The impact of trade Openness on human capital in Algeria for the period (1990-2022)

Lazhar Sahli [* (1)]   *Sihem Bousba* [(2)]

l.sahli@univ-skikda.dz   *si.bousba@univ-skikda.dz*

Université 20 Août 1955-Skikda,   *Université 20 Août 1955-Skikda,*

(Algeria)   *(Algeria)*

Laboratory SFKE   *Laboratory ECOFIMA*

Abstract

This study is an attempt to examine the impact of trade openness on human capital in Algeria for the period from 1990 to 2022. It has been using Autoregressive Distributed Lag Model (ARDL) because of this model is advantageous and suitable for small samples and data of stationary in the first-difference, the level or a combination of the two. In addition to that, this study arrives to a long-term balanced relationship between the study variables. This is because the negative and not significant relationship between the human capital, represented by the number of enrollments in secondary schools (Educ), and the government expenditure on education (govED) per capita growth. On the other hand, it was positive and not significant with the trade openness index (Op). Furthermore, the relationship was negative and significant with the government expenditure on health (govH) per capita growth and the total labor force (LF). As it was expected, the error correction factor was negative and significant. Thus indicates that the estimated model includes a mechanism for returning to balance again.

✓ Trade Openness, Human Capital, Algeria, Auto-regression Distribution Lag Model (ARDL)

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[*] *Lazhar Sahli*

1. INTRODUCTION

International trade receives a great deal of attention from policy-makers and decision-makers, because of its impact on the future of national economies. Trade clearly affects the achievement of rewarding economic growth rates and thus allows the possibility of achieving sustainable development goals in its three dimensions (Economic, Environmental and Social). In this context, the world has committed itself to implementing the 2030 Agenda for Sustainable Development, which includes 17 sustainable development goals that were adopted by the Member States of the United Nations in September 2015 to help achieve global sustainable development. In this regard, goals (3 and 4) stipulated above are: ensure healthy lives and promote well-being for all at all ages and Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. (United Nations, 2017)

The achievement of high and sustainable economic growth has become a common goal for any country that wishes to raise their people's living standard. Human capital defined as the stock of knowledge, skills and competency that the labor force possesses, plays an important role in economic growth. (Dao & Khuc, 2023)

Over the past three decades, Algeria's economy has been experiencing a dynamic growth, The Algerian economy expanded by 3.9 percent year-on-year during the first nine months of 2021, after contracting by 5.5 percent in 2020, (World Bank, 2022) The World Bank's Economic Update projects Algeria's economy to grow by 2.3 percent in 2023. (World Bank, 2023) This remarkable performance has shown an optimistic 'Algeria rising'. Despite the impressive economic performance, An undeniable challenge remains: can the algeria's dynamic economic expansion be converted into sustainable human capital?

Scholars have addressed the issue of overall Algerian economic development, but the developmental effect on the Algerian citizen remains unclear and largely unrealized. Studies that bring out the economic development are often met with a

counterargument that "development" should imply more than rising incomes. (Mbabazi, 2017) Taking this argument as a base and by focusing on trade in particular.

1.1. The research main problem

This study examines the impact of trade Openness on human capital in Algeria. More specifically, the research question is formulated as follows:

What impact does trade Openness on human capital in Algeria during the period (1990-2022)?

1.2. The research main hypothesis

This study is based on the hypothesis that trade Openness has a positive impact on human capital in Algeria during the period (1990-2022).

1.3. Research objectives

Studying the impact of trade openness on human capital is a critical issues in the field of economics sciences. The main objective of this study is to understand how openess trade impact the development of human capital, which includes factors like education and health, because the human capital plays a crucial role in a nation's overall productivity and economic performance, and this helps policy makers make decisions that contribute to achieving sustainable development goals.

1.4. Research importance

The importance of the research comes from the search on a very important topics, which are:

- Trade openness can stimulate economic growth, this leads to increased productivity, job creation, and higher income levels, and can facilitate the globalization of education, fostering a diverse and globally competitive workforce;
- The investment in human capital is a primary driver of economic growth. A well-educated and skilled workforce can enhance productivity, leading to increased economic output and prosperity. Investments in human capital can boost a country's gross domestic product (GDP).

- There is a research divide in the studies that address the impact of trade openness on human capital in Algeria.

1.5. Research method

In an attempt to test the research main hypothesis, an applied study was conducted using descriptive analysis and quantification according to Autoregressive Distributed Lag Model (ARDL) during the period (1990-2022) in Algeria.

2. Theoretical Framework

2.1. Human Capital

2.1.1. Definition

A set of different concepts are usually used to define the word 'Human Capital':

Human Capital includes the natural ability, innate and acquired skills, knowledge, experience, talent and inventiveness (KUCHARČÍKOVÁ, 2011, p. 65). Human Capital refers to "the capacity of human beings to produce an income" (Bottone, 2008, p. 07). Human Capital can be defined also as knowledge, skills, attitudes, aptitudes, and other acquired traits contributing to production (Kai-Joseph, 2007, p. 04).

This definition is agreed with the definition of "OECD" which pointed that human capital as: 'The knowledge, skills, competencies and other attributes em-bodied in individuals or groups of individuals acquired dur-ing their life and used to produce goods, services or ideas in market circumstances' (Iallouchen Iallouchen, Essarsar, Benkada, & Belouchi, 2018, p. 81).

2.1.2. Education as the most measure of "Human Capital"

The most used measures of human capital is the level of educational attainment (Škare & Lacmanović, 2015, p. 736) Estimation of the returns to education has been a popular subject in the literature and the quality of labour which is a key contributors to the Gross Domestic Product (GDP) of any country, There are three main components of 'Human Capital' (Nyakundi & Oranga, 2020, p. 13922):

- early ability;

- qualifications and knowledge acquired through formal education;

- skills, competencies and expertise acquired through informal education.

2.2. Trade Openness

Trade Openness is one of a set government policies and programs which is used to tapping into the enormous benefits offered by foreign trade.

The Trade-to-GDP ratio wich often called the trade openness ratio used to measure the importance of international transactions relative to domestic transaction and calculated by different measures:

- the sum of exports and imports of goods and services relative to GDP (OECD, 2011, p. 176);

- Trade intensity which calculated as total imports as percentage of GDP (Dastidar, 2015, p. 47);

- trade barriers which includes import duties, export duties, profits of export or import monopolies, exchange profits and exchange taxes (Dastidar, 2015, p. 47).

2.3. Contribution of Trade Openness on Human Capital

Trade openness can achieve positive results in the development of human capital and this is through its contribution to various aspects that impact education and the health of the workforce in the country. Trade openness increases a country's ability to access educational, technological resources and programs that improve education in the importing country. Additionally, trade openness plays a significant role in intensifying government investment in education, enabling the creation of a competitive workforce in international markets.

Furthermore, countries specializing in providing certain goods and services gain a comparative advantage, which helps develop specialized skills in manufacturing and technology. trade openness also facilitates labor mobility between different industries through individuals actively seeking employment opportunities that allow them to acquire new skills and experiences.

Another important aspect of trade openness is its impact on human resource health. It enables access to healthcare products and services from different countries. Access to healthy individuals significantly contributes to their productivity and consequently, enhances economic growth.

3. Literature review

There is a large body of literature done on the impact of trade openness on human capital, the debate around trade openness – human capital is centred around the fact that openness to trade is a vital element of successful human development strategies. In spite of a vast literature on the matter, the effect of trade openness on human capital remains controversial.

(Dao & Khuc, 2023) investigates the impact of openness on human capital in 112 countries during the period (2000–2019). A two-stage least square fixed effect model with instrumental variables is used to unravel the relationship between human capital and its key determinants. The empirical results show that the impacts of openness vary greatly among different groups of countries. For example, while FDI has no effect on human capital in developed and upper-middle-income developing countries, its effect is positive in lower-middle-income countries and negative in low-income countries. Exports stimulate human capital formation in developed countries but in low-income developing countries, they act as an impediment to human capital formation. Imports have a positive effect on human capital in developing countries; however, in developed countries, the effect of imports on human capital is negative. International cooperation effectively raises the level of human capital in developed, upper-middle-income and low-income countries; however, it has no effect in lower-middle-income countries.

(Tsaurai, 2021) explored the determinants of trade openness in transitional economies. The impact of the complementarity between foreign direct investment (FDI) and human capital development on trade openness in transitional economies was also a subject of investigation. The study used panel data analysis methods, namely the

dynamic generalized methods of moments (GMM), fixed effects, pooled ordinary least squares (OLS), random effects with panel data duringthe period (2000-2018). The empirical results show that the Human capital development, the interaction between FDI and human capital development, economic growth and mining sector growth were found to have a significant positive impact on trade openness in transitional economies.

(Vitenu-Sackey & Bathuure, 2020) studied the effect of public expenditure on secondary education on secondary school enrollment and economic growth in Ghana during the period (1971-2018). The cointegration test, fully modified ordinary least square, Wald test and granger causality tests were used in this study.

One of the most important findings of this study is that the public expenditure on secondary education has insignificant effect on secondary school enrollment in the long and short run but negative effect on economic growth in the short run.

(Tsaurai, 2017) studied the relationship between trade openness, human capital development and economic growth in three emerging markets using panel approach with data during the period (1994-2014). Panel co integration tests confirmed the existence of a long run relationship between the three variables. The study used Panel vector error correction model (VECM), the empirical results show that the economic growth and trade openness influenced human capital development in the long run in line with the Dunning's (1973) eclectic paradigm theory of foreign direct investment (FDI) which mentions that economic growth and trade openness attract FDI, which in turn bring benefits such as human capital development to the host country.

(Mbabazi, 2017) attempts to contribute to the limited literature on trade and human development by examining the impact of trade on income, education, and life expectancy in Sub-Saharan Africa (SSA). The study used generalized method of moments (GMM) approach in a panel data setting comprising 38 countries and 11 years. the empirical results suggest that an increase in trade is positively associated with enhancement in social welfare in Sub-Saharan Africa (SSA).

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(Craigwell, Bynoe, & Lowe, 2012) explored the efficacy of public spending on health care and education by evaluating the life expectancy and school enrolment rates, using a data set containing 19 Caribbean countries during the period (1995-2007) for health care and (1980-2009) for education, The Panel Ordinary Least Squares model was used in this study.

The empirical results show that public expenditure on health has a significant positive effect on health status, while expenditure on education has no appreciable influence on either primary or secondary school enrolment.

4. Econometric specification and methodology

4.1. Econometric methodology

In order to measure and analyze the impact of trade Openness on human capital in Algeria, an autoregressive distributed lag model (ARDL) was used, which is considered one of the best standard models adopted in the co-integration test within the framework of the Bounds Test. The model was developed by Pesaran & Shin (1999) and Pesaran & Smith (2001) (Pesaran, Shin, & Smith, pp. 289-326). It is distinguished from other standard models in that it is used regardless of the degree of stability of the time series of the study variables, provided that none of the time series is stable at the second difference, and the dependent variable is instability at the level.

4.2. Model specification and data

In order to measure and analyze the impact of trade openness on human capital Index (the number of students enrolled in secondary schools) in Algeria, a linear equation is specified to examine the long-run relationship between Enrolment in secondary school (Educ), The labor force (LF), The government expenditure on health (govH) and education (govED) per capita growth, and trade openness (OP) as follows:

$$\mathbf{ED_t = \beta_0 + \beta_1\, govED_t + \beta_2\, govH_t + \beta_3\, LF_t + \beta_4\, OP_t + \varepsilon_t}$$

This relationship can be converted into the following:

$$\mathbf{\Delta ED_t = \beta_0 + \beta_1 \sum_{t=1}^{n} \Delta govED_{t-1} + \beta_2 \sum_{t=1}^{n} \Delta govH_{t-1} + \beta_3 \sum_{t=1}^{n} \Delta LF_{t-1} + \beta_4 \sum_{t=1}^{n} \Delta OP_{t-1} + \beta_5\, ECM_{t-1} + \varepsilon_t}$$

Where; Δ shows the first difference of the variables. The coefficients of the lagged difference variables provide the short run dynamics of the model converging to the equilibrium path while we expect β_5 to be < 0 for it implies stability of the model. The coefficient of the ecm term signifies the speed of adjustment to equilibrium after a shock.

Data from 1990 to 2022 for the labor force (LF), The government expenditure on health (govH) and education (govED) per capita growth, and trade openness (OP) are obtained from the World Development Indicators database, while those for Enrolment in secondary school is obtained from National Statistics Office database (NSO). Table 1 summarizes the description of the variables.

Table 1. Description of the variables used in this study

Variable name	Variable définition
School Enrollment, Secondary (ED)	Net enrollment is the number of children of official school age who are enrolled in school. Secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teachers.
government expenditure on health (govH) per capita growth	Annual growth rate of public expenditure on health from domestic sources per capita.
government expenditure on education (govED) per capita growth	Annual growth rate of public expenditure on education from domestic sources per capita.
Labor force (LF)	Labor force comprises people ages 15 and older who supply labor for the production of goods and services during a specified period. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers.
Trade openness (OP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.

Source: Prepared by authors, based on World Bank data base.

5. Empirical Results and Discussion

5.1. Stationarity

We examine the stationarity properties of the variables using Phillips Peron (PP) and Augmented Dickey- Fuller (ADF) tests. To do this, we run PP and ADF unit root

tests in both level and first difference. The results of PP and ADF tests are reported in Table 2.

Table 2. Unit root tests.

|	Variable	Augmented Dickey-Fuller test statistic			Phillips-Perron test statistic		
		Constant	Constant, Linear Trend	None	Constant	Constant, Linear Trend	None
		Prob	Prob	Prob	Prob	Prob	Prob
level	ED	0.9801	0.0017*	0.9999	0.0007*	0.0042*	0.0017*
	govED	0.0000*	0.0003*	0.0000*	0.0000*	0.0003*	0.0000*
	govH	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
	LF	0.7106	0.0274**	0.2026	0.7960	0.0300**	0.2195
	OP	0.2403	0.8412	0.6686	0.4189	0.8796	0.6877
1st différence	ED	0.0007*	0.0042*	0.0017*	0.0124**	0.0592***	0.0018*
	OP	0.0001*	0.0004*	0.0000*	0.0001*	0.0004*	0.0000*

Notes: *, ** and *** denote 1%, 5% and 10% levels of significance, respectively.
Source: Author's computation (extracted from EViews13)

5.2. Model Selection Criterion

The criterion for variables lag order selection is presented in the following graph. On the basis of the Akaike Information Criterion (AIC). the optimal lag length has been selected. According to the AIC, among the top 20 model our best model for this study is ARDL (3,0,0,1,0) model.

Figure-1. Model Selection

Akaike Information Criteria (top 20 models)
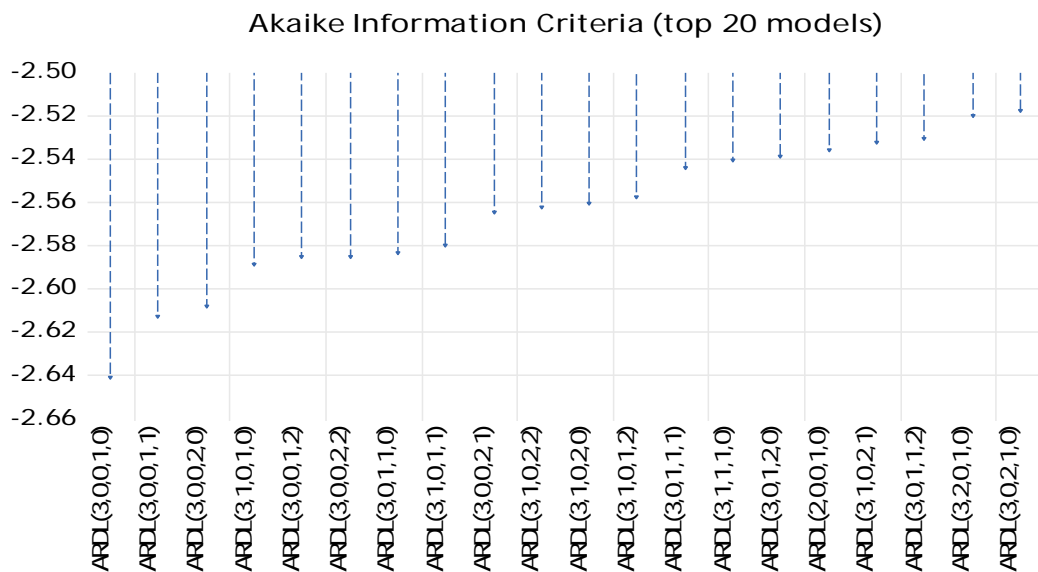
Source: Author's computation (extracted from EViews13)

5.3. Results of the ARDL Bounds Tests

In order to determine the presence of a long run relationship between the variables Enrolment in secondary school (ED), The labor force (LF), The government expenditure on health (govH) and education (govED) per capita growth, and trade openness (OP), the bounds test is conducted. The result of Bounds test is presented in Table 3. It is evident from Table 3 that the computed F-statistic based on Wald test is 6.024647 which exceeded the all upper bounds value. As the co-integration exists among the variables used in the model, therefore, the result presented for the long run are reliable.

Table-3. Bounds Test Result

	10%		5%		1%	
	F-statistic = 6.024647					
Sample Size	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
30	2.525	3.560	3.058	4.223	4.280	5.840
Asymptotic	2.200	3.090	2.560	3.490	3.290	4.370

* I(0) and I(1) are respectively the stationary and non-stationary bounds.

Source: Author's computation (extracted from EViews13)

5.4. Long-run and short run estimated coefficient of ARDL

Long-run and short run estimated coefficient of ARDL is presented in Table 4 and Table 5.

Table-4. Long Run Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
govED	-0.001125	0.001653	-0.680584	0.5026
govH	-0.006180	0.001586	-3.896632	0.0007
LF	-0.142872	0.018231	-7.836963	0.0000
OP	0.000456	0.003138	0.145405	0.8856
C	7.268843	0.868059	8.373677	0.0000

Source: Author's computation (extracted from EViews13)

Table-5. Short Run Estimation and ECM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.484625	0.072096	-6.721968	0.0000
D(ED(-1))	0.587587	0.135254	4.344323	0.0002
D(ED(-2))	0.330768	0.141333	2.340341	0.0275
D(LF)	-0.003382	0.014875	-0.227362	0.8220

CE = EDUC(-1) - (-0.001125*GOVEDU - 0.006180*GOVH - 0.142872*LF(-1) + 0.000456*OP + 7.268843)

Source: Author's computation (extracted from EViews13)

5.5. Diagnostic checking

Table-6. Diagnostic checking

| Diagnostic checking	
Breusch-Godfrey Serial Correlation LM Test	F-statistic = 0.182735 (p-value = 0.8345)
	Chi-Square (2) = 0.577095 (p-value = 0.7494)
Heteroskedasticity Test: ARCH	F-statistic = 0.106734 (p-value = 0.7465)
	Chi-Square (1) = 0.114475 (p-value = 0.7351)
Ramsey RESET Test	F = 0.071432 (p-value = 0.7921)
Jarque-Bera	χ^2 =0.067216 (pvalue = 0.966951)

Source: Author's computation (extracted from EViews13)

5.6. Stability Test

Cumulative sum (CUSUM) test and Cumulative sum of squares (CUSUM of squares) test has been examined to test the stability of long run coefficient.

The result obtained is given in the following figure-2:

Figure-2. Stability test of coefficient
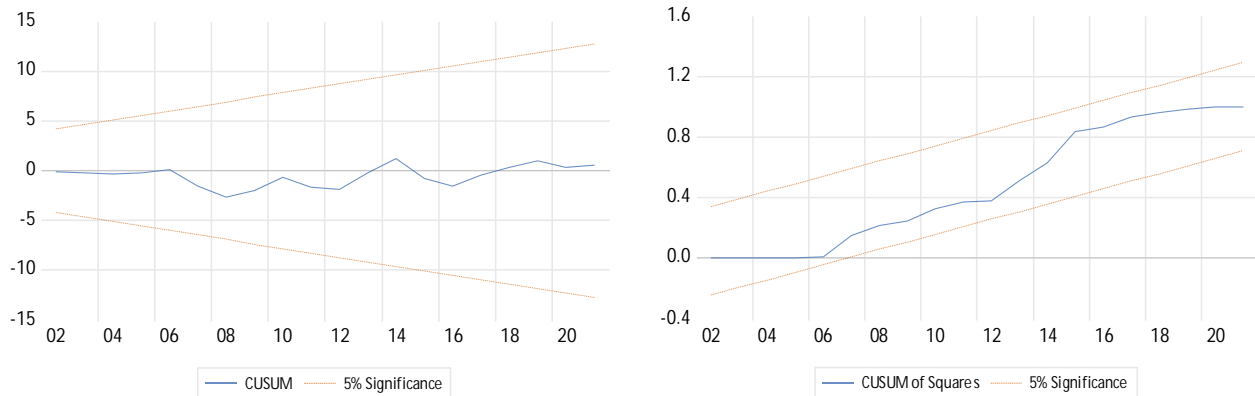
Source: Author's computation (extracted from EViews13)

It appears that the two graphs of the cumulative sum of residuals and the cumulative sum of squares of residuals fall within the framework of the critical limits at a significant level of 5%, which indicates the stability of the short and long-term parameters of the estimated model, meaning that the long-term results are fully consistent with the short-term results.

5.7. Discussion

This paper studied the impact of trade openness on human capital in Algeria for the period 1990 to 2022, using Autoregressive Distributed Lag Model (ARDL) because it is suitable for small samples and data of stationary in the first-difference or the level or a combination of the two. Results of the ARDL Bounds Tests observed that there exists a long run relationship between the variables under study. Long-run estimated coefficient of ARDL results are:

(1) Firstly, the government expenditure on education (govED) per capita growth influenced negatively and insignificantly on human capital development in the long run. **(2) Secondly**, the government expenditure on health (govH) per capita growth and labor force (LF), influenced negatively and significantly on human capital development in the long run. **(3) Thirdly**, the trade openness (OP) influenced positively and insignificantly on human capital development in the long run.

As it is expected, the error correction factor was negative and significant, which indicates that the estimated model includes a mechanism for returning to balance again.

- Despite the importance of investing in education for the development of human capital by increasing the number of enrollees in secondary schools, its impact appears to be negative and significant. Although the matter seems logical and understandable to a certain extent, the budget allocated by the higher authorities in the country for the education sector remains very weak and falls short of the required level. It is expected that increased spending on education would contribute to achieving the economic and social development goals of society, and provide a suitable and more appropriate educational environment that leads to educational outcomes with a high degree of skills. This, in turn, would contribute to enhancing productivity, innovation, and creativity in all aspects of economic life. Without neglecting the crucial role of education spending in reducing poverty and providing equal learning opportunities for all segments of society. Investing in education has remarkable long-term results by supporting the development of human capital. These results are matching with the results of (Vitenu-Sackey & Bathuure, 2020) for Ghana and (Craigwell, Bynoe, & Lowe, 2012) for Caribbean countries.

- The applied results have shown that the government expenditure on health has a negative and significant impact on the development of human capital through the number of enrollees in secondary schools. This is a clear and explicit indication that public expenditure on the health sector in Algeria still falls below the required level and necessitates significant efforts. Increasing Health expenditure could lead to improving the overall health situation of society, thereby reducing absenteeism or even school dropout due to illnesses. Additionally, providing students with proper health care would aid in their academic performance and elevate their academic achievement. This would result in higher enrollment rates, lower dropout rates, and the overall reduction in abandoning education.

Furthermore, a public health care system based on health care accessibility would alleviate the financial burdens on Algerian families, granting them financial relief to ensure their children's enrollment in school under comfortable and suitable conditions. Ultimately, the overall situation could have a clear impact on enhancing the country's economic reality.

- The practical results have shown that the labor force negatively and significantly impacts the number of enrollments in secondary schools. This is a logical outcome primarily attributed to the low wage levels among the working class in Algeria on one hand, and the high unemployment rates on the other hand. The spread of unemployment and the decrease in wage levels can render Algerian families incapable of affording the costs of enrolling their children in secondary schools. This, in turn, leads to an increase in the phenomenon of school dropout, as young people turn towards the labor force to support their families.

Conversely, the scarcity of job opportunities, especially for educated individuals, diminishes the motivation among the youth to pursue further education. All of these factors, along with others, have entirely negative effects on the overall economic situation of the country.

- The applied results show that trade openness has a positive effect on human capital (School Enrollment, Secondary), but it is not significant. On the export side, Algeria, like low-income countries, enjoys a comparative advantage in products that require low skills, especially agricultural commodities and raw materials. Here, trade openness provides exciting opportunities for production and export. Commodities in which you have a comparative advantage. When countries participate more freely in international trade, the less developed countries have the higher the relative price of low-skill goods. As a result, the demand for low-skilled workers increases, also their wages and the cost of access to education opportunities.

While imports stimulate the formation of human capital, and due to the existence of wide gaps in the technological level between the least developed countries and the

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developed countries, more freedom in international trade enables these countries to import high-tech machines. The application of advanced technology in production will lead to an increase in labor productivity and thus return to education. Higher returns to education urge people to invest more in education to acquire modern skills, which gives them the ability to absorb new incoming advanced foreign technology. Trade openness also facilitates the import of foreign education services, which leads to improve human capital formation. Students from developing countries have more opportunities to obtain advanced education and training in developed countries with a target of their countries. This finding strongly supports the study of Dao and Khuc (2023)

6. CONCLUSION

This research paper attempted to study the impact of trade openness on one component of the Human capital (the number of students enrolled in secondary schools) in Algeria for the period from 1990 to 2022. The Human capital in this study includes the total enrolled students in secondary schools. The explanatory variables (The government expenditure on health and education per capita growth), trade openness index, and total labor force were included in the estimation as determinants of progress in economic and human development.

The Autoregressive Distributed Lag (ARDL) model with distributed time lags was employed in this research paper. The results affirm that the The government expenditure on health and the total labor force have a significant negative impact on human capital through the number of students enrolled in secondary schools. Meanwhile, the growth in per capita spending on education and trade openness have a negative and insignificant impact on human capital through the number of students enrolled in secondary schools in Algeria.

In general, decision-makers in Algeria can work towards greater trade openness to leverage more benefits for increasing income levels and encouraging a stronger focus on education to enhance the quality of the human resource within a long-term strategy aimed at achieving sustainable development.

Finally, Certain preconditions must be available in Algeria's economy if trade openness is to be able to have an impact on human capital development.

7. Bibliography List

Bottone, G. (2008). Human Capital: an Institutional Economics point of view. (I. D. ECONOMICA, Ed.) Rome - Italy: Piazza dell'indipendenza.

Craigwell, R., Bynoe, D., & Lowe, S. (2012). Emerald Article: The effectiveness of government expenditure on education and health care in the Caribbean. International Journal of Development Issues, 11(01), (4-18). https://doi.org/10.1108/14468951211213831

Dao, T., & Khuc, V. (2023). The Impact of Openness on Human Capital: A Study of Countries by the Level of Development. (B. S. MDPI, Éd.) Economies 11: 175. doi:https://doi.org/10.3390/economies11070175

Dastidar, S. (2015). Essays on Public Education Expenditure, Trade Openness and Economic Growth of India. DOCTOR OF PHILOSOPHY. University of Dundee.

Iallouchen Iallouchen, A. A., Essarsar, M., Benkada, A. A., & Belouchi, M. (2018). HUMAN CAPITAL OR MAN-CAPITAL THEORY. International Journal of Scientific & Engineering Research, 09(08). Récupéré sur https://hal.science/hal-01865142

Kai-Joseph, F. (2007). A Review of Human Capital Theory: Microeconomics. (U. o. Gallen, Éd.) Provided by Research Papers in Economics. Récupéré sur http://www.vwa.unisg.ch

KUCHARČÍKOVÁ, A. (2011). HUMAN CAPITAL – DEFINITIONS AND APPROACHES. Human Resources Management & Ergonomics(07).

Mbabazi, G. (2017). The impact of trade on human development in Sub-Saharan Africa (SSA). (J. U. School, Éd.)

Nyakundi, E., & Oranga, J. (2020). Human Capital and Returns to Education. Review of literature. International Journal of Current Research, 12(09). doi:https://doi.org/10.24941/ijcr.39752.09.2020

OECD. (2011). Trade Openness. OECD Publishing. Paris: OECD Science, Technology and Industry Scoreboard. doi: doi:https://doi.org/10.1787/sti_scoreboard-2011-60-en

Pesaran, M., Shin, Y., & Smith, R. (n.d.). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics(16).

Škare, M., & Lacmanović, S. (2015). Human capital and economic growtha: a review essay. (T. B. Studies, Éd.) Journal, Amfiteatru Economic, 17(39). Récupéré sur http://hdl.handle.net/10419/168945

Tsaurai, K. (2017). Examining The Inter-Linkages Between Trade Openness, Human Capital Development And Growth In Selected Emerging Markets. Academy of Accounting and Financial Studies Journal, 21(03), (1-14).

Tsaurai, K. (2021). Determinants of Trade Openness in Transitional Economies: Does the Complementarity between Foreign Direct Investment and Human Capital Development Matter? International Journal of Economics and Business Administration, 09(01), (318-330).

United Nations, S. (2017). Global indicator framework for the Sustainable Development Goals Goals and targets (from the 2030 Agenda for Sustainable Development).

Vitenu-Sackey, P., & Bathuure, I. (2020). Assessment Of Government Expenditure On Secondary Education And Its Impact On Secondary School Enrolment And Economic Growth: An Empirical Evidence Of Ghana. International Journal of Information, Business and Management, 12(03), (37-50). Récupéré sur https://www.researchgate.net/publication/341099359

World Bank. (2022). Algeria Economic Update: Staying the Course for Transition. International Bank for Reconstruction and Development (The World Bank). Récupéré sur www.worldbank.org

World Bank. (2023). Algeria Economic Update: Staying the Course for Transition. International Bank for Reconstruction and Development (The World Bank). Récupéré sur www.worldbank.org https://data.albankaldawli.org/indicator (consulted on 02/August/2023).

Appendix. 1: variables used in this study for the period (1990-2022)

t	ED	govED	govH	LF	OP
1990	0,754	NA	NA	43,659	48,381
1991	0,752	150,980	34,424	43,960	52,718
1992	0,743	26,823	17,292	44,110	49,189
1993	0,747	27,515	14,666	44,474	44,923
1994	0,793	10,145	24,243	44,783	48,584
1995	0,821	10,234	10,250	44,860	55,191
1996	0,853	34,483	3,035	44,920	53,705
1997	0,855	5,523	3,381	44,650	52,244
1998	0,879	4,673	1,007	44,380	45,094
1999	0,910	2,941	1,041	44,110	50,929
2000	0,922	9,524	10,794	43,841	62,858
2001	0,976	28,696	0,663	43,572	58,706
2002	1,041	5,405	1,293	43,303	61,134
2003	1,096	11,538	18,256	43,035	62,125
2004	1,122	13,218	23,325	42,767	65,701
2005	1,123	4,061	18,299	42,499	71,279
2006	1,176	11,111	12,916	42,233	70,730
2007	1,036	30,476	16,427	41,966	71,938
2008	0,975	36,131	25,484	41,700	76,685
2009	0,975	35,389	21,376	41,430	71,324
2010	1,171	7,327	16,160	41,710	69,867
2011	1,199	39,483	20,746	41,855	67,474
2012	1,263	42,725	1,685	42,000	65,405
2013	1,498	25,023	1,928	43,200	63,611
2014	1,500	16,811	0,152	40,740	62,414
2015	1,527	2,328	24,226	41,710	59,695
2016	1,379	2,896	3,864	41,870	55,926
2017	1,287	0,319	1,983	41,817	55,321
2018	1,227	0,425	0,830	41,766	58,065
2019	1,223	0,841	35,969	41,750	51,810
2020	1,263	6,730	5,100	39,349	45,331
2021	1,479	1,700	3,400	40,055	53,195
2022	NA	1,435	3,100	40,582	54,116

Source: Prepared by authors based on World Bank data base (https://data.albankaldawli.org/indicator).