

# Research on the Influence of Farmers' Wage Income in Heilongjiang from National Agricultural Investment

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**Abstract**—Farmers' wage income is increasingly growing in Heilongjiang, but the growth rate is not high. With the implementation of national food security strategy, Heilongjiang receives national agricultural investment continually. Whether it will hamper farmers' wage income growth or not has become a new problem. Through correlation analysis, multiple linear regression and path analysis, the paper using the relevant data from 1995 to 2013 analyzes the relationship between farmers' wage income in Heilongjiang and national agricultural inputs, analyzes its direct and indirect influences and ultimately comes to the conclusion that national investment has a positive impact on farmers' wage income.

**Keywords**- national agricultural investment; farmers; wage income; direct influence; indirect influence

## I. MODEL SELECTION

### A. Multiple linear regressions

The purpose of the study is to analyze influencing factors of farmers' income and gets its main reason. So the paper analyzes the selected data using multiple linear regression models and specific form of the model is as follows<sup>[1]</sup>:

$$Y = C + \sum_{i=1}^n \beta_i X_i + \varepsilon \quad (1)$$

Y represents the farmers' income, C is a constant term,  $\beta_i$  is regression coefficients of corresponding variable,  $X_i$  is the corresponding variable,  $\varepsilon$  is a random disturbance, the range of n is between 1 and 21.

### B. Path analysis

In order to analyze the direct and indirect influence, this part draws on path analysis of Han Jie and the specific form is as follows<sup>[2]</sup>:

$$\begin{cases} Z_{11}K_1 + Z_{12}K_2 + \cdots + Z_{1n}K_n = Z_{1Y} \\ Z_{21}K_1 + Z_{22}K_2 + \cdots + Z_{2n}K_n = Z_{2Y} \\ \vdots \\ Z_{n1}K_1 + Z_{n2}K_2 + \cdots + Z_{nn}K_n = Z_{nY} \end{cases} \quad (2)$$

It can also be expressed as  $Z_Y = ZK$ ,  $Z_Y$  represents simple correlation coefficient matrix between n indicators

and dependent variable Y, the matrix is  $n \times 1$  order matrix. Z represents simple correlation coefficient matrix which is simple correlation coefficient between each indicator, the matrix is the  $n \times n$  order matrix. K represents direct path coefficients matrix between each indicator and Y, the matrix is  $n \times 1$  order matrix.  $Z_{ij}$  represents correlation coefficient between i factor and j factor,  $K_j$  represents direct path coefficient between j variable and dependent variable Y,  $Z_{iY}$  represents simple correlation coefficient between i factor and dependent variable Y.

### C. The simple correlation coefficient

This part uses simple correlation coefficient which belongs to Pearson's simple correlation coefficient and draws on the analysis method of Zhang Hongbing, the specific formula is as follows<sup>[3]</sup>:

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 (y_i - \bar{y})^2}} \quad (3)$$

## II. MODEL INDICATOR SELECTION AND DIRECTION FORECAST

### A. Game model selection

Through combing the relevant literature, the paper gets to the conclusion that the main factors of influencing farmers' wage income in Heilongjiang are labor factor, labor transfer factors, national investment factor, mechanization factor, price factor and urbanization factor and the specific indicators are as follows: X1 is the proportion of junior higher education on average hundred labors, X2 is the number of rural labor force, X3 is the proportion of primary industry of rural labors, X4 is the national investment in agriculture, X5 is the average machinery gross power, X6 is CPI, X7 is the proportion of urban population<sup>[4-7]</sup>. The direction forecast of influencing wage income from each factor is as follows:

TABLE I. ASSUMING DIRECTION OF MODEL VARIABLES

variables	assuming direction
proportion of junior higher education on average hundred labors (X <sub>1</sub> )	+
number of rural labor force (X <sub>2</sub> )	-
proportion of primary industry of rural labors (X <sub>3</sub> )	-
national investment in agriculture (X <sub>4</sub> )	+
average machinery gross power (X <sub>5</sub> )	+
CPI (X <sub>6</sub> )	+
proportion of urban population (X <sub>7</sub> )	+

III. MODEL DATA SELECTION AND RESULT ANALYSIS

The paper chooses influencing factors of per capita net income in Heilongjiang from 1993 to 2010, including X1 the proportion of junior higher education on average hundred labors, X2 the number of rural labor force, X3 the proportion of primary industry of rural labors, X4 the national investment in agriculture, X5 the average machinery gross power, X7 the proportion of urban population and X6 CPI from 1993 to 2010. Using SPSS, the paper analyzes relevant data through correlation analysis, multiple linear regression and path analysis and arrives at the following conclusions:

TABLE II. CORRELATIONS

	Junior higher education	number of rural labor force	proportion of primary industry of rural labors	national investment in agriculture	average machinery gross power	CPI	proportion of urban population
wage	.876 (**)	.706 (**)	-.919 (**)	.984 (**)	.968 (**)	-.355	.727 (**)
	.000	.001	.000	.000	.000	.148	.001
	18	18	18	18	18	18	18

\*\* Correlation is significant at the 0.01 level (2-tailed).

From the result, we can see that farmers' wage income in Heilongjiang has a positive correlation with X1 the proportion of junior higher education on average hundred labors, X2 the number of rural labor force, X4 the national investment in agriculture, X5 the average machinery gross power and X7 the proportion of urban population. It has a negative correlation with X3 the proportion of primary industry of rural labors and X6 CPI, but the correlation with X6 CPI is not significant. Among them, direction forecast of farmers' income is opposite with X2 the number of rural labor force and X6 CPI.

As we can see from the regression analysis results, two variable indicators are kept among seven indicators, which are X4 the national investment in agriculture and X1 the proportion of junior higher education on average hundred labors. X4 the national investment in agriculture enters the model first and its determination coefficient is 0.967 which indicates that X4 plays a significant role in influencing farmers' wage income in Heilongjiang and X4 the national investment in agriculture can explain the changes in wage income most among seven indicators. The second one is X1 the proportion of junior higher education on average hundred labors and its determination coefficient is 0.992 which increases by 0.25.

TABLE III. VARIABLES ENTERED/REMOVED (A)

Model	Variables Entered	Variables Removed
1	national investment in agriculture	.
2	proportion of junior higher education on average hundred labors	.

a Dependent Variable: wage income

TABLE IV. MODEL SUMMARIES

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.984(a)	.967	.965	62.84869
2	.996(b)	.992	.991	32.50022

TABLE V. ANOVA(C)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1926918.669	2	963459.334	912.138	.000(b)
Residual	15843.969	15	1056.265		
Total	1942762.638	17			

Through regression analysis, we can see that R<sup>2</sup> is 0.992 as the final model and R<sup>2</sup> is 0.991 after adjustment, indicating that the fitting effect of model is great. F = 912.138 and sig. = 0.000 < 0.05, which indicates that the model has passed F test and rejects the null hypothesis. The main factors of influencing farmers' wage income in Heilongjiang are X4 the national investment in agriculture and X1 the proportion of junior higher education on average hundred labors. They pass t test at 5% significance level and their sig. value is 0.000 and 0.000 respectively which is less than 5%. Their coefficients are 0.108 and 11.891 respectively. Finally, we get the decision equation of per capita wage income in Heilongjiang:

$$Y = -609.602 + 11.891X_1 + 0.108X_4 + \varepsilon \quad (4)$$

Through the equation, we can see when X4 the national investment in agriculture increases a unit (100 million yuan) and farmers' wage income will increase 0.108 yuan. When X1 the proportion of junior higher education on

average hundred labors increases a unit (a percentage point) and wage income will increase 11.891 yuan.

TABLE VI. COEFFICIENTS (A)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	609.602	107.685		-5.661	.000
national investment in agriculture	.108	.005	.780	20.354	.000
junior higher education	11.891	1.776	.257	6.696	.000

a Dependent Variable: wage income

TABLE VII. CORRELATIONS

	proportion of junior higher education	national investment in agriculture
proportion of junior higher education on average hundred labors	1	.794(**)
Sig.	.	.000
N	18	18
national investment in agriculture (hundred million)	.794(**)	1
Sig.	.000	.
N	18	18

\*\* Correlation is significant at the 0.01 level (2-tailed).

TABLE VIII. PATH COEFFICIENT OF EACH INDICATOR

indicators	direct path coefficient	indirect path coefficient	
		national investment in agriculture	proportion of junior higher education on average hundred labors
national investment in agriculture	0.780	0	0.204
proportion of junior higher education on hundred labors	0.257	0.619	0

Through path analysis, we can see that direct path coefficient of X4 the national investment in agriculture is 0.780 and indirect path coefficient of X1 the proportion of junior higher education on average hundred labors is 0.204. Direct path coefficient of X1 the proportion of junior higher education on average hundred labors is 0.257 and direct path coefficient of X4 the national investment in agriculture is 0.619.

#### IV. CONCLUSIONS

(1) National investment in agriculture is the investment factor<sup>[8]</sup>. It is also an important indicator to measure investment factor which has a significant impact on farmers' wage income in Heilongjiang. It improves wage income directly and mostly concentrates in infrastructure construction. Heilongjiang, as the demonstration of agricultural modernization, is actively building a modern large-scale agriculture. National investment in infrastructure construction provides job opportunities directly and farmers staying at home can participate in agricultural infrastructure construction. Therefore, national investment in agriculture will contribute directly the growth of farmers' wage income<sup>[9]</sup>.

(2) The proportion of junior higher education on average hundred labors is labor quality factor<sup>[10]</sup>. It is the main indicator of measuring labor education quality. Its improvement enhances directly farmers' overall cultural quality. With the improvement of cultural quality, employment chances of rural labor forces can be increased; meanwhile, it can widen employment scope of labors; at last, it improves farmers' wage income in Heilongjiang.

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