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Quality of human capital accumulation, higher education graduates and economic growth: A comparative analysis between BRICS, Southeast Asian and MENA countries

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Abstract.
BACKGROUND: The question of the accumulation of the quality of human capital and its relationship with growth is very rarely addressed by the literature.
OBJECTIVE: This article aims to investigate the impact of quality of human capital accumulation on economic growth for BRICS, Southeast Asian and MENA countries.
METHODS: Thus, we utilize endogenous growth model of Lucas [5] that is the most appropriate for the human capital-growth question. We use yearly data for each group employed in this paper during the period of study from 1990 to 2015.
RESULTS: The empirical results show that for BRICS and South East Asia countries, the nexus between quality of human capital and economic growth is positive, while for MENA countries the relationship has not been identified. Also, we show that positive link between quality of human capital and economic growth depends on the level of accumulation and effectiveness of higher education graduates and their employment rate in high value-added sectors.
CONCLUSION: The relationship among human capital and economic growth does not only depend on the employment rate of university graduates and labor market matching mechanisms, but it also depends on the nature of the job and the efficiency and productivity of human capital.

Keywords: Human capital accumulation, economic growth, higher education graduates, BRICS and Southeast Asia countries, MENA countries, panel data

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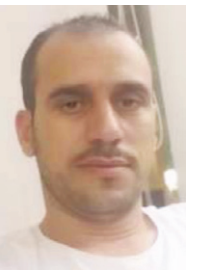

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1. Introduction

The education quality is a multidimensional variable that is difficult to define and to measure. The teaching quality as defined by Coombs means students' performance in terms of programs and standards. It depends on the relevance of what is taught and learned. It refers to significant reforms to the education system itself, the nature of its inputs, its objectives, education and program technologies and its socioeconomic, cultural and political environment [1–3]. In turn, World Bank defines education quality by all the results obtained regarding performance tests [4].

On the other hand, it seems difficult for us in an international comparison perspective to consider all the dimensions of the education quality at the higher level. Indeed, we assume that the quality of education is related mainly to the level obtained in higher education and to the individual achievements obtained by the students themselves.

An individual achievement combines the various performance tests that can improve students' competitiveness in the national and international labor markets. These gains come mainly from international education, monitoring and quality support programs, such as the International Assessment of Education Progress (IAEP) launched in 1988 and 1991 by the National Assessment of Educational Progress (NAEP), the Program for International Student Assessment (PISA) launched in 2000 and 2004 by the OECD, the Quality Support Program launched in 2008 by The International Bank for Reconstruction and Development (IBRD), etc.

In spite of all these supports and quality support programs, it seems to us that in some developing countries that have benefited from these programs and have already begun a process of reform aimed at improving the education quality, the relationship between human capital and economic growth is still uncertain and unstable. On the contrary, the employability rate of graduates is low, and unemployment is growing.

In our opinion, three explanations can be advanced to explain this phenomenon: unemployment of university graduates is structural and cyclical, the quality of education is low and does not meet the expectations of the labor market and university graduates move to unproductive and non-value-added sectors such as administration.

In this paper, we aim to examine the effect of quality of human capital accumulation on economic growth for BRICS, Southeast Asian and MENA countries. We have discussed this effect in three ways. First, we review the existing theoretical and empirical work. Then, we develop an endogenous growth model of Lucas [5] that is the most appropriate for the human capital-growth question. Finally, we had an extensive empirical section divided into two parts for two groups of countries. Two models for each group of countries which means four empirical regressions in panel data over the period from 1990 to 2015 are applied on BRICS and South East Asia countries and MENA countries in order to compare the nature of the relationship between quality of human capital and economic growth in these countries.

Our empirical results prove that for BRICS and South East Asia countries, the nexus among quality of human capital and economic growth is positive, while for MENA countries the relationship has not been identified. However, our second results show that positive relationship among quality of human capital and economic growth depends on the level of accumulation and effectiveness of higher education graduates and their employment rate in high value-added sectors.

The rest of this paper is organized as follow: Section 2 presents the main previous works on the relationship between human capital and economic growth. Section 3 presents the econometric methodology. In section 4, we expose the data used in this study. Section 5 presents the main empirical findings. Section 6 concludes. Finally, section 7 presents the main policy implications of our study.

2. Theoretical framework

Historically, the thesis on the relationship between human capital and economic growth goes back to Schumpeter's writing [6]. He was the first to focus on the crucial role of bankers who, through their targeting, encourage technological innovation, the accumulation of human capital and there by stimulate economic growth. Afterwards, the concept of human capital development and its impact on economic growth has been updated by the writings of Frankel [7], Mincer [8], Schultz [9] and Becker [10, 11].

Around the mid-eighties, this research area has grown with the pioneering work on endogenous growth models that introduce human capital in their production function's as a catalyst for an economic and social development and source of productivity

gain of production factors. As such, we note the models of Lucas [5], Romer [13, 14] and Barro [12] and the applied econometrics growth, which was started with the test of the convergence hypothesis of economies [15]. These models have shown that the rate of economic growth depends on the accumulation and efficiency of human capital. Education and research and development are the driving forces because they lead to a more intensive adaptation of technology and greater capacity for transformation and innovation.

On the theoretical side, while a consensus has emerged around a positive link between human capital and growth, studies such as the Pritchett [15], Islam [17] and Judson [18] have resulted in a conditioned and / or negative relationship. Since then, the interactions between human capital and economic growth are no longer systematically and unidirectional. Human capital is a catalyst for economic growth. At the same time, it is possible to consider it as a result of economic development. Reciprocity between human capital and growth is not excluded.

Pritchett [16] shows that the most robust econometric analyses do not resulted in a stable and positive relationship between human capital and economic growth. For him, the massive hiring of graduates in unproductive sectors, the virtual absence of the private sector and the low quality of human capital are the cause of a negative relationship between the human capital and economic growth.

Judson [18] shows that from the Solow [28] growth model, the weight of human capital in economic growth is low and does not exceed 10%. This impact, although positive, is incomparable with physical capital, whose share of growth is between one-third and one-half. Islam [17] finds, using a dynamic panel, a negative relationship between human capital and economic growth. Also, Romer [14], Chen and Hiau [21], Fleisher et al. [22], Pelinescu and Craciun [23], Khan et al. [40], Xinmin et al. [41] and Farrokhi et al [42] show in their studies that the contribution of human capital in economic growth is greater than physical capital.

On the other hand, Mankiw et al. [15] show, from the Solow model [28], that the difference in savings, education and population growth expresses the disparity of real GDP growth between countries. Ben Habib and Spiegel [24] prove that human capital is positively correlated with both the real GDP per capita growth rate and the overall productivity rate of economic growth factors. Similarly, World Bank [4, 19] and Fogel [20] show that investing in human capital is a source of innovation that underpins long-term growth and economic development.

However, the problem of data availability and the measurement of the quality of human capital have led to several limitations. The school enrolment rate and the average number of school years are vague and obsolete indicators for measuring human capital relative to education and do not make it possible, based on an intensity of supply, to measure the quality of learning outcomes [24].

De Vries et al. [25] examine structural transformation and its impacts for economic growth in the BRIC countries (Brazil, Russia, India, and China) from the 1980 s onwards. They conclude a structural decomposition assessment suggests that for China, India and Russia restructuring of labor across sectors is supporting to aggregate economic growth, although in Brazil it is not. Nevertheless, this finding is reversed when a difference is made among formal and informal activities within sectors. Growing formalization of the Brazilian economy since 2000 seems to be growth-boosting, but in India the growth in informality following the reforms is growth-lowering.

McMillan et al. [26] examine the importance of labour flows from low-productivity activities to high productivity activities which represent a key driver of development. Their empirical findings find that since 1990 structural adjustment has been growth decreasing with labour shifting from small to great productivity sectors in both Africa and Latin America, with the greatest stunning adjustments getting place in Latin America. Also, their results find that factors appear to be rolling around in Africa: after 2000, structural adjustment caused positively to Africa's overall economic growth. For the case of Africa, these findings are positive. Furthermore, the very small levels of productivity and industrialization around highly of the continent suggest an immense possibility for growth across basic variation.

3. Empirical strategy

3.1. Methodology

Lucas [5] and Romer [13, 14], qualified as endogenous growth models, have introduced human capital in the aggregate production function. Indeed, human capital in the model of Lucas [5] is introduced in an explicit way in order to justify the growth of

scale returns. It's endogenously accumulated and constituted the engine of economic growth. Two possible ways of capital accumulation are foreseen: the first through education (training) and the second through learning. Accumulation of human capital is an increasing function of time devoted to education. It's formulated as follows:

$$\dot{h}_t = \delta\,(1 - u_t)\,h_t \tag{1}$$

Where, h_t represents level of human capital per capita in time, δ represents human capital productivity indicator, $(1\text{-}u_t)$ represents endogenous fraction of time devoted to education (training) and u_t represents the fraction of time devoted to the production and $1 < u_t < 0$. We have:

$$N = \int_0^{\infty} N(\mathrm{h})\,\mathrm{dh}\text{:total population}$$

$$N^e = \int_0^{\infty} N(h)u(h\ d(h)\ :\ \text{qualifed workforce in the productive sector}$$

$u(h)N(h)$: total working time spent on production activity

$$h_a = \frac{N^e}{N}\ :\ \text{average level of human capital}$$

In fact, a person is more productive and effective if he operates in a high potential human environment where education has a positive external return on investment and production. The final good production function is written:

$$Y = AK_t^{\alpha}(u_t h_t L_t)^{1-\alpha} h_{at}^{\gamma}, \quad 0 < \alpha < 1 \tag{2}$$

Where, K_t is the stock of physical capital, $u_t\ h_t\ L_t$ is the efficient labour input; A is the level of technology; the parameters α and $(1\text{-}\alpha)$ denote the elasticity of output with respect to physical capital and labour.

The total output of the economy is composed of the physical capital investment and consumption. The equation of capital accumulation per capita is as follows:

$$\dot{k}_t = Ak_t^{\alpha}(u_t h_t)^{1-\alpha} h_{at}^{\gamma} - c_t \tag{3}$$

Where, c_t aggregate consumption per capita at time t. The representative agent seeks to maximise its intertemporal utility function U. The dynamic problem of the representative agent is written as follows:

Maximise

$$U = \int_0^{+\infty} e^{-\rho t} \frac{c_t^{1-\sigma} - 1}{1 - \sigma} dt; \tag{4}$$

Under constraints:

$$\begin{cases} \dot{h}_t = \delta(1 - u_t)h_t, \\ \dot{k}_t = Ak_t^{\alpha}(u_t h_t)^{1-\alpha} h_{a_t}^{\gamma} - c_t \\ k(0) = k_0 \\ h(0) = h_0 \end{cases} \tag{5}$$

where, $A, \gamma, \delta > 0\ et\ 0 < \alpha < 1$. Also, where, ρ is a preference rate for the present and σ is the coefficient measuring the degree of risk aversion. The Hamiltonian associated with this optimisation program is:

$$H = e^{-rt} \frac{c_t^{1-\sigma} - 1}{1 - \sigma} + \theta_{1t}$$

$$\left[Ak_t^{\alpha}(u_t h_t)^{1-\alpha} h_{at}^{\gamma} - c_t\right] + \theta_{2t}\left[\delta\,(1 - u_t)\,h_t\right] \tag{9}$$

Where, θ_{1t} and θ_{2t} are respectively implicit prices updated of physical capital and human capital. Solving this optimisation problem, we consider the two following assumptions:

H_1: economic agents do not consider the average stock of human capital (h_a). They see it as a given. It's a decentralised equilibrium.

H_2: the social planner takes into account the average stock of human capital (h_a) and assumes that $h_a = h$. This is a centralised equilibrium.

For centralised equilibrium the first order conditions give:

$$\dot{k} = Ak^{\alpha} h^{1-\alpha+\gamma} u^{1-\alpha} - c \tag{10}$$

$$\dot{h} = \delta\,(1 - u)\,h \ \Rightarrow\ \frac{\dot{h}}{h} = v = \delta\,(1 - u) \tag{11}$$

$$\dot{c} = \frac{c}{\sigma}\left(\alpha A k^{\alpha-1} h^{1-\alpha+\gamma} u^{1-\alpha} - \rho\right) \tag{12}$$

$$\dot{u} = (\frac{(\gamma - \alpha)\,\delta}{\alpha}\,(1 - u) + \frac{\delta}{\alpha} - \frac{c}{k} \tag{13}$$

$\Rightarrow$ Physical capital growth rate is:

$$g_k = \frac{1 - \alpha + \gamma}{1 - \alpha} g_h \tag{14}$$

$\Rightarrow$ The equilibrium growth rate of human capital:

$$g_h = \frac{1 - \alpha + \gamma}{(1 - \alpha + \gamma)\,\sigma - \gamma}\,(\delta - \rho) \tag{15}$$

From Equations (14) and (15), we show that the physical capital growth depends on that of human capital. More productivity of human capital is growing, more human capital is performing. For Lucas [5], economic growth is the result of endogenous

human capital accumulation and particularly through its effectiveness. We also note that the externality of the average level of human capital (h_a^{γ}) acts positively on economic growth. The more the economy develops in an intensive environment efficient and productive human capital, the more the positive effect on economic growth is established.

For the decentralised equilibrium, the social planner considers the externality ($h_a = h$). The resolution of the optimisation problem provides an optimal growth rate:

$$g_{op}^{*} = \frac{1}{\sigma}\left[\left(\frac{1-\alpha+\gamma}{1-\alpha}\right)\delta - \rho\right] \tag{16}$$

In conclusion, the economic growth rate to the decentralised equilibrium and balance are centralised as follows:

$$g_{eq}^{*} = \frac{1-\alpha+\gamma}{(1-\alpha+\gamma)\sigma-\gamma}(\delta-\rho)$$

(decentralized equilibrium)

$$g_{op}^{*} = \frac{1}{\sigma}\left[\left(\frac{1-\alpha+\gamma}{1-\alpha}\right)\delta - \rho\right]$$

(centralized equilibrium)

$$if\ \sigma = 1,\ g_{op}^{*} - g_{eq}^{*} = \frac{\gamma-\alpha}{1-\alpha}\rho,$$

$$if\ \gamma > \alpha \Rightarrow g_{op}^{*} > g_{eq}^{*} \tag{17}$$

At equilibrium, the effect of technological externality acts positively on economic growth and involves an optimal growth rate higher than that of the decentralised equilibrium. In the absence of externalities ($\gamma = 0$) the average level of human capital, the two growth rates are equal and are positive:

$$g_{op}^{*} = g_{eq}^{*} = \frac{1}{\sigma}(\delta-\rho) \tag{18}$$

The model of Lucas [5] leads to two main conclusions: A positive growth rate conditioned by the efficiency of the average level of human capital (δ) and its positive externality (γ); The lack of human capital externality causes suboptimal decentralised equilibrium. The investment in human capital is lower than the social optimum.

According to Equation (16), we note that the economic growth rate is an increasing function of the accumulation of human capital (δ) and its positive externality (γ). Indeed, for Lucas [5], the more one invests in education; the higher is the level of economic development. However, this relationship will be stated only if the human capital required is working (source of production and innovation) and productive (less unemployment for graduates).

It is deduced that in reviewing the literature, we find that most models of endogenous growth, previous theoretical and empirical studies, and econometric models agree on a positive relationship between human capital and growth economy. However, the few works of Pritchett [16], Islam [17] and Judson [18] that led to a neutral and / or negative relationship overthrew public opinion and made it more sceptical and complex relationship human capital-economic growth. The problem of human capital today revolves around several axes: it is a question of the rate of schooling or quality of graduates or mechanisms of matching on the job market or the assignment or nature of the business segments. For this purpose, two main hypothesis merits of being to be tested:

- H1: the relationship between the quality of human capital and economic growth is positive and unidirectional

- H2: The nature of the relationship between human capital and growth depends on matching mechanisms in the labour market

Several empirical researches studying the relationship between human capital and economic growth have concluded a positive relationship [7, 8, 11, 15, 24], while others, who have measured human capital through its accumulation, have obtained mixed results [16, 18, 20].

The possible presence of a negative relationship between an inefficient and non-integrated human capital in the productive system[1] and economic growth pushes us to reflect on the introduction of a variable in the interactive model. This variable measures the level of human capital accumulation, approximated by multiplying the graduates of higher educational levels and employment rates.

3.2. *Variables selection*[2]

Generally, theoretical models of economic growth distinguish two categories of variables: endogenous and exogenous.

The endogenous variable is economic growth as measured by real GDP per capita at constant prices, noted "GDP". As for the exogenous variables, we

[1] A high unemployment rate of higher education graduates and professional school.

[2] All variables are taken from the Global Development Network Growth Database (GDNGD) and World Development Indicators (WDI).

Table 1
Control variables calculation method and expected signs

Variables	Measure	Expected signs
Inflation rate (inflation)	The growth rate of the consumer price index	Negative
Population (population)	The population growth rate	Negative
Commercial opening of economy (trade)	The volume of exports plus imports divided by GDP	Undetermined
Private investment rate compared to GDP (investment)	Gross fixed capital training more the variation of private saving	Positive

include two sets of variables: quality of human capital measurement indicators and control variables.

• Human capital measurement indicators

To measure the human capital, we have chosen two indicators:

- *In the first time*: human capital quality, noted "**higher education graduates"** measured by level of higher education graduates relative to the active labour force.

- *In the second time:* human capital accumulation, noted "**accumulation_hk"** measured by an interactive variable that equals to the level of higher education graduates relative to the active labour force multiplied by the rate of their employment:

Accumulation_hk = *level of higher education graduates relative to the active labour force* **x** *the employment rate of higher education graduates*

3.3. Control variables

Table 1 includes control variables, empirical proxies and their expected impacts. These variables were traditionally used in the endogenous growth literature to explain and evaluate the variability of the real GDP growth per capita.

The consideration of individual data allowed us to use panel data. We test the relationship between economic growth and quality of human capital using two separate groups. The first group (G1) consists of a sample of ten developing countries. The second group (G2) contains five MENA countries. The period covers 26 years from 1990 to 2015. The model takes a general formulation compiling a relationship between economic growth as dependent variable and explanatory variables measuring human capital and control variables:

$$Y_{it} = \alpha_{i+}\beta_i HK_{it} + \mu_i CV_{it} + \varepsilon_{it} \quad (19)$$

This equation could be interpreted as part of a panel analysis in the following expanded form:

$$Y_{it} = \alpha_i + \sum_{j=1}^{j=K} \beta_{ij} HK_{ijt} + \sum_{j=1}^{j=M} \mu_{ij} CV_{ijt} + \varepsilon \quad (20)$$

Where, Y_{it} is economic growth rate, *HK* measures human capital and *CV* represents control variables and ε_{it} is error term; where, $E(\varepsilon_{it1)} = 0$, $E(\varepsilon_{it}{}^2) = \sigma^2{}_\varepsilon$ and $E(\varepsilon_{it}.\ \varepsilon_{js}) = \sigma_{ts} + s\ \sigma_{ij}\sigma^2$

3.3. Test specification

The objective of this test is to verify whether the theoretical model is the same for all countries. Otherwise, the specificities of each country must be considered. If we denote $y_{i,t}$ real GDP per capita, $HK_{i,t}$ the logarithm of the explanatory variable and $CV_{i,t}$ the logarithm of each of the control variables and we assume a Cobb Douglass growth function, general model is as follows:

$$y_{i,t} = \alpha_i + \beta_i HK_{i,t} + \gamma_i CV_{i,t} + \varepsilon_{i,t} \quad (21)$$

Where, $\forall i \in [1, N]$, $\forall t \in [1, T]$ $\varepsilon_{i,t}$ are assumed to be IID with zero mean and variance equal to σ_ε^2, $\forall i \in [1, N]$. The test specification is to check whether it's possible to assume a totally identical function for all countries ($\beta_i = \beta;\ \gamma_i = \gamma, and \alpha_i = \alpha$).

For the first group (Group 1), the result of this test is a Fisher statistic F (9, 245) which is equal to 2.24. At degree of risk of 5% we reject the null hypothesis of equality of constants since *P*-value < 5%[3]. It's, therefore, necessary to introduce the individual effects. The final specification of the model is written:

$$y_{i,t} = \alpha_i + \beta_i HK_{i,t} + \gamma_i CV_{i,t} + \varepsilon_{i,t}. \quad (22)$$

Where, $\forall i \in [1,\ 10]$, $\forall t \in [1990,\ 2015]$. For the second group (Group 2), the test result of existence of individual effects is a Fisher statistic F (4, 120) which is equal to 1.6. At 5% risk level we accept the null hypothesis of equality of constants since P-value>5%. It's not, therefore, necessary to introduce

[3] *P*-value <5% is mean that the probability of accepting the null hypothesis is less than 5%. Therefore, we reject the null hypothesis of equality of constants and we introduce the individual effects.

the individual effects. This is a completely homogeneous specification. The final model is:

$$y_{i,t} = \alpha + \beta_i I.HK_{i,t} + \gamma_i CV_{i,t} + \varepsilon_{i,t} \quad (23)$$

Where, $\forall i \in [1,\ 5]\,, \forall t \in [1990,\ 2015]$. It appears that the empirical form is best suited for the estimates required to adopt the individual effects for the first group and consistent approach for the second group.

3.4. Test of hausman specification

This test can be interpreted as follows:

$$H = (\hat{\beta}_{MCG} - \hat{\beta}_{Within})'$$
$$\left[\text{var}\left(\hat{\beta}_{MCG} - \hat{\beta}_{Within}\right)\right]^{-1}\left(\hat{\beta}_{MCG} - \hat{\beta}_{Within}\right) \quad (24)$$

Under the null hypothesis (H_0), the model can be specified with random individual effects and must retain estimator MCG. Under the alternative hypothesis (H_a), the model must be specified with fixed individual effects and must retain the within estimator.

4. Data

The BRICS and Southeast Asia countries are countries that are currently forming a major emerging economic power. Since the 1960s, these countries have relied heavily on education and training and, as a result, have achieved convincing results in terms of employment and economic growth. These countries, which share the world's population and produce almost half of its wealth, have taken human capital as the engine of their economic growth. MENA countries classified as developing and pre-emerging countries have also invested in education and training since the 1970s, but the expected results in terms of graduate employment and economic growth are incongruous. Thus, the choice of these two groups of countries is to dissect the factors of the disparity of accumulation of human capital. These two groups of countries have a comparable education system recognised by the competent authorities such as PISA, IAEP, etc. They have invested perpetually in education and training, but they have not achieved the same result.

The BRICS, South East Asian and MENA countries are economically, politically, educationally and institutionally comparable countries. Theoretically, the diversity of situations between these countries will provide new empirical insights into the issue. The analyses carried out so far have either neglected these countries in their sample, or have integrated them into larger samples and deprived themselves of having a more focused vision on countries with new commonalities (countries with high economic potential with relatively similar degrees of openness) while in different situations (initial level of real GDP per capita, natural resources, size, unemployment rate, level of education, importance of the state)

Methodologically our selection will be divided into two groups of countries: The first group consists of ten emerging countries that experienced strong growth since the 1960s and have invested extensively in education research in order to increase their economic growth and raise their standard of living. These countries are those from the group "BRICS" (Brazil, Russia, India, China and South Africa) and those of Southeast Asia (Indonesia, Malaysia, Philippines, Singapore and Thailand). Indeed, for those countries, human capital has been a major factor in their success.

The second group consists of five MENA countries for which statistics are available. It includes Morocco, Tunisia, Egypt, Algeria and Jordan. We consider that these countries have indeed provided the significant efforts in education, but they generally suffer high rates of unemployment, especially for higher education graduates. For this group we expect conflicting results from the first. In fact, the five MENA countries have not been able to achieve satisfactory levels of development. In the following, we proceed with two types of estimates. An estimate without human capital accumulation and another estimate with human capital accumulation.

For the first group (Group 1), the results show that the statistics of the Hausman test is equal 21.77. This statistic follows a chi2 with five degrees of freedom. At a 5% risk level, we reject the null hypothesis of no correlation between the individual effects and the explanatory variables since P-value $< 5\%$.[4] Thus, we adopt a fixed effects model and retain the within estimator.

For the second group (Group 2), as indicated by the test of homogeneity, there are no individual effects for this group. The chi2 test was used during the existence of individual effects and in this case to inform us about the nature of these effects (fixed or variable). Or for this group there are no individual effects.

[4] P-value = 0.0006 < 5% is mean that Prob > chi^2 = 0.006. That is, the probability of accepting the null hypothesis is less than 5%. The model cannot be specified with random individual effects and must retain estimator GLS.

5. Results and discussion

This paper aims to elucidate the relationship between economic growth and the quality of human capital. The intensity of human capital quality is measured by the level of higher education graduates relative to the labour force. Theoretically, we rely on the endogenous growth model of Lucas [5]. Empirically, regressions in panel data are applied on BRICS and South East Asia countries[5] and MENA countries[6].

5.1. Estimation without human capital accumulation

5.1.1. Estimation for Group 1

It's important at this point to remember the specification of the empirical model to estimate. For the first group which include "BRICS countries" (Brazil, Russia, India, China and South Africa) and those of Southeast Asia countries (Indonesia, Malaysia, Philippines, Singapore and Thailand)., we choose the following equation:

$$Y_{it} = \alpha + \beta_1\,(\text{L.higher education graduates})_{it} + \beta_2\,(\text{L.population})_{it} + \beta_3\,(\text{L.trade})_{it} + \beta_4\,(\text{L.inflation})_{it} + \beta_2\,(\text{L.investment})_{it} + \varepsilon_{it} \quad (25)$$

Where, $\forall i \in [1,\ 10]$, $\forall t \in [1990,\ 2015]$ and Y_{it} represents economic growth rate and L represents means the logarithm.

Statistic Fisher, F (9, 245) = 2.24 confirms the heterogeneity of individuals in the form of fixed effects (p-value=2.08%<5%). To correct the heteroskedasticity of Student t, we used White's method. This implies an Ordinary Least Square (OLS) estimate in which we introduced a dummy variable for each country. Table 2 contains the results of estimates of Equation (25) using the 2nd method. The "areg" provides robust estimators. This estimation is considered to justify the robustness of the model estimated and of the used variables.

The estimation results for the first group show that all the variables are significant and are with expected signs. The quality of human capital is positive and statistically significant. Indeed, for BRICS and South East Asia countries investment in higher education is a guarantee for development and economic growth.

Table 2
Estimation results (Group 1)

Variables	(1) (Fixed Effects)	(2) (areg)
L.higher education graduates	1.519*	1.519*
(0.780)	(0.780)	
L.population	–173.4***	–173.4***
(59.29)	(59.29)	
L.trade	–2.495**	–2.495**
(1.169)	(1.169)	
L.inflation	–1.691***	–1.691***
(0.650)	(0.650)	
L.investment	4.356***	4.356***
(1.579)	(1.579)	
Constant	5.376	5.376
(7.712)	(7.712)	
Observations	260	260
Number of countries	10	10
R-squared	0.124	0.228

Note: Standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

This result confirms the evidence provided by Schultz [9], Frankel [7], Mincer [8] and Becker [11].

All control variables are also significant. The investment rate is statistically significant and signalling its predominant effect on growth. The proliferation of the population negatively affects economic growth. This result confirms the effect of the loss of population growth models of Solow [28]. Trade openness is negative and significant. Its harmful effect on growth shows that it's not crowned by prior actions in terms of protection and immunisation of the national economy of the country. This result is consistent with the conclusions of Bekaert et al. [27]. Neoclassical growth models, derived from the Solow [28] model, assume that technological change is exogenous. In such a framework, a country's trade policies cannot therefore be considered as an element affecting its growth. Grossman and Helpman [29] also argue that a country protecting its economy can stimulate its growth. This is possible in the case where government intervention encourages domestic investment according to the country's comparative advantages. Greenaway et al. [30], using cross-sectional regressions, found that distortions due to state intervention in trade led to low growth rates. Whereas, Frankel and Romer [31] use an instrumental variable method including geographic characteristics and confirm that international trade has a significant and significant impact on growth.

[5]Brazil, Russia, India, South Africa, China, Indonesia, Malaysia, Philippines, Singapore and Thailand.

[6]Morocco, Algeria, Tunisia, Egypt and Jordan.

Table 3
Estimation results (Group 2)

Variables	Coefficient
L. higher education graduates	–0.0360
(0.0553)	
L.investment	–0.0689
(0.0672)	
L.population	–1.070***
(0.262)	
L.trade	0.0259**
(0.0126)	
L.inflation	–0.0718**
(0.0334)	
Constant	0.0480***
(0.0176)	
Observations	130
Number of countries	5

Note: Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

The inflation rate is negative and significant indicating that bad monetary policy systematically reduces economic growth. In this same dynamic, the study by Evans and Wachtel [32] shows that shocks of uncertain inflation can induce a drop in economic growth. This result has been corroborated in several studies, notably Davis and Kanago [33], Grier and Perry [34], Elder [36], Grier et al. [35], Bredin and Fountas [37] and Fountas et al. [38].

5.1.2. Estimation for Group 2

The first group includes Morocco, Tunisia, Egypt, Algeria and Jordan. For this group and given the available data, the following equation was adopted:

$$Y_{it} = \alpha + \beta_1 \,(\text{L.higher education graduates})_{it} + \beta_2 \,(\text{L.investment})_{it} + \beta_3 \,(\text{L.population})_{it} + \beta_4 \,(\text{L.trade})_{it} + \beta_5 \,(\text{L.inflation})_{it} + \varepsilon_{it} \quad (26)$$

Where, $\forall i \in [1,\ 5]$, $\forall t \in [1990,\ 2015]$, Y_{it} represents economic growth rate and L represents means the logarithm.

The estimation results in Table 3 show that human capital quality is not significant. This implies the absence of relationship between economic growth and university graduates in MENA countries. This result corroborates those of Pritchett [16] and Islam [17]. It follows that a high number of higher education graduates do not always lead to economic growth. This result might be due to the high unemployment rate of graduates in these countries.

5.2. Estimation within capital human accumulation

To better understand the nature of the relationship between economic growth and quality of human capital, it's envisaged to introduce in the initial model an interactive variable reflecting the accumulation and effectiveness of human capital and noted "accumulation_hk". This variable is calculated by multiplying the level of higher education graduates relative to the active labour force multiplied by the rate of their employment. It's introduced into the model in order to know whether the impact of human capital on economic growth depends on the employment rate of the labour force with a higher level. Thus, the theoretical model takes the following form:

$$\text{Growth} = \alpha + \beta\,[\text{HK*X}] + \gamma\,[\text{matrics of control variables}] + \varepsilon_i \quad (27)$$

Where, (*HK*X*) is an interactive variable reflecting the accumulation of human capital, denoted "accmulation_hk" and equal to the level of higher education graduates relative to the active labour force multiplied by the employment rate of higher education graduates). HK: Human Capital measured by the ***level of higher education graduates relative to the active labour force***, denoted "higher education graduates". *X*: employment rate of the ***higher education graduates,*** denoted (employment).

Equation (27) is the basis for estimating the effect of the accumulation and effectiveness of human capital on economic growth. If the interaction variable is positive and significant, it implies that the effect of human capital on economic growth is greater for countries to have a high employment rate of university graduates.

5.2.1. Estimation for group 1

Table 4 presents the results for the new model specification as indicated by Equation (28) for the first group.

$$Yit = \alpha + \beta_1 \,(\text{L.accumulation\_hk})_{it} + \beta_2 \,(\text{L.investment})it + \beta_3 \,(\text{L.population})_{it} + \beta_4 \,(\text{L.inflation})_{it} + \beta_5 \,(\text{L.trade})_{it} + \beta_6 \,(\text{L.employment})_{it} + \varepsilon_{it} \quad (28)$$

Where, $\forall i \in [1,\ 10]$, $\forall t \in [1990, 2015]$, Y_{it} represents economic growth rate and L represents means the logarithm.

Table 4
Estimation results group 1

Variables	Coefficient
L.accumulation_hk	1.946**
(0.793)	
L.investment	3.036*
(1.660)	
L.population	–197.5***
(59.58)	
L.trade	–2.488**
(1.158)	
L.inflation	–1.545**
(0.646)	
L.employment	7.553*
(3.925)	
Constant	12.81
(8.260)	
Observations	260
R-squared	0.247

Note. Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5
Estimation results for Group 2

Variables	Coefficient
L.accumulation_hk	–0.0821
(0.161)	
L.investment	–0.0690
(0.0691)	
L.population	–1.052***
(0.264)	
L.inflation	–0.0741**
(0.0340)	
L.trade	0.0284*
(0.0169)	
L.employment	–0.0113
(0.0475)	
Constant	0.0588
(0.0497)	
Observations	130
Number of countries	5

Note: Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Statistic Fischer: F (9, 245)=2.44 confirms the heterogeneity of individuals in the form of a fixed effect (p-value=1.14%<5%). To correct the heteroskedasticity of Student t, we used White's method. This implies an OLS estimate of a model in which we introduced a dummy variable for each country.

For the first group, all variables are significant and have the expected signs. At 5% degree of risk, both employment of higher education graduates and accumulation of human capital have a positive and significant effect on economic growth. It implies that the higher the employment rate of higher education graduates, the higher is the impact of skilled human capital on economic growth.

5.2.2. Estimation for group 2

For the second group, and due to non-significance, the "L.higher education graduates" variable is omitted. The characteristic equation of the estimated model is as follows:

$$\begin{aligned} Yit =& \alpha + \beta_1 \,(\text{L.accumulation\_hk})_{it} \\ &+ \beta_2 \,(\text{Linvestment})_{it} + \beta_3 \,(\text{L.population})_{it} \\ &+ \beta_4 \,\,(\text{L.inflation})_{it} + \beta_5 \,(\text{L.trade})_{it} \\ &+ \beta_6 \,(\text{L.employment})_{it} + \varepsilon_{it} \end{aligned} \tag{29}$$

Where, $\forall i \in [1,\ 5]\,, \forall t \in [1990,\ 2015]$, Y_{it} represents economic growth rate and L represents means the logarithm.

The results in Table 5 show that neither the employment of higher education graduates nor the accumulation of human capital is significant. However, a high level of higher education graduates does not systematically lead to economic growth. A sterile and inactive human capital cannot boost growth. On the contrary, sometimes it can lead to a burden and economic handicap factor.

At first, we thought that the higher the number of higher education graduates is, the more economic growth will be. The empirical result confirms this hypothesis for BRICS and Southeast Asian countries and denies it for MENA countries. This has led us to the second hypothesis implying that the positive impact of human capital quality on economic growth is greater as the unemployment rate of university graduates is low. Similarly, the empirical result confirms this hypothesis for the BRICS and South East Asian countries and denies it for the MENA countries. Thus, the absence of the correlation between the rate of economic growth and graduates of higher education in MENA countries should not be exclusively due to the high unemployment rate of their university graduates.

According to the Table 6 below, the average unemployment rate of university graduates from MENA

Table 6
Average unemployment rate of higher education graduates over the period 1990–2015 (in percentage)

MENA countries		BRICS countries		Southeast Asia countries	
Algeria	10.245%	South Africa	4.146%	Indonesia	8.464%
Egypt	15.529%	Brazil	4.207%	Malaysia	15.919%
Jordan	19.658%	Russia	27.984%	Philippines	27.665%
Morocco	9.65%	India	25.869%	Singapore	16.292%
Tunisia	14.32%	China	17.17%	Thailand	18.061%
Average	**13.88%**	Average	**15.87%**	Average	**17.28%**

Source: WDI database of and author's work.

countries (13.88%) during the period 1990–2015 is lower than that of the BRICS countries (15.87%) and Southeast Asia countries (17.28%). Thus, it is not the unemployment rate of university graduates that brake growth, but rather their rate of productivity. Therefore, although the unemployment rate of university graduates in Russia, India, China and Philippines is high, the growth rate of GDP is increasing.

The problem of university graduate's unemployment in the MENA countries is mainly related to the lack of a clear strategy and vision for the integration of graduates into high-productivity, and high-growth sectors as high technology sectors. Most graduates in these countries prefer to work in the public sector, such as administration, education and health that have not a significant added value on economic well-being.

In this context we could share the idea of Aghion et al. [39] implying that investment in higher education in developed countries has greater impact on growth as compared to developing countries. Investment in higher education combined with the advancement in technology facilitates to developing countries to grow faster.

In fact, investment in human capital is a source of technological innovation and a vector of economic development. The positive impact of human capital on economic growth seems obvious in theory and follows the development of endogenous growth theory which calls for the promotion of education, research and development.

Nevertheless, the positive impact of human capital quality on economic growth is neither systematic nor unidirectional. Paradoxically, if the human capital required is inefficient and unproductive, the impact on growth is reversed and becomes binding. The return of investment in human capital is related to the quality of higher education graduates and to employment policy, which mainly relate to matching on the labour market, the structure of the labour market, public expenditure on training, efficiency and integration of outgoing graduates in economic activity, etc.

6. Conclusion

In this paper, we examine the impact of quality of human capital accumulation on economic growth for BRICS, Southeast Asian and MENA countries. Then, we utilize panel data for each group used in this paper during the period of study from 1990 to 2015. Our empirical findings show that for BRICS and South East Asia countries, the nexus among quality of human capital and economic growth is positive, while for MENA countries the relationship has not been identified. However, our second result shows that positive link between quality of human capital and economic growth depends on the level of accumulation and effectiveness of higher education graduates and their employment rate in high value-added sectors.

Additionally, we show that for the BRICS and for Southeast Asia countries, the development of human capital has been a long-term pillar of growth. The investment effort in training and education allowed them to be among the most advanced countries. The empirical results show that the effect of human capital on economic growth is even greater, as these countries have a high employment rate of university graduates.

However, in MENA countries the relationship between human capital quality and economic growth is absent. Certainly, these countries have spent and invested in human capital, but the return derived in terms of growth and economic development remains very modest. This is mainly due two factors: weak dynamics and matching mechanisms on the labour market and the low quality of higher education graduates. Consequently, high rates of unemployment of

university graduates which have become structural and cyclical in these countries can be converted to a burden and social distress factor.

The relationship between human capital and economic growth does not only depend on the employment rate of university graduates and labor market matching mechanisms, but it also depends on the nature of the job (precarious or strong and sustainable), the efficiency and productivity of human capital and the added-value of the sectors of activity in which university graduates are hired.

7. Policy implications

There are developing countries where the unemployment rate of their graduates is lower than the unemployment rate of graduates in developed countries, but the relationship between human capital and economic growth is negative or sometimes absent.

For these countries much work remains to be done in the coming years for the employability of young graduates. They must rethink their employment policy in sectors with a high potential for employment, especially for women, who represent the largest share of unemployed graduates. Entrepreneurship, energy and biotechnology are growing and high added-value sectors that need to be supported and reinforced in the training of young graduates. Indeed, what distinguishes BRICS and Southeast Asian countries from MENA countries was the capacity of their employment markets to mobilise the skilled labour in high-value sectors and not the disparity in the employment rates.

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