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The effect of farmer's education on productivity and income (Case study: Herat province rural area's farmers)

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Abstract
Over 54 percent of the population is living under the poverty line while the number has risen to 67 percent during winter season in the country. And from each 5 poor 4 of them are living in the rural area and 43.6 percent of poor people are busy in agricultural sector and few of them have access to basic services

Estimation results show that educational variables (elementary, twelfth degree, fourteenth degree, bachelor's, master's and doctoral) have a positive effect on the dependent variables (farmers' productivity and income) and the results obtained by SPSS software show that the severity of the relationship between education and farmers' productivity and between education and farmers' income respectively Is equal to (0.681 **) and (0.738 **).and The farmer that is more educated is more likely to use new technology and modern agricultural methods. The research design for this study was the experimental research design.

Keywords: Education, Productivity, Income, Agricultural Method, Herat, human capital

Introduction

The study estimates the effects of farmer's education and its contribution on farmer's productivity and income in the rural area of Herat province.

One of the most important debates in the world in the last decade is the discussion of human capital. One of the ways to increase household income and reduce poverty is to focus more on human capital and education in societies. To this end, it is important to examine the impact of human capital or education on the productivity and income of farmers in Afghanistan.

Illiteracy is a major factor of poverty and low agricultural productivity in Afghanistan especially in the rural area.

The term human capital is used to refer to the knowledge, skills, or competencies that individuals possess. These skills or competencies are developed through education, learning in practice, networking and social environments, family history, personal characteristics and many other factors.

Competencies, skills, or in other words, human capital, increase one's ability to perform certain activities in the labor market to gain economic benefits. Thus, in the labor market, there is a variety of economic rewards for individuals based on their human capital.

The theory of human capital (Mincer, 1958) states that in practice education and learning increase the productivity and skills of individuals. This increase in skills and knowledge increases people's income. Thus, under the theory of human capital, education and learning in practice are among the key factors for one's economic performance.

According to this theory, like the process of producing a physical capital created by the factors of production, the production of human capital is also a result of investing in education and learning in practice. But unlike physical capital, human capital cannot be transferable without a learning process.

According to previous studies and experience of other countries, human capital can be considered as one of the important factors affecting people's income.

Agriculture has traditionally dominated Afghanistan's economy and contributed for a large part to its growth. About 70 percent of Afghans live and work in rural areas, mostly on farms, and 61 percent of all households derive income from agriculture. Despite a decline in its share of Afghanistan's overall economy, the sector still employs 40 percent of the total

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work force (World Bank, May 6, 2018) [7].

Live of nearly 80% of afghan people dependent in agriculture and the contribution of agricultural products in domestic products is 25%. (Agricultural Ministry 2018).

Despite Afghanistan is an agricultural country and there are enough capacity of producing agricultural products but yet the value of agricultural products that are imported yearly is too match it is about $4billion it means that more than 50% of imports are agricultural products. (Afghan voice agency 2017, 3, 29).if the products that are imported to Afghanistan produce by this country the economics will growth crucially and the farmers income will increase too much.

40 percent of Afghans don't have food security (ministry of agriculture18-10-2016). Malnutrition and food poverty is seen clearly on the face of the children that sailing low value goods in the cities, begging, and doing hard working.

According to ministry of public health 80% of Afghan's children are under nutrition (ministry of public 2017-16-10) [11]. So increasing agriculture products and farmers income who make 80% population of Afghanistan has a great impact on poverty decreasing specially on rural area.

In Afghanistan approximately 13.5 million people suffer from chronic food insecurity. Live for many of these people is nothing but struggle for being alive and they have to spend each 24 hours with one time eating (UNIMA, -2-13 2019).

From total area of Afghanistan (652000 km 2) just 12% (8milon hectare) is cultivatable .and from those 12% because the lack of water half of them are cultivated yearly.so to access to more of agricultural products, food and increasing farmers income should improve the factors that increase productivity of farmers .one of these factors is education of farmers thus government and policy makers should specially attend to this issue. And the support policy on farmer education will be crucial in case of poverty reduction in Afghanistan especially in rural area.

According to the role of human capital in enhancing economic growth and income, it is important to examine and analyze the various aspects of this impact on Afghan families. Identifying whether human capital in Afghanistan has been able to drive economic growth and thus increase household income is matters that can help community policymakers achieve their future economic and social goals.

Therefore, in this study, we try to extract the human capital indicators and evaluate the impact of these human capital (education) indicators on income and productivity of farmers in Herat province.

The results of the present study can be compared with those of Sharada Weir (1997) [21] in research found that education has an important role to play in increasing Agricultural production in rural Ethiopia. Productivity may be enhanced either through the adoption of more productive inputs and techniques or through improvements in productive efficiency for a given technology. Fung-Mey Huang and Yir-Hueih Luh (2009) clarified that agricultural productivity exhibiting obvious improvements throughout education. And also Jandhyala B.G. Tilak (1993) found that Education significantly influences methods of production, use of modern inputs like fertilizers, seeds and machines and selection of crops. And also some other researchers like Atal Bihari Das & Dukhabandhu Sahoo during 2009-10, Mohammad Sultan Bhatt and Showkat Ahmad Bhat (2014),

Bhalla (1979), Tilak (1979) found the same results that education can enhance farmer's productivity and income.

The study therefore seeks to address the following questions;

1. **To what extent** education levels affect farmers' productivity in Herat province?
2. **To what extent** education levels affect farmers' income in Herat province?

Objectives and hypothesis
Objectives
- The main objective of this study is to estimate and quantify the contributions of education on farm productivity and income in Afghanistan. This relationship will be investigated by explaining how output of wheat per area and farmer's income varies by level of farmer's education.
- The specific objectives are the following:

1. Investigating the Impact of Education degrees on Farmers' Productivity in Herat Province.
2. Investigating the Impact of Education degrees on Farmers' income in Herat Province.

- Hypothesis

1. Education levels seem to affect farmers' productivity in Herat province.
2. Education levels seem to affect farmers' income in Herat province.

Materials and methods
The volume and method of sampling
The sampling method in this study is cluster random sampling.

Since the statistical population in this study was unlimited, therefore, unlimited Cochrane formulas were used with a 10% error coefficient of 96 individuals selected and the researcher distributed 100 questionnaires

$$n = \frac{z^{\alpha}/_2 \cdot P.q}{B^2}$$

$P = 0.5$

$q = 0.5$

$B = 0.1$

$z^{\alpha}/_2 = 1.96$

$z = 1.96$ $\qquad \Rightarrow n = \frac{(1.96)^2 \cdot (0.5)^2}{0.01} \Rightarrow \frac{0.9404}{0.01} \cong 96$

Where:
n = Sample size
P = Success Probability (50%)
q=1-p
Z = 1.96 (Confidence Interval 95%)
B= Error coefficient

Data collection tools
In this investigation both theoretical and empirical approach are employed. The empirical data has been collected from 100 farmers of 4 districts (Guzara District, Injil District, Ghurian District Zendeh Jan District) by questionnaire. The secondary data that was used in this investigation was collected from both published and unpublished sources.

The questionnaire used in this study has 21 related questions

Table 3.1: Likert scale questionnaire rating

Very low	low	medium	much	Too much
1	2	3	4	5

Source: Research Findings, 2020

Validity
Validity of This questionnaire has been evaluated and approved using the opinion of experts of this field.

Reliability
Reliability of This questionnaire was obtained by Cronbach's alpha test using SPSS software as follow:

Table 3.2: Cronbach's alpha

Reliability Statistics	
Cronbach's Alpha	N of Items
.880	21

Source: Research Findings of 2020

Data analysis method
In this study, Pearson test were used to test the hypotheses and the regression model is used to find the relationship between variables as well as to find (the effect of the independent variable on the dependent variable). And the Data were analyzed by SPSS software. Also, excel software is used to draw graphs.

Data analysis
Examine the assumption that the variables are normal:
Since the normality of the dependent variable leads to the normality of the model residuals; it is necessary to check that it is normal before fitting the model. The null hypothesis and the opposite hypothesis of the normality test are as follows:

H0 Data distribution is normal:
H1 Data distribution is not normal:
Kolmogorov-Smirnov test was used to test the above hypothesis. In this test, when the significance level is less than 5%, the test null hypothesis is rejected at 95% confidence level. The Kolmogorov-Smirnov test compares an observed cumulative distribution function with a theoretical cumulative distribution. The theoretical distribution can be normal, uniform, or Poisson, a significance level greater than 0.05 indicating that the observed distribution is related to the theoretical distribution.

Table 4.1: Kolmogorov Smirnov Test

One-Sample Kolmogorov-Smirnov Test		Education	Productivity	Income
N		100	100	100
Normal Parameters[a,b]	Mean	3.6138	3.5791	75.1900
	Std. Deviation	.54475	.38106	8.02609
Most Extreme Differences	Absolute	.088	.051	.066
	Positive	.055	.030	.038
	Negative	-.088	-.051	-.066
Test Statistic		.088	.051	.066
Asymp. Sig. (2-tailed)		.053[c]	.200[c,d]	.200[c,d]
a. Test distribution is Normal.				
b. Calculated from data.				
C. Lilliefors Significance Correction.				
d. This is a lower bound of the true significance.				

Based on the values given in Table 4-3, since the significance level of the research variables (education, productivity and income) is greater than 0.05, then the null hypothesis that the variables are normal is confirmed and we can conclude that the obtained data has a normal distribution. Although the data are normal, Pearson correlation test is used to investigate the relationship between independent and dependent variables.

Analyzing the research hypotheses
Analyzing the first hypothesis
Education levels appear to affect farmers' productivity in Herat province.
To analyze this hypothesis, we use the following null hypothesis and the opposite assumption:
H0: There is no significant relationship between education level and farmers' productivity in Herat province.

H_1: There is significant relationship between education level and farmers' productivity in Herat province.

Table 4.2: Pearson correlation coefficient between education level and farmers' productivity

Education degree	
Pearson correlation coefficient = 0.681**	Farmers productivity
Significant level 0.000 =	
number of samples 100 =	
Significant level 0.01	

Source: Research Findings (Sample Size 100)

As shown in Table (4-6), Pearson's correlation coefficient is between education level and farmers' productivity in Herat province. At Pearson's output the significance level is equal to (0.000= sig) and is less than 0.01 ($\alpha < 0.01$). And also the correlation coefficient here was (0.681 **).Therefore, it can be stated that both variables have high correlation coefficient and since it is two stars, its error coefficient has been measured from the level (99%). As a result, it can be said that the null hypothesis is rejected and alternative hypothesis is confirmed because there is a significant relationship between the education level and the productivity of the farmers.

Analyzing the second hypothesis
Education levels appear to affect farmers' income in Herat province. To analyze this hypothesis, we use the following null hypothesis and the opposite hypothesis:
H_0: There is no significant relationship between education level and farmers' income in Herat province.
H_1: There is a significant relationship between education level and income of farmers in Herat.

Table 4.3: Pearson correlation coefficient between Education level and farmers' income

Level of education	
Pearson correlation coefficient = **0.738****	Farmer's income
Significant level 0.000 =	
Sample size 100 =	
Significant level 0.01	

Source: Research Findings (Sample Size 100)

As shown in Table (4-6), Pearson's correlation coefficient is between the education level and farmers' income in Herat province. At Pearson's output the significance level is equal

to (0.000 sig =) and is less than 0.01 ($\alpha < 0.01$).And also the correlation coefficient here is (** 0.738),

Therefore, it can be stated that both variables have high correlation coefficient and since it is two stars, its error coefficient has been measured from the surface (99%). Consequently, it can be said that the null hypothesis is rejected and the alternative hypothesis is confirmed; because there is a significant relationship between the education level and the income of the farmers.

Analysis of Regression Model

In this section, we evaluate the impact of the independent variable on the dependent variable using the regression model: Hypothesis 1: Degrees of education appear to affect farmers' productivity in Herat province.

Table 4.4: Summary model of regression Summary model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.677[a]	.458	.423	.28936	1.444

This table shows the correlation coefficients and the coefficient of determination. The correlation coefficient value of 0.677 indicates a simple correlation between the two variables, ie the intensity of the correlation between the two variables. As indicated by the R (correlation coefficient) between the two variables, there is a high correlation between the two variables (elementary education, 12th degree, 14th degree, bachelor, master and doctor) and productivity.

The R^2 value (the coefficient of determination) indicates the extent to which the dependent variable (productivity) can be explained by independent variables (degrees of education). In this example, variables of (education) can explain or specify the variables of farmers' productivity to the extent of (45.8%).

Table 4.5: Analysis of Regression Variance for independent and dependent variables (Anova)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.588	6	1.098	13.114	.000[b]
	Residual	7.787	93	.084		
	Total	14.375	99			

a. Dependent Variable: Productivity

b. Predictors: (Constant) PhD, Elementary, Fourteenth (14), Master, Twelfth (12), Bachelor

c. The above table is called ANOVA this table shows whether the regression model can predict dependent variable changes significantly (and appropriately). Let's look at the last column (sig) of the table for meaningful consideration. This column shows the statistical significance of the regression model, if the value is less than 0.05, we conclude that the model used is a good predictor of the dependent variable (productivity). The

significance level in the above example is (0.000) which is less than 0.05. It indicates that the regression model is meaningful.

Table 4.6: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.074	.202		10.258	.000
	Elementary	.038	.028	.103	1.344	.182
	Twelfth grade	.024	.038	.057	.626	.533
	Fourteenth grade	.141	.035	.362	4.037	.000
	Bachelor	.151	.045	.381	3.378	.001
	Master	-.076	.035	.456	2.133	.000
	Doctorate	.116	.027	.499	4.219	.000

a. Dependent Variable: productivity

The above table of Coefficients gives us information about the predictor variables this table provides the information necessary to predict the dependent variable. We observe that the variable values in the model are significant as we can see to sig column (sig = 0.000).). After determining the significance of the variable (degrees of education), the Standardized Coefficients column represents the standardized regression coefficient or the beta value. Since the beta coefficient of elementary education is equal to (0.103) and with a significant level (0.182) it can be stated that the level of primary education has an impact on farmers' income of 10% and is not significant because its significance level is greater than 0.05. Also, Beta coefficient of twelfth degree education is equal to (0.057) and with a significant level (0.533) it can be stated that Bachelor degree has an impact on farmers' income of 5.7% and is not significant because its significant level is larger than 0.05.

Beta coefficient of fourteenth degree is equal to (0.362) and with a significant level (0.000) it can be stated that higher education has 36.2% effect on farmers' income and its effects are significant. Because it's significance level is less than 0.05.

Beta coefficient of bachelor's degree is equal to (0.381) and with significance level (0.001) it can be stated that bachelor's degree has 38.1% effect on of farmers' income and its effects are significant because its significant level is less than 0.05.

Beta coefficient of master's degree is equal to (0.456) and with significance level (0.000) it can be stated that master's degree has 45% effect on farmers' income and its effects are significant because the significance level is less than 0.05.

Beta coefficient of doctoral degree is equal to (0.499) and with significant level of (0.000). It can be stated that doctoral degree has a 49.9% effect on farmers' income which is significant because the level is less than 0.05.

Hypothesis 2: Degrees of education appear to affect farmers' income in Herat province.

Table 4.11: Model Summary[b]

Model Summary[b]						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square hange	F Change
1	.718[a]	.516	.484	5.76334	.516	16.499

a. Predictors: (Constant), PhD, Elementary, Fourteenth degree , Master, Twelfth degree , Bachelor
b. Dependent Variable: income

This table shows the correlation coefficients and the coefficient of determination. The correlation coefficient value of 0.718 indicates a simple correlation between the two variables, In other words, it shows the intensity of the correlation between the two variables.

As shown by the R (correlation coefficient) between the two variables, there is a great deal of correlation between the two variables (elementary education, 12th degree, 14th degree, bachelor, masters and doctorate) and income. The coefficient of determination value indicates the extent to which the dependent variable (income) is explained by independent variables (education degree).

In this example, education variable can explain or specify the variables of farmers' income to extent of 51.6%.

Table 4.12: Analysis of Regression Variance for Independent and Dependent Variables ANOVA[a]

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3288.289	6	548.048	16.499	.000[b]
	Residual	3089.101	93	33.216		
	Total	6377.390	99			

a. Dependent Variable: income
b. Predictors: (Constant), PhD, Elementary, Fourteenth degree , Master, Twelfth degree , Bachelor

The above table is called ANOVA. This table shows whether the regression model can predict the dependent variable changes significantly (appropriately).

For meaningful consideration look at the last column (sig) of the table. This column shows the statistical significance of the regression model, Since the obtained value is less than 0.05; we conclude that the model used is a good predictor for the dependent variable (income). The significance level in the above is (0.000) which is less than 0.05. It indicates that the regression model is meaningful.

Table 4.13: Coefficients[a]

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	40.797	4.028		10.129	.000
	Elementary	.862	.566	.110	1.524	.131
	Twelfth grade	.719	.764	.081	.941	.349
	Fourteenth grade	3.035	.697	.370	4.357	.000
	bachelor	3.223	.892	.385	3.613	.000
	Master	-1.310	.706	0.506	1.856	.000
	doctoral	2.524	.546	.632	4.621	.000

a. Dependent Variable: income

The above table of Coefficients gives us information about the predictor variables. This table provides the information necessary to predict the dependent variable. We observe that the variable values in the model are significant (see sig column) (sig = 0.000). After determining the significance of the variable (degree of education), the Standardized Coefficients column represents the standardized regression coefficient or the beta value. Since the beta coefficient of primary education is equal to (0.110) and with a significant level (0.131) it can be stated that the effects of primary education on farmers' income is 11% and not significant because its significance level is greater than 0.05.

Also, Beta coefficient of education (twelfth grade) is equal to (0.081) and with a significant level of (0.349) it can be stated that twelfth grade has 08% impact on farmers' income and is not significant because its significant level is larger than 0.05.

Beta coefficient of fourteenth degree is equal to (0.370) and with a significant level (0.000) it can be stated that fourteenth degree has 37% effect on farmers' income and its effects are significant because the significance level is less than 0.05.

Beta coefficient of bachelor's degree is equal to (0.385) and with significance level (0.000) it can be stated that

bachelor's degree has a significant effect of 38.5% on farmers' income and its effects are significant because the level is less than 0.05.

Beta coefficient of master's degree is equal to (0.506) and with significance level (0.000) it can be stated that master's degree is effective at 50% of farmers' income and its effects are significant because level of significance is less than 0.05.

Beta coefficient of doctoral degree is equal to (0.632) and significant (0.000). It can be stated that doctoral degree has a 63.2% effect on farmers' income which is significant because the level is less than 0.05.

Table 4.14: Table of general coefficients

		Work experience	Marital status	age	elementary	Twelfth grade	Fourteen grade	bachelor	master	doctoral	education	productivity	income
							Statistics						
N	Valid	100	100	100	100	100	100	100	100	100	100	100	100
	Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean		2.7000	1.3000	3.4200	3.4400	3.4300	3.7100	3.9000	3.7500	3.9800	3.6138	3.5791	75.1900
Median		3.0000	1.0000	4.0000	3.0000	3.0000	4.0000	4.0000	4.0000	4.0000	3.6250	3.6101	75.5000
Mode		3.00	1.00	4.00	3.00	4.00	4.00	4.00	4.00	5.00	3.88	3.49[a]	72.00
Std. Deviation		.92660	.46057	1.22417	1.02809	.90179	.97747	.95874	1.08595	1.10078	.54475	.38106	8.02609
Variance		.859	.212	1.499	1.057	.813	.955	.919	1.179	1.212	.297	.145	64.418
Skewness		-.295	.886	-.418	.051	-.292	-.246	-.568	-.595	-.655	-.230	-.296	-.285
Std. Error of Skewness		.241	.241	.241	.241	.241	.241	.241	.241	.241	.241	.241	.241
Kurtosis		-.707	-1.240	-.805	-.660	-.074	-.921	-.564	-.555	-.952	-.395	-.156	-.017
Std. Error of Kurtosis		.478	.478	.478	.478	.478	.478	.478	.478	.478	.478	.478	.478
Minimum		1.00	1.00	1.00	1.00	1.00	2.00	2.00	1.00	2.00	2.25	2.51	52.00
Maximum		4.00	2.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.75	4.34	91.00
a. Multiple modes exist. The smallest value is shown													

Results

In this part of the research, the descriptive findings are first mentioned, and then the results of the hypothesis testing are examined. In the descriptive-analytical section, the following results were obtained:

Descriptive results (demographics): In the present study, 78% of the respondents are male and 13% are female. About 70% of respondents are married and about 30% of respondents are single. . Also, most people (33%) were between 26-30 years old.

5-2-2 inferential (analytical) results: In this study, two hypotheses were analyzed using descriptive and inferential statistics. The inferential analysis section describes and examines the inferential results and the relationships between the research variables using Pearson correlation coefficient tests and the results of the research hypotheses are presented in this part.

Conclusion of the first hypothesis

In the first hypothesis, it was claimed that education levels affect farmers' productivity in Herat province. According to the results obtained from data analysis in chapter four It was found that Degrees of education effect the productivity of the farmers, As shown In the fourth chapter Beta coefficient of elementary education is equal to (0.103) and with the significance level (0.182) it can be stated that the Elementary education have a 10% effect on the productivity of farmers and it's not significant because it Is greater than 0.05. and Beta coefficient of twelfth degree is equal to (0.057) and with the significance level (0.533) it can be stated that the twelfth degree has a 5% effect on the productivity of farmers and it's not significant because it Is greater than 0.05. And the Beta coefficient of fourteenth degree is equal to (0.362) and with the significance level (0.000) it can be stated that the fourteenth degree of education has a 36% effect on the productivity of farmers and its affect is significant because the significance level is less than 0.05. And the Beta coefficient of bachelor is equal to (0.381) and with the significance level (0.000) it can be stated that the bachelor degree has a 38% effect on the productivity of farmers and its affect is significant because the significance level is less than 0.05. And the Beta coefficient of master is equal to (0.456) and with the significance level (0.000) it can be stated that the master degree has a 45% effect on the productivity of farmers and it's affect is significant because the significance level is less than 0.05. and the Beta coefficient of doctoral is equal to (0.499) and with the significance level (0.000) it can be stated that the doctoral degree has a 50% effect on the productivity of farmers and it's affect is significant because the significance level is less than 0.05. . And its Pearson correlation coefficient is equal to (0.681) then there is a strong correlation coefficient between both variables. We therefore conclude that our first hypothesis is confirmed.

Conclusion of the Second hypothesis

In the second hypothesis, it was claimed that education levels affect farmers' income in Herat province.

According to the results obtained from data analysis in Chapter 4, it was found that the Beta coefficient of elementary education is equal to (0.110) and with the significance level (0.131) it can be stated that the Elementary education have a 11% effect on the income of farmers and it's not significant because it Is greater than 0.05. and Beta coefficient of twelfth degree is equal to (0.081) and with the significance level (0.349) it can be stated that the twelfth degree has a 8% effect on the income of farmers and it's not significant because it Is greater than 0.05. And the Beta coefficient of fourteenth degree is equal to (0.370) and with the significance level (0.000) it can be stated that the fourteenth degree of education has a 36% effect on the income of farmers and its affect is significant because the significance level is less than 0.05. And the Beta coefficient of bachelor is equal to (0.385) and with the significance level (0.000) it can be stated that the bachelor degree has a 38% effect on income of farmers and its affect is significant because the significance level is less than 0.05. And the Beta coefficient of master is equal to (0. 506) and with the significance level (0.000) it can be stated that the master degree has a 50.6% effect on income of farmers and its affect is significant because the significance level is less than 0.05. and the Beta coefficient of doctoral is equal to (0.632) and with the significance level (0.000) it can be stated that the doctoral degree has a 63% effect on income of farmers and it's affect is significant because the significance level is less than 0.05.. And since its Pearson correlation coefficient is equal to (0.738) there is a strong correlation coefficient between both variables. , So we conclude that our second hypothesis is also confirmed.

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