HUMAN CAPITAL AND PRODUCTIVITY GROWTH IN AGRICULTURE IN VIETNAM

Nguyen Quynh Hoa
National Economics University
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Abstract: For a country that is in the process of transforming its agricultural model for development like Vietnam, human capital development is one of the most important keys to ensure the sustainable of economy. In order improve agricultural productivity, it is needed to increase the level of human capital of the agrarian population. This study examines the relationship between human capital and labor productivity in the 1997 - 2018 period of Vietnam. This study employs a quantitative approach, using the endogenous growth model with the Cobb-Douglas production function to analyze the factor's contribution to Agriculture labor productivity. The result showed that human capital development has a significant impact on agricultural productivity in Vietnam. The result also showed that there exists a U-shaped quadratic relationship between trade openness and agricultural output. The findings also showed that the contribution rate of human capital in labor productivity growth is low, while capital investment does not reflect changes in labor productivity. Therefore, in order for human capital to become one of the important factors to promote Agriculture labor productivity in the future, Vietnam needs to raise awareness of the role of human capital and to focus on developing human resources as a tool for improving productivity of agriculture, to transform the growth model from width to depth. It should also be essential to move towards developing hi-tech agriculture with high productivity in the future.

Keywords: Human capital; productivity; agriculture.

1. Introduction

Agriculture always plays an important role in food security. This is why it occupies a prominent place among the Sustainable Development Goals (SDGs) that lead to the economic prosperity of the poorest nations. In Viet Nam, due to the impact of the COVID-19, the basic target for 2020 of the Agriculture and Rural Development has been held back. However, in order to be able to calculate the efficiency of the components that contribute to Agricultural growth is an issue of particular concern.

In history, the classical economists have identified land, labor, and physical capital as the three basic elements of economic growth. In the 1960s, neoclassical economists such as Schultz (1961) and Becker (1964) introduced the concept of human capital. They argued that the favors of an educated, well-trained and healthy workforce allowed for the effective use of the elements of Orthodox. Next was Mincer (1974), who proposed a simplified method to evaluate education. However, the idea that any investment in education offers long-term economic and social benefits, for both individuals and society at large, dates back to Adam Smith, if not desired. Investment in human capital development is a wise one. Today, with the importance of 'knowledge' in the economy, human capital is increasingly focused both Academically and the public

Email: quynhhoa3009@gmail.com

good. Human capital theory holds that human capital - the knowledge and skills embodied in people - and not physical capital, is an important factor in the economic prosperity of a country.

Nowadays, raising human capital has become one of the major concerns in economic growth and development policy. In turn, the focus on human capital spurred interest in how to measure it. However, although there is a broad consensus on the general definition of human capital, the measurement of human capital is proposed in various ways in the empirical literature including several general approaches: Cost-based, income-based, education-based, and productivity-based approaches.

In recent economic literature, the interest in human capital revolves around economic growth. Traditionally, the focus of generating more economic growth has been to give workers access to more physical resources, such as land, factories and machines. But modern theories of economic growth, such as that of De la Fuente (2003), emphasize free capital in their interpretation of growth. According to these theories, human capital can promote growth through stimulating innovation, inventing and innovating technologies, as well as facilitating the acquisition and imitation of new technologies. Many empirical studies have sought to establish a relationship between human capital and productivity. Although in some cases, human capital has been shown to promote growth, but the positive results have not prevailed in others. Therefore, the hypothesis that human capital plays an important role in growth of productivity is not empirically validated. For analyzing the effect of human capital development on agricultural productivity in Vietnam from 1997 to 2018, this study attempts to answer the following question:

- Specifically, what is the influence of human capital on agricultural productivity growth?

To answer this questions the main objective of this study is to evaluate the impact of human capital on the mechanisms of production and income of farmers.

In pursuance of the objectives of the study;

- HYPOTHESIS

H0: Human capital has no significant effect on agricultural productivity development.

H1: Human capital has a significant effect on agricultural productivity development.

2. Literature Review

2.1. Human capital

Human capital is the stock of competencies, knowledge and personality attributes embodied in the ability to perform labor so as to produce economic value (Crook et al., 2011); human capital increases through education and experience (De la Fuente, A. and A. Ciccone (2003). Many early economic theories refer to it simply as workforce, one of three factors of production, and consider it to be a fungible resource homogeneous and easily interchangeable. Other conceptions of this labor dispense with these assumptions. The use of the term in the modern neoclassical economic literature dates back to Mincer’s article in 1958.

For over three centuries, economists have been interested in valuing the productive capacity of the workers in an economy. This paper defines human capital as the stock of knowledge, skills, and abilities embodied in individuals that determines their level of productivity. In principle it includes innate abilities and skills acquired through education, training and experience. On a macro level, it is also common to measure the economy's human capital by the rates of enrolment in elementary and secondary schools and in post-secondary institutions. Human capital investment is aimed at increasing the productivity of the workforce and efficiency of labour market institutions. Hence, human capital is an important element of any agricultural drive. This variable as a measure of the stock of competence and is expected to to have a positive impact on agricultural production.

2.2. Labor productivity

Labor productivity is a measure of only possible labor in the production process, characterized by a system that compares only an output (output) with the labor to produce it. In each economic unit (such as companies and other types of enterprises), labor productivity is equal to the number of products produced per unit or the time required to produce a unit of product. Remaining in the whole economy, labor productivity is manifested into the productivity of household labor. (LP), defined on the basis of gross domestic product (GDP) or gross national product (GNP) divided by the number of employees working in each period in the economy (L).

$$\text{LP} = \frac{GDP}{L}$$

Labor productivity growth is an increase in productivity, a change in the way of working in the direction of shortening the time required for social labor to produce a good, so that there is less labor. This is an unlimited way to increase total social product, because it depends on the progress of science and technology, which has been practically proved to be limitless. Therefore, in Vietnam, labor productivity growth is considered as an issue of top importance, is one of the three strategic breakthroughs to transform the growth model, economic restructuring. The role of human capital in increasing labor productivity and related studies:

The neo-classical Human Capital theory emerged from the Growth Theory by Solow (1956) who took labor as an input and assumed constant return to scales in the production function. Solow's model was later criticized on the bases of the inequality between the rate of returns from human capital and physical capital and hence, Romer (1986) introduced the concept of increasing return to scales in order to equate the returns from human capital and the physical capital. But this view of human capital as a factor influencing productivity does not consider the possibility that some workers may be technically inefficient. In this case, the role of human capital may be biased during the valuing the production function. Other research results show that both education and health have a positive effect on growth in this country. Mincer approaches human capital at a microscopic level through a regression model based on income functions, this study shows that the accumulation of human capital of each individual brings economic benefits to that individual. Vietnam has a lot of research related to human capital and productivity.

3. Model of factors affecting agricultural productivity

Here we use the production function of the form Cobb-Douglas function:
Based on the endogenous growth model, many theoretical and empirical studies have also analyzed the relationship between human capital and economic growth in many different aspects. The author assesses the impact between the quantity and quality of labor resources on TFP growth of Vietnam in the 1997 - 2018 period, the results of the model emphasize the positive impact of investment in human resource development to increase the yield of the aggregate factor in the long run. The study is based on the consideration of the same multivariate linear regression model and the conventional least squares (OLS) method for the time series to examine the effect of human capital on industry productivity growth.

To describe the relationship between human capital and growth in labor productivity, the study is based on the existing studies of endogenous growth by Solow (1957) C. Lee (2005) and De la Fuente (2011) using the endogenous growth model of Mankiw (1992) et al. With measures built on the assumption that an economy has only one manufacturing sector with output Y taken through the Cobb - Douglas production function, using three inputs: human capital, physical capital and labor, corresponding to three variables K, H, L. This model is a function of the inputs and technology that come from the total factor productivity (TFP). This is also the model that has been applied by many economists around the world when analyzing resources for growth.

It assumes a standard neoclassical production function which begins from the premise that changes in quantities of factor of production account for growth. The neoclassical model adopted is based on the Cobb-Douglas function and is given as:

$Y = A\ K\alpha L^{\beta}$ (1) with:

Y: total production (the real value of all goods produced)

A = TFP total factors productivity

K: Value of capital input (the real value of all machinery, equipment and buildings)

L: labor input (the total number of persons-hours worked)

α, β is the elasticity of output, also the coefficient of contribution of labor, capital and people.

These values are constantly determined by available technology. Output elasticity measures the responsiveness of output to a change in levels either labor or capital used in production, centeris paribus.

Further, if $\alpha+\beta=1$, the production function has a constant return to scale, meaning that doubling the usage of capital k and l will also double output Y. If $\alpha+\beta<1$, returns to scale are decreasing and if $\alpha+\beta>1$, returns to scale are increasing. Assuming perfect competition and $\alpha+\beta = 1$, α & β, can be shown to be capital and labors shares of output.

• Logarithmic linear regression function showing growth rate of labor productivity will be:

$\ln Y_{it} = \alpha\ \mathrm{Ln}K_{it} + \beta\ \ln L_{it}$ (2)

In the production function (1), A is TFP, an exogenous variable and grows at a constant rate. At the same time, TFP affects firstly the labor factor, thereby transmitting to physical capital and human capital and the final result is to increase Y output

productivity. Human capital is a factor influencing labor productivity, an integral part of technological progress is investment in human capital and thus is termed endogenous factor because accumulation of physical capital is enhanced by knowledge, skills, attitudes and health status of the people who partake in such exercise. Thus, there is a strong and positive relationship between investment in human capital and output growth. In this regard, several studies have attempted to integrate exogenous forces with endogenous factors in explaining economic growth across countries by using augmented Solow neoclassical production function. These studies include but not limited to the following: Mankiw, Romer and Weil (1992), the impact of human capital on economic growth is incorporated according to the Mankiw, Romer and Weil (1992) framework and is given as below:

$$Y_{(t)} = K_{(t)}^{\ \alpha}\ H_{(t)}^{\ \beta} (A_{(t)} L_{(t)})^{1-\alpha-\beta} \quad (3)$$

Where

Y - Dependent variable is output

K = Physical capital

H = the Human Capital Stock

L=Labour force

A is level of technology and $\alpha,\beta < 1$, implying decreasing returns to capital. By implication, there is a strong and positive relationship between investment in human capital and output growth.

After selecting the model, for the conduct of this work, a linear model was developed as follows:

$$AGRQ = F(HC, TOP, AP, PGR)$$

Where

AGRQ = Agricultural output

HC = Human capital

TOP = Trade openness

AP = Agricultural product prices

PGR = Population growth rate

The model to be estimated becomes

$$AGRQ = \beta 0 + \beta 1\ HC + \beta 2\ TOP + \beta 3\ AP + \beta 4\ PGR + \mu t. \quad (4)$$

Where

$\beta 0$ = Constant

$\beta 1, \beta 2, \beta 3, \beta 4$ = Parameters

μt = Stochastic Error

Agricultural output (AGRQ): This is the total output of agricultural activities. Products by individuals are measured by weight, their varying densities makes the measuring of overall agricultural output difficult. Therefore, agricultural output is usually measured as the market value of final output, which excludes intermediate products such as corn-feed used in the meat industry. The total labor productivity does not show the difference in labor productivity between industries, occupations and especially business groups. A high productivity economy means it can produce more goods, higher agricultural output or services with the same amount of inputs/inputs. Hence agricultural output has a positive relationship with the growth of agricultural productivity.

Human capital (HC): Human capital is the intangible collective resources possessed by individuals and groups within a given population. These resources include, all the knowledge, talents, skills, abilities, experiences, training, judgment and wisdom possessed individually and collectively, the cumulative of which represents a form of wealth available to nations and organizations to accomplish their goals. This variable may be proxied by the sum total of government expenditures on social and community services as a measure of the stock of competence and is expected to to have a positive impact on agricultural production.

Agricultural product prices (AP) is expected to have a positive relationship with agricultural output. It is the value that will purchase a finite quality, weight or other measures of a good or service. Following the conventional economic theory of higher prices for higher supplies, vice versa, the prices of agricultural product, has a role to play in the output produced.

Trade openness (TOP): Trade openness refers to the degree to which the countries or economics permit or have trade with other countries or economies.

Population growth rate (PGR): This is the increase in the country's population during a period of time, usually one year, expressed as a percentage of the start of that period.

4. Data

The study used officially published secondary sources from various sources to calculate the regression function (3) in the period 1997 - 2018.

Agricultural productivity growth refers to output by a given level of input(s) in the agricultural sector of a given economy (Fulginiti and Perrin 1998). More formally, it can be defined as the rate of the value of total farm outputs to the value of total inputs used in the farm production (Olayide and Heady 1982). Agricultural productivity growth is measured as a ratio of final output, in appropriate units to some measure of inputs. However, measures depend on the number of inputs under consideration. Total output as a ratio of measure of labour quantity, usually man days in countries called labor productivity (LP) while output per area of land planted is land productivity (Zepeda 2001). The two previously mentioned measures are examples of single factor productivity (SFP), defined as the ratio of a measure of output quantity to the quantity of a single input used (Diewert and Nakamura 2005). In this study: Total factor productivity (TFP) is defined as a ratio of a measure of total output quantity to a measure of total input quantity (Wiebe 2003).

Trade openness (TOP) refers to the degree to which the countries or economics permit or have trade with other countries or economies. This is seen to affect the agricultural output of that country negatively, as output declines given increased demand for foreign products. Population growth rate (PGR) compares the average annual percentage change in populations, resulting from a surplus (or deficit) of births over death and the balance of migrants entering and leaving a country.

5. Result

Based on regression of the impact of human capital on the growth of agricultural labor productivity in Vietnam in the period 1997 - 2018, the Diagnostic tests of the model were carried out. The result is presented below.

Table 1: *Diagnostic test result*

Test type	Test Value
R^2	0.839594
Adjusted R^2	0.828762
Durbin -Watson Stat	1.225261
F - probability	0.000000
F - statistics	85.82122

Source: *Authors' calculation from statistics*

From the result above in Table 1, R2 value of 0.839594 suggests that the independent variable explain 83% of the variations of the dependent variable (AGRQ). After adjustment for degree of freedom the adjusted R2 value of 0.828762 indicates that approximately 82% of the dependent variable which is Agricultural output (AGRQ) is explained by the independent variables. This was therefore considered satisfactory for the study. The estimation results of the above regression show there are many interesting points. To test the overall significance of the regression, F-statistics was used. The rule is meaning: reject the null hypothesis when F-probability value is less than 0.05 but does not reject the null hypothesis when F-probability is greater than 0.05. From the above Table 1, we reject the null hypothesis since F-probability value, 0.000000 is less than 0.05. Therefore we conclude that the explanatory variables have a significant impact on the dependent variable (Agricultural output). On the other hand, the Durbin Watson statistics is 1.225261.

The Ramsey error specification test (RESET) was used to examine if the model has specification problem. If the F-probability statistics is less than the choosen level of significance, reject the null hypothesis otherwise do not reject the null hypothesis. The summary of the result obtained is shown below:

Table 2: *Ramsey error specification test*

Variable test	Value
F-statistics	0.049325
Probabilities	0.826046

Source: *Authors' calculation from statistics*

As can be seen: the F-statistics probability which is 0.826046 is greater than the chosen level of significance. So, we do not reject the null hypothesis and conclude that the model is not mis-specified. This section presents the regression results obtained from the ordinary least square estimates, cointegration and error correction mechanism.

Table 3: *OLS output*

Variable	Coefficient	Std. Error	t-Statistic
C	-27176.00	9847.278	-2.759747
HC	19.74438	2.352110	8.394327
TOP	-2366.484	2716.712	-0.871084
AP	9.904729	13.33993	0.742487
PGR	10806.57	3908.216	2.765092

Source: *Authors' calculation from statistics*

The OLS results presented in this table will, however, not be used for further analysis. This is because of the possibility of obtaining spurious results in using OLS estimates.

Table 4 : *Conitegration result*

Variable	Coefficient	Std. Error	t-Statistic
C	-18660.27		
HC	8.457375	2.17468	3.80165
TOP	-14919.72	1853.64	8.04020
AP	5.078539	6.76798	0.75037
PGR	8757.099	1705.26	5.13534

Source: *Authors' calculation from statistics*

This shows that the contribution of the remaining factors outside the model (such as changes in economic structure, competitiveness, ability to manage and manage state management...) is increasingly promoting its role in the development of the country.

The result can be summarized in equation form as follows:

AGRQ= -18660.27 + 8.457375HC -14919.72TOP + 5.078539AP + 8757.099 PGR

S.E= (2.17468) (1855.64) (6.76798) (1705.26)

t-stat = (3.80165) (8.04020) (0.75037) (5.13534)

The results in Table 3 reveals that independent variables (HC, TOP and PGR) are statistically significant at 5 percent level of significance.

From the result above we can see that human capital (proxied by total government expenditures on social and community services) has a positive effect on agricultural productivity. This is shown by the positive coefficient of HC (human capital). In addition, each unit change in HC (human capital), 8.457375 of such changes is transmitted to agricultural. Therefore as human capital development increases, agricultural output also increases. It makes intuitive sense, in that as farmers get equipped with innovation information generated from research and development, it helps to boost their productivity. The low level of influence of human capital on Agriculture labor productivity is reflecting the current state of the Vietnamese economy when the proportion of employees working in contravention of their professional occupations is very high, leading to poor human capital that needs to be promoted and utilized. The t-test of the long run estimate was used in testing the hypothesis. The hypothesis was tested for the significance of the independent variable at 5% level of significance.

H_0: Human capital has no significant effect on agricultural production development.

H_1: Human capital has a significant effect on agricultural production development.

From the result in Table 5 below, human capital has a significant impact on agricultural productivity. This is shown by the value of human capital t-test calculated, which is 3.71165, is greater than the table value, which is 2.150. Therefore, following the decision rule, we reject the null hypothesis and conclude that human capital development is statistically significant on agricultural productivity.

Table 5: *Summary of t test statistic*

Variables	t-calculated	t-tabulated	conclusion
HC	3.71165	2.150	Significant
TOP	8.04020	2.150	Significant
AP	0.75037	2.150	Insignificant
PGR	5.13534	2.150	significant

Source: *Authors' calculation from statistics*

The value of the t-statistics is derived from the distribution table using the rule (n-k) where n = number of observations, k = number of variables. This finding is shown by t-probability value of TOP t-test calculated which is 8.04020 and is greater than the t-test table value of 2.150. This implies that over the study period, trade openness had a real effect on agricultural output. There exists a U-shaped quadratic relationship between trade openness and agricultural output growth. This was evidenced by the negative long run effects of the degree of openness.

6. Conclusion

Developing human capital to improve social labor productivity is considered as one of the core issues in the management of socio-economic development to ensure prosperity and sustainable development. By using the endogenous growth model with the Cobb - Douglas production function to analyze the factor's contribution to Agriculture labor productivity growth, the result showed that human capital has a significant impact on agricultural productivity growth in Vietnam. The result also showed that there exists a U-shaped quadratic relationship between trade openness and agricultural output. Therefore, in order for human capital to become one of the important factors to promote Agriculture labor productivity in the future, Vietnam needs to implement three special solutions: Firstly, raising awareness of the role of human capital in the process of labor productivity growth. Training and education is a long process. For that reason, we must consider all levels of that process, especially focus on training high level. Secondly, education and training should be developed to improve the quality of human capital. The reform in agricultural schools must be based on a curriculum that combines teaching and hands-on training of local farmers, and especially on continuing education for senior farmers. Third, the country needs to focus on developing human resources as a tool for improving productivity of agriculture, to transform the growth model from width to depth, especially applying high-tech techniques to production towards the hi-tech agriculture with high productivity in the future.

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TÓM TẮT

VỐN CON NGƯỜI VÀ TĂNG TRƯỞNG NĂNG SUẤT NÔNG NGHIỆP TẠI VIỆT NAM

Nguyễn Quỳnh Hoa
Trường Đại học Kinh tế Quốc dân
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Đối với một đất nước đang trong quá trình chuyển đổi mô hình nông nghiệp để phát triển như Việt Nam. Phát triển vốn con người là một trong những chìa khóa quan trọng nhất để đảm bảo sự phát triển bền vững của nền kinh tế. Để có thể tăng trưởng năng suất nông nghiệp, cần phải tăng nguồn vốn con người trong nông dân. Nghiên cứu này xem xét mối quan hệ giữa vốn con người và năng suất lao động giai đoạn 1997 - 2018 của Việt Nam. Bằng cách sử dụng mô hình tăng trưởng nội sinh với hàm sản xuất Cobb - Douglas để phân tích sự đóng góp của vốn con người vào tăng trưởng năng suất lao động nông nghiệp. Kết quả cho thấy, phát triển vốn con người có tác động đáng kể đến năng suất nông nghiệp ở Việt Nam. Vì vậy, để vốn con người trở thành chìa khoá thúc đẩy năng suất lao động nông nghiệp trong tương lai, Việt Nam cần nâng cao nhận thức về vai trò của vốn con người và chú trọng phát triển vốn con người như một công cụ để nâng cao năng suất lao động nông nghiệp, chuyển đổi mô hình tăng trưởng từ chiều rộng sang chiều sâu và hướng tới phát triển nền nông nghiệp công nghệ cao, năng suất cao trong tương lai.

Từ khóa: Vốn con người; năng suất; nông nghiệp.