Working Paper Series

Growth elasticity of monetary and non-monetary poverty: an application to Iran

Hosnieh Mahoozi

ECINEQ WP 2016 - 403

ECINEQ 2016 - 403
June 2016

www.ecineq.org

Growth elasticity of monetary and non-monetary poverty: an application to Iran*

Hosnieh Mahoozi
Justus-Liebig University, Germany

Abstract

The sensitivity of the frequency of poverty to economic growth is one of the central issues of poverty and development discourse. In this paper we estimate the income growth elasticity of poverty and income inequality elasticity of poverty for a panel of 28 provinces of Iran from 1998 to 2009. We also, for the first time, estimate the growth elasticity of multidimensional poverty (estimated via Alkire-Foster method). The results demonstrated the low income growth elasticity of poverty while the income inequality elasticity of poverty is stronger and significant. Similar results are obtained for elasticities of multidimensional poverty. The results suggest that changes in inequality are more important for poverty reduction than in income growth.

Keywords: Growth elasticity of poverty, income inequality, monetary poverty, Multidimensional poverty.

JEL Classification: I30, D63.

*I thank Armin Bohnet and Jürgen Meckl for valuable suggestions and comments. I am grateful for the support of the department of development and environmental studies of Justus-Liebig University (ZEU). I also appreciate participants in the 2014 MAGKS Doctoral Colloquium for critical comments. Financial support from DAAD (Grant No. 57076385) is gratefully acknowledged.

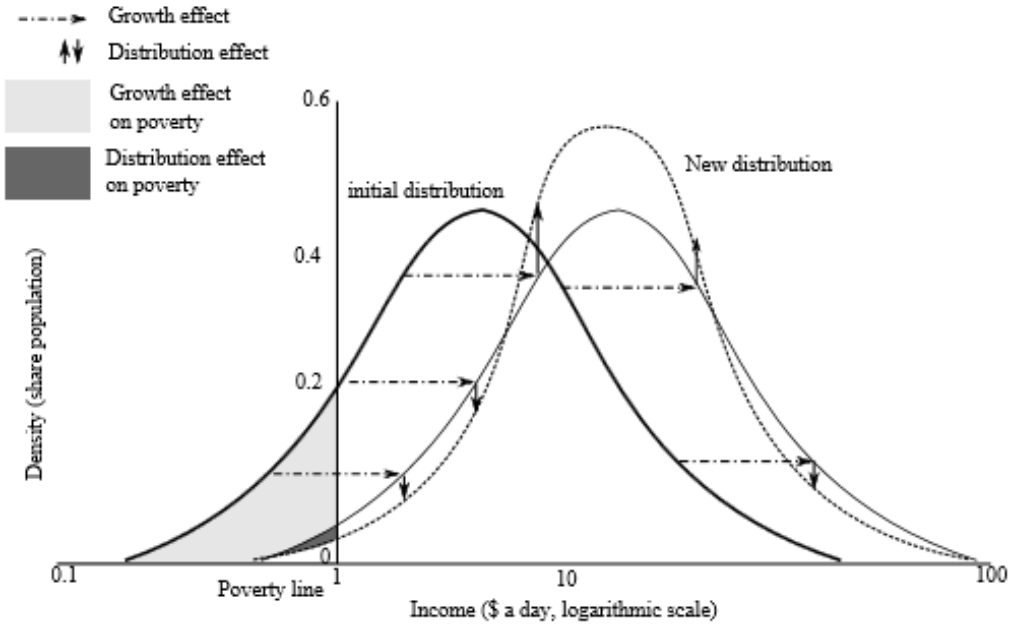
1. Introduction

In the welfare-economic discourse there is a strong argument stating that economic growth in the terms of increasing per capita incomes or expenditures reduces poverty in the developing world. However, there is no agreement on the exact extent that economic growth reduces poverty. In other words, the growth elasticity of poverty has become a subject of controversy.

The discussion about the sensitivity of the frequency of poverty to economic growth has been going on for about two decades (Ravallion and Chen, 1997, Bruno, Ravallion and Squire, 1998, Adams, 2000, Bhalla, 2002, Bourguignon, 2003, Richard and Adams, 2004, Kraay, 2006, Bresson, 2009). However, while the extent of poverty reduction by economic growth is a key concept for policy, the size of that sensitivity has been on debate. Whereas Ravallion and Chen (1997), and Bruno, Ravallion and Squire (1998) estimated the value of the growth elasticity of poverty for the cross section countries to be between -2.0 and -3.0, Bhalla (2002) calculated the growth elasticity of poverty for a large selection of developing countries to be about -5.0. Richard and Adams (2004) admitted that the growth elasticity of poverty is within the range of -2.0 and -3.0, and argued that Bhalla's suggestion (that the growth elasticity of poverty should be about -5.0) is only correct when the full sample of intervals for a large selection of developing countries is used and growth is defined by changes in the survey mean.

Parallel to the study on the growth-poverty relationship it was also largely debated that the impact of economic growth on poverty depends on the changes in income distribution over time (Bourguignon, 2003, Datt and Ravallion, 1992). In other words, the growth elasticity of poverty in any particular country depends on the level of initial income inequality in that country (Adams, 2000). Hence, the changes in headcount poverty can be decomposed into a growth effect and a distributional effect those are shown in figure 1 (from Bourguignon, 2003).

Figure 1. Decomposition of change in distribution and poverty into growth and distributional effects



Source: Bourguignon (2003)

Therefore, as we will discuss in the next section of Econometric Methods for Estimating Growth Elasticity of Poverty, normally in the literature the growth-poverty relationship is studied along with considering the effect of income inequality on poverty.

As mentioned above, many of the former studies estimated the elasticity of poverty for a cross section of countries. However, addressing this issue by regressing the rate of poverty on mean income for a range of countries suffers from numerous shortcomings; cross-country data often have a limited number of data points for each country so that the results are largely driven by cross-country differences (Meng et al., 2005), it could also potentially be misleading due to some conceptual and practical problems arising from currency conversions, different survey-based measures of living standards, different levels of development and omitted country-specific fixed effects correlated with income (Ravallion, 1995, Ravallion and Chen, 1997). Hence assessing growth and inequality elasticities of poverty, depending on particular country circumstances and growth scenarios could improve our insight and prospect about the impact of growth and distributional change on poverty reduction.

In this paper we study the income growth-poverty-inequality nexus in a particular country – Iran. Therefore, we avoid the conceptual and practical problems of similar studies with cross-country

comparisons, such as currency exchange or surveys diversity. In this study, we utilize data from the Household Expenditure and Income Survey (HEIS) for the whole country, i.e. 28 provinces, and for the period 1998 to 2009. These data present a more general picture of the poverty and the changes in inequality about the twelve-year time period in Iran.

The main contribution of this study to the literature, however, is that in the current study we measure the growth elasticity of multidimensional poverty as well as growth elasticity of one-dimensional monetary poverty.

The studies on the growth elasticity of poverty have mainly focused on the traditional income poverty. However, considering poverty as a multidimensional concept as Sen (1984) argued in his capability approach leads us to study the relationship of growth and multidimensional poverty. Such a study is also particularly essential, since a reduction in income poverty does not necessarily reduce non-income dimensions of poverty. "Measuring Pro-Poor Growth in Non-Income Dimensions" (Grosse, Harttgen and Klasen, 2008) is one of the few studies on the growth-poverty relationship which extend the toolbox of pro-poor growth measurement to non-income dimensions and composite measures of well-being (using the human development index, HDI, as a composite measure). They applied the growth incidence curve (GIC) of Ravallion and Chen (2003) for the case study of Bolivia during 1989-98 for measuring pro-poor growth. The GIC is visual tool for the assessment of the distributional pattern of growth, and shows the mean growth rate in achievements (e.g. incomes) at each centile of the distribution between two points in time. Although GIC is a nice visual tool, which shows the absolute changes of achievement for each centile, and successfully was applied by Grosse et al (2008) to investigate pro-poor growth in non-income dimensions, it can barely be considered as a substitute for growth elasticity of poverty for assessing the impact of growth on poverty. The growth elasticity of poverty gives us a digit, which is easier to interpret and does not have the limitation of GIC in the matter of estimating it for each centile separately. Hence, in the current paper we estimate the growth elasticity of (income and non-income) poverty for the case study of Iran over 1998-2009. In order to estimate growth elasticity of poverty, we applied the method of Ravallion and Chen (1997), while for extending the method to estimate growth elasticity of non-income poverty we have been inspired by the way Grosse, Harttgen and Klasen, (2008) in the way they extend the toolbox of pro-poor growth measurement to non-income dimensions and multidimensional poverty measures. Given that we estimate growth and inequality elasticities of non-income deprivation as well

as elasticities of multidimensional poverty, our study may also contribute to the understanding of growth, poverty, and inequality beyond Iran.

The paper proceeds as follows. Section 2 reviews the econometric methods for estimating the growth elasticity of poverty. Section 3 describes how we extend the method to estimate the growth and inequality elasticities of poverty for non-income dimensions. Section 4 derives the results for the case study of Iran. Finally, section 5 offers the concluding remarks.

2. Econometric Methods for Estimating Growth Elasticity of Poverty

Changing poverty due to income growth and income inequality has been strongly discussed in the literature. Kakwani (1993), Ravallion and Chen (1997), Bourguignon (2003), Klasen and Misselhorn (2008) are some of the most outstanding studies which worked in this area.

Kakwani (1993) estimated the pure growth effect on poverty and the effect of inequality on poverty. He argued that proportionate changes in poverty can be decomposed into an effect from mean income on poverty and an effect from a change in the Gini index. Denoting the poverty variable by θ, mean income by μ, and the Gini coefficient by *G*, this decomposition can be written as:

$$\frac{d\theta}{\theta} = \eta_\theta \frac{d\mu}{\mu} + \varepsilon_\theta \frac{dG}{G},$$

where η_θ denotes the growth elasticity of poverty, while ε_θ is the effect of change in the Gini index on the total poverty. Then he introduced marginal proportional rate of substitution (MPRS) between mean income and income inequality which can be computed for each poverty measure: $PRS = \frac{\partial \mu}{\partial G}\frac{G}{\mu} = -\frac{\varepsilon_\theta}{\eta_\theta}$.

Ravallion and Chen (1997) suggested the following regression to show the relation between poverty, mean income and inequality for a cross-country analysis

$$\text{Log } P_{it} = \alpha_i + \beta \log\mu_{it} + \Upsilon t + \varepsilon_{it} \quad (i=1, \ldots, N; t=1,\ldots, Ti),$$

Where P is the measure of poverty in country i at time t, α_i is a fixed-effect reflecting time differences between countries in distribution, β is the growth elasticity of poverty with respect to mean expenditure (or mean income) given by μ_{it}, Υ is a trend rate of change over time t, and ε_{it} is a white-

noise error term that includes errors in the poverty measure. Taking first differences in the equation above, x_i, the fixed effect term, can be eliminated in order to obtain:

$$\Delta \text{Log } P_{it} = \Upsilon + \beta\Delta \log\mu_{it} + \Delta\varepsilon_{it} - \beta\Delta v_{it}$$

Where v_{it} is a country-specific, time-varying error that is assumed to be white noise. In this equation the rate of poverty reduction (P) is regressed on the rate of growth in mean consumption (or income) and the rate of change in income inequality (Gini coefficient).

Another attempt for modelling poverty and elasticities was worked out by Bourguignon (2003), who tried to overcome the limitation of cross-country studies of poverty that generally there is no access to micro data sets of incomes or expenditures for all countries but usually estimate poverty based on grouped data. As a solution to that, Bourguignon suggested to approximate the entire income distribution of each country using a two-parameter log normal distribution. He assumed that income, y_t, is a log normal random variable, such that $\ln y_t \sim N(\mu_t, \sigma_t^2)$, and mean income can be written as $\bar{y}_t = E[y_t] = \exp(\mu_t + \frac{\sigma_t^2}{2})$. He introduced the "improved standard model" that is usually formulated in (annualized) differences:

$$\Delta \ln H_{it} = \alpha + \beta_1 \Delta ln\bar{y}_{it} + \beta_2 \Delta ln\bar{y}_{it} \times \ln\left(\frac{\bar{y}_{i,t-1}}{z}\right) + \beta_3 \Delta ln\bar{y}_{it} \times lnG_{i,t-1} + \gamma_1 \Delta lnG_{it} + \gamma_2 \Delta lnG_{it} \times \ln\left(\frac{\bar{y}_{i,t-1}}{z}\right) + \gamma_3 \Delta lnG_{it} \times lnG_{i,t-1} + \epsilon_{it}.$$

Where Δ is the difference operator and i is considered as the country subscript, α is denoted as the linear time trend and ϵ_{it} is denoted as an error term. The income elasticity is estimated as $\varepsilon_{it}^{Hy} = \beta_1 + \beta_2 \ln\left(\frac{\bar{y}_{i,t-1}}{z}\right) + \beta_3 lnG_{i,t-1}$ and the inequality elasticity is estimated as $\varepsilon_{it}^{HG} = \gamma_1 + \gamma_2 \ln\left(\frac{\bar{y}_{i,t-1}}{z}\right) + \gamma_3 lnG_{i,t-1}$.

Klasen and Misselhorn (2008) argued that poverty elasticities can give a distorted picture of poverty dynamics. For example, a drop in the poverty headcount from 2% to 1% in a rich developed country is treated just equal as a drop from 20% to 10% in a developing country. In order to overcome this problem, they suggested focusing on absolute poverty changes. Therefore, by substituting absolute changes to the log difference values in the model of Bourguignon (2003), they introduced a model of semi-elasticities of poverty.

In this study we intend to estimate the growth elasticity of poverty for a specific country case, while we estimate poverty based on micro data. We also want to estimate growth elasticity of poverty for a panel of 28 provinces over time. Hence, the type of the relationship that we want to estimate can be expressed following as an adopted and expanded version of the model suggested by the Ravallion and Chen (1997);

$$Log(P_{it}) = \alpha + \beta \log (Y_{it}) + \delta \log (G_{it}) + \mu_i + \varepsilon_{it}$$

P represents the poverty index, Y is the mean income, G is the Gini coefficient, μ is a vector of time-invariant provincial dummy variables, while ε_{it} is a random error term. The subscripts i and t index provinces and time.

3. Growth Elasticity of Deprivation for Non-Income Dimensions

In addition to measure the growth elasticity of monetary poverty, we are interested to measure the growth elasticity of multidimensional poverty and study the progress in multidimensional achievements. Apart from few attempts of demonstrating the growth-(non-income and multidimensional) poverty relationship such as Grosse, Harttgen and Klasen, (2008), this approach has been rarely applied in the literature. Partly because non-monetary and multidimensional poverty discussion in comparison with income poverty still is young, partly because most of the former studies were cross-countries studies using different surveys which usually do not contain enough or same information of multidimensional poverty. In addition to, some difficulties are brought out and should be dealt with by estimating growth and inequality elasticities of non-monetary and multidimensional poverty, such as compromising on an aggregated digit as the multidimensional poverty index or non-income deprivation, or the way we should choose to demonstrate the inequality.

In order to solve the first difficulty, we decided on measuring multidimensional poverty index by applying Alkire-Foster (2011) method, which gives us a single digit to signify experiencing multiple deprivations simultaneously. The Alkire-Foster methodology also gives us the facility of decomposing multidimensional poverty index to the dimensions, hence we can estimate the growth and inequality elasticities of (each dimension) deprivation.

Hereupon, we consider poverty as a set of dimensions containing as three main dimensions: nutrition, education and a non-monetary standard of living that is illustrated in detail in Table 1.

Table 1. Dimensions, weights and deprivation cut-off of the multidimensional poverty		
Dimension	**Indicator**	**The deprivation cutoff z_j**
Nutrition (1/3)	Daily food Expenditure (1/6)	1.08 $ in urban area and 0.69 $ in rural area
	Percentage of expenditures on food (1/6)	Spend more than 75% of expenditures on food
Education (1/3)	Literacy situation of the household head (1/6)	Illiterate household head
	School attendance (1/6)	Household member (6 to 16 years old) out of school
Living standard (1/3)	Electricity (1/15)	No access to electricity
	Safe water (1/15)	No access to safe water
	Overcrowding (1/15)	No enough (10qm) floor area of housing per capita
	Fuel of cooking (1/15)	Coking fuel is wood, charcoal or dung.
	Asset ownership (1/15)	Household does not own more than one of these items (radio, TV, telephone, bike, motorbike or refrigerators) and does not own a car.

The amount of deprivation is $0 < Ci < 1$, and the poverty cutoff is $Ci > 0.333$.

The second difficulty in estimating the growth elasticity of multidimensional poverty using the conventional regression model is the inequality index. Grosse, Harttgen and Klasen, (2008) tried to solve this problem in two different ways: in the first approach which they rank the individuals by each respective non-income variable and generate the population centiles based on this ranking; in the second approach they rank the individuals by income and calculate the growth of non-income achievements for these income percentiles. The advantage of first approach, is answering the questions such as how the education poor benefited disproportionately from improvements in education. The advantage of the second way is analyzing the impact of income growth on the income poorest centile, while provides an instrument to assess if public social spending programs have reached the targeted income poorest population groups and if the public resources are effectively allocated.

In our case we apply the second way and rank the individuals by income and calculate the growth of non-income achievements for these income percentiles. We cannot apply the first approach

to index the inequality, because the identity of most of our indicators makes the ranking impossible as the households either deprived in them or not. There is another idea to rank the individuals by the intense of their deprivation Ci. However, the Gini index which is calculated in this way suffers from a limitation. Actually this generates the problem that some households have reached the upper limit and upper level of welfare is not measurable. It generates the further problem that inequality in such indicator is typically low when a significant share of households has reached the upper limit. Hence, by computing the regression model with income Gini index, we estimate the relation of growth in non-income achievements to the distribution of income, while this provides insights about how far the income poor have benefited by improvements in non-income dimensions of well-being.

4. Empirical Results

We present the empirical results of the study in three orders in this section. First we present the trend of mean income, poverty and inequality for our particular time period in the case study of Iran, which we estimated from our available survey data. Second, we represent the results of our estimation of growth elasticity of monetary poverty. The third sub-section is dedicated to display the results of the estimation of growth elasticity of multidimensional poverty.

4.1. The Case Study of Iran

The time period we consider for our study on growth elasticity of poverty in Iran is from 1998 to 2009, concerning we have the survey data available for that particular time period. Over the certain time period Iran experienced both a reformist administration and a conservative government, and recorded 4.5 average growth rate of real GDP (Iran Central Bank, 2012), while the population in 1998 to 2009 changed from 62.103 million to 73.196 million people (Iran Statistical center, 2011).

Table 2 shows that the mean income per person calculated from the household expenditure and income survey (HEIS) of Iran statistical center (ISC) and constantly increased at the rural, urban and national levels over the time span under consideration. The mean income per person at the national level increased from 366.94$ per day in 1998 to 1617.51$ per day in 2009. However, our estimations of income per person in rural and urban areas show a large disparity of income distribution between rural and urban areas that echoes an important feature of Iran's economy. At the same time the urban population share in Iran changed from 39.06 in 1998 to 51.41 in 2009. This high pace of urbanization probably be the result of migration from rural to urban areas, which does not sound

surprising against the background of the large income disparity between rural and urban areas. However, we do not have complete information about how much this related from urban expansion into rural areas versus actual migration from rural to urban areas.

Over the time period 1998-2009, the expenditure poverty that we estimated from the HEIS data by applying the Foster-Greer-Thorbecke method is summarized in Table 4.3 and illustrated in Figure 2 and Figure 3, decreased alongside the mean income increasing, although the progress is not uniform. Table 3 shows that monetary poverty (with old poverty line) decreased from 0.649 in 1998 to 0.056 in 2009, while monetary poverty (with new poverty line) decreased from 0.829 in 1998 to 0.172 in 2009, which record a noticeable progress in monetary poverty reduction. However, our estimation of Gini indices demonstrated in table 4, shows that inequality has been increased over the particular time period. As it can be seen in Table 4, the Gini index at the national level increased from 0.441 in 1998 to 0.7 in 2009. The interesting point is that the Gini index over the same time period decreased slightly in both rural and urban areas (from 0.463 to 0.402 in rural areas, and from 0.386 to 0.362 in urban areas). This observation suggests that the inequality between rural and urban areas is the main source of inequality at the national level.

Likewise, the one-dimensional monetary poverty as our estimator of multidimensional poverty indicates a decreasing pace during the time period 1998-2009, though this progress is uneven. Eventually, Table 5 shows the multidimensional poverty in Iran from 1998 to 2009, which we estimated by Alkire-Foster method.

The estimated results presented in this subsection can be sum up as follows: over the time period 1998-2009 we observe a steady increasing income per capita trend in Iran, as well as a decreasing poverty (monetary and multidimensional) trend, while the Gini index at national level constantly increases. The results are tempting enough to lead us to the further investigation of the relationship between the income growth, poverty and inequality. Hence, we conduct a regression model with poverty as the response and income growth and inequality as the independent variable to show the relationship between poverty, income growth and inequality and demonstrate the growth elasticity of poverty and elasticity of poverty respecting to inequality.

Table 2. Summary statistics: Mean income per person in Iran 1998-2009

	Urban pop. Share (%)	Mean income per person ($)		
		Rural	Urban	National
1998	39.066	267.02	495.55	366.94
1999	40.234	284.80	512.01	383.36
2000	41.407	329.98	636.15	458.43
2001	42.587	360.36	681.39	495.62
2002	43.710	454.41	855.57	629.19
2003	44.835	574.97	1026.18	776.04
2004	45.966	640.54	1197.82	887.13
2005	47.096	787.29	1342.25	1036.98
2006	48.260	903.08	1609.62	1205.95
2007	49.288	1069.45	1901.17	1447.45
2008	50.340	1112.47	2021.63	1548.14
2009	51.416	1206.95	2037.30	1617.51

Table 3. Monetary Poverty in Iran, 1998-2009

	Poverty measures (%)					
	Old poverty line (1.25 $ per day)			New poverty line (2$ per day)		
	Rural	Urban	National	Rural	Urban	National
1998	0.792	0.491	0.649	0.919	0.729	0.829
1999	0.806	0.549	0.687	0.926	0.777	0.857
2000	0.717	0.416	0.579	0.889	0.671	0.789
2001	0.642	0.311	0.491	0.839	0.572	0.717
2002	0.512	0.217	0.374	0.756	0.452	0.613
2003	0.396	0.142	0.276	0.671	0.358	0.523
2004	0.302	0.100	0.206	0.570	0.273	0.429
2005	0.255	0.078	0.170	0.514	0.228	0.376
2006	0.218	0.065	0.148	0.468	0.197	0.344
2007	0.145	0.042	0.096	0.372	0.131	0.256
2008	0.096	0.024	0.060	0.286	0.085	0.186
2009	0.086	0.027	0.056	0.256	0.091	0.172

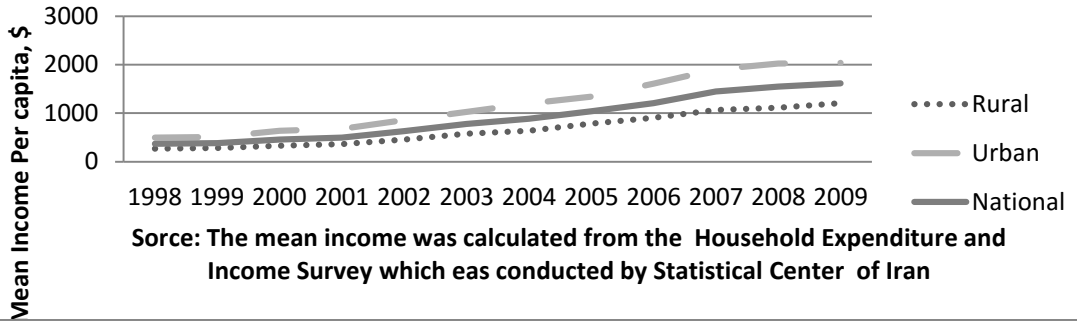
Table 4. Gini indices of income inequality

	Rural	Urban	National
1998	0.463	0.386	0.441
1999	0.4608	0.4052	0.4511
2000	0.4586	0.4016	0.3629
2001	0.4355	0.3889	0.4298
2002	0.4354	0.3963	0.4323
2003	0.4260	0.3835	0.5873
2004	0.4411	0.0345	0.5951
2005	0.4252	0.3763	0.5861
2006	0.4134	0.3895	0.5922
2007	0.4167	0.3806	0.5836
2008	0.4014	0.3697	0.5687
2009	0.4026	0.3625	0.6999

Table 5. Multidimensional Poverty in Iran, 1999-2009

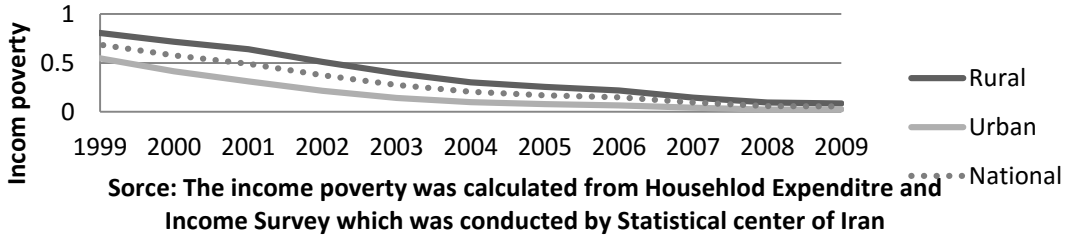
	Poverty measures (%)					
	Rural		Urban		National	
	(MD)H	MD Gini	(MD)H	MD Gini	(MD)H	MD Gini
1998	0. 919	0.178	0.506	0.327	0.724	0.263
1999	0.680	0.228	0.453	0.369	0.575	0.302
2000	0.655	0.248	0.299	0.435	0.492	0.343
2001	0.632	0.255	0.282	0.464	0.472	0.358
2002	0.573	0.299	0.449	0.410	0.515	0.360
2003	0.487	0.363	0.196	0.618	0.349	0.488
2004	0.423	0.417	0.142	0.680	0.289	0.546
2005	0.381	0.447	0.124	0.711	0.257	0.577
2006	0.346	0.469	0.105	0.736	0.236	0.595
2007	0.284	0.523	0.077	0.767	0.185	0.644
2008	0.217	0.565	0.053	0.783	0.136	0.678
2009	0.192	0.575	0.054	0.765	0.122	0.675

Figure 2. Mean Income per person ($) in Iran for 1998-2009



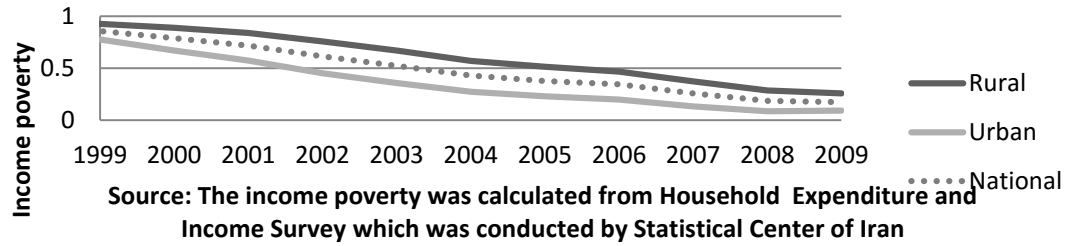
Sorce: The mean income was calculated from the Household Expenditure and Income Survey which eas conducted by Statistical Center of Iran

Figure 3. Income poverty in Iran 1999-2009 (Old poverty line 1.25 $ per day)



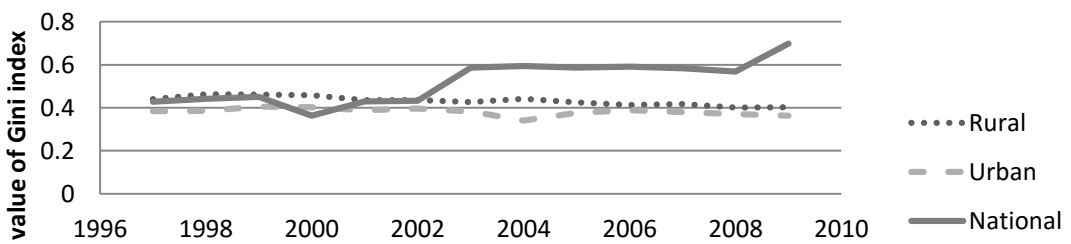
Sorce: The income poverty was calculated from Houselhod Expenditre and Income Survey which was conducted by Statistical center of Iran

Figure 4. Income poverty in Iran 1999-2009 (New poverty line 2$ per day)



Source: The income poverty was calculated from Household Expenditure and Income Survey which was conducted by Statistical Center of Iran

Figure 5. Gini index in Iran 1999-2009



Source: The Gini index was calculated from Household Expenditure and Income Survey which was coducted by Statistical Center of Iran

4.2. Growth Elasticity of Monetary Poverty

We estimate our regression using a fixed-effects model to control for unobservable time-invariant provincial effects. In order to conduct our regression model, we use a panel data of 28 Provinces in Iran for 12 years from 1998 to 2009 (It is worth- noting that the number of provinces in Iran since 2005 changed from 28 to 30 provinces. However, for keeping consistency in our panel we kept on with 28 provinces). Table 6 summarizes the result of our estimation of regressions of the log difference of monetary poverty on the log difference of growth rate of income and inequality.

A glance on constant terms show us that the poverty reduces over the time, while the pace of poverty reduction with old poverty line (1.25$ per day) is much faster than the poverty reduction with new poverty line (2$ per day). The results of our estimation also show that the coefficient of mean income or growth elasticity of monetary poverty for old poverty line is -0.011, while for new poverty line is -0.008. As a matter of fact, the result shows the stronger reaction of the poverty with threshold of 1.25 $ per day to increase of mean income than the reaction of poverty with threshold of 2 $ per day. It is implying that the smaller the poverty threshold, the more is the sensitivity of poverty for changes in mean income. According to Table 6, the same rule can be confirmed for the sensitivity of poverty for changes in income inequality. This means that with the lower poverty threshold the sensitivity of poverty for changes in income inequality are stronger and vice versa. However, the main fact we extract from the results in Table 6 is that it is the Gini coefficient which is the major contributor to the changing the path of poverty over the time. This is apparent from the numerical results on the elasticity of poverty for the Gini index. The effect of the log Gini coefficient on poverty is positive, statistically significant at a p-value of 0.005, while the effect of log mean income is small and not significant at a p-value of 0.005. It means poverty measures are considerably more elastic for changes in inequality than changes in mean income.

Table 6. Regressions of the rate of Monetary poverty reduction on rate of growth in household mean income from the survey

Old Poverty line (log difference)	Coef.	Std.Err	t	P>|t|
Constant	-0.2018	0.0142	-14.20	0.000
Mean income (log difference)	-0.0109	0.0259	-0.42	0.674
Gini index (log difference)	0.4253	0.1431	2.97	0.003
R^2	Within	Between	Overall	
	0.0309	0.1442	0.0333	
rho	0.04408			
Corr. error U_i with the regressors	0.0417			
New Poverty line (log difference)	Coef.	Std.Err	t	P>|t|
Constant	-0.1363	0.0111	-12.25	0.000
Mean income (log difference)	-0.0081	0.0203	-0.40	0.690
Gini index (log difference)	0.0593	0.1120	0.53	0.597
R^2	Within	Between	Overall	
	0.0015	0.1442	0.0030	
rho	0.0484			
Corr. error Ui with the regressors	0.0743			

4.3. Growth Elasticity of Multidimensional Poverty

Table 7 summarizes the results of our estimations of regressions of the log difference of multidimensional and non-monetary deprivations on the log difference of growth rate of income and inequality. The constant term shows Multidimensional poverty decreases over the time, although with much slower pace than monetary poverty reduction, which we observed in previous section. However, nutrition deprivation has increased over time, while education deprivation and living standard deprivation have reduced with a significant pace over time.

Table 7. Regression of the rate of changes of non-monetary deprivation on rate of growth in household mean income from the survey

log difference of multidimensional poverty	Coef.	Std.Err	t	P>|t|
Constant	-0.0643	0.0213	-3.01	0.003
Mean income (log difference)	-0.008	0.039	-0.21	0.832
Gini index (log difference)	1.03	0.215	4.82	0.000
R^2	Within	Between	Overall	
	0.0771	0.2352	0.0805	
rho	0.0401			
Corr. error U_i with the regressors	0.0476			
log difference of nutrition deprivation	Coef.	Std.Err	t	P>|t|
Constant	0.453	0.0976	4.64	0.000
Mean income (log difference)	-0.0016	0.1782	-0.01	0.992
Gini index (log difference)	2.362	0.9827	2.40	0.017
R^2	Within	Between	Overall	
	0.0205	0.0191	0.0182	
rho	0.0367			
Corr. error U_i with the regressors	-0.0356			
log difference of education deprivation	Coef.	Std.Err	t	P>|t|
Constant	-0.738	0.008	-92.92	0.000
Mean income (log difference)	0.0003	0.014	0.02	0.983
Gini index (log difference)	0.141	0.08	1.76	0.079
R^2	Within	Between	Overall	
	0.0112	0.0518	0.0117	
rho	0.2009			
Corr. error U_i with the regressors	0.0291			
log difference of living standard deprivation	Coef.	Std.Err	t	P>|t|
Constant	-0.926	0.003	-273.42	0.000
Mean income (log difference)	0.0037	0.006	0.60	0.546
Gini index (log difference)	0.051	0.034	1.49	0.136
R^2	Within	Between	Overall	
	0.0099	0.0049	0.0070	
rho	0.376			
Corr. error U_i with the regressors	0.0079			

The sensitivity of multidimensional poverty for changes in mean income is small and insignificant, while the sensitivity of multidimensional poverty for changes in the Gini coefficient is strong and statistically highly significant ($p<0.001$). The same result applies when we conduct the regression for nutrition deprivation, education deprivation and living standard deprivation. In all of these cases the sensitivity of deprivation for changes in mean income is very small and insignificant. The sensitivities of education and living standard deprivations to income inequality are rather strong but statistically insignificant. The point is that in our case study either non-monetary, multidimensional poverty, or income poverty are considerably more elastic for changes in inequality than changes in mean income.

Comparing the results of Table 6 and Table 7 shows the pace of multidimensional poverty reduction for our panel of provinces during the 12 years is less than the pace of monetary poverty reduction (with both upper and lower poverty threshold). The income growth elasticity of monetary poverty (-0.010) is rather equal to the income growth elasticity of multidimensional poverty (-0.008). However, the elasticity of multidimensional poverty to income inequality (1.03) is much more than the elasticity of monetary poverty to income inequality (0.425). That implies income inequality changes affected multidimensional poverty even much more than monetary poverty. The strong sensitivity of welfare measures to the income inequality suggests that even by slight diminishing of the percentile's gaps we can expect great improvement of chronic extreme poverty.

5. Concluding Remarks

In this paper we conducted a study to investigate the income growth elasticity of poverty and income inequality elasticity of monetary and non-monetary poverty. We concentrate on a single country and choose Iran as our case study. In order to estimate income growth and income inequality elasticities of poverty, we apply an expanded model of Ravallion and Chen (1997) model for a panel of 28 provinces of Iran from 1998 to 2009. The main contribution of the current study is that we estimated the growth elasticity of non-monetary deprivations and multidimensional poverty (estimated by the Alkire-Foster method).

Our estimations of income per capita, Gini index and poverty measures over the time period 1998-2009 show a steady increasing income per capita trend as well as decreasing poverty (monetary and multidimensional) trend, while the Gini index at national level constantly increases. Although we

observe a noticeable progress in the matter of (monetary and multidimensional) poverty alleviation at the national level, the progress is uneven between rural and urban areas.

The results of our fixed-effect analysis of twelve-years-panel of provinces in Iran implies that, both traditional and multidimensional poverty decrease over time. The income growth elasticity of expenditure poverty is -0.011 for the old poverty line (1.25 $ per day) and -0.008 for the new poverty line (2 $ per day). It indicates a weak income growth elasticity of poverty, which become even weaker by upper poverty threshold. At the same time the income inequality elasticity of poverty is stronger and statistically significant, which is 0.4253 for the old poverty line (1.25 $ per day) and 0.0593 for the new poverty line (2 $ per day). The results of our estimation of growth elasticity of non-monetary deprivations and multidimensional poverty indicate also rather similar. The sensitivity of multidimensional poverty for changes in mean income and the sensitivity of multidimensional poverty for changes in income inequality are more than the sensitivities of monetary poverty (with upper threshold) and less than the sensitivities of monetary poverty (with the lower threshold). The results also indicate that the smaller the monetary poverty threshold, the more is the sensitivity of poverty for changes in mean income and the more sensitivity of poverty for changes in income inequality.

To wrap it up, the high income inequality in Iran as a developing economy diminishes the positive effect of income growth and this effect is even stronger for monetary poverty with a lower poverty line and multidimensional poverty. These results can be relevant to policy making, when we can conclude even by slight diminishing of the percentile's gaps we can expect great improvement of extreme and chronic poverty, which here is particularly demonstrated by multidimensional poverty. Therefore, in order to diminish extreme and chronic poverty a policy based on focusing on income growth only has slightly or no effect, while a policy based on diminishing income inequality can make a significant effect on (extreme) poverty reduction.

6. References

Adams JR, R.H. (2000). Economic Growth, Inequality and Poverty: Estimating the Growth Elasticity of Poverty. World Development, 32, 12, 1989-2014.

Alkire, S., and Foster, J.E. (2011). Counting and Multidimensional Poverty Measurement. Journal of Public Economics, 95, 476-487.Bhalla, S. (2002). Imagine there's no country: Poverty,

inequality and growth in the era of globalization. Washingtn, DC: Institute for International Economics.

Bourguignon, F. (2003). The growth elasticity of poverty reduction: Explaining heterogeneity across countries and time periods, in Inequality and Growth: Theory and Policy Implications. ed. by T. S. Eicher and S. J. Turnovsky, Cambridge, MA: MIT Press, Cambridge, MA, chap. 1, 3–27.

Bresson, F. (2009). On the estimation of growth and inequality elasticities of poverty with grouped data. Review of Income and Wealth, 55, 266-302.

Bruno, M., Ravallion, M., & Squire, L. (1998). Equity and growth in developing countries: old and new perspectives on the policy issues. In V. Tanzi, & K. Chu (Eds.), Income distribution and high-quality growth. Cambridge, MA: MIT Press.

Datt, G. and M. Ravallion (1992). Growth and redistribution components of changes in poverty measures. Journal of Development Economics, 38, 275-295.

Grosse, M. and Harttgen, K. and Klasen, S. (2008). Measuring Pro-Poor Growth in Non-Income Dimensions. World Development, 36, 6, 1021-1047.

Kakwani, N. (1993). Performance in Living Standards- An international comparison. Journal of Development Economic, 41, 307-336.

Klasen. S. and Misselhorn, M. (2008). Determinants of the growth Semi-elasticity of poverty reduction. Technical report, Discussion papers, Ibero America Institute for Economic Research.

Kraay, A. (2006), When is growth pro-poor? Evidence from a panel of countries. Journal of Development Economics, 80(1), 198-227.

Meng, X. and Gregory, R. and Wang, Y. (2005). Poverty, inequality, and growth in urban China, 1986-2000. Journal of Comparative Economics, 33, 710-729.

Ravallion, M.(1995). Growth and poverty: Evidence for the Developing World. Economics Letters 48, 411-417.

Ravallion, M. and Chen, S. (1997). What can new survey data tell us about recent changes in distribution and poverty. The World Bank Economic Review, 11, 357-382.

Ravallion, M., and Chen, S. (2003). Measuring pro-poor growth. Economics Letters, 78, 93-99.

Richard, H. and Adams, JR. (2004). Economic growth, inequality and poverty: estimating the growth elasticity of poverty. World Development, 32, 12, 1989-2014.

Sen, A. (1984). The Living Standard. Oxford Economic Papers, 36, 74-90.