Analyzing Common Market Options in the Scope of OIC

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ABSTRACT

This paper initially employs the gravity model in order to analyze the trade data of selected 23 OIC countries and its 4 different subgroups. Then it applies stochastic frontier analysis to the model to gain efficiency scores and uncapped trade potential among countries in order to determine whether the group would have trade creation effect once they go for a Common Market structure. According to the statistical results, the 23 country group gives statistically significant results while deriving a %62 uncapped trade potential among group countries. Additionally, the 13-country subgroup also gives statistically significant results while deriving a %59 uncapped trade potential among them.

While there are a number of studies which applies stochastic frontier analysis to the gravity model and gains efficiency scores, this study is the first to employ the method for OIC countries in order to determine the best possible country group for a Common Market without having trade diversion affect. The purpose of this study is to determine the Common Market options for Türkiye in the scope OIC in order to be a reference point for future Common Market initiatives.

Key words: *Gravity Model, Stochastic Frontier Analysis, Common Market, OIC*

JEL Codes: C33, F15

1. INTRODUCTION

When countries start a process to establish any form of economic integration, such as customs union or a common market, there is surely a political aspect of that move. It sometimes resolves the long standing conflicts while it also serves the purpose of creating a power block. However it also has to have a purely economic aspect which usually can be stated as trade creation.

It was Viner (1950) who first laid out the fundamentals of trade creation and diversion. Later on Gehrels (1956), Meade (1956), Lipsey (1960) and Dayal and Dayal (1977) discussed the circumstances in which trade creation and diversion occur though they disagree either what the terms actually supposed to mean or what (Viner, 1950)

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actually meant. In any case they somewhat agree that most of the times trade creation is expected to happen between the countries that are underperforming because of non-tariff barriers or the conditions they are in.

So forming a union can eliminate all these non-tariff factors at once as well as the tariff themselves and can reveal their true trade potential. Ideally, a group of countries with an already low intra-trade ratio is more preferable to analyze an uncapped potential.

But since trade blocs are more than a trade block and imply political power, the success of a suggested trade block does not solely depend on these numbers. The European Union for instance can be regarded as the most successful trade and political integration of the recent history. The single market which was established with 12 countries in 1993 became the largest trade block in the world. Yet if we just take a look at the trade statistics of Germany, which is the powerhouse of the continent, for 1992 and 2018, we see that it already had a high trade volume with European Countries in 1992 and in fact the ratio of this volume is disrupted by China and USA over the years. In 1992, the year before the establishment of single market, Germany's biggest trading partners were France, Italy, Netherlands, Belgium and United Kingdom with a ratio of %45 to total trade volume (WITS, 1992). By 2018, only 3 European countries remained as top trading partners with a ratio of %20 to total trade volume while USA and China emerged to the list (WITS, 2018). Of course the adaptation of laws starting 1985 helped the Union to remove technical and bureaucratic barriers hence positively affected the process throughout 1993. But the gradual and consistent decline of member countries' share on total trade is normally not a good sign for a trade block. As for the members of OIC, we take a look to the countries which stands at the top 5 in terms of total value of intra-OIC net trade. By 2021, United Arab Emirates, Saudi Arabia and Türkiye's trade with OIC countries stands at roughly %20 to their total trade volume (ICDT, 2022). These ratios represent a general situation among all the countries since the target ratio remains %25 for all OIC members for the last 6 years (ICDT, 2022). So with respect to their economic mass, proximity and historic shared values, the intra-trade ratio certainly does not seem to reflect the potential that the member countries have. In sum, we think that OIC has way more trade potential to do better as a trade block than EU and its numbers indicate a shortcoming with its current disintegrated status.

In this study, we start with the assumption that OIC countries are underperforming on their trade volumes and creating a common market with the right OIC countries would certainly have a trade creation affect. To analyze that we used gravity model on selected group of OIC countries and applied stochastic frontier analysis to the model in order to gain efficiency scores of these countries. Since the efficiency scores indicate the usage of total potential trade volume, one can examine that whether a trade creation or a diversion affect would happen in case of an economic integration by looking at the uncapped potential of trade. If little or no trade potential is identified, then any form of union with that sample would have trade diversion affect and will simply divert the pre-existing trade to the newly formed union. However if a significant portion of uncapped trade potential is identified then it would make sense to form a union which could create trade creation affect.

In the context of analyzing OIC countries with gravity model, there are a number of valuable studies which applied gravity model to some or all OIC countries to outline the parameters of intra trade. (Bendjilali, 2000) analyzed the determinants of trade with cross sectional data of 1994 for 52 OIC countries. Karagöz and Karagöz (2009) derived

the determinants of trade volume for Türkiye by applying gravity model to 169 countries which include OIC countries as well. Gencer and Öngel (2011) also analyzed the intra trade volume for Türkiye, Lebanon, Syria and Jordan by using gravity model. Tatlıcı and Kızıltan (2011) used the model for 46 countries between 1994 and 2007 in order to determine the parameters of Türkiye's export volume. Akgül (2013) focuses on the variables that positively impact the multi trade for all 55 OIC countries and then calculates the trade potentials in a static form which only takes the year 2010 into account. Lastly Hassan and Sanchez (2015) analyze the trade creation and diversion effects of intra-OIC trade by applying the gravity model to 5 different OIC group of countries. They actually compared these country groups with respect to their trade potential. Yet they did not use any statistical methodology to estimate these potentials but rather grouped the countries as more likely to trade and less likely trade (Hassan and Sanchez, 2015).

This study is the first to apply stochastic frontier analysis to the gravity model and gain efficiency scores of OIC countries in order to suggest an economic integration. The literature which center Türkiye in their studies lacks stochastic frontier analysis with a few exceptions. No study utilizes SFA to calculate the trade potentials of OIC or to suggest an economic integration among OIC. We think that applying SFA to gravity model is a difference maker as explained in further sections. So this study aims to present a viable option for common market initiatives in the scope of OIC. Over the course of decades, so many studies discussed the aspects of economic integration among OIC countries. Few studies used statistical techniques while none of them calculated uncapped potentials without omitting time variation. It is our motivation to fill this gap and be a reference point of study for future political steps that could lead to a form of economic integration.

2. SELECTION CRITERIA

When determining our sample, we looked for a geographical integrity or wholeness as well as the criteria we used below as a base for selection of the countries:

- Being a member of OIC
- Being a neighbor country of at least one OIC member
- A land connection to Türkiye via all OIC member countries
- Having a distance of no more than 3300 km between Turkish capital of Ankara and the relevant country capital

Based on these criteria; a total of 23 countries are selected which made of one main group and four sub-groups to be tested. These countries and subsequently the groups are listed as follows:

Main Group-AC Group Countries; Afghanistan, Azerbaijan, Bahrein, Iraq, Iran, Qatar, Kazakhstan, Kirgizstan, Kuwait, Libya, Lebanon, Egypt, Uzbekistan, Pakistan, Syria, Saudi Arabia, Tajikistan, Turkmenistan, Türkiye, United Arab Emirates, Oman, Jordan and Yemen.

Sub-Group-CC Group Countries; Azerbaijan, Iran, Iraq, Jordan, Kuwait, Lebanon, Qatar, Saudi Arabia, Syria, Türkiye and Yemen

Sub-Group-EC Group Countries: Afghanistan, Azerbaijan, Iran, Iraq, Kazakhstan, Kirgizstan, Pakistan, Tajikistan, Türkiye, Turkmenistan and Uzbekistan.

Sub-Group-GC Group Countries; Azerbaijan, Egypt, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, Syria, Türkiye and United Arab Emirates

Sub-Group-MC Group Countries; Bahrein, Iran, Jordan, Kazakhstan, Kuwait, Kirgizstan, Lebanon, Pakistan, Syria, Tajikistan, Türkiye, United Arab Emirates and Uzbekistan.

3. GRAVITY MODEL AND ITS APPLICATIONS

The gravity model derived from Newton's original well known equation is first laid out by (Tinbergen, 1962) and then (Poyhonen, 1963) for the application to the international trade. The adopted basic equation can be written as:

$$F_{ij} = \left[G * (M_i * M_j\right] / R_{ij} \qquad (1)$$

Where Fij represents the bilateral trade between countries i and j, M_i and Mj are the economic mass for each country and R_{ij} indicates the distance between the two countries. In addition to these main parameters, adding dummy variables in accordance with the nature of the study is what makes the model unique in its own way. It's worth to mention that other trade models in the literature are not meant to explain the patterns and volumes of international trade like gravity model. For instance while Ricardian model concentrates on the comparative advantages of the goods that are subject to international trade, HO Model takes factor endowment as prime parameter to decide which goods are to be produced and exported.

In its roughly sixty years of course in the literature, so many studies contributed the evolution of the model like (Anderson, 1979) which outlined the theoretical foundation of the model, (Bergstrand, 1989) which added income per person to the augmented model, (Baldwin, 1994) which presented two stage approach to trade projections and (Anderson and Wincoop, 2003) who developed multi trade resistance (MTR). However since this study primarily focuses on frontier application to the model within trade projection techniques, listing the literature regarding this area would be more appropriate. Without a prediction, gravity model stays as an explanatory of determinants for international trade with no purpose of exploring any potential.

There are basically three prediction techniques that can be applied to the gravity model in the literature for the purpose of gaining trade potentials. These are in sample projection, out of sample projection and stochastic frontier analysis.

Baldwin (1994), Gros and Gonciarz (1996), Ata (2012) and Nilsson (2000) can be stated as lead examples of in sample projection in which the coefficients are gained from OLS prediction of current sample. According to Kalirajan (2007) in sample projection represents central values of the data set hence the potentials derived from this projection is far from the upper limits and does not represent true potentials. Egger (2002) brings up a different view and harshly criticizes in sample projection. He suggests that if the underlying model is consistent then there should not be any difference between actual and predicted trade flows in this type of prediction. So any deviation from observed trade flow should be interpreted as misspecification of the model rather than unused trade potentials (Egger, 2002). In addition to this, estimating the model with OLS could lead biased estimates and most importantly heteroscedasticity as Santos Silva and Silvana (2006) showed. It should be noted that most of these studies, including Akgül (2013) relied on OLS estimate when predicting in sample projections.

In contrast to this, out of sample projection derives the coefficients from a similar study's sample and injects them into the equation. The prominent studies which use this technique can be listed as Hamilton and Winters (1992), Brulhart and Kelly (1999) and Egger (2002). Out of sample projection mostly avoids the drawbacks which the in sample projection suffers from. The model misspecification is no longer an issue since a completely different sample is to be used. None of the studies we encountered used OLS estimation when predicting out of sample projections. However just like the in sample projection, out of sample projection also represents central values of the data set, this time utilizing an outside sample. While it certainly gives much more consistent estimates in comparison to in sample projection, the outcomes do not reflect the maximum potentials but rather average potentials.

Here in this study, we used SFA model because unlike the other two, frontier model calculates the maximum possible of output, not the average. To utilize this analysis of course, the data needs to fulfill the main assumption of the model which suggests that the variations from the mean (effectively caught by standard error term) is caused by not only from random or stochastic walk, but also a deterministic inefficiency. In other words SFA links uncapped potentials directly to inefficiency Note that none of the other estimation techniques requires such an assumption. Within trade terms, SFA assumes that there are some structural flaws which prevents the counties to reach their maximum trade potentials apart from the random economic fluctuations. That main assumption requires to divide the error term as Battese and Coelli (1995) structured like below:

$$Y_{it} = \exp(X_{it}\beta + V_{it} - U_{it}) \qquad (2)$$

The first application of SFA model to the production function was made by (Aigneret et al. 1977), but they used cross sectional data like most of the subsequent studies in that era. The first studies that present the model with panel data were Pitt and Lee (1981) and Schmidt and Sickles (1984) which also explained the advantages of panel data over cross sectional data. Until Battese and Coelli (1995) paper though, technical inefficiency was addressed with two stage approach and there was no explicit formulation for this inefficiency or distinction of error terms. As for the international trade; the very first study to apply SFA to the gravity model was Drysdale et al. (1998) which calculated the efficiency scores of 57 countries and gained a mean efficiency score of 0.34 for all countries. The usage of frontier model seems to be intensified after 2006. Kang and Fratianni (2006) applied the frontier to 177 countries and gained efficiency scores. Armstrong et al. (2008) analyzed the efficiency of East Asian and South Asian Countries' trade by presenting the efficiency scores upon running frontier model. Kalirajan and Kanhaiya (2008) studied the trade performance of China and India for the years between 2000 and 2003. Deluna and Edgardo (2014) centered their study on Philippines and tested the trade efficiency of 69 trade partners of that country. Ravishankar and Stack (2014) examined the ten former USSR countries' trade data and used frontier model in the span of 13 years in order to see whether the new members fulfill their potential with EU. Armstrong (2015) applied both in sample projection and SFA to gravity model for 65 countries with a 16 years panel data set and found SFA predictions more significant and consistent compared to in sample projection (Viego and Corbella, 2017). On the other hand analyzed the export performance of South American countries with frontier and subsequently gained efficiency scores as well. Finally Demir and Bilik (2018) applied the model to measure the efficiency of Turkish trade with 31 countries and found %60 efficiency on average over an 11-year span.

4. DATA SET AND VARIABLES

We used panel data for the selected 23 countries over the period of 1991 to 2018. The break-up of Soviet Union in 1991 was the key event to determine the starting year since a number of selected OIC countries are former USSR countries. Nonetheless, 28-year span is an ideal time period for time series analysis. The dependent variable for the gravity model gives the export value from relevant countries, hence each country appears in the data set twice; once as an exporter and once as an importer presumably taking different values. Distance which is a time invariant variable also appears twice for the relevant country pairs but with the same value this time. Variables like GDP and population that differ over time reflect the total value of importing and exporting countries' data for each year. UN Statistics Division (UNSD) and IMF DOTS (Direction of Trade Statistics) were used as data source for the Trade Flow variable. While UNSD data offers more sufficient data, there are some cases in which the countries reported to IMF but not to UN. So IMF data plays a complementary role for the dependent variable. For GDP and population, WDI (World Bank Development Indicators) data has been used as a sole source. Distance, shared border, official language and ethnic language variables are sourced from CEPII data set. Lastly trade agreements are gained from RTA-IS which belongs to WTA's information system. Needless to say all dummy variables takes 1 when they share relevant characteristic defined by variable and 0 if not.

In some models, having a correlation between dependent and independent variables is an unwanted situation since what they are measuring is the direct effect of that specific independent variable over dependent variable. For instance, measuring the effect of playing piano over the success of a student assumes that playing piano has no correlation with the dependent variable of student success. Gravity model however shall have this correlation with the correct sign by definition and not having this correlation between model's main variables suggests that the data is actually not a good fit for the model. So when we scatter the variables' data against each other we find that total trade volume has a %42 positive correlation with GDP and %20 with population. The distance variable on the other hand has a %37 negative correlation with total trade volume. These results indicate that data is in line with the theory and in fact a good fit for the gravity model.

5. METHODOLOGY

In the first stage, the model is estimated with maximum likelihood estimation for both all countries group and the subgroups. With respect to extended gravity model we can write the equation as below:

$$\ell n(Trade_{ijt}) = \beta_0 + \beta_1 \ell n(gdptotal_{ijt}) + \beta_2 \ell n(poptotal_{ijt}) + \beta_3 \ell n(distcap_{ijt}) + \beta_4 (rta_{ij}) + \beta_5 (comlang\_ethno_{ij}) + \beta_6 (comlang\_off_{ij}) + \beta_7 (contig_{ij}) + V_{ijt} - U_{ijt} \quad (3)$$

Where the dependent variable in the equation reflects the total export value of one sided trade from country i to country j at a given time period t; gdptotal is the sum of importing and exporting countries' GDP at time t; poptotal is the sum of populations for both countries again and distcap is the distance between the relevant countries' capitals. All independent variables and the dependent variable are in logarithmic form to dismiss zero observations. For the dummy variables; they indicate whether the

countries have any form of trade agreement between them (rta), whether the two countries share any ethnic languages (comlang_ethno), whether the two countries share any official languages (comnlang_off) and whether the two countries share borders (contig). Finally the error term consists two parts in line with the SFA model. The first part is the standard error term which takes a positive sign where the second part represents inefficiency in the model and therefore takes a negative sign.

While the distributional assumption is exponential, the model is estimated with true random effects model since we have time varying variables and estimating the model with fixed effect would cause inconsistency and could lead biased estimates. In order to derive, analyze and comment on the efficiency scores though, the gravity model itself and the stochastic frontier model must be significant and the main variables' coefficients must be in line with the gravity model. Once the frontier regression model gives a significant result along with the desired coefficients, then we can proceed to test whether the assumption of inefficiency in the model is true or not. It is very possible that the estimated values' deviations from actual trade volumes might just be a random walk and a stochastic variation rather than a deterministic inefficiency. If the error term that represents inefficiency in the model turns out to be not statistically different from zero, then the whole stochastic frontier specification collapses and the equation becomes nothing but a Cobb Douglas function. Needless to say there would be no uncapped potential to be calculated at this point. So the null and alternative hypothesis can be written as follows;

$$H_0 : U_{ijt} = 0 \qquad (4)$$

$$H_1 : U_{ijt} \neq 0 \qquad (5)$$

To test this hypothesis we performed one-sided likelihood test by using the log likelihood values of the restricted and unrestricted models as (Kumbhakar and Wang, 2010) suggested. Rejecting the null hypothesis will prove the existence of inefficiency in the model, hence will justify the use of stochastic frontier analysis. However even if we reject the null hypothesis that may not be enough to build a case for a common market although statistically we would be on the right track. An uncapped potential of say 5 or 10 percent would still be the whole story of so called existence of inefficiency. Meanwhile it would not make any country any good to go for a common market for such a small margin of unused potential. To reveal the size of true potential we shall look at the variance calculations for both error terms. The ratio of inefficiency term variance to total variance should give the information for how much of the variance in the sample is due to the technical inefficiency. Thus, a second source test named gamma parameter will be performed by using the standard deviations from Stata output. Gamma parameter was first used by Battese and Corra (1977) and have been widely used in the literature since then. The test would further prove that the inefficiencies in the sample are more than symbolic values and worth to be analyzed. Based on the gamma parameters' outcomes, we can then proceed on the next step which would be predicting the potentials.

The main purpose of the stochastic frontier analysis is not only having an idea about the general look on the data but also perform point predictions so that the root causes of any problem could easily be identified. For the point predictions, we used the JLMS methodology which is first used by Jondrow et al. (1982).

JLMS simply suggests that the total error term could be the predictor of inefficiency and was formulized as below:

$$TE_{JLMS} = \exp(-\hat{u}_{ijt}) \qquad (6)$$

By gaining the point predictions again calculated by Stata, the process would be completed and would be suitable for commenting on. Although the main purpose of this study is to get average uncapped potentials of pre-grouped countries, gaining the point predictions at t time will be helpful for the next steps in future studies.

6. ANALYSIS AND FINDINGS

6.1. AC Group Countries

For the sake of our whole analysis, it is very essential to gain significant results from the AC Group which consists all the 23 countries. In this sense, significant results will justify the usage of not only the gravity model but also for SFA model for all the sub-groups that we determined. In addition to that, considering the diverse and distanced structure of this group, having significant coefficients for all variables is also fairly important. Looking at the output results in Table 6.1.1, the value for Prob>chi2 is 0.00 indicating that gravity model and the SFA model are in fact significant. The coefficients for independent variables are also in line with the model at %99 confidence level except ethnic language dummy variable.

Frontier	Coeff.	Std. Error	P>z
gdptotal	1.099979	0.04047	0.000
poptotal	0.7466979	0.0868706	0.000
distcap	-1.226002	0.136208	0.000
rta	0.4323052	0.0642364	0.000
comlang_ethno	0.3730046	0.3670154	0.309
comlang_off	1.328987	0.4039095	0.001
contig	1.073575	0.2102752	0.000
_cons	90.63148	6.050092	0.000
sigma_u	1.234998	0.0259919	0.000
sigma_v	1.095228	0.0173163	0.000
Prob>chi2=0			

Table 6.1.1. Estimation results for AC Group Countries

That's a breakthrough for the study in order to proceed to the next steps. The next step is then to perform one-sided likelihood test to see whether the inefficiency term is equal to zero or not. While the Stata output provided the value for unrestricted model of SFA (-22.930), the value for the restricted model of OLS needs to be calculated. When we calculate the value and apply both values to the model, 9708.273 is gained which is far greater than the critical threshold value of 5.412 with one restriction at %99 confidence level. The critical threshold values of this test can be found in Kodde and Palm's (1986) study. Thus, the null hypothesis is rejected and the error term that represents inefficiency turns out to be different than zero which allows us to proceed gamma parameter calculation. In order to calculate gamma parameter, standard deviations of both error terms are to be used as mentioned in the methodology. Since these values are already given by Stata output (Table 6.1.1.), we just need to calculate

the variances and get the necessary ratio as it was suggested. After calculating this, the inefficiency variance to total variance percentage results %55, indicating that %55 of the total variance in the sample is due to the inefficiency. As the last step, we performed JLMS predictions in order to derive a general look on inefficiencies for this group. The summary of results can be seen in Table 6.1.2 which shows a %38 efficiency in this sample. In other words uncapped potential or the inefficiency is %62 for all countries. Both the variance and the JLMS predictions gave the desired outcomes, hence there is no drawback to move on to the sub-groups.

Variable	Obs	Mean	Std. Dev.	Min	Max
Te	11671	0.377333	0.175279	5.60E-12	0.862689

Table 6.1.2. JLMS predictions for AC Group Countries

6.2. CC Group Countries

For the CC Group counties which are fairly close to Türkiye, the output results are shown in Table 6.2.1.

Frontier	Coeff.	Std. Error	P>z
gdptotal	1.072558	0.0563233	0.000
poptotal	0.6596231	0.1195984	0.000
distcap	-1.560026	0.1212415	0.000
rta	0.1414861	0.0953186	0.138
comlang_ethno	-0.282936	0.3924073	0.471
comlang_off	1.749443	0.4021839	0.000
contig	-0.474825	0.2417235	0.049
_cons	70.38102	8.41546	0.000
sigma_u	1.192132	0.0383643	0.000
sigma_v	0.7455293	0.0244203	0.000
Prob>chi2=0			

Table 6.2.1. Frontier estimation results for CC Group Countries

The Prob>chi2 value is 0.00 which suggests that the gravity and the SFA model are both significant for this sub-group. Looking at the coefficients of independent variables; in addition to the ethnic language variable, shared border and trade agreement dummies are also not in line with the model assumptions and therefore insignificant. Since this group consists Gulf countries which share borders and entered GCC trade agreement, this is very much an understandable situation. For these specific countries, neither border nor the trade agreement has no positive affect on the countries' trade volumes as their economic structure are very much alike. Based on the 2018 numbers, the ratio of intra-trade to the total trade is only %10.13, which puts GCC one of the worst performing unions as its rank would be 15 out of 20 trade unions worldwide (Global Edge, 2019). All other variables seem to be significant with expected coefficients. Proceeding to the next step, one sided likelihood test shall be performed as the values for restricted and unrestricted models are -6543.06 and -5022.99 respectively. When we apply these values to the test, 3040.14 is the value we gained which is far greater than the critical value of 5,412 at %99 confidence level.

Thus, the null hypothesis of zero inefficiency in this sample is rejected. For the gamma parameter test the values of standard deviations from output are to be used to calculate the source of variance. When we apply 1.1921 and 0.7455 to the test, the variance that belongs to inefficiency results %71 which is a really high ratio. At the last stage, we calculate the efficiency coefficients for each observation. The summary results shown in Table 6.2.2. indicate that there is a %60 inefficiency or uncapped potential in this group of countries.

Variable	Obs	Mean	Std. Dev.	Min	Max
te	2851	0.404131	0.199783	7.45E-08	0.860923

Table 6.2.2. JLMS predictions for CC Group Countries

6.3. EC Group Countries

Based on the output results given in Table 6.3.1., Prob>chi2 value is 0.00 indicating the significance of both models for this country group as well. Looking at the independent variables, GDP and distance are significant and have the signs in line with the model. In addition to these two main variables shared border and ethnic language dummies are also significant with the expected signs. However the rest of the variables including population turned out to be insignificant with mixed signs. In any case having two main variables of the model as significant would be enough to proceed to the next steps since the prob-chi square value had a desired outcome as well.

Frontier	Coeff.	Std. Error	P>z
gdptotal	0.8814121	0.05232	0.000
poptotal	-0.5371621	0.138141	0.000
distcap	-0.7260963	0.2335856	0.002
rta	-0.3055154	0.1001973	0.002
comlang_ethno	1.636086	0.464471	0.000
comlang_off	-2.01921	0.5746898	0.000
contig	2.321413	0.2473713	0.000
_cons	25.96773	8.171689	0.001
sigma_u	1.022328	0.0453811	0.000
sigma_v	0.9527855	0.0297785	0.000
Prob>chi2=0			

Table 6.3.1. Frontier Estimation results for EC Group Countries

When we calculate the one-sided log likelihood value for this group, we gain 2168.219 which is bigger that the critical value of 5.412, rejecting the null hypothesis of zero inefficiency. Gamma parameter calculation however gives an almost equal source of variances from both error terms with %53 belongs to the inefficiency term. Nonetheless that's still over %50 of a variance caused by inefficiency. Lastly, JLMS predictions are given in Table 6.3.2. which shows a %42 efficiency rate. In other words, the sample has an uncapped trade potential of %58 on average over these years.

Variable	Obs	Mean	Std. Dev.	Min	Max

te	2562	0.4181522	0.182567	1.20E-05	0.83121

Table 6.3.2. JLMS predictions for EC Group Countries

6.4. GC Group Countries

For the GC sub-group of countries the probability of chi square is again zero (Table 6.4.1.) which can be interpreted as the association between the variables are significant or there is high degree of goodness of fit for this sample. However distance variable's standard error and z values seem to be not calculated in the output although the coefficient of the variable has the correct sign with a fairly high value. These two inputs together says that the distance data in our model has a perfect fit to the equation; the residual is zero and so the standard error for this coefficient. Looking at the other variables, shared border and common trade agreement variables are again insignificant just like in OC Group countries. Since same gulf countries are included in this sample predominantly we will not repeat the same root causes for this situation. All other dummy variables along with the main variables are significant with expected signs.

Frontier	Coeff.	Std. Error	P>z
gdptotal	2.015367	0.0939052	0.000
poptotal	0.9447932	0.1174376	0.000
distcap	-2.979729		
rta	-0.05539	0.1730208	0.749
comlang_ethno	-2.28891	0.5252834	0.000
comlang_off	3.291095	0.4485634	0.000
contig	-1.721198	0.2958032	0.000
_cons	176.4818	16.2379	0.000
sigma_u	1.121589	0.0459743	0.000
sigma_v	0.8621657	0.0308663	0.000
Prob>chi2=0			

Table 6.4.1. Frontier estimation results for GC Group Countries

The calculation of one sided likelihood test with the restricted and unrestricted values of -5342.79 and -4212.71 respectively gives us the 2260.14 which is far greater than the critical value of 5.412 at %99 confidence level. This outcome reject the null hypothesis of zero inefficiency in the model. Proceeding to the gamma parameter; we gain the source variance values from the standard errors of 1.121 and 0.8621. After applying these values to the model, the variance due to inefficiency turns out to be %62 for this sample (Table 6.4.2.). That's again a very good ratio for the purpose of this study. Lastly, when we predict the efficiency scores for each observation, we see that there is a %59 inefficiency in this sample on average.

Variable	Obs	Mean	Std. Dev.	Min	Max
te	2350	0.411557	0.192435	4.27E-07	0.851521

Table 6.4.2. JLMS predictions for GC Group Countries

6.5. MC Group Countries

As shown in Table 6.5.1. the probability chi square value is zero as expected and all the variables except ethnic language dummy is significant and have the correct sign. After applying the restricted and unrestricted models' log likelihood values to test the null hypothesis of no efficiency, we gain 2640.22 which is far greater than the critical value of 5.412 at %99 confidence level.

Frontier	Coeff.	Std. Error	P>z
gdptotal	1.322318	0.0556062	0.000
poptotal	0.7793689	0.1052017	0.000
distcap	-0.6401035	0.1346235	0.000
rta	0.4120941	0.1051864	0.000
comlang_ethno	-0.164539	0.4396149	0.708
comlang_off	2.781665	0.5891152	0.000
contig	1.910681	0.28144	0.000
_cons	142.3093	7.017418	0.000
sigma_u	1.122247	0.0440816	0.000
sigma_v	0.908856	0.0304255	0.000
Prob>chi2=0			

Table 6.5.1. Frontier estimation results for MC Group Countries

Thus, the null hypothesis is rejected which allows us to proceed gamma parameter in order to determine the source of variance. Applying the same procedure as mentioned previous groups, we find that the inefficiency variance has a %60 ratio overall. With that ratio we move forward to the last step of efficiency scores for each observation. After the prediction, we gain %41 of efficiency on average which means that there is a %59 inefficiency in this sample (Table 6.5.2.).

Variable	Obs	Mean	Std. Dev.	Min	Max
te	3542	0.415707	0.185369	6.58E-07	0.849463

Table 6.5.2. JLMS predictions for MC Group Countries

In a brief sum, it can be said that MC sample seem to have the most desired results of all sub-groups.

7. CONCLUSION

A total of five groups, one for all 23 countries and four sub-groups, have been tested to analyze which sample would be a better pick for a common market initiative. Although all the groups gave significant results, we can still compare the groups with the help of three parameters; the inefficiency ratio to total variance, the average uncapped potentials of point predictions and the number of significant variables for each group. As a side note, having an insignificant variable in a certain sample does not necessarily mean that this group is being adversely affected by this situation. In our case however, the insignificance of common border and trade agreement dummies

for instance, indicates a structural problem since these two shall contribute the trade volume in normal circumstances.

Country Group	Inefficiency/Total Variance	Uncapped Potential	Insignificant Variables
AC Group Countries	55%	63%	Ethnic Language
CC Group Countries	71%	60%	Ethnic Language, Shared Border, Common Trade Agreement
EC Group Countries	53%	58%	Official Language, Population, Common Trade Agreement
GC Group Countries	62%	59%	Distance, Ethnic Language, Shared Border, Common Trade Agreement
MC Group Countries	60%	59%	Ethnic Language

Table 7.1. Parameter comparison between group countries

Recalling the GC Group Countries' results; these two variables clearly do not contribute or help to use the uncapped trade potential of that group and that would not be something we want. It's worth to emphasize that countries with same economic structure, such as oil-based economies, are doomed to fail in case of an economic integration. That clearly is the case with GCC which is one of the worst performing trade blocs in the world (Abdulghaffar and Al-Ubaydli, 2013). The results we gained on GC Group countries also indicate this fact. Thus, choosing best performed sub-group based on the mentioned parameters including the significance of the variables in this model shall determine the sample pick. Looking at the Table 7.1., all sample groups' ratio values are over %50 which is the necessary condition of this study. For the 3rd parameter though, AC Group Countries and MC Group Countries stand out among other groups with having just one insignificant variable which is ethnic language.

Since this study aims to derive purely empirical results to be a reference point in the future, we can conclude that a relatively small initiative consisting MC Group Countries could be a good starting point for a Common Market. In the second stage this initiative can expand to AC Group Countries as the final phase. To achieve this statistical conclusion in reality though, there are some steps that needs to be taken by member countries. No integration is succeeded overnight and the process can take real time and effort as it happened in EU. First of all, intergovernmental institutions like Economic Cooperation Organization (ECO), which aims the removal of trade barriers within the region, could to be strengthened and expanded. From a policy maker point of perspective, it is not always possible to correctly identify so called behind the border trade barriers or the root causes of those barriers. But these kind of institutions can specialize for target countries and for different sections such as legal affairs, transportation issues or industry cooperation and can be a bridge between the field and government offices. In addition to this aspect, social and cultural bonds also play an important role for the path of integration. In this sense, organizations like The Union of NGOs of the Islamic World (UNIW), which aims to ensure cooperation and coordination between non-governmental organizations, could be supported in a more efficient way. Exchanging the views and sharing mutual trade and social problems certainly can help creating that bond. With all its economic aspects, it is about creating a new power center in global arena and at the end of the day it is what matters.

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