

## The Benefit Of Economic Cooperation: A Quantitative Study Of The Gulf Cooperation Council



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### I. Introduction

The Arabian Gulf region is composed of six states: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. The Arabian Gulf States have a combined population of more than 21 million and are considered to be among the highest in per capita purchasing power in the world. These states have excellent infrastructure and relatively free mobility of capital and goods. In 1981, the six Arabian Gulf states formed the Gulf Cooperation Council (GCC) with the declared aim of fostering cooperation among them. Promoting trade and economic cooperation are considered to be top priorities of the GCC members. Consequently, the formation of GCC motivated joint venture projects such as the Gulf Investment Group, which is the first financial institution to be set up under GCC auspices. The establishment of joint investment projects and the reduction of trade barriers among GCC members should promote more efficient use of the GCC member states' human and capital assets.

How much material gain have the Arabian Gulf States made, and how much has this gain been affected by the establishment of the GCC? Certainly, sufficient time has passed to judge whether the establishment of GCC has affected economic progress in the Gulf region. Thus, this paper studies the effect of economic cooperation on technical efficiency in the Arabian Gulf region.

The empirical measurement of efficiency is derived from the concept of the frontier production function, first introduced by Farrell (1957) and more rigorously developed in recent years by Haung (1984) and Al-Obaidan and Scully (1995). In this paper an Aigner-Chu deterministic frontier function and a maximum likelihood stochastic frontier function are estimated. A theoretical analy-

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sis is presented in Section II. Technical efficiency is defined as producing a given output with the cost-minimizing input ratio. The gain of economic cooperation is conceived of as increased technical efficiency of the resources in the GCC member states. Data and variable construction are discussed in detail in Section III. The empirical results, which are discussed in Section IV, suggest, *ceteris paribus*, that since the formation of GCC, the technical efficiency of the member states' human and capital assets have been enhanced by approximately 15 percent.

## **II. Regional Cooperation and Economic Efficiency: The Case of the GCC Member States**

Viner (1950) was the first to introduce the foundation for the theory of customs union, which represents the core of the theory of international economic integration. The Vinerian customs union theory exposes two short-run "once and for all" effects of liberalizing intraregional trade: the replacement of domestic production by imports from partner countries (trade creation) and the replacement of imports from nonmember countries (trade diversion). Both effects emerge as a result of liberalizing trade among partner countries and of changing relative prices between imports from member and nonmember countries. The important question is, therefore: Which aspect of preferential trade arrangements is dominant? Is a particular trade arrangement trade-diverting (that is, taking trade away from efficient outside suppliers and giving it to inefficient trade member countries), or is trade-creating (that is, generating trade from one more-efficient member at the expense of another less-efficient member)? Viner's theory provoked an extensive theoretical discussion additional consumption and production effects of customs union and alternative assessment criteria (a single country's welfare versus the world's welfare). Furthermore, the theory generated a wide range of issues that impact the regional development question: the lack of sensitivity to geography by trade theorists (Grant, 1994), externalities and the local-

ization of industry (Krugman, 1991, 1993a, 1993b), the role of history and the path of dependence (Krugman, 1990), and the implications of economic and monetary integration for regional growth (Krugman 1993c; Casella, 1993). The result of this discussion was inconclusive. The question then arises as to whether a subset of countries would benefit from strengthening economic cooperation among them? In general, although economic cooperation among a subset of countries is not the best for the world, because trade impediments between the region and the rest of the world remain, it may be an optimal policy for the countries in the region. Moreover, to the extent that small domestic markets constrain growth, regional integration is looked upon as an instrument to make such constraint less binding. When domestic markets prove to be too small to allow reaping the benefits of scale economies, formation of a regional market is seen as a way out of this impasse. However, it is well known that the magnitude of benefits stemming from a regional integration arrangement depends largely on the relative strength of different economic motives and rationales for concluding a regional agreement, and on the ways in which the balance of arguments, pressures, and incentives develops as integration goes ahead, both within and between national states. Thus, the incentive for economic cooperation is the anticipation of a net economic gain compared with the situation without economic cooperation.

Regional integration through freer and preferential trading arrangements is particularly useful for the relatively small GCC states. These states have modest domestic markets and cannot sustain effective industrialization on their own. International trade in the prevailing international economic system is generally characterized by protectionism, preventionism, and adverse competition. Therefore, liberalizing trade among GCC members promotes more efficient production within each member state through its access to a larger market and greater sources of investment capital. In these aspects, GCC resembles the usual conception of a common market, in which each member hopes to lessen its dependence on external markets in favor of greater regional interdependence.

Although in general the GCC countries are similar to a certain extent in terms of their resource endowments, they have incentive to trade. Their trade may often be in goods that are produced with similar factor proportions; this type of trade does not involve large adjustment problems or the income distributing effects characteristic of more conventional trade (Krugman, 1990). This is because, with the growth of income, consumers are not satisfied with identical or standardized goods. They demand and pay for varieties of the same basic goods, often tailored to their individual needs.

Moreover, regional integration may facilitate multilateral movements of surpluses and deficits of the capital markets (Jovanovic, 1992.) Thus, existing financial markets in the GCC countries may benefit from specialization, economies of scale, and improved competition. Consequently strengthening regional ties is especially crucial as a means of achieving adequate market share that lowers unit costs and improves the utility of available physical and financial resources.

On the other hand, regional economic integration permits the coordination of activities on both the global and national levels to overcome the weakness inherent in development based upon actions of isolated national entities. Regional action can be of direct benefit to GCC member states in several areas. This includes the pooling of their resources and cooperating in their various undertakings. The promotion of cooperative production, financing, transport, stocking and distribution benefits can be derived in greater measure than if these tasks were attempted by each individual member state.

Furthermore, the adoption of unified economic policies related to regional and/or international matters enhances the ability of the GCC member states to extract more favorable terms from other regional economic blocks. This may improve the comparative advantage of the GCC member states in penetrating new foreign markets and may open new opportunities for reciprocal trade and investment projects. Morawetz (1974) maintains that intraregional trade ex-

pansion can promote intra-industrial specialization through product diversification and therefore may improve the competitiveness of extraregional exports.

Cooperation may take many other forms, ranging from the simple exchange of information through the provision of joint training facilities to the mutual recognition and adoption of rules and regulations, and the establishment of joint institutions with quasi-legislative powers. Thus, given the general lack of institutional development between the Arabian Gulf States before the establishment of GCC, the regional economic cooperation resulting from the formation of GCC may have a positive economic impact. The enhanced technical efficiency may accrue from the expansion of trade and investment, and the exchange of information and knowledge that permit more rational use of productive resources through improved utilization of existing productive units. This expansion is expected to further affect the size and localization of new investments, and enhance the technical efficiency of the resources in the region.

### III. Data and Variable Construction

#### Stochastic Specification

Technical inefficiency is the result of the systematic choice of technical inefficiencies hinges on the ability to separate random errors from the systematic error component. This can be accomplished by specifying a particular distribution for the systematic error term. The Aigner-Chu deterministic frontier notes that random errors should average out over time, leaving a systematic component assumed to be time-independent. In contrast, the stochastic frontier function utilizes a half-normal distribution under the assumption that technical inefficiency is an asymmetric and increasing, but never decreasing, cost component. Both measures of inefficiencies were estimated with no difference in the conclusion.

### The Aigner-Chu deterministic frontier function

A deterministic frontier function, as proposed by Aigner et al. (1968), assumes that the observed frontier deviates from the efficient frontier by an inefficiency component,  $\epsilon_i$ . Thus, the observed frontier function is:

$$\ln Y_i = f(K_i, L_i) + \epsilon_i \quad (1)$$

Where

$\epsilon_i \geq 0$  is an error term, which measures the economy's deviation from the efficient frontier

$Y_i$  = output

$K_i$  = capital stock

$L_i$  = number of labor

The deterministic frontier is estimated by minimizing the sums of the absolute residuals. The Aigner-Chu approach, therefore, considers all deviations from the efficient frontier function as arising from technical efficiency.

### The stochastic frontier.

A criticism of the Aigner and Chu method of estimating the efficiency frontier with one-sided error term (assumed to be normal) is that only one part of the term defined in equation (1) may actually be deterministic; part of the error may be truly stochastic. Thus, the stochastic frontier (Aigner, Lovell Knox, & Schmidt, 1977), decomposes the error term into two components  $\epsilon = u + v$ , Where  $u$  is a one-sided disturbance term representing the degree of technical inefficiency and  $v$  is a symmetric, normally distributed random influence. Accordingly, the log-likelihood function of equation (1) is given by:

$$\ln L = \frac{N}{2} \ln \frac{2}{\pi} - N \ln \sigma - \frac{1}{2\sigma^2} \sum_{i=1}^N \epsilon_i^2 + \sum_{i=1}^N \ln \left[ \phi \left( \frac{\epsilon_i \lambda}{\sigma} \right) \right]$$

Where  $N$  = Number of countries. Jondrow et al. (1982) shows that the ratio of variability,  $\sigma_u^2 / \sigma_v^2$ , can be used to measure a country's mean inefficiency, where  $\alpha = [\sigma_u^2 + \sigma_v^2]$ ,  $\lambda = \sigma_u / \sigma_v$ ,  $\phi(\bullet)$  is the standard normal density function and  $\Phi$  is the standard normal cumulative distribution. Inefficiency measures are derived for all years for the complete sample as follows:

$$E(u_i | \epsilon_i) = \left[ \frac{\sigma \lambda}{1 + \lambda^2} \right] \left[ \frac{\frac{\phi\left(\frac{\epsilon_i \lambda}{\sigma}\right)}{\Phi\left(\frac{\epsilon_i \lambda}{\sigma}\right)} + \frac{\epsilon_i \lambda}{\sigma} \right]$$

### Functional Specification

Economies can be thought of as big firms. Just as the efficiency of firms is affected by enlarged market size, so is the efficiency of economies. Economies or nations have determined their interregional trade relations through a wide range of bilateral and multilateral agreements by which individual economic actors seek to utilize the prevailing trade and investment opportunities. Increased interregional economic integration has consequences for the allocation of resources (efficiency) in the economy.

Let the economy be described by a simple neoclassical production function, homogeneous of degree one in inputs,<sup>(1)</sup> as:

$$\ln Y = \ln f(K, L) \tag{2}$$

where  $Y$ ,  $L$ , and  $K$  are the national output, labor force, and capital stock, respectively. In the intensive form, the production function is written as:

$$\ln \gamma = \ln f(R) \tag{3}$$

Where  $\gamma = Y/L$  (country's output per unit of labor input) and  $R = K/L$  (the proportion in which  $K$  and  $L$  are used).

(1) The assumption is testable. A flexible production function was estimated. An F-test on the unrestricted model versus the restriction of unity for the sum of the coefficient yielded  $F = 0.30$ , which is insignificant.

The effect of an increase in the productivity of the capital-labor ratio on the productivity of real per capita gross domestic product depends on how resources are utilized in the economy. For equal rates of capital formation, economies that are able to utilize prevailing interregional trade opportunities will enhance the productivity of their capital stocks and human assets. On the other hand, reduction or elimination of interregional trade opportunities may lead to underutilization of the nations' capital stocks and human assets, which will lead to transforming inputs into output relatively inefficiently. One or more of the economies described by the neoclassical production function above will have values of output per capita during certain periods (increased economic cooperation) that are greater than other periods (reduced economic cooperation) with similar values of the input ratio. These economies are the most technically efficient in transforming inputs into output. It is hypothesized that efficiency differences between economies are the result of differences in the economic cooperation between the countries in the sample. Designate the efficient economies as  $\gamma^*$ , the efficiency frontier. Economies can be compared to the efficiency frontier, and a measure of technical efficiency, TE, is defined as  $TE = \gamma / \gamma^*$ , with  $0 < TE \leq 1$ .

### Data and variables

The cross - country economic data employed in this study comes mainly from "National Accounts of Arab Countries," published by the Arab Monetary Fund. Data on gross domestic product (at factor cost in millions of U.S. dollars), total investment (in millions of U.S. dollars), and population was obtained from "National Accounts of Arab Countries." The use of population as a proxy for the labor force is disagreeable but conventional. The annual series of total investment is the capital stock used in this study.

The GCC countries' economies differ in their degree of dependency on mining, quarrying, and fuel production activities. Since the degree of dependency on these economic activities may influence efficiency, *ceteris paribus*, the effect must be neutralized. Analysis of variance tests reveal that the degree of dependency on mining, quarrying, and fuel production activities affected the capital and labor productivity of the economies in the sample. Since the objective of the study is to test the benefit of economic cooperation, the effect of the degree of de-

pendency on these economic activities must be neutralized. This is accomplished by defining and introducing into the empirical analysis the following variable:

Mining, quarrying, & fuel production (MQ&F) ratio<sup>(2)</sup> = MQ&F in millions of U.S. dollars/ GDP at market prices \* 100

The MQ&F ratio reflects the degree of dependency of the country on these activities. Countries that are totally dependent on these activities will have an MQ&F ratio of 100. Countries that are not engaged in the activities will have a value of 0, countries that are engaged in the activities will fall in the interval of 0 to 100, A pooled cross-country and time series of the GCC member countries (Six economies) for the period 1976-92 (N=102) is utilized in this study. Table 1 presents the economies in the sample along with their gross investment per capita (in U.S. dollars), gross domestic product per capita (in U.S. dollars) and population. Since the GCC was established during 1981, a dummy variable is used to differentiate between the periods before and after the establishment of the GCC. The dummy variable is equal to 1 if the year is after 1981, and 0 if the year is before 1981. Using the year 1981 as a cut-off point, 36 observations are defined as pre-GCC, and 66 observations are defined as post-GCC.

#### IV. Empirical Results

The estimated deterministic frontier and the stochastic frontier function are presented in Table 2. The dependent variable is gross domestic product at factor cost in millions of U.S. dollars divided by labor. The independent variable is total investment in millions of U.S. dollars divided by labor, and the MQ&F ratio. The SAS program generates t-values for the deterministic approach and chi-square statistics for the stochastic frontier equation. The estimated frontier functions are statistically highly significant.

The frontier functions in Table 2 are the basis for the estimates of technical efficiency (TE). Technical efficiency is the dependent variable in the test of the effect of the establishment of GCC on efficiency in Table 3. The independent

(2) The ratio is obtained from "National Accounts of Arab Countries," published by the Arab Monetary Fund.

variable in the equation in Table 3 is a dummy variable (GCC variable) that is equal to 1 for the post-GCC period and 0 for the pre-GCC period. In both the deterministic frontier approach and the stochastic frontier approach, the GCC coefficient is positive and statistically highly significant. The statistical results suggest that technical efficiency is 0.083 points higher during the post-GCC period than during the pre-GCC period for the deterministic approach, and 0.084 points higher for the stochastic approach. Comparison of the average technical efficiency of the pre-GCC period with that of the post-GCC period reveals that the GCC countries are 115 percent ( $\{(0.543 + 0.083)/0.543 + 1.153\}$ ;  $\{(0.549 + 0.084)/0.549 + 1.153\}$ ) as efficient as in the period before the establishment of the GCC. Thus, *ceteris paribus*, GCC countries can increase the utility of their human assets and capital stocks by approximately 15 percent simply by promoting and enhancing economic cooperation among member countries.

## V. Summary and Conclusion

Enhancing economic cooperation among the Arabian Gulf States promotes more efficient production within each member through its access to a larger market and greater sources of investment capital. Moreover, regional grouping enables member countries to coordinate activities on both the global and national levels to bridge the operational gap present in a strictly global strategy, and to overcome the weaknesses inherent in development based on the actions of isolated national entities. Therefore, strengthening regional integration among GCC member states generates economic benefit. The empirical evidence presented in this paper provides an objective, quantitative measure of the benefits of enhancing economic cooperation in the Arabian Gulf region. The empirical results suggest, *ceteris paribus*, that promoting economic cooperation among GCC member states enhances the technical efficiency of member countries by approximately 15 percent. Thus, our growing understanding of the GCC model tells us the process of enhancing economic cooperation generates economic gains and that there are still large potential gains from the continuation of the process in the Arabian Gulf region.

**Table (1):  
Gulf Cooperation Council Countries,1992**

Country	Population (millions)	Gross Domestic Product per Capita (U.S. dollars)	Gross Investment Per Capita (U.S. dollars)
1. Bahrain	0.54	8309	2878
2. Emirates	2.01	17414	4268
3. Kuwait	1.4	15506	5531
4. Oman	1.62	7092	1205
5. Qatar	0.52	14371	2734
6. Saudi Arabia	15.14	7999	1964
<b>Total</b>	21.23		

**Table (2):  
Estimated Frontier Functions**

Dependent Summary Variable a	Statistics Constant total investment/labor MO&F			Adj R-sq F-value
	Aigner-Chu deterministic frontier b Output/Labor	4.517 {11.882}	0.558 {11.510}	0.008 {3.620}
Stochastic Frontier c Output/Labor	4.517 {145}	0.558 {136}	0.008 {13}	Scale 0.337

a Variables are in logarithms.

b The statistics in parentheses are t-values.

c The numbers in parentheses are chi-square statistics.

**Table (3):**  
**Estimates of the effect of the establishment of**  
**GCC on technical efficiency**

Functional specification	Statistics		F-value
	Constant (t-statistics)	GCC (t-statistics)	
<u>Aigner-Chu deterministic frontier</u>	0.543 {18.688}	0.083 {2.308}	5.326
<u>Stochastic frontier</u>	0.549 (18.688)	0.084 {2.308}	5.327

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