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ARTICLE

Determinants of Comparative Advantage and its Dynamic Relationship with Trading Partners: The Case of Egypt

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Abstract

Egypt is a promising market. It is full of auspicious economic opportunities for investments. These can be found in natural resources and low-cost labour sectors, which are considered scarce resources in many countries in the Global North. The theory of comparative advantage plays a vital role in assessing the strength of the country's exports. Comparative advantage has been heavily investigated in trade literature; however, it is not extended to measure the interdependence of this advantage on the trading partners. Thus, the objective of the paper is to compute the Egyptian comparative advantage through its Revealed Comparative Advantage (RCA) index, as well as measure the interdependence that RCA have between the country and its trading partners. The paper will be using a panel data approach incorporating stationarity and causality tests. The findings revealed that when natural resource needs outnumber technology and quality needs, RCA has a causal effect on the macroeconomic variables of trading partners. Besides, when natural resources are needed for technology and quality needs, therefore, unidirectional causality relationship, trading partners' macroeconomic variables have a causality effect on the Egyptian RCA. Lastly, when natural resource needs equal technology and quality needs, there is a bidirectional causality relationship between Egyptian RCA and trading partners. The research findings and recommendations are in line with the vital role of trade in Africa and elsewhere in the Global South through stable macroeconomic variables, sustained growth, maximising value-added, creating job opportunities and increasing the real GDP per capita.

Keywords: Egypt, International Trade, RCA, Comparative Advantage, Ricardo, Exports

JEL classi ication: F10, F14, F49

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1. Introduction

In trade literature, there are many trade theories that analyse the advantages of products across countries, and they are mainly categorised as classical, neo-classical, and modern trade theories. Comparative advantage, as a classical theory of trade, is one of the cornerstones in international trade literature, where countries specialise in products that have been produced at lower costs compared to other countries (Siggel 2006; Yeats 1992; Leromain & Orefice 2014; Yu et al. 2009; Ahmed et al.

2017; Beyene 2017). Many economists agree that it is important not only as a theory but also as a tool for economic policy recommendations (Yu et al. 2009; Leromain and Orefice 2014). Nobel laureate Paul Samuelson (1969) was once challenged by the mathematician Stanislaw Ulam to identify one true and non-trivial theory in social sciences, after years of searching his answer was the theory of comparative advantage. Which emphasizes the importance of comparative advantage in trade literature.

The experience of Egypt illustrates their point. Egypt's Vision 2030 (Economic and Social Development Plan for fiscal year 2019/2020, 2020) aims at achieving sustainable growth and development for the country through improving its economic, social, institutional, political, and environmental aspects. The main objective of the vision is to achieve a stronger, more competitive, and more diversified economy in order to boost the living standards of Egyptian citizens. One of the main objectives of the 2030 Vision is to facilitate a stronger trade portfolio through increasing exports, which is supported by the trade liberisation policies (Nazier 2012; Smith and Kulkarni 2010). Therefore, it is of great importance to analyse the advantages of Egyptian products to be able to maximise gains from trade.

In 1965, Bela Balassa proposed Revealed Comparative Advantage (RCA) as a measure for Ricardian concept of comparative advantage. RCA added an empirical side for comparative advantage theory and allowed for investigating vast data set. (Fertö & Hubbard 2003; Hoen & Oosterhaven 2006; Serin and Civan 2008; Yeats 1992; Yu et al. 2009; Laursen 2015; Seyoum 2007; Ahmed et al. 2017; Yasmin and Altaf 2014; Leishman et al. 1999; Beyene 2017; Startiene and Remeikiene 2013).

Our objective is to incorporate RCA that is based on Ricardian comparative advantage into assessing the trade position of Egypt through calculating RCA for all the product categories that in which Egypt trades. As well, use the dynamics of Granger causality to identify the effects of the RCA on the Egyptian trading partners. To our knowledge, this is the first study to calculate the RCA for all product categories while applying the dynamics of Granger Causality to highlight the extent to which this comparative advantage could affect the main trading partners of Egypt. The study is providing a new approach for analysing RCA through incorporating its effect on the trading partners to be a more dynamic and effective measure in assessing trade. We argue that the characteristics of the product whether it is based on natural resources, technology, or quality affect the interdependence between the country and its trading partners using comparative advantage theory. The rest of the article is divided into literature review, followed by methodology, results, discussions, and finally the conclusion.

2. Literature Review

David Ricardo, in his famous book On Principals of Political Economy and Taxation (1817), introduced the theory of comparative advantage. Ricardo used an example of two goods and two countries to explain his theory. England and Portugal are the two countries, and cloth and wine are the two goods. According to Adam Smith's theory of absolute advantage (see table 1), Portugal has an absolute advantage in producing both goods because it requires fewer labor units to produce one unit of the good. However, Ricardo introduces the four magic numbers, or in other words, the opportunity cost. If England produces cloth, it will only lose 0.83 units of wine; but if it produces wine, it will lose 1.2 units of cloth. Portugal, on the other hand, will lose 1.125 units of wine if it produces cloth, but only 0.89 units of cloth if it produces wine. Therefore, England has a comparative advantage in clothing and Portugal has a comparative advantage in wine (Maneschi 1992; Meoqui 2011; Gehrke 2015; Maneschi 2008; King 2013). To conclude, a country can gain a comparative advantage in producing a specific product when it produces it at a lower opportunity cost (Husted and Melvin 2007; Salvatore 2014).

Since this theory was propounded, many studies have been conducted about trade. Comparative advantage can be considered one of the important cornerstones in international trade literature

Table 1. Opportunity Cost Analysis

	England	Portugal
Unit of Cloth	100	90
Unit of Wine	120	80
Cloth Opportunity Cost	100/120 = 0.83	90/80 = 1.125
Wine Opportunity cost	120/100 = 1.2	80/90 = 0.89

Source: Maneschi 1992; Meoqui 2011; Gehrke 2015; Maneschi 2008; King 2013

(Siggel 2006; Yeats 1992; Leromain & Orefice 2014; Yu et al. 2009; Beyene 2017). Many economists agree on its importance not only as a theory but also as a tool for policy recommendation for countries (Yu et al. 2009; Leromain and Orefice 2014). In other words, a country says it has a comparative advantage when it starts to produce and export goods at lower factors of production cost than other countries. The lower cost of factors of production will lead to relatively lower wages in comparison with other countries that produce the same goods. Therefore, a country earns specialization relative to other economies and comparative advantage is achieved (Hunt and Morgan 1995; Serin and Civan 2008; Yeats 1992; Yu et al. 2009; Laursen 2015; Beyene 2017). Furthermore, a country gains a comparative advantage when the good it produces is sold at the lowest pre-trade price relative to other countries (Husted & Melvin 2004; Hillman 1980; Leromain & Orefice 2014; Siggel 2006 & Seyoum 2007).

Overtime, however, there was a decline in interest in the Ricardian theory of comparative advantage In which greater attention is directed towards ne-classical and new trade theories. The Neo-classical view of trade is explained by the Austrian school, Heckscher-Ohlin model, Heckscher-Ohlin-Samuelson model, Corollary view, Leontief Paradox, and Staffan Linder view. The Austrian school defines trade through the utility of forgone consumption of exported goods and services. This school of economics supports free trade on a Pareto efficiency [1]basis and not only on comparative advantage between nations. The Austrian school is the methodology for the next step in the Neo-classical school, which is the Heckscher-Ohlin model of trade. The H-O model tries to find out the determinants of comparative advantage and reaches one of the most famous conclusions in trade. The conclusion is that a country exports goods and services in which the country has a comparative advantage, which is gained from the abundance of specific resources domestically and imports ones with scarce resources (Sen 2005).

Samuelson then extended the H-O model to the H-O-S model, where the equilibrium model is used in analyzing the comparative advantage of a country. In his work, Samuelson plugs in the factors of prices and consumer income into the analysis of trade patterns between countries. The following conclusion was reached: in equilibrium, prices are equal in countries that trade together if prices are not equal, therefore, countries have not reached equilibrium yet (Sen 2005).

Furthermore, economists find out that the US exports more labor-intensive products than its exports of capital-intensive products, although the US, according to the H-O-S model, is a capital-intensive country. This paradox was discussed for years in the literature until the concept of "quality of labor" was introduced by Leontief. Leontief finds that yes, the US is a capital-intensive country, but it also has a high quality of labor with special skills and experience that is considered part of their capital. The problem was then solved and named after Leontief by the Leontief Paradox. Finally, the last theory under the Neo-classical view is the overlapping demand proposed by Steffan Linder in 1961. This theory posits that countries at the same income per capita level will demand the same goods and services and end up with overlapping demand between these countries. The Linder Hypothesis was not proven by him mathematically; therefore, it is neglected in the empirical economic literature studies (Sen 2005; McPherson et al. 2001).

1. Which is to make at least one more individual better off without worsening the other individual

In the beginning of 80s, the world was growing and international trade become one of the vital research areas; because of its importance for the nations' growth and development. The main contribution of the New Trade Theories (NTT) to the trade literature. NTT's major assumptions are the concept of economies of scale in which firms can increase output at lower costs and product differentiation between producers; therefore, there is no homogeneity anymore in products. Furthermore, considering market imperfections where perfect competitive market is a hypothetical market and start to study effect of forms of markets on trade. These three major assumptions led to the development of competitiveness other than comparativeness. It is not only a matter of opportunity cost, but also a matter of quality, experience, learning, research, and cost.

The main criticism of neo-classical and new trade theories is the lack of empirical investigations. Besides, the view that the decline in the Ricardian theory was attributed to the radical ideological and political changes that the England society was dealing with in the 19th century (Reich 1980). Reich (1980) added that the Ricardian theory showed consistant significant relevance with contemporary industry reports. Which shows the importance of re-visiting the Ricardian theory of trade. Now that the African Continental Free Trade Agreement, it is important to revisit the literature on Ricardo's theory.

In 1965, Bela Balassa introduced Revealed Comparative Advantage (RCA) as a measure for Ricardian comparative advantage. It is also referred to as relative export performance and is used since then to measure country's comparative advantage in exports. The formula is as follows:

$$RCA = \frac{x_{ij}/x_{it}}{x_{nj}/x_{nt}} \quad (2.1)$$

X is exports; i is a country, j is a commodity, t is the set of commodities, and n is a set of countries. RCA measures the share of the exports of a given country relative to the total world's exports. If RCA is less than one, the country is at a disadvantage; if RCA is greater than one, the country is at an advantage. Literature such as; (Hoen & Oosterhaven 2006; Laursen 2015;; Leishman et al. 1999; Yeats 1992; Yu et al. 2009;).Literature, such as; Ahmed et al. (2017), Beyene (2017), Fertö & Hubbard (2003), Serin & Civan (2008), Seyoum 2007 and Yasmin & Altaf (2014) used RCA to evaluate the extent to which a country has comparive advantage in specific products.

It is of great importance to identify the sectors of comparative advantage in order to be able to effectively increase the strength of the country's exports relative to the world's exports. However, the macroeconomic determinants of comparative advantage have not been examined before in the trade literature; thus, the paper has to build a theoretical foundation for such determinants. To start with, the concept of Ricardian comparative advantage is based on the exports of the country relative to the rest of the world. Thus, in analyzing the determinants of RCA, the macroeconomic indicators that show a relationship with exports will be chosen.

Because the concept of spillover effect between RCA and macroeconomic variables has never been tested in the trade literature, the research will build on the identified macroeconomic determinants of RCA. Ricardian comparative advantage along with its measure, the Balassa index, is based on the exports of the country relative to the rest of the world. Thus, in analyzing the determinants of RCA, the macroeconomic indicators that show a relationship with exports will be chosen. To begin with, empirically, Gross Domestic Product (GDP) has a direct relationship with a country's exports; when a country's exports increase, its GDP increases significantly (Jordaan & Eita 2007; Hsiao & Hsiao 2006; Kónya 2006; Saaed & Hussain 2015; Wan et al. 2021). Moreover, GDP is a measure of the country and individuals' income; as long as income is increasing, the country will import more. *Therefore, when the GDP of the trading partners increases, the imports of Egyptian goods that have a comparative advantage will consequently increase.*

Furthermore, the second important indicator is the exports of the same product categories. If trading partners gain a comparative advantage in a product category, exports in that category will

rise, resulting in lower imports (Choi & Park 2018). The following macroeconomic indicator is the exchange rate. When the domestic currency depreciates, exports tend to increase due to the relative lower price. According to the relative purchasing power parity theory, when the currency of country X appreciates relative to country *Y*, it is therefore better to buy goods from country *Y* (Balassa 1964; Rogoff 1996; Taylor 2003; Obansa et al. 2013; Korkmaz 2013). Consequently, when a currency depreciates relative to the currencies of the trading partners, it is expected to increase domestic exports. The last macroeconomic indicator that will be considered is inflation. Inflation simply means an increase in prices; therefore, when domestic prices increase, export prices will increase and demand will decrease (Gylfason 1999; Mayevsky et al. 2019; Batrancea 2021). *Therefore, when trading partners' exports of the same product category decrease, the foreign currency appreciates, and inflation increases, the imports of goods from Egypt that have a comparative advantage will consequently increase.*

To sum up, it can be extracted that RCA is determined by GDP, export size, exchange rate and inflation. Besides, identifying the determinants of comparative advantage, the paper attempts to assess the trade situation of Egypt and its trading partners. The aim will be fulfilled through calculating the RCA index for 119 product categories that Egypt trades in, then order the products as weak, medium, and high comparative advantage. The second step is to identify the macroeconomic determinants of comparative advantage in Egypt. Then examine the causality relationship between Egyptian comparative advantage and its main trading partners. The objectives is summarized as follows:

1. What is the Egyptian RCA for all exported product categories?
2. Is the Egyptian RCA stable?
3. What are the determinants of Egyptian RCA?
4. What is the causality relationship between Egyptian RCA and the trading partners' macroeconomic variables?

3. Methodology

3.1 Context and Data

The Egyptian authorities have been trying to enhance trade for years. Trade has been seen as one way to address these political-economic problems. As with many other Africa countries, trade liberalization has been pursued historically. In Egypt, this strategy has intensified since 2001 by joining trade agreements that promote exports. Moreover, exchange rate adjustments where implemented in an attempt to improve trade balance. This all makes it very essential to evaluate the determinants of comparative advantage to direct trade.

Egyptian comparative advantage (CA) has been investigated in trade literature either for small number of product categories or for short-time period as in Abu Hatab et al. (2014), Soliman and Bassiouny (2012), Yego et al. (2016), and Torayeh (2013) . In this paper, Egyptian RCA index is calculated from 1995 until 2016 to the 119 product categories, where data is extracted from the UNICTAD database. In addition, we empirically test the previously identified determinants of comparative advantage in the Egyptian context. Then the causality relationship will be investegated between Egyptian RCA and its trading partners' macroeconomic variables and vice versa. The importance of the paper lies in examining the RCA concept with causality methodology, which applies new techniques to examine and investigate one of the most important theories in trade.

3.2 Revealed Comparative Advantage

The paper uses Balassa index in calculating comparative advantage. RCA is extensively used empirically in testing comparative advantage, one of the important researches on RCA is Costinot and Donaldson (2012) research, in which empirical findings of the calculated RCA goes in line with the existing reality, proving the validity of the index empirically. RCA formula used is as follows:

$$RCA = \frac{x_{ij}/x_{it}}{x_{nj}/x_{nt}} \quad (3.2.1)$$

Where X is exports, i is country, j is commodity, t is the set of commodities and n is set of countries. RCA measures the share of the exports of a given country relative to the total world's exports. If RCA <1; therefore, the country has comparative disadvantage, and, if RCA>1; therefore, country has comparative advantage (Fertö & Hubbard 2003; Hoen & Oosterhaven 2006; Serin and Civan 2008; Yeats 1992; Yu et al. 2009; Laursen 2015; Seyoum 2007; Ahmed et al. 2017; Yasmin and Altaf 2014; Leishman et al. 1999; Beyene 2017; Startiene and Remeikiene 2013). Along with, Startienėa and Remeikienė (2014) propose a numerical scale for RCA analysis, in which, if the index value is between 0 and 1; therefore, no RCA, if the index value is between 1 and 2; therefore, weak RCA, if index value is between 2 and 4; therefore, medium RCA and values greater than 4 is strong RCA that will be used in the research.

3.3 Unit Root Test

Unit root test is a perquisite test for ensuring that data set is stationary; in order to be able to check causality. Initially, unit root test is a test for checking whether the data has a trend or having same mean and variance. Therefore, the null hypothesis of unit root test is data has unit root and alternative hypothesis is data has no unit root test (Khan et al. 2016; Erdal and Gocer 2015; Gokmen and Turen 2013 & Salahuddin and Alam 2016). The equation of unit root test is as follows:

$$Y_t = \rho Y_{t-1} + U(-1 \leq \rho \leq 1) \quad (3.3.1)$$

Where, Y is the variable under analysis at time T, regressed on P and Y at time T – 1. If P = 1; therefore, equation becomes a random walk model, which means that the equation has a trend and non-stationary. The concept of unit root is to regress lagged variable values at time T-1 on its values in T, if the variable has stability in mean and variance; therefore, the variable is stationary.

Levin, Lin and Chu (2002) then will be used to test whether the data set has a unit root or stationarity. Using individual unit root test, makes detecting stationarity among the observations much difficult. On the other hand, using panel unit root increases the power of the test (Lin & Ali 2009). One of the powerful stationarity tests is Levin, Lin and Chu or the simply called LLC, besides, its main feature is to estimate a proxy (α) for variable under analysis in time T along with its lagged value. The equation of LLC is as follows (Barbieri 2006):

$$\Delta Y_t = \rho Y_{t-1} + \alpha_{0i} + \alpha_{1it} + U_{it} \quad (3.3.2)$$

Where, ΔY is the change in variable under analysis at time T, regressed on Y at time T – 1.α1 it is the time trend and αi is the individual effect in the equation.

3.4 Causality Test

The research will use Pairwise Dumitrescu Hurlin panel causality test. The model is an extension for the causality model developed by Granger 1969. The old version of the model is depending mainly on improving the forecasting of one variable based on another one. In other words, the concept in Granger causality test is, if variable X trend is the same as the lagged value of Y; therefore, variable X causes Y (Gujarati and Porter 2009). Thus, Granger causality used for testing the causality relationship between two variables and its equation is as follows (Gujarati and Porter 2009):

$$X_t \sum_{i=1}^{n} \alpha i Yt - i + \sum_{j=1}^{n} \beta j Xt - j + U_{1t} \quad (3.4.1)$$

$$Y_{it} = \sum_{i=1}^{n} \gamma i Yt - i + \sum_{j=1}^{n} \delta j Xt - j + U_{2t} \quad (3.4.2)$$

Where bidirectional relationship is tested between dependent variable X and Y. T stands for time, i and j are the lags specified for each variable. Slops α&δ called Wald statistic, where the importance of the variable is stated. If Wald statistic is equal to 0 then the variable under study is not important in the model and it can be removed.

Dumitrescu and Hurlin in 2012 afterwards try to propose a model that allows for heterogeneity in regression as well as in the causality relation. The data set that will be used for this model should be cross-section independent (Chu and Chang 2012), balanced (Akbas et al. 2013) and heterogeneous across countries (Chu and Chang, 2012 & Akbas et al. 2013). However, according to Mont Carlo condition, Pairwise Dumitrescu Hurlin panel causality test results in the cross-section dependency shows very strong outcomes. The optimal way to test causality is to combine both cross-section and time series data (Lin & Ali 2009). The model allows for testing causality between multiple variables and its equation as follows:

$$Y_{\mathrm{it}} = \alpha_i + \sum_{k=1}^{k} \beta ik Yi, t - k + \sum_{k=1}^{k} \gamma ik Xi, t - k + \varepsilon_{\mathrm{it}} \quad (3.4.3)$$

Where Xit and Yit are the two stationary variables of the model for individual i in period t. Besides, the null hypothesis of the model is no causality effect, and the alternative hypothesis is the presence of causality effect. The equation run individually to test causality between dependent and each independent variable in the data set. Further, the coefficient is different; to allow for heterogeneity and the lagged value K is the same for all variables (Lopez and Weper 2017).

In order to investigate if the predetermined macroeconomic variables of Egypt cause changes in the Egyptian RCA and vice versa; pairwise causality test will be conducted between RCA, GDP, EX, INF and EX. Pairwise causality test conducted between RCA GDP, RCA EX, RCAINF and RCAER, separately. The test equations are as follows in set (3.4.4):

$$RCA_{\mathrm{it}} = \alpha_{\mathrm{i}} + \beta_1 GDP_{i,t-1} + \varepsilon_{\mathrm{it}} \quad \& \quad GDP_{\mathrm{it}} = \alpha_{\mathrm{i}} + \beta_2 RCA_{i,t-1} + \varepsilon_{\mathrm{it}}$$

$$RCA_{\mathrm{it}} = \alpha_{\mathrm{i}} + \beta_3 \text{ Exports }_{i,t-1} + \varepsilon_{\mathrm{it}} \quad \& \quad \text{Exports }_{\mathrm{it}} = \alpha_{\mathrm{i}} + \beta_4 RCA_{i,t-1} + \varepsilon_{\mathrm{it}}$$

$$RCA_{\mathrm{it}} = \alpha_{\mathrm{i}} + \beta_5 \text{ Inflation }_{\mathrm{i,t-1}} + \varepsilon_{\mathrm{it}} \quad \& \quad \text{GDP }_{\mathrm{it}} = \alpha_{\mathrm{i}} + \beta_6 \text{ Inflation }_{\mathrm{i,t-1}} + \varepsilon_{\mathrm{it}}$$

$$RCA_{\mathrm{it}} = \alpha_{\mathrm{i}} + \beta_7 \text{ Exchange Rate }_{\mathrm{i,t-1}} + \varepsilon_{\mathrm{it}} \quad \& \quad GDP_{\mathrm{it}} = \alpha_{\mathrm{i}} + \beta_8 \text{ Exchange Rate }_{\mathrm{i,t-1}} + \varepsilon_{\mathrm{it}}$$

Where RCA is the Egyptian Revealed Comparative Advantage, i is the cross-section data for each time observation t, lag GDP, lag Exports of related products, lag Inflation and lag Exchange rates are macroeconomic variables of Egypt. Besides, the causality effect between Egyptian RCA and the trading partners macroeconomic variables will be tested through the following set of equations (3.4.5):

$$RCA_{it} = \alpha_i + \beta_1 GDP_{i,t-1} + \varepsilon_{it} \quad \& \quad GDP_{it} = \alpha_i + \beta_2 RCA_{i,t-1} + \varepsilon_{it}$$

$$RCA_{it} = \alpha_i + \beta_3 \text{ Exports }_{i,t-1} + \varepsilon_{it} \quad \& \quad \text{Exports }_{it} = \alpha_i + \beta_4 RCA_{i,t-1} + \varepsilon_{it}$$

$$RCA_{it} = \alpha_i + \beta_5 \text{ Inflation }_{i,t-1} + \varepsilon_{it} \quad \& \quad GDP_{it} = \alpha_i + \beta_6 \text{ Inflation }_{i,t-1} + \varepsilon_{it}$$

$$RCA_{it} = \alpha_i + \beta_7 \text{ Exchange Rate }_{i,t-1} + \varepsilon_{it} \quad \& \quad GDP_{it} = \alpha_i + \beta_8 \text{ Exchange Rate }_{i,t-1} + \varepsilon_{it}$$

4. Results

4.1 Revealed Comparative Advantage

After calculating the RCA for 119 product categories that Egypt trades in, the findings show that only 43 product categories (Index values are available upon request). Divided into 23 categories have weak RCA, 16 categories have medium RCA and 4 categories have strong RCA, summarized in table 2.

4.2 Unit Root Test

The research uses Levin, Lin and Chu (LLC); as a common unit root process testing for the variables under analysis. LLC uses Im, Pesaran and Shin, Augmented Dickey Fuller and Fisher Chi-square tests for individual unit root testing. Panel unit-root test conducts for RCA of 43 product categories, and five macroeconomic variables (GDP, Inflation, Exports, and Exchange Rates) of Egypt and its trading partners. Afterwards, 40 product categories have P-values of 0.0000; therefore, results are statistically significant at first difference at 1%. Subsequently, reject null hypothesis and do not reject alternative hypothesis, which means that variables under analysis are all stationary at 1% significance (results is available upon request)

4.3 Causality Test

In analyzing the determinants of comparative advantage in Egypt, the findings illustrate that GDP, Exports, Exchange rate and inflation proves to be the main determinants of comparative advantage in Egypt; due to the 1% significance results in causality test used (see table 3). After identifying the determinants of RCA, the paper will proceed with examining the dynamic effect of Egyptian comparative advantage on its trading partners. The paper will investigate the causality relationship between Egyptian RCA and determinants of comparative advantage within trading partners' countries.

The findings show that causality between Egyptian RCA and its main trading partners has three scenarios as follows "summarized in table 3":

- Egyptian RCA has a unidirectional causality relationship on its trading partners;
- Trading partners have a unidirectional causality relationship on Egyptian RCA; and
- Bidirectional causality relationship in the same/different macroeconomic variable between Egyptian RCA and trading partners.

5. Discussion

The first form of causal effect is when Egyptian RCA affects the macroeconomic variables of the trading partners. For example, the Egyptian RCA has a causal relationship with trading partners' GDP; as trading partners increase their spending on Egyptian imports, the GDP rises. Moreover, exports of the same product category will decrease in the countries of the trading partners; as a result, they will import the product from Egypt, which has a higher comparative advantage than the trading partners do. In addition to GDP and exports of the same product, the exchange rate is a vital issue in the discussion. Egypt has a relatively low value currency in terms of the trading partners' currencies; therefore, according to the relative purchasing power parity theory, it will always be better for the trading partners to import products from Egypt. Add to that, the increasing values of inflation within the trading partners' countries that encourage importing goods from a lower price level country.

Afterwards, the second type of causal effect is when the trading partners' macroeconomic variables affect the Egyptian RCA. In this type of causality, trading partners control the industries with high RCA through mainly quality and technological levels. Trading partners' GDP do affect Egyptian RCA. Simply put, as GDP increases, they will start to export from countries that produce high

Table 2. RCA Categories Classification

Categories that have weak RCA is as follows (RCA ranges from 1-2) :
1. Essential oils for perfume materials and cleaning preparations
2. Manufactured goods
3. Non-metallic mineral manufactures, n.e.s.
4. Iron and steel
5. Prefabricated buildings, sanitary, heating and lighting fixtures, n.e.s.
6. Commodities and transactions, n.e.s.
7. Unclassified products (Lall classification)
8. Memo: Ores, metals, precious stones and non-monetary gold (SITC 27 + 28+ 68 + 667 + 971)
9. Labor-intensive and resource-intensive manufactures
10. Food and live animals
11. Dairy products and birds' eggs
12. Cereals and cereal preparations
13. Miscellaneous edible products and preparations
14. Crude materials, inedible, except fuels
15. Coal, coke and briquettes
16. Processed Animal and vegetable oils and fats Food, basic (SITC 0 + 22+)
17. Food, basic excluding tea, coffee, cocoa and spices (SITC 0 + 22 + 4 less 07)
18. Agricultural raw materials (SITC 2 less 22,27 and 28)
19. Ores and metals (SITC 27 + 28 + 68)
20. Non-ferrous metals (SITC 68)
21. Other ores and metals (SITC 27 + 28)
22. Other manufactured goods (SITC 6 + 8 less 667 and 68)
23. Memo: Primary commodities, precious stones and non-monetary gold.
Categories that have medium RCA is as follows (RCA ranges from 2-4):
1. Petroleum, petroleum products and related materials
2. Gas, natural and manufactured
3. Inorganic chemicals
4. Leather, leather manufactures and dressed fur skins
5. Textile yarn and related products
6. Articles of apparel & clothing accessories
7. Primary products (Lall classification)
8. Resource-based manufactures: other (Lall classification)
9. Low technology manufactures: textile, garment and footwear (Lall classification)
10. Primary commodities, precious stones and non-monetary gold (SITC 0 + 1 + 2 + 3 + 4 + 68 + 667+ 971)
11. Primary commodities
12. Fuels (SITC 3)
13. Textile fibers, yarn, fabrics and clothing (SITC 26 + 65 + 84)
14. Sugar, sugar preparations and honey
15. Crude animal and vegetable materials, n.e.s.
16. Mineral fuels, lubricants and related materials
Categories that have strong RCA is as follows (RCA>4):
1. Vegetables and fruit
2. Textiles fibres and their wastes
3. Crude fertilizers other than division 56, and crude minerals
4. Fertilizers

Table 3. Pairwise Dumitres and Hurlin Causality Tests

Null Hypothesis	Probability
GDP Does not Homogeneously Cause RCA	9. E-07
RCA Does not Homogeneously Cause GDP	0.0023
Exports Does not Homogeneously Cause RCA	2.E – 08
RCA Does not Homogeneously Cause Exports	0.0076
Exchange Rate Does not Homogeneously Cause RCA	0.0000
RCA Does not Homogeneously Cause Exchange Rate	0.0387
Inflation Does not Homogeneously Cause RCA	0.0001

Source: Software Output

quality and advanced products because their trading partners' income is now higher. In the long run, when GDP increases, the incremental technological level will get higher and, consequently, so will the production level within trading partners' countries. Therefore, the exports of related product categories will increase and imports from Egypt will decrease along with RCA. When production increases along with exports in the trading partners' countries, their currency values will start to increase. Subsequently, according to purchasing power parity theory, they will start to consume higher quality and technologically advanced product categories. Therefore, the final effect of the previously mentioned scenarios is to decrease Egyptian RCA over time.

In the previous unidirectional causality relationship, trading partners affected the Egyptian RCA through GDP and exports of related product categories. Egypt requires minimum technological standards as well as a required level of quality in products such as iron and steel, sugar and honey, leather, and so on. Egypt requires a final product that is demanded internationally in order to compete, and thus exports increase. On the other hand, product groups such as gas, non-metallic materials, crude fertilizers, and non-ferrous materials cannot be produced without the availability of natural resources; therefore, Egyptian RCA will have a causality effect on the trading partners' macroeconomic variables. In this segment, the extracted raw materials are exported directly without any major processing and then without any crucial need for technology.

Consequently, to start with the bidirectional relationship, whether the causality relationship is the same or different for macroeconomic variables, in this case, the whole process becomes two-way and not one-way. Hence, both parties in this situation are in crucial need of the natural resources available in Egypt and, at the same time, need a level of technology along with standards of quality; as a result, both parties cause changes in each other's.

The Egyptian product categories need to have three main characteristics. First, the presence of scarce natural resources in Egypt that are not available in the countries of the trading partners; as land, oil, and petroleum. Second, products must be produced with an acceptable level of quality in order to be competitive internationally. The third characteristic is providing a sufficient level of technology to be able to transfer natural resources into processed products, which will be used as an intermediate product, such as essential oils for perfumes, or final good to be used by the end consumer, such as vegetables and fruits.

All product categories under the bidirectional relationship require the three main characteristics stated before, which are natural resources, technology, and quality of output. Since three characteristics are equally needed, the spillover effect will be bidirectional between Egyptian RCA and its main trading partner. The Egyptian RCA will be dominant when technology and quality are crucial for production, as these are products related to the food industry. On the other hand, when the product is mainly based on natural resources, the Egyptian RCA effect will be dominant over technology and quality, as in fuels and textile yarns. The main finding of the study is comfirmed by Tawada et al. (2022) proposition on the inter dynamic relationship between countries with respect to RCA.

Tawada et al. (2022) claimed that the level of RCA is defined based on the level of factors endowment in the country. To illustrate, if the country is capital intense in terms of resources, therefore, it should have a comparative advantage in technology-based products.

To our knowledge, the Egyptian RCA as well as its macroeconomic determinants have not been examined before in the literature. On the other hand, greater attention has been given to the microeconomic determinants of comparative advantage, as in Morsy and Levy (2020), where comparative advantages are examined using RCA through changing trends in labor productivity using panel data for a set of Africa and the Global South, with a greater emphasis on Egypt. Furthermore, Shuai et al. (2022) provide a detailed framework for the microeconomic analysis of export determinants based on the Constant Market Share Model (CMS). They claimed that exports depended mainly on structural, competitive, and second-order effects. First of all, structural effects are related to the structural changes in the economy based on GDP growth, market dynamics, and commodity characteristics. Second, competitive effects are tackling the advantage that the country scores relative to the rest of the countries. Finally, the second order effect is affecting the dynamic relationship between the levels of exports and imports. On the environmental aspect, Faichuk et al. (2022) examined RCA in the EU trading partners with respect to CO2 emissions. The findings show that Africa and the Global South have a higher opportunity of increasing agriculture trade with the EU due to their economic nature, which will subsequently help in increasing their GDP. After investigating the impact of RCA on Egyptian trading experiences, it is critical to consider the benefits of the African Continental Free Trade Agreement (AfCFTA). AfCFTA is a trade agreement between 54 countries on the African Continent in which trade barriers such as tariffs and quotas are removed in order to facilitate the movement of goods and labor across the borders. The agreement was brokered by the African Union and came into force in 2018 with 44 countries. The agreement enhances intra-trade in Africa, which is derived from the success of intra-trade across America, Asia, and Europe. According to the Economic Development in Africa Report (2019) issued by UNCTAD, intra-trade enhances trade in Africa by only 15% compared to 47% in America, 61% in Asia and 67% in Europe. Therefore, African economies are striving for an agricultural breakthrough that unlocks the potential of the market, in which 1.3 billion consumers are available.

The main economic gains from AfCFTA are to enhance the economic growth of African countries by 1% to 3% (Economic Development in Africa Report 2019), increase real income by 7%, significantly increase manufacturing across the continent, and increase exports, which will contribute to a better balance of payments and lower budget deficits (Maliszewska and Ruta 2020). The major benefit of the agreement is lifting 30 million people out of extreme poverty due to economic enhancements and creating new job opportunities. Besides, 67.9 million people escaped moderate poverty (Maliszewska and Ruta 2020). Socially, the agreement will contribute to a decreasing income gap based on gender through increasing female income by 10.5% to that of males.

The main finding of the paper is that African countries, especially Egypt, in which natural resources are abundantly available in the economy, have a comparative advantage over other countries with fewer natural resources. As a result, countries endowed with natural resources should postpone products that rely primarily on the availability of natural resources in order to gain a comparative advantage. Intra trade will secure an opportunity for African countries to trade together with minimum conditions, common consumption patterns, a high number of consumers, diverse societies, and the lowest transportation costs. Thus, production will be improved and continuously grow over time. AfCFTA is the gate through which African countries can unlock many trade barriers such as tariffs, quotas, mobility of goods, and labor. It is of great importance for each African country to analyze its status quo in terms of comparative advantage in order to increase its gains from intra-African trade, especially through AfCFTA.

Table 4: Pairwise Dumitres and Hurlin Causality Tests

Causality Relationships									
Bidirectional relationship					Unidirectional relationship				
MV	GDP	EX	ER	INF	MV	GDP	EX	ER	INF
Product RCA					Product RCA				
Ores & metals	✓	✓		•	Resources based products	❖	❖	❖	❖
Essential oils for perfumes	✓	✓	•	•	Sugar & honey	❖	❖	❖	❖
Dairy products	✓	✓		❖	Leather	❖	❖		
Petroleum & related materials	•	•		❖	Crude animal & vegetables	❖	❖		
Textile fibers & wastes	❖	❖	❖	✓	Food & live animals	❖	❖		
Primary products (all classification)			✓	•	Food basics excluding tea	❖	❖		
Agricultural raw material	❖	❖	❖	✓	Iron & steel	❖	❖		
Low technology products	✓				Coal coke	❖			❖
Other ores & metals	✓	✓	❖	•	Other manufactured goods				❖
Crude materials, except fuel	❖	❖		✓	Fertilizers other than group 272	❖			
Vegetables & fruits	❖	❖	•		Crude fertilizers	•	•		
Fuels	•	•	❖		Textile fibers & yarns	•			•
Food basics	❖	❖	•		Gas		•		•
Cereals and preparations			❖	•	Commodities & transactions	•			•
Memo: primary commodities	❖	❖	•		Non-metallic minerals	•			
Textile yarns & related products	•	•	•	❖	Unclassified products	•			•
Mineral fuels	•	❖	•		Non-ferrous metals	•	•		•
Articles of appeal	❖		•						
Textile fibers & yarns	•	•	•	✓					

Source: Author

√ This is the sign of Bidirectional causality relationship between RCA & trading partner macroeconomic variables.
● This is the sign of RCA causality effect on trading partners' indicators macroeconomic variables.
⋆ This is the sign of trading partners' macroeconomic variables causality effect on of RCA.

6. Conclusion

Egypt is a promising market full of auspicious economic opportunities for investments due to the availability of natural resources and low-cost labor, which are considered scarce resources in many developed countries. Through decades, trade has played a major role in nations' growth and development. This role is reflected in the extensive research on trade effectiveness in economic literature. One of the major cornerstones in trade is the comparative advantage concept, in which David Ricardo emphasizes that a country is said to enjoy a comparative advantage when it can produce goods at lower costs relative to other countries. In 1965, Bela Balassa ennobled comparative advantage invention with its mathematical measure, which is the Revealed Comparative Advantage Index (RCA). RCA is measured in each product separately by dividing the share of exports from a product in a country over the total share of other countries.

Economic literature concentrates on measuring the RCA of each country and how it will affect trade through exports, but the causality effect between trading partners and a country's RCA should be the next paradigm in trade. Economic events that take place in the United States, for example, will definitely affect China, the gigantic trade partner of the US. Therefore, the causality effect cannot be ignored anymore in the globalized economic world we live in. As a result, the research tests the causality effect of the main trading partners of Egypt on its RCA. The research will be divided into three steps. First, RCA index values will be calculated; then panel unit root test, followed by pairwise panel causality.

The research results do not reject the alternative hypothesis of panel unit root and pairwise causality after calculating RCA. In other words, RCA and trading partners' macroeconomic variables are all stationary at a 5% significant level. Besides, out of 40 stationary product categories, 36 categories show a causality relationship between RCA and macroeconomic variables. Findings show that the causality relationship between RCA and macroeconomic variables can take three forms as follows:

- Natural resources need > Technology and quality need; therefore, unidirectional causality rela-

tionship, RCA has a causality effect on the trading partners' macroeconomic variables.

Natural resources need; technology and quality needs; therefore, unidirectional causality relationship; trading partners' macroeconomic variables have a causality effect on the Egyptian RCA.

- Natural resources need = technology and quality needs; therefore, bidirectional causality relationship between Egyptian RCA and trading partners.

Explicitly, the research findings follow the conclusion reached by Heckscher and Ohlin, in which a country specializes and exports product categories that use the country's abundant resources. Since Egypt is a capital-abundant country, RCA of products based on capital or natural resources has a causality effect on the trading partners' macroeconomic factors. The findings totally agree with comparative advantage and factor endowment theories of trade with an extension of testing spillover effects between trading partners and countries RCA. Moreover, the research findings and recommendations are in line with the Egyptian vision for 2030 that emphasizes the vital role of trade in developing the nation through stable macroeconomic variables, sustained growth, maximizing value-added, creating job opportunities, and increasing the real GDP per capita. From now on, the trade situation in Egypt can be efficiently understood through the historical analysis in the literature along with the methodological testing from 1995 until 2016. Defects in the trade system are detected, accompanied by recommended detailed solutions for each problem in both the short term and long term. It is the government's turn to implement and modify the solutions if they are highlighted for the Egyptian community's prosperity. Trade will always be the guiding light for Africa and the Global South on the difficult path of growth and development.

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Conflicts of interest

The authors declare no conflict of interest.

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