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How Open are Arab Economies? An Examination with the CTI Measure

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Abstract

In empirical trade openness studies where trade openness is usually measured as (X+M)/GDP, most Arab countries, particularly larger economies, such as Algeria and Egypt, are determined to be closed to the advantages of world trade. This paper uses a new measure of trade openness, the composite trade intensity (CTI) measure, suggested by Squalli and Wilson (2006) to reconsider the question of Arab country trade openness. The paper suggests that when trade openness is measured using CTI, many Arab economies, particularly the larger ones, are not as closed to the benefits of trade as traditionally thought.

Keywords: Arab trade openness; composite trade intensity.

JEL Classification: F10; F43.

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How Open are Arab Economies?

1 Introduction

A vast literature investigating aspects of the relationship between trade openness and income growth exists. There is strong theoretical support grounded in classical, neoclassical and endogenous growth theory that increased trade leads to higher incomes. This theoretical literature has spawned an extensive empirical literature aimed at testing for evidence in support of the theory. One strand involves testing the export-led growth (ELG) hypothesis using mostly standard econometric time-series procedures. The results from these many studies are mixed, although most find evidence of some support for the contention that exports contribute to economic growth.[1] In the ELG literature, a very narrow definition of trade openness is used: exports' share, or manufactured exports' share of income and their relationship with economic growth.

A second strand uses various production function frameworks. Important examples include Edwards (1992, 1998) and Frankel and Romer (1999). In these studies, trade openness measures are included as additional explanatory variables in the regression models. The trade openness measures tend to be narrow and those typically used are either X/GDP, M/GDP, or $(X+M)/GDP$, usually described as trade intensity (TI). Again the results from this literature are mixed. Generally, cross-section studies tend to offer greater support for the proposition that trade openness matters compared to time-series studies.

The inconsistent results emerging from these studies have prompted Frankel and Romer (1999) to note that "despite the great effort that has been devoted to studying the issue, there is little persuasive evidence concerning the effect of trade on income" (p. 379). It is our contention that part of the explanation for this lack of conclusive evidence is due to the inappropriate way in which trade, defined in terms of trade openness, is measured in the empirical literature.

[1] See Giles and Williams (2000a) and (2000b) for a review of the empirical literature.

In what follows, we use an alternative approach suggested by Squalli and Wilson (2006) that reflects more accurately the income generating benefits derived from trade openness to test just how open are Arab economies. To this end, the paper is organized as follows. Section 2 describes the popular measures of trade openness used extensively in the literature. Section 3 introduces an alternative measure of trade openness. Section 4 provides some robustness tests of the new trade openness measure. Section 5 concludes.

2 Measuring Trade Openness

Trade openness has been measured in various ways in the hundreds of studies investigating the issue, but most measures share a common feature; they express trade in terms of its share of income for a given country. Table 1 provides a summary list of several of the more common measures of trade openness that have been used. The table lists the three most popular and traditional measures: M/GDP; X/GDP; and $(X + M)/GDP$; plus several alternatives that have been suggested to deal with outliers. In addition Alcalá and Ciccone (2004) have argued recently that the standard measure of trade openness, TI, can yield an estimate on income that is biased downwards because of the impact of non-tradeables on productivity. Hence, they suggest that nominal trade be divided by purchasing-power adjusted income, or real GDP.

Irrespective of the trade openness measure used, in each case, the various measures provide a method for determining how open an economy is to world trade and the income growth benefits that flow from trade. Put simply, the higher is, for example, TI for a particular country, the more open its economy to trade benefits. Table 2 provides TI measures and resulting rankings for a selected number of Arab countries using trade and income data for the year 2000, obtained from the Penn World Tables (PWT) (Heston et al; 2002). The top three Arab countries according to the TI measure are Jordan, Yemen, and Tunisia. That is, these are the three Arab economies most open to trade. Hence these countries ought to, theoretically, derive considerable benefit from trade in generating income.

One advantage of using TI-based measures of openness is that they are not contrived.[2] Using TI measures, which are based on trade and income level outcomes achieved by various countries, it is usual practice to represent countries as being on an open to closed continuum. At the very open end are economies such as Jordan. As we move along the continuum, we move from very open, to open, to less open, to less closed then closed economies. By symmetry, those countries at the bottom end are deemed to be very closed and unable to take advantage of the income growth benefits of trade. According to Table 2, the bottom three and most closed Arab economies are: Egypt, Lebanon, and Algeria. That is, using this standard TI measure, one of the Arab world's largest economies, Algeria, is a very closed economy.[3] It is closed in the sense that its trade share of total economic activity is very low by world standards and it is therefore closed to trade benefits. But how sensible is it to classify countries such as Algeria as closed economies? Moreover how sensible is it to use other related measures listed in Table 1 as the indicators of trade openness?

3 An Alternative Approach to Measuring Trade Openness

The obvious weakness in using TI, or its related alternatives listed in Table 1, is that they are one-dimensional measures of trade openness. They look only at the relative position of a country's trade performance compared to its domestic economy. That is, they focus on the question of how large is the proportion of a country's income associated with international trade. The weakness of these measures lies in their inability to consider another important dimension of trade openness, that being how important is the particular country's trade level to world trade. Put another way, they fail to take into account a country's openness to total world trade.

Consider a set of countries, $j = \{1, 2, \ldots, n\}$, where country $i \in j$, then country i's relative

[2]This is in contrast to the trade policy openness measures used by other researchers such as the arbitrary binary (1,0) measure suggested by Sachs and Warner (1995).

[3]The most recent estimates rank Algeria's economy as the third largest Arab economy after Saudi Arabia and Egypt with a real GDP estimated at $235 billion and a worldwide ranking of 40th out of 233 countries (Source: CIA World Fact Book, https://www.cia.gov/cia/publications/factbook/rankorder/2001rank.html).

world trade intensity ($RWTI_i$) can be expressed as:

$$RWTI_i = \frac{(X+M)_i}{\sum_{j=1}^{n}(X+M)_j} \tag{1}$$

representing country i's total trade relative to total world trade. Table 2 provides measures and resulting ranks for each country in terms of a country's relative share of international trade. The three biggest trading countries in this sample of Arab countries are: Algeria, Egypt, and Morocco. That is, these are obviously open economies in terms of the extent to which each one trades with the rest of the world. By comparison their respective TI ranks are as follows: Algeria 90th, Egypt 123rd, and Morocco 85th. Thus we have a very different group of countries ranked as the most open using this second-dimensional measure of trade openness, RWTI, compared to TI, but each one of these three countries is ranked very lowly in terms of its TI.

From a theoretical point of view, the income benefits of trade are generated irrespective of whether a country enjoys a relatively large or small TI, so long as it trades with the rest of the world. Therefore when trade openness is measured only using the TI or related measures, it overlooks this second important dimension of trade openness which captures the income generating benefits associated with trading relatively heavily with the rest of the world. In what follows we suggest an alternative way of measuring trade openness combining both dimensions: TI and RWTI.

Trade openness is a two-dimensional concept. Both dimensions capture, in a different way, the extent to which a country's economy is linked to international economic activity. The first dimension involves measuring the proportion of a given country's total income that is linked to international trade and may be represented by TI and its related measures listed in Table 1. Country i's trade intensity may theoretically be measured in the range:

$$0 \leq (X+M)_i/GDP_i \leq \infty$$

Measures greater than unity indicate that the country's level of international trade exceeds its income. Such countries often perform minimal value adding on imports which are then re-exported.

Alternatively, some countries may heavily specialize in products in which they possess a comparative advantage, while extensively sourcing many other goods and services from the rest of the world. In either case, these countries are described as very open. By contrast, in cases where $(X+M)_i/GDP_i$ approaches zero, then trade represents a small proportion of a country's income and such countries are typically described as very closed.

The second dimension of trade openness involves the relative contribution that a country makes to total world trade and is measured by $RWTI_i$. The larger is $RWTI_i$, the bigger is the country in world trade, that is the more open is the country's economy to world trade in relative terms to all other countries. The closer is this measure to zero then the less the country trades with the rest of the world and the more closed off from world trade the country is. Importantly, if one country is able to increase its relative world trade intensity, then there must be a fall in the rest of the world's combined share of world trade.

By combining TI and RWTI, Squalli and Wilson (2006) derive a composite trade intensity index (CTI) which they show may be calculated as follows:

$$\begin{aligned} CTI_i &= \frac{1}{\bar{x}}(RWTI_i \times TI_i) \\ &= n(RWTI_i \times TI_i) \\ &= \frac{n(X+M)_i^2}{GDP_i \sum_{j=1}^{n}(X+M)_j} \end{aligned} \tag{2}$$

where $\bar{x}$ represents the mean of the RWTI ratios. By using CTI, TI adjusts to take account of the relative importance, or openness, of a country to world trade. Larger Arab trading countries like Algeria and Egypt will see their trade openness measures raised substantially compared to the standard TI measure. CTI will, therefore, more accurately capture the income generating benefits that come from trade openness for these Arab countries, whether trade openness is sourced from TI or RWTI. Table 2 includes CTI measures for the sample of Arab countries. The top three countries ranked by CTI are Algeria, Morocco, and Tunisia. This new modified trade openness measure, CTI, is therefore able to capture both dimensions of international trade openness and combine

them to give a more meaningful measure of trade openness.

4 Robustness of the CTI

To assess the robustness of CTI in determining Arab economy openness, we perform additional tests. Using several additional data sets, we verify the robustness of the world rankings by comparing the performance of the TI, RWTI, and CTI measures. There is no single, consistent data set providing trade and income data for all countries of the world. Instead, there are several different data sets in existence that include different country samples for different time periods. The first data set, used in the previous sections, is the PWT data, which includes trade (X+M) and GDP data for 136 countries for the year 2000. The second data set used is the World Economic Forum Database (Lopez-Claros et al., 2005), which comprises data on exports, imports, and GDP for 117 countries for the year 2004. The third data set used is the World Bank's World Development Indicators (WDI) for 2000, which includes data on exports, imports, and GDP for 171 countries.[4]

The first test involves comparing the pattern of scatter plots of TI against RWTI using each data set. Figure 1b is a scatter plot generated using the WEF data set, whereas Figure 1c is generated using the WDI data set. Figures 1b and 1c are very similar to Figure 1a, which is generated from the PWT data set.

In summary, the scatter plots represented by Figures 1a, 1b, and 1c are similar and exhibit the properties of a convex distribution which is consistent with the theoretical stipulations described by Squalli and Wilson (2006). It is also important to note that most countries are close to the origin with respect to the RWTI. Furthermore, no countries are observed farther outward from the origin as the properties of the TI and RWTI measures do not permit that.

A comparison of country rankings using the TI, RWTI, and CTI measures across the two additional data sets reveals results which are consistent with those reported for the PWT data set. For instance, as reported in Tables 3 and 4 and consistent with the PWT data set, Algeria ranks

[4] Although the rankings and scores are calculated for all countries in these samples, only a selected number of Arab economies are reported.

as one of the most open Arab economies according to the CTI. According to the WEF data set, Table 3 indicates that the United Arab Emirates is considered to be the most open under both the TI and CTI measures. Under the WDI data set, Table 4 shows that this top ranking goes to Saudi Arabia. Algeria is the second most open Arab economy when using the WEF data and the third most open when using the WDI data.

The second robustness test involves substituting the alternative measures of trade openness listed in Table 1 for TI in Equation 2 and checking the resulting cross-correlations. As summarized in Tables 5 and 6, we find that most of the openness measures discussed in Table 1 are highly positively correlated, although the real TI measure exhibits relatively lower correlation values, ranging between 0.68 and 0.82, due to substantially higher real GDP values for most countries after adjusting for purchasing power parity.[5] This suggests that the ranking of countries using any of the alternative measures listed in Table 1 will yield results that are similar and consistent with the TI measure.

5 Concluding Remarks

Theoretically, trade openness matters. However, the empirical literature testing the trade openness-income hypothesis has been less conclusive. It is our contention that part of the reason for the sometimes contradictory empirical results is the inappropriate method used to measure trade openness, usually measured as TI or its closely related alternatives listed in Table 1. However, all these measures suffer from the same problem; they capture only one dimension of trade openness, the dimension linking trade to domestic income.

The income growth advantages of trade are also derived by economies that may have low TI measures but trade heavily with the rest of the world. This paper uses an alternative measure, CTI, suggested by Squalli and Wilson (2006) to obtain more accurate measures of trade openness. Irrespective of which data set is used, larger Arab countries such as Algeria and Egypt, traditionally

[5] Correlation tests are not completed using PWT data set because of export and import data constraints. Similarly, the real TI measure is excluded for the WDI data set.

described as closed economies when trade openness is measured by TI, are now substantially more open and are much closer to median trade openness measures, using CTI. By comparison, smaller Arab countries such as Jordan and Mauritania see their trade openness measures fall substantially when CTI is used.

The compelling contribution of this paper has been to reconsider the question of trade openness in Arab countries by using CTI, a new more complete and more accurate composite measure of trade openness; a measure that more sensibly represents the degree of true trade openness. By combining both the trade intensity of a given country with its relative share of world trade, we have created a composite trade intensity measure that is better able to classify the degree of trade openness enjoyed by Arab countries. The paper suggests that traditional perceptions concerning the relative trade openness of some larger Arab countries may require reconsideration. According to the CTI, many Arab economies are not as closed to the advantages of trade as has been previously thought.

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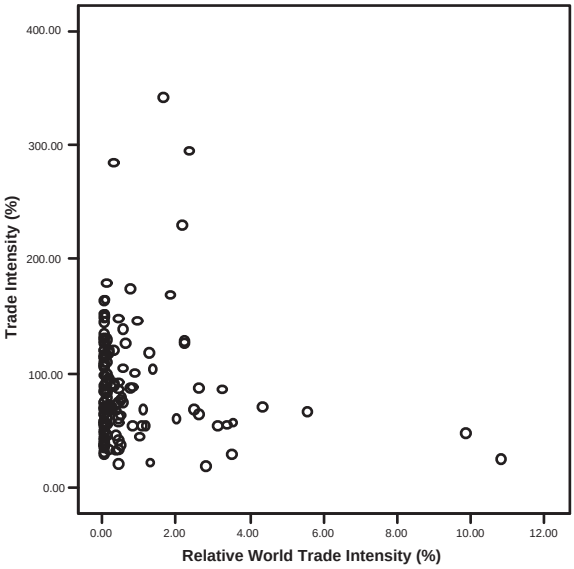
Table 1: Measures of Trade Openness

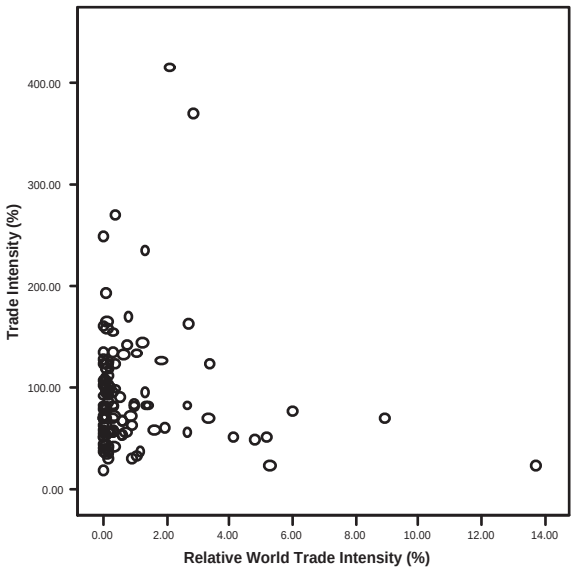
Measure	Definition
M_i/GDP_i	Import trade intensity; measured as imports (M) divided by country i's nominal income (GDP)
X_i/GDP_i	Export trade intensity; measured as exports (X) divided by country i's GDP
$(X+M)_i/GDP_i$	Trade intensity (TI); measured as exports and imports divided by country i's GDP
$1-[(X+M)_i/2GDP_i]\times 100$	Adjusted trade intensity; and alternative method for handling outliers originally suggested by Frankel (2000)
$M/GDP_i-(1-GDP_i/\sum_{i=1}^{k}GDP_i)$	Adjusted trade intensity; a modification to the Frankel (2000) approach, suggested by Li et al. (2004)
$(X+M)/rGDP_i$	Real trade intensity; where the denominator is purchasing power parity adjusted GDP (real GDP) following Alcalá and Ciccone (2004)

Table 2: PWT Trade Openness Measures and Ranks (2000)

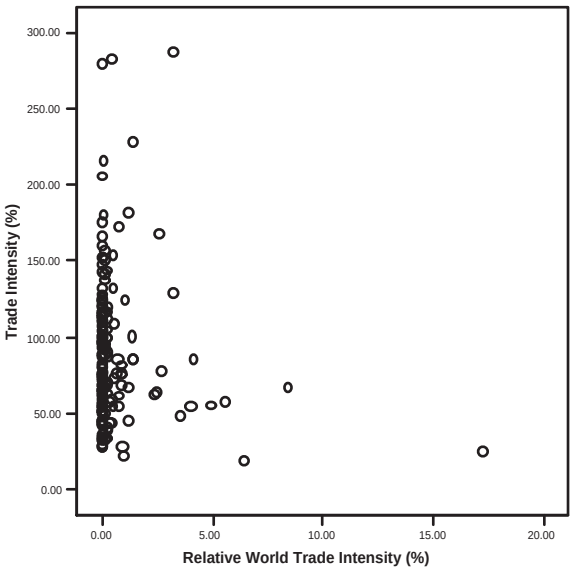
Countries	(X+M)/GDP	Rank	RWTI	Rank	CTI	Rank
Algeria	64.35	90	0.502	39	4397.08	43
Egypt	38.81	123	0.460	41	2428.66	56
Jordan	110.96	36	0.098	72	1473.70	65
Lebanon	50.83	110	0.056	92	389.47	100
Morocco	68.41	85	0.355	51	3303.47	50
Syria	68.59	84	0.203	60	1889.69	62
Tunisia	91.58	53	0.263	57	3271.14	51
Yemen	91.95	52	0.088	78	1094.34	76



(a) PWT Data (n=136)



(b) WEF Data (n=117)



(c) WDI Data (n=171)

Figure 1: Trade Intensity and Relative World Trade Intensity

Table 3: WEF Trade Openness Measures and Ranks (2004)

Countries	(X+M)/GDP	Rank	RWTI	Rank	CTI	Rank
Algeria	71.20	73	0.268	50	2234.30	51
Bahrain	158.50	11	0.079	69	1461.67	59
Egypt	57.97	86	0.206	53	1400.45	60
Jordan	124.50	25	0.063	75	920.12	67
Kuwait	97.10	43	0.233	52	2642.55	48
Morocco	57.40	90	0.132	59	888.00	68
Qatar	87.50	50	0.115	63	1178.51	62
Tunisia	92.51	48	0.122	62	1322.67	61
United Arab Emirates	169.80	7	0.752	31	14931.51	19

Table 4: WDI Trade Openness Measures and Ranks (2000)

Countries	(X+M)/GDP	Rank	RWTI	Rank	CTI	Rank
Algeria	63.77	116	0.228	50	2484.40	53
Bahrain	151.57	18	0.081	72	2090.84	58
Egypt	39.18	156	0.260	44	1742.41	66
Jordan	110.23	49	0.062	78	1172.44	73
Kuwait	88.24	76	0.218	51	3289.79	45
Lebanon	50.75	139	0.056	81	488.22	97
Libya	51.02	138	0.118	63	1025.50	74
Mauritania	96.2	66	0.006	145	99.33	138
Morocco	68.97	104	0.153	55	1808.84	64
Oman	89.07	73	0.118	62	1802.82	65
Saudi Arabia	68.55	106	0.861	26	10088.09	30
Sudan	29.73	165	0.024	106	123.13	131
Syria	67.81	109	0.082	71	945.14	77
Tunisia	91.85	70	0.120	61	1878.57	63
Yemen, Rep.	77.57	87	0.049	86	648.62	86

Table 5: Correlation Matrix (WEF Data Set)

Variable	M/GDP	X/GDP	TI	Andersen	Li et al.	$(X+M)/rGDP$
M/GDP	1.00					
X/GDP	0.91	1.00				
TI	0.97	0.97	1.00			
Andersen	0.91	0.94	0.95	1.00		
Li et al.	0.99	0.90	0.97	0.89	1.00	
$(X+M)/rGDP$	0.68	0.82	0.77	0.73	0.68	1.00

Table 6: Correlation Matrix (WDI Data Set)

Variable	M/GDP	X/GDP	TI	Andersen	Li et al.
M/GDP	1.00				
X/GDP	0.77	1.00			
TI	0.93	0.94	1.00		
Andersen	0.86	0.95	0.96	1.00	
Li et al.	0.99	0.76	0.93	0.85	1.00