

# Latent Comparative Advantages of Turkish Economy in China under the Belt and Road Initiative

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**ABSTRACT:** This study identifies latent comparative advantages (LCA) of the Turkish economy in China under the Belt and Road Initiative (BRI) China-Central West Asia economic corridor. The LCA of Turkey is anticipated to increase the export volume of Turkey in China, resulting in a decline in Turkey's foreign trade deficit with China. The growth identification and facilitation framework proposed by new structural economics is implemented with crucial modifications, including PRODY and EXPY calculations and comparisons of EXPY and some product space indicators, to pick the LCA of Turkey in China. Benchmark countries are chosen from BRI's China-Central West Asia economic corridor owing to their similar transportation routes and infrastructure investment by China and themselves. Comparing the Turkish economy to its benchmark countries regarding export diversification reveals that Turkey exhibits LCA in several manufacturing commodities, including machinery and mechanical appliances, loudspeakers, and fire extinguishers. LCA's binding constraints, barriers, and obstacles are examined to facilitate LCA production. The policy recommendations and their instruments are suggested to ease LCA production regarding the determined LCA's binding constraints, barriers, and obstacles.

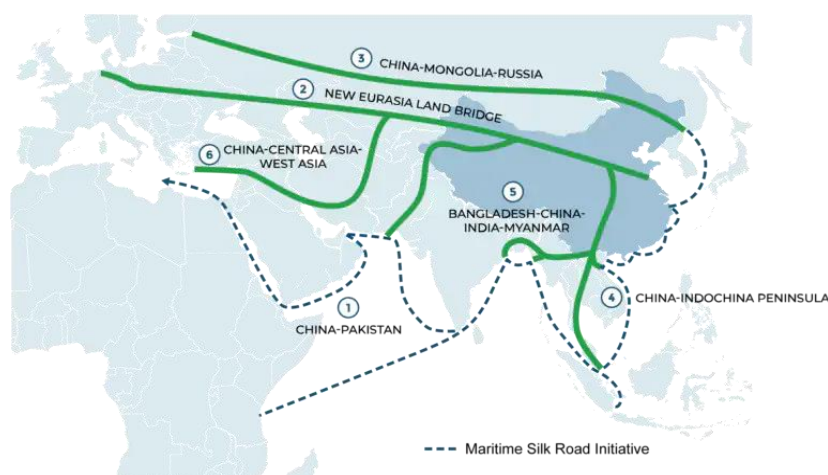
**Keywords:** New Structural Economics, Latent Comparative Advantage, Turkish Economy, Growth Identification and Facilitation Framework, Product Space Methodology, Belt and Road Initiative.

## 1. Introduction

A regional trade agreement (RTA), defined as a treaty between two or more countries/governments, determines the trade rules among the signatories (World Bank, 2023a). The significance of RTA has been increased by its total numbers and impacts on international trade, therefore, the scale of economies. About 580 RTA have been signed between the parties since the 1950s (World Trade Organization, 2023). North American Free Trade Agreement (NAFTA), Central American-Dominican Republic Free Trade Agreement (CAFTA-DR), the European Union (EU), and Asia-Pacific Economic Cooperation (APEC) are some of the well-known RTA that have impacts on international trade and cooperation. RTA has some crucial positive impacts on its members, such as food security (Herath, Liang & Yongbing, 2014), agricultural products trade (Korinek & Melatos, 2009; Carrère, 2004; Szerb, Csonka

& Ferto, 2022), economic growth (Alisa et al., 2017; Kamau, 2010; Kumar, 2020), quality of export products (Sun, 2021), international trade (Kurihara, 2011; Barbalet et al., 2015), agricultural products export (Bureau & Jean, 2013), and industrialization and structural economic change (Heng & Gayathri, 2004). The positive impacts of RTA stimulate governments to organize new eras to improve their economic and social position. One of the latest RTA and infrastructure motivations, called initiative, is *Belt and Road Initiative* (BRI). The main aim of the BRI is to connect Asia, Africa, and Europe contents by land and maritime transport to improve regional integrations, trade, and economic growth.

More than 2000 years ago, the Han Dynasty of China proposed Silk Road to link South and Central Asia with Europe and the Middle East (McBride, 2015). In line with the Silk Road for thousands of years with cooperation, openness and mutual learning and benefit among East and West, the new Silk Road, named as *Belt and Road Initiative* (BRI) or *One Belt One Road*, has a similar spirit to create new possibilities to improve BRI countries's development, cooperation, and mutual benefits among itself. To this end, the president of China, Xi Jinping, during his visit to Kazakhstan, announced the 21<sup>st</sup> century Silk Road as a BRI in September and October of 2013 (The State Council of the People's Republic of China, 2015a and 2015b). The BRI framework was summarized by Xi Jinping (2017) as *"China will actively promote international cooperation through the Belt and Road Initiative. In doing so, we hope to achieve policy, infrastructure, trade, financial, and people-to-people connectivity and thus build a new platform for international cooperation to create new drivers of shared development"*. The BRI includes six different economic corridors starting from China to have successful results for the BRI, as in Figure 1. The six BRI economic corridors named as New Eurasian Land Bridge, China-Mongolia-Russia, China-Central Asia-West Asia, Bangladesh-China-India-Myanmar, China-Indochina Peninsula, and China-Pakistan corridors were divided (Ramasamy et al. 2017). The different economic corridors need different infrastructure investments.



**Figure 1:** The Six Economic Corridors of BRI, **Source:** Standard Chartered (2023).

The China-Central Asia-West Asia Economic (CWAS) corridor includes 24 countries that link Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan, Iran, and Turkey to China (OECD, 2018). CWAS is the most challenging global and economic condition compared to the other corridors in BRI (Lei, 2023). Under the framework of CWAS, China has signed cooperation agreements to build a belt with Tajikistan, Kyrgyzstan, Uzbekistan, and other countries. China has also agreed to a Memorandum of Understanding (MOU) for the Belt and Road with Turkey, Iran, Saudi Arabia, Qatar, Kuwait, and other countries.

Turkey has a crucial geo-strategic position connecting Central Asia, the Middle East, the Mediterranean, and Europe (Yıldırımcağar, 2019). This geographic position makes Turkey an important location among BRI, especially for CWAS to link the belt. Turkey also can benefit from BRI due to its economic difficulties (Zan, 2016). Regarding BRI, Turkey and China have reached a significant consensus on building a high-speed railway project from the east to the west of Turkey (Office of the Leading Group for the Belt and Road Initiative, 2017). In the sense of infrastructure by transportation investment, the train route from China to Turkey through Kyrgyzstan, Tajikistan, Turkmenistan, and Iran was established in 2002 (ESCAP, 2022). The first Chinese freight train from Xi'an/China arrived in Istanbul/Turkey, in a 12-day period from one month on November 2019. Furthermore, the first train from Istanbul/Turkey to Xi'an/China also reached in a 12-day period on December 2020 (Gabrielyan, 2022). The improvements of the transportation routes between Turkey and China through CWAS can decrease the cost of transportation, which can be an advantage for inter-regional trade among CWAS. The relatively lower transportation cost possibilities among BRI-CWAS on the train routes from China to Turkey due to increased infrastructure stimulates the gross national income and welfare (Van & Halleck, 2021).

The first diplomatic relations between Turkey and China were established in 1971. After the 1980s, the opening process of the two countries stimulates the political and economic relationship (Ministry of Foreign Affairs of Turkey, 2023). Since the 1980s, the total trade volume between Turkey and China has increased (WITS, 2023). China's membership in the World Trade Organization in 2001 encouraged the rate of increase in total trade volume between China and Turkey. However, the trade balance in Turkey has also sharply decreased, resulting in a foreign trade deficit. Thus, there is an imbalance in trade between the two countries. In 2022, China exported about 34 billion USD to Turkey, while Turkey exported about 4 billion USD to China. In this aspect, Turkey mainly exported low-value-added, low-variety, and price determined by the world markets goods to China in the early 2000s. At the same time, China exported high-value-added and technology-intensive goods to Turkey (Öz,

2013). Turkey's export and import basket to China still reflects the similarity compared to the early 2000s. The top ten export of Turkey to China in 2021 includes mainly crude materials, inedible, except fuels (classified under numbers starting with 2 in SITC)<sup>1</sup> that is resource and labor-intensive commodities. These commodities have low-value added and are used as input for production. On the contrary, Turkey imports machinery and transport equipment (classified under numbers starting with 7 in SITC)<sup>2</sup> that are relatively more capital-intensive and high-value-added commodities. The differences between import and export diversification between Turkey and China are essential due to their factor endowment differences determining international trade patterns.

The comparison of the capital-labor ratio of Turkey and China in 2019<sup>3</sup> shows that the factor endowment structure of Turkey is relatively more capital-intensive than China's. Besides the capital-labor ratio, the export capability of Turkey and China can also be included in their factor endowment. In this aspect, comparing Turkey's and China's Economic Complexity Index (ECI)<sup>4</sup> illustrates that China can produce more complex export goods. Nevertheless, in 2019, the Complexity Outlook Index (COI)<sup>5</sup> that explains the potential growth in ECI indicates that Turkey has relatively more potential than China. Therefore, it is evident that Turkey can potentially have the latent advantage of producing more complex export products in the near future due to its relatively higher COI. Comparisons of capital-labor ratio and the export capability of Turkey could be factors to determine the future comparative advantage of Turkey.

The export pattern of Turkey to China and the total export pattern of Turkey to the world have differences regarding commodity diversification. With the relatively more capital-intensive factor endowment, the export pattern of Turkey to China is expected to include the relatively more capital-intensive commodities in terms of the Heckscher-Ohlin theory. However, Turkey exports relatively more labor-intensive commodities to China while importing relatively more capital-intensive commodities from China. At the same time, Turkey exports relatively capital-intensive commodities

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<sup>1</sup> Under the SITC Rev. 3 classification, the commodity group for 2 determined as “crude materials, inedible, except fuels” (United Nations, 2023a).

<sup>2</sup> Under the SITC Rev. 3 classification, the commodity group for 7 determined as machinery and transport equipment” (United Nations, 2023a).

<sup>3</sup> The capital-labor ratio of Turkey and China is calculated by real capital stock and labor force data from PENN World Table (2023).

<sup>4</sup> ECI mainly explains export products of the extent to which a particular country's skills and knowledge were quantified by diversity, ubiquity, and complexity (The Growth Lab at Harvard University, 2023). The ECI value of Turkey and China were 0.60 and 1.36 in 2019, respectively (The Growth Lab at Harvard University, 2019).

<sup>5</sup> COI measures how the countries are close to produce more complex products (Hausmann et al., 2013). COI, therefore, can explain the potential of a country to reach relatively more ECI level. The COI value of Turkey and China were 2.40 and 0.63 in 2019, respectively (The Growth Lab at Harvard University, 2019).

to the world. On the other hand, regarding the COI, Turkey has relatively more potential to produce more complex export goods than China. Considering Turkey's relatively capital-intensive factor endowment structure and potential to produce more complex goods, Turkey can have "latent" comparative advantages that are not already produced and/or exported to China. In the line of BRI, some of the CWAS countries with similar connections with China through railways, roads, and ports have revealed comparative advantages in China. Turkey, with employing the similar transportation infrastructure investment and road by their self and/or China that can cause to decrease transportation time and cost, can have similar latent comparative advantages compared to CWAS's revealed comparative advantage. The revealed comparative advantages of CWAS can be candidates to be latent comparative advantages of Turkey in China. The latent comparative advantages of Turkey in China can stimulate the export volume of Turkey to China. Moreover, under BRI, the latent comparative advantage of Turkey in China can create possibilities for outward foreign direct investment of China to Turkey.

To identify the latent comparative advantages of Turkey in China, GIFF, proposed by NSE, is implemented with some crucial modifications in this study. The LCA of Turkey in China, by regional revealed comparative index (RRCA), are founded in some resource-intensive and manufacturing commodities such as machinery and mechanical appliances; for public works, building or the like; loudspeakers; multiple, mounted in the same enclosure; and fire extinguishers; whether or not charged. The RRCA of Turkey in China are observed in most textile and manufacturing industries.

This study is applied modified GIFF to find the LCA of Turkey in China. The growth diagnostic tree methodology is applied to find constraints, obstacles and barriers in front of LCA. Despite the many studies that implement different methodologies to pick key industries in Turkey, this study is the first study in the English and Turkish language literatures to my knowledge that implement modified GIFF for Turkey under BRI-CWAS countries. In this aspect, the second part consist theoretical literature related with NSE. The third part includes empirical literature. The fourth part indicates the applied methodology of this study. The results and discussion of other studies are given in the fifth part. The last part consists of this study's conclusion, policy recommendation, limitations, and future direction.

## **2. Theoretical Framework: New Structural Economics**

New Structural Economics (NSE) framework, which can be mentioned as economic thought, was proposed with the whole theory and its application, growth identification and facilitation framework, by the pioneer that is Justin Yifu Lin (2012). NSE's primary value for development thinking

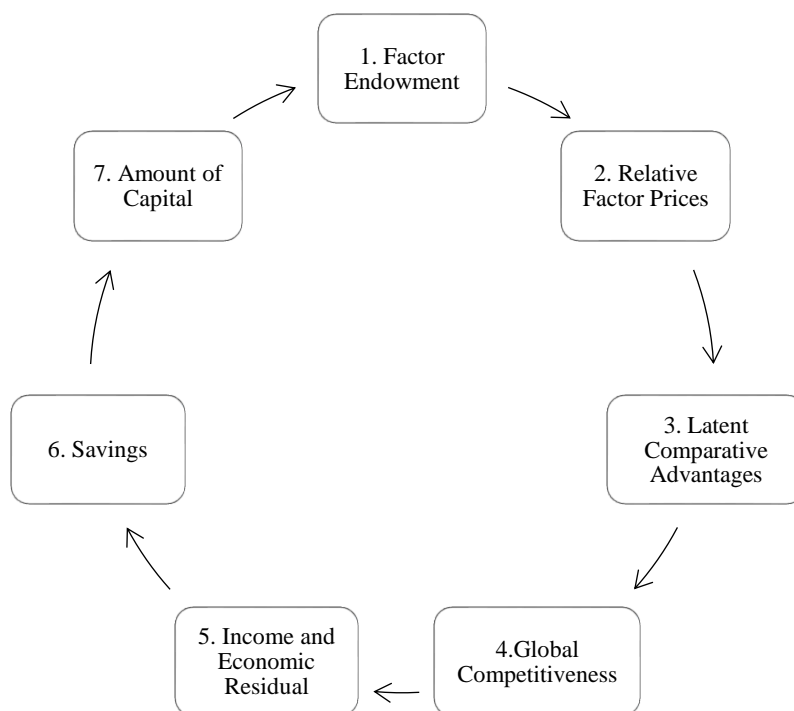
can be mentioned as new policy insights. NSE developed a framework to understand the nature of economic development and assist low- and middle-income countries with thriving, sustainable economic development experiences (Lin, 2012).

Regarding the NSE theory, it is proposed that economies/countries should follow their factor endowment structure that assumes capital and labor as determinant factor endowment. The following factor endowment is the crucial proposal of NSE. However, this is not the only one. Moreover, the soft and hard infrastructure needs of the factor endowment evaluation also needs to be met. The appropriate soft and hard infrastructure, then, declines the production cost to have more international and domestic comparative advantage. The following factor endowment feature also gives some insight for developing countries.

As a propose of NSE, following comparative advantage under the competitive market ensures structural change and higher growth rates. Figure 2 illustrates the cycle of factor endowments and consists of how the comparative advantages change a country's factor endowment structure (Gurbuz & Tuncer, 2023). Under the competitive market assumption for all steps, the first step explains factor endowment, mainly capital and labor. The second step determines the relative factor prices in terms of the scarcity of the production factor. Under the relative factor prices, the LCA by GIFF application (the targeted country should determine its LCA from the benchmark countries RCA<sup>6</sup>) is determined in the third step. If the country follows its LCA, the global competitiveness power will increase as in step four. The fifth step explains the increasing income and economic residual because of the enhanced competitiveness. Therefore, step six illustrates savings increase due to increased income. Increasing savings lead to capital accumulation in step seven. When the cycle ends, the country will be more capital-intensive if the capital growth rate is relatively more than population growth. Factor endowment of the next cycle will be more capital-intensive, causing relatively more income to stimulate economic growth.

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<sup>6</sup> GIFF proposes to select LCA for targeted country from the benchmark country industries that are already matured. For choosing these matured industries, CCFE uses RCA index as a measure of export performance of the specific industry/sector/product.



**Figure 2: Country's Cycle of Factor Endowment**

**Source:** Gurbuz & Tuncer (2023).

If a labor or resource-intensive country defies the comparative advantages, in other words, if the labor and/or resource-intensive countries followed capital-intensive production that does not fit their factor endowment structure, then the protection of defied comparative advantages led to increasing related price of import and import-substituting goods, dictation of ineffective different consumption basket, the small size of production that causes inefficiency, losing competitive power of domestic firms and creating rents and corruption (Lin, 2012).

### 3. Literature Review

As a main aim of this study finding the latent comparative advantage of Turkey in China, in other words, determining the trade potential of Turkey in China has no previous studies in existing literature. Furthermore, the empirical evidence of the GIFF applications is limited and considered new. The first GIFF application was applied through the study of Lin and Treichel (2011) for Nigeria. Then, GIFF applications to find with some modifications and changes were implemented for, in chronological order from the past to present, Pacific Island countries, Uganda, Iran, Nepal, Senegal, Pakistan, Togo, Zambia, and Turkey, as shown in Table 1.

Lin and Treichel (2011) selected Nigeria as important because of the employment crisis and being a populous African country. The main aim of this study is to determine the LCA of Nigeria and the barriers and constraints in front of the determined LCA. Dinh and Lin (2014) applied GIFF proposed



by the NSE framework for Pacific Island countries (PIC); Cook Islands, Fiji, Kiribati, the Marshall Islands, the Federated States of Micronesia, Nauru, Niue, Palau, Papua New Guinea, Samoa, the Solomon Islands, Tonga, Tuvalu, and Vanuatu. PIC economies dominated by tradable sectors, including some labor-intensive, light manufacturing goods and services such as tourism and agriculture, grew up less than Sub-Saharan African countries. Lin and Xu's (2016) study on Uganda picked LCA under its backwardness and observed binding constraints in front of LCA by GIFF application. Comparing the top 10 key export shares of the benchmark countries for 1995, 2000, 2005, 2010 and 2012, and observing the self-discovery product by RCA index, LCA of Uganda is determined. Xu and Hager (2017) analyze Nepal's growth possibilities by applying GIFF. The main three binding constraints on LCA are (1) a relatively higher cost of electricity production, (2) a relatively higher transportation cost, and (3) relatively higher wages compared to countries with the same level of economic development. The survey method included at least five firms for each industry, which is implied to observe the industry-specific constraints for LCA.

Sejkora and Sankot (2017) studied to find the relatively productive manufacturing industries with the potential to foster income in Senegal by GIFF application. Ishtiaq, Khan and Sohail (2019) identify LCA by GIFF application to reveal potential growth possibilities of Pakistan through designated nine special economic zones under CPEC. Afolabi et al. (2020) use the GIFF methodology's quantitative and qualitative side to analyze LCA for Togolese economy. The constraints on LCA of Togo are observed as an unstable electricity supply, relatively higher electricity cost compared with other West African countries, and lack of transportation facilities. Sichoongwe, Kaonga and Hapompwe (2021) focus on Zambia, a landlocked and resource-intensive country, to implement GIFF to find the industries with potential. The constraints and policies to deal with constraints are determined for the agriculture sector, mineral processing, manufacturing, and tourism. Gurbuz and Tuncer (2023) focused to reveal the LCA of Turkey to stimulate structural transformation and increase income level (GDP) by implementing an impure GIFF methodology. Besides the pure GIFF methodology, this study employs some product space tools and complexity indexes.

The previous GIFF application literature mentioned above has similarities and differences regarding their approach and application. All studies picked benchmark countries regarding the factor endowment similarities with the targeted country. However, the studies for Togo (Afolabi, Rahman, Fetuu and Nankela, 2020) and PIC (Dinh and Lin, 2014) do not pick their benchmark countries out of their territories. These two studies concentrate more on comparing countries in their territory instead of with other countries with similar factor endowments and more successful growth experiences. On



the other hand, there are differences in measuring factor endowment levels of the targeted and benchmark countries in GIFF application literature. Lin and Treichel (2011) for Nigeria; Dinh, and Lin (2014) for PIC; Lin and Xu (2016) for Uganda; Xu and Hager (2017) for Nepal; Ishtiaq, Khan and Sohail (2019) for Pakistan; Sichoongwe, Kaonga and Hapompwe (2021) for Zambia are focused on some critical macroeconomic indicators such as, generally, share of manufacturing value added in GDP, population density and human capital level to compare factor endowment of countries. Nevertheless, Afolabi, Rahman, Fetuu and Nankela (2020) for Togo focuses mainly on the labor cost differences to identify factor endowments. Sejkora and Sankot (2017) for Gurbuz and Tuncer (2023) for Turkey also calculate the capital-labor ratio using capital and population data to select benchmark countries. Gurbuz and Tuncer (2023) also employs product space indexes such as economic complexity and complexity outlook to measure technology and potential technology levels. Sejkora and Sankot (2017) for Senegal and Gurbuz and Tuncer (2023) for Turkey calculated RCA and normalized RCA to determine the LCA.

Alongside the NSE's core policy recommendations, previous GIFF implementations also made different recommendations in line with NSE's recommendations. Dinh and Lin (2014) recommend to allow migrates from industrial countries by bilateral agreements into PIC. Lin and Xu (2016) advise building appropriate environments, such as industrial parks, to provide works appropriate living conditions in Uganda. For Pakistan, Ishtiaq, Khan and Sohail (2019) advocate altering the domestic raw exports with finished products produced from domestic raw materials.

**Table 1: GIFF Application Literature**

Source	Targeted Country and Period	Benchmark Countries	Factor Endowment Measurement	Latent Comparative Advantages
Gurbuz and Tuncer (2023)	Turkey; 1998-2017	Estonia, Latvia, Lithuania, Poland, Slovakia	Capital-Labor Ratio, Economic Complexity and Complexity Outlook Indexes, EXPY, Human Capital and Development Index	Agricultural and Related Labor-Intensive Products
Sichoongwe, Kaonga and Hapompwe (2021)	Zambia; 2018	Vietnam, Indonesia, Morocco and Ghana	Industrial Employment Rate, Production Area Share in Total Area of Country, Share of Industries in GDP	Agriculture, Mineral, Manufacturing, Tourism

Afolabi, Rahman, Fetuu and Nankela (2020)	Togo; 2000 and 2017	West African Countries	Labor Cost	Phosphate, Limestone, Iron
Ishtiaq, Khan and Sohail (2019)	Pakistan; 1995 and 2016	China and Uzbekistan	Comparison Methodology	Footwear, Garments, Video and Radio Equipment, Trunks and Cases, Cotton, Yarn, Iron, Agro-Processing Business and Steel Paper Production, Dyeing/Colouring Materials, Printing Industry, Glass and Glass Wear
Sejkora and Sankot (2017)	Senegal; 1995-2016	Tanzania, Cambodia, Lao, Vietnam and Cape Verde	Natural Capital, Capital-Labor Ratio and Human Capital Index	Footwear and Apparel Production
Xu and Hager (2017)	Nepal; 1995-2013	China, Vietnam, and India	Manufacturing Value Added in GDP	Light Manufacturing Including Garments, Trunks, and Footwear
Lin and Xu (2016)	Uganda; 1995, 2000, 2005, 2010 and 2012	China, India, Nigeria, Uzbekistan and Vietnam	Manufacturing Value Added in GDP	Footwear, Trunks and Cases, Video and Radio Equipment, Cotton Yarn, Agro-Processing Business, Iron and Steel, Paper Production, Dyeing/Colouring Materials, Printing Industries, Glass and Glassware
Dinh and Lin (2014)	Pacific Island Countries (PCI); 1999-2009	Among PIC	Share of Sectors in GDP, Production Features of The Sectors, Population, Land Area Human Development Index, Human Poverty Index.	Fishery, Mining, Manufacturing Sector and Its Subsectors, Services (Tourism), Remittance
Lin and Treichel (2011)	Nigeria; 2009	Vietnam, China, India, Indonesia	Comparison Methodology	Footwear, Textiles, Tv Recorders, Aquaculture, Motor Vehicle Parts, Vegetable Oil, Fertilizers

## 4. Methodology

### 4.1. Period and Data Selection

Regarding applying GIFF for Turkey under the BRI initiative, some commodity and country-level data are used in this study. The BRI-China Central West Asia Corridor (24 countries) is listed by OECD (2018). Starting from the first step to determine the benchmark countries, the factor endowment is calculated with real capital stock and total population data from the PENN World Table (2023)-Groningen Growth and Development Centre for 2018. The export data<sup>7</sup> of the CWAS to China is extracted from United Nations (2023b). GDP per capita data is extracted from World Bank (2023b) to calculate PRODY as well as EXPY indexes. The human development index (HDI) is used from UNDP (2023) to compare the human development level of the benchmark countries. The human capital index (HCI) is extracted from World Bank-World Development Indicators (2023c) to compare the economic potential of the labor force among benchmark countries. The World Bank-Enterprise Surveys (2023d), collected between December 2018 and June 2019 as a joint project of the European Bank for Reconstruction and Development, the European Investment Bank, and the World Bank Group, are analyzed to observe potential barriers and constraints on the Turkish LCA by growth diagnostic tree. To compare Turkey's production cost advantages or disadvantages, average monthly earnings of employees, mean nominal hourly labor cost of manufacturing, and output per worker/labor productivity data are extracted from the International Labour Organization database (2023a, 2023b, 2023c).

The GIFF application period is selected in terms of data availability. The data for 2018 is selected because the whole data set includes the 6-digit HS classification commodities for all of the CWAS countries used in this study contains the latest year, 2018. 2019 cannot be selected due to Iran's inexistence of commodity-level export data. Thus, 6-digit HS codes are used in this study to dictate the commodity classification. The starting year is 1999, which includes about two decades ago.

### 4.2. Modified Growth Identification and Facilitation Framework

Embodied from historical development experiences, NSE proposes a growth identification and facilitation framework (GIFF) to find the LCA and remove barriers and constraints in front of the LCA. GIFF mainly includes six steps; the first three steps are related to the selection of sectors/commodities (Lin, 2012). In the first step, the governments, including central and local agencies, can identify the tradable goods with LCA and indicate the intermediate and final products. The identified goods in

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<sup>7</sup> The export data of the CWAS countries are represented in terms of 6-digit Harmonized System (HS) commodity codes.

growing countries for the last two decades should have similar endowment structures and higher income (between 100% and %300) of the targeted country. Therefore, picking up the (relatively) higher income countries create possibilities to reveal the advantage of backwardness of the targeted country. The second step mentions that the governments should prioritize the list of selected industries/products with LCA. The governments are also recommended to identify the barriers, constraints, and limits on upgrading the production quality and entrance of the new other firms into these industries. To identify the barriers, constraints, and limits, the value-chain analysis or growth diagnostic tree framework proposed by Hausmann, Rodrik and Velasco (2008) can be implemented to detect binding constraints. Governments can implement policy measures to remove or ease the barriers and constraints by detecting them.

According to the LCA, some may be entirely new for domestic firms. For the new comers, the governments can use some measures to create attraction to firms in the higher-income to invest (as foreign direct investment) as domestic firms by taking advantage of lower labor costs for the third step. The governments can also encourage private domestic firms into listed industries through an incubation program. Besides the industries/products selected in the first step, the developing countries should also concentrate on self-discovery firms with comparative advantages to encourage and support the fourth step. By encouraging and supporting, these firms can have possibilities to increase their scales. In the fifth step, the governments can provide industrial parks, export processing zones, or any special area well-structured by appropriate infrastructure and a friendly business environment to attract domestic and/or foreign firms to invest. In this way, firms enjoy relatively lower transaction costs from infrastructure improvements and a friendly business environment. Considering budget and capacity constraints, some governments cannot meet suitable enhancements.

For this reason, the above-mentioned particular areas that include the advantage of industrial clustering can be handled more as an alternative. For the last step, as a fundamental policy recommendation, the government should subsidy and support domestic pioneers and foreign investors willing to produce the picked commodities in the first step. These incentives can include income-tax holidays, direct credits, foreign reserves access, and related measures. To protect from the rent-seeking/monopolistic activities and political capture, the mentioned incentives are recommended to have limitations in terms of time and financial costs. To reduce the risk of rent-seeking and political capture, incentives are needed to arrange for escaping from monopoly rent, high tariffs, or other distortions.

Besides pure GIFF applications, this study proposes some modifications in terms of the aim of the study. In the first step, the pure GIFF application selects the benchmark countries with similar factor endowment structures compared with the targeted country and better economic growth experience for the last 20 years. The criteria of having more income for the last 20 years are about observing how the benchmark countries have better economic growth experiences than the targeted country. However, this study's main aim is not to capture the benchmark countries' better growth experience. Instead, this study focuses on catching the benchmark countries' better export performance. Therefore, better economic growth should not be a criterion for selecting benchmark countries.

Without having better growth performance, the similarity of the factor endowment structure of benchmark and targeted countries still have importance. Following the comparative advantage determined by factor endowment structure can still provide a better competitiveness level of export products without any distortion of resource allocation. Therefore, to find the LCA of the targeted country, the factor endowment similarity of the benchmark countries is a crucial criterion to observe which products of the benchmark countries have already revealed comparative advantage. Another crucial modification is determining the revealed comparative advantage of the targeted and benchmark countries. Due to the focus on export performance for all exports to the world that explains the country's export performance, pure GIFF is concentrated on analyzing the country's export performance among other countries. On the contrary, this study concentrated on the export performances of the member countries to the specific country (China) that is a member of the initiative countries<sup>8</sup>.

The international trade theory of Heckscher-Ohlin is designated to observe comparative advantages determined by the relative abundance and scarcity of the production factors. It is commonly mentioned that existing comparative advantage is mainly reasoned by relative abundance (Stone, Cepeda & Jankowska, 2011). To discover the factor endowments, starting from the base model of relative factor endowment calculation can be an instrument to understand the process of why the countries will have better export performance in its commodities is in line with relative factor endowment structure. In this process, an economy with relatively abundant capital would have enhanced export volume in capital-intensive commodities. Assuming; (1) two countries, (2) two commodities, (3) two factors that are capital (K), measured by adding physical units, and labor (L) without natural resources (is in line with NSE that is assumed production factors as just capital and labor), (4) having the same quality of capital equipment present the same capital equipment for two

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<sup>8</sup> Initiative countries indicate Belt and Road Initiative-China-Central West Asia countries.

countries, (5) perfect competition market, the relative factor endowment measured as below (Ford, 1966);

$$\left(\frac{K}{L}\right)_A > \left(\frac{K}{L}\right)_B \quad (1)$$

where  $K$  and  $L$ , respectively, present capital and labor.  $A$  and  $B$  indicate different countries.  $K/L$  proposes the capital-labor ratio as a measure of factor endowment of the indicated country. Regards with equation one, country  $A$  has a relatively capital-abundant factor endowment. In reverse, country  $B$  has a relatively labor-abundant factor endowment. Again, regarding the assumption of NSE, the natural resources as production factors have to be constant. Therefore, the factor endowment structure of the countries is calculated by the capital-labor ( $K/L$ ) ratio.

Revealed comparative advantage (RCA) index, proposed by Balassa (1965), measures the relative export performance of a country. RCA fundamentally focuses on the share of specific goods or services in a country's total exports and the world's total exports. However, this study concentrates on comparing the RCA level of any country in the specific country under initiative countries. Therefore, the more specific total export has to be measured instead of focusing on world-level total export. The new RCA index, named as regional revealed comparative advantage (RRCA) index, is proposed and calculated as below;

$$RRCA_{Ai} = \frac{\frac{X_{Ai}}{\sum_{j \in P} X_{Aj}}}{\frac{X_{Ri}}{\sum_{j \in P} X_{Rj}}} \quad (2)$$

where  $P$  indicates prices of commodities,  $A$  indicates a country in the region,  $i$  represents commodity, and  $R$  presents in specific country-level total.  $X_{Ai}$  shows the export of commodity  $i$  in country  $A$  to a specific country.  $\sum_{j \in P} X_{Aj}$  indicates the total export of country  $A$  to a specific country at price  $P$ .  $X_{Wi}$  shows export of commodity  $i$  of the member countries of the region to a specific country.  $\sum_{j \in P} X_{Wj}$  indicates total export of member countries of the region to a specific country the at price  $P$ . Measured RRCA value explains the relative competition power of the selected member country in specific country in the region regarding the specific product. The relatively higher RCA value, therefore, identify country  $A$  represent as more competitive in commodity  $i$  compared to other member countries.

Factor endowment structure is central to GIFF application to determine the benchmark countries. However, some other measures can support strengthening the validity of the results. For this purpose, PRODY and EXPY indexes that are measured to measure productivity differences and

similarities are calculated for country-level. PRODY and EXPY indexes were introduced by Hausmann, Hwang and Rodrik (2007) to calculate the income level of a country's exports with the weighted average of the country's income. The RRCA weights of the countries are included in these measurements. PRODY then calculates income/productivity level of a specified good. EXPY calculates income/productivity level of export basket of country. When PRODY measures export-weighted average of targeted goods, EXPY indicates the productivity level of specializing pattern of country.

The PRODY index is weighted by the country's income measured by GDP per capita. Some variables should be modified to calculate the PRODY and EXPY index which is in line with the aim of this study. The indicator of the country is changed as a country to align with the study's aim. With the modification, PRODY index and its components are indicated as below;

$$X_j = \sum_l x_{jl} \quad (3)$$

where  $j$  indicates country and  $l$  indexes goods.  $X_j$  presents total export of country  $j$ .

$$PRODY_k = \sum_j \frac{\left(\frac{x_{jk}}{X_j}\right)}{\sum_j \frac{x_{jk}}{X_j}} \cdot Y_j \quad (4)$$

where  $Y_j$  presents GDP per capita of country  $j$ .  $PRODY_k$  explains the productivity level of product  $k$ .  $x_{jk}/X_j$  is the value-share of commodity  $k$  in the country's overall export basket.  $\sum_j (x_{jk}/X_j)$  shows the total value-shares among the all-country goods that export. PRODY index, then, defines the weighted average of GRP per capita that correspond to RRCA of each country in good  $k$ . The productivity level related to the export basket of the country  $j$  then calculated as below;

$$EXPY_j = \sum_k \left(\frac{x_{jk}}{X_j}\right) \cdot PRODY_k \quad (5)$$

where  $j$  still indicates the country, and  $k$  still presents good. EXPY explains the country's export competitiveness regarding the capabilities such as production knowledge, financial sufficiency, intermediate inputs, human capital, soft and hard infrastructure, and technology capacity. Upgraded capabilities show the sophistication level of export (Lazarov, 2019). Therefore, similar EXPY values can indicate similar productivity of countries. After determining the LCA of Turkey in China, the growth diagnostic tree proposed is implemented to detect binding constraints instead of comparative value-chain analysis for the second step of GIFF. The third, fourth, fifth, and sixth step of GIFF mainly recommends some policies for economic agents.



## 5. Results and Discussion

The criteria, including factor endowment comparisons, are selected for the GIFF application to select the benchmark countries. Table 2 indicates the capital-labor ratio of the CWAS. It is observed that Israel, Turkmenistan, Croatia, Romania, Lebanon, Iran, Albania, and Serbia can have a similar factor endowment structure to Turkey. However, Lebanon is removed from the list due to its massive amount of copper (a natural resource) covering a large part of its exports to China. The Lebanon copper export (740400, 740321, 740200)<sup>9</sup> to China consists of about 82% of its total export to China. Nonetheless, Lebanon has other commodities to export to China. Lebanon is included to measure PRODY and EXPY indexes. On the other hand, about 98% of the exports of Turkmenistan consisted of petroleum gases (271121)<sup>10</sup>, a natural resource, to China in 2018. Therefore, Turkmenistan should remove the list of countries with similar factor endowments to Turkey because Turkey has no significant oil or gas resources yet. Without factor endowment similarity, Iraq has been eliminated from calculations of the PRODY and EXPY indexes due to its similar export patterns to Turkmenistan. Syria is also deleted from the list because of its insignificantly less export volume to China. Therefore, the export values of Turkmenistan, Iraq, and Syria are excluded from the PRODY and EXPY calculations.

**Table 2: Capital-Labor Ratio, Export and Import of the CWAS (2018)**

Country	Total Population (in millions)	Real Capital Stock	Capital-Labor Ratio	Export to China (million \$)	Import from China (million \$)	Net Export to China (Balance of Trade between China) (million \$)
Israel	8.38152	1117631	133345	4794.38	10466	-5671.584
Turkmenistan	5.8509	765632	130857	6435.96	316.925	6119.0345
Croatia	4.15641	524323	126148	158.42	952.398	-793.97799
Turkey	82.3401	9244392	112271	3078.64	21506	-18427.357
Romania	19.5061	1635782	83859.9	88355.4	521100	-432744.2
Lebanon	6.85941	558849	81471.9	22201.1	2048778	-2026576.8
Iran (Islamic Republic of)	81.8002	6435005	78667.4	9217.7	10248.6	-1030.8602
Albania	2.88274	217551	75466.7	52735.4	498572	-445836.67
Serbia	7.01884	522469	74438	91.7253	2167.52	-2075.797
Montenegro	0.62781	41495.6	66096	16570.4	302217	-285647.04
Georgia	4.00294	254810	63655.6	19910.8	8341.33	11569.45
Bulgaria	7.05161	419648	59511	901091	1555557	-654465.07

<sup>9</sup> These HS 2017 commodity codes indicate (740400) copper; waste and scrap, (740321) copper; copper-zinc base alloys (brass) unwrought, and (740200) copper; unrefined, copper anodes for electrolytic refining.

<sup>10</sup> This HS commodity code presents (271121) petroleum gases and other gaseous hydrocarbons; in gaseous state, natural gas.

<b>North Macedonia</b>	2.08296	121096	58136.5	6525.94	52322.4	-45796.465
<b>Tajikistan</b>	9.10084	335440	36858.1	57.0757	594.154	-537.07868
<b>Bosnia and Herzegovina</b>	3.32393	120737	36323.5	2235.58	80808.4	-78572.815
<b>Jordan</b>	9.96532	338519	33969.7	111667	2767120	-2655453.2
<b>Uzbekistan</b>	32.4762	1041891	32081.6	212093	353949	-141856.09
<b>Armenia</b>	2.95175	91216.2	30902.5	10722.2	66080.1	-55357.901
<b>Iraq</b>	38.4336	1081868	28149	22495.3	7903.32	14591.95
<b>State of Palestine</b>	4.86298	123741	25445.6	48.9149	424918	-424868.85
<b>Azerbaijan</b>	9.94954	246477	24772.7	11357.3	11966.5	-609.14824
<b>Syrian Arab Republic</b>	16.9451	398577	23521.7	0.86941	1272.77	-1271.9025
<b>Republic of Moldova</b>	4.05194	92541.8	22838.9	18.8188	600.387	-581.56855
<b>Kyrgyzstan</b>	6.30403	77137.9	12236.3	61.2378	1942.26	-1881.0199

**Source:** Total Population and Real Capital Stock from PENN World Table (2023); Export to China and Import from China from UN Comtrade (2023)

**Note:** Capital-labor ratio is the authors' own calculation.

Consequently, the benchmark countries are picked as Israel, Croatia, Romania, and Iran, as shown in Table 3. The benchmark countries are selected regarding the factor endowment similarity to Turkey and their export diversification. Moreover, the similarity and/or insignificant difference of the HDI and HCI between Turkey and benchmark countries predicts that Turkey also has a similar development level and similar human capital stock. This measurement also increases the power to pick benchmark countries to set an example for Turkey. Besides the factor endowment and development level similarity among Turkey and benchmark countries, the productivity levels of these countries' export commodities are also significant. For this purpose, PRODY values of each exported commodity of CWAS were calculated. From the PRODY values, EXPY values measured from the PRODY values by the countries' weighted-average national income level (GDP per capita) present the country-level export productivity level. The similarity of the EXPY level shows the similar productivity level that indicates the existence of potential to produce similar commodities compared to benchmark countries by Turkey. The EXPY value of Turkey is higher than the benchmark countries, with a value of about 0,033. Therefore, Turkey's higher export productivity level shows that Turkey can potentially produce the export commodities that the benchmark countries already exported to China relatively more efficiently. In this case, Turkey can have a relatively more comparative advantage resulting from the

relatively lower production costs caused by its export productivity. The RRCA of the benchmark countries, therefore, can be LCA of Turkey.

**Table 3: Turkey and the Benchmark Countries to Compare with Turkey**

Country	Capital-Labor Ratio	EXPY	Economic Complexity Index	Complexity Outlook Index	Human Development Index	Human Capital Index
Israel	133345	0.01269	1.21	1.00	0.919	0.763
Croatia	126148	0.00449	0.89	1.48	0.856	0.729
Turkey	112271	0.03314	0.59	2.36	0.839	0.625
Romania	83860	0.01355	1.15	1.19	0.827	0.594
Iran	78667	0.00865	-0.29	-0.43	0.787	0.592

NSE dictates the factor endowment similarities and differences to select benchmark countries to compare with the targeted country. Besides the factor endowment measured by the capital-labor ratio, the information accumulation that determines the technology level of countries is also significant if the least-developed countries are not analyzed. As an upper-middle-income country Turkey, comparing the technology level differences with the benchmark countries became crucial. Comparisons of the technology differences between Turkey and benchmark countries also show whether Turkey has the advantage of backwardness<sup>11</sup>. Developing countries are not on the global technology frontier as developed countries. Therefore, developing countries can select, imitate and borrow the best-fit technology innovations from developed countries. If it is assumed that knowledge accumulation determines the technology level of the countries, then the knowledge accumulation differences indicate the technology level differences among countries. To measure the technology differences, and similarities between Turkey and its benchmark countries, the economic complexity index (ECI) and complexity outlook index (COI) are employed in this study, indicated in Table 3. The ECI of Turkey is below the benchmark countries except for Iran. Turkey's ECI, which is below the benchmark countries except Iran, shows that the technology level of the benchmark countries has upper technology level than Turkey. Then, one question arises from NSE. Does Turkey have an advantage of backwardness compared to its benchmark countries? To answer this question, the COI value of Turkey compared with benchmark countries became significant. The comparisons of the COI among Turkey and its benchmark countries point out that Turkey has a higher value of 2,36. Having a

<sup>11</sup> "Advantage of backwardness" terminology is mentioned by NSE explained as developing countries have a wide selection of the capital intensity of production and can import ideas, technology, and know-how from the rest of the world. With the advantage of backwardness, developing countries can learn and borrow technological innovations from developed countries, then grow faster than developed countries (Lin, 2012).

higher COI value signals that Turkey has the potential to produce the RCA of the benchmark countries with higher technology levels as Turkey's LCA.

Regarding the GIFF application, the RRCA of the benchmark countries are calculated and determined. The determined common RRCA of the benchmark countries is expected to be role models as the LCA of the targeted country. The LCA of the targeted country, then, has the potential to produce the before-mentioned RRCA of the benchmark countries that have similar factor endowment and knowledge accumulation. In this aspect, the RRCA as a measure for export diversification and export competitiveness of the benchmark countries are calculated for 1999 and 2018. In 1999, 14 of the CWAS countries exported to China. In 2018, all of the CWAS countries exported to China.

The export commodities data are extracted in terms of the HS codes. Due to differences in the HS classification codes between 1999 (HS 1996) and 2018 (HS 2017), the HS 1996 and HS 2017 codes are merged in terms of the correspondence table created by the United Nations Statistics Division (UN, 2023). The gain of RRCA compared between 1999 and 2018 is calculated. The top 100 export commodities with the highest RRCA gain value have been picked to compare for Iran, Romania, Israel, and Croatia. All of the picked commodities have an RRCA value of more than one that shows the existence of RRCA.

The comparisons of RRCA among Turkey and its benchmark countries present some significant outcomes in terms of the LCA of Turkey in China, shown in Table 4. Regarding the comparisons, it is evident that Turkey already has RRCA in 848420 compared with all other benchmark countries. Furthermore, Turkey also has RRCA in 401519, 253090 and 293299 more than, respectively, Croatia and Iran. Turkey still has the potential to increase its export of these two commodities, even though Turkey already has RRCA in terms of these two commodities. Therefore, Turkey can have LCA on 253090 and 293299. The total export of these two commodities to the world except China, which exceeds the total export to China, also proves the possibility of increasing total export to China.

The commodities of 680299, 391290, 847910, 851822 and 842410 exported in two out of four benchmark countries (respectively, Iran and Croatia; Iran and Israel; Croatia and Israel; Croatia and Israel; Croatia and Israel). However, Turkey did not export these five commodities to China yet. Nevertheless, Turkey exports these five commodities to the world except China. Thus, due to showing similar RRCA increase of these five commodities between benchmark countries and Turkey's current export of these five commodities to countries other than China, 680299, 391290, 847910, 851822, and 842410 are expected to be LCA of Turkey in China. These LCA of Turkey in China can be RRCA that stimulates the export volume of Turkey to China in the future. Therefore, the balance of the trade gap between Turkey and China can decrease.

**Table 4: Top 100 Commodities with the Highest Regional Revealed Comparative Advantage Gains Comparisons of Turkey and Its Benchmark Countries, and Export Values of Turkey (1999-2018)**

HS 2017 Code*	Commodity Description	Increase in RRCA				Turkey		Total Export to World Except China (USD)
		Iran	Romania	Croatia	Israel	Increase in RRCA	Total Export to China (USD)	
<b>Most RCA Increase in Top 100 Commodities in 2 Benchmark Countries and Exported in Other 2 Benchmark Countries</b>								
<b>848420</b>	Seals; mechanical	<u>32.44</u>	1.93	<u>44.37</u>	1.98	243.28	158131	11844008
<b>Most RCA Increase in Top 100 Commodities in 2 Benchmark Countries and Exported in Other 1 Benchmark Country</b>								
<b>680299</b>	Stone; natural (excluding marble, travertine, alabaster, other calcareous stone or granite), monumental or building stone, (other than simply cut or sawn, with a flat or even surface)	<u>121.24</u>	----	<u>34.22</u>	5.52	----	Not exported	3496733
<b>Most RCA Increase in Top 100 Commodities in 2 Benchmark Countries</b>								
<b>253090</b>	Mineral substances; n.e.c. in chapter 25	<u>109.63</u>	----	<u>40.34</u>	----	62.21	1252393	9750445
<b>401519</b>	Rubber; vulcanised (other than hard rubber), gloves, mittens and mitts other than surgical gloves	<u>17.17</u>	----	<u>55.08</u>	----	338.35	255000	1310498
<b>391290</b>	Cellulose and its chemical derivatives; n.e.c. in item no. 3912, in primary forms	<u>4.52</u>	----	----	<u>243.40</u>	----	Not exported	1076744
<b>293299</b>	Heterocyclic compounds; with oxygen hetero-atom(s) only, no lactones or unfused furan rings (hydrogenated or not) in the structure, other than isosafrole, 1-(1,3-benzodioxol-5-yl) propan-2-one, piperonal, safrole, tetrahydrocannabinols (all isomers)	<u>2.14</u>	----	----	<u>243.12</u>	7.58182	14218	157386
<b>847910</b>	Machinery and mechanical appliances; for public works, building or the like	----	----	<u>253.58</u>	<u>243.72</u>	----	Not exported	31501535
<b>851822</b>	Loudspeakers; multiple, mounted in the same enclosure	----	----	<u>84.54</u>	<u>249.30</u>	----	Not exported	1445199
<b>842410</b>	Fire extinguishers; whether or not charged	----	----	<u>31.91</u>	<u>251.04</u>	----	Not exported	7525918

**Source:** Author own calculations: Increase in RRCA based on UNDP-Comtrade Database (2023)

**Notes** \* indicates the 6-digit Harmonized System 2017 commodity codes.

Besides Turkey's determined LCA in China, Turkey's RRCA is also significant. Named a self-discovery industry, some RRCA is already revealed in China. Therefore, it has to be supported to enlarge its export scale. Of the 1723 commodities that Turkey exported to China in 2018, Turkey exported 473 of these products to China alone among the CWAS countries. Therefore, 473 export commodities of Turkey to China naturally have an RRCA of more than one. The pattern of these commodities contains textiles (146 commodities), machinery/electrical (80 commodities), metals (59 commodities), and chemicals and allied industries (43 commodities) commodities more than other export commodities to China compared to other products.<sup>12</sup> Some of these commodities just are exported by Turkey to China. These RRCAs have significance to last self-discovery firms' commodities.

After identifying Turkey's potential LCA in China, the second step of the GIFF proposes to determine the constraints, barriers, and limits in front of identified LCA. The application of growth diagnostic tree framework or value-chain analysis is necessary to make it reveal these pressures on LCA. In this aspect, the growth diagnostic tree methodology is applied in this study. The first level of this tree focuses on the level of private investment and entrepreneurship. Assuming the investment level determines the production, the manufacturing sector share in GDP became a determinant of observing the manufacturing investment level. Comparing Turkey's manufacturing share in GDP between 1999 and 2021, it is obvious that there have been no significant value changes starting from about 20% in 1999 and ending from about 22% in 2021 (World Bank, 2023e). The benchmark countries, except Iran, manufacturing share in GDP sharply decrease from 1999 to 2021. The manufacturing investment level determining production has become less in the benchmark countries. Interestingly, the manufacturing RRCA of the benchmark countries increased at the same time, while Turkey did not have RRCA or LCA on some manufacturing commodities in China. On the other hand, the decrease in the manufacturing share of GDP in benchmark countries can be a sign for Turkey to have RRCA on manufacturing that determined LCA previously if the manufacturing RRCA will decrease due to a decrease in manufacturing production.

The second level of the growth diagnostic tree is divided by the low return of economic activity and the high cost of finance for the second level/division. Starting from defining the potential barriers on Turkish LCA regarding macro risks under the second level of growth diagnostic tree, the expected impacts on the manufacturing sector from an economic crisis could be signs to show how and which part of the manufacturing sector is fragile. Regarding the survey of Asgary, Ozdemir and Özyürek (2020) on small and medium manufacturing enterprises in Turkey, financial crises in important economies, uncontrollable inflation, and severe structural unemployment or underemployment were

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<sup>12</sup> The commodity classification is grouped by 2-digit HS codes as 50-63 for textiles, 84-85 for machinery/electrical, metals, and 28-38 for chemicals and allied industries.

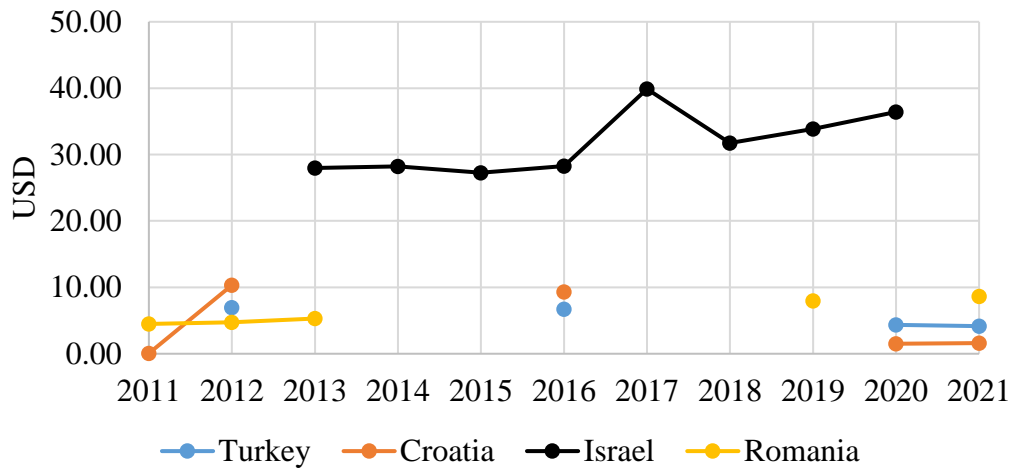
founded as the most significant expectations. On the other hand, the key macroeconomic components' impact on the manufacturing sector also includes the importance. In this aspect, economic growth as positive; financial depth, exchange rate, and openness as unfavorable to manufacturing sector performance impacts firms' performance in the manufacturing sector (Doruk, 2019).

Another division of the second level of the growth diagnostic tree is about the financial constraints. Analyzing the Turkish manufacturing sector business dynamism, it is found that it started to decline from 2012 due to lack of access to global liquidity (Akcigit, 2020). Furthermore, the R&D investment of the manufacturing sector in Turkey, as a main driver of economic growth, depends on the firms' inverse relationship of financing constraints (Gezici, Orhangazi & Yalçın, 2020). Thus, the financing constraints of the firms can depreciate the R&D investment of the firms that discourage economic growth. From another aspect, surprisingly, family-owned manufacturing firms do not have financing constraints, while nonfamily-owned has financing constraints (Ergün & Doruk, 2020).

Besides the determined constraint, the World Bank Enterprise Survey (2023d) shows some results in determining manufacturing sector obstacles. In this questionnaire, a question about the part of the business environment is related to the manufacturing firm's obstacle. The answers to this question indicate that the biggest obstacle, respectively, are tax rates (27%), access to finance (26%), inadequately educated workforce (16%), political instability (9%), electricity (6%), practices of competitors in the informal sector (4%), customs and trade regulations (3%), labor regulations (3%), access to land (1%), tax administration (1%), transport (1%), corruption (1%) and crime, theft and disorder (1%) according to the ratio from the largest to the smallest. Therefore, economic agencies should be aware of these constraints in front of the manufacturing sector, including Turkish LCA.

Besides the constraints in front of manufacturing LCA of Turkey in China, Turkey has some cost advantage or equality compared to benchmark countries. Regarding the average of the all-sector average monthly wage, Turkey has the minimum labor cost of production compared to benchmark countries except Iran (due to the unavailability of the data) between 2019 and 2021. As shown in Figure 3, Turkey also has one of the lowest labor costs in the manufacturing sector labor cost between 2011 and 2021. On the other hand, Turkey's labor productivity (measured as output per worker) has ranked first after Israel compared to its benchmark countries. Turkey's high labor productivity level is a sign of lower labor costs, resulting in a comparative advantage over Turkey between 2011 and 2022 (International Labour Organization, 2023c).





**Figure 3: Average Hourly Labor Cost of Manufacturing**

**Source:** International Labour Organization (2023a).

**Notes:** Data for some years and for Iran were not available

In the existing literature that identifies the key industries by GIFF application for Turkey is limited. Gurbuz and Tuncer (2023) identified the latent comparative advantages of the agricultural and some labor-intensive industries of Turkey in the world-level by applying modified GIFF methodology to the Turkish economy. This study is known as the first and sole study that applied GIFF for the Turkish economy before. With the similar aim that is to pick key industries in Turkey, Çeştepe and Çağlar (2017), and Yıldırım (2018) applied product space methodology. Çeştepe and Çağlar (2017) picked machinery industry in the short-run and chemicals, health related products, and electronic industries. Moreover, Yıldırım (2018) found machinery, electrical machinery, and chemicals as the key industries. By input-output table application, Uğurlu and Tuncer (2017) showed that wood products, chemicals and products, electricity, gas, steam, and hot water production and distribution are important to prioritize production as key industries for the Turkish economy. Regarding different methodology applications, Topçu and Sarigül (2015) identify the competitiveness level of the top five exported sector using RCA and Vollrath's competitiveness, revealed symmetric comparative advantage and trade balance index by product mapping methodology. Turkish textile and clothing industries are founded as the strongest comparative advantages.

This study focuses on the BRI Central West Asia corridor to pick the LCA of Turkey in China. Therefore, this study's results differ from the study of Gurbuz and Tuncer (2023), which also applied GIFF to the Turkish economy. This study uses some crucial modifications when applying GIFF. The main difference is hidden in the main aim of the studies. This study focuses on increasing the trade of balance of Turkey with China; another study focused on stimulating the economic growth of Turkey through the increase in export. The other crucial difference between these two studies is which

countries are analyzed and covered. This study covers BRI-CWAS countries, while Gurbuz and Tuncer (2023) covered all countries.

The picked LCA of Turkey in China as machinery and mechanical appliances; for public works, building or the like, loudspeakers; multiple, mounted in the same enclosure, and fire extinguishers; whether or not charged are more capital-intensive compared to the identified LCA in Gurbuz and Tuncer (2023) as agricultural and some labor-intensive industries. The difference in observed LCA is due to factor endowment structure among Turkey and China. Turkey has more capital-intensive factor endowment compared to China. As expected, Turkey's LCA in China became more capital-intensive. On the other hand, the result of this study is more similar with the studies of Çeştepe and Çağlar (2017), and Yıldırım (2018).

## 6. Conclusions and Policy Recommendations

The main aim of this study is to pick Turkey's LCA and determine the obstacles, constraints, and barriers in front of the LCA of Turkey in China among BRI-CWAS countries. The picked LCA production is expected to decrease the deficit of Turkey's trade of balance with China. In terms of the aim of the study, the GIFF application proposed by NSE with some crucial modifications is implemented. The EXPY, PRODY, economic complexity, and complexity outlook indexes are also used to determine benchmark countries for Turkey among BRI-CWAS countries.

The GIFF methodology proposes that Iran, Romania, Croatia and Israel are benchmark countries. The comparisons between the RRCA of the benchmark countries suggest the potential LCA of Turkey in China. Commodities with the higher potential for LCA of Turkey are observed as stone; natural (excluding marble, travertine, alabaster, other calcareous stone or granite), monumental or building stone, (other than simply cut or sawn, with a flat or even surface); cellulose and its chemical derivatives; n.e.c. in item no. 3912, in primary forms; machinery and mechanical appliances; for public works, building or the like; loudspeakers; multiple, mounted in the same enclosure; fire extinguishers; whether or not charged; mineral substances; n.e.c. in chapter; and heterocyclic compounds; with oxygen hetero-atom(s) only, no lactones or unfused furan rings (hydrogenated or not) in the structure, other than isosafrole, 1-(1,3-benzodioxol-5-yl) propan-2-one, piperonal, safrole, tetrahydrocannabinols (all isomers). Most of the picked LCA include capital-intensive manufacturing commodities.

The obstacles, barriers, and constraints in front of the LCA of Turkey in China are mainly determined as financial crises in significant economies, uncontrollable inflation, severe structural unemployment or underemployment, manufacturing sector performance, lack of access to global liquidity, financing constraints for the R&D investment, and financing constraints for the nonfamily-

owned firms. Besides some findings of constraints in front of the Turkish manufacturing sector, the World Bank Enterprise Survey (2023d) for manufacturing industries in Turkey has also proposed some insight into the obstacles. According to this survey, Turkey's manufacturing industries suffer mainly by tax rates, access to finance, an inadequately educated workforce, and political instability. Furthermore, Turkey has a lower average monthly wage and manufacturing labor cost than its benchmark countries except Iran. Turkey's output per worker/labor productivity is also higher than its benchmark countries except Israel. Turkey can enjoy its higher labor productivity level to have comparative advantage compared with its benchmark countries except Israel.

Appropriate soft and hard structure investments for LCA as well as RRCA of Turkey that consist special rules and arrangements (soft infrastructure), transportation, energy, etc. (hard infrastructure, providing; the competitive free-market system; creating the special economic zones and/or charter cities near the BRI transportation routes; tax incentives, investment credits, access to foreign exchange and subsidization for LCA of Turkey to the LCA are recommended as a policy tools for Turkish economic agencies.

The LCA of Turkey in China is found by modified GIFF methodology. This study is focused on BRI-CWAS countries. Future studies can focus on all the members of the BRI. Some more economic corridors of BRI also can be observed. On the other hand, different methodologies to find the LCA of Turkey in China can be implemented.

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