Time Series Analysis Choices for General and Vocational Education in Arab Economies

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Abstract:

The current research focuses on the analysis of the determinants of educational choices in Arab countries using time series. This is to reveal the likely model of choice between general and vocational training in these economies. The selected theoretical framework considers that educational choices are globally influenced by education and macroeconomic variables. These include unemployment, GDP growth, and GDP per capita. The empirical analysis is based on regression, time series analysis and causality tests as inspired by the above theoretical framework. The findings show different outcomes for each of the Arab countries as such revealed decisions depend globally on the macroeconomics and performance of education in each country. These economies show that vocational education accounts differently for the macroeconomic variables while few accounts but also differently, for the schooling performance. Even with these differences that are related to signs of the effects, the monitoring of vocational education versus general training in Arab countries needs to be pursued as this allows for a more balanced educational and employment systems.

JEL: I25, J68, M51

Keywords: Vocational education, Arab world, Time series.

I. Introduction

The existing literature refers to the effects of macroeconomic variables and outcomes from general education in the determination of the role of vocational education. It is well known that high economic growth leads to higher investments with higher enterprise creation and thus higher demand for skills and employment. Under this scenario, demand for vocational education is expected to increase. Any drop-out from general education might feed vocational education in this type of high economic growth. This sets the grounds for the existence of links between macroeconomic variables, outcomes from general and vocational education including skills and unemployment. The yearly variations in the economy leads to variations in the directions of the links between all these variables as yearly adjustments take place on the supply and demand sides of the economy.

The offers of training and educational programs need to be adjusted throughout years for the balancing of general and vocational education and to the job market needs (Mackinsey, 2012). Policy proposals aim to analyze these different types of education as to promote economic growth with focus on the school-to-work transition (Hanushek, Woessmann, & Zhang, 2011).

Major issues related to vocational education in Arab countries such as Algeria, Egypt, Jordan, Saudi-Arabia, and Tunisia, are already addressed in series of publications (ETF, 2014). The European Training Foundation (ETF) as an EU agency accounting for economic transitions in developing countries has promoted a large set of literature on series of Arab economies (ETF, 2014 and 2015).

In Morocco, the new employment plan takes into account the skill recovery and updating in addition to education. Vocational education in Morocco is provided by the public sector through the OFPPT (Office de la Formation Professionnelle et de la Promotion du Travail), with limited contributions of the private sector (ETF, 2002). In Tunisia, the vocational training is offered by the public sector through the Tunisian Vocational Training Agency (ATFP) and also by private vocational training institutions certified by the Ministry of Vocational Training and Employment (Centres de formations de Cadres en Tunisie, 2015). Similar institutions exist in other Arab countries.

In the sense of the present research, the assessment of knowledge and skills are considered of prime importance for the acquirement of abilities and their transformation into job acquisition and enterprise creation (Driouchi and Harkat, 2016).

The major empirical issues addressed in the present research concerns the determinants, both macroeconomic and educational that influence choices between general education and professional training within Arab countries. The previous study of Driouchi and Harkat (2016) considers Arab countries as one pool of countries and addresses only the significance of the dropout from school. Results show that only United Arab Emirates, Morocco, and Egypt have significant and positive coefficients regarding the relationship between the dropout rate and the ratio of vocational to general education.

The current research is assumed to be complementing this previous contribution through using time series analysis with all the macroeconomic and education variables cited.

The current paper introduces this issue throughout a literature review, followed by the theoretical framework and the empirical model applied. Finally, the attained results are introduced and discussed.

II. Literature Review

Previous research reveals that, in some sectors such as health and technology, vocational education shows a significantly higher impact. In the case of Austria, Germany, and Switzerland, a new model is developed and tested. This latter is a mix of vocational and general education. The results show a positive influence of this new type of education on macroeconomic variables in both Austria and Switzerland while no significant impact in found for Germany (Lukas, 2016). In order to address the inadequacies between education and training programs and to reduce the skill mismatch, ETF (2015) provides some initiatives. But, employment policies that support improved job prospects for the youth are still to be developed (ETF, 2015).

Some authors analyze the case of some Arab countries such as Egypt, Jordan, and Tunisia to evaluate the dynamics of unemployment. They also link unemployment to series of variables in a promising economic model (Ragui and Krafft, 2016). In the case of Morocco and Tunisia,

Bouoiyour, Dumas, El Merghadi, El Yacoubi and Hanchane (2008) have assessed the role of vocational training system and its impact on the development of these economies.

In the case of Gulf Cooperation Council (GCC), AlMunajjed (2012) observes the concern of shortage of skills that leads to higher unemployment rate. This issue is not avoidable even though there is high economic growth and high investment in education. Thus, the concern to be addressed is the interrelationship of the quality of vocational and training education services and their relevance to the labor market with emphasis on the required skills by the enterprises. The British Council (2013) addresses this issue throughout a professional workshop.

Series of debates about Arab countries moving toward the knowledge-based economic development need to be inducing shifts to more effective formation systems for skills (Schwalje, 2013). ILO highlights the non-satisfactory levels of productive employment in Arab countries even under heavy investment in education and technical programs. The contributions of ILO through reports (ILO, 2013a and ILO, 2013b) indicate that the likely growth of Arab countries is subject to the constraint of the costs of long-term unemployment that keep increasing and Arab countries need to enhance the enlargement of the skills needed for research and innovation. FEMISE report (2011) finds the importance and the role of vocational education in both demand and supply of skills and finds that personal individual choices are essential to guarantee the best learning path. However, research is still proceeding with studying skill mismatch to give recommendations to policy makers. Gamblin, Hogarth, Murphy, Spreadsbury, Warhust and Winterbotham (2016) and by Baião (2016) are the recent contributions to such an issue. But Hanushek et al. (2013) provides the most favorable theoretical guidance. Calero, Huertas and Bara (2016) is the latest publication dealing with education, age and skills. Earlier analyzes of Arab countries include the contribution of Heeti, & Brock, C. (1997).

The study of the determinants of education choices in Arab countries shows a strong correlation between the enrolment in vocational education or general education and wage differentials. Current statistics indicate lower contributions in professional education and vocational education within Arab economies. For instance, between 1999 and 2011, the percentage of technical education as a percentage from total enrolment in secondary programs in Algeria dropped out from 14.3% to 9.5% and in Morocco dropped out from m 7% to 6.1%. Also,

there is a conspicuous raise in public funding and investment for general education. (Mona and Fatma, 2008, Collins, 1997, UNESCO Regional Bureau, 2014).

Recent contributions in Arab countries about technical education try to understand the impact of this type of education on the growth and progress level on the individuals and society. Findings indicate that general education outperforms the vocational education in terms of the average rate of return. Still, on the macroeconomic scale, the vocational education and professional training could be more valuable to the economy (Mona and Fatma, 2008).

Within Arab countries, there is an absence of coordination between providers of training and ministries and this goes from the basic levels of education to the extent of employment services and professional training. Thus, enterprises face lack of skills in relation to adopting new technologies while youth face indecision in moving from education to work (Arab Forum on Development and Employment, 2008; Nour and Mohamed 2013 & Nour and Mohamed 2015). Vocational education is also explained by other factors that are income, public funding and investment in education. This helps understand the likelihood of the shortages among Arab countries in terms of level of education, its impacts on the labor market and other economic variables. Lebanon and other surrounding countries encounter an increase of the unemployment rate, mostly within youth and women since employers face a severe deficiency of skills. The Lebanese Center for Policy Studies discusses and interprets this issue by the deterioration of education, mainly the vocational type. Furthermore, there seems to be an avoidance of vocational professions, as they are perceived to lead to lower working conditions (Saif, 2012 and Hall, 2016 and Busemeyer, Cattane, Wolter, 2011 and AFD, 2014).

Empirical analysis of different policies regarding education within Arab economies enlightens the limitations and imperfections of professional training and vocational education. This is further explained by the lack and unavailability of data that leads to limiting the computation of indicators and indexes. Thus, evaluating the impacts of education on different sectors and on macroeconomic levels is also limited. This leads to imbalances and inequities in employment among sectors (UNESCO, 2014 and Masri, 2009).

III. Theoretical & Empirical frameworks

The selected theoretical framework accounts for macroeconomic variables and those related to education. It also accounts for the relationship between types of education and the children dropout from school. Promising conditions in the macroeconomic context relate to economic growth as they relate to lower unemployment within economies. Therefore, the need of vocational or general education depends on the enterprises' required skills. Previous empirical studies distinguish between general and vocational education as two separate variables. Malamud and Pop-Eleches (2008, 2010) develop a model based on regression analysis in order to examine the impact of these types of education on macroeconomic variables. Ragui and Krafft (2013 & 2016) develops a model that examines whether the risk of unemployment is reduced by the enrolment in general education. As this model is applied to Egypt, findings show a significant positive correlation between the increase in the rate of general education and the risk of unemployment. These results imply that the need of vocational education better meets the enterprise needs.

Another model is developed by Hanushek, Schwerdt, Wiederhold, Woessmann (2015). It analyzes the mechanisms and causes that relate education skills to the labor market outcomes. This latter model as well as other similar ones, uses cross-country comparison and gives better incentives to different impacts of education variables on economic growth (Caselli, 2004 and Hanushek, Woessmann, 2012).

A similar framework is used to analyze empirically the likely determinants of educational choices for Arab countries.

The countries under this study are: Algeria, Egypt, Jordan, Kuwait, Lebanon, Morocco, Qatar, Syria, Tunisia and United Arab Emirates, for the period between 1970 and 2015. The data used are from the World Bank Database. They include: enrolment in vocational education, enrolment in general education, GDP growth (GDPD), GDP per capita (GDPperCapita), unemployment (UNE), and children out of school (COS).

To analyze the determinants of the vocational to general ratio per each of the Arab countries, the following model is used.

$$\boldsymbol{Ratio_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \varepsilon_t}$$

The Ratio measures enrolment in vocational relative to that in general education, X_1, X_2 and X_3 are the macroeconomic variables representing respectively GDP growth, GDP per capita, and unemployment, with X_4 referring to the education variable (children out of school). These series have been made stationary and represented under their logarithmic values. As said, the variables represent yearly data for the period 1970-2015. The Coefficients β_i are simply the coefficients corresponding to each variable.

The second part of the analysis is based on time series approach. Yearly data for the ratio of vocational to general education are also used to test policy responses to the education and macroeconomic variables. This is further tested through Granger causality tests.

IV. Results

The attained results, based on the above empirical methods, are introduced in this section. They concern the descriptive statistics and time trends in variables and the hypotheses related to the significance of the coefficients using Ordinary Least Squares (OLS) Method, time-series analysis and the Granger Causality Tests.

1. Descriptive Statistics and Time Trends in Variables

Vocational to general education ratio as a measure of the proportion of enrolment in vocational education relative to enrolment in general education differs among Arab countries with values that range from 0.052 and 0.988. The lowest values are for Morocco and Qatar, with the highest value for the United Arab Emirates.

Table 1 introduces the results of the estimation of time trends in the variables included in the study with the estimated coefficient and the corresponding t-statistic (between parentheses).

Results indicate that the children dropout from school is significant for Algeria, Egypt, Kuwait, Morocco, Qatar, Syria, Tunisia, and United Arab Emirates. All these latter countries have a negative coefficient meaning that the number of children that leave schooling at early levels is significantly decreasing. For the rest of the countries, no significant trends are noticed.

Concerning the unemployment variable, it is significant for all Arab countries except Qatar. It has a negative coefficient with Algeria, Jordan, Lebanon, Morocco, and Tunisia. This indicates that within these Arab economies, the employment is increasing while for the countries with positive coefficient, it indicate higher rates of unemployment.

The GDP growth is only significant with, but with a negative coefficient, Jordan, Lebanon, Syria, Tunisia, and United Arab Emirates. But the GDP per capita measure is positively significant in all Arab countries.

The vocational to general ratio is significant positively in Egypt, Lebanon, Morocco meaning that through time, these countries noticed a significant enrolment in vocational education as a percentage from general education while the opposite applies for Qatar and Tunisia.

Table 1: Trends per variable per each of the Arab countries

	COS	UNE	GDPG	GDPperCapita	V/G
Algeria	-27.755 (-14.129)	-34.648 (-5.211)	-12.742 (-1.953)	36.179 (8.841)	6.905 (1.023)
Egypt	-17.958 (-6.427)	72.955 (6.838)	-8.599 (-1.119)	38.615 (30.447)	64.528 (3.129)
Jordan	-9.262 (-1.198)	-67.528 (-3.726)	-14.389 (-2.457)	41.522 (11.631)	13.948 (1.428)
Kuwait	-20.034 (-9.624)	24.984 (7.675)	-6.435 (-1.059)	39.393 (10.012)	9.118 (1.909)
Lebanon	8.479 (1.739)	-73.262 (-3.711)	-11.456 (-3.378)	25.947 (10.304)	50.378 (4.758)
Morocco	-23.355 (-10.098)	-68.949 (-7.588)	-7.337 (-0.786)	43.176 (23.636)	38.279 (6.263)
Qatar	-13.253 (-2.126)	1.966 (0.295)	-2.370 (-0.608)	29.273 (9.426)	-33.951 (-22.041)
Syria	-19.178 (-6.297)	22.699 (2.501)	-13.675 (-2.676)	32.474 (3.797)	9.252 (0.671)
Tunisia	-16.313 (-11.344)	-83.278 (-3.003)	-12.119 (-2.287)	41.749 (23.614)	-20.907 (-5.082)
UAE	-17.734 (-3.568)	53.077 (4.974)	-9.438 (-2.097)	60.478 (3.069)	-48.842 (-1.664)

These trends are already used for smoothing out the yearly series and making them stationary, before their inclusion in the regression and time series analyzes. The remaining attained results are introduced respectively for OLS regression and time series analysis and in relation to the three hypotheses.

2. Results from OLS estimation

The analysis of vocational to general education within Arab countries appears mainly to be under the effects of macroeconomic variables for all the economies without exception. But the school drop our rate is significant only for some of these economies.

Results in table 2 show that they are major variations among Arab countries. Unemployment appears to be driving vocational education in Algeria, Jordan, Morocco, and the UAE. Unemployment has negative effects on the ratio of vocational to enrollment in general education ration in Algeria, Jordan, and the UAE. Morocco is the only case where unemployment leads to higher ratio implying that higher employment leads to higher enrollment in vocational education.

GDP per capita appears to have influences in Egypt, Jordan, Lebanon, Morocco, Qatar and Tunisia with positive effect for all these latter countries except Jordan and Qatar. But, GDP growth affects negatively vocational enrollment ratio in only the UAE meaning that a 1% increase in growth leads to 0.1 % decrease in vocational enrollment. Vocational education in Lebanon and Qatar seem to be moving in the same direction with children that are out of school but Lebanon and Syria show the opposite trend. The most promising revealed vocational education policies are those of Jordan, Lebanon, and Morocco where macroeconomic determinants and education factors appear to be considered.

Table 2: Regression results of vocational to general ratio with education and macroeconomic variables:

	R-squared	Intercept	GDP per capita	GDP growth	Children out of school	Unemployment
Algeria	0.35	-0.680 (-3.692)				-0.363 (-2.468)
Egypt	0.204	-0. 910	0.137			

		(-6.584)	-2.816			
Jordan	0.45	4.074 -2.406	-1.041 (-3.379)			-1.565 (-2.019)
Kuwait	0.696	-1.674 (-13.376)			-0. 387 (-2.865)	
Lebanon	0.631	-1.995 (-4.814)	0. 298 -2.707		0.087 (2.322)	
Morocco	0.611	-2.741 (-5.537)	0.325 (2.705)			0.438 (4.649)
Qatar	0.923		-0.504 (-8.783)		0.181 -4.762	
Syria	0.144				-0.137 (-2.320)	
Tunisia	0.518	-6.337 (-3.116)	1.268 (3.907)			
UAE	0.438			-0.116 (-2.037)		-0.665 (-2.179)

3. Results from Time-Series Analysis

Dropout from school regarding children is a result of failure to pursue both primary and secondary education levels. For vocational education, it is mainly the concern of those who targets professional skills. Table 3 exhibits the time series analysis results as it shows time series patters that explains to which extent the macroeconomic as well as school variables responds to yearly changes in the general school performance.

Table 3: Outcomes of time series analysis for each of the Arab countries, Method: least squares estimation

Country	R-square	Durbin-Watson	Unemployment	GDP per capita	GDP growth	Children out of school
Algeria	0.995	2.518	0.169 (6.333)	0.191 (17.434)		
Egypt	0.980	1.624	0.419 (3.031)	0.159 (2.046)	0.156 (2.756)	0.068 (2.623)
Jordan	0.992	2.639		0.646 (5.322)	-0.095 (-2.589)	-0.156 (-3.300)
Kuwait	0.522	1.090	0.821 (3.208)	-0.444 (-19.848)	0.291 (2.059)	
Lebanon	0.768	2.445	-0.696 (-6.532)	-0.060 (-2.228)		
Morocco	0.634	1.871	0.608 (3.907)			-3.286 (-3.161)

Qatar	0.835	2.145		-0.448 (-57.015)	0.093 (2.705)	
Syria	0.234	0.608		-0.328 (-16.673)		-0.117 (-2.032)
Tunisia	0.376	2.343	-2.212 (-4.223)	0.412 (2.321)		
UAE	0.982	2.212	-0.164 (-5.627)	0.222 (26.361)	-2.031 (-5.773)	

Table 3 shows time series patterns that reflect the effects and the impacts of the vocational and general education on both education and macroeconomic variables throughout the years. It implies the extent to which these education choices have influenced different economies.

The dropout of children from school is significant for Egypt, Jordan, Morocco, and Syria, but only Egypt shows a positive coefficient, meaning that a portion of children who leave school, enroll in vocational education. This implies that Egypt is following the model based on relating changes in dropout from school to the enrolment in vocational education while it is not the case for other economies.

The time patterns between the vocational to general ratio and unemployment have a significant positive relationship in Algeria, Egypt, Kuwait, and Morocco while they have negative correlation in Lebanon, Tunisia and the United Arab Emirates. Positive relationship indicates that higher enrolment in vocational education lead to higher employment. Regarding the analysis of GDP per capita as an explanatory variable, it is significant will all the Arab countries, except Morocco, with negative coefficients in Kuwait, Lebanon, Qatar, and Syria. Finally, the GDP growth is positively significant in Egypt, Kuwait and Qatar as it is significant but negatively in Jordan and the United Arab Emirates.

4. Results of Granger-Causality Tests

This analysis of the causality and effects of the vocational and general education related to macroeconomic and education variables gives better understanding to policy makers regarding policy orientation. Results enable understanding of the previous policies with their implication and contribution in the economic prosperity. Table 4 provides the results of the F-statistic values for each test with their corresponding probabilities with analysis made with a confidence interval of 10%.

Table 4: Granger-Causality F-Values

Null Hypothesis	Algeria	Egypt	Jordan	Kuwait	Lebanon	Morocco	Qatar	Syria	Tunisia	UAE
COS does not Granger cause V_G	8.316 (0.001)	n/a	3.037 (0.086)	3.427 (0.058)	7.233 (0.033)	0.616 (0.547)	0.300 (0.744)	0.688 (0.511)	0.253 (0.779)	1.636 (0.232)
V_G does not Granger cause COS	1.123 (0.334)	n/a	0.050 (0.951)	0.632 (0.544)	0.811 (0.495)	0.623 (0.939)	4.567 (0.023)	4.627 (0.019)	0.069 (0.934)	0.013 (0.987)
GDPG does not Granger cause V_G	0.528 (0.598)	0.109 (0.897)	0.356 (0.707)	0.105 (0.904)	2.557 (0.139)	2.874 (0.080)	0.398 (0.686)	0.192 (0.828)	1.105 (0.353)	2.541 (0.128)
V_G does not Granger cause GDPG	1.510 (0.245)	1.542 (0.239)	7.236 (0.007)	1.058 (0.449)	1.463 (0.287)	1.798 (0.191)	2.098 (0.193)	0.888 (0.437)	1.779 (0.197)	0.036 (0.965)
GDPperCapita does not Granger cause V_G	1.116 (0.340)	3.653 (0.046)	0.788 (0.467)	1.518 (0.239)	2.474 (0.134)	1.931 (0.162)	1.556 (0.226)	0.758 (0.478)	0.237 (0.790)	1.002 (0.383)
V_G does not Granger cause GDPperCapita	1.080 (0.352)	4.305 (0.029)	3.015 (0.069)	5.696 (0.009)	0.499 (0.621)	2.549 (0.094)	0.820 (0.449)	1.419 (0.259)	1.981 (0.157)	0.000 (0.999)
Une does not Granger cause V_G	0.017 (0.983)	14.989 (0.014)	8.357 (0.059)	0.182 (0.836)	0.954 (0.418)	1.959 (0.180)	0.263 (0.773)	6.464 (0.082)	3.668 (0.074)	1.023 (0.408)
V_G does not Granger causeUne	1.327 (0.308)	0.264 (0.781)	2.904 (0.199)	0.412 (0.675)	1.409 (0.289)	2.027 (0.171)	0.931 (0.417)	0.077 (0.927)	0.458 (0.648)	0.125 (0.885)

The results indicate that children dropout from school leads to the enrolment in professional training for Algeria, Jordan, Kuwait, and Lebanon. In Qatar and Syria, students leave the general education earlier to join the vocational one. Morocco and Jordan are the only countries that have a cause-effect relationship between the increase of vocational education and the growth of the GDP. Any increase of GDP in Morocco results in a higher enrolment in vocational education while in Jordan, any increase in the enrolment in vocational education leads to economic growth. Further, higher enrolment in vocational education significantly leads to higher GDP per capita for Egypt, Jordan, Kuwait, and Morocco while the opposite exists for Egypt. Regarding unemployment, higher rates significantly lead to the enrolment in vocational education in Egypt, Jordan, Syria, and Tunisia.

V. Discussion and Conclusion

The above regression model and time series patterns indicate that some Arab countries are implicitly linking their vocational education ratio to some macroeconomic and education variables. But, there are variations by country with regard to the direction of effects and the pertinent macroeconomic variable. These results are different from the ones attained in Driouchi & Harkat (2016). Causality tests show that policy practices for these economies do not seem to be clearly linking the difference of yearly dropout from general education to enrolment in professional training.

This research contributes to further understanding of the implications of the vocational and general education on macroeconomic variables. Each of the Arab countries has a different model in which the number of significant variables and sign of correlation differs. This implies that policy orientation differs from a country to another such as the balance between the two types of education within different economies depart.

Previous contributions have already established the linkages between economic growth and types of educations, Afzal et al. (2010) using time series investigation in Pakistan. Furthermore, Devi and Devi (2014) analyze linkages between governments spending and number of school in Pakistan with enrolment in education with results revealing a positive relationship. The contribution of Agodini, Uhl and Novak (2004) about enrolment in vocational secondary education is on the same line. It approves the need of further economic research to promote new and continuous policies for each Arab country to ensure adjusting linkages for both shorter and longer terms between school dropout, unemployment and economic growth.

New policies regarding the increase or decrease of professional training among countries need to take into account all the above elements and concerns with highlights on each level of education. The skills and know-how update within different economies should add desired capabilities for non-educated individuals as for educated ones. Thus, the additional knowledge should be in accordance with skills required by enterprises and also adjusted to the potential users and learners.

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