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Determinants of Egyptian exports

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Abstract— Exports are a crucial factor in the development of any country's economy. However, the factors that determine the volume and destination of exports are still not fully understood. This study aims to identify the determinants of Egyptian exports from 2000 to 2022, using the gravity model for estimation. According to the Fixed Effects Model, Egyptian exports are positively affected by GDP and negatively by population. Geographical and cultural factors do not affect exports. On the contrary, Egyptian exports are positively affected by concluding free trade agreements (FTAs). Corruption acts as a constraint on Egyptian exports, but the high level of corruption in its trading partner enhances exports. This counterintuitive result warrants further scrutiny and investigation.

Keywords: Exports, Egypt, Gravity Model.

1. Introduction

Exports play a pivotal role in driving national economic growth and development. By providing access to larger markets, exports generate foreign exchange earnings, stimulate domestic production, and create employment opportunities (Helpman & Krugman, 1987; Ram, 1985). However, the ability of a nation to successfully compete in the global marketplace and expand its exports depends on a complex interplay of various factors. These determinants can range from internal characteristics like a country's resource endowment and infrastructure to external factors such as geographical proximity to trading partners, the presence of FTAs, and the overall economic climate in trading partners (Baldwin & Taglioni, 2006; Zou & Stan, 1998).

Understanding these complex relationships is crucial for policymakers seeking to formulate effective strategies to boost export performance. Among the various analytical tools available, the gravity model has emerged as a powerful framework for empirically estimating the impact of different determinants on bilateral trade flows (Tinbergen, 1963). The gravity model, taking inspiration from Newton's law of gravitation, suggests that trade flows between nations behave similarly to the attraction between objects. Just as larger objects exert a stronger pull, economically powerful countries tend to attract more trade. Conversely, distance acts like gravity's inverse square law: the farther apart two countries are, the weaker their trade relationship is likely to be. (Baier & Standaert, 2020).

While the jury is still out on the overall impact of these FTAs on Egypt's economy and export performance, the sheer number of agreements underscores a clear policy direction towards greater global trade integration.

1.1 *Problem statement:*

What are the determinants of Egyptian exports according to the gravity model?

1.2 *Secondary Research Questions:*

- How do the economic size of Egypt and its trading partners affect how much Egypt exports?
- How does the geographical distance between Egypt and its trading partners affect bilateral trade flows?
- Do FTAs have a statistically significant effect on Egyptian exports?

1.3 *Hypotheses:*

- Egyptian exports increase as the size of its economy or the economy of its trading partner increases.
- Geographical distance will have a negative and significant impact on Egyptian exports.
- The study anticipates that when Egypt has a FTA in place with a partner country, Egyptian exports to that country

will experience a significant boost.

1.4 *Organization of the study:*

This study investigates the factors influencing Egyptian exports through the lens of the gravity model. The research unfolds in five distinct stages. It begins with an introduction, laying out the context of the study, the central research question, and proposed hypotheses. The second section establishes the theoretical underpinnings, reviewing existing knowledge on export determinants and the gravity model. The third section details the research methods employed, including the tools used and data sources. The fourth section presents the findings of the analysis and discusses their implications. Finally, the research concludes by summarizing the key discoveries and insights.

2. Literature Review:

2.1 Egypt's FTAs with its Trading Partners:

Egypt has increasingly looked towards FTAs as a key pillar in its strategy to unlock the potential of its export sector. By gradually dismantling barriers to trade such as tariffs and quotas, these agreements aim to make Egyptian goods more attractive in the global marketplace, thereby attracting foreign investment and spurring economic growth. This strategy is reflected in the range of bilateral and regional FTAs Egypt has actively pursued over the past few decades.

One of the most significant agreements is the Egypt-EU Association Agreement, signed in June 2001 and entering into force in June 2004. This landmark agreement established a free trade area between Egypt and the European Union, one of its most important trading partners. This was followed by the Egypt-EFTA Free Trade Agreement in 2004, which came into effect in 2007, extending similar benefits to trade with the EFTA states of Iceland, Liechtenstein, Norway, and Switzerland. Egypt also recognized the growing importance of south-south cooperation, signing the Egypt-Turkey Free Trade Agreement in December 2005, which entered into force in March 2007. and the Mercosur Preferential Trade Agreement in August 2010, entering into force in 2017, granting preferential terms with the South American bloc. On the multilateral front, Egypt has been a long-standing member of regional economic blocs. It signed the Common Market for Eastern and Southern Africa (COMESA) Treaty in 1991, with the agreement entering into force for Egypt in 1998, aiming to create a free trade area among 21 East and Southern African nations. A similar commitment was made to the Arab world with the signing of the Greater Arab Free Trade Area (GAFTA) Agreement in 1997, entering into force in 1998, which aims for free trade between all Arab League states. Egypt also joined the Agadir Agreement, establishing a FTA with Tunisia Morocco, and Jordan, signed in 2004 and enacted in 2007. Looking towards even deeper integration, Egypt signed the Tripartite Free Trade Area (TFTA) in 2015, though it is not yet in force, which ambitiously seeks to establish a free trade area encompassing the COMESA, East African Community (EAC), and Southern African Development Community (SADC) regions (WTO, 2024).

2.2 Determinants of Trade according to the gravity model:

- **Zhai (2023)** analyzed factors driving China-ASEAN trade from 2001 to 2021, using data from 10 ASEAN countries. The study found that larger economic size, proximity, larger ASEAN populations, the FTA, and the Belt and Road Initiative all positively impacted trade. Conversely, per capita resource endowment, exchange rates, and the size of some ASEAN nations had smaller negative effects. Notably, trade between China and Vietnam has plateaued, requiring new avenues for growth. In contrast, significant untapped trade potential remains between China and the other nine ASEAN nations.
- **Ismaiel Ali Ismaiel et al (2023)** investigated the factors influencing Egypt's overall trade and, specifically, its rice trade with 11 partner countries. Using a gravity model and data from 2001-2020, the study revealed that Egypt's GDP positively impacted its exports, particularly agricultural and rice exports, but negatively affected its overall imports. Population growth hindered both imports and exports. Distance negatively impacted exports, highlighting the importance of proximity to trading partners. The study recommends focusing on high-GDP partners geographically closer to Egypt and shifting from traditional trade relationships to strategic partnerships focused on food security.
- **Achour and HADJI (2021)** examine the factors influencing trade between the Agadir Agreement countries and 57 of their trading partners from 2000 to 2019, employing the gravity model. Surprisingly, the study found that distance, cultural similarities, and shared colonial history did not significantly impact trade between these Arab

nations, contradicting typical gravity model expectations. These unexpected findings prompted the use of a more robust statistical method – the Poisson pseudo-maximum likelihood with High-Dimensional Fixed-Effects (PPMLHDFE) – to account for complexities in multilateral trade relationships. This analysis confirmed the importance of income levels for bilateral trade, while revealing a negative impact associated with an increase in the number of Agadir Agreement members. Furthermore, the study highlighted that shorter distances, shared borders, linguistic similarities, and colonial ties positively influenced trade flows within the Agadir Agreement. Significantly, FTAs were found to substantially boost trade. The Agadir Agreement itself contributed to a 29.35% increase in trade, while FTAs between Agadir Agreement countries and other partners led to a substantial 47.25% rise in trade flows.

- **Abdullahi, Aluko, and Huo (2021)** discuss the factors influencing the volume, effectiveness, and untapped potential of Nigerian agri-food exports to the European Union between 1995 and 2019. Utilizing a gravity model framework and employing stochastic frontier analysis, the study reveals several key findings. The economic size of both Nigeria and EU member states, represented by their respective GDPs, emerges as a positive driver of Nigerian agri-food exports to the EU. However, the geographical distance between Nigeria and its European trading partners also demonstrates a positive relationship with export levels, suggesting potential logistical challenges or the influence of specialized products with higher transportation costs. Interestingly, while overall national wealth appears beneficial, higher per capita income levels in both Nigeria and EU countries are negatively correlated with Nigerian agri-food exports. This finding suggests that as income rises, consumption patterns might shift towards non-agri-food products or alternative sources, influencing trade flows.
- **Abidin and Sahlan (2013)** explore how economic factors influence the exchange of goods between Malaysia and member countries of the Organization of Islamic Cooperation (OIC). Analyzing bilateral trade data from 1997 to 2009 through the lens of a gravity model, the research highlights several key drivers. The findings underscore the importance of economic size, reflected in GDP, and the degree of trade openness as significant factors promoting Malaysian exports to OIC nations. Additionally, both inflation rates and exchange rate dynamics emerge as influential determinants of bilateral trade flows. Furthermore, the study reveals that geographical distance, while often a barrier to trade, plays a surprisingly positive role in shaping Malaysia's exports to OIC countries. This suggests the potential influence of specialized goods or unique trade relationships within the OIC bloc that transcend mere proximity.
- **García, Navarro Pabsdorf, and Gómez Herrera (2013)** study the factors driving trade between Mercosur member countries. Using a gravity model and analyzing yearly bilateral export data from 75 countries spanning 1980 to 2008, the research examines the impact of the Mercosur trade agreement. Two different statistical approaches – pooled ordinary least squares "OLS" and panel fixed effects – reveal that while the agreement has positively affected trade within the bloc, the impact is relatively modest. Overall, the findings suggest that Mercosur has fostered greater trade, but its full potential might not yet be fully realized. The authors suggest that deepening relationships among member countries and potentially expanding membership could further bolster Mercosur's influence on regional trade.

3. Methodology and Data

This study aims to identify the factors that determine the volume of Egyptian exports to 58 trading partners for the period 2000–2022. The model is estimated in three steps. In the first step, we estimate the model using pooled regression (OLS), and then we conduct a symbolic test to verify the validity of the model. In the second step, we estimate the FEM. The results of the Poolability test confirm the best model between pooled OLS and FEM. In the last step, we estimate according to the random effects model (REM). We conduct the Hausman test (1978) to find out the best model between FEM and REM. Equation (01) expresses the model estimated by us.

$$\ln ex_{ijt} = d_1 + d_2 lngdp_{it} + d_3 lngdp_{jt} + d_4 lnpop_{it} + d_5 lnpop_{jt} + d_6 lndistw_{ijt} + d_7 Contig_{ijt} + d_8 col_{ijt} + d_9 lnlc_i + d_{10} lnlc_j + d_{11} GAFTA_{ijt} + d_{12} AGADIR_{ijt} + d_{13} EUMFTA_{ijt} + d_{14} EFTA_{ijt} + +d_{15}\text{Turkey}_{ijt} + d_{16} MERCOSOR_{ijt} + \varepsilon_{\text{ijt}} \ldots\ldots\ldots\ldots 01$$

Where: ln is the natural logarithm; t denotes duration; i is Egypt country; j is the exporting country, respectively; ex is the dependent variable, which is the size of the export; gdp and pop are Gross Domestic Product and population, respectively; $DISTW$ is the weighted geographical distance; $Contig, and\ col$ are dummy variables express of borders,

and colonial respectively, and take the value 1 in the case of commonborders, and colonial and the value 0 otherwise.

The equation utilizes the natural logarithm ln and analyzes data over a specific duration (t). "i" represents Egypt, while "j" signifies its various export destination countries. The primary variable of interest (ex) represents the volume of Egyptian exports. The model incorporates factors such as Gross Domestic Product (gdp), population (pop), and weighted geographical distance (DISTW). Dummy variables, "Contig" and "col", indicate the presence (value of 1) or absence (value of 0) of shared borders and colonial history, respectively, between Egypt and its trading partners. lc epresents a measure of control corruption, with higher values indicating lower levels of perceived corruption. Specifically, an "lc" value closer to 100% signifies a stronger control of corruption. Egypt's trade agreements with its trading partners are denoted by the acronyms GAFTA, AGADIR, EFTA, Turkey, and MERCOSUR; the acronym "1" denotes a member and the value "0" otherwise. ε_{ijt} is the error term. d are model parameters $d = 0,1,2, \ldots \ldots 16$.

To gather the necessary data, we drew upon several reputable sources. We obtained information on control of corruption, GDP, and population from the World Bank database. Data on exports was sourced from the International Monetary Fund's Direction of Trade Statistics (DOTS). Finally, variables related to distance, shared borders, and colonial history were sourced from CEPII.

4. Results and discussion

The table below presents the standard outcomes of the model along with their interpretations. Table.01 provides the results obtained from estimating the model using the OLS.

Table 1: Results of the gravitational model estimation according to OLS

lnex	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lngdpi	1.196	.188	6.36	0	.819	1.572	***
lngdpj	.393	.196	2.00	.05	-.001	.786	*
lnpopi	-.309	.745	-0.41	.68	-1.801	1.183	
lnpopj	.348	.196	1.77	.082	-.045	.741	*
lndistw	-.827	.257	-3.21	.002	-1.342	-.311	***
Contig	1.243	.476	2.61	.012	.289	2.197	**
col	1.164	.523	2.22	.03	.116	2.211	**
lnlci	-.509	.258	-1.97	.054	-1.026	.008	*
lnlcj	.077	.231	0.33	.742	-.386	.539	
GAFTA	1.433	.449	3.19	.002	.534	2.332	***
AGADIR	.518	.337	1.54	.13	-.156	1.192	
EUMFTA	.053	.363	0.15	.884	-.673	.779	
EFTA	-1.068	.784	-1.36	.178	-2.637	.501	
Turkey	.121	.454	0.27	.79	-.787	1.03	
MERCOSOR	.72	.37	1.95	.057	-.021	1.46	*
Constant	-11.853	11.138	-1.06	.292	-34.148	10.442	

Mean dependent var	11.063	SD dependent var	2.205
R-squared	0.490	Number of obs	1333

F-test	.	Prob > F	.
Akaike crit. (AIC)	5020.465	Bayesian crit. (BIC)	5093.198

*** p<.01, ** p<.05, * p<.1

Source: Stata Outputs

Table 2: Ramsey RESET test

```
Ramsey RESET test using powers of the fitted values of lnex
       Ho:  model has no omitted variables
                 F(3, 1314) =     10.41
                   Prob > F =      0.0000
```

The Ramsey RESET test suggests the model specifications are sufficient.

The output Ramsey RESET test shows: Prob > F = 0.0000. This p-value is far below the significance level of 0.05. Therefore, we fail to reject the null hypothesis of the RESET test.

Ho: model has no omitted variables

Since we fail to reject the null, it means there's not enough evidence to suggest the model is missing important variables or suffers from incorrect functional form. This implies the model specifications, as they stand, appear to be sufficient.

It's crucial to remember that this is a pooled OLS estimation. While it offers valuable insights, it doesn't account for potential unobserved factors that might be constant over time for a specific country pair but vary across different pairs. More sophisticated panel data methods could be explored to address this in further analyses.

In this step, we estimate the gravity model according to the FEM. Table 3 provides the results obtained from estimating the model using the FEM. The F-test value of 136.029 is statistically significant at the 1 percent level, indicating that the FEM is superior to the OLS.

Table 3: Results of the gravitational model estimation according to FEM

lnex	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lngdpi	.774	.118	6.56	0	.543	1.006	***
lngdpj	1.114	.093	11.98	0	.931	1.296	***
lnpopi	-.239	.456	-0.52	.6	-1.133	.656	
lnpopj	-.523	.21	-2.50	.013	-.934	-.112	**
lndistw	0	.	.	.	.	.	
Contig	0	.	.	.	.	.	
col	0	.	.	.	.	.	
lnlci	.017	.176	0.10	.923	-.329	.363	
lnlcj	-.267	.11	-2.43	.015	-.483	-.051	**
GAFTA	.894	.331	2.70	.007	.244	1.543	***
AGADIR	.581	.224	2.60	.01	.142	1.021	***
EUMFTA	.352	.109	3.22	.001	.138	.567	***
EFTA	.19	.223	0.85	.395	-.248	.628	

Turkey	.509	.38	1.34	.181	-.237	1.255	
MERCOSOR	1.343	.302	4.45	0	.751	1.934	***
Constant	-11.596	6.801	-1.71	.088	-24.938	1.746	*

Mean dependent var	11.063	SD dependent var	2.205
R-squared	0.564	Number of obs	1333
F-test	136.029	Prob > F	0.000
Akaike crit. (AIC)	3239.593	Bayesian crit. (BIC)	3307.130

*** *p<.01, ** p<.05, * p<.1*

Source: Stata Outputs

In this step, we estimate the gravity model according to the REM. Table 4 provides the results obtained from estimating the model using the REM.

Table 4: Results of the gravitational model estimation according to REM

lnex	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lngdpi	.817	.118	6.95	0	.587	1.048	***
lngdpj	.975	.086	11.33	0	.806	1.143	***
lnpopi	-.338	.454	-0.74	.457	-1.228	.552	
lnpopj	-.13	.121	-1.07	.283	-.366	.107	
lndistw	-.947	.286	-3.32	.001	-1.506	-.387	***
Contig	1.082	1.515	0.71	.475	-1.886	4.05	
col	.742	1.086	0.68	.494	-1.386	2.869	
lnlci	-.066	.176	-0.37	.709	-.41	.279	
lnlcj	-.281	.108	-2.61	.009	-.492	-.07	***
GAFTA	1.196	.288	4.15	0	.632	1.761	***
AGADIR	.6	.222	2.70	.007	.165	1.034	***
EUMFTA	.367	.107	3.42	.001	.157	.578	***
EFTA	.121	.222	0.54	.586	-.314	.555	
Turkey	.542	.379	1.43	.153	-.201	1.284	
MERCOSOR	1.323	.302	4.37	0	.73	1.916	***
Constant	-6.618	6.959	-0.95	.342	-20.258	7.022	

Mean dependent var	11.063	SD dependent var	2.205
Overall r-squared	0.410	Number of obs	1333
Chi-square	1640.736	Prob > chi2	0.000

R-squared within	0.562	R-squared between	0.346

*** p<.01, ** p<.05, * p<.1

Source: Stata Outputs

To determine whether the FEM or the REM is more appropriate for our data, we will employ the Hausman test.

Table 5: Hausman test

```
Test:  Ho:  difference in coefficients not systematic

             chi2(12) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =        38.33
            Prob>chi2 =       0.0001
            (V_b-V_B is not positive definite)
```

Source: Stata Outputs

The Hausman test results shown in Table 5 strongly suggest that the FEM is better than the random effects model.

The null hypothesis of the Hausman test is that the preferred model is random effects, meaning the unobserved individual effects are uncorrelated with the independent variables.

The p-value (Prob>chi2) is 0.0001, which is much smaller than the significance level of 1 percent. This means we reject the null hypothesis.

Rejecting the null hypothesis indicates that the REM is not appropriate because there is evidence of the correlation between the unobserved individual effects and the independent variables. In this situation, the random effects estimator would be biased and inconsistent.

The Fisher statistic ($F = 136.03$) is significant at the 1% level, indicating that the overall model is statistically significant. The R^2 value of 0.564 suggests that 56.4% of the variation in the dependent variable is explained by the explanatory variables. The results from the FEM emphasize the crucial role of GDP in influencing export volumes. A 1% increase in Egypt's GDP leads to a 1.06% rise in exports with its trading partners, while a 1% increase in the GDP of trading partners results in a 1.11% increase in exports. These findings align with the theoretical principles of the gravity model. However, contrary to expectations, Egyptian exports decrease as the population of Egypt or its trading partners decreases. Augier , Gasiorek, and Lai Tong (2005) explained this by noting that densely populated countries tend to rely more on their domestic markets to meet their needs. In the FEM, variables such as distance, shared borders (contiguity), and colonization history do not significantly impact Egyptian exports. These findings are in line with those of Mele and Baistrocchi (2012) and Achour and Hadji (2020).

When Egypt enters into FTAs, its exports increase. Specific agreements such as GAFTA, Agadir, EMEFTA, EFTA, the Turkey agreement, and MERCOSUR play a significant role in boosting these exports. GAFTA leads to a 0.894 percent rise, Agadir contributes a 0.581 percent increase, EUMEFTA adds 0.352 percent, EFTA results in a 0.19 percent growth, the Turkey agreement enhances exports by 0.51 percent, and MERCOSUR has the most substantial impact with a 1.343 percent increase. These agreements collectively bolster Egypt's export performance, highlighting their importance in trade policy.

Conclusion

This study investigated the determinants of Egyptian exports from 2000 to 2022, employing the gravity model within a fixed effects estimation framework. The analysis revealed that economic size, represented by GDP, is a key driver of Egyptian exports, while surprisingly, population growth exhibits a negative relationship. Contrary to typical gravity model expectations, geographical proximity, shared borders, and common colonial history showed no significant impact.

Crucially, the study underscores the vital role of free trade agreements in boosting Egyptian exports, highlighting their

effectiveness in fostering trade relations. A nuanced relationship between corruption and exports emerged, with domestic corruption hindering exports while high corruption levels in trading partner countries were unexpectedly associated with increased Egyptian exports, warranting further investigation.

These findings provide valuable insights for policymakers seeking to enhance Egypt's export competitiveness. Prioritizing economic growth, strategically engaging in free trade agreements, and addressing the complex influence of corruption are crucial steps towards achieving sustainable export-led growth. Further research could explore the unexpected relationship between corruption and exports, delve into the impact of specific product categories, and analyze the potential influence of non-traditional trade barriers.

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