THE ROLE OF HIGHER EDUCATION ON ECONOMIC DEVELOPMENT: THEORY AND EMPIRICAL EVIDENCE FROM THE MENA COUNTRIES

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Abstract: The purpose of this paper is to investigate the role of higher education on economic development in the MENA countries. The main question this paper attempts to answer is whether higher education contributes to sustainable development in developing economies. Although the question has been extensively studied by the literature, the conclusions are often found to be contrasting. In other words, the body of empirical evidence does not provide any conclusive positive role of higher education. In this context, we revisit the evidence by (i) accounting for development path of each economies and (ii) employing endogenous growth model. In general, we find that the role of higher education on economic growth is different across countries depending on the country's position on economic development.

Keywords: Economic growth, neoclassical growth model, income convergence, relative clubs of convergence, panel data.

Introduction and Background:

Recent literature on higher education and its role on economic growth prompted an increasingly important question on whether governments should spend on higher education (Aghion et al, 2009). This question, despite the wider interest in the relationship between higher education and economic growth, has resulted conflicting conclusions and little empirical evidence in favour of the positive role higher education plays in economic development.

Nonetheless, a number of studies in the literature acknowledge the important role of higher education, and universities, in improving the economic performance of a country. For example, the literature in Holland *et al* (2013), Benos and Zotou (2013), Holmes (2013), Aghion*et al* (2009), Bils and Klenow (2000), Judson (1998), Gremmell (1996), Benhabib and Speigel (1994), amongst others, provide empirical evidence on the positive role of higher education on economic growth. In this context, economic theory

suggests the existence of a number of channels and transmission mechanisms through which higher education may affect economic development. In addition to personal return to ones' human capital, higher education may produce several externalities such as technological innovation, research and development making, thus increasing capital and labour productivity leading to higher economic growth.

Thus, the role of higher education institutions, such as universities, is of crucial relevance for higher education to be effective for economic growth. The role of higher education institutions, universities in particular, can be viewed through the following channels: (i) in producing skilled and highly trained labour, (ii)in the role of research and development activities and collaboration with industries and (iii) the entrepreneurial engagement and preparing future graduates to become business leaders through setting up start-up businesses. These roles of higher education institutions have been key in improving productivity in the economy according to Barrell (2010). Indeed, many of the developing economies have focused in the last 25 years their attention to the economic potential of universities and research institution as argued by Kruss et al (2010) and Pillay (2010). There is, however, no wider consensus on whether higher education institutions, and by extension, higher education might stimulate economic growth in the long run and the empirical conclusions can be described -at best- as fragile (Holmes, 2013;Aghion*et al* (2009)).

This lack of conclusive and strong evidenceis generally attributed tovarious reasons. First, many of the previous research raised concerns regarding the quality of the proxies used by researchers to capture the effect of education generally. This has produced consistently contradicting conclusions on the role of education, and more importantly, higher education. For example, Cohen and Soto (2007) argue that measurements of human capital in general suffer from conceptual and empirical problems. At the conceptual level, the literature does not offer any clear definition on how human capital and its types should be represented. Indeed, it has been often the case that years of schooling or the average years of educational attainment are the common proxies to capture the role of human capital in economic growth. The use of such proxies may lead to erroneous conclusions about the role the various types of education since the years of schooling do not necessarily capture the contribution of higher education. This is because not all members of the society chose to acquire a higher education degree. Moreover, these proxies assume that the effect of primary education is the same as the effect of higher education (including PhD and Masters levels), which does not seem to capture the effect of the mechanism to which investment in education is linked to economic growth (Aghion *et al*, 2009). In

addition, the empirical literature such as in Cohen and Soto (2007), De la Fuente and Domenech (2002, 2006) and Krueger and Lindahl (2001), show that the data in many countries suffer from quality and reliability issues leading to measurement errors.

Second, the effect of higher education may be affected by how developed, fast-growing and rich is the economy. This is because, as argued by Aghion et al (2009), a country's education investments are non-random, which implies that the economies with better infrastructure and superior institutions may find it easy to expand on their higher education spending. In this case, economies with low economic growth or growing by slower rates may experience a negative relationship between economic growth and higher education spending (Bils and Klenow, 2000). In other words, the speed at which an economy grows reflects the rate at which it absorbs available technology, and human capital is no different in this case. Thus, one may assume that the impact of higher education may be related to the convergence rate of an economy to the steady state level. In this context, one may investigate the performance of higher education by accounting for the position of the long run time path of growth of an economy.

In this paper, we focus on the latter issue. We propose a two-stage approach to study the impact of higher education on economic growth. We first study the dynamic nature of economic development in the MENA countries by means of the concept of income convergence.The concept of income convergence studies whether a set of economies converge to the same long run level over time. The concept has been extended to include several types of convergence including absolute and conditional convergence [Barro and Sala-i-Martin (1992); Bernard and Durlauf, (1996)], beta and sigma convergence [Barro and Sala-i-Martin (1992), Baddeley et al (2006)] and more recently the concept of clubs of convergence. This latter type of convergence refers to two variations that exist in the recent literature. The first is introduced by Chatterji (1992) and Quah (1997), which refers to the presence of two clubs that distinguish between rich and poor economies. The second variation has been introduced recently by Phillips and Sul (2007) that allows modelling and analysing economic transition behaviour under the presence of common growth characteristics consistent with neoclassical growth model.

The Phillips and Sul (2007) approach, PS hereafter, provide a very general framework that captures both, the overall convergence and clubs of convergence. Moreover, the number of clubs is defined by the number of steady states that may exist and to which a group of economies of similar convergence rate can be clustered in one group. The approach also allows estimating the speed of convergence. This latter is very important feature

since it allows accounting for the position of the long run time path of growth of an economy. The second stage involves investigating whether the role of higher education differs across economies depending on how fast these economies grow for each economy.

The remainder of this paper is organized as follows. Section 2 outlines the econometric model and introduces the PS approach. Data and the empirical results are discussed in Section 3. Section 4 concludes.

- **The Econometric Model**

In this section we discuss the econometric setting for this paper. In the context of this paper, we employ the neoclassical framework that captures accounts for the issue of income convergence. The standard equation employed can be defined as:

$$\Delta \log y_{it}^{j} = \beta_{0}^{j} + \beta_{k}^{j} \log SK_{it}^{j} + \beta_{h}^{j} \log SH_{it}^{j} + \sum_{q=1}^{k} \phi_{q}^{j} z_{q,it}^{j} + u_{it}^{j} \quad (1)$$

Note that the specification above is modified to account for the panel data setting (with i=1, 2,…, N individual observed over time t=1, 2, …, T) and the position of an economy i in a steady state- or long run level- j=1,2,…,m. Equation (1) defines economic growth per capita, $\Delta \log y$, as a function of physical capital per capita SK, human capital per capita SH and the set of additional variables z. Note that the set z contains the set of other variables that measure convergence or endogenous growth effects such as the levels of initial income, physical capital or schooling. The term u_{it} refer to residual term, which can be defined as

$$u_{it} = \alpha_{i} + e_{it} \quad (2)$$

where $e_{it} \sim N(0, \sigma_{e}^{2})$ is homoscedastic with zero mean error term and α_{i} is individual time-invariant effect, which can be either fixed or random effects. In order to identify the position of each economy in the long run time path of growth, we apply PS approach convergence test. The econometric model is defined as:

$$\log y_{it} = \delta_{it} \mu_{t} \quad (3)$$

where logged income per capita, $\log y_{it}$, is defined in a panel data model with the dependent variable observed across $i = 1,2,...,N$ individuals and over time period $t = 1,2...,T$, where μ_t is growth component- common across individuals (i.e. proxy for commonly available world technology). It can also be described as a common stochastic trend in the panel data. The term, δ_{it}, refer to an individual transition factors to measure the individual economic performance in relation to the common stochastic trend, μ_t. In other words, this idiosyncratic term captures the share of common factor μ_t each individual in the panel experiences. Phillips and Sul (2007) defines this term formally as:

$$\delta_{it} = \delta_i + \sigma_i \zeta_{it} L(t)^{-1} t^{-\alpha} \qquad (4)$$

where δ_i fixed, $\zeta_{it} \sim iid(0,1)$ across $i = 1,2,...,N$ but weakly dependent over time. $L(t)$ is slowly varying function of time, where $L(t) \to \infty$ as $t \to \infty$. This term is key to ensure convergence towards a common long, and thus the smaller the discrepancies between $\log y_{it}$ and μ_t, the more likely the convergence is satisfied. Thus, understanding the dynamics of δ_{it} is of great importance. The above structure of the idiosyncratic term implies that the null hypothesis of convergence is accepted if for all $\alpha \geq 0$, $\delta_{it} \to \delta_i$. This implies that the analysis of convergence is around the loading coefficient, by using the relative transition coefficient, h_{it}, as a measure of the loading coefficient δ_{it} relative to the cross-sectional average in the panel.

Phillips and Sul (2007) propose the following relationship to approximate the loading coefficient, δ_{it}:

$$h_{it} = \frac{X_{it}}{N^{-1}\sum_{i=1}^{N} X_{it}} = \frac{\delta_{it}}{N^{-1}\sum_{i=1}^{N} \delta_{it}} \qquad (5)$$

The convergence is then assessed based on the loading coefficient, in which PS show: if for all $\alpha \geq 0$, $\delta_{it} \to \delta_i$, then $h_{it} \to 1$ and the cross-sectional variance of h_{it} converges to zero, and we have as $t \to \infty$:

$$\sigma_t^2 = \frac{1}{N}\sum_{i=1}^{N}(h_{it} - 1)^2 \to 0 \qquad (6)$$

which is a very important property and essential to test for the null of convergence and clubs of convergence.

The relative transition time path, h_{it}, captures the divergent behaviour of individuals from the common long-run path, μ_i. The PS procedure is implemented in two stages. First, PS test for the presence of overall convergence, the null hypothesis of overall convergence: $H_0 : \delta_i = \delta$ and $\alpha \geq 0$, against the alternative of no convergence $H_1 : \delta_i \neq \delta$ for all *i*, or $\alpha < 0$. If the null of convergence is rejected, then the second stage is implemented to test for the presence of clubs convergence.

The test procedure is applied to the *logt*regression, which is derived based on the cross sectional variance ratio H_1/H_t. The regression is defined as follows:

$$\log\left(\frac{H_1}{H_t}\right) - 2\log L(t) = \hat{a} + \hat{b}\log t + \hat{u}_t \qquad (11)$$

where

$$H_t = \frac{1}{N}\sum_{i=1}^{N}(h_{it} - 1)^2 \qquad (12)$$

$t = [rT], [rT]+1, ..., T$, with $r>0$, $L(t) = \log(t+1)$, $\hat{b} = 2\hat{\alpha}$ and $\hat{\alpha}$ is the estimated value of α in the null above, which the speed at which the time series converges to. The regression is run starting at $t = [rT]$, which is the integer part of rT for some fraction r>0. PS recommend to use $r=0.3$. Once the regression is run, the null is accepted, if the autocorrelation heteroscedasticity robust one tail $t_{\hat{b}}$ statistic is above the critical value, c (e.g. at 5% level of significance, fail to reject the null if $t_{\hat{b}} \geq -1.65$). Rejection of the null does not imply that there is no convergence. It may, in fact, imply that we move to relative convergence test. In other words, we test whether there are clusters of convergence.

- **Data and Empirical Findings:**

The data we use in this paper are obtained from the World Bank and United Nations Conference on Trade and Development (UNCTAD). Due to the issue of data availability, we focus on only 16 MENA countries including: Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, UAE and Yemen. The data covers variables measuring economic development (GDP per capita), investment (Gross Domestic Savings as a proxy for investment), Openness, and measures of higher education including research and development (R & D), innovation, start-up and entrepreneurship andskilled labour. Details on the proxies used to measure each of the factors are found on Table 2 notes below. The data for income per capita are available from the 1970s, while other data availability differs from one variable to another. The time period of choice- where all income data are available is 1990-2016. All data are annual and expressed in real terms when appropriate.

- *Clubs of Convergence:*

We apply the PS approach to the GDP per capita, which illustrated in Figure 1. Figure 1 shows income disparities across MENA economies, where Qatar is the leading economy in terms of income, while Yemen displays the lowest levels of income over the time period. This gap between rich and poor economies in MENA region seems to get wider over time as shown in Figure 2. According to the data depicted in Figure 2, economies around the median level of income show no sign of change over time and they have the tendency

to exhibit a relatively low and stable economic growth. In contrast, economies on the higher end and lower end distribution exhibit a tendency to change over time. While rich economies show a tendency to grow -at slower rate-, poor economies show significant decline in economic growth.

In relative terms, the transition curves- as defined by equation (5) above, in Figure 3 provide estimates for the time path of income across the MENA countries considered in this paper. The LR line refers to the long run level to whichall economies would converge if there is an overall convergence. As shown by the data in Figure 3, the time path of all economies does not seem to converge to the overall long run level. Instead some economies display the tendency to grow faster and higher over time (e.g. Qatar), while other show tendency to decline over time (e.g. Yemen and Libya). The overall convergence test reported in Table 1 reports the rejection of the null hypothesis of overall convergence, and thus we conclude that income per capita across the MENA economies does not move to the same level in the long run.

Table 1 also reports the tests statistics for the presence of clubs of convergence. According to the findings in Table 1, there are three clubs of convergence and one divergent club. The formation of clubs suggest that the economies in Club 1 converge to the equilibrium at faster rate than the members of Club 2, but slower than those economies in Club 3. Qatar and Yemen do not converge to any of the estimated steady states. Qatar, as the data shows, is leading the MENA economies and appears to drift away to higher levels than the rest of the economies, while Yemen's income is found to be in significant decline over time relative to the rest of the economies (e.g. Figure 3). Figure 4 illustrates the composition of the clubs estimated and their time path. There is a significant gap between the club of rich economies and those located in the second and third club. This shows the persistence of the gap between MENA economies over time.

- *Growth Model Panel Estimates:*

In this section, we report the results of estimating specification (1) accounting for the time path of each economy. Table 2 reports the estimation output and provide detailed notes on the estimator, the models, and post estimation inference. We adopt two variations of the specification: the Basic Model and Extended Model. The Basic model is the restricted form of the specification in (1), which allows only for measures of investment, higher education and initial income. The Basic Model is estimated for the whole panel, without accounting for the time path for robustness check purposes. The model is also estimated accounting for the time path of each group of convergent economies. This means that Qatar and Yemen are dropped from the regressions. In general, all specifications considered for this model

suggest that higher education, as measured by the rate of tertiary education enrolment, have positive and statistically significant impact on economic growth, though the marginal effect is very small. This implies that higher education does not have strong impact on economic growth (between 0.1% and 0.4%). The exception is the economies in Club 1, where higher education is found to have the wrong sign and statistically insignificant impact. The models are all highly significant and better fitted with the Fixed Effects model.

Similar econometric exercise is carried out on the Extended Model. The conclusions, however, are in complete contrast with the Basic Model. First the role of higher education is only significant for Club 1 but with the wrong sign suggesting that higher education may have a negative impact on economic growth for the Gulf countries. Other factors of innovation, R & D and entrepreneurship are mostly insignificant except for Club 3 countries where innovation is significant with negative sign. This again contradicts the expected outcome.

One key issue with these regressions is the poor quality of the data. The data sets available, especially for the developing economies, are full of missing values leading sample size distortion and hence lack of variations. This issue is often the cause of rejecting models that are, otherwise highly plausible. This issue is often raised in the literature and often caused many models to be rejected and erroneously producing misleading or fragile conclusions (e.g. Aghion*et al* (2009), Cohen and Soto (2007)).

- **Concluding Remarks:**

The present paper deals with the issue of the role of higher education in economic performance. The main hypothesis of the paper is to attribute the role of the higher education to the speed at which economies grow. Unlike the literature, we proceed by exploring the issue of income convergence to locate the position of the economies in our sample in the long run time path. By applying the concept of clubs of convergence, we find evidence that per capita income in the MENA economies does not converge to a unique steady state. This also identified a widening gap over time where rich economies seem to fluctuate farther up, while poor economies experience a decline in their economies. This work, in the context of income convergence, is not aimed to explain these dynamics since it is beyond the scope of the paper.

Based on the evidence in section 3, we find evidence that higher education may play an important role for economies with low growth rates and have a relatively slow to moderate speed of convergence. This is in contrast with the economies that are found to be fast growing. There are very weak evidence that support a wider contribution of the other components of higher education such as innovation and R & D. This, by no means, implies that there is no positive role ofinnovation and R & D. The lack of evidence

may be attributed to issues concerning data availability and their quality. This case is often faced by researchers in the literature. Thus, one needs to be cautious in drawing conclusions for academic and policy purposes.

Table 1: *Clubs of Convergence Tests Results*

Test	Test Statistics
Overall Test	$\hat{t} = -30.950$ * $\hat{\alpha} = -0.231$
Club 1	$\hat{t} = 4.159$ $\hat{\alpha} = 0.281$ [BEH, KUW, SAU, UAE]
Club 2	$\hat{t} = 0.616$ $\hat{\alpha} = 0.02$ [IRAN, IRAQ, LEB, MOR, OMAN, TUN]
Club 3	$\hat{t} = 4.900$ $\hat{\alpha} = 0.354$ $\hat{\alpha} = 0.351$ [ALG, EGY, JOR, LIB]
Divergent Club	$\hat{t} = -27.974$ * $\hat{\alpha} = -0.471$ [QAT] , [YEM]

Results above are based on trimming rate equal to 0.3. $\hat{t}$: is the estimated *t* statistic and $\hat{\alpha}$: is the speed of convergence. (*) indicates the rejection of the null of convergence at 5% level of significance (i.e. *t* critical value is -1.65). The null hypothesis states that there is overall convergence. We need both, the null to hold and the positive sign of the speed of convergence $\hat{\alpha}$. If the latter is negative, then equation (4) above will not converge to the cross sectional level. Divergent Club implies that both Yemen and Qatar do not converge to any of the clubs. The tests conducted on the time period 1990-2016 due to missing data (Yemen data are available from 1990).

Table 1*: Panel estimated of the growth model in equation (1).*

	Basic Model			
Variables	*Panel*	*Club 1*	*Club 2*	*Club 3*
Investment	-5.17e-12	8.36e-08*	-3.45e-11***	1.96e-09
Higher Education	0.002*	-0.001	0.004**	0.001*
Initial Income	-0.234*	-0.529*	-0.196*	-0.101*
Entrepreneurship				
Innovation				
R & D				
Openness				
Constant	1.95*	5.177*	1.506	0.761
R^2	0.25	0.86	0.10	0.192
F	7.59*	157.94*	2.38**	3.12**
Hausman Test	81.96*	N.A.	9.15**	9.44*
T	258	54	99	71

Estimation method: IV estimator since the model suffers from endogeneity. The set of instruments include lagged dependent variable and lagged endogenous variables. Basic model includes the variables: Investment (measured by domestic savings), Higher Education (measured by the proportion of students in tertiary education) and Initial Income (measured by lagged log per capita income). Extended Model extends the Basic Model with additional variables including: Entrepreneurship (measured by the start-up indicator: the number of patents obtained by residents), Innovation (measured by High Tech exports as ratio of all manufacturing exports), R & D (measured as number of scientific technical papers published in academic journals) and Openness (measured as the sum of exports and imports divided by the GDP and expressed in logged terms). The sample covers the time period 1990-2016. Missing values handled by using statistical interpolation when appropriate. When interpolation is not possible, the missing values are dropped out of the sample. Club 1, Club 2 and Club 3 refer to the panels estimated accounting for the economy's position on the long run time path. The R^2 is within effects R^2. The H statistic tests the null that all the fixed effects are jointly insignificant. The Hausman test is employed to choose the model to report, Fixed Effect or Random Effect. The null hypothesis of this test stated that the appropriate model is Random Effect. Rejecting the null implies that the appropriate model is Fixed Effect. (*), (**) and (***) refer to significance at 1%, 5% and 10% levels. T is the useable sample size. N.A. refers to the case when the Hausman test fails to meet the asymptotic assumptions. □ refer to the Wald statistic. It tests for the joint significance of the model. The null states that the model is jointly insignificant. It is reported only when the model is a Random Effect model. (*****) the variable dropped due to perfect collinearity.

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