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Rags and Riches: Relative Prices, Non-Homothetic Preferences, and Inequality in India

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Summary. — It is well known that consumption patterns change with income. Relative price changes would therefore affect rich and poor consumers differently. Yet, the standard price indices are not income-specific, and hence, they cannot account for such differences. In this paper, we study consumption inequality in India, while fully allowing for non-homotheticity. We show that the relative price changes during most of the period from 1993 to 2012 were pro-poor, in the sense that they favored the poor relative to the rich. As a result, we also find that conventional measures significantly overstate the rise in real consumption inequality during this period. The main lesson from our study is the importance of accounting for non-homotheticity when measuring inequality. The price index literature has, as of yet, paid relatively little attention to this. In our application, however, it turns out that the allowance for non-homotheticity is quantitatively much more important than much discussed adjustments, such as those for substitution in consumption.

Key words — India, Asia, cereal, consumption, income, distribution

1. INTRODUCTION

It is well known that consumption patterns change with economic affluence, i.e., preferences are non-homothetic. Relative price changes will hence affect people differently even if all face the same set of prices (Muellbauer, 1974). Yet, the conventional price indices are not income-specific, and they will therefore mask these differences. [1] This is likely to be a problem of first-order importance when discussing distributions and inequality, but it might also be a problem for other types of analysis as it is not transparent whose cost of living the standard indices represent (see e.g., Almås, Beatty, & Crossley, Working paper). For example, the typical consumer price index formulae would, due to the aggregation technique used, generate price indices that represent a relatively rich consumer, and this "representative" individual will be increasingly rich when the level of inequality rises.

In this paper, we study consumption inequality and expenditure-specific cost of living in India during the period 1993–94 to 2011–12. We show that the changes in relative prices in most of this period were pro-poor, meaning that they favored the poor rather than the rich. We also show that these relative price changes have a large impact on measured inequality. Standard measures suggest that inequality rose quite steeply during our study period (Cain, Hasan, Magsombol, & Tandon, 2010; Datt & Ravallion, 2009; The World Bank, 2011). [2] However, about one third of the increase during 1993–94 and 2004–05 disappears when we apply our expenditure-specific cost of living adjustment. For the years after 2004–05, we find that the relative price changes were pro-rich and that the standard measures therefore somewhat understate the rise in inequality. Much of these patterns can be explained by changes in the relative prices of food grains versus the relative prices of different non-food items. In our data we find that the budget share devoted to food grains falls as people become richer, whereas the budget share devoted to non-food goods increases. The cost of living of the rich therefore rises relatively to that of the poor when non-food prices increase more than grain prices. This is exactly what happened during the period from the mid 1990s to the mid 2000s, and the opposite of what happened during the subsequent period.

Overall, we also find that the conventional inequality measures overstate the *variance* in inequality over time. We cannot, however, conclude that this is a general bias of measures relying on homothetic preferences. Yet, there are plausible scenarios in which these measures will exhibit such a bias. For example, we could imagine societies where the poor are producing and consuming necessities, while the rich are producing and consuming luxury goods in addition to necessities. In such societies, relative increases (decreases) in the prices of luxury goods would lead to higher (lower) nominal inequality as the relative wages of the rich rise (fall). The effect on real inequality would be smaller, however, because the cost of living of the rich also would rise relative to that of the poor. Since the conventional measures do not account for this they will overstate the variance in real inequality. We provide some empirical evidence for such a systematic relationship between income and cost of living effects following from relative price changes, by comparing how poor rural farmers and others are affected by prices of food grains.

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The standard price indices have other biases beside those induced by relying on homothetic preferences. For example, the fixed basket approaches, such as the Laspeyres, the Paasche, and the classical Geary methods—the latter underlies the Penn World Table—fail to incorporate substitution, as the assumed consumer basket is held fixed in comparisons involving different relative price levels. A large part of the price index literature is about how to avoid this problem (Akmal & Dowrick, 2005; Diewert, 1978; Feenstra, Ma, Neary, & Rao, 2012; Neary, 2004). In our empirical investigation, we make an effort to disentangle the biases caused by not adjusting for substitution and the biases caused by implicitly relying on homothetic preferences. This is done by comparing our estimates, which incorporate both substitution and non-homotheticity, with inequality measures derived through the Geary index, which does not allow for either of the two, and with measures derived through an index that allows for substitution but that relies on homothetic preferences. This comparison suggests that substitution alone has a very limited quantitative importance in our application—the differences between our estimates and the traditional fixed basket approaches are driven almost entirely by the allowance for non-homotheticity in our estimates.

We implement our analysis with household data collected by the National Sample Survey Organisation (NSS). This is the standard source for household expenditure comparisons in India. Using these survey data, we construct expenditure-specific cost of living indices in three main steps. In the first step, we calculate unit values and use those as measures of item prices (Deaton, 2008; Deaton & Dupriez, 2011; Deaton & Tarozzi, 2005). In the second step, we characterize consumer preferences. This is necessary in order to account for non-homotheticity. It is also necessary in order to incorporate substitution in consumption. As a way of recovering preferences, we estimate the Quadratic Almost Ideal Demand System (Banks, Blundell, & Lewbel, 1997), using 11 aggregate consumption groups and percentiles of the expenditure distributions within each state, sector (urban and rural) and time period as the unit of observation. [3] In the third and final step, we make use of the estimated price and income responses to compute money metric utilities and use those to calculate expenditure-specific cost of living. From this it is straightforward to compute measures of real inequality. To evaluate the robustness of our measures, we repeat the procedure for a series of alternative specifications. All these alternative setups provide similar inequality trends as our main estimates, and all confirm that the allowance for non-homotheticity is quantitatively much more important than the allowance for substitution.

Our paper illustrates how conventional inequality measures are biased, depending on the particular patterns of relative price changes. We are not the first to discuss this type of bias. Some papers have, for example, proposed solutions on how to weight individual cost of living to obtain one aggregated "social cost of living index" (Crossley & Pendakur, 2010; Muellbauer, 1976; Pollak, 1980, 1981). More recently, other papers have directly discussed how price changes within countries affect different income groups (Cravino & Levchenko, 2016; Faber, 2014; Handbury, 2013; Moretti, 2013; Sakai, Estudillo, Fuwa, Higuchi, & Sawada, 2017). Mishra and Ray (2011), Nicholas, Ray, and Valenzuela (2010) and Pendakur (2002) investigate real consumption inequality in India, Australia, and Canada, respectively, correcting for cost of living differences by indices closely related to ours. These authors also calculate money metric utility using the cost function. However, the other standard indices are not derived in any of the papers and they do not make an attempt to adjust for cost of living differences across geographical areas. Hence, they cannot nail down how important the adjustment for non-homotheticity is compared to other adjustments. One of the contributions of our paper is to calculate cost of living deflators across time and space using standard indices and thus separate the bias stemming from the assumption of homothethic preferences from other types of biases.

The rest of the paper is organized as follows. In Section 2 we describe the construction of the different cost of living indices used in the empirical investigation. In Section 3 we present the data and discuss the implementation of our methods. We present our main findings in Section 4. In Section 5 we discuss the robustness checks, whereas concluding remarks are given in Section 6.

2. NON-HOMOTHETIC PREFERENCES AND COST OF LIVING

This section gives an overview of the different cost of living indices used in the analysis. For brevity, we use the notation "unit" for a unique state in a specific time period and sector (urban or rural). Throughout, there are n commodities indexed $i = 1, \ldots, n$, and m units indexed $j = 1, \ldots, m$. For each unit, there is a price vector p^j and a corresponding per capita quantity vector q^j. The total quantity consumed in a unit is given by the vector Q^j. Per capita nominal consumption in unit j is given by $z_j = p^j q^j$.

The Geary index, also known as the Geary–Khamis index, is based on the idea of evaluating quantities, not by actual prices, but by a vector of average prices, π. The real per capita consumption level of unit j, evaluated in this way, could be written as:

$$I_j^{cons} = \pi q^j, \tag{1}$$

and the corresponding cost of living index as:

$$P_j^{cons} = \frac{p^j q^j}{\pi q^j}. \tag{2}$$

So far, this is similar to any conventional consumer price index. Therefore, we label this index by "cons", for "consumption index". As actual quantities are evaluated at the reference prices, this index does not take into account substitution in consumption. That is, the index does not adjust for the fact that the consumers would have chosen a different consumption basket if faced with the reference prices instead of the actual prices in their unit. The failure of the standard indices, such as the Geary index, to account for substitution has spurred a literature on more structural cost of living indices, sometimes referred to as "the economic approach" to price index measurement (Akmal & Dowrick, 2005; Neary, 2004). [4] This approach requires the estimation of preferences and is based on evaluating money metric utilities, $m(\pi, p^j, z_j)$. The real consumption level of unit j in this system could be denoted by:

$$I_j^{exp\text{-}h} = m(\pi, p^j, z_j) = e(\pi, v(p^j, z_j)), \tag{3}$$

where $e(.)$ and $v(.)$ are the expenditure function and the indirect utility function, respectively (that are specified once preferences have been estimated, more on this later). The cost of living index of unit j could now be written as:

$$P_j^{exp\text{-}h} = \frac{e(p^j, v(p^j, z_j))}{e(\pi, v(p^j, z_j))}. \tag{4}$$

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