Nanotechnology Perceptions
ISSN 1660-6795
www.nano-ntp.com

Revisiting Intra-industry Trade and Revealed Comparative Advantage on the Thai Gem and Jewelry Industry

Sujinda Chemsripong[1], Nitad Chemsripong[1], Phimkanda Jundahuadong[2]

[1]Faculty of Business, Economics and Communication, Naresuan University, Thailand,
[2]Kamphaeng-Phet Rajabhat University, Thailand
Email: sujindac@gmail.com

The Thai Gem and Jewelry Industry has a prominent role in domestic trade development due to being the source of export income and an important source of employment in the market sector. This research reviews and analyzes Comparative and Competitive Advantages in the Thai Gem and Jewelry Industry by using the Intra-Industry Trade (IIT) Index, Marginal Intra-Industry Trade (MIIT) Index Revealed Comparative Advantage (RCA) Index, and Relative Trade Advantage (RTA) Index in recent data from 2004 to 2024. Gems and Jewelry export values were accumulated and presented by analyzing data from Thailand and foreign data which used the same industry trade index model and the Revealed Comparative Advantage model. It was found that IIT was taking place at a high level. Higher quality trade was taking place between 2004 and 2023. Low-quality products were exported in some years. The gem and Jewelry industry had a comparative disadvantage throughout the reference period.

1. Introduction

The main purpose of international trade is to develop economic growth based on comparative and competitive advantages such as import and export values, product specialization, and productivity increase, [1], [2]. Comparative costs play a significant role in foreign trade, not only in terms of country exports and imports not by its character in isolation, but also concerning those of its trading partners. Based on the concept of Samuelson, "Foreign trade offers a consumption possibility frontier that can give more of all goods than own domestic production possibility frontier"[3]. Therefore, trade liberalization has played a significant role in expanding new markets. Since the late 1940s, the world's trading patterns dramatically changed as well as the measures employed by countries to survive in a world where trade is being liberalized [4]. Globalization led to a reduction in trade barriers emphasizing promoting export competitiveness, [5] and [6].

The extension idea of comparative advantage began in the 19th century which emphasized production and international trade advantage by emphasizing lower opportunity costs

compared to other economies, and the optimal use of available resources. Ricardo's concept points out that "International trade will very powerfully contribute to increase the mass of commodities, and therefore, the sum of enjoyments of countries with different comparative advantages engaging in trade will profitably benefit from it" [7]; [8]. However, [9] argued that Ricardo's comparative advantage theory regarding foreign trade didn't work in his study, therefore competitive advantage was applied to move forward. Later, the concept of competitiveness has become more market liberalization and a global economy. The competition used to be more localized within regions and nations with increasing international trade everywhere. Competitors are not as fully identified as they used to be and might come from faraway places, which was not the case previously [8]. The competitiveness advantage concept has developed by evaluating the effectiveness of competition, and the ability to apply innovations, production efficiency, and quality of products and services in an open market. This makes competitiveness important for the world.

Many empirical trade competitiveness studies have focused on scale economies and trade by [10], specific products such as the ICT industry [11], textiles and clothing [12], gems, and jewelry industry in India [13], etc. The study also focuses on labor costs in Thailand [14], and competitiveness in Portuguese [15]. Some previous studies focus on the determinants of new market potentials and export commodities in the South Asian Region [16]; etc. For more than four decades theoretical and empirical researchers of international trade moved forward to interest in the measurement index of the two-way exchange of products belonging to the same industry have been keenly interested, known as intra-industry trade (IIT), while theories of comparative advantage based on factor endowment focused on inter-industry trade. The basis of Heckscher-Ohlin's comparative advantage in terms of factor endowments describes that A country will export a commodity that "utilizes its abundant factor and import a commodity that utilizes its scarce factor [17]. Both types of trade models assume that "goods traded are homogeneous and that a country will therefore either only export goods within the same industry, or only import these goods, but not simultaneously export and import goods within the same industry" [18]. However, a large portion of the output of modern economies involves differentiated rather than homogeneous products of the same industry which is intra-industry trade (IIT) as opposed to inter-industry trade in completely different products. Therefore, conventional trade theories are deficient in this respect and cannot explain this type of emerging trade pattern. After the pioneering study by [19], the initial key contributions to the theory of IIT study include [20] and [21]. Instead of specialization in an entire industry or activity, inter-industry specialization, intra-industry specialization involves a country specializing in a narrow range of products within a given industry [22]; [23]. Another corollary of IIT theory is related to economies of scale, principally because IIT occurs when each country with economies of scale produces only a limited range of products within an industry.

Thus, IIT represents a simultaneous movement towards specialization in separate differentiated goods and achieves economies of scale in production. This leads to two-way trade in products similar enough to be grouped in the same industry in standard industry classification schemes. As [20] pointed out, IIT with these features produces extra gains from international trade because it creates a larger market. As a consequence, a country engaged in

a narrower form of specialization can, via IIT, increase both productivity and the variety of goods available to domestic consumers. Many dimensions of international trade patterns have been applied, namely trading between country-specific, IITs of India [24]. The IIT phenomenon was first considered empirically when the European Common Market grew into the European Union and currently consists of twenty-five countries. Study on trade patterns of different countries, such as the impact of trade patterns between inter-IT and IIT between India and Asia by [25], the Effect of Inter-industry Trade on Competitiveness in Turkey [26], comparative advantages and IIT in global world products, and pattern of trade and trade advantage in transport equipment industry in India [27]; etc.

A large number of theoretical and empirical studies have been carried out to measure the size and importance of IIT, and also to investigate the determinants of it since that time such as on the determinants of India's IIT [28]. In addition to the desirable welfare effects mentioned before, trade analysts also noted another positive aspect of IIT from the investigation of the European experience after the formation of the EC, namely, the adjustment cost of economic integration. Accordingly, the bulk of empirical studies have focused on the IIT of developed countries. However, an increasing number of studies have also been done on developing country IIT, or on the IIT between developed and developing countries. Some of the studies have focused on country-specific determinants of IIT while others have concentrated on industry-specific ones. However, a few studies focus on comparative advantage via RCA and competitive advantage via IIT. on the country level, such as US manufacturing with China [29], in the Central American Common Market. Some study extends the relationship and focuses on horizontal and vertical IIT from the inter-industry in Asia, and the EU [30], between Turkey and the European Union [31], and the Competitiveness of Turkey [26], etc.

Therefore, in this study, we estimated the extent of intra-industry trade (IIT) in industry trade considering the major importers and exporters worldwide by using the Grubel–Lloyd (G-L) index to measure the IIT of a particular product. The concept was introduced by [19] and several alternative measures have been developed in the literature to estimate the degree of IIT. This index measures IIT as a percentage of a country's total trade which is assumed to be balanced, that is exports equal imports. The nature of an economy's comparative/competitive advantage has utility as it can help to identify the implications for an economy of a shift in a policy regime and to determine the influence on economic welfare both in the long run and in the short run. Understanding comparative advantage clearer regarding an economy's trade and investment regime should benefit from explicit differences in international factor endowments and relative demand. Gains from global trade are realized due to an improvement in the allocation of scarce resources when an economy produces its comparative advantage. With the gradual reduction in trade barriers led by the process of globalization, more emphasis is now being placed on promoting export competitiveness.

Thai Gem and Jewelry Industry have been applied in this study for many reasons. The first reason is to develop a source of export income, especially on high-value products, such as diamonds, rubies, sapphires, and other colored gemstones, to the global market, namely USA, EU, Japan, and China. The second is to develop the source of employment of the Thai

gem and Jewelry Industry e.g. Thai craftsmen's skills and craftsmanship in grinding and exquisite design. The third reason is that the products of Thailand have quality and uniqueness stand out and are recognized in the global market. Another reason is the variety of natural resources in Thailand such as sapphires from Chanthaburi, rubies, etc. from various provinces. Other colored gemstones are of high quality, allowing Thailand to produce products directly to serve the global demand market. Also, infrastructure in Thailand such as transportation, communication, and logistics services are conducive to exports and support to the government, via tax policies and preferences.

Thailand‘s gems and jewelry industry has recorded as the third rank of export products to the world during 2021-2020, followed by the vehicles, equipment & components, and computers, equipment, and components industry. The value of gem and jewelry export and import industry products increased continuously from 2,603.19 billion US dollars in 2004 to 14,636.88 billion US dollars in 2023 and 4,915.74 billion USD in 2024 (January-April), especially, since the imports value was greater than the exports in 2010-2014, 2017-2018, and 2022-2023. The export value was higher than imports and was the highest in 2019-2020, as shown in Fig. 1.

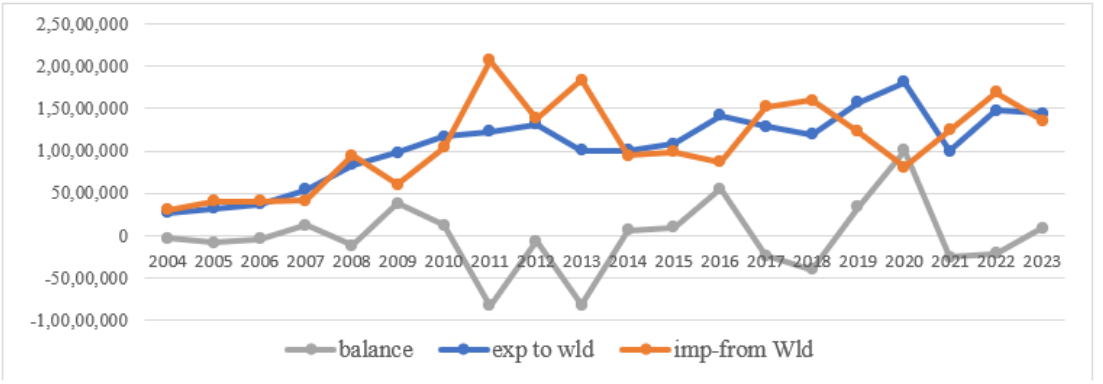

Fig 1 Thailand exports to and imports from the world, 2004-2023

Source: Information and Communication Technology Center, Office of the Permanent Secretary of the Ministry of Commerce with the cooperation of the Customs Department.

Table 1 shows the export value of Thai gems and jewelry for all products during 2020-2023 increased from 231,534.10 to 284,561.80 million dollars and gold jewelry decreased (47.71%) (Consider Table 1 and Figure 2).

TABLE 1 EXPORT VALUE OF THAI GEMS AND JEWELRY BY COMMUNITY, 2004-2023, (MILLION DOLLARS)

Gems and Jewelry	2000	2010	2015	2020	2023
1) Gem	768.22	1,584.67	2,833.91	1,506.69	3,376.01
1.1 diamond	529.21	1,097.80	1,777.42	946.4	1,327.96
1.2 Gems	236.76	473.03	1,041.88	549.47	2,014.55

1.3 Pearl	2.25	13.84	14.61	10.83	33.5
2) Authentic Jewelry	827.02	3,122.12	3,698.48	2,639.98	4,610.88
2.1.Made with Silver	252.14	1,304.77	1,585.80	1,410.23	1,621.89
2.2. Made with Gold	558.43	1,620.14	1,849.28	1,099.77	2,648.01
2.3 Made of other metals	16.45	197.21	263.4	129.98	340.98
3) Artificial Jewelry	63.31	288.23	390.94	244.18	304.68
3.4 Artificial Gem	14.93	82.21	114.3	45.84	154.13
3.5 Unformed Gold	22.37	6,493.84	3,807.24	13,339.92	5,978.77
3.6 Precious metals covered with other metals.	46.00	80.75	149.82	432.33	362.78
3.7 Jewels and ornaments included	1,741.80	11,651.80	10,994.70	18,208.90	14,787.26
Total Export of all products				231,634.10	284,561.80

Source: Customs Department Processed by the National Gem and Jewelry Research and Development Institute

(NAGEM and GEM) (Public Sector)

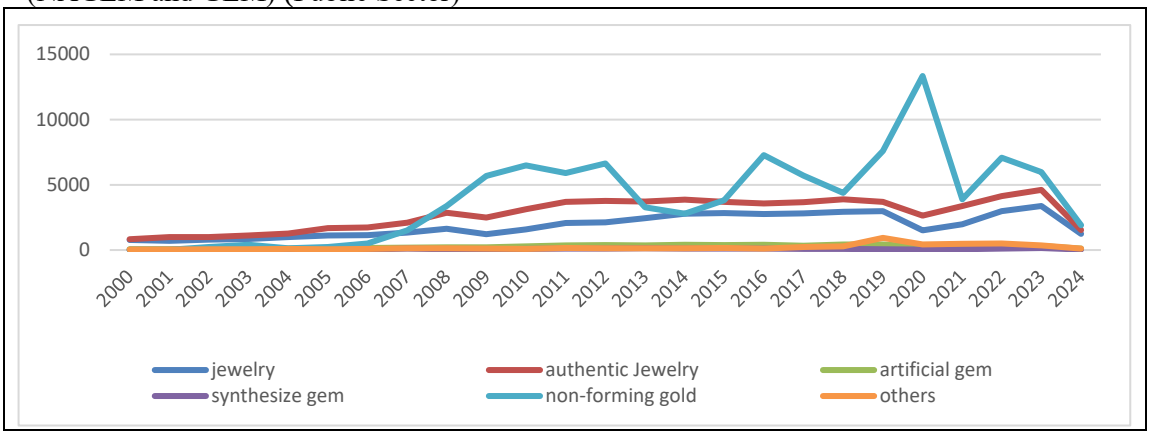

Fig 2 Export value of Thai gems and jewelry by commodity

Source: Center for Information and Communication Technology, Office of the Permanent Secretary of the Ministry of Commerce, in cooperation with the Customs Department

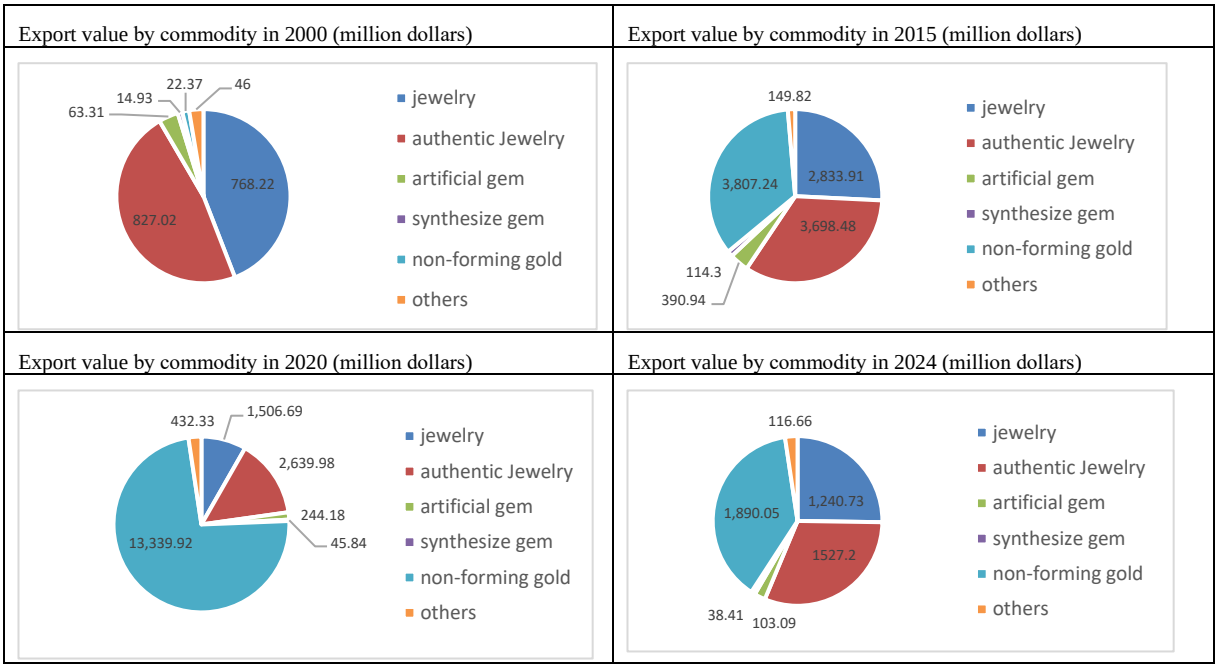

Fig 3 Thailand exports to the world

Source: Information and Communication Technology Center, Office of the Permanent Secretary of the Ministry of Commerce, with the cooperation of the Customs Department.

Thai Gem and Jewelry decreased by 72.39% in 2021 compared to 1977 (From USD 3.74 billion to USD 1.03 billion (including gold), and the export value excluding gold and genuine gems and jewelry decreased by 27.43%) is an important issue in Thailand. The COVID-19 pandemic crisis was the main reason, followed by the competitiveness in the global market from other producer countries, such as India, China, and Vietnam with lower production costs, geopolitical changes, lack of raw materials, and limitations in access management. Diamonds, for example, must be imported from abroad and face fluctuations in raw material prices from the world. Moreover, technology and innovation development issues impact production and design adapting to the market consumers have changed their behavior rapidly, such as the desire to consume environmentally friendly products or the need for customization, etc. Thailand must adapt to this trend. Few empirical research on gems and jewelry competitive advantage such as in the SME industry [32]; [33], sustainable export performance in the Brazillian gems and jewelry [34], and market integration strategy, etc.

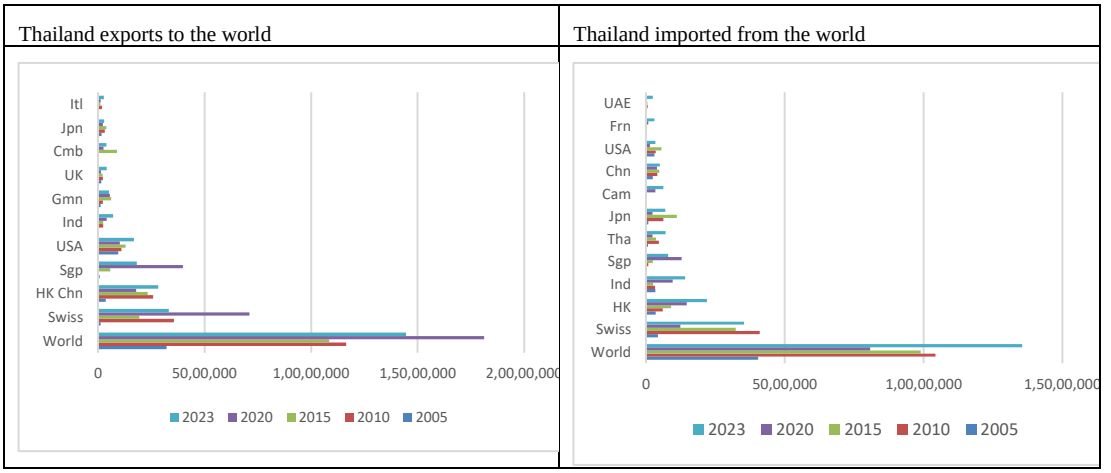

Fig 4 Thailand export-import to all countries (value US dollar thousand)

This study will contribute new opportunities for the Thai gem and jewelry industry to penetrate new markets that have experienced economic growth and higher demand for luxury products, such as China, India, and the Middle East. In addition, developing unique products via created global branding and global marketing issues to increase awareness and build more Thai brands to be more well-known has been recommended. Also, creating friendly environmental products in line with consumer trends is important to sustainability investing in new technologies, R&D, and innovations such as AI and machine learning technology in the design or development of new materials to increase competitiveness in the global market is an important issue. Therefore, three research questions have been examined: 1) What types of comparative or competitive advantage does the Thai Gem and Jewelry Industry have? 2) What level of Thai Gem and Jewelry Industry's Comparative or Competitive Advantage by-product classifications in Thailand? 3) What are the future recommendations for the Thai Gem and Jewelry Industry? The remainder of the paper is structured as follows. Section 2 discusses the methodology and data. The main empirical results are presented in Section 3. Section 4 includes a discussion of the results. Finally, our concluding remarks are presented in the last section.

2. METHODOLOGY AND DATA

Based on secondary data for the period spanning between 2004 and 2023. The export, import, and total trade for the Gem and Jewelry industry in the world and Thailand was drawn from the WTO statistical database [35]. The Information and Communication Technology Center, Office of the Permanent Secretary of the Ministry of Commerce, with the cooperation of the Customs Department [36]. The following statistical tools were used to analyze the data. Intra-industry trade (IIT) will be used to measure the Competitiveness Advantage in this study. The IIT refers to international trade between the same products caused by economies of scale that lead to larger quantities of products and lower unit costs making it better competitive in the

market. The increase in the production council encourages manufacturers to develop innovation and Production Authority. The IIT or GL index created by Grubel and Lloyd in 1975 is one of the most popular static index measures. This index is similar to measure the share of intra-industry in the trade. The GL index was used to measure the static level of IIT in this industry. For an individual product group or industry i the share of IIT is formulated as :

$GL_i = 1- |X_i - M_i| / (X_i + M_i)$

Where X_i and M_i stand for the exports and imports of industry i, respectively,

If all trade was balanced, the GL index would equal 1. On the other hand, if all trade was one-way, the GL_i would equal zero. Thus, the closer GL_i is to 1 (that is, $X_i = M_i$), the more trade in industry i is IIT. The closer GL_i is to zero (that is, either $X_i = 0$ or $M_i = 0$), the more trade in industry i is inter-industry trade. Therefore, the index of IIT takes values from 0 to 1, that is, $0 \leq GL_i \leq 1$. If $GL_i = 1$, there is only IIT, no inter-industry trade. Conversely, if $GL_i = 0$, there is no IIT, only inter-industry trade.

When the GL index is less than 0.25 IIT level is low; when the GL index is greater than 0.25 or less than or equal to 0.5, IIT is at a lower level; when the GL index is greater than 0.5 and less than or equal to 0.75, IIT is at a higher level; when the GL index is greater than 0.75 and less than or equal to 1, shows that IIT is at a very high level. Moreover, to extend the increase in IIT during two time periods over time, Marginal Intra industry trade (MIIT) was used to measure by considering the pattern of industrial adaptation (Brulhart, 1994), formulated as

$$MIIT_i = (\Delta X_I - |\Delta Mi|) / (|\Delta Xi| + |\Delta M_i|)$$

where ΔX = changes in exports of that type of goods over a period of time.

ΔM = changes in imports of that type of goods over a period of time.

Apart from the Competitiveness Advantage mentioned above, the Comparative Advantage using the Revealed Comparative Advantage (RCA) index will be the next measure in this study. The RCA index proposed by Balassa (1977) is widely used to measure open advantage, calculated from the ratio of the share of exports of goods.

If RCA>1 shows that the country has an advantage in producing such goods. If the share of a particular product or service in a country's total exports is relatively larger than its share in total world exports, the comparative advantage in that product or service some authors (e.g. [37] would term it as a measure of international specialization rather than of international competitiveness. Thus, the study was based on export and import data covering 24 years from 2000 to 2024. The index for country i in commodity j is calculated as follows:

$RCA_{ij} = (X_{ij}/X_{wj})/(X_i/X_w)$

Where

RCA_{ij} = Revealed comparative advantage of the Thai Gem and Jewelry industry.

X_{ij} = Merchandise exports of the Thai Gem and Jewelry industry to the world

X_{wj} = World merchandise exports of the Thai Gem and Jewelry industry

X_i = Total merchandise all exports of Thailand to the world.

X_w = Total merchandise world exports to The world.

i = Thailand j = gem and jewelry

If the RCA index for a particular industry is greater than 1, the country would have a revealed comparative advantage in the exports/imports of that industry and vice-versa. A positive value of RCA might be interpreted as an indication of comparative advantage. The RCA is measured using post-trade data. The comparative advantage index considers the intrinsic advantage of a particular export/ import commodity and is consistent with changes in an economy's relative factor endowment and productivity. Theoretical range of the Balassa RCA values: To provide a more even distribution of the RCA scores, Hinloopen and Marrewijk (2005) have divided the theoretical range of the Balassa Indices. The RCA values into four classes as follows: RCA Classifications

Class 'a' is 0 < 1 Comparative disadvantage

Class 'b' is 1< 2 Weak comparative disadvantage

Class 'c' is 2 < 4 Medium comparative advantage

Class 'd' is 4 < Strong comparative advantage

Two major problems with Balassa's RCA index were since the values on one side of unity cannot be compared with those on the other side, the measure is asymmetric [37]. To deal with this issue, [38] suggested the transformation of the RCA index into Revealed Symmetric Comparative Advantage (RSCA) of asymmetry as 'pure' RCA is not comparable on both sides of unity, as the index ranges from zero to one if a country is not to be specialized in a given sector. In contrast, the value of the index ranges from one to infinity if a country is to be specialized. The index is made symmetric, following the methodology suggested by [38] and the new index is called 'revealed symmetric comparative advantage' (RSCA).

Mathematically, it can be expressed by the equation $RSCA_{ij} = (RCA_{ij}-1) / (RCA_{ij}+1)$.

This measure ranges between -1 and +1 and is free from the skewness problem. A commodity is said to have a comparative advantage in its exports if the corresponding RSCA value is positive and vice versa. The present study used the $RSCA_{ij}$ to examine the comparative advantage of the selected commodities. Comparative advantages, i.e. competitiveness on international markets are directly compared with the degree of export specialization for these products.

The data obtained on Thai's gem and jewelry trade in 10 different items from the World Trade Organization (WTO) of Trade in Commercial Services Dataset during 2004–2024 from the WTO website. WTO provides information on exports and imports of the following items: overall gems and jewelry for 2004–2024.

3. EMPIRICAL RESULTS & DISCUSSION

Table 2 presents the indices calculated to measure the static level of IIT in the Thai Gem and Jewelry industry based on GL indices and MIIT proposed by [39]. The GL indices showed

that it was greater than 0.5 for all the years explaining that the IIT was taking place at a high level. Especially in 2014, 2015, 2022, and 2023 take high level. The absolute value of MIIT was closer to 0 showing the higher level of IIT over the reference period from 2004 to 2023. As per the methodology of [40] and [41], the total IIT is separated by product classification, and the results are shown in Table 2.

TABLE 2 IIT AND MIIT (STATIC & DYNAMIC) INDICE ON GEMS AND JEWELRY IN THAILAND, 2004-2023

Year	GL Indices Static	MIIT Indices Dynamic	Year	GL Indices Static	MIIT Indices Dynamic
2004	0.9434	0.7410	2014	0.9711	-0.7809
2005	0.8833	0.9067	2015	0.9483	1.0810
2006	0.9488	0.8926	2016	0.7535	1.0040
2007	0.8794	0.9645	2017	0.9192	1.1317
2008	0.9361	0.7360	2018	0.8627	1.3004
2009	0.7612	1.0000	2019	0.8731	0.8557
2010	0.9450	0.9404	2020	0.6148	1.4420
2011	0.7466	0.5272	2021	0.8874	1.0330
2012	0.8826	0.8248	2022	0.9476	0.8271
2013	0.7068	0.8898	2023	0.9621	-8.5314

source: Author Calculations, based on the WTO (2024) statistical database

Table 3 shows that pearl has a high level of IIT followed by gold, Synthetic Gemstones, and Diamonds respectively. In contrast, silver has the lowest value followed by powder/dust of gems, scraps not made of precious metals, and silver-clad metal, respectively. Pearl imports are nearly 80% from Hong Kong, Japan, China, Indo, and Australia. Diamonds are imported from India, Israel, Hong Kong, Belgium, and the USA. Gemstones are imported from Switzerland, India, and Hong Kong. Thailand exports gemstones to Switzerland, Hong Kong, Singapore, the US and India. Thailand imports from Switzerland Hong Kong India, and Singapore.

TABLE 3 IIT (STATIC) INDICES ON GEMS AND JEWELRY BY PRODUCT CLASSIFICATION IN THAILAND, 2004-2023

Product Classification	2004	2010	2015	2020	2021	2022	2023	level
Pearls	0.6285	0.8696	0.6869	0.7684	0.8416	0.8034	0.8922	Higher
Diamond	0.8037	0.8266	0.6448	0.8484	0.8396	0.8662	0.8488	Higher
Gem	0.7461	0.7321	0.5302	0.7399	0.7588	0.8031	0.7431	Higher
Synthetic Gemstones	0.6505	0.9211	0.9353	0.9370	0.8165	0.8662	0.8568	Higher
Powder/ Dust of gem	0.1523	0.1050	0.0751	0.0414	0.0683	0.8265	0.0474	Low
Silver	0.2562	0.0419	0.1055	0.4217	0.3527	0.3029	0.0603	Low
Silver clad metal	0.0000	0.0000	0.4615	0.0000	0.1667	0.0000	0.0000	No IIT

Gold	0.2263	0.9055	0.6898	0.5488	0.6278	0.7734	0.8603	Higher
Gold Clad Metal	0.0000	0.5455	0.3750	0.5882	0.2500	1.0000	0.2500	Low
Platinum	0.0664	0.1951	0.0774	0.5025	0.2566	0.2526	0.2676	Low
Silver or gold metal	0.0000	0.0000	0.0769	0.1250	0.8235	0.4000	0.8246	Higher
Scraps that are not made of precious metals.	0.0626	0.0142	0.1023	0.0078	0.1330	0.0081	0.0165	Low
Authentic Jewelry	0.2146	0.2984	0.2558	0.3644	0.3468	0.4437	0.5135	Low
Gold or Silver	0.6093	0.3547	0.5968	0.6412	0.5742	0.5331	0.7124	Higher
Other items covered with precious metals.	0.2182	0.2571	0.1459	0.3917	0.4354	0.3721	0.4100	Low
Items made of pearls and jewels.	0.7673	0.7479	0.6253	0.2174	0.0621	0.1199	0.2194	Low
Artificial Jewelry	0.1691	0.2316	0.2418	0.3498	0.3780	0.4063	0.4829	Low
Mint	0.2347	0.0950	0.0991	0.3182	0.1374	0.1347	0.0970	Low
Total IIT	0.9434	0.9450	0.9483	0.6148	0.8874	0.9476	0.9621	Higher

Source: Author Calculations, based on the WTO (2024) statistical database

Consider the competitive advantage from Balassa Revealed comparative advantage (BRCA) indices along with the theoretical range suggested by [42]. Revealed Symmetric comparative advantage (RSCA) methodology given by [38] is shown in Table 4.

TABLE 4 TRENDS IN REVEALED COMPARATIVE ADVANTAGE

Year	BRCA	Explanation	RSCA	Explanation
2004	1.2705	Weak CA	0.1191	Comparative Advantage
2005	1.3341	Weak CA	0.1432	Comparative Advantage
2006	1.2682	Weak CA	0.1182	Comparative Advantage
2007	1.5075	Weak CA	0.2024	Comparative Advantage
2008	1.7979	Weak CA	0.2852	Comparative Advantage
2009	2.1710	Medium	0.3693	Comparative Advantage
2010	2.0665	Medium	0.3478	Comparative Advantage
2011	1.5581	Weak CA	0.2182	Comparative Advantage
2012	1.3577	Weak CA	0.1517	Comparative Advantage
2013	0.9463	CDA	-0.0275	Disadvantage
2014	1.1790	Weak CA	0.0821	Comparative Advantage
2015	1.3259	Weak CA	0.1401	Comparative Advantage
2016	1.6075	Weak CA	0.2330	Comparative Advantage
2017	1.4494	Weak CA	0.1835	Comparative Advantage
2018	1.4160	Weak CA	0.1722	Comparative Advantage
2019	1.8377	Weak CA	0.2952	Comparative Advantage

2020	1.9243	Weak CA	0.3161	Comparative Advantage
2021	0.9639	CDA	-0.0184	Disadvantage
2022	1.4167	Weak CA	0.1724	Comparative Advantage

Source: Author Calculations are based on the WTO (2024) statistical database

It was evident that the Gem and Jewelry industry had a comparative disadvantage on account of both the indices since the indices underclass 'a' ($0 < 1$) were indicative of the fact that there were comparative disadvantages throughout the reference period based on the theoretical range suggested by [42] and also based on symmetric methodology given by [38]. Based on the calculations, it was noticed that the changes were nearly equal showing both competitive advantage (positive values) and competitive disadvantage (negative values). RCA was mainly registered from 2009 to 2014 and in the initial year 2001.

Based on GL indices, the MIIT indices for the Gem and Jewelry industry proposed by [39], it was taking place at a high level. Products of higher quality were traded from Thailand from 2014, 2015 to 2022, and 2023, and low-quality products were exported in 2003, 2006, and 2008. The results underpin the importance of improving the facility of the economy and forming strategies to encourage FDI inflows in more diversified areas. It has been suggested that Thailand has to make an effective policy to promote exports. To achieve sustained trade growth, Thailand's policymakers should consider the role of trade openness in their policy actions. The government should support such as organizing the largest Bangkok Gems & Jewelry Fair in Asia and exempting import taxes, raw materials, and machinery.

4. RECOMMENDATION

According to this study, Thailand has become one of the gem and jewelry industry leaders in the global market based on competitiveness and competitive advantage. The recommendations that have been made will encourage more intra-industry trade for this research. First is producing high-quality gem and jewelry products tracking the specialization advantage, grinding, and refinement advantage from Thai craftsmen skills. Second focus on diversified products to meet the needs of the global market by importing raw materials such as raw diamonds and gemstones from abroad and seeking more environmentally friendly raw materials to use in production. Third is using innovations to develop design techniques in the gem and jewelry industry such as 3D printing to design and manufacture more complex jewelry. Lastly join integrating economic blocs and free trade agreements such as the ASEAN Economic Community and making agreements with other countries to reduce costs and trade barriers, such as tariffs and non-tariff trade barriers

References

[1] D. Bernatonyte, (2009), Intra-industry trade and export specialization: Lithuanian case, Economics & management: 2009. 14, 668- 678 ISSN 1822-6515

[2] V. Vijayasri, (2013), "The Importance of International Trade in the World", International Journal of Marketing, Financial Services & Management Research, 2(9):111-19.

[3] M. Manonmani, (2018)., "Pattern of Trade & Trade Advantage in Transport Equipment Industry in India", The Indian Journal of Industrial Relations, 53, (3), January 2018, 378-390.
[4] Ali. Asghar, (2016), "Foreign Direct Investment and Trade Openness: The Case of South Asian Economies", Hafiz International Journal of Innovation and Applied Studies, 17(2):513-21.
[5] B. Balassa, (1965). Trade liberalization and revealed comparative advantage. The Manchester School of Economic and Social Studies, 33(May), 99–123.
[6] B. Balassa, (1977), "Revealed Comparative Advantage Revisited: An Analysis of Relative Export Shares of Industrial Countries, 1953-1971", The Manchester School of Economic & Social Studies, 45(4): 327-44.
[7] R.J., Carbaugh, (2008). International economics (8th.ed); US.: Thomson south-western.
[8] S. Chemsripong, (2022), Introduction to international Economics, Naresuan University Publishing House.www.nupress.grad.nu.ac.th
[9] C.W., Murdock, (2019), "Why Ricardo's theory of comparative advantage regarding foreign trade doesn't work in today's global economy": Labor Arbitrage, Disloyal Capital, WTO Violations and National Security Implications, May 2019, 63 pages, Electronic copy available at: https://ssrn.com/abstract=3373832,
[10] D.P., Clark, (2012), "Scale economies and trade", Applied Economics Letters, 19, 965-968.
[11] Yu, Jae-Seon., (2022), "A study on the Trade competitiveness of Korea and Japan in ICT industry", 96: 17-33, DOI: 10.46396/Kjem.96.2
[12] N.,Yilmaz, Hacer Simay Karaalp-Orhan, (2015). Comparative Advantage of Textiles and Clothing: Evidence for Top exporters in Eastern Europe", Economics, Business, DOI:10.5604/12303666.1167411
[13] Sharma, Shikha & Batra Durgesh., (2015), "Assessing competitiveness of Indian gems and jewelry industry through revealed, comparative advantage analysis", The Journal of Management Awareness, 18, (2), 27-37 ISSN 0974-0945, DOI: 10.5958/0974-0945.2015.00010.2.
[14] S. Chemsripong, (2014), "Labour cost and Marginal Intra-Industry Trade: The Thailand Experience", Theoretical Economics Letters, January 2014, 04(01):125-131.
[15] N.C., Leitao, H.F. Braz, & P. Oliveira, (2022), "Revisiting Marginal Intra-industry trade and Portuguese labour Market", Evaluation Review, 46(3), 336–359. doi:10.1177/0193841X221085792
[16] Mohammad, Ali Nur Sidiq, (2019), "The Analysis of New MK potentials and determinants of Indonesian Export commodities in the South Asian Region". International Journal of Scientific Research in Science, Engineering, and Technology IJSRSET 2019, https://doi.org/10.32628/IJSRSET196552, Online ISSN : 2394-4099
[17] T.L., Vollrath, (1991), "A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage", Weltwirtschaftliches Archive.130: 265–79.
[18] S. Chemsripong, (2004). "An Economic Analysis of Intra-Industry Trade Between Thailand and Other APEC Countries, 1990-1999", Naresuan University Journal, 12 (3) (2004): September-December 2004.
[19] H.G. Grubel, & P.J. Lloyd, (1975), Intra-industry Trade: The Theory and Measurement of International Trade in Differentiated Products, Wiley, New York.
[20] P.R. Krugman, (1979), "Increasing Returns, Monopolistic Competition, and International Trade", Journal of International Economics, 9(4): 469-79.
[21] K. Lancaster, (1980), "Intra -industry Trade under Perfect Monopolistic Competition", Journal of International Economics, 10 (2):151-75.
[22] L.G. Burange, R.R.Ranadive & N.N. Karnik, (2019). Trade Openness and Economic Growth Nexus: A Case study of Brics, Foreign Trade Review, 2019,54, (1), 1-15.
[23] D. Bernatonyte, (2009), Intra-industry trade and export specialization: Lithuanian case, Economics & management: 2009. 14, 668- 678 ISSN 1822-6515
[24] C.Veeramani, (2002), "Intra-industry trade of India: Treads and country-specific factors", Weltwirtschaftliches Archiv, 138 (3), 509-533,
[25] C.Handique, (2024), "An empirical analysis of inter-industry and Intra-industry trade between India and Asia impact of revealed comparative advantage (RCA) in commodities".International Journal of Management (IJM), 11(12) December 2020, 108-117.Article ID: IJM_11_12_013 Available online

at http://www.iaeme.com/ijm/issues.asp?JType=IJM&VType=11&IType=12 ISSN Print: 0976-6502 and ISSN Online: 0976-6510 DOI: 10.34218/IJM.11.12.2020.013, July 20, 2024,

[26] A.Muhittin (2022), "The Effect of inter-industry trade on Competitiveness, An evaluation in the context of Turkey". June 6, 2022, 21 (43), 399 - 418, 15.06.2022 https://doi.org/10.46928/iticusbe.1086685

[27] M.Manonmani, (2018)., "Pattern of Trade & Trade Advantage in Transport Equipment Industry in India", The Indian Journal of Industrial Relations, 53 (3), January 2018, 378-390.

[28] A. Srivastava, (2015), "Exploring the determinants of India's IIT: A panel VAR/VECM Approach", IJCEM International Journal of Computational Engineering & Management, 18 (3), May 2015 ISSN (Online): 2230-7893 www.IJCEM.org.

[29] G.Shen, A.Yanxiang Gu (2007), Revealed Comparative Advantage, Intra-industry Trade and the US Manufacturing Trade Deficit with China. China & World Economy,15(6) November-December,2007,87-103. http:// doi.org/10.1111/j.1749-124x.2007.00094.x

[30] Chang, Shun-Chiao., (2009), "Horizontal and Vertical Intra-industry Trade and Firm's Investment Strategies: Evidence from the IT Industry in the Asian, EU, and US Markets", Global Economic Review, 38, (1), 6376, March 2009, 63-76.

[31] A Kocyigit, & Alien, (2007). "The Extent of Intra-industry Trade between Turkey and the European Union: The Impact of Customs Union", Journal of Economic and Social Research, 9 (2):61-84.

[32] P.Jundahuadong, & S.Chemsripong, (2019). "Confirmatory factor analysis of Absobtive capacity and competitiveness of small and medium-sized enterprises of Thailand's Gems and Jewelry Industry". Journal of Community Development Research (Humanities and Social Sciences. 2019; 12 (4)

[33] P,Jundahuadong, & S. Chemsripong, (2020). "Enhancing competitive advantage in the turbulent environment of the Thai Gems and jewelry industry groups SMEs: Interaction between social integration mechanisms and absorptive". Journal of Advance Research in Dynamical & Control Systems. https://doi. org/10.5373/JARDCS/V12SP7/20202253, 12(07), 1499-1517.

[34] Palma, Eliete Pozzobon., (2014), "Sustainable strategies and export performance: An analysis of companies in the gems and jewelry industry", Environmental Quality Management,27,(4)97-10, https://doi.org/10.1002/tqem.21557

[35] World Trade Organisation (WTO) (2024). WTO Data Information on Trade and Trade Policy Measures, https://data.wto.org/en

[36] National Gem and Jewelry Research and Development Institute (NAGEM and GEM), (2023), Information and Communication Technology Center, retrieved from https://www.git.or.th/, August 7, 2023

[37] K. Laursen, (2015), "Revealed comparative advantage and the alternatives as measures of international specialization" Eurasian Business Review, Springer; Eurasia Business and Economics Society, vol. 5(1), pages 99-115, June. DOI: 10.1007/s40821-015-0017-1

[38] Dalum, B., K. Laursen, & G. Villumsen, (1998), "Structural Change in OECD Export Specialization Patterns: De-Specialisation and Stickiness", International Review of Applied Economics, 12: 447–67.

[39] M. Brulhart, (1994), "Marginal Intra-Industry Trade: Measurement and Relevance for the Pattern of Industrial Adjustment", Weltwirtschaftliches Archive, 30 (3): 600-13.

[40] D. Greenaway, R. Hine, and C.Milner, (1994), Adjustment and the measurement of MIIT

[41] D. Greenaway, C. Milner, & J.R. Elliott (1999), "UK Intra-industry Trade with EU North and South", Oxford Bulletin of Economics and Statistics, 61(3): 365–84.

[42] Hinloopen, Jeroen & Charles Van Marrewijk (2005), "Dynamics of Chinese Comparative Advantage", Tinbergen Institute Discussion Paper No. 04-034/2.