Topics in Middle Eastern and African Economies
Proceedings of Middle East Economic Association
Vol. 22, Issue No. 1, May 2020

EXPORT SOPHISTICATION FOR MENA COUNTRIES

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Extended Abstract

Economic development is the process of structural transformation as countries' economic structure diversify from agriculture and manufacturing to service sector. In order to ensure this transformation, and hence, stable growth, economies should upgrade their productive structure, moving from lower to higher value-added products. Developing countries may use the advantage of being the follower, i.e., learning know-how and spillover effects to transform the production facility to higher sophistication levels. Open economic structure further increases diffusion of technology from the developed world. However, exporting more sophisticated products is another level together with the competition in the global markets. Specialization on some specific products may provide productivity whereas some may not which highlights the importance of good governance by choosing optimal policies. An index for the product complexity (PCI) is designed by Hausmann et al. (2011) that calculates the knowledge intensity of a product by considering the knowledge intensity of its exporters. In the same manner, economic complexity index (ECI) measures the knowledge intensity of an economy by considering the knowledge intensity of the products it exports. These annual indices enables country and product comparisons in terms of complexity and hence provides information for policy-makers.

This study measures export sophistication for Middle East and North African countries (MENA) to make a comparison between region countries for the period of 2004-2016. We also examine the effect on export sophistication on economic growth for MENA region and confirm Hausmann et al. (2007) that export goods associated with higher productivity grow more. There is a vast literature regarding the importance of product diversification in exports, especially for developing country groups in reducing export fragilities and contributing to economic growth. However, it is becoming more dominant in the relevant literature that the technological density of the export basket, rather than product variety, affects economic growth. One of the main results of these studies is that the effect of export product diversification on economic growth depends to a large extent on how production concentrates on sophisticated products (Rodrik, 2006; Hausmann et al., 2007; Di Maio and Tamagni, 2008; McMillan and Rodrik, 2011). Another relevant result is that countries are more indispensable and powerful in international production / trade relations together with the production of more sophisticated products rather than homogeneous products (Besedes and Prusa, 2006; Brenton et al., 2010; Corcoles et al., 2014). There are several studies that agree on the effect of sophistication on growth (Hidalgo and Hausmann, 2009; Hausmann and Hidalgo, 2011) whereas the initial paper to measure export sophistication do not observe strong relationship using a similar measurement (Lall et al., 2005). Jarreau and Poncet (2012), investigating the link for Chinese provinces, find positive impact of export sophistication on growth. Grancay et al.

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(2015) examine the validity of the link during economic crisis and inflation and confirm the link for 206 countries in the period 2004-2013. Lederman and Maloney (2012) also confirm that "what you export matters". Fortunato and Razo (2014) using 158 countries during the period 1996-2008 confirm the effect.

In this study, we empirically investigate the effect of export sophistication (*ES*) on GDP per capita growth using several control variables (*Y*) taking the relevant literature, i.e., initial GDP per capita, human capital, investment and institutional variable; and the specification of the country group into account, i.e., oil price, OPEC dummy.

$$Growth_{it} = f(ES_{it}, Y_{it})$$

PCI and the export values for 773 products for the period 2004-2016 are employed from MIT's Observatory of Economic Complexity (https://oec.world/en) and (https://oec.world/en/resources/data), successively. PCI is not constant but changes each year. Hausmann et al. (2014) explains that PCI ranks the degree of capabilities required by a product that is measured by its diversity and ubiquity. Diversity is defined as the amount of embedded knowledge that a country has. Ubiquity is defined as the number of countries that make a product, such that, the lower the ubiquity, the more complex the product is. Oil prices is OPEC basket price (https://www.opec.org/opec_web/en/data_graphs/40.htm). The rest of the data are obtained from World Bank. As for institutional variable, regulatory quality (RQ) is used which reflects perceptions of the regulatory success of the government. GDP per capita (GDPPC) is constant US dollar with base year 2010. Gross secondary school enrollment rate is used as a proxy for human capital. Gross fixed capital formation as a ratio of GDP is employed for investment variable.

Export sophistication is calculated using PCI, using the methodology of Lectard and Rougier (2018), instead of Prody Index designed by Hausmann et al. (2007). It is suggested that this specification bypasses the circularity problem that rich tend to export rich-country products. Sophistication is simply the weighted average of PCI, where weights are the value shares of the products (*k*) in the country's (*i*) total exports:

$$ES_i = \sum_k \frac{x_{ik}}{X_i} PCI_k$$

As PCI is an index including negative numbers, we rescale the index to have a positive scale. SITC4 (Rev.2) classification is used for PCI.

Table 1 presents static analysis for the model using pooled OLS and fixed effect. For all regressions, export sophistication (*ES*) is positive and significantly effective on growth. This finding confirms Hausmann et al. (2007). The rest of the model is also consistent with the literature. Institutional variable, RQ, has positively effective, whereas oil price has negative impact on growth. These static analysis provide information about the long run relationship.

Table 1: Static Analysis

Dependent	(1)	(2)	(3)	(4)
	FE	FE	FE	Pooled
Sophistication	0.096**	0.231***	0.166***	0.067***
	(0.049)	(0.054)	(0.061)	(0.025)
Investment			0.0004	0.002***
			(0.001)	(0.001)
Human Capital				0.0002
				(0.0003)
Initial GDPPC				-0.004
				(0.005)
RQ	0.056***	0.062***		
	(0.018)	(0.017)		
Oil Price			-0.0003**	-0.0005***
			(0.0001)	(0.0001)
Constant	-0.034*	-0.111***	-0.036	0.009
	(0.019)	(0.025)	(0.029)	(0.039)
Crisis Dummy			-0.046***	-0.051***
			(0.012)	(0.011)
Oil Price*OPEC Dummy		0.0008***		
		(0.0003)		
Effect	country	country/time	country	no
R-sq	0.35	0.52	0.39	0.37
Observations	133	133	118	75

Note: *, **,*** denote significance at 10%, 5% and 1%, successively.

Table 2 provides dynamic analysis using GMM methodology. Export sophistication is again observed to be positively effective on growth. In the same manner, oil price is negatively and RQ is positively effective on growth. P-values for AR(1) and AR(2) autocorrelation tests in the first-differenced errors are provided in the lower section of the table. The results reflect that we reject the null hypothesis of no autocorrelation in the first order and we fail to reject the null hypothesis of no autocorrelation in the second order. Hence, it is observed that moment conditions for all GMM tests are valid. Dynamic analysis provides short run information for our model.

Table 2: Dynamic Analysis - GMM

VARIABLES	(1)	(2)	(3)	(4)	(5)
L.gdppcgr	0.518***	0.502***	0.474***	0.489***	0.483***
	(0.116)	(0.108)	(0.113)	(0.114)	(0.109)
L.esi	3.708**	4.978**	6.059***	5.070**	4.986***
	(1.743)	(2.106)	(2.187)	(2.004)	(1.901)
L.rq		-0.997**	-1.115***	-0.979**	-3.358**
		(0.404)	(0.426)	(0.388)	(1.588)
L.oilprice			-0.0244***	-0.0149	-0.0184**
			(0.00778)	(0.00955)	(0.00828)
crisisdummy				-2.857**	-2.721**
				(1.279)	(1.177)
esi_rq					5.603**
					(2.730)
Observations	137	137	137	137	129
Number of pid	12	12	12	12	12
AR(1)	0.012	0.011	0.016	0.012	0.007
AR(2)	0.962	0.903	0.928	0.613	0.960
Sargan	0.375	0.352	0.209	0.133	0.171

Note: Each model includes constant and time dummies. One-step estimator of GMM is used.

This study investigates the export sophistication of MENA countries for the period 2004-2016. The time series figures reflects a positive trend in the export sophistication of oil-exporters in the region. Israel and Turkey is observed to be the countries with the highest export sophistication. As an additional study to test the effect of sophistication on growth, static and dynamic models are utilized. Empirical findings are consistent with Hausmann et al. (2007) such that sophisticated production is generally associated with higher productivity and hence higher growth.

As many previous studies have shown us, this study also implies the importance of export sophistication on the strong and sustainable growth of countries. The policy implication of this fact is that developing countries should aim to produce sophisticated products to be competitive and converge to the level of per capita income of developed countries.

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