

Vector Analysis Of Human Capital and Agriculture in China

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Abstract : This study examines the impact of the direction of the relationship of education and health development in China on agricultural development efforts in China. This study using vectors which are generally used in a-theory research so that human capital theory is used as a determinant of key factors, not as the basis for econometric equations. The results of the vectoring carried out in this study can be described through the estimation of the IRF (impulse response function) estimation. The next step is to forecast the influence of each variable in the form of a forecasting graph so that it can be seen clearly the combination of the direction of the relationship or the influence of each variable. We found that education and health investment has a positive relationship with agricultural performance which was driven by agricultural performance in the previous period and negatively related to employment in agriculture. However, from this it can be seen that productivity which is the result of developing human resources through education mechanisms is getting bigger. Where labor productivity increases over time. However, looking at the graph of labor absorption in the agricultural sector which continues to decline very sharply, it becomes a threat in itself in the future. Because there is a decline in performance in the future due to labor shortages and it is possible that the agricultural sector will be completely destroyed when there is a shortage of labor in this sector if the interest of the China youth in the agricultural sector is not invested.

Keywords: Human Capital, Agriculture, Employment in Agriculture, Vector Analysis

JEL Classification : C01,E24,J24,J43

1 INTRODUCTION

China implements an integrated education system. The education system in China is currently divided into basic education, secondary education, and higher education. In May 1985, the "Decision on Reforming the Educational System" of the Central Committee of the Chinese Communist Party proposed that nine years of compulsory education should be implemented step by step (6 years for elementary school and 3 years for junior high school) (Bahtilla & Xu,2021 ; Zweig,2018).

There are two types of basic education in China, namely ordinary elementary schools and adult elementary schools. Ordinary primary schools enroll children from the age of 6 to 7 years, universal primary education, and the study period is 5 to 6 years. The goal of adult primary school is to be literate, especially learning languages and arithmetic (Morgan et al,2017). A middle school in China is ordinary, divided into two stages: junior high school (3 years) and high school (2~3 years). After graduating from junior high school, students can enter vocational schools (3 years) in addition to completing secondary school courses at ordinary high schools or technical schools (2 ~ 3 years), or professional secondary schools (3 ~ 4 years), or school adult amateur secondary (2~3 years old) to complete senior secondary education.

Higher education in China is divided into three levels, namely junior college education, undergraduate education, and postgraduate education. The length of study for a junior college education is 2 to 3 years, for undergraduates, it is 4 to 5 years, for postgraduates it is 2 to 3 years, and for doctoral students, it is 3 to 4 years. There are more than 2,000 regular colleges and universities in the country. After graduating from high school, students can enter colleges and universities by participating in the annual unified national exams for colleges and universities. In addition to the higher education provided by regular colleges and universities, there are also more than 900 adult high schools that offer degree programs. For example, radio and television universities, correspondence universities and evening universities hosted by universities, or independent correspondence colleges all offer degree programs. In addition, higher education qualifications can be obtained through higher education self-study exams (Shuiyun,2019 ; Hu, 2019).

Over the past 60 years, Chinese people's health has improved tremendously. Due to high birth rates, high mortality rates, infectious diseases, and malnutrition, the average life expectancy of Chinese people has increased from 35 years to 75 years in 2012. The dominant model has shifted to low birth rates, low death rates, and chronic disease. China's

rapid economic growth, rapid urbanization in the long term, rapid industrialization, large-scale population migration, coupled with factors such as population aging, diseases, and risk factors related to lifestyle and aging have become the most important health problems. China's health challenges are the attention of the Chinese government at this time (Burns & Liu,2017 ; Liu et al,2018).

From the late 1970s to the early 1990s, it was a stage of agricultural modernization dominated by rural reform and structural change. The establishment and institutionalization of the household contractual responsibility system have made farmers the rulers of agricultural development. Reform of the rural system encouraged rapid agricultural growth. After the mid-1980s, reforms in the structure of the rural economy accelerated, and urban and rural enterprises became the main force in absorbing surplus agricultural labor and reducing the relationship between rural people and land. Chinese agriculture is developing very well (Li, 2017 ; Ren et al.,2017).

2 LITERATURE REVIEW

The so-called human capital is the total knowledge and skills that can provide value to the organization's strategy. These knowledge and skills are owned by employees and form the value of human assets after capitalization. Under the theory of intellectual capital and resource foundation, this concept has been vigorously praised, and the importance of talent management has been touted to the sky. But the logic behind it is very simple, namely when an organization has resources that are difficult to obtain or imitate by competitors, it will naturally be easy to gain a competitive advantage. These resources can include all types of tangible and intangible assets, and human assets are one of them. Since it is called an asset, it should be reflected in the financial performance of the organization. Unfortunately, apart from research reports or unilateral statements that are inconsistent with research methods, a large number of empirical studies of SSCI around the world have found that the correlation between human capital and organizational performance is very low, which seems to make people begin to question the practicality of human capital theory (Widarni & Bawono,2020).

The true human capital of a company is knowledge and skills unique to the organization, which can only be applied to the organizational environment. If it can be hunted or trained by competitors, it is universal human capital that is easily circulated but has no strategic value, and will continue to increase the company's salary costs, but will reduce organizational performance. For example, familiarity with the unspoken rules of internal communication within the organization is often a key factor in the success or failure of a project. However, compared to project management skills in general, due to the lack of external labor market value, it is difficult to rely on such abilities to change jobs, and instead reduce the turnover rate. Here, it is also indirectly concluded that seniority or organizational following can often reflect the unique human resources of the company (Afriani,2021 ; Mora & Afriani,2021).

Organizational performance based on financial indicators is mostly distorted by directors or managers due to policy needs. And the higher the human capital of the company, due to better performance, their employees or managers will take more bonuses or dividends from profits, which will reduce the financial performance of the quarter. Therefore, to truly evaluate human capital, one should start with operational performance indicators, such as non-performing rates or market growth rates, which are not directly related to financial indicators. In other words, human capital affects financial performance through operational performance, and there is an indirect relationship, not a direct relationship (Rusmingsih et al.,2021).

Agriculture cannot be separated from agri-business. Agribusiness is a general term used to describe all parts of the modern food production system, from seed growers to supermarkets. The industry is divided into several sub-groups, each with its own business practices and goals. Generally, agribusiness is used to describe a particular agribusiness practice called corporate farming. A company farm is a farm owned by a company and used to grow profitable crops. The environmental impact of company farms and interest-oriented views have sometimes given rise to much controversy (Drean & Bawono,2021). Overall, the general goal of agribusiness is to feed people and animals. In fact, the system is much more complicated. Unlike some industries, the process of making and selling food is rarely that simple. Purchase materials for production, but there will be no production for months or years. The time frame and scale of land used are much larger than most other manufacturing systems. At the beginning of the agribusiness industry chain, several production industries created things for agriculture, such as seeds, fertilizers, and pesticides. Next are the agricultural groups themselves, which use the commodities they produce to produce entirely different commodities.

This is different from normal supply chain operations, as much of the initial investment is essentially destroyed during the growth process. Finally, the food produced will continue to be sent to other production sites, where it will be made into packaged food or directly sold in supermarkets. In addition, there are hundreds of other industries that are directly or indirectly involved in the process.

3 RESEARCH OBJECTIVE AND METHODOLOGY

We derive an econometric model with a Vector Autoregressive approach that focuses on phenomena with the assumption that the autoregressive vector model does not differentiate between exogenous and endogenous variables. Therefore, one variable can be an independent variable in an equation and can also be a dependent variable in another equation. The basis for taking the key variables is the theory of human capital which becomes education as a mechanism in developing human capital. Where human capital has an impact on human work performance itself (Widarni & Bawono, 2021). This study using vectors which are generally used in a-theory research so that human capital theory is used as a determinant of key factors, not as the basis for econometric equations. The results of the vectoring carried out in this study can be described through the estimation of the IRF (impulse response function) estimation. The next step is to forecast the influence of each variable in the form of a forecasting graph so that it can be seen clearly the combination of the direction of the relationship or the influence of each variable.

4 RESULTS AND DISCUSSION

The table below presents a summary of descriptive statistics of several variables used in this study during the period 2000 to 2019 in China.

Table 1. Descriptive statistics of agricultural performance in USD value in January 2021, education (investment in education in USD value in January 2021), and employment in agriculture (total working population).

	AGRICULTURE_PERFORMANCE	EDUCATION	EMPLOYMENT_IN_AGRICULTURE	HEALTH
Mean	5.72E+11	1.32E+11	2.89E+08	3.11E+11
Median	5.30E+11	1.11E+11	2.90E+08	2.38E+11
Maximum	1.02E+12	2.97E+11	3.73E+08	7.51E+11
Minimum	1.78E+11	2.29E+10	1.99E+08	5.42E+10
Std. Dev.	3.15E+11	9.49E+10	6.17E+07	2.42E+11

Based on Table 1. above, it appears that from the period 2000 to 2019, the average agricultural performance in China is very high at around 572 billion USD which can be seen from the mean value in table 1. with a high level of volatility at 315 billion USD. With an average number of workers 289 million people with an average educational investment value of 132 billion USD and Health investment 311 billion USD. However, this statistical descriptive analysis table is not sufficient to provide a general description of human capital investment through educational mechanisms on agricultural performance as seen from the productivity of workers in China.

Estimation using the VAR model requires all variables to be stationary at the level, if the variable is not stationary at the level, the estimation is carried out using the VECM model on the condition that all variables formed are cointegrated with each other where the results are shown in table 2. below:

table 2. stationarity test

Method			Statistic	Prob.**
ADF - Fisher Chi-square			5.32E+01	0.00E+00
ADF - Choi Z-stat			-5.97E+00	0.00E+00
Series	Prob.	Lag	Max Lag	Obs
D(AGRICULTURE_PERFORMANCE,2)	4.40E-03	1.00E+00	3.00E+00	1.60E+01
D(EDUCATION,2)	3.00E-04	1.00E+00	3.00E+00	1.60E+01
D(EMPLOYMENT_IN_AGRICULTURE,2)	7.30E-03	0.00E+00	3.00E+00	1.70E+01
D(HEALTH,2)	3.00E-04	1.00E+00	3.00E+00	1.60E+01

From the results of stationarity testing with Augmented Dickey-Fuller, it can be seen that at the 2nd level the

difference is stationary and vector estimation uses Vector Autoregressive. It can be seen that the probability is less than 0.05 in each tested variable. After doing the stationarity test, a cointegration test was conducted to see the long-term integration between variables. If there is cointegration between variables, the estimation is made using the Panel Vector Error Correction Model (VECM) method, but if there is no cointegration, the estimation is made using the Vector Autoregressive method. Cointegration test results are shown in table 3.

Table 3. Cointegration test results

Hypothesized		Trace	5.00E-02	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	7.70E-01	4.57E+01	4.79E+01	7.84E-02
At most 1	5.08E-01	1.93E+01	2.98E+01	4.74E-01
At most 2	3.02E-01	6.51E+00	1.55E+01	6.35E-01
At most 3	1.47E-03	2.65E-02	3.84E+00	8.71E-01

From the cointegration results, the critical value is higher than the Trace Statistics value and the Max-Eigen Statistics value which indicates that there is a no cointegration relationship in the variable equation so that the next method that can be used to determine long-term and short-term relationships is the Vector Autoregressive method.

Optimum lag test is used to determine the time period of the influence of a variable on other variables which will give optimal results. This is because changes in the movement of a variable are not directly responded to by changes in other variables, but there is still a certain grace period. Therefore it is important to know the lag length. The optimum lag test can be seen in table 4.

Table 4. Optimum lag test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1.49E+03	NA	2.44E+67	1.67E+02	1.67E+02	1.67E+02
1	-1.43E+03	9.84E+01	7.91E+64	1.61E+02	1.62E+02	1.61E+02
2	-1.39E+03	35.14085*	1.32E+64*	158.5985*	160.3792*	158.8440*

From the results of the Optimum lag test, it can be seen that the optimum lag is found in lag 2. The results of the Vector error correction model estimation are shown in table 5.

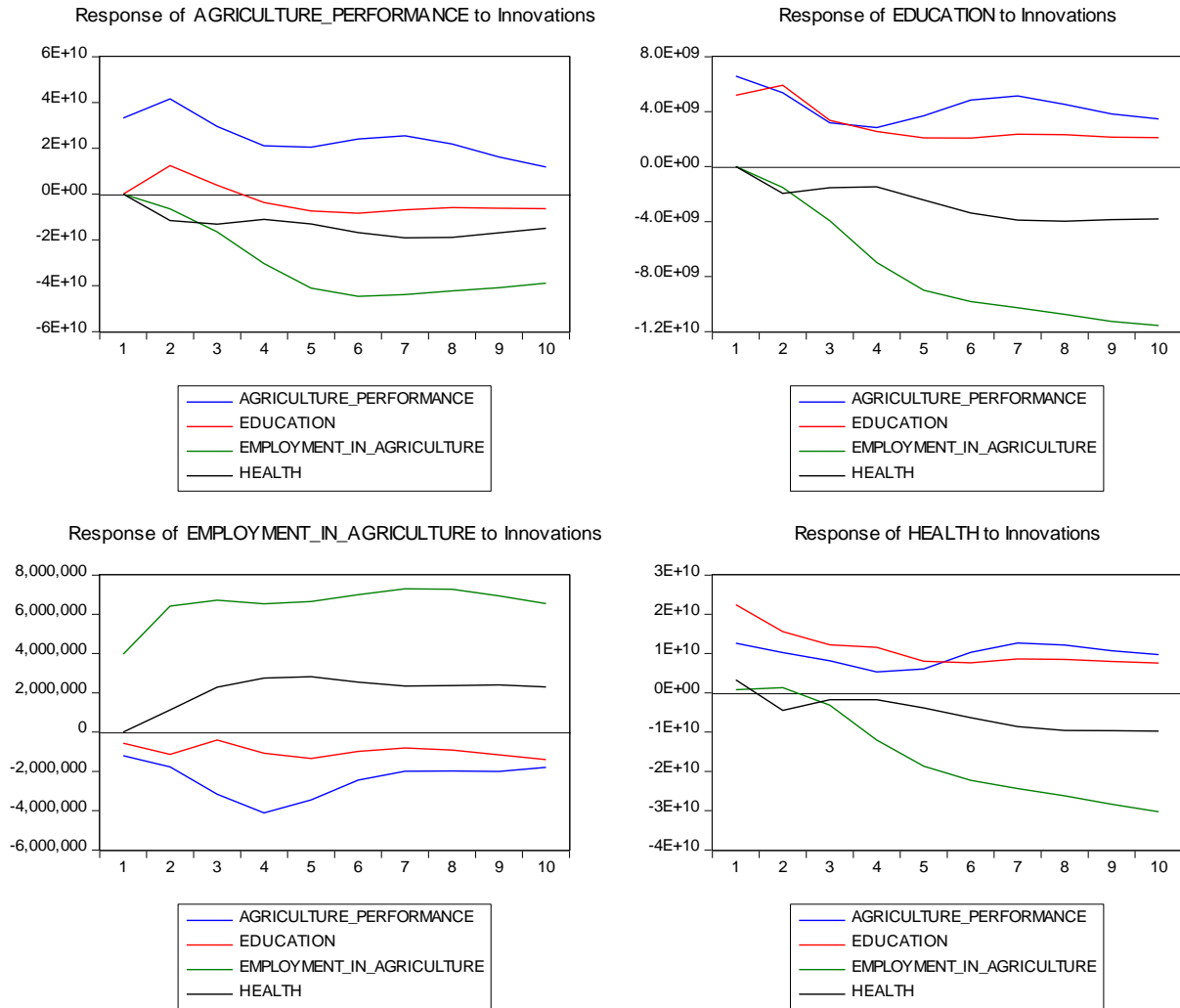
Table 5. The results of the Vector Autoregressive estimation

	AGRICULTURE_PERFORMANCE	EDUCATION	EMPLOYMENT_IN_AGRICULTURE	HEALTH
AGRICULTURE_PERFORMANCE(-1)	-8.91E-01	-3.49E-01*	1.74E-04*	-9.16E-01*
	-1.26E+00	-3.17E-01	-1.60E-04	-9.81E-01
	[-0.70989]	[-1.10073]	[1.10295]	[-0.93416]
AGRICULTURE_PERFORMANCE(-2)	1.02E+00*	2.04E-01*	-6.10E-05*	4.56E-01*
	-9.85E-01	-2.48E-01	-1.20E-04	-7.70E-01
	[1.03540]	[0.81940]	[-0.49120]	[0.59197]
EDUCATION(-1)	1.73E+01	3.67E+00	-1.53E-03*	8.88E+00
	-1.17E+01	-2.95E+00	-1.48E-03	-9.15E+00
	[1.48096]	[1.24100]	[-1.03391]	[0.97121]
EDUCATION(-2)	-9.90E-01	3.02E-02	-1.01E-03*	8.10E-01
	-6.44E+00	-1.63E+00	-8.10E-04	-5.03E+00
	[-0.15365]	[0.01861]	[-1.24753]	[0.16090]
EMPLOYMENT_IN_AGRICULTURE(-1)	-9.25E+02	-2.62E+02	1.55E+00*	6.01E+02
	-1.88E+03	-4.73E+02	-2.36E-01	-1.46E+03

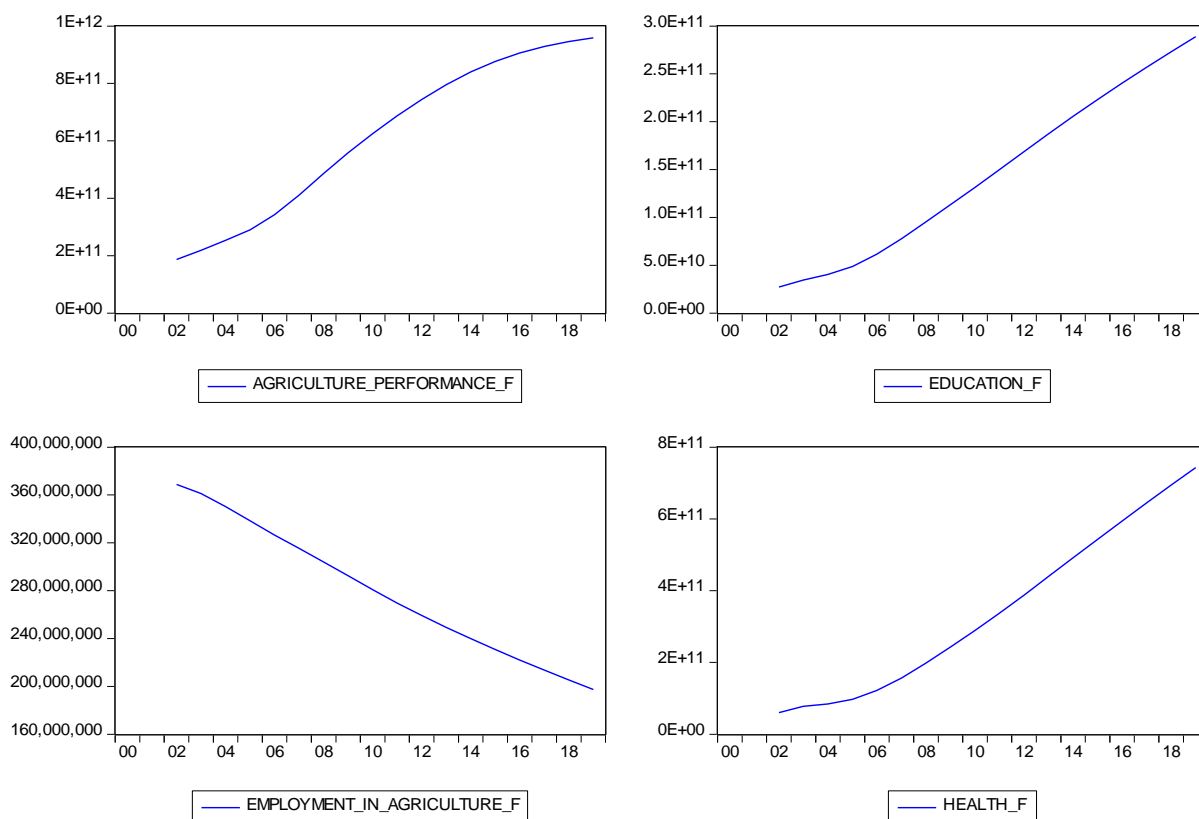
	[-0.49324]	[-0.55352]	[6.54990]	[0.41027]
EMPLOYMENT_IN_AGRICULTURE(-2)	3.89E+03	5.01E+02	-1.29E+00*	6.67E+02
	-3.97E+03	-1.00E+03	-5.00E-01	-3.10E+03
	[0.97995]	[0.50074]	[-2.57148]	[0.21517]
HEALTH(-1)	-3.49E+00	-5.91E-01*	3.42E-04*	-1.35E+00
	-2.92E+00	-7.36E-01	-3.70E-04	-2.28E+00
	[-1.19495]	[-0.80363]	[0.93128]	[-0.59127]
HEALTH(-2)	-1.21E+00	-2.22E-01*	3.30E-04*	-4.99E-01
	-1.52E+00	-3.84E-01	-1.90E-04	-1.19E+00
	[-0.79532]	[-0.57743]	[1.72083]	[-0.41984]
C	-1.07E+12	-7.94E+10	2.72E+08	-4.57E+11
	-1.50E+12	-3.70E+11	-1.80E+08	-1.10E+12
	[-0.73233]	[-0.21553]	[1.48003]	[-0.40064]
R-squared	9.94E-01	9.96E-01	9.97E-01	9.94E-01
Adj. R-squared	9.88E-01	9.92E-01	9.95E-01	9.88E-01
Sum sq. resids	9.93E+21	6.31E+20	1.58E+14	6.06E+21
S.E. equation	3.32E+10	8.38E+09	4.18E+06	2.59E+10
F-statistic	1.74E+02	2.57E+02	4.14E+02	1.78E+02
Log likelihood	-4.55E+02	-4.31E+02	-2.94E+02	-4.51E+02
Akaike AIC	5.16E+01	4.88E+01	3.36E+01	5.11E+01
Schwarz SC	5.20E+01	4.93E+01	3.41E+01	5.15E+01
Mean dependent	6.16E+11	1.44E+11	2.80E+08	3.39E+11
S.D. dependent	3.02E+11	9.23E+10	5.85E+07	2.38E+11

Based on the results of the estimated output, it can be indicated the direction of the relationship, and the significance of each variable and each period. Negatively related variables are marked (-). Significant relationships are marked with a sign (*). The value of the coefficient of determination (Adj. R-Square) shows the degree of truth of the estimate of 0.988. This means 99% accuracy of the calculation rate of the vector error correction model. Impulse Response Function (IRF) describes the response of an endogenous variable to shock that occurs in other variables in a dynamic VAR system. IRF can be used to see the effect of fluctuations or shocks from one variable on the value of another variable either now or in the future. The results of the Impulse Response Function (IRF) of the Infrastructure variable against other variables are shown by the following Impulse Response graph:

Response to Cholesky One S.D. (d.f. adjusted) Innovations



Based on the response and impulse graphs, it can be seen that each variable responds to each other since the first time period with a lag of 2. This shows that in China the three variables influence each other. To see the direction of influence can be seen in the following forecasting chart:



From the forecasting results, it can be seen that education and health investment has a positive relationship with agricultural performance which was driven by agricultural performance in the previous period and negatively related to employment in agriculture. However, from this it can be seen that productivity which is the result of developing human resources through education mechanisms is getting bigger. Where labor productivity increases over time. However, looking at the graph of labor absorption in the agricultural sector which continues to decline very sharply, it becomes a threat in itself in the future. Because there is a decline in performance in the future due to labor shortages and it is possible that the agricultural sector will be completely destroyed when there is a shortage of labor in this sector if the interest of the China youth in the agricultural sector is not invested.

5 CONCLUSION

Education and health investment has a positive relationship with agricultural performance which was driven by agricultural performance in the previous period and negatively related to employment in agriculture. However, from this it can be seen that productivity which is the result of developing human resources through education mechanisms is getting bigger. Where labor productivity increases over time. However, looking at the graph of labor absorption in the agricultural sector which continues to decline very sharply, it becomes a threat in itself in the future. Because there is a decline in performance in the future due to labor shortages and it is possible that the agricultural sector will be completely destroyed when there is a shortage of labor in this sector if the interest of the China youth in the agricultural sector is not invested.

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