	47.7	15.5

\* st dev = standard deviation. Source: Author's calculations based on United Nations (2006) COMTRADE data from World Integrated Trade Solution (WITS), Geneva.

Table 2 depicts the extent of intra-industry trade for these different types of sectors in China for selected years. It shows that the level of intra-industry trade is particularly low for unskilled-labor intensive sectors, particularly high for technology intensive sectors,

and intermediate for the other types of sectors. As countries, such as China, successfully develop, the composition of their trade flows tends to move away from primary products, initially towards unskilled-labor intensive products, and subsequently towards technology and human-capital intensive products. Associated with these changes there is an ultimate increase in the extent of intra-industry trade.

In a study summarizing the growing importance of intra-industry trade, the OECD (2002) lists the following empirical characteristics: Intra-industry trade

- has risen significantly since the 1980s in most (OECD) countries
- is particularly high for sophisticated manufactured products (chemicals, machinery, transport equipment, electrical equipment, and electronics; both based on product differentiation and fragmentation)
- is particularly high for very open countries (“supertrading” economies, where both imports and exports account for more than half of GDP)
- is connected to FDI inflows, particularly in Eastern European “transition” economies
- is related to preferential trade agreements, for example the sharp increase in intra-industry trade in Mexico after the North American Free Trade Agreement
- is to a large extent based on intra-firm trade, either based on product variety or on fragmentation (intra-firm trade accounts, for example, for one third of exports in Japan and the USA).

In conclusion, we note that intra-industry trade, the simultaneous import and export of similar types of goods or services, is measured using the Grubel-Lloyd index, is to some

extent based on lumping together different types of goods in one sector (aggregation problem), can be based on (horizontal) product differentiation or (vertical) fragmentation, is associated in particular with the production of sophisticated manufactured goods, and is an increasingly important part of (intra-firm) total trade flows in today's globalizing world, particularly for developed countries.

*See also: economies of scale, fragmentation, Heckscher-Ohlin model, intra-firm trade, monopolistic competition, new trade theory, vertical versus horizontal FDI*

### **Further Reading**

Grubel, Herbert G., and Peter Lloyd. 1975. *Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products*. London: MacMillan.

Most influential study on measuring and understanding intra-industry trade.

Helpman, Elhanan, and Paul Krugman. 1987. *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*. Boston: MIT Press. Overview of the main theories explaining intra-industry trade by two prominent contributors.

OECD. 2002. "Intra-Industry and Intra-Firm Trade and the Internationalisation of Production." *Economic Outlook* No. 71, Chapter 6: 159-170. A recent discussion of the growing importance and characteristics of intra-industry trade.

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