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Intra-Industry Trade in High-Tech Product Groups within the South Korean Manufacturing Industry

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ABSTRACT

This article aims to determine the degree of similarity between South Korea and its foreign trade partners in terms of manufacturing industries producing high-tech products. To achieve this, the article analyses the intra-industry trade (IIT) of South Korea's manufacturing industry producing high-tech (high value-added) products. To this end, calculations were made using the Grubel-Lloyd index, which is the most widely used in the literature, with 3-digit (SITC-Rev.3) foreign trade data within the manufacturing sector for the period 2010-2022. With regard to South Korea's high-tech manufacturing industry and its foreign trade partners, it has been observed since 2010 that the IIT values in question exceed 0,57, with a value of 0,74 being reached in 2022. Conversely, while standard technology products played a significant role in achieving high IIT values in 2010, the increasing IIT values of high technology products since 2015 have been instrumental in South Korea's attainment of high IIT values. Furthermore, it has been established that this value is particularly concentrated in the machinery and transport sector and the chemical sector. It can thus be concluded that South Korea's foreign trade with other countries in the same or similar product groups is dominated by high-tech exports. Additionally, it has been observed that manufacturing industry products, which were previously included in inter-industry trade, have undergone a transformation towards IIT and have contributed to high IIT values. In order for South Korea to become a more prominent player in intra-industry trade in high-tech products, it is necessary for the country to implement more flexible production strategies and develop more comprehensive supply chains.

Keywords: Manufacturing Industry, High-Tech Products, Intra-Industry Trade, Grubel-Lloyd Index, South Korea

Güney Kore İmalat Sanayiindeki Yüksek Teknolojili Ürün Gruplarında Endüstri-İçi Ticaret

Süreç

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ÖZ

Bu makalenin amacı, Güney Kore'nin dış ticaret ilişkisi içinde bulunduğu diğer ülkeler ile yüksek teknolojili ürün üreten imalat sanayi sektörleri açısından birbirlerine ne kadar benzeştiğini tespit etmektir. Bunu gerçekleştirmek için, makalede Güney-Kore'nin yüksek teknolojili (yüksek katma değerli) ürünler üreten imalat sanayiinin Endüstri-İçi Ticareti (EİT) analiz edilmiştir. Bu doğrultuda 2010-2022 yılları arasında imalat sanayi kapsamında 3 basamaklı (SITC-Rev.3) dış ticaret verileri ile literatürde en çok kullanılan Grubel-Lloyd endeksi ile hesaplamalar yapılmıştır. Bunu yaparken, Güney Kore'nin yüksek teknolojili ürünlerinin EİT verileri çeşitli tablolarda analiz edilmiştir. Güney Kore'nin dış ticaret yaptığı ülkeler ile yüksek teknolojili imalat sanayii kapsamında 2010 yılından itibaren 0,57 ve üzerinde Endüstri-içi Ticaret (EİT) oranları ile karşılaşılmış ve bu değerin 2022 yılında 0,74'e ulaştığı hesaplanmıştır. Diğer taraftan, standart teknoloji ürünler 2010 yılında yüksek EİT değerleri üzerinde önemli rol oynarken, 2015 yılından itibaren yüksek teknoloji ürünlerinin artan EİT değerleri Güney Kore'nin yüksek EİT değerlerine ulaşmasında etkili olmuştur. Ayrıca, bu değerin özellikle makine ve ulaşım sektörü ile kimya sektöründe yoğunlaştığı tespit edilmiştir. Dolayısıyla, Güney Kore'nin diğer ülkelerle aynı veya benzer ürün gruplarındaki dış ticaretinin yüksek teknoloji ihracatı ağırlıklı olduğu anlaşılmıştır. Ayrıca daha önce endüstriler-arası ticarette yer alan imalat sanayi ürünlerinin de EİT'e doğru dönüşüm geçirdiği ve yüksek EİT değerlerine katkıda bulunduğu gözlemlenmiştir. Güney Kore'nin yüksek teknoloji ürünleri endüstri-içi ticaretinde daha fazla öne çıkabilmesi için daha esnek üretim ve daha kapsamlı tedarik zincirleri kurması gerekmektedir.

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Anahtar Kelimeler: İmalat Sanayii, Yüksek Teknoloji Ürünleri, Endüstri-İçi Ticaret, Grubel-Lloyd Endeksi, Güney Kore

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Introduction

International trade has been a pivotal factor in the economic prosperity of Asian countries. The export-oriented development strategy adopted by countries such as Japan, South Korea, Taiwan, and Singapore has played a pivotal role in driving their rapid economic growth since the 1960s (Kuznets, 1988). In South Korea, the proportion of exports in gross domestic product (GDP) increased from 3% in 1960 to nearly 37% by 2023. In Taiwan, the figure rose from 10% to 57% over the same period. In China, the ratio rose from 3,15% to nearly 19% (UNCTADstad, 2024; World Bank Group, 2024). China's ascendance from an isolated, closed economy to a prominent trading nation has constituted a pivotal aspect of its reform and growth trajectory over the past four decades. Furthermore, the Free Trade Area (FTA) established by the Association of Southeast Asian Nations (ASEAN) in 1992 to facilitate trade and economic integration among its members has evolved into one of the most significant regional trading blocs in the world (Sawyer, 2010, p. 485).

This study focuses on South Korea, one of the leading Asian nations. South Korea's economic and commercial prominence on the global stage began in the 1990s and became especially notable after the 2000s (Cho, 2019, p. 37). Notwithstanding the contraction in global trade and the sluggishness of major economies, South Korea succeeded in maintaining its status as the seventh largest exporter and ninth largest importer in the world in 2020, representing 2,76% of the global trade volume. In 2023, this figure experienced a slight decline, reaching 2,65% (Trade Map, 2024; UNCTADstad, 2024). South Korea's FTAs with other countries have played a significant role in this regard. Foreign trade in South Korea is consistently promoted through the implementation of free trade agreements (Korea Law Translation Center, 2024). In the present era, the South Korean government has elected to reinforce bilateral and multilateral trade collaboration with the objective of further augmenting export objectives (Ministry of Economy and Finance, 2024, p. 9).

However, this development of Asian countries has been accompanied by the advent of a significant transformation in international trade patterns. Until the 1980s, the typical North-South inter-industry trade patterns that had previously dominated East Asian trade were still in evidence. During this period, the developing countries of East Asia exported raw materials and labor-intensive products, while Japan exported a wide range of finished goods to this vast region. This type of trade pattern, which may also be referred to as traditional trade patterns based on factor abundance, is explained by the Ricardian theory of traditional comparative advantage. This theory assumes that the location of production and the pattern of international trade are largely determined by differences between countries in terms of resource endowments, labor-capital ratios, and technological level (Ando, 2006, p. 257).

The traditional trade model assumes that countries specialize in a few industries, that there are only two countries, and that this two-country, reciprocal trade is mostly one-way (Van Biesebroeck, 2011, p. 71). It is evident that inter-industry trade is reflective of both Ricardian traditional comparative advantage and Heckscher-Ohlin's Factor Endowment theory (Ruffin, 1988, p. 759). This is because these models suggest that if each country has a different factor endowment pattern, it will specialize in production where it intensively uses relatively abundant factors of production and then gains international trade by opening up (Ergün, 2023, p. 78; Wakasugi, 1997, p. 354). Contrary to stated observations, it is evident that countries with similar industrial structures engage in greater trade in industrial products (Kuçlu & Yenilmez, 2024, p. 104). This is evidenced by the fact that two-way international flows of goods within the same industry exhibit a faster growth rate than international flows of goods between different industrial sectors (Wakasugi, 1997, p. 354).

This unexpected development demonstrated the existence of a new trade model: Intra-Industry Trade (IIT). IIT refers to the phenomenon of numerous countries simultaneously exporting and importing similar goods and services among each other. In other words, IIT refers to the exchange of similar products of the same industry between countries (Root, 1994, p. 104; Van Marrewijk, 2002, p. 182; Ulucan et al., 2014, p. 32).

In contrast to inter-industry trade, IIT does not reflect the principle of comparative advantage (Çeştepe et al., 2017, p. 345). Even if countries have the same "capital/labor" ratio, firms in these countries will continue to produce differentiated products, and consumers' demand for products produced abroad will continue to create IIT (Krugman & Obstfeld, 2003, p. 138; Şahin, 2022, p. 9). Indeed, as evidenced by trade statistics, there are numerous instances of two-way trade of products within the same industry between two parties, which can be defined as IIT. A straightforward explanation for this phenomenon being reflected in the statistics is that the statistics encompass a multitude of products within a unified category. Consequently, what may be perceived as a singular product is, in fact, comprised of numerous products (Grosse & Kujawa, 1992, p. 81). The subject of trade patterns represents the most crucial area of study within the field of international microeconomics. Given that a considerable proportion of global trade comprises products that are similar or even distinct, a phenomenon known as IIT has emerged. This has led to the development of a substantial theoretical and empirical literature on the subject (Bernhofen, 1997, p. 225-226; Sezer & Önder, 2024, p. 2-3). Although the initial studies on IIT were conducted by Balassa (1966), it was Grubel and Lloyd (1971) who developed the most widely used index for measuring IIT (Davis, 1995, p. 225-226; Phan & Jeong, 2014, p. 834).

Grubel and Lloyd's demonstration of intensive IIT among industrialized countries (endowed with similar factor ratios) appeared to contradict traditional theories of comparative advantage. However, this result led to the development of a "new theory of trade" under the

framework of imperfect competition (Adıgüzel, 2022, p. 403; Davis, 1995, p. 225-226). Subsequently, numerous other economists have made significant contributions to this field (Aggarwal, 2023, p. 3). The majority of empirical studies to date have been based on the standard Grubel-Lloyd measure (Azhar et al., 2008, p. 338; Azhar & Elliott 2006, p. 479; Egger et al., 2007, p. 1959; Nielsen & Lüthje, 2002, p. 590).

One of the justifications for the use of IIT is the fact that the majority of trade is conducted in differentiated products (Martin-Montaner & Ríos, 2002, p. 340; Şaşmaz, 2024, p. 273). This phenomenon is exemplified by the trade of information technologies (IT) industry products, including cell phones, scanners, and fax machines, between the United States and South Korea or between South Korea and Japan. For instance, the iPhone (Apple) is sold in South Korea and Japan, while Samsung cell phones and Toshiba computers are exported from these countries to the United States. This facilitation of trade in IT industry products reveals that the products of this sector are highly differentiated, which allows for the coexistence of the brands mentioned above in the same market at the same time, despite their differentiation from each other (Grosse & Kujawa, 1992, p. 81).

The key to the development and dissemination of IIT is the existence of intra-industry specialization across countries (Şahin, 2017, p. 230). One of the factors contributing to such specialization is the potential for economies of scale (Davis, 1995, p. 202; Şaşmaz, 2024, p. 273). The process is sequential in nature. The existence of economies of scale encourages the formation of specialized production units, which in turn facilitates the development and dissemination of IIT (Schmitt & Yu, 2001, p. 127-128). Indeed, some economists working on the theory of IIT have even argued that economies of scale are a sine qua noncondition for intra-industrial specialization. This is because, in the absence of economies of scale, all types of products can be produced domestically, and IIT cannot be realized (Davis, 1995, p. 223; Doru & Özer, 2022, p. 454).

The fact that the traded products originate from the same industry indicates that the factor intensities of these traded products are comparable. Furthermore, the fact that products from the same industry are subject to foreign trade and the similar demand structures of these products across countries are concurrent. Consequently, the increase in the level of IIT indicates that there are no comparative advantages between countries due to the similarity of their economic structures (Saygın, 2020, p. 103).

Approximately a quarter of global trade is comprised of IIT, which refers to the exchange of goods between two parties within the confines of standard industrial classifications (Thies & Peterson, 2016, p. 37). IIT plays a particularly significant role in trade in manufactured goods between advanced industrialized countries, which account for the majority of global trade. Over time, industrialized countries have become increasingly similar in terms of technology levels and the availability of capital and skilled labor. It is often the case that large trading nations have no net comparative advantage in an industry, given that they become increasingly similar in terms of technology and resources. Consequently, the majority of international trade is likely driven by economies of scale, with two-way exchanges within industries becoming the dominant form of trade rather than inter-industry specialization based on comparative advantages (Krugman & Obstfeld, 2003, p. 139).

With regard to Asia, the prevailing trade patterns observed in East and Southeast Asia, similar to those observed in Western countries, cannot be fully explained by the traditional theory of comparative advantage (Van Biesebroeck, 2011, p. 258). The rapid growth of Asian countries, their export-oriented industrialization, and the international segmentation of production have increased the importance of IIT in Asia. Asia has emerged as the continent most benefited by the international segmentation of production. While some Asian countries produced intermediate goods, others produced final products, while others produced raw materials (Sawyer, 2010, p. 485).

Although research on IIT has been extensive and sophisticated in Europe, East Asian countries have not demonstrated the same level of interest in IIT as European countries. However, in recent years, IIT has become increasingly important in East Asia's international trade and has started to play a decisive role in South Korea's international trade (Bhattacharyya, 2005, p. 810; Han & Lee, 2012, p. 116). Thus, as the country's economy developed, market size increased, trade barriers decreased, and foreign direct investments increased, South Korea's IIT had to expand from the 1960s onwards. In particular, with the growth of capital accumulation, the proportion of IIT in total trade in capital-intensive sectors has increased over time (Kim & Kim, 1998, p. 175).

The establishment of official diplomatic relations between China and South Korea in 1992 has facilitated enhanced collaboration across a range of sectors (Hwang, 2021, p. 218). One of the most significant areas of cooperation has been trade. Currently, China has become South Korea's largest export and import market. Conversely, South Korea has emerged as China's fourth-largest exporter and second-largest importer (Li et al., 2015, p. 115).

The product structure of exports from China to South Korea has undergone a gradual shift from primary products to manufactured products. In contrast, imports from South Korea are predominantly manufactured products. As trade between China and South Korea has expanded, IIT has gradually supplanted inter-industry trade, becoming the dominant mode of trade between the two countries. In this trade between China and South Korea, manufactured goods have consistently constituted the largest share. It follows that an increase in bilateral trade in manufactured goods between the two countries will contribute to the growth of intra-industry trade (Li et al., 2015, p. 115).

Literature Review

This section presents a discussion of studies on the determination of the level of IIT in South Korea's foreign trade.

Havrylyshyn and Civan (1985) examined the IIT of newly industrializing and developing countries. In 1978, the value of IIT in South Korea's foreign trade was 0,35, the value of IIT in South Korea's trade with developing countries was 0,26 and the value of IIT in South Korea's trade with newly industrializing countries was 0,29. Therefore, the value of IIT in South Korea's foreign trade was slightly higher than the value of IIT in its foreign trade with developing countries and newly industrialized countries.

Kim (1992) conducted an analysis of South Korea's IIT for the period 1978-1987. During this period, an increase in the level of IIT was observed as capital stock increased at a faster rate than labor stock. However, South Korea's level of IIT was found to be relatively high in comparison to other Asian countries and developed countries with which it has foreign trade. Conversely, it was determined that the level of IIT between South Korea and the Organization of Petroleum Exporting Countries (OPEC) member countries is relatively low. Additionally, it was observed that South Korea's level of IIT in the manufacturing sector was higher than in the agricultural sector. Conversely, it was stated that an increase in South Korea's Gross Domestic Product (GDP) per capita would result in a diversification of consumer preferences, thereby leading to an expansion in the level of IIT as firms differentiate their products.

Kim and Kim (1998) conducted an analysis of the IIT in South Korea, Japan, and the USA for the period 1962-1995. Although there has been an increase in the intensity of physical and human capital in South Korea's manufacturing industry sectors, it is stated that labor-intensive sectors are more prominent than in Japan and the USA. From 1980 to 1995, South Korea's level of IIT exhibited a more rapid increase than Japan's level of IIT. Furthermore, it was demonstrated that capital-intensive sectors in South Korea became increasingly prominent over time. Furthermore, it has been demonstrated that South Korea's IIT level is correlated with GDP per capita, free trade, and increased foreign direct investment (FDI).

Lee and Sohn (2004) analyzed the degree of IIT between South Korea and select trading partners over the period 1991-2001 employing the Grubel-Lloyd index. The study revealed that the marginal level of IIT is also high between South Korea and its trading partners with a high level of IIT. Furthermore, the study revealed that trade harmonization arrangements between South Korea and its trading partners exert a positive influence on the level of IIT, whereas trade imbalance and distance to the market exert a negative influence on the level of IIT.

Umemoto (2005) analyzed the IIT of South Korea and Japan in the automotive parts sector was analyzed over the period from 1985 to 2001. The findings revealed that South Korea and Japan exhibited lower IIT values in comparison to those observed in the NAFTA, EU, and MERCOSUR regions. Conversely, the IIT levels in South Korea and Japan were found to be higher than those observed between Northeast Asian countries and East Asia.

Bhattacharyya (2005) applied the Grubel-Lloyd index to assess South Korea's IIT over the 33-year period from 1963 to 1995. The study demonstrated that enhanced interactions between producers and consumers in countries engaged in trade with South Korea led to a notable expansion in total trade volume. Consequently, vertical IIT was observed to exceed horizontal IIT.

Chemsripong et al. (2005) conducted an analysis of intra-industry trade (IIT) in the manufacturing sector between Thailand and the Asia-Pacific Economic Cooperation (APEC) countries over the period 1980-1999. The study employed a comparative approach, examining the IIT patterns between pre- and post-APEC countries. The findings revealed that the value of IIT between Thailand and South Korea exhibited an increase following the establishment of APEC.

Kim (2005) analyzed the level of IIT between South Korea and the ASEAN in the period 1996-2003. It was found that the level of IIT in the electronics sector increased between South Korea and the ASEAN due to the development in information technologies. In addition, a negative relationship was found between customs tariffs between these countries and the level of IIT.

In a study spanning 1988-2006, Yoshida (2008) examined the extent of IIT between Japan and South Korea. The study revealed that newly traded goods exert a positive influence on IIT, whereas traded goods with high value have a negative impact on IIT. Furthermore, the study revealed that Japan's highest level of economic cooperation with other countries in 2006 was with South Korea.

Kang and Lee (2012) conducted a study to determine the level of IIT between South Korea and 15 member countries of the Organization for Economic Cooperation and Development (OECD) and Taiwan for the period 1996-2003. The study revealed that South Korea's R&D investments are primarily driven by price competition, while FDIs from South Korea are concentrated in productive sectors. Conversely, FDIs from South Korea to the aforementioned countries are directed towards substitute markets within the scope of vertical IIT. Moreover, it has been demonstrated that South Korea has relatively low export prices in the context of vertical IIT among OECD countries. Consequently, it has been demonstrated that South Korea occupies a southern position within the North-South model of IIT.

Han and Lee (2012) analyzed IIT between South Korea and China for 1992-2006 in the textile, chemical, basic metals, machinery, electricity and automobile industries. As a result of the study, it was found that increased FDI expenditures from South Korea to China have a positive impact on vertical integration between the two countries. Conversely, the disparities in per capita income between the two countries are negatively correlated with vertical IIT.

Kien and Heo (2014) focused on bilateral trade between South Korea and Vietnam. The results revealed that there is a low level of intra-industry trade between South Korea and Vietnam, with considerable fluctuations. Furthermore, it

was determined that bilateral trade between the two countries is complementary in nature, rather than competitive.

Li et al. (2015) used Grubel-Lloyd index, Brülhart index, horizontal and vertical IIT indices to determine the level of IIT in manufacturing industry sectors between South Korea and China. The study found that the expansion of trade between the two countries between 1992 and 2013 had a positive effect on the level of IIT. In the context of foreign trade between the two countries, labor-intensive sectors exhibit a higher level of IIT than capital and technology-intensive sectors.

Haddou and Jang (2018) compared the IIT values between South Korea and selected Middle East and North African countries (MENA) during the period 1995-2015. The study concluded that South Korea reached a high level of IIT values as a result of its FTAs with both the EU and the US. Conversely, no significant change was observed in the IIT values of Algeria with its FTA with the EU during this period. Following the Customs Union with the EU, Turkey's IIT values have increased significantly, and its integration into world trade has increased.

Kim and Cho (2018) examined the fluctuations in the IIT between South Korea and China, the United States, and Japan, which are the countries with which South Korea has the most extensive trade relations in terms of manufacturing, over the period 1994-2011. The study revealed that the IIT between South Korea and China increased due to economies of scale, FDI, the ratio of intermediate costs to total costs, and R&D intensity. However, the study revealed that South Korea's IIT with the United States increased due to economies of scale, FDI, and research and development (R&D) intensity. Moreover, FDI, the ratio of intermediate cost to total cost, and R&D intensity have been identified as crucial variables affecting IIT between South Korea and Japan.

Cheong and Yoo (2020) investigated South Korea's e-commerce with IIT. The analysis revealed that the share of IIT was less than that of general trade in the country's e-commerce sector. In this regard, the theory of comparative advantage may offer a more valid explanation of South Korean e-commerce. The results indicate that South Korea's e-exports exceed the level of IIT with its free trade agreement partners. Conversely, a lower e-commerce rate suggests a greater potential for import growth. Additionally, the export profile of South Korea is characterised by high-quality goods, while its major trading partners import merchandise based on price and commodity choice.

Yuan and Du (2020) examined the IIT between China, Japan and South Korea. The study, which covers the years 2009-2018, revealed that the level of IIT has not yet reached a high level despite the development of trade between the three countries. The study further suggests that the level of IIT with both Japan and South Korea is expected to increase with the development of the Chinese economy.

Neumann and Tabrizy's (2021) study examined the foreign trade of the top exporters in Asia during the period from 2001 to 2015. The study revealed that South Korea exhibited low IIT values in the wood, transportation equipment, and food sectors. Conversely, the manufacturing industry exhibited high levels of IIT, particularly in the domains of machinery, metal, and paper products.

Wood et al. (2021) conducted an analysis of China's IIT relationships with its Asia-Pacific Economic Cooperation (APEC) partners for the period 2000-2014. The analysis revealed a high level of inter-industry trade in China's trade with South Korea. The analysis revealed that inter-industry trade between China and South Korea has evolved through both horizontal and vertical integration.

Aggarwal et al. (2023) conducted an examination of India's bilateral trade relations, determining that the nation's IIT with Japan and South Korea has undergone an increase. The underlying factors contributing to this phenomenon were identified as the deepening of trade preferences, measures implemented for the facilitation of trade, and the diversification of products.

Baek and Yoon's (2023) analysis of trade between South Korea and Vietnam revealed a notable finding. Their analysis revealed a substantial degree of IIT between the two nations.

Podoba (2023) studied the trade between The Eurasian Economic Union (EAEU) and South Korea for the period 2015-2021. The study revealed that trade between the two regions is predominantly inter-industry trade. A study revealed that IIT between the EAEU and South Korea is particularly prevalent in the iron and steel product group. Furthermore, the possibility of IIT between the two sides in regard to chemical and non-fuel raw material products was identified.

Kurt (2024) examined the nature of IIT between Turkey and South Korea in the automotive industry. The study concluded that the value of IIT between the two countries in the automotive industry is relatively low.

Sezer & Önder (2024) analyzed Turkey's intra-industry trade with selected sectors and countries. The study's findings indicate that the intra-industry trade values in Turkey's foreign trade with South Korea are comparatively low in the product groups that Turkey exports with the highest frequency.

Despite the growing significance of IIT in East Asia's global trade and its emerging role in shaping South Korea's international trade landscape, scholarly attention devoted to the IIT's impact on South Korea's foreign trade has witnessed a notable decline in recent years. Moreover, there has been no analysis of the IIT for high-tech product groups in South Korea. This study differs from previous research in that it aims to analyze the IIT values of high-tech product groups in South Korea's manufacturing industry's foreign trade. Consequently, this study is anticipated to contribute to the existing body of literature.

Material and Method

Material

KITA (2023) SITC (International Code System for Commodity Groups) (Rev. 3) data were used to calculate the IIT in South Korea's manufacturing industry foreign trade. The data period covers 2010-2022. See the Appendix for manufacturing industry product group classification by technology level.

Method

The Grubel-Lloyd Index is the most frequently cited method in the literature for the analysis of IIT (Azhar & Elliott, 2006, p. 479; Azhar et al., 2008, p. 338; Egger et al., 2007, p. 1959; Nielsen & Lüthje, 2002, p. 590). The calculation of the Grubel-Lloyd Index can be demonstrated as follows (Grubel & Lloyd, 1971):

$$IIT^{G-L} = \frac{[(X_i+M_i)-|X_i-M_i|]}{(X_i+M_i)} \quad ; 0 \leq IIT^{G-L} \leq 1 \quad (1)$$

X_i: export value in commodity group *i*,
M_i: import value in commodity group *i*.

As illustrated above, the IIT^{G-L} scale encompasses a range between 0 and 1. Values of 0,50 and above are indicative of a high level of IIT, while values below 0,50 are indicative of a low level of IIT.
Furthermore, calculations can be made for product groups or sub-sectors on an aggregated basis. In this regard, the average IIT, which is calculated by weighting the export and import ratios of product groups in the total value of international trade across a number of sectors, can be calculated as follows (Grubel & Lloyd, 1971; Grubel & Lloyd, 1975):

$$\overline{IIT}^{G-L} = \frac{\sum_i^n B_i(X_i+M_i)}{\sum_i^n (X_i+M_i)} = \frac{\sum_i^n (X_i+M_i)-\sum_i^n |X_i-M_i|}{\sum_i^n (X_i+M_i)} \quad ; 0 \leq \overline{IIT}^{G-L} \leq 1 \quad (2)$$

Table 1 presents the IIT ratings according to the Grubel-Lloyd (G-L) index.

As indicated in Table 1, IIT values vary between 0 and 1 ($\overline{IIT}^{G-L}$). Values of 0,50 and above are indicative of high IIT, while values below 0,50 are indicative of low IIT. When IIT values are high, it can be inferred that trade between countries is realized bidirectionally in similar commodity groups. Conversely, low IIT values indicate that trade between countries occurs in the form of inter-industry trade. Furthermore, inter-industry trade provides insight into the fact that trade between countries is predominantly based on comparative advantage.
Aggregation levels represent an industrial sector, as they encompass specific product groups (Grubel & Lloyd, 1975, p. 3). Aggregation levels result in elevated IIT values at higher aggregation levels with fewer product groups (Başkol, 2009, p. 6; Bedir, 2023, p. 119). Consequently, the selection of an aggregation level is regarded as a crucial aspect of IIT analysis (Bhattacharyya, 2007, p. 61). In this study, the SITC 3-digit aggregation level was selected as it is a widely used level in the literature (Greenaway & Milner, 1986; McCorriston & Sheldon, 1991).

Results

In 2022, South Korea is projected to rank sixth in the world in exports and eighth in imports (WTO, 2023, p. 60). In this context, South Korea, which is among the most significant countries in global trade, has achieved a considerable proportion of its foreign trade through the manufacturing industry, as evidenced by Table 2.

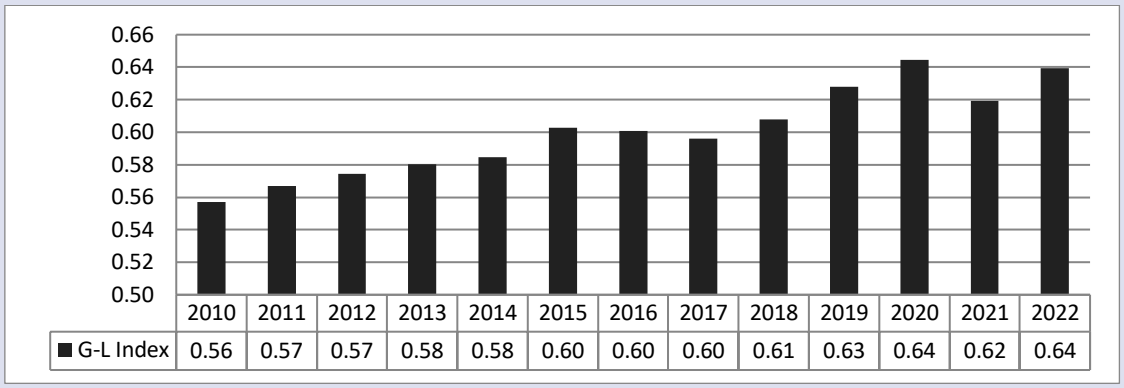
Table 1. IIT Ratings Based on G-L Value Ranges

G-L Value Ranges	IIT Ratings
0< IIT^{G-L} or $\overline{IIT}^{G-L}$ <0,50	Low
0,50< IIT^{G-L} or $\overline{IIT}^{G-L}$ <1	High

Table 2. Share of Manufacturing Industry in South Korea's Foreign Trade

	Manufacturing Industry Foreign Trade Values (Thousand $)		Total Foreign Trade Values (Thousand $)		Share of Manufacturing Industry in Foreign Trade	
Year	Export	Import	Export	Import	Export Share	Import Share
2010	420144201	252204660	466383762	425212160	0,90	0,59
2011	484534486	282584877	555213656	524413090	0,87	0,54
2012	473371377	269962126	547869792	519584473	0,86	0,52
2013	491182380	275258301	559632434	515585515	0,88	0,53
2014	506227722	288629977	572664607	525514506	0,88	0,55
2015	480703804	280645676	526756503	436498973	0,91	0,64
2016	454550334	274888959	495425940	406192887	0,92	0,68
2017	522655199	310564212	573694421	478478296	0,91	0,65
2018	541555582	326011729	604859657	535202428	0,90	0,61
2019	484817354	315019598	542232610	503342947	0,89	0,63
2020	470727136	320902647	512498038	467632763	0,92	0,69
2021	584797781	395544806	644400368	615093447	0,91	0,64
2022	598692870	427842083	683584760	731369657	0,88	0,58

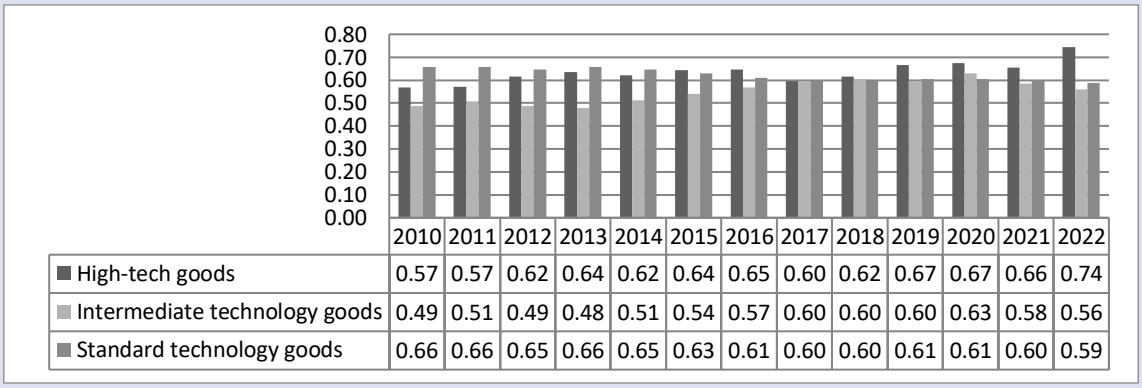
Source: Own calculations based on KITA foreign trade statistics (2023).



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
G-L Index	0.56	0.57	0.57	0.58	0.58	0.60	0.60	0.60	0.61	0.63	0.64	0.62	0.64

Figure 1. IIT values of the manufacturing industry in South Korea's foreign trade from 2010 to 2022 (Average G-L index)[1]

Source: Own calculations based on KITA foreign trade statistics (2023).



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
High-tech goods	0.57	0.57	0.62	0.64	0.62	0.64	0.65	0.60	0.62	0.67	0.67	0.66	0.74
Intermediate technology goods	0.49	0.51	0.49	0.48	0.51	0.54	0.57	0.60	0.60	0.60	0.63	0.58	0.56
Standard technology goods	0.66	0.66	0.65	0.66	0.65	0.63	0.61	0.60	0.60	0.61	0.61	0.60	0.59

Figure 2. IIT values by technology intensity in South Korea manufacturing industry from 2010 to 2022 (Average G-L index)

Source: Own calculations based on KITA foreign trade statistics (2023).

A review of South Korea's foreign trade data, as presented in Table 2, reveals a notable increase in both total foreign trade and foreign trade in manufacturing industry sectors over time. In general, 90% of total exports consisted of manufacturing industry products, while imports fluctuated between 52% and 69%. In 2012, the proportion of manufactured goods exported fell to 86%, but rose to 92% by 2020 and was recorded at 88% in 2022. With regard to imports, the proportion of manufactured goods in total imports fell from 52% in 2012 to 69% in 2020 and 58% in 2022. In this context, it is evident that the manufacturing industry plays a pivotal role in both South Korea's exports and imports. Although this table provides preliminary information about South Korea's manufacturing industry foreign trade structure in the form of IIT, it does not provide insight into the technology structure.

In the period under review, South Korea has consistently exhibited a positive trade balance with the exception of 2022. A comparison of the foreign trade surpluses of different sectors reveals that the manufacturing industry has a higher surplus than other sectors. In 2022, South Korea exported approximately 684 billion dollars, while importing 731 billion dollars. In this context, the country experienced a foreign trade deficit of 47 billion dollars. In 2022, despite the country's posting of a foreign trade deficit, the manufacturing industry, which plays a significant role in the country's foreign trade, continued to generate a positive balance of trade.

According to Figure 1, the value of IIT increased from 0,56 in 2010 to 0,60 in 2015. In 2022, the value of IIT in foreign trade was 0,64. In this context, it is evident that the foreign trade structure of South Korea's manufacturing industry is predominantly in the form of IIT. South Korea's foreign trade structure gives the impression of a developed country.

It is necessary to analyze the industry based on technology intensity to better understand the structure of IIT in South Korea's manufacturing foreign trade. This includes high-tech goods, intermediate technology goods, and standard technology goods.

Figure 2 illustrates that in 2010, standard technology products exhibited the highest IIT values, with an IIT value of 0,66. In contrast, medium-technology products exhibited a relatively low IIT value in 2010, but this value increased from 2017 to 2020 and reached 0,56 in 2022. In high-tech products, the value of IIT was 0,57 in 2010, but by 2022 it had increased to 0,74. It can be argued that the main reason for South Korea's high manufacturing industry IIT values is the high IIT values of high-tech products. Furthermore, the arithmetic mean of the annual rates of change of IIT values for the period 2010-2022 indicates an increase of 2,33% for

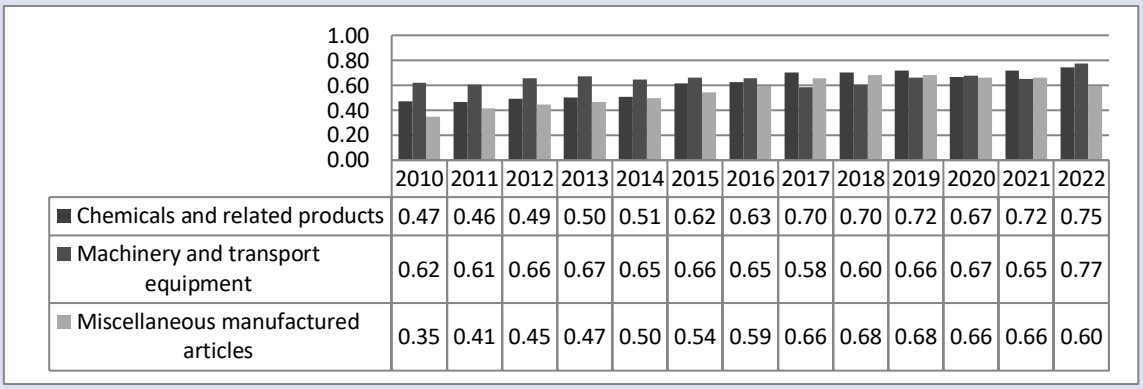
[1] Equation 2 is employed for the calculation of South Korea's IIT values. In contrast with the foreign trade data presented in Table 2, the calculations are based on foreign trade data pertaining to product groups.

high-tech products, an increase of 1,22% for medium-tech products and a decrease of 0,91% for standard technology products. This demonstrates that the product group exhibiting the most rapid growth in South Korea's IIT values belongs to the high-tech product group.

Figure 3 illustrates the intra-industry trade structure in the chemicals sector (coded 5) until 2013 and in the manufacturing industry products not elsewhere specified sector (coded 8) until 2014. During this period, there was a noteworthy rise in IIT values in the chemical sector, increasing from 0,47 in 2010 to 0,75 in 2022. The machinery and transportation equipment sector, coded 7, reached the highest level of IIT value (0,77) in 2022.

As demonstrated in Table 3, the IIT value for product group 541, "Medicinal and pharmaceutical products, other than medicaments of group 542," is notably elevated and reached its maximum in 2022.

In terms of high-tech product groups, no IIT was found for processed products coded 6.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Chemicals and related products	0.47	0.46	0.49	0.50	0.51	0.62	0.63	0.70	0.70	0.72	0.67	0.72	0.75
Machinery and transport equipment	0.62	0.61	0.66	0.67	0.65	0.66	0.65	0.58	0.60	0.66	0.67	0.65	0.77
Miscellaneous manufactured articles	0.35	0.41	0.45	0.47	0.50	0.54	0.59	0.66	0.68	0.68	0.66	0.66	0.60

Figure 3. IIT values by sectors consisting of high-tech product groups in the South Korean manufacturing industry from 2010 to 2022 (Average G-L index)

Source: Own calculations based on KITA foreign trade statistics (2023).

Table 3. IIT values of high-tech goods from 2010 to 2022 (Chemicals and related products, n.e.s.) (G-L index)

SITC Code	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
541	0,67	0,64	0,60	0,63	0,62	0,79	0,89	0,95	0,98	0,98	0,81	0,88	1,00

Source: Own calculations based on KITA foreign trade statistics (2023).

Table 4. IIT values of high-tech goods from 2010 to 2022 (Machinery and transport equipment) (G-L index)

SITC Code	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
721	0,73	0,71	0,74	0,84	0,66	0,67	0,57	0,71	0,55	0,47	0,44	0,46	0,43
722	0,64	0,46	0,47	0,59	0,44	0,26	0,51	0,42	0,41	0,43	0,37	0,29	0,23
724	0,28	0,35	0,29	0,30	0,31	0,29	0,36	0,41	0,57	0,66	0,97	0,61	0,57
725	0,57	0,96	0,94	0,93	0,93	0,97	0,89	0,90	0,94	0,92	0,97	0,80	0,94
726	0,46	0,63	0,65	0,69	0,74	0,65	0,67	0,69	0,73	0,73	0,64	0,67	0,65
727	0,72	0,76	0,63	0,72	0,53	0,61	0,59	0,63	0,68	0,53	0,56	0,67	0,64
728	0,62	0,70	0,76	0,91	0,87	0,94	0,87	0,75	0,90	0,90	0,87	0,76	0,79
741	0,70	0,65	0,61	0,64	0,61	0,57	0,58	0,68	0,71	0,59	0,59	0,72	0,75
742	0,74	0,80	0,84	0,80	0,85	0,89	0,99	1,00	1,00	0,96	0,93	0,95	0,97
743	0,90	0,99	1,00	0,98	0,97	0,94	0,91	0,97	0,93	0,91	0,94	0,90	0,93
744	1,00	0,87	0,92	0,98	0,98	0,95	0,88	0,77	0,69	0,71	0,76	0,87	0,79
745	0,86	0,91	0,89	0,97	0,99	1,00	1,00	0,95	0,95	0,98	0,93	0,89	0,94
746	0,60	0,62	0,69	0,78	0,85	0,88	0,94	0,98	0,96	0,96	0,96	0,95	0,97
747	0,79	0,89	0,95	0,82	0,76	0,88	0,96	0,88	0,93	0,93	0,93	0,84	0,83
748	0,81	0,87	0,85	0,88	0,98	0,95	0,86	0,88	0,89	0,85	0,87	0,94	0,96
749	0,89	0,64	0,54	0,54	0,46	0,45	0,43	0,44	0,54	0,42	0,39	0,49	0,56
751	0,88	0,90	0,92	0,97	0,98	0,97	1,00	0,93	0,92	0,91	0,87	0,91	0,91
752	0,80	0,82	0,93	0,92	0,88	0,93	0,89	0,91	0,84	0,27	0,16	0,14	0,15
759	0,54	0,62	0,71	0,61	0,51	0,61	0,79	0,58	0,56	0,70	0,56	0,50	0,66
772	0,91	0,92	0,96	0,90	0,80	0,78	0,74	0,74	0,78	0,79	0,79	0,82	0,84
774	0,97	0,98	0,89	0,82	0,77	0,79	0,79	0,77	0,77	0,79	0,83	0,73	0,74
776	0,80	0,80	0,79	0,77	0,76	0,77	0,74	0,59	0,51	0,65	0,68	0,66	0,92
778	0,81	0,71	0,59	0,57	0,59	0,56	0,52	0,50	0,56	0,73	0,74	0,82	0,89
792	0,61	0,38	0,56	0,75	0,71	0,66	0,63	0,90	0,94	0,80	0,83	0,66	0,82

Source: Own calculations based on KITA foreign trade statistics (2023).

Table 5. IIT values of high-tech goods from 2010 to 2022 (Miscellaneous manufactured articles) (G-L index)

SITC Code	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
871	0,20	0,23	0,24	0,22	0,26	0,30	0,33	0,47	0,53	0,41	0,43	0,45	0,35
872	0,67	0,67	0,72	0,73	0,76	0,74	0,70	0,68	0,66	0,66	0,61	0,72	0,77
873	0,95	0,83	0,79	0,91	0,95	0,90	0,81	0,85	0,78	0,81	1,00	0,86	0,96
874	0,50	0,57	0,60	0,70	0,72	0,73	0,78	0,77	0,78	0,78	0,72	0,67	0,74
881	0,57	0,45	0,43	0,55	0,67	0,82	0,89	0,57	0,80	0,87	0,56	0,59	0,63
882	0,47	0,51	0,57	0,60	0,79	0,90	0,97	1,00	1,00	0,98	1,00	0,97	0,98
884	0,81	0,90	0,93	0,92	0,92	0,93	0,89	0,87	0,83	0,79	0,78	0,80	0,90

Source: Own calculations based on KITA foreign trade statistics (2023).

As illustrated in Table 4, 725 "Paper mill and pulp mill machinery, paper cutting machines and other machinery for the manufacture of paper articles; parts thereof", 727 "Food-processing machines (excluding domestic); parts thereof", 728 "Other machinery and equipment specialized for particular industries; parts thereof, n.e.s.", 741 "Heating and cooling equipment and parts thereof, n.e.s.", 742 "Pumps for liquids, whether or not fitted with a measuring device; liquid elevators; parts for such pumps and liquid elevators", 743 "Other pumps; compressors, fans, ventilating or recycling hoods incorporating a fan, centrifuges, filtering or purifying apparatus; parts thereof", 744 "Mechanical handling equipment and parts thereof, n.e.s.", 745 "Non-electrical machinery, tools and mechanical apparatus and parts thereof, n.e.s.", 746 "Ball or roller bearings", 747 "Taps, cocks, valves and similar appliances", 748 "Transmission shafts", 751 "Office machines", 772 “Electrical apparatus for switching", 774 "Electro-diagnostic apparatus" and 776 "Thermionic, cold cathode or photo-cathode valves and tubes; diodes, transistors, and similar semiconductor devices". Throughout the period, all of these product groups had high rates of IIT. It is evident that the rates for IIT products have declined in recent years in the product groups 721 "Agricultural machinery (excluding tractors) and parts thereof", 722 "Tractors", and 752 "Automatic data processing machines". In the product groups of 724 "Textile and leather machinery and parts thereof, n.e.s.", 726 "Printing and bookbinding machinery and parts thereof", 749 "Non-electric parts and accessories of machinery, n.e.s.", 759 “Parts suitable for use with machines 751 and 752", 778 "Electrical machinery and apparatus, n.e.s." and 792 "Aircraft and associated equipment", low IIT rates were encountered in some years, but they were high in 2022.

Table 5 reveals that the product groups "Measuring, checking, analyzing and controlling instruments and apparatus, n.e.s." (874), “Photographic apparatus and equipment, n.e.s." (881), and "Photographic and cinematographic supplies" (882) exhibited consistently high IIT values throughout the observation period. In the 874 and 882 product groups, high IIT values were observed in all years except 2010. In the 881 product group, IIT values were high and fluctuating in all years except 2011 and 2012. With the exception of 2018, 871 product groups exhibited low IIT values.

Conclusion

IIT, which is the bilateral international trade of similar goods within the same industry and takes place between countries with similar industrial structures, accounts for approximately a quarter of world trade today. IIT is expanding at a faster rate than inter-industry trade, which is the one-sided international trade of dissimilar goods from different sectors based on the theory of comparative advantage. IIT is typically conducted between developed countries. While until the last 35-40 years, the parties to this trade were predominantly Western developed industrialized countries, today Asian countries also engage in this trade to a significant extent. The reasons for the growing importance of IIT in Asia's foreign trade can be attributed to three key factors: the phenomenon of high economic growth, export-oriented industrialization, and the internationalization of production in the countries of this continent.

South Korea is one of the Asian countries in which the IIT has been experiencing an increasing share in its foreign trade. Since the 1960s, South Korea's economy has undergone significant growth, with an expansion in market size, a reduction in trade barriers, and an increase in foreign direct investment. These developments have laid the foundation for the growth of the IIT in Korea's manufacturing industry. In particular, with the growth of capital accumulation, the value of IIT in total trade of high-tech capital-intensive sectors has increased over time.

This article aims to examine the extent of South Korea's intra-industry trade of high-tech (i.e., high-value-added) manufacturing products with other countries. To this end, the development of the share of the manufacturing industry in South Korea's foreign trade is analyzed using 3-digit foreign trade data within the scope of the manufacturing industry (SITC-Rev.3) between 2010 and 2022. The results indicate that this share is 88% in exports and 58% in imports in 2022. It is notable that, despite the manufacturing industry maintaining a relatively constant share of the relevant period, its share in imports declined to its lowest value in 2022.

Subsequently, we proceeded to the analysis of South Korea's IIT. For this purpose, the Grubel-Lloyd Index, which is the most preferred method in the literature, was selected. In 2010, the value of IIT in South Korea's manufacturing industry's foreign trade was 0,56. This value increased to 0,60 in 2015 and 0,64 in 2022. In other words, the values of IIT have been on an upward trend in the 2010-2022 period, with the exception of 2021. By 2022, South Korea's manufacturing IIT values had reached their

highest level. Consequently, in South Korea's manufacturing industry, IIT has become the dominant foreign trade structure.

This study examines the technological change in the structure of South Korea's foreign trade, with a particular focus on the IIT. While standard technology products played an important role in the high IIT values in 2010, the increasing IIT values of high-tech products since 2015 have been effective in maintaining the high IIT values of South Korea. South Korea's prioritization of investments in high-tech products in manufacturing industries and augmented R&D investments have been instrumental in this outcome. Moreover, the predominant opinion is that the promotion of free trade agreements is imperative to maintain regional competitiveness, given the increasing number of free trade agreements between South Korea and Asian countries. Indeed, the fact that South Korea, which previously applied higher tariffs than many other countries, entered into numerous free trade agreements and negotiated lower tariffs, particularly on industrial products, had a beneficial impact on IIT.

The machinery and transportation sector, as well as the chemical sector, have emerged as key contributors to the high value of high-tech products. Additionally, it was observed that manufacturing industry products, which were not previously mentioned, underwent a transformation from inter-industry trade to IIT and also contributed to the high IIT values. In this context, it is understood that the foreign trade of the same or similar products with the countries with which South Korea conducts foreign trade is in high-tech product groups. In this framework, a higher share of IIT in South Korea's foreign trade will enable South Korea to gain more from foreign trade. To this end, South Korea must pursue greater product differentiation and specialization in high-tech or, in other words, high-value-added product groups in its foreign trade. In this regard, South Korea must enhance its regional and bilateral cooperation with Asian countries, as well as with the broader global community. In order to achieve this objective, it is essential to enhance collaboration in investment domains. Within the scope of these collaborations, it is also necessary to identify and prioritize high-tech companies. Increasing the operational efficiency of these companies can be achieved by strengthening their scale structure. Additionally, it is imperative to augment investment in R&D to ensure the sustained competitiveness and innovation capacity of these companies.

Furthermore, although Korea has experienced less adverse effects from the Russian-Ukrainian conflict and the global pandemic than other Asian countries, it remains susceptible to the repercussions of the prevailing inflationary pressures. Moreover, South Korean industry is reliant on imported raw materials. To prevent these from reducing competitiveness in high-tech products and dragging down the value of IIT, and to mitigate their negative impact on the balance of trade, it is necessary for South Korea to establish more flexible production and more extensive supply chains. In this context, although South Korea has recently signed a supply chain partnership agreement with Singapore in the field of energy, it is thought that the realization of these activities with other sectors and other Asian countries will play an important role in increasing the IIT values of this country. In order for South Korea to become more prominent in IIT in high-tech products, it is necessary to implement the "Mother Factory" strategy. This strategy involves the construction of main factories, which are defined as production facilities characterized by advanced technologies and equipment, domestically, while factories whose functions are mainly related to mass production are located in foreign countries. In addition, South Korea must streamline its bureaucratic processes, particularly in the context of high-tech investments, and augment the magnitude of R&D investments and tax incentives in these domains.

Katkı Oranları ve Çıkar Çatışması / Contribution Rates and Conflicts of Interest

Etik Beyan	Bu çalışmanın hazırlanma sürecinde bilimsel ve etik ilkelere uyulduğu ve yararlanılan tüm çalışmaların kaynakçada belirtildiği beyan olunur.	**Ethical Statement**	It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.
Yazar Katkıları	Çalışmanın Tasarlanması: MFA (%60) OBK (%40) Veri Toplanması: MFA (%60) OBK(%40) Veri Analizi: MFA (%60) OBK (%40) Makalenin Yazımı: MFA (%60) OBK(%40) Makale Gönderimi ve Revizyonu: MFA (%60) OBK(%40)	**Author Contributions**	Research Design: MFA (%60) OBK(%40) Data Collection: MFA (%60) OBK (%40) Data Analysis: MFA (%60) OBK (%40) Writing the Article: MFA (%60) OBK (%40) Article Submission and Revision: MFA (%60) OBK (%40)
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Çıkar Çatışması	Çıkar çatışması beyan edilmemiştir.	**Conflicts of Interest**	The author(s) has no conflict of interest to declare.
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Etik Kurul	Etik kurul iznine ihtiyaç bulunmamaktadır	**Ethics Committee**	Ethics committee approval is not required.

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Appendix

Product Category	Product Code	SITC (Rev. 3) Definition
High-Tech Goods	541	Medicinal and pharmaceutical products, excluding 542
	721	Agricultural machinery (excluding tractors) & parts
	722	Tractors (excluding those of 71414 & 74415)
	724	Textile & leather machinery, & parts thereof, n.e.s.
	725	Paper mill, pulp mill machinery; paper articles man.
	726	Printing & bookbinding machinery, & parts thereof
	727	Food-processing machines (excluding domestic)
	728	Other machinery for particular industries, n.e.s.
	741	Heating & cooling equipment & parts thereof, n.e.s.
	742	Pumps for liquids
	743	Pumps (excluding liquid), gas compressors & fans; centr.
	744	Mechanical handling equipment, & parts, n.e.s
	745	Other non-electr. machinery, tools & mechan. appar.
	746	Ball or roller bearings
	747	Appliances for pipes, boiler shells, tanks, vats, etc.
	748	Transmis. Shafts
	749	Non-electric parts & accessor. of machinery, n.e.s.
	751	Office machines
	752	Automatic data processing machines, n.e.s.
	759	Parts, accessories for machines of groups 751, 752
	772	Apparatus for electrical circuits; board, panels
	774	Electro-diagnostic appa. for medical sciences, etc.
	776	Cathode valves & tubes
	778	Electrical machinery & apparatus, n.e.s.
	792	Aircraft & associated equipment; spacecraft, etc.
	871	Optical instruments & apparatus, n.e.s.
	872	Instruments & appliances, n.e.s., for medical, etc.
	873	Meters & counters, n.e.s.
	874	Measuring, analysing & controlling apparatus, n.e.s.
	881	Photographic apparatus & equipment, n.e.s.
	882	Cinematographic & photographic supplies
	884	Optical goods, n.e.s.
Intermediate Technology Goods	511	Hydrocarbons, n.e.s., & halogenated, nitr. Derivative
	512	Alcohols, phenols, halogenat., sulfonat., nitrat. der.
	513	Carboxylic acids, anhydrides, halides, per.; derivati.
	514	Nitrogen-function compounds
	515	Organo-inorganic, heterocycl. compounds, nucl. Acids
	516	Other organic chemicals
	522	Inorganic chemical elements, oxides & halogen salts
	523	Metallic salts & peroxysalts, of inorganic acids
	524	Other inorganic chemicals
	531	Synth. organic colouring matter & colouring lakes
	533	Pigments, paints, varnishes and related materials
	553	Perfumery, cosmetics or toilet prepar. (excluding soaps)
	554	Soaps, cleansing and polishing preparations
	562	Fertilizers (other than those of group 272)

	573	Polymers of vinyl chloride or halogenated olefins
	575	Other plastics, in primary forms
	579	Waste, parings and scrap, of plastics
	581	Tubes, pipes and hoses of plastics
	582	Plates, sheets, films, foil & strip, of plastics
	583	Monofilaments, of plastics, cross-section > 1mm
	591	Insectides & similar products, for retail sale
	592	Starche, wheat gluten; albuminoidal substances; glues
	593	Explosives and pyrotechnic products
	597	Prepared addit. for miner. oils; lubricat., de-icing
	598	Miscellaneous chemical products, n.e.s.
	599	-
	611	Leather
	612	Manufactures of leather, n.e.s.; saddlery & harness
	621	Materials of rubber (pastes, plates, sheets, etc.)
	625	Rubber tyres, tyre treads or flaps & inner tubes
	629	Articles of rubber, n.e.s.
	641	Paper and paperboard
	642	Paper & paperboard, cut to shape or size, articles
	711	Vapour generating boilers, auxiliary plant; parts
	712	Steam turbines & other vapour turbin., parts, n.e.s.
	713	Internal combustion piston engines, parts, n.e.s.
	714	Engines & motors, non-electric; parts, n.e.s.
	716	Rotating electric plant & parts thereof, n.e.s.
	718	Other power generating machinery & parts, n.e.s.
	731	Machine-tools working by removing material
	733	Mach.-tools for working metal, excluding removing mate.
	735	Parts, n.e.s., & accessories for machines of 731, 733
	737	Metalworking machinery (excludingmachine-tools) & parts
	761	Television receivers, whether or not combined
	762	Radio-broadcast receivers, whether or not combined
	763	Sound recorders or reproducers
	764	Telecommunication equipment, n.e.s.; & parts, n.e.s.
	771	Electric power machinery, and parts thereof
	773	Equipment for distributing electricity, n.e.s.
	775	Household type equipment, electrical or not, n.e.s.
	781	Motor vehicles for the transport of persons
	782	Motor vehic. for transport of goods, special purpo.
	783	Road motor vehicles, n.e.s.
	785	Motorcycles & cycles
	786	Trailers & semi-trailers
Standard	651	Textile yarn
Technology	652	Cotton fabrics, woven
Goods	654	Other textile fabrics, woven
	656	Tulles, trimmings, lace, ribbons & other small wares
	657	Special yarn, special textile fabrics & related
	658	Made-up articles, of textile materials, n.e.s.
	659	Floor coverings, etc.
	661	Lime, cement, fabrica. constr. mat. (excludingglass, clay)
	663	Mineral manufactures, n.e.s.
	664	Glass
	665	Glassware
	667	Pearls, precious & semi-precious stones
	671	Pig iron & spiegeleisen, sponge iron, powder & granu
	672	Ingots, primary forms, of iron or steel; semi-finis.
	673	Flat-rolled prod., iron, non-alloy steel, not coated
	675	Flat-rolled products of alloy steel
	676	Iron & steel bars, rods, angles, shapes & sections
	677	Rails & railway track construction mat., iron, steel
	678	Wire of iron or steel
	679	Tubes, pipes & hollow profiles, fittings, iron, steel
	681	Silver, platinum, other metals of the platinum group
	682	Copper
	684	Aluminium
	685	Lead
	689	Miscellaneous no-ferrous base metals for metallur.

691	Structures & parts, n.e.s., of iron, steel, aluminium
692	Metal containers for storage or transport
693	Wire products (excluding electrical) and fencing grills
694	Nails, screws, nuts, bolts, rivets & the like, of metal
695	Tools for use in the hand or in machine
696	Cutlery
697	Household equipment of base metal, n.e.s.
699	Manufactures of base metal, n.e.s.
791	Railway vehicles & associated equipment
811	Prefabricated buildings
812	Sanitary, plumbing, heating fixtures, fittings, n.e.s.
813	Lighting fixtures & fittings, n.e.s.
821	Furniture & parts
844	Women's clothing, of textile, knitted or crocheted
846	Clothing accessories, of textile fabrics
848	Articles of apparel, clothing access., excluding textile
851	Footwear
891	Arms & ammunition
892	Printed matter
893	Articles, n.e.s., of plastics
895	Office & stationery supplies, n.e.s.
896	Works of art, collectors' pieces & antiques
897	Jewellery & articles of precious materia., n.e.s.
898	Musical instruments, parts; records, tapes & similar
899	Miscellaneous manufactured articles, n.e.s.