Journal of Physical Sciences, Vol. 26, 2021, 1-12
ISSN: 2350-0352 (print), www.vidyasagar.ac.in/publication/journal
Published on 26 December 2021

Analyzing the Role of the Agriculture Section in Growing Iran's Economy

Shahryar Zaroki[a] and Saeed Rezvani[b*]

[a]Department of Economics, University of Mazandaran, Iran
[b]Department of Economics, University of Allame Mohades Nori, Iran
[a]email: zarokish@gmail.com
[*]Corresponding author. [b]email: Saeedrz901@gmail.com

Received 2 October 2021; accepted 12 December 2021

ABSTRACT

The agricultural sector is one of the most fundamental economic divisions. We investigated the effect of value-added indicators of the agricultural division on Iran's economic growth by an autoregressive method with distributive intervals (ARDL) during the period 1968-2015 in this study, regarding the significance of the agricultural sector and the role of its value-added on Iran's economic growth and ultimately, on the growth of the national economy. According to the first model, it was concluded that the value-added of the agricultural division in the short and long term has a positive and negative effect on economic growth, respectively. Additionally, the agricultural division's investment index in both short-term and long-term periods is statistically significant and positively affects economic growth. The index of trade liberalization of the agricultural sector has no positive effect on the economic growth in the short term, but it has a negative and significant effect on economic growth in the long term. Subsequently, according to the second model, the value-added index of the agricultural sector in the short term has no significant effect on economic growth but has a negative and significant effect on economic growth in the long term. Also, the residual index of agricultural facilities index has no significant effect on economic growth in the short term but has a positive and significant effect on economic growth in the long term. The effect of the index (first-time interruption) degree of economic openness of the agricultural division in the short term has no significant effect on economic growth, but has a positive and significant effect on economic growth with two interruptions, but has a negative and significant effect on economic growth in the long term. Hence, the government must seriously consider the agricultural division to realize its macroeconomic objectives

Keywords: Agricultural division, Balance of facilities, Degree of economic, Economic growth, Value-added of agricultural division

Mathematical Subject Classification (2010): 58E15

1. Introduction

The agricultural division in developing countries, including our country, is the main economic growth component and development. Developing countries should pay attention to their agricultural division to cope with the underdevelopment crisis and think of combining this division with advanced technologies to make their products more efficient

and try to expand agricultural production. Agriculture in Iran is the biggest economic division after the services sector, which includes about 20% of GDP and a major share of non-oil exports. It also uses a large part of the country's population. Also, the growth of this division highly determines the economic growth of the country. In the economic literature, the development of the agricultural division has been highly considered a factor that can result in economic growth. Many studies have investigated how the role of the agricultural division influences economic growth.

Kym [1] specified that the economic growth feature includes a slow rise in demand for food and the rapid growth of agriculture productivity compared to non-agriculture. Therefore, it is possible to understand the decline in agricultural production in periods related to economic development in a closed economic system. But even in economies with open fast-growing that have a competitive advantage in agricultural production, agricultural production has been reduced, and it is questionable. He concludes that the demand for non-agricultural commodities has a higher income elasticity; hence, even resources tend to produce these commodities in open economic systems. Hwa [2] examined the significant participation of agriculture to economic growth utilizing statistical analysis and applying cross-sectional data in a paper. The significant result of his research was that the growth of agriculture is heavily related to the industry's growth during the process of economic development. It also participates comprehensively through its beneficial effect on the productivity of all production factors during economic growth. Yoa [3] applied a vector autoregression model to examine the relationship between initial divisions in China. The results revealed that support for agricultural products after economic reforms had developed agricultural growth and industry efficiency. In a paper, Yao [4] investigated the significance of the agricultural division in China's economic development. In the mentioned study, the research method included experimental data and a convergence test. Two principal results of the research were achieved first. However, the percentage of agriculture in GDP decreased. It is still considered a constituent in the economic growth of other divisions, and second, the accelerated growth of other divisions affects the growth of an agricultural division insignificantly.

In their papers, Calirajan and Sankar [5] investigated the relationship between agricultural and non-agricultural divisions employing the data-output matrix method and Granger causality test and concluded a two-way relationship between agricultural and industrial divisions. They also considered 14 regions of India, examined the relationship between the regions, and concluded a definite correlation between the two zones in many regions. Deller [6], in a paper entitled "The Role of Agriculture in Rural Economic Growth" examines the role of agriculture in rural economic convergence with an application of 2,240 data from non-metropolitan districts in the United States during the period 1990-1995. He examined regional economic growth utilizing a simple neoclassical model. Traditional neoclassical theory foretells that poor rural regions grow quicker than rich ones. The test results suggest that higher levels of dependence on agriculture may reduce growth rates. Ratts and Torvik [7] investigated differentiation between the agricultural and industrial divisions. The results confirm that differentiation against agriculture may decrease economic growth and eliminate the technological advantages of industry. Rezvani [11-18], considered fuzzy preference relations and their applications in group decision making. In a study, Onder and Ozyildirim [8] analyzed the lending activities of state and

specialized banks during the period 1992-2010 in Turkey. The results reveal that bank payments play a significant role in compensating for the outcomes of economic shocks.

2. Methodology and model specification

Research conducted on the role of value-added in the agricultural division in economic growth is divided into two principal groups utilizing the production function, which are identified by the type of variable that is accepted as a representative of value-added in the economic division or is the method of inserting the mentioned variable. This type of research's principal focus is that the added value of the agricultural sector is highly important in economic growth. Nevertheless, researchers have achieved various results of its importance by explaining this variable and measuring it, and the results achieved considerably depend on the used method.

The statistical population of the study includes Iran in the period 1968-2015. Data related to value-added in the agricultural division, investment in the agricultural division, the balance of facilities in the agricultural division, degree of economic openness in the agricultural division, and economic growth have been derived from the most advanced data published by the Statistics Center and the Central Bank of the Islamic Republic of Iran and the World Bank.

3. Providing a research model

Two models are manifested to test the research hypothesis on the positive effect of value-added in the agricultural division on economic performance. In the first model, the dependent variable is economic growth, and the explanatory variables are the added value of the agricultural division, investment in the agricultural division, and the degree of economic openness in the agricultural division. In the second model, combining the variables is the same as in the first model. The difference is that the balance of facilities of the agricultural division is utilized instead of investing in the agricultural division in the explanatory variables in the second model to prevent alignment. Based on this issue, we have:

(i) The first research model

$$\Delta LnRGDP_t = \beta_0 + \beta_1 LnAgriRVAdd_t + \beta_2 LnAgriRInvest_t + \beta_3 AgriOpen_t + \varepsilon_t \quad (1)$$

wherein:

$\Delta LnRGDP$ as economic growth and a measure of economic performance that has been calculated from the change in the natural logarithm of real GDP. The scale of real GDP is in billions of rials and hence the growth is measured in percent.

$LnAgriRInvest$ is the natural logarithm of real value-added in agriculture. The scale of real value-added is billions of rials.

$AgriOpen$ is the natural logarithm and an indicator of the degree of openness of the agricultural division, which is the ratio of total agricultural exports and imports to the

value-added of agriculture. The scale is in terms of the percentage according to the relative form.

ε is a component of the regression equation dysfunction.

(ii) The second research model:

$$\Delta LnRGDP_t = \beta_0 + \beta_1 LnAgriRVAdd_t + \beta_2 LnAgriF_t + \beta_3 AgriOpen_t + \varepsilon_t \qquad (2)$$

wherein:

$LnAgriF$ is the natural logarithm of the banking system payment facilities to the agricultural division. The scale of payment facilities of the banking system to the agricultural division is billions of Rials.

4. The description by applying the table

According to the research's time period, the whole period (1968-2015) has been classified into seven sub-periods. These sub-periods include the period before the revolution (1968-1977), the period after the revolution until the end of the imposed war (1978-1988), the period of the first development plan and the year (1989-1994), the period of the second development plan (1995- 1999), the period of the third development plan (2000-2004), the period of the fourth development plan (2005-2009) and the years (2010-2015) are the seventh sub-periods. In the seven mentioned sub-periods, the average of all research variables has been calculated and reported in Table (1).

As Table (1) shows, the average economic growth index in the whole period is 3.1%, that is the highest level of this variable (average) belongs to the pre-revolutionary period with 9.4%, and the lowest level belongs to the period after the revolution until the end of the imposed war with -4.3%. Interestingly, after the revolution until the end of the period (based on sub-periods), the average index symbolizes a downward trend in economic growth.

Table 1: Average of research variables

Period of time	Economic Growth (Percentage)	The real added value of agriculture (Billion in Rial)	Investment in agriculture (Billion in Rial)	Banking facilities in the agricultural division (Billion in Rial)	Degree of openness of the agricultural division (Percentage)
Before the Revolution (1968-1977)	-9Apr	29654,1	Feb-37	Apr-60	Sep-67

After the revoluti (1988-1978)	After the revolution until the end of the imposed war		-4,3	50263,3	130,5	529,2	May-36
	Years after the imposed war	The first development program	-5Jun	75895,3	505,6	Jul-03	Jan-40
		The second development	-2May	92473	Jan-99	13343,7	Jan-32
		The third development	-5Jun	104653,4	13178,2	52431,1	Jun-44
		The fourth development	-4Mar	122933,4	40316,6	185407,9	Mar-52
		The fifth development	Sep-00	129133,7	64584,1	430195,9	Jul-55
Whole periods			-3Jan	76664,8	14173,7	80511,2	Feb-47

Source: Calculations based on data collected from the Central Bank

As Table 1 shows, the average real value-added index of agriculture in the whole period is 76664.8 billion rials that the highest level of this variable (average) belongs to the period of the Fifth Development Plan and the lowest level belongs to It is the period before the revolution (1968-1977). It is essential to say that the average index shows an upward trend in the value-added of the agricultural division after the revolution until the end of the period (based on sub-periods). Additionally, the average investment index in the agricultural division in the whole period is 14173.7 billion rials that the highest level of this variable (average) belongs to the Fifth Development Plan period, and the lowest level belongs to the period before the revolution (1968-1977). This is if after the revolution until the end of the period (based on sub-periods) the average index reveals an upward trend in investment in the agricultural division, and the average index of bank facilities in the agricultural division in the whole period is 80511.2 billion rials that the highest level of this variable (average) belongs to the period of the Fifth Development Plan and the lowest level belongs to the period before the revolution (1968-1977). It is amazing to state that after the revolution until the end of the period (based on sub-periods), the average index shows an upward trend in banking facilities in the agricultural division.

Additionally, the average degree of openness in the agricultural division in the whole period is 47.2% that the highest level of this variable (average) belongs to the pre-revolutionary period with 67.9%, and the lowest level belongs to the post-revolutionary period up to the end of the imposed war that is 36.5%. It is interesting to state that after the revolution until the end of the period (based on sub-periods), the average index shows a downward trend in the agricultural division's degree of openness.

5. Static examination of variables

It is important to study the series in the static form in estimating regression models as time series. Based on the values of ADF statistics and its comparison with the critical values of Table (2), the null hypothesis of the presence of a single root for all variables (except the

variable of economic growth, which is without a static trend) has not been rejected. In other words, all model variables had been at an unstable level. Based on the first difference test of variables, all variables except the economic growth after differentiation have rejected the static hypothesis. In other words, these variables have been static with a difference.

(i) Pattern estimation

As described in the earlier chapter, two models are introduced to estimate the influence of value-added in the agricultural division on the Iranian economy the first model includes the dependent variable, economic growth, and independent variable, value-added of the agricultural division, investment in the agricultural division, and the degree of economic openness in the agricultural division. Furthermore, combining the variables is the same as the first model, with the difference that the balance of facilities of the agricultural sector is applied instead of investing in the agricultural division in the second model in the independent variable in the second model to avoid collinearity.

Table 2: Generalized Dickey-Fuller static test

Variable	In the level of		In the first-order difference	
	Computational statistics t	Probability level	Computational statistics t	Probability level
Economic Growth	-4,36	0,00	-	-
The real value-added logarithm of the agricultural division	-1,71	0,73	-8,19	0,00
The logarithm of the degree of openness of the agricultural division	-3,24	0,02	-7,65	0,00
The logarithm of real investment in the agricultural division	-1,24	0,89	-6,71	0,00
The logarithm of payment facilities of the banking system to the agricultural division	-1,7	0,71	-5,08	0,00

6. The results achieved by estimating the first model

As Table (3) shows, the estimated coefficient of investment in the agricultural division in both short-term and long-term periods is statistically significant and has the expected and positive effect on economic growth. In other words, a one percent increase in investment in the agricultural division increases economic growth in the short and long term at 0.05 and 0.16 percent, respectively.

The effect of value-added of the agricultural division on the country's economic growth in the short term, although it is related to a positive effect on economic growth, in the long term, this effect on economic growth will be reversed.

It can be declared based on the estimated coefficient that with a one percent increase in this real value-added of the agricultural division, economic growth will increase by 0.31 percent in the short term and decrease by 0.28 percent in the long term.

Table 3: Long-term and short-term coefficients in the first model

Short-term model				
Variable	**Estimation coefficient**	**Standard error**	**t statistics**	**Probability level**
The real value-added logarithm of agriculture	0,31	0,16	1,99	0,05
The logarithm of real investment in the agricultural division	0,16	0,04	3,49	0,001
The logarithm of the degree of economic openness of the agricultural division	-0,0008	-0,0006	-1,24	0,22
Error correction sentence	-0,68	0,12	-5,7	0,00
Long- term model				
The real value-added logarithm of agriculture	-0,28	0,15	-1,86	0,07
The logarithm of real investment in the agricultural division	0,05	0,09	1,90	0,06
The degree of economic openness of the agricultural division	-0,001	-0,0008	-1,81	0,08
The coefficient of		0,46		
The adjusted coefficient of determination		0,37		
Statistics F		5,59		
Probability Level of				

Source: Research Findings

The index of trade liberalization of the agricultural division has no significant effect on economic growth in the short term but has a negative and significant effect on

economic growth in the long term. Economic growth is decreased by 0.001 percent, with a one percent increase in this index in the long run. This effect can show the phenomenon that Iran's agricultural division is commonly import-oriented, which has a negative effect on economic growth.

The error correction sentence's estimated coefficient also reveals that the size of this coefficient is smaller than the unit according to the negative expectation and is statistically significant. The size of this coefficient is -0.68, which means that 68% of the economic growth imbalance is compensated for its long-term values in each period.

We will need to recognize the long-term relationship to definitely understand that explanatory variables influence economic growth in the long term. The bounds test can be employed for this purpose. The null hypothesis in the bounds test is the absence of a long-term relationship. Table (4) shows the result of this test. The test statistic value is 6.28, which is larger than all the bounds listed in levels one and two. Consequently, the null hypothesis is rejected. As a result, there is a long-term relationship between economic growth prices and explanatory variables, and the interpretation of long-term estimated coefficients (reported in Table 3) is approved.

Table 4: Border test in the first estimate of the model

Test statistic	**Bound 1**	**Bound 2**	**Error level**
6,28	4,66	3,65	**1%**
	6,67	2,79	**5%**
	3,2	2,37	**10%**

Resource: Research findings

7. The results achieved by estimating the second model

As Table (5) shows, the value-added index of the agricultural division in the short term has no significant effect on economic growth. In the long-term, it has a significant negative effect on economic growth. Economic growth is decreased by 0.27 percent, with a one percent increase in this index in the long term.

Furthermore, the balance index of agricultural facilities in the short term has no significant effect on economic growth, but it has a positive and significant effect on economic growth in the long term. Economic growth is increased by 0.04 percent, with a one percent increase in this index in the long term.

Table 5: Long-term and short-term coefficients in the second model

Short-term model				
Variable	Estimated coefficient	Standard error	T statistic	Probability level
The first interruption of economic growth	0,28	0,12	2,33	0,03

The real value-added logarithm of	0,10	0,16	0,66	0,51
The logarithm of the balance of facilities of	0,05	0,05	1,13	0,27
	-0.0008	0.0006	-1,48	0,15
The first-time interruption of the	0,002	0,0006	3,86	0,0005
The second interruption of the logarithm of the	-0,01	0,13	-7,49	0,00
Long-term model				
The logarithm of real agricultural value-	-0,27	0,13	-2,1	0,04
The logarithm of the balance of facilities of	0,04	0,02	2,10	0,04
The logarithm of the degree of economic	-0,002	0,0007	-3,49	0,001
The coefficient of		0,65		
The adjusted		0,56		
Statistics F		7,27		
Probability Level of				

Source: Research Findings

The effect of the index (first-time interruption) degree of economic openness of the agricultural division in the short term has no significant effect on economic growth but has a positive and significant effect on economic growth with two interruptions, but it has a negative and significant effect on economic growth in the long term. Based on the estimation coefficient's size, it can be stated that economic growth is increased by 0.002 percent in the short term with a one percent increase in this index and is decreased by 0.002 percent in the long term.

The error correction sentence's estimated coefficient also reveals that the size of this coefficient is smaller than the unit according to the negative expectation and is statistically significant. The size of this coefficient is -0.1, which means that 1% of the economic growth imbalance is compensated for its long-term values in each period.
We will need to recognize the long-term relationship to definitely understand that explanatory variables influence economic growth in the long term. The bounds test can be employed for this purpose. The null hypothesis in the bounds test is the absence of a long-term relationship. Table 6 shows the result of this test. The test statistic value is 10.48, which is larger than all the bounds listed in levels one and two. Consequently, the null hypothesis is rejected. As a result, there is a long-term relationship between economic growth prices and explanatory variables, and the interpretation of long-term estimated coefficients (reported in Table 6) is approved.

Table 6: Bounds test in the second model estimate

Test statistic	Bound 1	Bound 2	Error level
10,48	4,66	6,65	**1%**
	6,67	2,79	**5%**
	3,2	2,37	**10%**

8. Conclusion

The hypothesis of this study is that "the value-added of the agricultural division has a positive effect on the Iranian economy". The estimation results exhibited in Tables (3) and (5) have been employed for this hypothesis.

According to the results achieved from Table (3), the value-added coefficient of the agricultural division in the positive short-term model and in the negative long-term model is a value of 0.31 and -0.28, respectively; additionally, the probability value (or significance level) of the t-test for the value-added variable of the agricultural division in the short-term and long-term models is 0.05 and 0.07, respectively. This means that there is a positive and significant relationship between the value-added of the agricultural division in the short term and economic growth, but this assumption is insignificant in the long term.

The results collected from Table (5) show the value-added coefficient of the agricultural division in the positive short-term model and in the negative long-term model that the values are -0.10 and -0.27, respectively; additionally, the probability value (or level of significance) of the t-test for the value-added variable of the agricultural division in the short-term and long-term models is 0.51 and 0.04, respectively. This is to reject the research hypothesis, i.e., the positive influence of agricultural value-added on the Iranian economy.

9. Suggestions

Based on the results of the hypothesis, the following suggestions have been presented:

• The results of this study revealed that the added value of the agricultural division has a positive effect on Iran's economic growth in the short term (Table 3); therefore, it is recommended to administrators to take the necessary measures to attract more capital in this division. Tax exemptions, production incentives (in the form of subsidies), cheap banking facilities with exact supervision, providing technical and scientific advice, development of agricultural-industrial complexes, development of processing industries for agricultural products, and internal and external marketing of products can be considered as suitable solutions to develop the agricultural division and the optimal use of available capacities in this division.

• The results of this study revealed that investment in the agricultural division has a positive effect on Iran's economic growth in the short and long term (Table 3), it is possible to increase the added value in this division considering the relationship between value-added and investment in agriculture and its influence on economic growth and applying modern production technologies in the agricultural division, which will result in more investment and create higher added value in this division, to eventually increase the economic growth.

• Additionally, it is possible to attract capital to it due to the high return on capital in this division. Consequently, according to the economic justification for investing in the agricultural division, if proper policies and measures are practiced, we can hope to attract capital to this division and, consequently, the country's economic growth in the future.
• Considering the positive influence of value-added in the agricultural division in the short term (Table 3) and the balance of agricultural division facilities in the long term (Table 5) and agricultural division investment in the short and long term (Table 3), the following policies and suggestions can be introduced for economic growth:
- Allocating government development credits based on the criteria of productivity and efficiency.
- Evaluating the investment plans by the banking network.
- Making the agricultural division more profitable than other sectors.
- Providing proper grounds to expand foreign investment in the agriculture and food industry.
Attracting the villagers' liquidity and small savings by creating the necessary institutions such as agricultural investment companies.
- Exemption of agricultural-industrial units from paying taxes as a whole.

Acknowledgments.
The authors are grateful to the referees for their suggestions for the improvement of the paper.

REFERENCES

1. A.Kym, On Wy Agriculture decline with economic growth? Agricultural Economics, 1(3) (1987) 195-207.
2. E.C.Hwa, The Contribution of Agriculture to economic growth: some empirical evidence. World Development, 16(11) (1988) 1329-1339.
3. S.Yoa, Sectoral cointegration, structural break and agriculture role in chinese economy in 1952-1992: a VAR approach. Applied Economics, 28 (1996) 1269-1279.
4. S.Yao, How important is agriculture in China’s Economic Growth?” Oxford Development Studies, 28 (2000) 33-50.
5. K.P.Calirajan and U.Sankar, Agriculture in India economic reform program, Journal of Asian Economics, 12 (2001) 383-399.
6. S.C.Deller, B.W.Gould and B.Jones, Agriculture and rural economic growth. Journal of Agricultural Economics, 35(3) (2003) 517-527.
7. J.Ratts and R.Torvik, Interactions between Agriculture and Industry: Theoretical Analysis of the Consequences of Discriminating Agriculture in Sub-Saharan Africa. Review of Development Economics, 14 (2003) 138-151.
8. Z.Önder and S.Özyıldırım, Role of bank credit on local growth: do politics and crisis matter. Financial Stability. 9 (2013) 13-25.
9. www.cbi.ir. Economic Time Series Database (tsd).
10. http://www.sci.ir.org.
11. S.Rezvani, Multiplication Operation on Trapezoidal Fuzzy numbers, Journal of Physical Sciences, 15 (2011) 17–26.

12. S.Rezvani, A new method for ranking in perimeters of two generalized trapezoidal fuzzy numbers, International Journal of Applied Operational Research, 2(3) (2012) 83-90.
13. S.Rezvani. Ranking method of trapezoidal intuitionistic fuzzy numbers. Annals of Fuzzy Mathematics and Informatics, 5(3) (2013) 515–523.
14. S.Rezvani, Ranking generalized exponential trapezoidal fuzzy numbers based on variance, Applied Mathematics and Computation, 262 (2015) 191-198.
15. S.Rezvani and X.Wang, A new type-2 intuitionistic exponential triangular fuzzy number and its ranking method with centroid concept and euclidean distance, in: 2018 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE), pp. 1–8, 2018.
16. S.Rezvani, X.Wang and F.Pourpanah, Intuitionistic fuzzy twin support vector machines, IEEE Transactions on Fuzzy Systems, 27 (2019) 2140-2151.
17. S.Rezvani and X.Wang Erratum to entropy-based fuzzy support vector machine for imbalanced datasets, Knowledge-Based Systems, 192(15) (2020) 105287.
18. S.Rezvani and X.Wang, Class imbalance learning using fuzzy ART and intuitionistic fuzzy twin support vector machines, Information Science, 578 (2021) 659–682.