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Robust growth-equity decomposition of change in poverty: The case of Iran (2000–2009)

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ABSTRACT

This paper examines a robust nonparametric methodology for decomposition of change in poverty into growth and redistribution components. The decomposition is exact, symmetric and free of residual terms. It is equivalent to the Shapley value decomposition in this two-component case. We avoid parametric assumptions about the underlying distributions and Lorenz functions. All of the currently popular poverty measures may be decomposed as suggested in this paper. We identify the issues that arise with parametric approaches to decomposition. An empirical application is given based on recent data on real consumption in rural and urban areas of Iran in 2000, 2004 and 2009 (covering the country's third and fourth five-year development plans). We find that both 'pure growth' and 'redistribution' components are present in a striking change in poverty, especially among rural households. It would appear that stochastic dominance rankings of the consumption distributions make poverty analyses and decompositions robust to the choice of a poverty line, or poverty measure.

1. Introduction

There is a common belief that economic growth is an effective way to eradicate poverty in developing countries. But there are dissenting views and empirical evidence is not consistently supportive of a simple consensus view. Some economists interpret the historical evidence as suggesting that the benefits of growth have not reached the poor, or may have been counteracted by adverse changes in inequality. Economists and international institutions, notably the World Bank and the IMF, have supported growth-oriented economic policies, on the ground that they create opportunities for the poor to increase their incomes. It is acknowledged, however, that the *pattern* of growth plays an important role in determining its impact on poverty (World Bank, 1990).

The relation between change in poverty and economic growth bears further thorough analysis and empirical examination. The experience of economic policies of developing countries suggests that incomes of "the poor" usually grow slower than the average (Kakwani, 1993). In an empirical study covering the 1980s, Ravallion (1995) concluded that, in developing countries, the growth process typically had neither strongly adverse impact on the relative position of the poor, nor was it associated with a tendency for "inequality" to either increase or decrease. Much of this literature tends to take for granted the existing univariate definitions of "the poor" and poverty lines, and similar notions of "inequality", typically in some measure of income. Recent literature on multi-attribute analysis of well-being has exposed the complex notion of "poverty frontiers" in many dimensions, revealing the challenges in the choice of dimensions of well being, and the technical issues surrounding the definition of multidimensional "quantile sets", as well as the additional aggregation issues. See Maasoumi and Lugo (2008), Maasoumi and Racine (2012), and Maasoumi and Salehi (2009). This paper deals with a single measure of wellbeing, which may be an aggregate of wellbeing based on several attributes. The choice of such aggregators is discussed in Maasoumi (1986), Maasoumi and Lugo (2008), Maasoumi et al. (2005), and in Maasoumi and Salehi (2009), the latter two being examinations of multidimensional well-being in Iran.

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As an empirical matter, to understand the "contribution" of "growth" and "redistribution" to changes in poverty, one needs robust measurement of its components, one being the growth in average income, and the other being the redistribution of income. This is difficult, as has been pointed out by Shorrocks (1999), who singles out a number of problems with existing decomposition approaches.

Several methods for decomposition of poverty changes have been proposed, for example by Kakwani and Subbarao (1990), Datt and Ravallion (1992), Shorrocks (1999), and Tsui (1996). Shorrocks (1999) is based on Shapley (1953), and extending Owen (1977), when there is a hierarchical set of attributes and components. The Shapley approach is compatible with our method here where there is symmetry with respect to the order in which the contribution of each of our two components (growth and inequality) is eliminated. The Datt and Ravallion and other approaches extant, tend to have several limitations. Firstly, the growth and redistribution components are not symmetric with respect to the base and final years, or the elimination process. Secondly, the decompositions are not exact and contain a 'residual' component (see the next section). A more desirable decomposition method is one that exactly sums the contributions of determining factors of total changes. A further limitation of the current methods is due to their specificity with regards to measures of inequality or poverty. Another, less widely appreciated limitation is due to parametric choice of the distribution function (alternately, the Lorenz functions). This paper proposes a nonparametric method for estimating the components of change in poverty (growth and redistribution components) and illustrates the proposed approach with recent data for Iran. We are able to exactly decompose poverty changes into two components, based on the empirical CDF (cumulative distribution function), without residuals, and symmetrically with respect to the reference point in time. Our components are estimated and statistical significance is indicated for each component of change in poverty. This paper is about "measurement" to accurately identify certain well defined components of changes in the distribution of a measure of well being. It is not about identifying economic policies that may be conducive to "growth" or "equality", much less the mechanism by which such policies may be transmitted. Our measures help establish "what is" the state of poverty, at various points in time. This provides an "equilibrium metric" which may be helpful in evaluating economic outcomes. Attribution to specific economic policies is a far more challenging task that is not addressed in this paper.

The paper is organized as follows. Section 2 presents a short review of economic growth, inequality and poverty, including in Iran. Section 3 exemplifies current decomposition methods such as the one described in Datt and Ravallion (1992). Section 4 describes our proposed approach to decomposing these effects. Section 5 provides a sketch of recent experience in Iran. Section 6 presents our empirical application of the proposed methodology to recent data on real consumption in rural and urban areas in Iran in 2000, 2004 and 2009. Conclusions are in Section 7.

2. A brief review of the relationship between economic growth, inequality and poverty

The debate concerning the relationship between growth and poverty, and inequality and poverty, has a long history, going back to Ricardo and Malthus, and the more recent "inverted U" curve of Kuznets (1955). Generally the pre 1970s view is one of "exchange" between growth and poverty. In the 1970s there was a shift toward poverty reduction independent of growth (for instance, see Chenery & Ahluwalia, 1974). During the next decade and later, growth has been considered as necessary for poverty reduction. Challenges to this view have emerged with conflicting empirical evidence since 1990s. Some believe economic growth benefits the poor; others see it as ultimately detrimental to the poor. Although there are other ideas that exist between these two extreme beliefs, most of them are somewhat in agreement with the relationship between growth-poverty and also inequality-poverty (especially the second relationship). The empirical evidence which would appear to contradict these "relationships" is exemplified by Ravallion (1995), who argues that in developing countries, the growth process has not had a significant negative effect on the relative situation of the poor, while according to Fosu (2011), in most developing countries, growth has been the main factor decreasing poverty. The diversity of the inferences increases when inequality changes are examined as well. For instance, some have suggested that China has been able to reduce poverty without increasing inequality (Ravallion & Chen, 2007), while in Botswana economic growth has not reduced poverty (Fosu, 2011).

The decomposition of poverty changes into the two components of growth and inequality plays an important role in clarifying these issues, without attributing causal relations to specific policies. Studies like those of Datt and Ravallion (1992) and Kakwani (1993) are important primary examinations of this kind. There are also empirical studies of poverty changes in Iran. These include Piraee (2004) who has decomposed the poverty changes of the first development plan into three areas: urban areas, rural areas and the whole economy. The results show that in all three areas, growth has been "associated" with a rise in poverty, while inequality has had a positive association. Mahmoudi (2001) has also provided a decomposition in urban and rural areas during the first plan in Iran. His results indicate an association between reduced poverty and both net growth and redistribution, especially in rural areas. Salehi-Isfahani (2006) has examined the association between growth, inequality and poverty over 25 years since the Islamic revolution of 1979. His findings indicate an improvement in poverty and growth indicators over that period. Salehi-Isfahani (2009) examined the same association between poverty, inequality and growth during different presidencies. He concluded that poverty has been consistently decreasing with growth, but inequality has remained stable. We will examine these questions for Iran based on our techniques, for the decade ending in 2009.

3. Growth-equity decomposition of a change in poverty

Let x denote income, $F(x)$ denote its cumulative distribution function (proportion of population with income less than x), and $L(F; p)$ the Lorenz curve, giving the fraction of total income that the holders of the lowest pth fraction of incomes possess. Lorenz curve is a mean-normalized integral of the inverse of a distribution function

$$L(p) = \frac{1}{\mu}\int_0^p F^{-1}(\pi)\, d\pi \tag{1}$$

If $L'(p)$ denotes the slope of the Lorenz curve, then:

$$x = F^{-1}(p) = \mu L\prime(p)$$

where μ is mean income. The distribution function evaluated at the poverty line is the well-known "headcount ratio" poverty index. For a poverty line z, and the poverty rate, P_0:

$$L\prime(P_0) = \frac{z}{\mu} \tag{2}$$

From (2) it is clear that any change in the poverty rate P_0 may be related to the change in the Lorenz curve, $L(F; p)$ and the change in mean income, μ. These are the two components whose effects