



International Journal of Economic Research

ISSN : 0972-9380

available at <http://www.serialsjournals.com>

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Volume 14 • Number 14 • 2017

Decomposition of Income Inequality by Population Subgroups in Iran, 2008-2013

Income Inequality Decomposition in Iran

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ABSTRACT

This paper employs a decomposition analysis of inequality by different population categories to understand and explain particular aspects of inequality in both urban and rural areas at household level in Iran between 2008 and 2013. Income inequality is analyzed in terms of Theil index and generalized entropy. The trend of Gini coefficient measure in both rural and urban area decreased during this period, but at the same time, the level of Inequality was higher in rural than in urban areas.

The results indicate that the Employment status of the household head in rural communities and education level of the household head in urban communities are the most determinant factors in explaining income inequality in Iran. Despite of relative improve in income share in rural and urban areas, as the inflation has mostly affected low income household, Therefore, the income gap between the high- and low-income households has widened. By continuing the increase in the inflation rate, the relative improvement of income distribution becomes neutral and due to the high inflation, the lower income deciles, especially the middle class will suffer more.

JEL Classification: D63; O15; O18.

Keywords: Inequality; income distribution; decomposition analysis; Population subgroups.

1. INTRODUCTION

“Development” is not a value-free term. It depends on a number of economic, social and cultural indicators and has a unique meaning for each individual country. Poverty, and more generally inequality, has been recognized as being among the most important indicators for evaluating the degree of development (Papatheodorou 1998). Inequality has been an issue of concern of social scientists and policy makers. In all modules inequality has been investigated as the «overall inequality» among a given set of individuals with given income levels. However, inequality may stem from different groups or sectors of population with different intensities.

In inequality decomposition studies we can distinguish two fundamental approaches. The traditional and larger applied technique is to identify the influence coming from specific population subgroups. A complementary - rather than alternative - approach is to establish how different types of income affect total inequality: an example could be to detect the relative contribution of incomes from financial investments with respect to wages, capital profits, rents or state factors (transfers and taxes).

A very important feature of inequality measures is therefore decomposability. Actual policies may have a much differentiated impact on subgroups of population (e.g. rural and urban households). It is therefore essential to split overall inequality among different groups of population. Decomposition by population group has been the leading approach to quantifying how deferent factors and components affect inequality and then calculates the level of inequality within each sub-sample and between the means of the sub-samples (Morduch and Sicular 2002).

Our paper aims at contributing to the better understanding of income inequality in Iran by analyzing the influence of certain household characteristics on income variability. This will be done using the Thiel inequality and generalized entropy technique decomposition with household income data from 2008 to 2013. This tool provide the analytical and the practical framework to understand where inequality comes from. Decomposing inequality indexes means exploring the structure of inequality, i.e. the disaggregation of total inequality in relevant factors. Policy makers might be helped by these results in two main ways: first, by being able to decide on more effective policies for reducing inequality, and second, by improving their tools for evaluating and predicting the potential implication that other government policies or actions might have on income inequality, poverty and consequently social development. This paper is organized as follows.

The next section is briefly reviewing the relevant literature in the area of income inequality and then we expose methodology and technical details of our decomposition analyses that are applied to this study. Section 4 presents the results and finally, Section 5 summarizes and draws conclusions.

2. LITERATURE REVIEW

Analyses of distribution of income and understanding causes of inequality are one of the most important interests of econometrics since 1990s to answer a wide range of questions, but the first significant theoretical researches on economic inequalities belong to Sen in 1973 and Atkinson in 1975, while pioneers of income inequality are Kuznets (1955) and Mincer (1958). Kuznets has promoted the idea that between economic development and income inequalities there is a relation of a form of an inverted U-shaped curve. This

relationship has been in the focus of many researchers since then and their findings show that this issue is far from being solved (Bourguignon and Morrisson 1998 ; Ravallion 2004a, b).

For the economist primarily interest is the effects of the distribution of income upon the distribution and total amount of economic welfare, which may be derived from income. Inequality, though it may be defined in terms of economic welfare, must be measured in terms of income. Under this procedure, no one measure of inequality will emerge, whose appropriateness will be independent of the particular functional relation assumed (Dalton 1920).

Judgments about equality imply the use of additional assumptions concerning the social welfare attached to income and its distribution. Aigner and Heins (1967) discover an unambiguous, welfare-related equality measure. What is produced is an “index” of equality which describes the performance of a given distribution relative to the maximum welfare derivable from the total income it represents. The measure thus depends functionally on the welfare attributes of income, something which in reality we know little about.

A number of studies examine the problem of measuring inequality in distribution of income. They argue that inequality and ranking of distribution depend on form of social welfare function to be employed and finding show that they have properties which are unlikely to be acceptable (Atkinson 1970).

Number of studies attempt to analyzed the distribution of income at the aggregate level and shown that total income measured by additive factor components and then deriving the separation rule to decompose inequalities to corresponding values The basic purpose of this analysis must be to explain the total Gini is absolutely affected by the sub component Gini's factors (Fie1978; Fields 1979; Rao 1969; Shorrocks 1982; Toyoda 1980).

Income inequality can be decomposable in the sense that, if the population of income-earners is broken down into a certain number of subgroups. This analysis typically focuses on the ‘contributions to inequality’ from different subgroups of the population. The inequality measure for the total population can be expressed as a sum of the inequality measures “within” its subgroups, weighted by coefficients depending on their aggregate characteristics, and of the inequality existing “between” them. The variance coefficient and Theil's coefficient are such decomposable measures of inequality and they have been extensively used in identifying and explaining the main sources of inequality in a given population. (Bourguignon 1979; Shorrocks 1984)

Akita et. al., (1999) explore the factors and forces underlying income inequality in Indonesia, using the Theil inequality technique. Urban inequality is larger than rural inequality and inter- provincial inequality has been a major factor in overall inequality. Another finding is that education is a significant determinant of inequality while gender appeared to be insignificant in Indonesia. Hence, the elimination of gender inequality will not reduce total inequality by very much.

Silber (2000) attempts to determine the impacts of income sources and population categories in rural and urban areas had on the overall level of income inequality in turkey in 1994. Inequality is higher in urban than in rural areas. In rural areas the main component is the within categories inequality while in urban areas it is the between categories. Moreover Proprietors represent the main category in rural areas while Wage and Salary Earners are the most important group in urban areas.

Brewer (2012) decomposes changes in income inequality in Great Britain over the period 1968-2009 according to household characteristics which are expected to influence income.

3. DATA AND METHODS

Our analysis is based on data set of twenty thousand rural and urban household's income collected from all provinces by the Statistical central of Iran, The survey covers the period of 2008-13.

In practice, there are several decomposable inequality indicators. Perhaps the most convenient for the decomposition is the family of generalized entropy indices including the mean logarithmic deviation, the Theil coefficient, and the Half of the squared coefficient of variation (Theil 1967; Bourguignon 1979; Shorrocks 1984; Cowell 1980). A type of question frequently encounter in the analysis income inequality concerns the extent to which inequality in the total population can be attributed to income differences between major population subgroups. We may interested in assess the overall income inequality, and decomposed it based on certain household characteristics, such as educational level of the household head, marriage status of the household head, area of residence and the gender of the household head and etc. The main motivation of decomposing inequality by population subgroups is given by the possibility of examining the relationship between the demographic structure of a population and the associated income distribution. The family of generalized entropy inequality achieves this objective; as a consequence, they are often used in empirical works in order to provide keys of understanding for the observed patterns of inequality. The general formula is given by:

$$GE(\alpha) = \frac{1}{\alpha(\alpha - 1)} \left[\frac{1}{N} \sum_{i=1}^N \left(\frac{y_i}{\bar{y}} \right)^\alpha - 1 \right]$$

where, \bar{y} is the mean income. The values of GE measures vary between 0 and ∞ with zero representing an equal distribution and higher value representing a higher level of inequality.

The parameter α in the GE class represents the weight given to distances between incomes at different parts of the income distribution, and can take any real value. For lower values of α , GE is more sensitive to changes in the lower tail of the distribution, and for higher values GE is more sensitive to changes that affect the upper tail. The commonest values of α used are 0, 1 and 2. GE (1) is Theil's T index, which may be written as:

$$GE(1) = \frac{1}{N} \sum_{i=1}^N \frac{y_i}{\bar{y}} \ln \left(\frac{y_i}{\bar{y}} \right)$$

GE (0) sometimes referred to as the mean log deviation measure, is given by:

$$GE(0) = \frac{1}{N} \sum_{i=1}^N \ln \left(\frac{\bar{y}}{y_i} \right)$$

With Consider each individual in the total population characterized by the general pair $(y_i, k) = y_{i,k}$ of total income $y_{i,k} \in Y$ and one attribute $k = 1 \dots K$. Suppose that this attribute divides the total population into K mutually exclusive and exhaustive groups. Then, we can define

$$n = \sum_{K=1}^k n_k; \pi_k = \frac{n_k}{n}; y_k = n_k \mu_k = \sum_{i=1}^{n_k} y_i; k = 1, \dots, K$$

where, n_k and μ_k represent the number of individuals and the k -group mean, respectively. The minimum requirement for population decomposability is that if inequality increases in a population subgroup then, other things being equal, inequality increases overall (property of subgroup consistency).

The “aggregation problem” is solved by Theil (1967) providing a breaking down rule made of two components: the first identifies the distance between homogeneous groups of units, while the second incorporates the dispersion within each group. In formula, we have:

$$T(y) = \sum_{j=1}^k \frac{n_j}{n} \frac{\bar{y}_j}{\bar{y}} \ln \left(\frac{\bar{y}_j}{\bar{y}} \right) + \sum_{j=1}^k \frac{n_j}{n} \frac{\bar{y}_j}{\bar{y}} \ln \left(\frac{1}{n_j} \sum_{i=1}^{n_j} \frac{y_{ij}}{\mu_j} \ln \left(\frac{y_{ij}}{\mu_j} \right) \right)$$

$$= \sum_{k=1}^k \pi_k s_k \ln s_k + \sum_{k=1}^k \pi_k s_k \cdot T_k = T_b + T_w$$

where $\pi_k s_k = \frac{n_k}{n} \frac{\mu_k}{\mu} = \frac{Y_k}{Y}$ is the total income share held by subpopulation k . The between group (Tb) and the within-group (Tw) components measure the inequality contribution coming, respectively, from the differences in subgroup means (μ_k) and the income differences inside each population subgroup. Note that the first term contributes nothing only if $s_k = 1, \forall k$. In all other cases it will be strictly positive. The second term, which corresponds to the weighed mean of the K sub-indices, is also never negative and reaches its minimum (zero) in case of equally, distributed incomes inside each subpopulation k .

4. RESULTS

4.1. Decomposition by Household Dimension

Larger Households tend to have a higher level of household income. However, “per capita” household income decreases as household dimension increases. Investigating the share of population in the rural and urban households during the period under review indicates that three and four-member families make the highest percentage among all households. The results reveal that the growth of household dimension has decreased during the period in both urban and rural communities. Numerous changes in society such as urbanization, changing in the life style, nuclear family and etc. are factors which have directly or indirectly reduced family size.

Comparing the average of family members in different income deciles during the study period shows that the lowest and highest number of people is in the first and tenth income deciles in both rural and urban communities; although, the public perception is that households in the lower income deciles have more members in comparison with households in the top decile.

The survey of average income in rural and urban households makes it clear that the average income of larger Households is more than other households. This result strengthens the assumption of the participation of employed members in households in the assistance to the head of household.

Between-group Theil index shows that household dimension explains 15% and 6% of total inequality in rural and urban communities, respectively. Higher share of between-group inequality in rural communities reveals that household dimension involves in the incidence of income inequality in rural communities more than that in urban communities. According to the table, which present the decomposition results,

household dimension inequality is not prominent factor in overall income inequality, as the between-group component only 8 and 3 percent of total inequality, as the measured by GE(2). In other words, elimination of household dimension inequality will not reduce total income inequality by very much.

Table 1
Inequality Decomposition by Household size

		<i>GE(2)</i>	<i>%Share</i>	<i>Theil</i>	<i>%Share</i>
Rural	Within-group	0.361	92	0.211	85
	Between-group	0.034	8	0.039	15
	All groups	0.395	100	0.25	100
Urban	Within-group	0.359	97	0.202	94
	Between-group	0.011	3	0.013	6
	All groups	0.37	100	0.215	100

1. Decomposition by Age

According to the results published in Statistical Center of Iran from seventh General Population and Housing Census in 2011, the average growth of urban and rural households is reduced from 2.74 to 2.14 and from -0.4 to -0.63 in the years of 2006 to 2011, respectively. In Iran, the life expectancy is increasing similar to most parts of the world because of medical advances. During the mentioned period, Iran's population age structure indicates the decline in the young population and increase in the middle-aged and elderly people within years of 2006 to 2011 that is the transition from the young people to elderly population.

Mean of Household income usually increase generally with the age of household head, and it reaches a peak at the ages 35 to 57, thereafter, it decrease. One of the main factors is that household size become larger as the household head gets older, but after children become independent, it become smaller. (Akita 1999)

Between group Theil index shows that the age of head of household explains 4% of total inequality in rural communities; as well as, in urban communities. The same amount of Between group inequality in urban and rural communities suggests that this factor has been equally effective in both communities.

The following table represents the decomposition results, the within-group component account for 96 percent of total inequality as the measured by the Thiel index, thus indicating that disparities within age group were significant in the overall income inequality. Within-age-inequality appears to increase with the age of household heads and after ages 35 to 57 it dropping.

Table 2
Inequality Decomposition by Age

		<i>GE(2)</i>	<i>%Share</i>	<i>Theil</i>	<i>%Share</i>
Rural	Within-group	0.385	97	0.24	96
	Between-group	0.01	3	0.01	4
	All groups	0.395	100	0.25	100
Urban	Within-group	0.359	97	0.207	96
	Between-group	0.011	3	0.008	4
	All groups	0.37	100	0.215	100

2. Decomposition by Education

Since one's labor productivity is affected by amount of knowledge, information, and skill required, education is considered to be one of the key determinants of income inequality. As expected, the mean household income in both communication is shown to increase with educational attainment. The mean income for household with university education is (in rural and urban area respectively) 4.8 and 4.9 times as large as for those with no formal education.

The results indicate that the increase in income has an increasing trend up to associate and bachelor education levels while on master degree and above; average revenue growth rate shows a downward trend despite the increase in the level of wages. It may be said that among people with university education, disappointment to find a suitable employment has caused to turn in graduate studies rather than entering into the job market. According to the results of Labor Force Survey published by Statistical Center of Iran, the unemployment rate of people with master degree and above reveals an increased trend in recent years so that the average unemployment rate of people with university education is higher than unemployment rate in the whole country (results of Labor Force Survey reports of Statistical Center of Iran).

And also the urban- to- rural ratio in the mean household income is very stable across the educational levels of household heads, with the value range from 1.30 to 1.44, indicating that location and education have no significant interaction effects on mean income. In other words, households whose heads have higher education are likely to have higher income relative to those in the same location (rural or urban)

Table 3
Inequality Decomposition by Education

		<i>GE(2)</i>	<i>%Share</i>	<i>Theil</i>	<i>%Share</i>
Rural	Within-group	0.375	95	0.232	93
	Between-group	0.02	5	0.018	7
	All groups	0.395	100	0.25	100
Urban	Within-group	0.337	91	0.185	86
	Between-group	0.033	9	0.030	14
	All groups	0.37	100	0.215	100

Between group Theil index shows that the education level of the head of household causes 7% and 14% of total inequality in rural and urban communities, respectively. It can be concluded that the education level of the head of households plays a significant role in the incidence of income inequality in urban communities more than that in rural communities.

3. Decomposition by Work status

While the employment status of the head of household is an important determinant of household income, so too is the number of other individuals in employment in the household (Brewer 2012).

Iran's economy has always been subject to numerous problems in recent years. After the enforcement of targeted subsidy law and the unprecedented expansion of sanctions, the shortage of resource exchange caused by financial and transactional restrictions imposed on the country as well as the significant growth of exchange rate and consequently increase in the cost of production, we have seen an increase in the

inflation rate, reduction in the country's economic growth and incidence of the phenomenon of stagflation. The results show that the population share of employed heads has decreased from 2008 to 2012 while in 2013, the ratio again increased by the significant improvement in the economy section in 2013 compared to the previous year (Summary of the country's economic developments 2013).

What cause concerns are; the reduction of economic participation and more percentage of unemployment at the age group of 15 to 35 years old. The results of this study indicate that the employment share of heads at the age group of 15 to 35 years old shows a decline from 22% to 14% compared to total employment in the country during 2008 to 2012, while in 2013, there has been an increase in economic participation for this group in both urban and rural communities. On one hand, inflexible structure of Iran's labor market, inadequate investment in economic projects and on the other hand, the continuous increase of imports can be considered as major reasons for the lack of adequate job opportunities and economic obstacles to increase the level of employment, especially in the younger age groups.

The quantitative expansion of higher education in Iran is temporarily considered as a factor of pressure reduction in the supply of manpower in the labor market; however, after a time lag, workforce is continuously produced with heightened expectations to enter into the labor market.

Between-group Theil index shows that it causes about 7% and 1% of total inequality in rural and urban communities, respectively. In other words, the employment status of head of household, especially in the urban communities is not considered as a factor affecting income inequality and other factors have a greater share in income inequality.

Table 4
Inequality Decomposition by Work status

		<i>GE(2)</i>	<i>%Share</i>	<i>Theil</i>	<i>%Share</i>
Rural	Within-group	0.378	96	0.231	93
	Between-group	0.017	4	0.019	7
	All groups	0.395	100	0.25	100
Urban	Within-group	0.369	100	0.213	99
	Between-group	0.001	0	0.002	1
	All groups	0.37	100	0.215	100

4. Decomposition by Marital Status

It is assumed that marriage improves economic status. In welfare laws, "marriage" is considered as a means increasing income and reducing the need or eligibility for welfare. On the contrary, there is a negative correlation between divorce and average income; particularly it causes more negative impacts on women's economic status such that increases the risk of poverty and inequality, especially for women with children. The results of the present study show that the per capita income among married households in rural communities is 252 times greater than that in households whose head have divorced and this ratio is 144 times in urban communities.

According to the between group Theil index, the marital status of the head of household causes about 7% and 3% of total inequality in rural and urban communities, respectively. More level of between-group

inequality in rural communities suggests the more influence of marital status of the head of households on the income inequality compared to that in urban communities.

According to the generalized entropy index, between-group inequality- or error factor- with a share of 96% and 98% of total inequality in both rural and urban communities respectively is considered as the most efficient source of inequality in this category.

Table 5
Inequality Decomposition by Marital status

		<i>GE(2)</i>	<i>%Share</i>	<i>Theil</i>	<i>%Share</i>
Rural	Within-group	0.38	0.38	0.234	93
	Between-group	0.015	0.015	0.016	7
	All groups	0.395	0.395	0.25	100
Urban	Within-group	0.364	0.364	0.209	97
	Between-group	0.006	0.006	0.006	3
	All groups	0.37	0.37	0.215	100

5. Decomposition by Gender

The population share of men-headed households is far greater than women-headed households' proportion share in both rural and urban communities. The ratio of the mean of household income to male head in rural communities is 1.9 times income of households whose head is female while the ratio is about 1.5 times in urban communities. Various parameters may be involved in the division of income inequality of households. First, the share (%) of men-headed households of university education is higher than the share of women-headed households and (the study data) this ratio difference in rural communities is more pronounced than that in urban communities.

Second, due to the lower level of familiarity with social skills, the lack of access to resources and as a result, low quality of life and the loss of the network of relationships and responsibility of dependents, women-headed households are at the risk of injury more than men. In most developing countries and in Iran, many jobs except for professions such as nursing and teaching which are considered associated with women are monopolized by men. The possibility of employment of men is more than women in both public and private sectors. In fact, the field of female employment is not vast and varied in the area of social and economic activities.

Economically, women-headed households are much more vulnerable than male-headed households so that based on the results of the study, 67% women-headed households in rural communities and 61% in urban communities are in three low income decile while the proportion in men in the rural and urban communities is 25% and 33%, respectively. Third, the household size is more in households whose head is male in comparison with those whose head is female. Between-group Theil index shows that the gender of head of household lonely causes about 7% and 3% of total inequality in rural and urban communities. The above results suggest the greater impact of the gender of head of household in rural communities than that in urban communities on the incidence of income inequality.

According to the generalized entropy index, within-group inequality- or error factor- with a share of 96% and 98% of total inequality in both rural and urban communities respectively is considered as the

most efficient source of inequality in this category. In other words, the gender of head of household is not considered as an effective factor on the income inequality and other factors have a greater share in income inequality.

Table 6
Inequality Decomposition by Gender

		<i>GE(2)</i>	<i>%Share</i>	<i>Theil</i>	<i>%Share</i>
Rural	Within-group	0.38	96	0.233	93
	Between-group	0.015	4	0.017	7
	All groups	0.395	100	0.25	100
Urban	Within-group	0.364	98	0.209	97
	Between-group	0.006	2	0.006	3
	All groups	0.37	100	0.215	100

Decomposition by Income decile

Investigation of mean income in rural and urban communities reveals that 3 low income deciles allocate only 11% and 13% of income to themselves and 3 upper deciles of community involve more than half of income of community.

The trend of share of different deciles also contains valuable information. During the period under review, the share of the first to seventh deciles has slightly increased, while the share of the eighth to tenth deciles has slightly decreased compared to total income of per year in rural communities. While in urban communities, the share of the first to fifth deciles has slightly increased, the share of the sixth to ninth has been stable and the share of the tenth decile has slightly decreased in the same year. Thus, it appears that the income situation of low-income households has slightly improved in both rural and urban communities over time.

Evaluating the Gini coefficient of first income decile indicates a rising trend in rural communities in the period under review up to 2011 and then, a decreased trend. Evaluating the Gini coefficient of highest income decile reveals a decreasing trend in rural communities while the Gini coefficient of highest and lowest decile shows a downward trend in urban communities.

Further investigation of inflation rate and consumer price index in urban communities over years of 2008 to 2011 determines that inflation rate and CPI increase while this trend is different in different income deciles so that the lowest income decile faces with higher inflation compared to the tenth decile. According to the reports published by Iranian Statistical Center, the inflation rate in fifth decile is increased from 10.4% in 2009 to 28.5% in 2011 (18.1% increase) in urban communities while this amount has increased from 8.2% in 2009 to 14.2% in the tenth decile. The inflation rate of the fifth income decile as representative of middle-class showed an increase of 17.3% up to 2011. Given the stability of income in the middle deciles, it can be concluded that the improvement Gini coefficient does not only mean an improvement in income distribution in the lower deciles of community but also a type of more equitable distribution of poverty that is the low income classes have not virtually wealthy but the financial situation of middle income classes has hurt. By continuing the increase in the inflation rate, the relative improvement of income distribution becomes neutral and due to the high inflation, the lower income deciles, especially the middle class will

suffer more. More than 80% and about 60% of total inequality have been explained based on Theil and generalized entropy indexes, respectively by the income decile of household. In other words, the income decile of household is considered as the most effective factor in explaining income inequality.

Table 7
Inequality Decomposition by Income Decile

		<i>GE(2)</i>	<i>%Share</i>	<i>Theil</i>	<i>%Share</i>
Rural	Within-group	0.141	36	0.028	11
	Between-group	0.254	64	0.222	89
	All groups	0.395	100	0.25	100
Urban	Within-group	0.15	41	0.026	12
	Between-group	0.22	59	0.189	88
	All groups	0.37	100	0.215	100

5. CONCLUSION

This paper has attempted to contribute to the better understanding of the determinants of income inequality in rural and urban communities in Iran at household level. We have studied the influence of demographic characteristics on income inequality by decomposing total inequality into two components: within group and between group inequality. We have assessed the size of income inequality by using the Theil and generalized entropy inequality index. Our calculations were based on the household income.

Inequality is higher in rural than in urban areas and Distributions of demographic characteristics are different in covering income inequality in urban and rural communities, a higher level of urbanization is likely to lead to a higher level of income inequality. Finding shows that more than 88% of the total income inequality between households can be attributed to household income decile. Another important finding is that education is a significant determinant of income inequality in urban area, as the between-education component accounted for 30 percent of total inequality. Considering the fact that more than 82 percent of household heads in urban communication had only elementary education or less, rising general education level would have significant bearing on the reduction of the overall inequality in Iran. In rural communities, employment status of the head of household is one of the most affecting factors in income inequality after household dimension. Thus, policymakers should focus more on the household dimension, education level and occupation status of household heads in order to reduce overall national inequality.

With attention to ethnic, racial and religion identity are prominent characteristic of populations in Iran, result of income inequality decomposition in this subgroups can be outstanding. This type of analysis can be used in context of distribution effects of government expenses that sometimes payed equally to beneficiary and then neglect of these issues.

This study has a limitation, in this research we did not adjust the data for the cost-of-living differentials between urban and rural sector thus urban rural income inequality may encounter to exaggerate.

Acknowledgements

Authors tend to appreciate an anonymous referee for who made several comments to improve this paper. The authors wish to thank to Ali Molagholamali and Hafez Salehi for assistance with the data used in the

study. This Paper was extracted from dissertation of the MSc degree in Economics at Kharazmi University, Tehran, Iran.

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