

The Potential Manufacturing Exports of Egypt in African Continent: Empirical Evidence

Gehad Omran*

Institution: Faculty of Economics and Political Science, Cairo University, Cairo, Egypt.

Abstract: Within the context of AfCFTA, and Egypt's strategic objective to increase the manufacturing exports in Africa, this paper aims to examine and determine the potentiality of African countries as target destination markets for the Egyptian manufacturing exports by empirical evidence, using the gravity model with panel data series covering a time frame from 2000 till 2020. The paper investigates the current trading nature, compares the actual versus the predicted export values in each African country by sector and determines the main factors affecting the Egyptian exports' flow in Africa, in order to finally conclude precisely the most potential exporting sectors and target African countries. Results show that GDP, population, distance, institutional quality, and common RTA namely COMESA and AfCFTA are all highly significant, and determines the trade flow between Egypt and Africa. The top (10) African countries with the highest potential export values for Egypt are: Nigeria, Sudan, Algeria, Tunisia, Kenya, Ethiopia, Morocco, South Africa, Libya and Congo. While the top (5) potential manufacturing sectors for Egypt in Africa are; Stone and Glass, Plastics and Rubbers, Textiles, Chemicals and Allied Industries, Furniture and Wood Industries.

Keywords: AfCFTA, Africa, COMESA, Composite Index, Gravity Model, Panel Data.

Paper Type: Research Paper.

1. INTRODUCTION

Country's exports play an integral role in stimulating national development and economic growth. The export-led growth hypothesis (ELGH) postulates that export expansion, especially for manufacturing products, is one of the main determinants of growth. It holds that the overall growth of countries can be generated not only by increasing the amount of labor and capital within the economy but also by expanding exports (Torayeh, 2011). According to this hypothesis, exports can act as an engine for growth.

Within this regard, official statistics indicates that non-oil manufacturing exports for Egypt accounted for approximately 68% from the total exports and contributed by about 4.9% from the total GDP in FY 2019/20. However, the destination markets for Egyptian exports were not widely diversified, as 31% of total exports were directed towards the European Union, 26% towards Arab countries, 9% towards the United States, and 2% towards African countries (CBE, 2021). On the other side, Africa is an active participant in the international trade. African imports reached USD 595.9 Billion in 2021. Egypt was ranked to be the 26th exporting country to Africa, that shared only by 0.8% from the total African imports in 2021 (ITC, 2022).

The limited contribution of Egyptian exports in Africa has encouraged the Ministry of Trade and Industry in Egypt to

formulate an "Export Development Action Plan towards African Markets" in May 2017. The action plan has many pillars, including market intelligence studies, logistical support, provision of export-related services and promotional activities, branding Egyptian products, participating in international exhibitions and trade fairs, and organizing trade and buyer missions (MTI, 2022).

The effective implementation of the subject action plan inherits loads of financial costs and expenses, accordingly this paper can act as a policy support guidance to investigate the potentiality of Egyptian exports in Africa based on empirical evidence and gravity model approach. The paper also highlights the current trading nature and predicted values for Egyptian exports in Africa by country and manufacturing sector.

This paper is supported by Egypt's strategic ties and observable economic relations with the African continent, which is reflected currently in Egypt's leadership role as a chair country for the Common Market for Eastern and Southern Africa (COMESA), as well as a founding signatory for the African Continental Free Trade Agreement (AfCFTA). Noting that as of June 2021, 54 African states had signed the AfCFTA, and 35 countries had deposited their instruments of ratification. When fully implemented, AfCFTA is expected to create an integrated African market of 1.3 billion people, making it the world's largest single market for goods and services (OECD *et al.*, 2021). This agreement is considered an extensive opportunity for Egyptian exports to penetrate the African continent successfully. Accordingly, this paper will assist in pinpointing the target African markets and potential

*Address correspondence to this author at the Institution: Faculty of Economics and Political Science, Cairo University, Cairo, Egypt;
E-mail: gehadomran@gmail.com

manufacturing sectors for Egypt based on the concrete results of the gravity model.

2. LITERATURE REVIEW

Since its introduction in the 1960s by (Tinbergen, 1962), the gravity model has become a popular tool for empirically estimating the potential trade flows among different countries and regions. It has been extensively used in empirical studies and international trade research to determine the significant variables that affect international trade, assess policy implications, analyze the effect of trade agreements, and determine potential trade flows among different countries including for example; (Cassim, 2001), (Zarzoso, 2003), (Ngepah and Udegha, 2018), as well as (Bakouan and Ouedraogo, 2022).

Furthermore, several empirical studies have examined the export potential of African countries using the gravity model and concluded that continental countries have an extensive export potentials and growth opportunities. For instance; (Tansey and Touray, 2010) applied the gravity model to analyze trade flows among African countries and concluded that exports are expected to increase with the country's growth, both for sourcing and partner countries. (Simwaka, 2011) estimated the trade potential expected from the Southern African Development Community (SADC) and concluded that the observed intra-regional trade was lower than the potential values. A comparison of the performance of the Common Market for East and Southern Africa (COMESA) and the Association of Southeast Asian Nations (ASEAN) by (Ebaidalla and Yahia, 2013) pointed out that COMESA countries are far from their potential trade levels compared to ASEAN countries. Additionally, (Geda and Seid, 2015) examined potential intra-African trade and the prospects of deepening regional economic integration. The study concluded that great intra-African trade potential exists, yet this potential varies across countries, given the geographic proximity, cultural affinity, and size of the economies.

By focusing on studies that investigated the main determinants and potential trade flows between Egypt and Africa using the gravity model, it is noted that (Shehata, 2011) examined the expected trade flow between Egypt and COMESA, indicating that Libya, Sudan, Ethiopia, and Kenya were responsible for the increase in Egyptian exports to COMESA, in contrast to Djibouti, Mauritius, and Zambia, who were responsible for the decrease in Egyptian exports due to their distant locations. (El-Sayed, 2012) examined the determinants of trade between Egypt and three main trade blocs: AFTA, COMESA, and EU. The results indicate a significant impact of GDP and the insignificance of GDP per capita and the common border on bilateral trade. The distance variable or geographic dimension was statistically significant with regard to AFTA but insignificant in the case of COMESA and EU.

Furthermore, (El-Morsy, 2015) conducted a study to identify the most important and effective variables that determine the trade intensity of Egypt with COMESA countries, concluding that the GDP of COMESA countries and the existence of shared borders between Egypt and COMESA countries are the most important variables that determine Egypt's trade with COMESA. Additionally, (Mahmood *et al.*, 2016) used

the gravity model to investigate the determinants of Egyptian agricultural trade in COMESA countries. The study concludes that Egypt's GDP and population negatively influence the agricultural balance of trade (BOT), whereas COMESA's trading partners' GDP and population have a positive impact on the BOT.

To capture the potential export values for Egypt, (Youssef and Zaki, 2019) developed a study to predict bilateral trade flows based on economic size, geographic distance, and other relevant characteristics to identify specific sectors and markets for which Egypt seems to have untapped potential. The study concludes that Egypt is under trading, with 63% of the destinations, while African countries represent half of these destinations. Another report by (Helmy *et al.*, 2018) pointed out the potential manufacturing sectors for export growth and job creation and introduced many variables such as the GAFTA, Agadir, and COMESA agreements. They find that the three agreements are positive and significant, with GAFTA showing the highest coefficient, followed by Agadir and COMESA.

Another study by (Sohail *et al.*, 2021) applied the gravity model to determine the variables that affect the Egyptian exports to 36 global trading partners across annual data covering a period from 2000 to 2018. In its random effect model of the panel data, the gravity model results showed that the main factors influencing the Egyptian bilateral trade are Egypt's GDP, importer's GDP, the border factor, and the distance between Egypt to the main trading partners, while the language factor is negative and insignificant to Egypt's trade.

Furthermore, (Robertson *et al.*, 2021) uses a gravity model to predict bilateral trade flows based on gravity model to determine if trade agreements produce the same increase in Egyptian exports as has occurred in other countries. Results conclude that although trade agreements tend to enhance trade, the Egyptian exports following these agreements have been above internationally estimated averages indicating the significant impact of trade agreements on Egyptian exports.

Within this context, and given the importance of investigating the potential of African countries as export destinations for Egyptian manufacturing products, this paper adds to the literature and used the gravity model to specifically examine whether African countries can be considered a potential and target destination market for Egyptian manufacturing exports by empirical evidence that investigates the current trading nature and compares the actual and predicted potential export values in each African country and per manufacturing sector. Additionally, the paper determines the main variables and factors affecting the Egyptian export flows to Africa, to conclude precisely the most potential exporting sectors and target African countries for Egypt, while considering different economic, cultural, geographical, and demographic indicators, including common trade agreements between Egypt and Africa, namely, COMESA and AfCFTA.

The results of the current paper show that the top (10) African countries with the highest potential export values for Egypt are Nigeria, Sudan, Algeria, Tunisia, Kenya, Ethiopia, Morocco, South Africa, Libya, and the Congo. While the top (five) potential manufacturing sectors of Egypt in Africa are

stone and glass, plastics and rubber, textiles, chemicals and allied industries, furniture, and wood.

Within this regard, the next section will show facts and data concerning Egypt's current position in the African regional integration index, in addition to highlighting the structure of manufacturing exports of Egypt by sector and region, to then present the factors that affect Egypt's position in Africa, including the revealed comparative advantage and the different forms of trade barriers.

3. DATA AND MATERIALS

Egypt has a unique geographical location and distinctive strategic position with Africa, Europe, and Middle East. Egypt is Africa's third largest economy by GDP after Nigeria and South Africa, accounting for 12.5% of continental GDP, and is the third most populous country after Nigeria and Ethiopia, with nearly 100 million inhabitants (OECD *et al.*, 2021).

Egypt has maintained a policy of proactive and leading engagement in both regional and bilateral dialogue on several trade arrangements. Within this context, Egypt is currently the chair country for COMESA and plays a leading role in both the tripartite free trade area (TFTA) and Continental Free Trade Area (AfCFTA).

In this regard, AfCFTA is considered the world's largest free trade area, including 55 member countries from the African Union (AU). As of June 2022, 54 AU member states had signed the AfCFTA, and 43 countries had completed ratification procedures (AfCFTA, 2022). The overall mandate of the AfCFTA is to create a single continental market with a population of approximately 1.3 billion people and a combined GDP of approximately US\$ 3.4 trillion. The aim is to enable free flow of goods and services across the continent and boost trading positions in the global market. Part of its mandate was to eliminate trade barriers and boost intra-African trade. By 2035, AfCFTA is estimated to increase total exports by 29%, intra-African exports by 81%, and exports to non-African countries by 19% (World Bank, 2020). Accordingly, AfCFTA is considered an escalating opportunity to increase Egyptian exports to Africa and the whole world.

To identify the regional integration level of Egypt in Africa, it is important to highlight that Egypt is considered a high-performing country, as per the Africa Regional Integration Index (ARII). ARII is a composite index developed by the African Union to reflect the state and efforts undertaken by African countries to achieve greater regional integration. The index is composed of 16 indicators grouped into five dimensions: trade, productivity, macroeconomics, free movement of people, and infrastructure. In general, the African integration is relatively low with an average score of 0.327. The highest score (0.625) shows that Africa has extensive potential to boost integration and tap its benefits. Egypt ranks sixth in ARII with a score of 0.422 indicating that it is a high-performing country (African Union *et al.*, 2019).

Egypt's overall long-term trade policy aims to integrate deeply into the multilateral trade system as an indispensable hub for innovation, manufacturing, and export of high-technology value-added goods. In light of Egypt's Sustainable Development Strategy - Vision 2030, the national near-

term trade policy objectives is to ensure that the exports contribute by 25% from the annual GDP growth rate, with at least 10% as an annual increase, and trade deficit deduction by 4% of the GDP by 2030 (WTO, 2018).

Egypt's manufacturing exports have increased by 27% to reach USD 32.26 billion by 2021, contributing almost 85% of total Egyptian exports (CBE, 2021). By product group, chemicals and fertilizers are considered to be the largest exports, constituting 23% of the total manufacturing exports in 2021, followed by food and agricultural industries, building materials, textiles and readymade garments, engineering, and electronics products. These five product groups collectively accounted for 83.2% of total manufacturing exports (GOEIC, 2022).

By region, Arab and European Countries were the top destination countries, constituting the largest percentage, amounting to almost 60% of the total manufacturing exports in 2021. Africa, excluding Arab countries, shares 6% of Egypt's total manufacturing exports with the world, while Africa, including Arab countries, shares 16.7% (GOEIC, 2022).

To identify export diversification and concentration in Egypt, it is important to highlight that export diversification reflects the degree to which a country's exports are diverse for many products. This finding contrasts with export concentration, where a larger level of export diversification reflects a smaller level of export concentration, and vice versa. Data indices for countries were published by UNCTAD. Data shows that the export and concentration indices for Egypt during 2010-2020 are relatively well diversified, with an index almost equal to 0.6, and less concentrated, with an index equal to 0.1 (UNCTADstat, 2022).

To investigate the comparative advantage of Egyptian exports in Africa, Revealed Comparative Advantage (RCA) index is calculated as a ratio of Egypt's exports to Africa for a given product group to world exports to Africa for the same product group divided by Egypt's share in worldwide exports to Africa. The value of RCA index above or below (1) represents a revealed comparative advantage or disadvantage for that particular product group. Table 1 shows RCA index for Egyptian exports in Africa by manufacturing sector. Table I indicates that RCA is above (1) for chemicals, plastics, furniture, textiles, glass, and metals, highlighting the comparative advantage of Egypt in Africa for these products.

Table I. Rca of Egyptian Exports in Africa By Product Group. Values in Million USD.

HS Code	Product Group (by HS Code)	RCA of Egyptian Exports in Africa
28-38	Chemicals & Allied Industries	1.46
39-40	Plastics & Rubbers	2.14
41-43	Raw Hides, Leather & Furs	0.02
44-49	Furniture & Wood Industries	1.37
50-63	Textiles	1.37
64-67	Footwear/ Headgear	0.07

HS Code	Product Group (by HS Code)	RCA of Egyptian Exports in Africa
68-71	Stone & Glass	3.40
72-83	Metals	1.19
84-85	Machinery/ Electrical	0.44
86-89	Transportation	0.05
90-97	Miscellaneous	0.99

Source: Calculated Based on ITC Database, Accessed in 29/05/2022.

In addition to the competitiveness of Egyptian products in Africa, trading costs and specifically tariffs are considered to be an important concern in penetrating African countries. Data shows that the highest MFN rates were imposed by Egypt, Algeria, Ethiopia, and Comoros, amounting to 19.1%, 18.9%, 1704%, and 15.4%, respectively, whereas Mauritius imposed the lowest rate at 0.8%, followed by Seychelles at 3.2%. On the other hand, Algeria maintained the largest number of applied tariff lines, reaching 16,516 lines compared with other African countries, yet the rest of the tariff lines for other countries ranged from 5,000 to 8,000 (WTO-stats, 2020).

Non-Tariff Measures (NTMs) are another trade barrier including any technical, health, or environmental policy measures. NTMs are mainly Technical Barriers to Trade (TBT) and Sanitary and Phyto-Sanitary (SPS) measures such as food safety and animal and plant health measures. Data shows that the total number of TBT-notified measures in African countries was 3,289 in 2019, headed by Uganda and Kenya, accounting for almost 60% of the total TBT notifications. On the other side, the total number of SPS measures imposed by African countries mainly Kenya, Egypt, Uganda, South Africa, Morocco, and Tunisia were 425 in 2019 (WTOstats, 2020).

In addition to tariffs and NTMs, time-to-trade is an additional trade barrier that contributes to increase logistical trade costs towards Africa. Data shows that the highest time to import in Africa is for Tanzania, Congo, and Cameroon, which reached 402, 397, and 271, respectively, while the lowest time to export is for Mauritius, Togo, and Botswana by the total number of hours amounting to 9, 11, and 18 respectively in 2019 (World Bank, 2019).

The following section highlights the research methodology, mainly the gravity model, which considers different economic, demographic, and trade variables.

4. METHODOLOGY

(Tinbergen, 1962) was the first economist to use the gravity equation to analyze trade flows among different countries. The gravity model has undergone many theoretical improvements over the years, including (Deardorff, 1995), MacCallum (1995), (Smarzynska, 2010), (Anderson and Wincoop, 2003), (Santos and Tenreyro, 2006).

The importance of the gravity model was highlighted by (Evenett and Keller, 1998) and (Paas, 2000) who emphasized that trade theory explains why trade occurs, but did not explain the extent of trade, whereas the gravity model allows

more factors to be taken into consideration to explain the extent of trade as an aspect of international trade flows. On the other hand, recent developments and variable additions were made in the gravity model equation; for example, (Fontagné and Zignago, 2007) added the variable of regional trade agreements (RTA), and (Iwanow, 2008) included the institutional environment indicator in the gravity model. This is in addition to many other empirical studies that applied the gravity model, as mentioned in the previous section of the literature review.

Within this context, this paper examines the potential export values of the Egyptian manufacturing sector in Africa, specifically in 51 African countries: Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Capo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Congo Democratic, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome & Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia and Zimbabwe.

The estimation covers the period 2000–2020. The manufacturing products included in the model are defined by the Harmonized System (HS) at two Digits from HS Code 28 to 98 and classified into eight manufacturing sectors: chemicals, plastics, leather, wood industries, textiles, footwear, stone and glass, metals, transportation, machinery, and electrical industries.

The gravity model equation is as follows:

$$\ln(X_{ijkt}) = \alpha_0 + \beta_1 \ln(GDP_{it}) + \beta_2 \ln(GDP_{jt}) + \beta_3 \ln(POP_{jt}) + \beta_4 \ln(DIS_{ij}) + \beta_5 \ln(TARIFF_{jt}) + \beta_6 \ln(INSTIT_{jt}) + \beta_7 COMRTA_{ijt} + \beta_8 COMLANG_{ij} + \beta_9 COMCOL_{ij} + \beta_{10} COMBORDER_{ij} + \beta_{11} LANDLOCKED_j + \sigma_t + \sigma_j + \epsilon_{ijkt}$$

All the variables are expressed in natural logarithms except dummy variables.

The dependent variable X_{ijk} represents the flow of manufacturing exports from Egypt (j) to its African trading partner (j) by manufacturing sector (k): based on ITC database. The independent variables include GDP and Distance as the standard gravity model variables. GDP is used as a proxy for economic size in both Egyptian and African countries. Population (POP) reflects the market size. GDP and POP are based on IMF Database. The distance variable DIS captures transportation costs, as the distance between the capital cities of Egypt (j) and the African trading partner (i). TARIFF reflects the tariff rates applied as a simple mean for all products imposed by the trading partner country (i), as mentioned in the World Bank Indicators in year (t). INSTIT indicates the effectiveness of the institutional governance score in the trading partner country (j) in year (t), as mentioned in the World Governance Indicators WGIs. COMRTA is a dummy variable that takes the value of one when Egypt and its trading partner (j) share the same RTA, namely, COMESA and AfCFTA, and zero otherwise in year (t). COMLANG,

COMCOL, and COMBORDER are dummy variables that take a value of one when Egypt and its trading partner share a common official language, colonizer, and border and zero otherwise. The common language LANG is used as a cultural variable to capture information costs, and BORDER implies that countries with shared borders have a higher chance of developing stronger bilateral trade relations. LAND-LOCKED is another dummy variable that takes the value of 1 when the trading partner country (j) is landlocked, and 0 otherwise, as a proxy for the ease of trade flow and transportation means (Youssef and Zaki, 2019). The data for these dummy variables were derived from Center d'Études Prospectives et d'Informations Internationales (CEPII).

The predicted level of trade is estimated from the gravity model as the difference between the observed level and the residual of the regression as follows:

$$\ln(X_{est_{ijkt}}) = \ln(X_{ijkt}) - \epsilon_{ijkt}$$

The observed trade level is then compared to the estimated trade level, as predicted by the gravity model:

$$\text{Ratio} = \ln(X_{est_{ijkt}}) / \ln(X_{ijkt})$$

Ratios below 1 indicate that the country is trading with its trading partner compared to the economic, geographic, and trade agreement characteristics of Egypt and its trading partners. By contrast, a ratio greater than one indicates a bias (or overtrading) towards these markets beyond the predicted level. A narrow margin of approximately 1 is considered very close to 1. Ratios below 0.9 are classified as under-trading, while ratios above 1.9 are classified as over-trading (Youssef and Zaki, 2019).

A panel data technique is used to examine the gravity model. The advantages of the panel data method are its ability to indicate important relationships between variables over time, monitor trading partners' individual effects, and avoid biased estimates.

Panel data contain many models that can be estimated, namely, pooled effects, fixed effects (FE), and Random Effects (RE). The empirical results of these models are presented in the 1st, 2nd and 3rd Column of Table 2. A limitation of the pooled model is that it does not consider the unobserved heterogeneity of countries. The fixed-effects model has a problem in estimating variables that do not change over time, as they inherent transformation combs out such variables, which means that the dummy and distance variables need to be dropped. Accordingly, for the precise selection of panel data models, both the Hausman Test and Breusch and Pagan Lagrangian Multiplier (LM) tests were applied.

The Hausman test was used to choose between fixed- and random-effect models. The results showed that the p value was greater than 0.05. Hence, failure to reject the null hypothesis indicates that a random effect is used. On the other hand, the Breusch and Pagan Lagrangian Multiplier (LM) test was used to choose between the Pooled and Random effect models. If P-value is greater than 0.05, the pooled effects model will be preferred over the random effects model; however, if P-value is less than 0.05, the random effects model will be used. The results show that P-value is less than 0.05, so the random effect model was confirmed to be used in this paper compared to the pooled and fixed effects

model; hence, more elaboration and focus will be directed towards random effect results.

To identify Egyptian manufacturing sectors with strong potential for export growth to Africa, a composite index was developed considering supply and demand indicators into account (Helmy *et al.*, 2018). The composite index is based on five criteria, classified into three main categories: the export performance of the Egyptian manufacturing sectors (supply), the demand structure in African countries (demand), and the potentiality ratio, which is the ratio between the observed and predicted export values estimated from the gravity model. Equal weights were assigned to avoid selecting arbitrary weights. Table II lists the compositions of the indices.

Table II. Composite Index for Identifying Potential Export Sector.

Category	Components	Details	Weight
I. TRADE (SUPPLY) PERFORMANCE	Revealed comparative advantage (RCA)	RCA = The share of product j in Egypt's total exports compared to the share of product j in Africa's total exports (%)	0.2
	Share in Egypt's total manufacturing exports	Share of a sector's exports in Egypt's total manufacturing (%)	0.2
	Share in Egypt's total manufacturing exports to Africa	Share of Egypt's exports from a specific sector to total exports to Africa from the Egyptian manufacturing sector	0.2
II. DEMAND STRUCTURE	Share in Africa's imports	Share of a sector in Africa's total imports	0.2
III. POTENTIALITY RATIO	Potentiality Ratio	The observed/predicted export values of sector concluded from gravity model	0.2

Source: Constructed by Author.

5. RESULTS AND DISCUSSION

This paper focuses on interpreting the results of the gravity model using the random effects model, as mentioned in the 3rd column of Table III. The results show that the R² is 72%, indicating that the gravity model variables can explain 72% of the changes in Egyptian exports to Africa. Gravitational variables have the expected signs, thus complementing the literature. Distance, tariff, and being locked have negative signs, indicating that an increase in any of these variables reduces Egyptian exports to African countries. On the other hand, the GDP of Egypt and African countries, in addition to population, institutional quality, common language, common border, and common RTA, have positive signs, indicating

that any escalation in these variables will cause an increase in Egyptian exports to Africa. This also demonstrates the positive impact of COMESA and AfCFTA on Egyptian manufacturing exports to Africa.

With regard to the significance level, the results show that the GDP of Egypt and African countries, as well as population, distance, institutional quality, and common RTA are all highly significant. This indicates a strong impact of these variables on the Egyptian exports to Africa. An increase in GDP and population provides a great opportunity for trade because of the increase in consumption and investment, thus creating greater demand for trade and exchanging goods. Distance is considered a proxy for both transportation and logistical costs, and the time spent on trade. Thus, a longer distance results in higher costs, and hence, negatively affects trade flow. Institutional quality is also considered an enabler of trade, reflecting the business environment, ease of trade, and quality of governmental institutions, which directly affect trade procedures and dispute settlements. Thus, high-quality institutions create an enabling business environment for trade. In addition, common RTAs also exist. COMESA and AfCFTA are expected to have a significant impact on the export value of Egypt to Africa, owing to the expected reduction in trade barriers, as AfCFTA is expected to create a single market for goods and services in Africa. Hence, it reduces the cost of trade and creates a better and easier opportunity to penetrate the African markets.

However, the results indicate that tariffs and being landlocked are less significant, whereas common language, common border, and common colonizer are all insignificant and do not affect the flow of Egyptian exports to Africa. This can logically explain the prevailing realization of the potential benefits and opportunities provided in Africa, in addition to the strategic will to increase the share of Egyptian products in Africa. The common official language, Arabic, appears to be unimportant because of the common use of English in African countries.

As for the coefficients, the highest positive coefficient is for Egypt's GDP (GDP_{it}), reflecting the impact of Egypt's economic size on increasing the export flow to Africa, whereas the lowest negative coefficient is for the distance variable (DIS), which indicates the substantial impact of distance on the flow of exports, which is negatively affected by the change in distance.

Table III. Gravity Model Empirical Results.

	(1)	(2)	(3)
Variables	Pooled Model	Fixed Effect Model	Random effect Model
GDP _{IT}	1.877***	1.214***	1.361***
	(0.124)	(0.148)	(0.120)
GDP _{IT}	0.349***	1.108***	0.934***

	(1)	(2)	(3)
Variables	Pooled Model	Fixed Effect Model	Random effect Model
	(0.0720)	(0.146)	(0.123)
POP	0.872***	0.396**	0.453***
	(0.0668)	(0.184)	(0.130)
DIS	-2.169***	Omitted	-2.222***
	(0.230)		(0.756)
INSTIT	0.658***	0.297***	0.321***
	(0.0719)	(0.108)	(0.100)
TARIFF	0.741***	-0.0162	-0.0484*
	(0.138)	(0.123)	(0.122)
COMLANG	0.702***	Omitted	0.415
	(0.209)		(0.744)
COMRTA	0.838***	0.976***	0.878***
	(0.136)	(0.354)	(0.290)
COMBORDER	0.806**	Omitted	0.291
	(0.388)		(1.365)
COMCOL	0.282**	Omitted	0.0693
	(0.134)		(0.454)
LANDLOCKED	-1.587***	Omitted	-1.201**
	(0.145)		(0.495)
CONSTANT	9.196***	-119.3**	14.62**
	(2.249)	(49.66)	(6.411)
OBSERVATIONS	1071	1071	1071
R-SQUARED	0.683	0.478	0.722
NUMBER OF COUNTRIES	51	51	51

*** p<0.01, ** p<0.05, * p<0.1

(1), (2), (3) Standard errors in parentheses

The potential or predicted values for exports are estimated and calculated as the difference between the observed level and the residual of the regression resulting from the random effects model. Table IV shows the current and potential levels of Egyptian manufacturing exports to the 51 African countries. The results show that the top (10) African countries with the highest predicted and potential export values for Egypt are Nigeria, Sudan, Algeria, Tunisia, Kenya, Ethiopia, Morocco, South Africa, Libya, and Congo. According to the gravity model, these ten countries are expected to cover almost 90% of Egypt's predicted total exports to Africa.

Table IV. Current and Potential Manufacturing Exports Of Egypt to Africa.**Values in Thousands USD.**

Countries	Current/ Observed value in 2020	Predicted/ Potential Values	Difference between potential and obs. positive values: predicted value > observed value negative values: predicted value < observed value
Nigeria	86,947.00	848,809.45	761,862.45
Sudan	388,367.00	789,061.86	400,694.86
Tunisia	135,939.00	397,587.37	261,648.37
Ethiopia	63,132.00	282,193.98	219,061.98
Algeria	362,518.00	498,121.85	135,603.85
Kenya	241,713.00	369,948.84	128,235.84
South Africa	44,797.00	165,828.60	121,031.60
Congo Democratic	11,828.00	71,010.28	59,182.28
Tanzania	27,196.00	65,001.78	37,805.78
Angola	7,461.00	23,552.33	16,091.33
Congo	3,509.00	9,125.78	5,616.78
Benin	6,721.00	10,369.93	3,648.93
Cameroon	32,768.00	34,981.69	2,213.69
Malawi	2,147.00	3,794.35	1,647.35
Namibia	96.00	1,496.58	1,400.58
Niger	3,436.00	4,435.77	999.77
Botswana	62.00	653.59	591.59
Central African Rep.	26.00	279.67	253.67
Guinea-Bissau	52.00	151.22	99.22
Chad	3,702.00	3,764.39	62.39
Seychelles	348.00	213.83	(134.17)
Sao Tome & Principe	344.00	30.25	(313.75)
Comoros	849.00	347.52	(501.48)
Zambia	6,460.00	5,796.61	(663.39)
Eswatini	3,543.00	2,832.17	(710.83)
Cape Verde	1,278.00	158.82	(1,119.18)
Ghana	62,285.00	59,104.95	(3,180.05)
Sierra Leone	4,638.00	1,025.24	(3,612.76)
Mauritania	6,257.00	2,591.31	(3,665.69)
Gambia	4,092.00	344.52	(3,747.48)
Uganda	47,390.00	43,549.78	(3,840.22)
Mauritius	6,656.00	2,726.57	(3,929.43)
Madagascar	14,097.00	9,653.10	(4,443.90)

Countries	Current/ Observed value in 2020	Predicted/ Potential Values	Difference between potential and obs.
			positive values: predicted value > observed value negative values: predicted value < observed value
Zimbabwe	8,615.00	4,027.80	(4,587.20)
Liberia	5,412.00	492.83	(4,919.17)
Mali	8,216.00	2,241.10	(5,974.90)
Gabon	9,740.00	3,430.75	(6,309.25)
Mozambique	11,028.00	4,323.04	(6,704.96)
Guinea	11,396.00	4,232.39	(7,163.61)
Côte d'Ivoire	43,842.00	36,052.81	(7,789.19)
Burundi	9,892.00	1,173.83	(8,718.17)
Eritrea	18,359.00	6,340.76	(12,018.24)
Burkina Faso	17,376.00	3,922.30	(13,453.70)
Rwanda	25,421.00	7,588.34	(17,832.66)
Senegal	29,925.00	10,725.76	(19,199.24)
Togo	26,131.00	3,490.52	(22,640.48)
Djibouti	41,478.00	5,277.21	(36,200.79)
Morocco	317,442.00	210,607.19	(106,834.81)
Libya	345,707.00	105,152.82	(240,554.18)

Source: Constructed by Author and Calculated by Gravity Model Based on ITC Database.

Table V. Trading Nature of Egyptian Manufacturing Exports to Africa (By Country).

#	Under trading		Theoretical		Over trading	
	Country	Ratio	Country	Ratio	Country	Ratio
1	Niger	0.77	Seychelles	1.63	Gambia	11.88
2	Algeria	0.73	Morocco	1.51	Sao Tome & Principe	11.37
3	Kenya	0.65	Madagascar	1.46	Liberia	10.98
4	Benin	0.65	Eswatini	1.25	Burundi	8.43
5	Malawi	0.57	Côte d'Ivoire	1.22	Cape Verde	8.05
6	Sudan	0.49	Zambia	1.11	Djibouti	7.86
7	Tanzania	0.42	Uganda	1.09	Togo	7.49
8	Congo	0.38	Ghana	1.05	Sierra Leone	4.52
9	Guinea-Bissau	0.34	Chad	0.98	Burkina Faso	4.43
10	Tunisia	0.34	Cameroon	0.94	Mali	3.67
11	Angola	0.32			Rwanda	3.35
12	South Africa	0.27			Libya	3.29
13	Ethiopia	0.22			Eritrea	2.90
14	Congo Democratic	0.17			Gabon	2.84
15	Nigeria	0.10			Senegal	2.79

#	Under trading		Theoretical		Over trading	
	Country	Ratio	Country	Ratio	Country	Ratio
16	Botswana	0.09			Guinea	2.69
17	Central African Republic	0.09			Mozambique	2.55
18	Namibia	0.06			Comoros	2.44
19	Equatorial Guinea	0.00			Mauritius	2.44
20	Lesotho	0.00			Mauritania	2.41
	20 COUNTRIES		10 COUNTRIES		21 COUNTRIES	
	39% FROM TOTAL COUNTRIES		19% FROM TOTAL COUNTRIES		41% FROM TOTAL COUNTRIES	

Source: Constructed by Author and Calculated by Gravity Model Based on ITC Database.

On the other hand, to identify the nature of Egyptian manufacturing exports to African countries, the ratio = observed/estimated level of trade. Table V shows that Egypt's actual exports are less than its potential level or under trading with 20 African countries (almost 39% of the total African countries), including Nigeria, Algeria, Kenya, Benin, Malawi, Sudan, Tanzania, and Congo. By contrast, Egypt overtrades 21 African countries (41% of the total African countries), including Gambia, Sao Tome, Liberia, Burundi, Djibouti, and Togo. However, 10 African countries (19% of the total African countries) have an index close to 1 (from 0.90 to 1.1), indicating that the predicted level is in line with the observed level.

To identify potential African countries for Egyptian manufacturing exports by sector, Table VI shows the current and predicted export values estimated from the gravity model, and highlights the target African countries for each sector. Countries mentioned in Table V are selected conditioned that potentiality sign is "Positive" meaning that the predicted export values for the subject sector are higher than the observed values, and accordingly as well the trading nature is "Under Trading," in other words that the ratio of observed export value to the predicted values are less than 1.

Table VI. Potential African Countries for Manufacturing Exports of Egypt (by Sector)

Values in Thousands USD

Potentiality Sign: Positive (Predicted Value > Observed Value)

Trading Nature: Under Trading

Country	Current/ Observed Value in 2021	Predicted/ Potential Values	Potentiality Ratio (Observed/ Predicted)
Chemical sector			
Namibia	50.00	1,160.08	0.04
Malawi	68.00	1,013.48	0.07
Comoros	33.00	926.85	0.04
Cape Verde	384.00	1,151.12	0.33
Seychelles	32.00	783.62	0.04
Eswatini	14.00	229.85	0.06
Central African Rep.	9.00	197.81	0.05
PLASTIC SECTOR			
Niger	61.00	259.43	0.24
Cape Verde	345.00	433.32	0.80
Seychelles	245.00	327.71	0.75
Eritrea	1.00	63.15	0.02
Central African Rep.	1.00	61.34	0.02
Equatorial Guinea	1.00	48.71	0.02

Country	Current/ Observed Value in 2021	Predicted/ Potential Values	Potentiality Ratio (Observed/ Predicted)
Furniture Sector			
Comoros	38.00	218.03	0.17
Zambia	79.00	144.69	0.55
Sierra Leone	16.00	71.12	0.22
Malawi	24.00	74.40	0.32
Burkina Faso	3.00	36.45	0.08
Eritrea	2.00	34.57	0.06
Zimbabwe	18.00	47.10	0.38
Gambia	16.00	43.88	0.36
Benin	37.00	50.68	0.73
Chad	18.00	22.98	0.78
Textile Sector			
Comoros	5.00	160.66	0.03
Mozambique	2.00	105.25	0.02
Cape Verde	11.00	42.13	0.26
Eritrea	2.00	29.60	0.07
Malawi	27.00	41.07	0.66
Chad	4.00	7.12	0.56
Congo	26.00	26.98	0.96
Glass Sector			
Comoros	16	273.11	0.06
Botswana	38	135.39	0.28
Seychelles	17	106.22	0.16
Mali	85	118.73	0.72
Liberia	127	160.63	0.79
Benin	30	53.90	0.56
Metal Sector			
Mauritius	85.00	564.52	0.15
Seychelles	24.00	321.36	0.07
Malawi	75.00	337.83	0.22
Cape Verde	160.00	378.66	0.42
Burkina Faso	16.00	114.66	0.14
Machinery			
Namibia	6.00	227.75	0.03
Guinea-Bissau	2.00	165.25	0.01
Comoros	34.00	91.39	0.37
Central African Rep.	19.00	54.81	0.35
Transportation			

Country	Current/ Observed Value in 2021	Predicted/ Potential Values	Potentiality Ratio (Observed/ Predicted)
Guinea	3.00	9.51	0.32
Congo Democratic	6.00	9.06	0.66
Angola	5.00	6.53	0.77

Source: Constructed by Author and Calculated by Gravity Model Based on ITC Database.

Table VII. Composite Index Results for Identifying Potential Export Sector to Africa.

Product Group	Demand			SUPPLY	Potentiality Ratio	INDEX
	Rca of Egyptian Exports in Africa	Share in Egypt's Total Manf. Exports	Share in Egypt's Total manf. Exports to Africa (%)	Share in Africa's Manf. Imports		
WEIGHT	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(1)
STONE & GLASS	3.403	0.016	0.108	0.032	1.534	5.092
PLASTICS & RUBBERS	2.140	0.026	0.181	0.085	1.242	3.674
TEXTILES	1.370	0.014	0.100	0.073	1.709	3.266
CHEMICALS & ALLIED INDUSTRIES	1.455	0.034	0.236	0.162	1.21	3.098
FURNITURE & WOOD INDUSTRIES	1.373	0.008	0.057	0.041	1.491	2.971
METALS	1.186	0.02	0.139	0.117	1.436	2.899
TRANSPORT.	0.051	0.001	0.008	0.154	2.299	2.513
MACHINERY/ ELECTRICAL	0.439	0.017	0.117	0.268	1.542	2.383
FOOTWEAR/ HEADGEAR	0.074	0.000	0.001	0.012	0.941	1.028
RAW HIDES & LEATHER	0.017	0.000	0.000	0.004	0.538	0.559

Source: Constructed by Author and Calculated Based on ITC Database, Retrieved 29/05/2022.

To identify the Egyptian manufacturing sectors that have observable potential for export growth in Africa, a composite index was developed considering several supply and demand indicators (Helmy *et al.*, 2018). Table VII presents the ranking of the potential manufacturing sectors exported by Egypt to Africa. The top (five) potential sectors with the highest index were stone and glass, plastics and rubber, textiles, chemicals and allied industries, furniture, and wood.

Identifying the target African countries and potential manufacturing export sectors, as illustrated in the above section, is expected to provide clear guidance to related governmental entities and decision-makers to capture the expected trade opportunities from AfCFTA and to efficiently apply export-related programs and action plans directed towards increasing Egyptian exports to Africa based on solid research and empirical evidence. These programs and support can take many forms, including the provision of market intelligence services and organizing inward and outward trade missions to help national exporters generate opportunities and create direct linkages and matchmaking between Egyptian exporters and international buyers, particularly for potential manufacturing sectors and African countries. Supporting techniques include helping national exporters participate in international exhibitions and trade fairs to help Egyptian companies penetrate new countries, exhibit their products, and in-

crease their market share and export values. This mechanism offers several advantages. The first is to introduce Egyptian exporters to potential buyers in a professional world-class showcase that creates a positive perception of the marketplace. In addition, trade fairs provide valuable marketing and market entry opportunities, and help exporters to stay abreast of the latest international developments in their sectors, including new technology and techniques. On the other side, providing technical services to national enterprises can help in complying with international quality standards and hence increase the competitiveness of the Egyptian products in African markets.

6. CONCLUSION

This paper examines potential manufacturing exports of Egypt in African markets using the gravity model approach. The model is derived from Newton's gravity law in physics, and has been extensively used to analyse international trade flows since its introduction in the 1960s. The estimation model covers 51 African countries within a timeframe from 2000 to 2020 and 11 explanatory variables, including different economic, geographical, demographic, and cultural variables. The model aims to highlight the significant variables affecting Egyptian manufacturing exports to Africa, in addition to examining the nature of trade with African countries

and estimating the potential value of Egyptian manufacturing exports in Africa. The model also helps identify the target African countries for each manufacturing sector and the potential manufacturing sectors for Egypt in Africa.

The results of the gravity model indicated that R^2 was 0.72. In other words, the variables of the gravity model succeeded to explain 72% of the changes in Egyptian exports to Africa and had expected signs. With regard to the significance level, the results show that the GDP of Egypt and African countries, as well as population, distance, institutional quality, and common RTA are all highly significant, whereas tariffs and being landlocked are less significant. By contrast, the results show that common language, common border, and common colonizer are all insignificant and do not affect the flow of Egyptian exports to Africa.

The potential/predicted values of manufacturing exports to Africa are then estimated based on the gravity model as the difference between the observed level and residual of the regression. The results show that the top (10) African countries with the highest potential export values are Nigeria, Sudan, Algeria, Tunisia, Kenya, Ethiopia, Morocco, South Africa, Libya, and the Congo. This paper also identifies the trading nature of Egyptian manufacturing exports to African countries as the ratio of observed and estimated export values. Results show that Egypt's actual exports are less than its potential level or under trading with 20 African countries, over trading with 21 African countries, and in line with the predicted values with 10 African countries.

Furthermore, the paper highlights the target African countries for each manufacturing sector, in addition to identifying and ranking manufacturing sectors with a strong potential for export growth to Africa. The results indicate that the top (five) potential sectors for Egypt in African markets are stone and glass, plastics and rubber, textiles, chemicals and allied industries, and furniture and wood.

Given the results of this paper, it is important to highlight that increasing exports to Africa is considered to be one of the highest strategic priorities, especially after considering its market size. Hence, governments can interfere with export promotion policies (EPPs), which are used by most countries worldwide.

In general, EPPs involve all measures and programs aimed at assisting current and potential exporters in foreign market penetration, such as export subsidies, reduced tax rates, advantageous financial conditions, and variations in exchange rates. EPPs may also hinge on domestic regulations such as loosening the requirements for export licenses, easing technology controls for exported goods, and reducing antitrust concerns in the export sector. Another tool may be allowing exporters to import intermediate foreign products at accessible prices through duty drawbacks and temporary admission schemes or public investments in physical infrastructure, human capital (education), and information and communication technologies (ICTs). These measures may involve all firms producing within national borders or being selective to specific regions and areas as free trade zones, and can be addressed to either domestic producers or multinational investors producing locally or both (Belloc and Maio, 2011).

Within this context, it is essential to continue helping exporters penetrate the target African countries by expanding the provision of market intelligence reports and technical services, namely, business development services, technical trainings, and the development of new and improved products based on market needs and quality requirements. Efforts should also be diverted to raise exporters' awareness about RTAs' benefits, namely COMESA and AfCFTA, in addition to facilitating trade means to Africa, decreasing trade barriers, and limiting tariffs and non-tariff barriers.

For future research, it will be useful to utilize this paper - which highlights the export potential sectors for Egypt in Africa - in undertaking deep product analysis based upon HS Code 6 digits.

LIST OF ABBREVIATIONS:

AfCFTA: African Continental Free Trade Area

AU: African Union

CBE: Central Bank of Egypt

COMESA: Common Market for Eastern and Southern Africa

GDP: Gross Domestic Product

GOEIC: General Organization for Export and Import Control, Egypt

ITC: International Trade Centre

MTI: Ministry of Trade and Industry, Egypt

UNCTAD: United Nations Conference on Trade and Development

CONFLICT OF INTEREST

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