



Evaluating Mutual Impacts of Agricultural Growth and Inequality in Iran's Rural Area Divided to Provinces with Amenity and Deprived: Simultaneous Equations of Panel Data Approach

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Abstract

Purpose- Income distribution inequity in low-income societies spreads poverty faster therefore it is essential to indicate the relation between economic growth and income distribution in low-income societies like rural societies which gain income through agricultural activities. On the other hand, recent studies show that societies amenity or deprivation is effective on the relation between growth and income distribution. So, the aim of this study is to indicate the relation between rural income distribution and Iran agricultural sector growth dividing to regions with amenity or deprived.

Design/methodology/approach - Due to economic literature income distribution and economic growth has interactional effect on each other and the relation between them is different in regions with amenity and deprived. To explain the relation between rural income distribution and agricultural sector growth in this study two equations are introduced, the first equation analyzes the effective factors on agricultural sector growth and the second equation examine the factors determining rural income inequality. These equations are estimated by provincial data divided to regions with amenity and deprived during 2008-2016 and simultaneous equations approach of panel data is used.

Finding-The results show that, in low amenity and deprived provinces agricultural sector growth reduces the inequality while agricultural sector growth has no significant effect on inequality in provinces with amenity. Also, inequality increase lead to economic growth in deprived regions, but in regions with amenity the effect of inequality on growth is not significant. Besides, the results of estimation imply that government's expenditure in provinces increase rural income inequality and development expenditure only in deprived and low amenity provinces cause rural income inequality decrease and in other rural is not significant on inequality index.

Practical implications- Based on the results of this study and in order to reduce rural income inequality and the growth of agricultural sector, it is necessary to consider the distribution of public facilities and infrastructure in order to enjoy deprived and low amenity rural regions.

Keywords- Rural income distribution, Agricultural sector growth, Deprivation, Simultaneous equations of panel data approach.

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1. Introduction

Inequality income distribution in low-income societies spreads poverty faster and causes irreparable social harms and side effects. So, in these societies' equal income distribution and economic growth are important. One of the low-income societies is villages in developing countries. Villagers of developing societies are low income and usually gain their income through agricultural sector activities. The statistics show that in Iran 30 percent of the population are rural whereas the agricultural sector share out of total production of the country is 8 percent due to the reports of the Iran statistic center.

On the other hand, the average annual growth of the agricultural sector for the years under review is about one percent, while the figure for the industrial and service sectors is two and three percent, respectively. This information shows that rural income is lower than the average income of the urban population and rural welfare level has gradually decreased compared to the urban population during the period under review. Of course, the emphasis on agricultural sector growth increase does not necessarily lead to rural welfare improvement, but the distribution of benefits from agricultural sector growth among the rural is significant. Unequal distribution of income causes the benefits of growth to dispose to a particular group of the society, and thus inequality can limit the impact of economic growth on poverty. Therefore, one of the most important goals of societies is economic growth along with reducing income inequality.

In the Islamic Republic of Iran, according to principle (3) of the constitution rule, the government is obliged to use all its resources to achieve the goals of the system for matters such as establishing a correct and fair economy according to Islamic criteria to alleviate poverty. In this system economic growth considers with equal income distribution and for this in developing plans after the revolution the growth with equal distribution is emphasized. Also, according to Clause 27 of the sixth development plan, the government is obliged to implement the general policies and resistance economy, identify and exploit the capacities in rural areas and promote the social status of rural and the position of rural in the national economy and to create the

necessary basis for the prosperity and development of the justice-oriented villages.

The first step in growth together with income distribution is identifying the mechanisms through which growth and income distribution influence each other. Economic literature review shows that there are different theories about the relationship between growth and income distribution. Classic believes economic growth leads to equal income distribution. While due to recent theories, income inequity decrease, increases economic growth through different mechanisms like Strengthen property rights, economic stability, and increase the number of middle-class households. The studies about agricultural sector growth and rural income distribution for Iran done with emphasize the first group view ([Kuznets's view emphasized](#)) but there are no common results. For example, [Khaledi et al. \(2009\)](#) and [Khaledi and Sadrolashrafi \(2005\)](#) shows that agricultural sector growth does not affect rural income distribution improve in Iran because of severe fluctuations and instability while other studies like [Hasani Sadr-Abadi \(1999\)](#), [Samadi \(1999\)](#), [Sadr – Naieni- Manochehri \(1997\)](#), [Salami and Ansari\(2009\)](#) and [Khaledi and Haghghatnezahd Shirazi \(2012\)](#) express that agriculture sector development reduces rural income gap.

One of the points emphasized in new theories like [Calderon and Chong \(2004\)](#) and [Valerio-Mendoza \(2017\)](#) about growth and income distribution is the role of regions' deprivation rate to reach economic growth with equal distribution. Infrastructure creation through the increase of access to main economic activities of deprived regions and providing income opportunities for the poor, increase the deprived regions' income so the income gap reduces.

While the effect of deprivation of societies on the relationship between growth and inequality has been shown in theoretical discussions and empirical studies, but most studies have been conducted on the relationship between growth and rural income inequality of Iran is for the entire economy and regardless of the heterogeneity of different regions in enjoying public facilities. However, the level of deprivation is not the same in different regions of the country and different regions have different facilities for example [Shaykh-baygloo \(2012\)](#) study shows that provinces like Esfahan, Tehran, Shiraz, and

Mazandaran have higher public facilities while provinces like Sistan & Baluchestan, North Khorasan and Hormozgan are among the most deprived provinces in the country in addition to the degree of deprivation due to national accounts and rural household income and expenditure survey of Iran statistic center report agricultural sector growth and rural income distribution is not homogeneous among the provinces. For example, due to national accounts of Iran statistic center report agricultural sector growth for the period 2007-2015 is more than 10 percent in provinces like Hormozgan, Yazd, Semnan and in other provinces is less. Also, the agricultural sector share in some provinces like Mazandaran, Lorestan, Ardabil, and Kerman is a significant share of the province's economy (more than 25 percent) while the agriculture sector share in provinces like Tehran, Booshehr, and Khoozestan is low and is less than 5 percent (The report of national accounts of Iran, statistic center, (2008-2016)). The rural Gini coefficient shows that income in some provinces like Yazd, Markazi, and Hormozgan is much more unequal distributed comparing to other provinces. (Rural Household Income and expenditure Survey, Statistics Center of Iran 2008- 2016)

Considering the above points, in analyzing the relationship between agricultural sector growth and rural income distribution, first it is necessary to pay attention to the interactional relationship between the two variables. Secondly, the heterogeneity of different provinces in having facilities should be considered. In this study, the relation between agricultural sector growth and rural income distribution in Iran is interactional and analyzed divided into deprived and amenity provinces in the form of simultaneous equations Panel data. The aim is to answer the questions "In which provinces are the benefit of agricultural production is distributed equally among the rural?" and "Does the amenity of a province cause the agricultural sector growth to join with equal rural income distribution?"

In order to do this review first theoretical foundations and research background about the relationship between growth and income distribution are investigated. Then with analyzing the country's provinces amenity level, a model is introduced to investigate the relation and after analyzing the amenity of the provinces and model estimation, the relation between agricultural

sector growth and rural income distribution and effective factors of each is explained divided to the regions.

2. Research Theoretical Literature

Due to the aim of the study, in this part, the most important perspectives and concepts are provided on the relationship between economic growth and inequality.

In the economic literature, different approaches have been proposed regarding the relationship between economic growth and income distribution. Classic view believed the capital accumulation is the key to economic growth. Due to this view, the rich desire to save more than the poor and the income inequality cause higher economic growth and in the next round, the poor will benefit from the growth result.

In the economic development literature during 1960 and 1970 different mechanisms are analyzed through which economic growth affects income inequality. [Kuznets \(1955\)](#) by analyzing the effect of economic growth on income distribution shows that in the early stages of development, economic growth cause income inequality increases but in the next stages of development the economic growth will lead to income equality.

Kuznets presents economic development as the process of transition from traditional (rural) to the modern (urban) economy and mentions that in the early stages of development the income distribution is unequal because few people can transmit to the modern sector, that's why there is a big gap between the traditional and modern sectors' wage. Due to this theory in the next stages of the development income distribution will improve, because more people can enter the modern center, and gradually due to the scarcity of labor in the traditional center the wage levels are also rising in the traditional center and reach the wage levels of the modern center. Kuznets believe the inequality in the rural sector is low and in urban is high and agricultural sector development reduces inequality. ([Aboonouri and Farahani, 2016:4](#))

Kuznets's theory pays close attention to the urban-rural relationship, which has been greatly facilitated today by the expansion of transportation networks and technological infrastructure and caused a part of the rural income to achieve from activities and investments in the cities. Due to Kuznets's theory, this part of

income cause income inequality to increase between villagers and it is because this part of the income is assigned to some villagers and obtained from an urban section.

While lots of studies like [Dastidar \(2012\)](#), [Kahya \(2012\)](#), and [Abounoori and Farahati \(2016\)](#) have analyzed and confirmed Kuznest's theory in developed and developing countries. But during the second half of the twentieth century, some countries like Hong Kong, South Korea, Singapore, and Taiwan experienced high rates of economic growth with a low-income gap. Also, lots of countries like Latin America had poor economic growth with high inequality. These countries' experiences caused numerous economists to criticize the negative effect of inequality on growth ([Myrdal \(1973\)](#) idea). [Aghion et al. \(1999\)](#) believe the classic theory is contrary to experimental results. Due to the studies some of the important mechanisms through which income inequality affects economic growth is as follows:

- Inequality rise leads to social and political instability, undermines property rights, and leads to economic uncertainty which causes low investment and economic growth. ([Alesina & Perotti](#));
- Inequality rise in the economy with incomplete capital market reduces the ability and motivation of people to invest ([Anand & Kanbur,1993](#));
- Increasing inequality induces birth rates and thus reduces the level of education and ultimately reduces economic growth;
- Increasing inequality reduces demand and economic growth by reducing the number of middle-class households ([Todaro,1997](#) and [Murphy et al.,1989](#)).

Some of the economists like [Calderon and Chong \(2004\)](#), [Estache et al. \(2002\)](#), [López \(2003\)](#), and [Fleisher et al., \(2010\)](#) also expressed that infrastructure services improvement reduce income inequality and increase economic growth. The main idea is infrastructure development not only increases average income but also increases the income level and welfare of the poor. [Valerio-Mendoza \(2017\)](#) with the emphasis on infrastructure facilities of different states of china believes that economic growth besides equal income distribution is achieved when deprived

regions access the infrastructures. In these studies, infrastructure development improves income distribution while contributing to economic growth.

In most of the studies like the study of [Agenor and Moreno-Dodson \(2006\)](#), it is expressed that, infrastructure by affecting labor productivity, health, nutrition, education, and also investment continuity cause economic growth in deprived regions. But about the effect of infrastructures development on income distribution improvement [Estache et al. \(2002\)](#), [Fleisher et al. \(2010\)](#), and [Valerio-Mendoza \(2017\)](#) state that infrastructure development deprived regions residents access the main economic activities and this increases the income achievement opportunities. Also, [Gannon and Liu \(1997\)](#) believe infrastructures development in poor regions leads to reduce production and Transaction costs so the poor people's income will increase.

In some other studies, it is emphasized that infrastructure access in deprived regions, increases the value of the poor people's assets. For example, in recent studies, the value of the assets of poor agricultural regions is assessed due to the distance from their production market so connection and road services reformation, increase poor farms' lands' return and lead to income increase. ([Jacoby, 2000](#)).

The theoretical foundations above inferred that economic growth and income distribution have an interactional effect on each other which can be positive or negative means that income inequality helps the economic growth or stops the growth. Also, economic growth due to Kuznets theory can affect inequality. Moreover, according to the mechanisms about the effect of inequality on economic growth and contrariwise relation, the relation between the two factors in traditional societies and modern societies is different and the important point is: this relation in traditional rural societies due to the amount of rural amenity can be different. It is expected growth and income distribution relation give different results when different regions have different amenity levels. Analyzing growth and rural income distribution due to these points clarifies the different reasons of studies results about agricultural sector development and rural income distribution.

Lots of studies analyzed the relation between income distribution and economic growth but few studies are analyzing the relation between rural income distribution and agricultural sector growth and the role of infrastructure facilities amenity. This section first reviews studies that analyze the relationship between income distribution and agricultural sector growth and next the studies that analysis the effect of the region's amenity of infrastructure facilities on growth and income distribution.

To achieve growth together with proper income distribution some studies emphasized agricultural sector growth. [Abounoori and Farahati \(2016\)](#) studied the production structure and income distribution in Iran during (1979-2012) and resulted from the increase of inequality by transferring the share of the added value of the agriculture sector to other sectors.

While transferring added value from other sectors to the agricultural sector reduces the inequality. [Dastidar \(2012\)](#) has researched developed countries (with amenity) and developing countries (deprived) and shows that in none of the countries income distribution inequality don't increase by transferring production from agriculture to industry. Also, Dastidar's findings show that in developed countries transferring production from agriculture to services has no effect on inequality but in developing countries increases the inequality.

The two above studies' result analysis shows that in developing regions agriculture sector development is significant to lower the inequality. But the main point is the rural income distribution of developing countries and raises the question that "Will rural income distribution improves with agriculture sector development in developing societies and total income distribution improvement of all the society? "In this item about Iran there are no common opinions, some of these studies will be reviewed next.

[Salami and Ansari \(2009\)](#) analyze the role of the agricultural sector in creating jobs and income inequality distribution decrease due to the Iranian Social Accounting Matrix and show that agricultural sub-sectors development not only leads to a significant increase in household income but also creates income opportunities for low-income groups and at last causes the income gap decrease. Also, [Khaledi and Haghghatnezhad Shirazi \(2012\)](#) in their research came to the point

that during (1960-2007) in Iran investing in the agricultural sector can cause absolute rural poverty to reduce.

While [Khaledi et al. \(2009\)](#) study by seemingly unrelated equations and statistics of (1960-2004) conclude that although investing in the agricultural sector caused that sector's growth but the benefits do not go to rural poor residents [Pirae & Ghana'atian \(2007\)](#) analyzed economic growth effect on poverty and inequality in Iran during 1996-2004 for rural and urban regions and resulted that poverty reduces in both rural and urban regions but the intensity and depth of poverty increased in rural regions. [Khaledi and Sadr-Alashrafi's \(2005\)](#) study about the relation between agricultural sector growth and rural region's income distribution with linear and nonlinear models show that agricultural sector growth did not lead to income inequality decrease in rural regions of Iran.

There can be various causes for the different results above, one of the points which are not considered in these studies but were emphasized in theoretical topics is the two-way and interactional relation of agriculture sector growth and rural income distribution. [Moinoddini \(2014\)](#) with analyzing the interactional effect of agricultural research investment on agricultural sector added value and rural inequity in Iran during (1976-2012) according to simultaneous equations approach shows that agricultural research investment increases agricultural sector added value and rural income inequity reduction but this effect is poor. [Hasanvand and Khocheiani \(2018\)](#) by analyzing the direction of movement of the income inequality index and economic growth for three periods (1975-1985), (1998-2009), and (2009-2013) for Iran shows that the analyzed variables are in the same direction but the last period for the first two periods, the studied variables moved in the same direction, but in the last period, increase inequality was accompanied by economic growth. Also, [Kazerooni et al. \(2020\)](#) by ARDL method showed that with increasing economic growth in Iran, income inequality increases.

The other feature of the studies about Iran is that most of the researchers analyzed the total economy of Iran without considering the heterogeneous of different rural regions' amenity level of infrastructure facilities. While some studies like [Torkamani and Jamalimogadam](#)

(2006) introducing effective factors on rural poverty including total productivity of agriculture production factors, wage rate, non-agricultural employment, watering technology, length of constructed roads, literacy rate, and electric power of different rural regions in the form of equations system show that different rural regions amenity is significant in agricultural sector growth and income inequity decrease. And then the result is that investment in rural development, road construction, watering, and agriculture research and promotion respectively has the greatest impact on reducing rural poverty.

It is important to consider the study of [Karami et al., \(2000\)](#) that analyzed the relation between growth and inequity in the amenity province Fars. [Karami et al.](#), tried to analyze the impact of sprinkler irrigation technology on the rural poverty and inequity rate in the rural society of Fars province and explained that promoting to use these facilities in regions with amenity cause farmers' social gap to increase because of institutional constraints, the orientation of the organizations involved in the action is towards wealthy members of the social system.

The above studies show that different regions' amenity of facilities affects the quality of the relationship between agricultural sector growth and rural income inequity. So, in the next part, we will study the researches that use the region's amenity level in their study. [Valerio-Mendoza \(2017\)](#) by emphasizing China's different regions' infrastructure facilities, introduces indexes to measure different region's access to infrastructure facilities. Then by analyzing how each of the infrastructures affects inequity concluded that growth together with equal income distribution occurs when deprived regions access infrastructures facilities.

Studying the impact of amenity of infrastructure facilities on rural growth relation and inequity, [Fleisher et al. \(2010\)](#), with the emphasis on communication infrastructures, in a study called "labor, economic growth and China 's region inequality" expressed that if investment in communication infrastructures is made for deprived regions, economic growth improves and inequality reduces.

Also, they show that investing in communication infrastructures for developed regions leads to

increased inequality. [Xiaolu \(2006\)](#) in a study called "China inequality and effective factors" with emphasis on transportation facilities and communication infrastructures stated that transportation facilities and communication infrastructures through providing job opportunities for deprived regions, cause the reduction of income inequality. [Fan et al., \(2002\)](#) in a study called "growth, inequality, and poverty in Chinese rural area" studied the role of government investment on growth and inequality in the form of simultaneous equations and show that government credits' increase, agricultural research development, watering system, rural education, and infrastructures (roads, electric power, and communication) not only increase agricultural production growth but also reduce the rural poverty and region inequality.

Analyzing the relation between growth and inequality and the regions' amenity impact in the quality of the relationship is done by [Calderon and Serven \(2003\)](#) for Latin America with time-series data of 1980-2000. They considered the infrastructures' economic effect on growth and distribution. Their results show that infrastructure service improvement can reduce inequality in Latin America and help economic growth. [Calderon and Chong \(2004\)](#) by analyzing the cross-sectional data of 101 countries studied the infrastructure development impact on income distribution inequality and the results show that infrastructure improvement can induce income inequality and increase economic growth.

Analyzing the studies above expresses that agricultural sector growth led to income distribution improvement in developing societies and deprived and to achieve equal income distribution agriculture sector should develop and this is the point emphasized in the studies. But to answer the question " will rural income distribution improve with agricultural sector growth?", there is no common opinion in the studies conducted for Iran. These studies regardless of the level of deprivation present different results. While in studies conducted for Latin America and China the regions' amenity is considered and common results of the relation between growth and inequality are emphasized. Also, in studies conducted for Iran, the two-way relation between growth and inequality was not

considered which can influence the results. That's why in this study we consider the two-way and interactional relation between agricultural sector growth and rural income distribution divided by provinces and with the emphasis on deprived rate and amenity level.

3. Research Methodology

To analyze the relation between agricultural sector growth and rural income inequality divided into provinces with amenity and deprived first the study model is presented and then the equation method is expressed and at last provinces with amenity and deprived are specified.

3.1. Model

Due to the theoretical foundations, economic growth affects income inequality and vice versa. So in analyzing the relation between income inequality and economic growth a two-way relation should be considered between them. In other words, two equations in the form of a system of equations simultaneously, that in one of their economic growth is the dependent variable and income inequality index is the independent variable and in the other equation income inequality index is the dependent variable and economic growth is the independent variable. So implicit equations system is as follows:

$$\begin{aligned}gru &= f(pgdpar, E) \\pgdpar &= g(gru, F)\end{aligned}$$

In the equations above GRU is the rural income inequality index that the rural Gini coefficient is used to measure it and *pgdpar* is the agricultural sector real per capita added value, the changes of which shows the agricultural sector growth. E and F include a set of control variables that affect rural income inequality index and agricultural sector growth. The control variables affecting rural income inequality (E) and agricultural sector growth (F) are determined based on empirical studies and theoretical arguments.

According to the theoretical foundation and whatever mentioned above one of the effective factors on rural income inequality is agricultural sector production increase. Also due to the studies, the other effective factors on rural income inequality considered in this study are unemployment and inflation. An inflation increase causes the transfer of wealth and income among the members of the society and affects

income inequality. Also with unemployment increase, some people lose their income which affects income inequality. Moreover, government expenditure and tax income are two effective factors in income distribution. The governments transfer income by taxing and re-spending in the society and affect income distribution. Due to whatever was said before the first equation is as follows:

$$Gr_{it} = f(Pgdpar_{it}, inf_{it}, un_{it}, cr_{it}, gc_{it}, tax_{it}, rp_{it})$$

GRU stands for rural Gini coefficient, *pgdpar* stands for agriculture sector real added value. *inf*, *un*, *sr*, *gc*, *tax* and *rp* show inflation rate, unemployment rate, development credits, government expenditure, tax income, and rural population collected from statistic yearbook by provinces and used with real price in the model. *i* and *t* are province and year.

Using the province's unemployment rate instead of the rural unemployment rate was because the total unemployment can show the total economy's recession and its effect on rural income. While rural unemployment just shows rural economy recession and cannot show the rural income changes from other sectors which are effective on rural income distribution. As urban citizens' demand and consumption affect the rural economy and rural income and its distribution is not effective just by rural inflation because the connection between village and city total inflation is used instead of rural inflation.

In the second equation, the effective factors on the agricultural sector added value are considered. As it is mentioned in the theoretical foundation one of the effective factors on production growth is income distribution. So due to the study aim which is trying to find a two-way relation between production and income distribution, one of the main effective factors on agricultural sector added value is rural income inequality. Also according to the production function bases in which production is a function of factors of labor production and capital. The unemployment rate, rural population, and urbanization coefficient are considered in the second equation which indicates provinces' agriculture sector's amount of labor. Moreover, the inflation rate which is the cause of instability in production is introduced as one of the effective factors on production in the second equation. So the second equation is as follows:

$$pgdpar_{it} = g(gru_{it}, inf_{it}, un_{it}, ur_{it})$$

In the equation above, Pgdpar stands for province's agricultural sector real added value per capita, Gru stands for province's rural Gini coefficient, inf, un, ur are for the inflation rate, unemployment rate, and urbanization coefficient which are collected for each province from the statistic yearbook and used in the model. Due to the information above the systematic model is as follows:

$$\begin{cases} Gru_{it} = f(Pgdpar_{it}, inf_{it}, un_{it}, cr_{it}, gc_{it}, tax_{it}, rp_{it}) \\ pgdpar_{it} = g(gru_{it}, inf_{it}, un_{it}, ur_{it}) \end{cases} \quad (1)$$

In this model, the first equation is the effective factors on rural inequality and the second equation is related to agriculture sector growth. Due to the arguments of theoretical foundations in this study, the relation between rural income distribution and agriculture sector growth is analyzed by panel data simultaneous equations for (2008-2016) in 30 provinces divided into regions with amenity and deprivation.

3.2. Estimate Technique

The total form of panel data simultaneous regression equations are as follows:

$$Y_{it} = \alpha Z_{it} + \beta X_{it} + u_i + v_{it} \quad (2)$$

In which Z_{it} and X_{it} are the endogenous factors vector (including income distribution factors and agricultural sector growth) and exogenous vector (includes government's expenditure, inflation, tax,...). In the equations system (2) two residual u_i (residuals related to cross-section data) and v_{it} (the residual related to time series) exists that the endogenous factors are correlated with v_{it} but there is no relation between residual sentence v_{it} with exogenous variables. While there is a possibility of correlation between u_i (residuals related to cross-sectional data) and exogenous variables. So the coefficients obtained from the OLS and GLS estimation methods will be inconsistent.

To estimate equation (2) consistently, [Balestra & Krishnakumar \(1987\)](#) introduced a kind of

random effect called G2SLS in which instrumental variables are used in model estimation (Panel with instrumental variables with two-stage least square method) to eliminate the relation between residual and explained variables. Thus, the G2SLS method is efficient and consistent for the above panel data. And there is no need for the Hasman test to examine the consistency of random models (random effect). ([Rafat and Baigzadeh, 2012 :17](#)) The rank condition for determining simultaneous equations establishes when the number of each equations' exogenous variables are greater than or equal to the number of endogenous variables of the equations. Therefore, equation (1) is estimated with simultaneous panel random effect approach and two-stage least square method.

3.3. Dividing the provinces into provinces with amenities and deprived

In most of the studies, the level of the development of the regions and country's provinces division to deprived or with amenity evaluated with different methods and indexes like [Ghadir -Masoum & Habibi \(2003\)](#), [Rezvani & Sahneh \(2005\)](#), [Badri & Akbarian \(2006\)](#) and [Shaykh-baygloo \(2012\)](#). Shaikh-bagloo's study's classification is used because of its comprehensiveness in using different techniques, comprehensive indexes, and the emphasis on the agricultural sector, foundations, educational and health facilities. The author has used 40 indexes in different dimensions. The evaluation of the level of the development of a province in Shaikh-bagloo's study is accomplished with different methods like taxonomy, Topsis ideal approach, Morris development degree index, and indexing method and at last, a combined factor from the different methods' results is used and the last index is the average resulted from all those methods.

In this study, the last index of [Shaykh-baygloo](#) is the criteria of determination of deprived or amenity degree of the regions. So ten first provinces in [table 1](#) are with amenity provinces, the second ten provinces are low amenity and the last ten provinces are deprived. ([Table 1](#))

Table1- Countries provinces' Ranking(Source: [Shaykh-Baygloo, 2013, 17](#))

provence	Rank	provence	Rank	provence	Rank
Semnan	1	Razavi Khorasan	11	Kermanshah	21
Tehran	2	East Azerbaijan	12	Kurdistan	22
Mazandaran	3	Golestan	13	South Khorasan	23
Isfahan	4	Chaharmahal and Bakhtiari	14	Lorestan	24
Yazd	5	Hamadan	15	Khuzestan	25
Fars	6	Bushehr	16	Kerman	26
Qom	7	Ardabil	17	Ilam	27
Guilan	8	Zanjan	18	North Khorasan	28
Qazvim	9	Kohgiluyeh and Boyer-Ahmad	19	Hormozgan	29
Markazi	10	West Azerbaijan	20	Sistan and Baluchestan	30

4. Research Findings

To avoid pseudo-regression, the variable's stationery was tested before model estimation. Panel data stationary test done through two ways, single root test for common root and single root test for individual root. Levin et al. (2002) believe that for panel data single root test for common root is more effective than a single root test for individual root in every root separately ([Baltagi, 2005](#)). So in this study to examine the factors stationary Levin, Lin & Cho test is used. The zero hypothesis for this test shows non-stationary in analyzed variables. To do

the test statistics t is used. The t statistics are larger than the t statistics' standard table value (about one percent residual, equals 2/36) which shows that zero hypotheses are rejected and variables' stationery is confirmed. The results of the stationary test are shown in [table \(2\)](#) according to Levin, Lin & Cho test. Due to the [table](#), t statistics for all the variables is about one percent which is larger than the standard value of the table and shows the stationery of all the variables.

Table2- Stationary Test

Source: Research Findings, 2020

Variable	T	prob T	Result
Rural Gini Coefficient	-18	00	Stationary
Agricultural sector's production per capita	-11.9	00	Stationary
Unemployment	-4	00	Stationary
Inflation	-3.2	00	Stationary
Government Current Expenditure	-15	00	Stationary
Development Expenditure	-3.7	00	Stationary
Tax Revenue	-13.4	00	Stationary
Rural people	-3.6	00	Stationary
Urbanization	-2.9	00	Stationary

After the stationary test, the presented model was estimated with the G2SLS method and using the data of 30 provinces of Iran during 2008-2016 for regions with amenity and deprivation in the form

of two equations and the results presented in 5 scenarios in [table 3](#). The first scenario is related to all the rural regions of Iran and includes 30 provinces, the other scenarios are as follows:

- A. regions with amenity (first ten provinces of [table 1](#))
- B. regions with amenity and low amenity (first twenty provinces of [table 1](#))
- c. regions with low amenity and deprived (last twenty provinces of [table 1](#))
- d. deprived regions (last ten provinces of [table 1](#))

As in all the 5 scenarios and equations, the number of exogenous variables is more than the indigenous variable so all the equations can be estimated with the ranking condition.

Due to [table \(3\)](#), the results of the first model of the equation for all the rural regions show that agricultural added value per capita has a negative and significant effect on the Gini coefficient, which means that agricultural sector added value increase leads to income gap decrease. This result mostly happens in regions with low amenity and deprivation and is due to Kuznets theory. Due to this theory in regions with low amenities and deprived because of low level of facilities, more villagers immigrate to cities and these villages face a lack of labor so the remained villagers especially the ones with no farm or low-income face more income-earning opportunities for agricultural activities. Therefore, developing the agricultural sector joins with rural income increase and leads to income inequality decrease.

Also, the second equation results for all the regions show that the Gini coefficient has a positive and significant effect on agricultural sector added value, which means by rural income inequality increase agricultural sector added value increases too. This matches the classic theory which is expressed that, by income inequality increase and income aggregation to a specific group the desire to save money increases and leads to investment increase and agricultural sector growth.

The results of the equation about regions with amenity (scenario 2) indicate that there isn't a significant relation between agricultural sector added value per capita and inequality coefficient in none of the equations for regions with amenity. While this relation is significant for regions with low amenity and deprivation (scenario 5). As you see in [table 3](#) by moving from scenario 2 to scenario 5 and from regions with amenity to low amenity regions and deprived, the effect of agricultural sector added value per capita increase to decrease rural income gap is more and significant. Also, the effect of rural income

inequality on agricultural sector income per capita is significant just in regions with low amenity and deprivation.

According to the results of the first equation in [table \(3\)](#), the province's inflation increases cause the rural income gap to decrease which can be explained by the results of the second equation of [table \(3\)](#). Due to the results of the second equation of [table \(3\)](#), the inflation causes production increase in rural regions especially in low amenity regions and deprived. since agricultural products need more labor so due to the trade view the increase in these products leads to a demand increase for labor and wages.

Agricultural products price increase causes the wages of the labor increase so the villager's income who ownless farm and stock and work for others increase.

In addition to the inflation rate, the results of [Table \(3\)](#) show that increasing the provincial unemployment rate reduces the income gap between rural. Because with unemployment increase and provincial economy recession most of the villagers who have gone to work in the cities come back to their villages to work in the traditional agricultural sector and as the income of these activities distributed equally between the villagers due to Kuznets theory. So, in a province unemployment rate increases, reduces the rural income gap. As the results of [Table \(3\)](#) for the second equation expresses, with the increase in provincial unemployment and fact the occurrence of recession in other sectors, production in rural regions increases.

Due to the results of [table 3](#), government expenditure increases in provinces cause the rural inequality increase in all of the provinces while the development expenditure only in deprived and low amenity regions reduces rural income inequality and in other regions, it doesn't have a significant effect on inequality. [Gannon and Liu \(1997\)](#) believe that by government development expenditure increase and establishing some facilities like road, communication infrastructure, rural schools, and health centers, rural production costs reduce and the villagers can connect with the city and generate income for the poor villagers. So increasing development credits reduces the income gap of the villagers and it was significant in deprived or low amenity provinces.

The results of table 3 indicate that provinces' tax income improves rural income distribution. As lots of agricultural sectors activities are tax-free, income distribution improvement due to rural non-agricultural income can be explained. Some villagers earn income from activities in other

sectors besides agricultural income, which can increase rural income inequality. Therefore, when more taxes are received from the non-agricultural incomes of the villagers, the rural income inequality decreases.

Table (3), Model (1) estimation results

Variable	All Regions	Regions with amenity	Regions with amenity & low amenity	low amenity & Deprived Regions	Deprived Regions
First equation (depend on variable: Rural Gini)					
Intercept	387	341	373	370	378
sector's agricultural production per capita	*-/36	-0.18	**0.25	*-0.8	*-1.1
inflation	**78	*-80	**86	—	*-151
Unemployment	*-3.1	—	-1.6	*-3	
Current Government Expenditure	*002	*0006	*0006	*002	*001
Expenditure Development	**46	—	-2.6	*7/8	
Revenue Tax	*-0/3	—	*-0/27	—	
people Rural	*-/04	—	-0/02	*-0/03	
Second equation (depend on variable: agricultural sector's production per capita)					
Intercept	-0/002	-0/015	-0/005	-0/005	0/002
Gini Rural	**0/21	0/7	0/34	**0/15	0/13
inflation	**0/008	0/13	0/07	**0/05	0/06
Unemployment	*0/006	0/006			0/003
Urbanization			**0/008	**0/005	

***significant in 5 percent & significant in 10 percent

Due to the results of table 3 rural population increase in provinces reduces rural income inequality. This result is compatible with Baro's (2000) and Erharth's (2009) argument. They believed rural populations are usually high in deprived regions and these regions according to the Kuznets hypothesis, the income from activities is equally distributed. Table (3) shows that the rural population coefficient is significant for low amenity and deprived regions.

At last urbanization in deprived and, low amenity regions has a positive and significant effect on income distribution improvement because of the increase in city and village communications which makes income opportunity for the poor (people who have no land, farm, stock, or income in the

village). But it is not significant in regions with amenities because of their amenity (there is a little difference between city and village facilities).

5. Discussion and Conclusion

Due to the importance of rural income distribution and the role of deprivation level in the relationship between growth and income distribution, in this study, the relation between agricultural sector growth and the distribution of its benefits among rural in provinces of Iran during (2008 -2016) divided by regions with an amenity or deprived and in the form of panel data simultaneous equations is analyzed. The results of the model estimation show that there isn't a significant relationship between the agricultural sector added value per capita and income inequality coefficient in amenity regions.

While by agricultural sector production increases rural income inequality reduces significantly in the deprived and low amenity. The effect of agricultural production increase on income gap reduction becomes more and significant by moving from regions with amenities to semi-deprived and deprived regions. These results are compatible with Kuznets's hypothesis which believes that economic growth in deprived regions reduces the income gap and is in conflict with the hypothesis which indicates that with regions amenity increase both aims (equal income distribution and growth) simultaneous realization is possible. Also, rural income inequality's effect on the agricultural sector added value per capita is significant only in deprived and low amenity regions and causes the growth of these regions.

The above results for deprived regions are compatible with the results of [Salami and Ansari \(2009\)](#), [Khaledi and Haghghatnezhad Shirazi \(2012\)](#) and [Torkamani and Jamalimogadam \(2005\)](#), and about regions with amenity the above results are compatible with [Khaledi and Sadr-Alashrafi \(2005\)](#), [Khaledi et al. \(2009\)](#). Also, this study results about regions with amenities are compatible with the results of [Karami et al. \(2000\)](#) in which the effect of sprinkler irrigation technology on poverty and inequality among rural societies of Fars province is analyzed. [Karami et al.'s \(2000\)](#) findings imply that because of institutional limitations, the orientation of the organizations involved in the process is towards the richer members of the social system.

Considering the results of the present study and comparing the results with the findings of the other studies about the relationship between rural income inequality and agricultural sector growth indicates that the findings of those studies for Iran in different provinces depending on the degree of deprivation can be logical.

In addition to the studies above, the present study's results indicate that price level increase led to agricultural production increase and as production of agricultural products needs more labor than technology so labor wages increase too (the labors are poor rural). So provincial inflation rate causes agricultural sector production to increase and rural income distribution to improve. [Shirvanian and Esmaeil \(2009\)](#) by analyzing the effect of products price variation on rural poverty indicate that food

and housing price increase benefits poor rural families but the increase of other products price decreases poor rural welfare. According to the findings of these researchers, the increase of all products price levels (inflation rate) benefits poor rural families and improves rural income distribution. [Pourmokhtar and Moghaddas \(2017\)](#) show that inflation increase leads to farmer's welfare improvement. Also [Jorjorzade & Eghbali \(2005\)](#) concluded that inflation harms the Gini coefficient and causes inequality decrease. [Aboonoori et al., \(2011\)](#) study results indicate that inflation's impact on rural income inequality is less than its impact on urban income inequality and believe the reason for this difference is the rural economy's self-living feature.

According to the results of the present study, the province's tax income improves rural income distribution while the previous studies give different results about tax impact on income distribution. For example, [Seifeepour and Rezaee \(2011\)](#) and [Khanzadi et al. \(2015\)](#) reports the negative impact of direct tax and positive impact of indirect tax on income distribution. Also, [Mehrara and Esfahani \(2016\)](#) came to the point that some taxes like income tax, corporate tax improves income distribution but a tax on production and services make the income distribution worse. Of course, in these studies, the impact of tax on rural income distribution is not discussed and there is no incompatibility in the results of the present study with previous studies.

Due to the present study's results government development credits only in deprived and low amenity regions significantly influences rural income inequality to reduce. This result is compatible with the findings of [Fleisher et al., \(2010\)](#) which indicates that investing in infrastructures of deprived regions decreases inequality but investing in infrastructures of amenity and developed regions intensify the inequality. Also, the results of the present study about the government's expenditure impact on rural income inequality are compatible with the findings of [Rezaee et al. \(2014\)](#) and [Nademi and Hassanvand \(2015\)](#) which indicates that the government's expenditure increase led to income inequality increase.

Due to the results of the study, the agricultural sector's production increase and also government development credits in regions with a low amenity or deprivation improves rural income distribution. Therefore, planning to increase the production of the agricultural sector, as well as public facilities increase and deprivation elimination of deprived and regions with low amenity is one of the strong recommendations of this study for deprived and low amenity regions. As the facility increase causes the income from the agricultural sector growth flow to the low-income groups in deprived rural regions and reduces poverty in deprived regions and the whole community. On the other hand, as the results show in the regions with amenity the increase of government development credits, public facilities creation, and also agricultural production increase does not affect rural income distribution which indicates that in these regions the focus is on creating facilities that benefit most middle and upper-income groups and the existing social institutions do not provide the opportunity to use the facilities equally for all groups of the rural community. In other words, although the regions with amenities have been strengthened in terms of facilities and infrastructure in these regions institutional

frameworks do not have the efficiency for distributing the benefits of increasing agricultural production properly. Therefore, in the regions with amenity reviewing the rules and institutions that are effective on distribution is necessary. Otherwise, income distribution inequality, despite production growth, will spread poverty in rural society.

According to the results of the present study and to reduce rural income inequality and to prevent poverty spread especially in low amenity and deprived regions, it is essential to allocate development credits and infrastructure facilities of these regions due to the degree of deprivation and agricultural sector activities boom emphasize by the government required encouragement and creating the required background for fair pricing the agricultural productions. Also in regions with amenities, the method of development credits allocation for rural infrastructures and existing institutional framework for proper income distribution should be rewired.

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ارزیابی اثرات متقابل رشد بخش کشاورزی و نابرابری درآمد در مناطق روستایی ایران به تفکیک استان‌های محروم و برخوردار: رویکرد معادلات همزمان پانلی

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چکیده مبسوط

۱. مقدمه

توزیع ناعادلانه درآمد در جوامعی که از درآمد پایین برخوردار هستند، فقر را سریع تر از جوامع دیگر گسترش می‌دهد. بررسی آمار و ارقام در این خصوص برای روستاهای ایران حاکی از آن است که به طور متوسط حدود ۳۰ درصد از جمعیت کل کشور را جمعیت روستایی تشکیل می‌دهد. در حالی که سهم بخش کشاورزی از تولیدات کل کشور فقط ۸ درصد است. از طرفی میانگین رشد سالانه بخش کشاورزی برای سالهای مورد بررسی در حدود یک درصد است در حالی که رقم مذکور برای بخش‌های صنعت و خدمات به ترتیب دو و سه درصد می‌باشد (گزارش حساب‌های ملی ایران، مرکز آمار ایران، سالهای ۱۳۸۶-۱۳۹۴). این اطلاعات نشان می‌دهد که درآمد روستائیان کشور به طور متوسط نسبت به درآمد جمعیت شهری کمتر بوده و سطح رفاهی روستائیان نسبت به جمعیت شهری به تدریج طی دوره مورد بررسی کاهش یافته است. این در حالی است که تحقق همزمان رشد و توزیع عادلانه درآمد براساس اصل (۳) قانون اساسی و همچنین برنامه‌های توسعه بعد از انقلاب در نظام جمهوری اسلامی ایران مورد تاکید قرار گرفته است.

با عنایت به مرتب فوق تبیین رابطه بین رشد اقتصادی و توزیع درآمد در جوامع روستایی ایران ضروری است. از سویی در بررسی‌های اخیر نشان داده شده است که میزان برخورداری و محرومیت جوامع می‌تواند در نوع ارتباط بین رشد و توزیع درآمد موثر باشد. لذا در این مطالعه تبیین رابطه توزیع درآمد روستایی و رشد بخش کشاورزی ایران به تفکیک مناطق محروم و برخوردار در بین استان‌های ایران مد نظر قرار گرفت.

۲. مبانی نظری تحقیق

در ادبیات اقتصادی رویکردهای متفاوت در خصوص رابطه بین رشد اقتصادی و توزیع درآمد ارائه شده است. براساس دیدگاه کلاسیک‌ها، ثروتمندان میل به پس‌انداز بالاتری نسبت به فقرا دارند و نابرابری درآمد به رشد اقتصادی بالا منجر می‌شود در این میان کوزنتس (۱۹۵۵) با بررسی تاثیر رشد اقتصادی بر توزیع درآمد در طول زمان نشان می‌دهد که در مراحل اولیه توسعه، رشد اقتصادی موجب افزایش نابرابری درآمد است، اما در مراحل بعدی توسعه، رشد اقتصادی منجر به برابری درآمدها می‌شود.

در حالی که مطالعات بسیاری نظریه کوزنتس را در کشورهای در حال توسعه و توسعه یافته مورد بررسی و تایید قرار داده‌اند. اما طی نیمه دوم قرن بیستم، اقتصاددانان متعددی با تاکید بر آثار منفی نابرابری بر رشد از طریق افزایش بی ثباتی، کاهش انگیزه سرمایه‌گذاری و کاهش تقاضای افراد طبقه متوسط جامعه نتیجه گرفتند که دیدگاه کلاسیک‌ها با نتایج تجربی مغایر است. در این میان برخی محققین نشان دادند که بهبود در خدمات زیر بنایی می‌تواند نابرابری درآمدها را کاهش داده و رشد اقتصادی را افزایش دهد.

از تحلیل مباحث نظری چنین استنباط می‌شود که رشد اقتصادی و توزیع درآمد اثرات متقابلی نسبت به هم می‌توانند داشته باشند و این اثرات متقابل می‌تواند مثبت و منفی باشد. همچنین با عنایت به ساز و کارهای مطرح شده در خصوص اثرگذاری نابرابری بر رشد اقتصادی و برعکس، چنین استنباط می‌شود که رابطه بین دو متغیر مذکور در جوامع سنتی می‌تواند متفاوت از جوامع مدرن باشد و مهم تر اینکه رابطه مذکور در میان جوامع سنتی روستایی نیز با توجه به میزان برخورداری روستاها از امکانات می‌تواند متفاوت باشد.

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۳. روش تحقیق

با عنایت به استدلال‌های بیان شده در مبنای نظری، رابطه توزیع درآمد و رشد اقتصادی اثرات متقابلی بر هم داشته و رابطه بین آنها در مناطق محروم و برخوردار متفاوت است، لذا در این مطالعه به منظور تبیین رابطه توزیع درآمد روستایی و رشد بخش کشاورزی، سیستمی مشتمل بر دو معادله به شرح زیر معرفی شد که در معادله اول عوامل موثر بر رشد بخش کشاورزی و در معادله دوم عوامل تعیین کننده نابرابری درآمد روستایی مورد بررسی قرار می‌گیرد.

$$\begin{cases} Gru_{it} = f(Pgdpar_{it}, inf_{it}, un_{it}, cr_{it}, gc_{it}, tax_{it}, rp_{it}) \\ pgdpar_{it} = g(gru_{it}, inf_{it}, un_{it}, ur_{it}) \end{cases}$$

که در آن gru ضریب جینی روستایی و $pgdpar$ ارزش افزوده واقعی بخش کشاورزی است. در معادله اول inf ، un ، cr ، gc ، tax و rp به ترتیب نرخ تورم، نرخ بیکاری، اعتبارات عمرانی، مخارج جاری دولت، درآمد مالیاتی و جمعیت روستایی می‌باشند همچنین در معادله دوم un ، inf و ur به ترتیب نرخ تورم، نرخ بیکاری و ضریب شهرنشینی می‌باشند. اطلاعات این متغیرها به تفکیک استانها از سالنامه آماری جمع آوری شدند.

معادلات فوق با استفاده از داده‌های استانی به تفکیک مناطق محروم و برخوردار برای دوره (۱۳۸۶-۱۳۹۴) و با استفاده از رویکرد معادلات همزمان داده‌های پانلی برآورد شدند. برآورد مدل فوق در ۵ سناریو صورت گرفت که سناریو اول مربوط به کل مناطق روستایی کشور و شامل ۳۰ استان است و سناریوهای بعدی به ترتیب الف- مناطق برخوردار (شامل ۱۰ استان اول برخوردار)، ب- مناطق برخوردار و نیمه برخوردار (شامل ۲۰ استان اول برخوردار)، ج- مناطق نیمه برخوردار و محروم (شامل ۲۰ استان دارای محرومیت بیشتر) و د- مناطق محروم (شامل ۱۰ استان از محروم ترین استان‌ها) می‌باشند.

۴. یافته‌های تحقیق

بر اساس نتایج این تحقیق در استان‌های محروم و نیمه برخوردار رشد بخش کشاورزی منجر به کاهش نابرابری می‌شود، در حالی که در استان‌های برخوردار رشد بخش کشاورزی اثر معنی‌داری بر نابرابری ندارد. همچنین یافته‌های این تحقیق موید آن است که در مناطق محروم، افزایش نابرابری منجر به رشد اقتصادی می‌شود، اما در مناطق برخوردار تاثیر نابرابری بر رشد معنی‌دار نیست. علاوه بر این نتایج حاصل از تخمین الگو نشان داد که افزایش مخارج جاری دولت در استانها موجب افزایش نابرابری درآمد روستایی است و مخارج عمرانی دولت فقط در مناطق محروم و نیمه برخوردار موجب کاهش نابرابری درآمد روستایی بوده و در بقیه مناطق روستایی تاثیر آن بر شاخص نابرابری معنی‌دار نیست.

۵. بحث و نتیجه‌گیری

بر اساس نتایج این مطالعه و به منظور کاهش نابرابری درآمد روستایی و جلوگیری از گسترش فقر به خصوص در مناطق محروم و نیمه برخوردار لازم است اعتبارات عمرانی و امکانات زیر بنایی مناطق مذکور بر حسب درجه محرومیت تخصیص یافته و رونق فعالیت‌های بخش کشاورزی از طریق ارائه مشوق‌های لازم دولتی و ایجاد زمینه‌های لازم برای قیمت‌گذاری عادلانه محصولات کشاورزی مورد تاکید قرار گیرد. همچنین در مناطق برخوردار، شیوه تخصیص اعتبارات عمرانی برای زیر ساخت‌های روستایی و چارچوب‌های نهادی موجود به منظور توزیع مناسب درآمد مورد بازبینی قرار گیرند.

کلیدواژه: توزیع درآمد روستایی، رشد بخش کشاورزی، محرومیت، معادلات همزمان داده‌های پانلی.

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