Essay 2

Pro-Poor Growth and Inflation Inequality

The essence of money is in its absolute worthlessness.
Norman O. Brown, 1913-2002

Abstract: Despite the extensive debate on how to define and measure pro-poor growth, neither the theoretical literature on pro-poor growth nor empirical applications have paid sufficient attention to inflation inequality, or in other words to varying inflation rates across the income distribution. We show that incorporating inflation inequality into pro-poor growth measures is not only a theoretical necessity but if ignored can seriously bias empirical assessments of the pro-poorness of growth. Hence, we suggest simple methods to redress such bias. As an empirical illustration, we apply our concepts to the case of Burkina Faso, using the growth incidence curve and the decomposition of poverty changes as pro-poor growth measures.

based on joint work with Michael Grimm.
2.1 Introduction

Pro-poor growth (PPG), i.e. the question to what extent the poor benefit from economic growth, has over the past years become one of the central issues of development economics. Also in this context, the question of how one should define and measure pro-poor growth has been intensively discussed and a wide range of definitions and measures of pro-poor growth have been provided by several authors.¹

Despite the ongoing debate on the concept and measurement of PPG, there is especially one point that has not received sufficient attention in all PPG measures - or at least in their respective applications: the issue of inflation inequality, i.e. the phenomenon of substantially varying inflation rates across households along the income distribution. The existence of inflation rates which differ by household income is very well supported by various studies for both industrialized countries (e.g. Slesnick, 1993; Newbery, 1995; Crawford and Smith, 2002; Hobijn and Lagakos, 2003) as well as developing economies (e.g. Pritchett et al., 2000; Deaton, 1998; Deaton, 2003a). Moreover, the issue of varying inflation rates should receive particular attention in the measurement of PPG, given that these dynamic welfare measures are especially focused on disaggregated growth rates, or in other words, on the change of purchasing power across the entire income distribution.

For all that, PPG measures usually assume away inflation inequality and only use aggregate (national) price indices to deflate income over time. If, however, the aspect of inflation inequality is ignored - independent of which definition or measurement of pro-poor growth is used - we might not derive an appropriate assessment of whether and to what extent the poor benefited from economic growth, i.e. to what extent growth was ‘pro-poor’.

The objective of this paper is, hence, first to demonstrate theoretically how inflation inequality can easily be incorporated into any PPG measures, using the *Growth Incidence Curve* (Ravallion and Chen, 2003) and the *Datt-Ravallion Decomposition of Poverty Changes* (Datt and Ravallion, 1992) as two widely used measures. Second, we illustrate empirically, for the case of Burkina Faso, how

¹For a comprehensive overview and comparison of the various measures see e.g. Son (2003a) or Klasen (2004).
pro-poor growth assessments can differ whether the phenomenon of inflation inequality is taken into account or not.

The remainder of the paper is organized as follows. Section 2.2 briefly reviews the different concepts and measures of pro-poor growth. Section 2.3 discusses the phenomenon of inflation inequality, or in other words income-correlated inflation rates, both from a theoretical as well as from an empirical perspective. Section 2.4 first outlines the standard methods to construct growth incidence curves and to perform poverty change decompositions and second, suggests for both approaches alternative methods which take into account inflation inequality. Section 2.5 illustrates the importance of using these adjusted PPG measures for the case of Burkina Faso. Section 2.6 concludes.

2.2 Measurements of Pro-Poor Growth

Almost all of the numerous PPG measures are on the one hand built on one of two broader ‘conceptional’ categories, and on the other hand, on one of two broader ‘methodological’ categories.

Concerning the two ‘conceptional’ categories, one can distinguish between an ‘absolute’ concept and a ‘relative’ concept of pro-poor growth. The former ‘absolute’ concept defines growth to be pro-poor if growth leads to absolute poverty declines, irrespective of whether inequality in- or decreases (e.g. Kraay, 2003; Ravallion, 2004). The latter ‘relative concept’ only classifies growth to be pro-poor if the poor benefit relatively more than the average or the non-poor from economic growth, i.e. growth has to be accompanied by decreasing inequality (e.g. Kakwani and Pernia, 2000; Klasen, 2004).

In addition to this ‘conceptional’ difference, PPG measures might also be subdivided into two ‘methodological’ categories. ‘Growth patterns’ analyze the changes in income over the whole or part of the income distribution, i.e. they compute income-specific disaggregated growth rates to analyze which segments of the income distribution benefited most from growth: examples are the distribution-weighted growth rate of Klasen (1994), the poverty growth curve of Son (2003b) and the growth incidence curve of Ravallion (2004). The advantage of these measures is that they do not need to specify a poverty line and that changes in the income of the poorest of the poor can be taken into account. A problem with
those measures is that they are sometimes not able to provide a clear index if a
certain growth process was more pro-poor than another.

The second ‘methodological’ group might be called ‘growth-poverty-links’. All of these measures link in some way or the other changes in poverty to changes in mean income and/or to changes in inequality: examples are the decomposition of poverty of Datt and Ravallion (1992), the poverty bias of growth of McCulloch and Baulch (2000) and the poverty equivalent growth rate of Kakwani and Pernia (2000). The advantage is that, in contrast to ‘growth patterns’, these measures are able to provide a specific pro-poor growth index, which facilitates pro-poor growth comparisons across countries and time. The problem is that they are based on country-specific poverty lines which make the outcome of such measures very sensitive to the poverty line chosen and to the country’s initial income distribution and initial level of economic development (see Bourguignon, 2003).

Obviously, whether and to what extent a specific growth process2 was pro-poor might in a lot of cases be assessed differently by the various PPG measures - depending on which concept and method they are based on. But diverging results should not lead to the conclusion that a certain PPG assessment is not robust to different measures or that some measures do not capture pro-poor growth appropriately. In contrast, different concepts and methods look at pro-poor growth from different perspectives, and taken together help to get a more detailed and comprehensive picture. Different measures should therefore be considered as complements rather than as substitutes.

There is, however, one issue that all PPG measures have in common, no matter if they are based on the ‘absolute’ or ‘relative’ concept of pro-poor growth or if they fall into the category of ‘growth patterns’ or ‘growth-poverty-links’. They all consider pro-poor growth as a function of growth rates among the poor. Certainly, here the real increase in purchasing power among the poor and not nominal growth rates are of interest, leading to the essential question which price deflator should be used to compare incomes over time. In most applications of PPG measures the general (national) Consumer Price Index (CPI) is used for this purpose, which might in many cases, and as shown in next section, not be an appropriate deflator for all income groups.

---

2In general, one is interested in a particular country over a specific period of time.
2.3 Theory and Empirics of Inflation Inequality

2.3.1 Homogenous Price Indices

Whenever we are interested in the evolution of households’ wellbeing over time, i.e. in real changes of wellbeing or utility, nominal income changes have to be deflated with an appropriate deflator which should ideally represent the change in the cost-of-living of households, defined as:

\[ COL_t = \frac{e(u, p_t)}{e(u, p_{t-1})} \]  

(2.1)

where \( e(u, p) \) is the minimum expenditure required to reach the utility level \( u \), given prices \( p \). It is hardly feasible to calculate such a cost-of-living index, which could also be labeled as an utility index. The utility derived from different consumption baskets is not observable and even the calculation of a simple ordering of utilities would require knowledge of preferences, whose approximation would imply some ‘arbitrary’ assumptions (Deaton and Zaidi, 2002). Moreover, we might also not have prices and measured quantities for all goods being part of a household’s utility function.

Hence, as a short-cut a price index, which is in general the Consumer Price Index (CPI), is applied as an approximate estimate, to derive real changes of households’ wellbeing over time. The CPI measures the change in prices over time paid by an ‘average’ household for a specific and constant consumption basket:

\[ CPI_t = \frac{\sum_{j=1}^{J} p_{t,j} q_{t-1,j}}{\sum_{j=1}^{J} p_{t-1,j} q_{t-1,j}} \]  

(2.2)

where \( p_{t,j} \) is the price and \( q_{t,j} \) the quantity consumed of good \( j \) at time \( t \). As can be seen from equation (2.2), the CPI usually constitutes a Laspeyres index, i.e. the quantities \( q \) of the base period \( t-1 \) are held constant. The quantities \( q_{t-1} \), or more often the weights \( w_{t-1,j} \), of the consumption basket are either derived from the aggregate expenditure shares of the National Accounts or Household Surveys, or from the expenditure shares of specially designed ‘Price and Expenditure Surveys’.

\( w_{t-1,j} \) is the expenditure share \( \frac{p_{t-1,j} q_{t-1,j}}{\sum_{j=1}^{J} p_{t-1,j} q_{t-1,j}} \) of good \( j \).
Obviously, such a CPI does not account for differences in the consumption pattern of different households. Moreover, and what is most interesting for pro-poor growth analysis, because of the averaging process in its construction, the CPI usually gives more weight to the consumption pattern of rather ‘rich’ households, bypassing the consumption pattern of the majority of the poorer population (see e.g. Prais, 1959; Nicholson, 1975; Ley, 2005).

If the CPI is computed via National Accounts or Household Surveys this is simply due to the fact that expenditures of richer households are much higher than those of poorer ones. Therefore the expenditure shares of richer households largely determine the aggregate weights for each consumption item. This means that the CPI is not based on a ‘democratic’ basis, where each household’s expenditure shares would get an equal weight, but on a ‘plutocratic’ basis where households are weighted according to their total expenditure. Hence, although the budget shares of the CPI are equal to the budget shares of an ‘average’ or an ‘aggregate’ household they are not ‘representative’ for the majority of households (Ley, 2005).

If specific ‘Price and Expenditure Surveys’ are used, in general, still more weight is given to the consumption pattern of rather rich households. Because of data availability, especially in developing countries, often only urban households working in the ‘formal’ sector are surveyed. These households are very likely to be situated at the upper-end of the income distribution.

This bias would obviously not matter if there was no systematic relationship between total household expenditure and the expenditure pattern of households. However, households with lower income are very likely to have consumption patterns that differ significantly from households with higher income (see Section 2.3.2). The general CPI is therefore usually very close to a price index computed specifically for the ‘rich’ but is significantly different from a price index specifically computed for the poor. Thus Arrow (1958) stated already in the 1950s that ‘there should be a separate cost-of-living index number for each income level’.

---

4 Clearly, there are several other reasons, why the CPI does not reflect the ‘true’ price index of various households. For an overview see for example Boskin et al. (1997) or Lebow et al. (2003).

5 See also Essay 4 on a detailed discussion of ‘informal’ and ‘formal’ employment.

6 For example, Deaton (1998) estimates for the US that the budget shares in the CPI are representative for households at the 75th percentile of the expenditure distribution.
Whereas this is sometimes recognized in industrialized countries, where price indices are computed for several income groups, this is only rarely done in developing countries, but should not be of less importance here (see e.g. Guénard, 1998; Pritchett et al., 2000a; Deaton, 2003b).

2.3.2 Heterogenous Consumption Patterns and Prices

In general, it can be assumed that households with lower income spend relatively more on necessities, whereas relatively well-off households spend more on luxury goods (see e.g. Arrow, 1958 or Engel’s Law). In developing economies, one of the most important difference between poor and non-poor households’ expenditure pattern is the share of total income spent on food (Deaton, 1997).

As food represents the ‘first necessity’ of a household’s consumption, poor households spend the highest share of their income on food items. In addition, the demand for food items is characterized by rather low income elasticities. Hence, the household budget share devoted to food expenditures substantially decreases with increasing total income.\(^7\) This relationship between total household income and the allocation of household resources between food and non-food items was already analyzed in the early economic literature (Engel, 1895) and became known as the *Engel curve*, which states that the food share in total consumption decreases as total expenditure increases.

Certainly, differences in the consumption pattern between poor and non-poor households alone would not lead to different inflation rates, as long as the various goods households consume showed equal price movements. However, if this were the case we would not even need to construct a CPI: if it were assumed that all price movements were highly correlated over time, simply the price change of one consumption good would have to be measured. And in developing countries, particularly the prices of domestically produced food crops are often only weakly correlated with general price movements (see e.g. Pritchett et al., 2000a; Marouani and Raffinot, 2004).

\(^7\)At the very low end of the income distribution this might not necessarily be the case (e.g. Deaton and Paxson, 1998) with higher income leading to higher food consumption and to a (more expensive) dietary change.
Food production is, especially in sub-Saharan Africa countries, to a large extent heavily dependent on annual fluctuations of climatic conditions and - compared to other sectors - less dependent on long-term macro-economic policies. Moreover, these countries often face significant transport and trade constraints. Thus, a lower domestic production of food crops cannot easily be substituted with higher imports of food crops, which could in theory smooth food supply and prices.

Also, (basic) food items do not only account for a larger share in poor households’ budget, but poor households have in general rather limited substitution possibilities for (basic) food items. If the relative price of food increases, food can only be substituted up to a minimum of about 2100 calories per person with non-food items. If the relative price of basic food items increases, again poor households can only to a certain extent substitute basic food items with absolutely more expensive food items. This might lead to very low price elasticities of demand for basic food items. Hence, in the presence of low income elasticities as well as low price elasticities of food demand, food production fluctuations can lead to considerable food price swings and to considerable inflation differences across the income distribution.

Given the fact that all pro-poor growth measures are interested in the change of the purchasing power of the poor, using the CPI seems therefore not very appropriate. Instead, price indices, which are relevant to the poor (and non-poor) should be used. This is true for both PPG measures which analyze the growth rate along the income distribution as well as for PPG measures which focus on changes in poverty rates (see Section 2.2).

For a methodological and empirical illustration of how inflation inequality can be considered in PPG measures, the Growth Incidence Curve (GIC), as proposed by Ravallion and Chen (2003), and the Decomposition of Poverty Changes, as suggested by Datt and Ravallion (1992), will be applied. The former falls into the ‘methodological’ category of ‘growth patterns’ and the latter into the category of

---

8 See also Essay 1 and Essay 3.
9 A closely related issue is raised in the entitlement approach of famines (Sen, 1981).
2.4 Methodology

2.4.1 Growth Incidence Curve with PCPIs

The growth incidence curve (GIC), as proposed by Ravallion and Chen (2003), calculates the growth rate in income per capita (or alternatively the growth rate in expenditure per capita) at each percentile point along the income distribution. The GIC is hence defined as:

$$g_t(p) = \frac{y_t(p)}{y_{t-1}(p)} - 1$$

(2.3)

where \(g_t(p)\) is the growth rate in income \(y\) of the \(p\)th percentile between \(t\) and \(t-1\). If the GIC is positive at all points up to some point \(z\), then poverty, as measured by the Watts index (Watts, 1968), has fallen for all poverty lines up to \(z\) and hence growth has been pro-poor up to point \(z\). The extent of the pro-poorness of growth, or the rate of pro-poor growth, is defined as the area under the GIC up to point \(z\). Thus growth is obviously more pro-poor if the GIC shifts upward at all points along the income distribution up to point \(z\).

The GIC and the thereof derived rate of pro-poor growth first of all focuses on the absolute income growth of the poor. However, the GIC also allows conclusions on the relative extent to which growth was pro-poor, i.e. if the poor benefited relatively more than the average or non-poor from economic growth. Such an analysis can be undertaken, by comparing the mean of the percentile-specific growth rates, which is defined as:

$$g_{p,t} = \frac{1}{100} \sum_{p=1}^{100} g_t(p)$$

(2.4)

with the growth rate in mean income, which can be written as:

$$g_{\mu,t} = \frac{\mu_t}{\mu_{t-1}} - 1$$

(2.5)

\(^{10}\)An additional motivation to use these two measures for illustrative purposes is that both are now widely used by international organizations in the current assessment of the pro-poor growth performance of developing countries (see e.g. the Operationalizing Pro-Poor-Growth (OPPG) project sponsored and managed by the World Bank).
where $\mu_t$ is the mean income of the whole income distribution at time $t$. Whenever the growth rate in equation (2.4), which is population weighted and hence gives more weight to the income growth of the poor, is higher than the growth rate in equation (2.5), which is expenditure weighted, and thus often largely determined by growth gains of the richest two quintiles (Klasen, 1994), growth can be considered to be pro-poor in relative terms. Alternatively, the shape of the GIC can be analyzed: If the GIC is downward sloping over the whole income distribution then the distributional pattern of growth benefited the poor, whereas if the GIC is upward sloping over the whole income distribution the upper end of the income distribution benefited relatively more from economic growth.

Equation (2.3) represents the GIC in nominal terms. In empirical analysis, we are, however, interested in real and not nominal percentile-specific growth rates. Applications of the GIC, therefore, usually compute:

$$ g_t(p) = \frac{Y_t(p) \cdot \frac{1}{1+i_t}}{Y_{t-1}(p)} - 1 $$

where $i_t$ is the inflation rate approximated by the national CPI between $t$ and $t-1$. Such an approach would only be justified if the inflation rate was the same for all percentiles across the income distribution. However, and as argued in Section 2.3, this is often not the case. CPIs are generally much closer to a computed price index for the non-poor and might be significantly different from a computed price index for the poor.

Using a price index, which is for most households not representative, as a deflator to compare incomes over time is certainly less problematic if applied to national means, i.e. to equation (2.5). In contrast, if the effort is made to calculate percentile-specific incomes with micro-economic household survey data, we should also use percentile-specific consumer price indices (PCPIs) for the computation of percentile-specific growth rates. Otherwise, we are not only inconsistent in our methodological approach, but might also draw wrong conclusions about the 'pro-poorness' of growth, both from an absolute and a relative perspective. The GIC should therefore be calculated as:

$$ g_t(p) = \frac{Y_t(p) \cdot \frac{1}{1+i_t(p)}}{Y_{t-1}(p)} - 1 $$

(2.7)
where \( i_{t(p)} \) is the specific inflation rate of the \( p \)th percentile, which should be approximated by PCPIs, which take into account the specific consumption basket of the households at the \( p \)th percentile at time \( t \).

Certainly, one might argue that PCPIs are also misleading because they implicitly assume that there is no mobility across the income distribution. However, GICs and hence also PCPIs rely on the axiom of anonymity, i.e. they only compare cross-section distributions (and not panel distributions) ignoring mobility of households along the income distribution. This means that the percentile-specific income, and hence also the percentile-specific consumer price indices, should only be seen as representative for specific percentiles and not of specific households within these percentiles. The underlying assumption is that the consumption pattern of households is largely determined by income and that households with certain not income-related preferences for specific consumption baskets do not systematically move through the income distribution over time.\(^\text{11}\) However, it would certainly be interesting to calculate GICs with PCPIs for panel data.

### 2.4.2 Triple Decomposition of Poverty

The decomposition of poverty changes over time as proposed by Datt and Ravallion (1992) analyzes the contribution of (i) changes in mean income and (ii) changes in income inequality to changes in poverty over time. Hence, two components are calculated: (i) the change in poverty that would have emerged if the observed growth rate had occurred without any changes in inequality and (ii) the change in poverty that would have occurred if the observed changes in inequality happened in the absence of growth in mean income (see Figure 2.1). This can be written as:

\[
\Delta P_{t+1,t} = [P(\mu_{t+1}, L_t) - P(\mu_t, L_t)] + [P(\mu_t, L_{t+1}) - P(\mu_t, L_t)] + R_{t+1,t} \tag{2.8}
\]

where \( P(\mu_t, L_t) \) is the poverty measure with a mean income of \( \mu_t \) and a Lorenz curve \( L_t \) in period \( t \). The first component of equation (2.8) corresponds to the

\(^{11}\)In fact we do control for rural and urban residence - as the consumption pattern of rural and urban households in developing countries is in general quite different - and calculate price indices separately for rural and urban households.
change in poverty explained by the growth component with a constant relative income distribution while the second component corresponds to the change in poverty explained by the distribution effect (see also Figure 2.1).

Figure 2.1: Decomposition Paths of Poverty

Source: Own Illustration.

Notes: - Income distribution in year \( t (\mu_t, L_t) \). - - - Income distribution in year \( t+1 (\mu_{t+1}, L_{t+1}) \). Grey line: Decomposition path (upper graph: \( \mu_{t+1}, L_{t+1} \), lower graph: \( \mu_t, L_{t+1} \)).

The magnitude of both components is path dependent, i.e. depends on whether first the growth and then the distribution component or vice versa is computed. This is nicely illustrated in Figure 2.1. In both graphs the solid black line represents the income distribution in period \( t \). However, whereas in the first graph the growth component is followed by the redistribution component, in the sec-
ond graph the redistribution components is followed by the growth component, which, as can be seen in Figure 2.1, has an impact on the size of the respective components.

Because of this path dependency, the magnitude of the growth and redistribution components in equation (2.8) is dependent on whether the initial or the final year is taken as the reference period.\(^{12}\) Moreover, whenever we use the initial (or final) period to compute both the growth and the redistribution components, we also obtain a residual \(R\), which represents the interaction term between the growth and distribution components. Hence, in many empirical applications, first the initial and then the final year is taken as a reference period and then the decomposition results are averaged over the two possible reference years. This methodology provides the averages of the growth and redistribution components and cancels out the residuals.

Such a decomposition of observed poverty changes obviously requires that the poverty line is kept constant in real terms over time. This means, that the inflation rate underlying the poverty line should be equal to the inflation rate underlying the income variables, which is in general the CPI. As discussed in Section 2.3, the consumption basket underlying the poverty line should in general be quite different from the one underlying the CPI and thus the implicit inflation rate of the poverty line might be substantially different from the inflation rate of the CPI. This can lead to a poverty line in \(t + 1\) whose real value in terms of purchasing power has remained constant but whose ‘real’ value in relation to a hypothetically CPI inflated poverty line has considerably changed.

This means, that besides a growth and a redistribution component, we have to compute a third component when decomposing poverty changes: a ‘relative price shift’ or ‘poverty line’ component (see Figure 2.2), which is the change in poverty explained by the difference of the inflation rate of the poverty line to the inflation rate of the general CPI, or in other words, the change in poverty explained by a relative price shift between the bundle of goods consumed by the poor and the

\(^{12}\text{In equation (2.8) the initial year } t \text{ is taken as the reference period.}\)
bundle of goods consumed by the non-poor. We therefore derive the following ‘triple’ poverty decomposition:

\[
\Delta P_{t+1,t} = [P(\mu_{t+1}, L_t, z_t) - P(\mu_t, L_t, z_t)] + [P(\mu_t, L_{t+1}, z_{t+1}) - P(\mu_t, L_t, z_t)] \\
+ [P(\mu_t, L_t, z_{t+1}) - P(\mu_t, L_t, z_t)] + R_{t+1,t}
\]  

(2.9)

Similar to a dual decomposition, the first component corresponds to the change in poverty explained by the growth component (with a constant real poverty line) and the second component corresponds to the change in poverty explained by the distribution effect (again with a constant real poverty line). The third component now corresponds to the change in poverty explained by relative price changes, i.e. caused by the inflation difference between the poverty line and the national CPI, in a growth- and distributional neutral case. \(R\) is again the residual.

**Figure 2.2: Triple Decomposition of Poverty**

![Diagram of poverty decomposition](image)

**Source:** Own Illustration.

**Notes:** - Income distribution in year \(t\) \((\mu_t, L_t)\). — — Income distribution in year \(t+1\) \((\mu_{t+1}, L_{t+1})\).

As already discussed, in a dual decomposition of poverty changes decomposition results are averaged over the two reference periods \(t\) and \(t+1\) to derive the ‘average’ growth and distribution components as well as to cancel out the residual. Note that in a dual decomposition taking the initial and final year as reference points to calculate the growth and redistribution component is equal to computing all growth and redistribution fragments of the \(2! = 2\) possible decomposition paths.
2.4. Methodology

In a triple decomposition 'only' taking the average over the components computed in the initial and the final year is somewhat arbitrary as several of the growth, redistribution, and poverty line fragments of the now $3! = 6$ possible decomposition paths are left out.\(^{13}\) More precisely, the intermediate step of any triple decomposition path is ignored. Hence, we propose that in a triple decomposition all six decomposition paths are calculated to derive the average growth, inequality and poverty line components. By doing so, also the residual is canceled out. A STATA 8.0 Macro to undertake such a ‘triple’ decomposition can be found in Appendix A.

To derive the impact of the change in the poverty line relative to the CPI, the poverty line $z_{t+1}$ is calculated by deflating the ‘real’ poverty line in $t+1$ with the change of the CPI between $t$ and $t+1$. Hence, if the implicit inflation rate of the poverty line were the same as the CPI the calculated poverty line $z_{t+1}$ would be equal to the poverty line $z_t$, and the ‘poverty line’ component would cancel out.

Two points are worth to note. First, in this ‘triple’ decomposition the growth (and inequality) component has to be interpreted a bit differently than in a ‘dual’ decomposition. It represents the change in poverty that would have occurred with the observed growth rate (change in inequality) given that all households had experienced the same change in the ‘cost-of-living’, or in other words, given that the consumption basket underlying the poverty line had experienced the same increase in prices than the consumption basket underlying the CPI.

Second, although closely related to the adjustments made for inflation inequality in the calculation of growth incidence curves, here instead of percentile-specific inflation rates only two different inflation rates are taken into account: one for the poor (represented by the implicit inflation rate of the poverty line) and one for the non-poor (represented by the CPI). One might think about applying percentile-specific price indices for the deflation of households’ consumption. The growth component of such a triple decomposition would then constitute the growth component taking into account differences in inflation rates across households, whereas the inequality component would show the ‘real’ and not ‘nominal’ change in inequality across time. Instead of the CPI, a ‘democratic’ price index, which is the average of the percentile-specific price indices, should be applied to

---

\(^{13}\)For example in Figure 2.2 only one, namely the growth-redistribution-poverty line decomposition path, of 6 possible decomposition paths is illustrated.
deflate the 'real' poverty line in $t+1$. The interpretation of such a poverty line component, which should be quite small, is however not clear.

We do not opt for this latter approach because of two reasons. First, the latter approach does not clearly show the impact of inflation inequality on changes in poverty, as relative price shifts are partly captured by the growth component, partly captured by the inequality component, and partly captured by the poverty line component. Hence, the first method mentioned is much more transparent. Second, as in some countries it might be quite difficult to derive percentile-specific price indices, we think that a triple decomposition of poverty which only requires the CPI and the implicit inflation rate of the poverty line is often much more feasible. Such a triple decomposition does therefore also present a nice alternative to the growth incidence curve whenever we are interested in pro-poor growth measures which are sensitive to inflation inequality.

2.5 Empirical Application

2.5.1 Data Description

We take the case of Burkina Faso during the period 1994 to 2003 to empirically illustrate the implication of inflation inequality adjusted growth incidence curves and poverty decompositions. The analysis is based on three household surveys, Enquêtes Prioritaires (EP), which were all undertaken by the Institut National de la Statistique et de la Démographie (INSD) with the financial and technical assistance of the World Bank in 1994 (EPI), 1998 (EPII), and 2003 (EPIII). The respective sample sizes are 8,642, 8,478, and 8,500 households. All three surveys contain detailed information on disaggregated expenditure data of households which are necessary both to calculate households’ expenditure per capita \(^{14}\) as well as percentile-specific inflation rates (PCPIs). For a more detailed discussion of the data see also Grimm and Günther (2004).

To estimate PCPIs, we first calculate for each household in the household survey of 2003 the budget shares for the seven expenditure categories represented in

\(^{14}\)Note that for an empirical application we use expenditure and not income to assess households’ welfare, which is the preferred welfare measure for households in developing countries (Deaton, 1997; Deaton and Zaidi, 2002).
Table 2.1: Household Expenditure Budget Shares

<table>
<thead>
<tr>
<th></th>
<th>Budget Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CPI</td>
</tr>
<tr>
<td>Food Crops</td>
<td>0.10</td>
</tr>
<tr>
<td>Other Food Items</td>
<td>0.24</td>
</tr>
<tr>
<td>Rent and Utilities</td>
<td>0.11</td>
</tr>
<tr>
<td>Education</td>
<td>0.03</td>
</tr>
<tr>
<td>Health</td>
<td>0.04</td>
</tr>
<tr>
<td>Transport</td>
<td>0.16</td>
</tr>
<tr>
<td>Transfers</td>
<td>0.00</td>
</tr>
<tr>
<td>Others</td>
<td>0.33</td>
</tr>
<tr>
<td>Total</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Source: Consumer Price Index (CPI): Institut National de la Statistique et de la Démographie (INSD). Household Budget Shares: EPIII. Computations by the authors.

the CPI.\textsuperscript{15} Table 2.1 shows the average budget shares of the first and last decile in the Burkinabè household expenditure distribution, also in comparison with the respective expenditure weights used in the national CPI. As can be seen, the main difference between poor and rich households’ expenditure pattern is the share of income spent on staple food. Food crops add up to almost 40 percent of total expenditure for the poorest households, but account for only 12 percent of expenditure for the very rich.

It is striking, that the expenditure share for food crops in the CPI is even smaller than of the richest 10 percent of the expenditure distribution. This shows that the CPI in Burkina Faso is not only income-biased but also urban-biased. Whereas the expenditure shares of the CPI were derived from an ‘Expenditure Survey’ of formal urban households in 1998 (INSD 1998) the expenditure shares for the richest 10th percent of the expenditure distribution is computed for the entire population. Not only poorer but also rural households spend a relatively higher share on food crops.

Second, we analyzed the price changes for the main staple foods (maize, millet, sorghum, and rice) in Burkina Faso between 1994 and 2003. The prices were

\textsuperscript{15}The seven expenditure categories in the Burkinabè CPI are food crops, other food items, rent and utilities, education, health, transport, and others.
taken from the Burkinabè *Grain Market Price Surveillance System* (Ministry of Trade, Burkina Faso, 2004), which collects prices of the major cereals on various regional markets in Burkina Faso on a weekly basis. A food crop price index was computed as a weighted average of the prices paid for maize, millet, sorghum, and rice, using the weights applied by the INSD to compute the food poverty line in Burkina Faso in 2003.

As documented in Table 2.2, the prices of these goods of first necessity increased much faster than those for most other goods between 1994 and 2003. Whereas the CPI only increased by 31.4 percent, the prices for food crops increased by 125.2 percent during the same period.\(^{16}\)

<table>
<thead>
<tr>
<th>Table 2.2: National Price Indices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>1994</strong></td>
</tr>
<tr>
<td>CPI</td>
</tr>
<tr>
<td>Food Crops</td>
</tr>
<tr>
<td>CPI w/o Food Crops</td>
</tr>
</tbody>
</table>

*Source: Consumer Price Index (CPI): INSD. Food Crops: Burkinabè Grain Market Price Surveillance System. CPI w/o Food Crops: Computation by the authors.*

Combining the results of Table 2.1 with the ones of Table 2.2, one can easily derive PCPIs which take into account the specific consumption pattern of households and the relative price change between staple foods and other consumption goods that occurred in Burkina Faso between 1994 and 2003. More precisely, first, the average budget shares for food crops and ‘other consumption goods’ over expenditure percentiles were computed for 2003. Second, these shares were used as weights for the computation of percentile-specific price indices, accounting for the specific price changes of food crops, as measured by the *Grain Market Price*

---

\(^{16}\)This massive price distortion mainly occurred between 1994 and 1998, when the CPI increased by only 22.7 percent but food crop prices increased by 152.2 percent. Conversely, between 1998 and 2003, the CPI continued to rise whereas prices for food crops decreased (see also Grimm and Günther (2004) and Essay 1).
Surveillance System and of ‘other consumption items’, as measured by the CPI with the price change of food crops netted out (Table 2.2).\textsuperscript{17}

Given the illustrative purpose of this analysis we only distinguished between food crops and ‘other consumption items’. Of course one could be more specific and distinguish between the eight expenditure categories as outlined in Table 2.1 and thus derive even more refined household deflators. However, since the main difference in consumption patterns as well as in relative price changes were between staple foods and other goods (see Tables 2.1 and Table 2.2), this simplified approach should be sufficient to demonstrate the impact of inflation inequality.\textsuperscript{18}

Note that in contrast to the CPI which represents a Laspeyres index, we used a Paasche index\textsuperscript{19} to construct the PCPIs. In general, the Paasche index reflects a lower-bound whereas the Laspeyres index reflects an upper-bound to the ‘true’ change in cost-of-living, as they both do not allow for substitution, i.e. they ignore the fact that consumers adjust their consumption basket when relative prices change.\textsuperscript{20}

Mainly because of practical reasons, the CPI is often a Laspeyres index as it requires lower data requirements (Boskin et al., 1997). For the Laspeyres index ‘old’ budget shares can be applied, whereas for the Paasche index the budget shares of the ‘current’ period need to be calculated. We applied a Paasche index, to be consistent with the estimated poverty lines, which are also based on a

\textsuperscript{17}Obviously, such price information from government price surveys is not a perfect data source and one would prefer price information directly observed in household surveys. But given the fact that in the Burkinabè household surveys, households only reported total expenditures for each consumption category, and no information on quantities or prices was given, these prices were the only available to us.

\textsuperscript{18}Moreover, most of the other expenditure categories in the CPI represent very heterogeneous categories. For example, transport expenditures among rich households might be composed of quite different expenditure items than among poor households and we do not possess price deflators which are more disaggregated than general ‘transport expenditure’.

\textsuperscript{19}A Laspeyres index calculates the price changes between $t$ and $t+1$ of an observed consumption basket of the base period $t$. In contrast, in a Paasche index, the observed consumption basket of the final period $t+1$ is held constant.

\textsuperscript{20}Or in other words, the Laspeyres index might overstate inflation rates and understate increases in wellbeing, whereas the Paasche index might understate inflation rates and overstate increases in wellbeing.
Paasche index. Moreover, the expenditure shares of the official CPI of Burkina Faso were derived from an ‘Expenditure Survey’ which was undertaken in 1998 (INSD, 1998). Thus using the expenditure shares of the EPIII in 2003 is not ‘less appropriate’ than using the expenditure shares of the EPI in 1994. In any case, we also applied a Laspeyres instead of a Paasche index for a robustness check. This did not significantly alter the estimated PCPIs. Since in Burkina Faso the substitution of food crops is - as expected - rather low, the difference between a Laspeyres and a Paasche index is not too large.

Since we can only observe budget shares and not quantities in the household surveys we have to rewrite the Paasche index at a specific percentile $p$ along the income distribution as:

$$
P_{t}(p) = \frac{\sum_{j=1}^{J} p_{t,j} q_{t}(p),j}{\sum_{j=1}^{J} p_{t-1,j} q_{t}(p),j} = \left[ \sum_{j=1}^{J} w_{t}(p),j \frac{p_{t-1,j}}{p_{t,j}} \right]^{-1}
$$

(2.10)

where $p_{t,j}$ is the price of good $j$ at time $t$. $q_{t}(p),j$ would be the quantity consumed at the $p$th percentile. But since we cannot observe $q_{t}(p),j$ with our household surveys, we use $w_{t}(p),j$ as the share of households’ total budget devoted to item $j$.

Figure 2.3, which indicates the price index between 1994 and 2003 for each percentile of the expenditure distribution and separately for rural and urban areas, clearly shows that the cost-of-living of the poor increased much faster than of the non-poor, leading to a redistribution of purchasing power in favor of the rich, which is not appropriately reflected in the general CPI. Also the prices of the rural population increased much more than of the urban population.

The poverty lines for 1994, 1998, and 2003, necessary for the decomposition of poverty changes, were constructed as described in Essay 1. As discussed, they also constitute a Paasche index.

---

21 The reason why the poverty line we use is based on a Paasche index is to be in line with the latest official poverty estimates in Burkina Faso (see Essay 1).

22 Note that before applying the PCPIs to deflate household expenditures, we also adjusted household expenditures for price differences among the 13 Burkinabè regions. These deflators were provided by the INSD in Burkina Faso. These deflators are sought to reflect general regional price differences, but do not take into account differences in consumption habits of households.
2.5.2 Growth Incidence Curve with PCPIs

Figure 2.4 shows the national growth incidence curve, the growth rate in mean, and the mean of percentile-specific growth rates computed with both the general Burkinabé CPI and with PCPIs from 1994 to 2003. Figures 2.5 and Figure 2.6 show the same curves separately for urban and rural households. If we first take a look at the GICs, where the general CPI was used to convert nominal into real household expenditure per capita (represented by the grey lines in Figures 2.4, 2.5, and 2.6), we observe that household per capita expenditure increased to a significant extent over the whole income distribution on the national as well as on the rural level but not in urban areas.

Hence, on the national level as well as in rural areas, growth was absolutely pro-poor independent of where the poverty line is set, as both the national and rural GIC is above zero for all percentiles of the expenditure distribution. In contrast, in urban areas growth is only slightly pro-poor up to the 20th percentile, then up to the 80th percentile growth rates are negative but then again positive thereafter. Also, the mean of the percentile-specific growth rates lies above the growth rate in mean for both the national and the rural level, whereas the contrary is true for urban areas. This indicates that national and rural growth (in contrast to urban...
growth) was also pro-poor taking the relative concept of pro-poor growth, i.e. the poor benefited relatively more than the average from economic growth (see also Table 2.3).

Analyzing the growth incidence curves which use PCPIs as a deflator (represented by the black lines in Figures 2.4, 2.5, and 2.6) it can clearly be stated that growth in Burkina Faso between 1994 and 2003 was less pro-poor both in absolute and in relative terms than it was suggested by the CPI-deflated GICs. Among poor households in both rural and urban areas, the percentile-specific growth rates computed with the PCPIs are substantially lower than those computed with the CPI. The difference is, as expected, considerably smaller among urban households and for households at the upper part of the income distribution, reflecting the fact that their specific consumption pattern is much closer to the weights underlying the CPI (Table 2.1).

Moreover, growth in Burkina Faso was not only in absolute but especially in relative terms less pro-poor if the more appropriate PCPIs are applied. With the PCPIs the mean of the percentile specific growth rates lies below the growth rate in mean for national, urban, and rural households. This implies that the poor
benefited relatively less than the average population from growth. This stands in contrast to the empirical results derived with the CPI-deflated GICs, where the poor (at least on the national and rural level) seemed to have benefited more than the non-poor from economic growth (see also Table 2.3).
Table 2.3: Growth Rate in Mean & Mean of Growth Rates

<table>
<thead>
<tr>
<th></th>
<th>Urban</th>
<th>Rural</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPI</td>
<td>(g_\mu)</td>
<td>0.3</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>(g_p)</td>
<td>-0.2</td>
<td>3.5</td>
</tr>
<tr>
<td>PCPIs</td>
<td>(g_\mu)</td>
<td>0.5</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>(g_p)</td>
<td>-0.5</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Source: EPI, EPIII. Computations by the authors.

Notes: CPI: Growth rates calculated with the general consumer price index. PCPIs: Growth rates calculated with percentile-specific price indices. \(g_\mu\): Growth rate in mean. \(g_p\): Mean of percentile-specific growth rates. All growth rates are annual growth rates in household expenditure per capita.

Comparing growth rates in mean and means of percentile-specific growth rates calculated with the general CPI on the one and calculated with PCPIs on the other hand also nicely illustrates that applying the CPI as a deflator to national averages is less problematic than to income level specific growth rates. As expected, growth rates in mean income computed with the CPI and PCPIs are much closer than the means of percentile-specific growth rates (Table 2.3).

If we focus on the shape of the curves, we see that in contrast to the CPI-deflated GICs now all PCPIs deflated curves show a massive ‘up-swing’ of growth rates at the upper-end of the income distribution, implying that, due to their specific consumption pattern, households along the upper percentiles of the income distribution were less affected by the massively increasing food prices between 1994 and 2003, and hence gained in relative purchasing power. This loss of relative purchasing power of the poor is not appropriately reflected in the GICs if the CPI is used as a deflator. 23

23 Note that the use of PCPIs does not necessarily lead to GICs that are less pro-poor than GICs calculated with the general CPI. At least for the case of Burkina Faso, the different inflation rates we could observe across the income distribution were not correlated over time. This means that percentiles which experienced higher than average inflation rates than others in one period (1994-1998) did not necessarily face higher than average inflation rates in the next period (1998-2003).
2.5.3 Triple Decomposition of Poverty

Table 2.4 (a) and Figure 2.7 show the estimates of a ‘triple’ decomposition of poverty changes. As can be seen in Table 2.4 (a) and Figure 2.7, the impact of the ‘poverty line’ component on changes in poverty can be significantly negative (between 1994 and 1998 and between 1994 and 2003) as well as positive (between 1998 and 2003) and might in some cases even outweigh the impact of the growth as well as the redistribution component. This implies that relative price changes were the major force behind the poverty increase which could be observed between 1994 and 1998. In addition, poverty would have decreased by 17.5 percent between 1994 and 2003 if the prices of the goods of the poor had experienced the same inflation rates as the prices of the goods of the non-poor. However, the high relative price shifts offset the positive effects of the growth and redistribution component by 9.2 percentage points (Table 2.4 (a)).

![Figure 2.7: Poverty Decomposition of ΔP0](image)

**Source:** EPI, EPII, EPIII. Computations by the authors.

**Notes:** Illustrated impacts correspond to Table 2.4.

Such a ‘triple’ decomposition seems not only useful whenever the development of the price index specific to the consumption of the poor differs significantly from the development of the general CPI, but also for long term poverty decompositions. Several authors have stated that in the course of economic development it is very unlikely that the poverty line can be kept absolutely constant over time,
Table 2.4: Poverty Decomposition of ΔP0

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔP0</td>
<td>6.3</td>
<td>-14.6</td>
<td>-8.3</td>
</tr>
<tr>
<td>(a) Growth (CPI)</td>
<td>-4.4</td>
<td>-9.0</td>
<td>-12.9</td>
</tr>
<tr>
<td>Redistribution</td>
<td>-2.2</td>
<td>-1.2</td>
<td>-4.6</td>
</tr>
<tr>
<td>Poverty Line (PLPI)</td>
<td>12.9</td>
<td>-4.6</td>
<td>9.2</td>
</tr>
<tr>
<td>Residual</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ΔP0</td>
<td>6.3</td>
<td>-14.6</td>
<td>-8.3</td>
</tr>
<tr>
<td>(b) Growth (PLPI)</td>
<td>8.6</td>
<td>-13.3</td>
<td>-3.5</td>
</tr>
<tr>
<td>Redistribution</td>
<td>-2.3</td>
<td>-1.3</td>
<td>-4.8</td>
</tr>
<tr>
<td>Poverty Line (PLPI)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Residual</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ΔP0</td>
<td>-8.8</td>
<td>-9.9</td>
<td>-18.6</td>
</tr>
<tr>
<td>(c) Growth (CPI)</td>
<td>-4.8</td>
<td>-10.3</td>
<td>-13.4</td>
</tr>
<tr>
<td>Redistribution</td>
<td>-4.0</td>
<td>0.4</td>
<td>-5.2</td>
</tr>
<tr>
<td>Poverty Line (CPI)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Residual</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: EPI, EPII, EPIII. Computations by the authors.

Notes: CPI: consumer price index used as a deflator. PLPI: poverty line price index used as a deflator.

even if the objective is to measure absolute poverty (see e.g. Kilpatrick, 1973; Jäntti and Danziger, 2000). Since even the concept of absolute poverty cannot be seen independently of the social and economic development of a country, significant economic progress usually leads to a real increase of poverty lines. Hence, and for a better understanding of the driving forces behind changes in poverty, it should be useful to include a ‘relative price shift’ or ‘poverty line component’ into decompositions of poverty changes in any case.

Or, to be consistent with the ‘dual’ decomposition methodology, as proposed by Datt and Ravallion (1992), one has to make sure that the poverty line is kept constant in real terms over time, which means that the income variable and the poverty line have to be de- or inflated with the same price index.

This can either be achieved by using the inverse of the implicit inflation rate of the poverty line between \( t \) and \( t + 1 \) as a deflator for the income variable at \( t + 1 \) (Table 2.4 (b)), maintaining the purchasing power of the poverty line but deflating
all incomes with the inflation rate of the poor. Obviously, the change in poverty is the same as in a triple decomposition (Table 2.4 (a)). The growth component of this decomposition reflects the poverty change explained by the growth of the purchasing power of the poor (Table 2.4 (a)). Hence, it captures approximately the growth and the poverty line or price shift component of a triple decomposition.

An alternative is to inflate the poverty line in year $t$ of the base year with the inverse of the deflator which is used to deflate the income variable in year $t + 1$. Table 2.4 (c) shows that if the poverty line is inflated over time with the CPI, we obtain estimated poverty changes which are quite different to the poverty increases or decreases stated with a triple decomposition. This is caused by a change in the underlying real purchasing power of the poverty line, as the CPI often under- or overstates the change in cost-of-living of the poor. Note that in such a dual decomposition the growth and redistribution component are very similar to a triple decomposition, whereas the poverty change captures the ‘real’ change in poverty and the poverty line or price shift component of a triple decomposition.

Both described alternative methods obviously lead to a poverty line component which is equal to zero and hence constitute a ‘dual’ decomposition

### 2.6 Conclusion

As relative price shifts between goods primarily consumed by the poor and goods primarily consumed by the non-poor often constitute an important phenomenon of developing countries, we argued both from a theoretical as well as from an empirical perspective that inflation inequality has to be included in PPG measures.

Since all PPG measures intend to measure the impact of economic growth on the real and not nominal income growth of the poor (often relative to the non-poor), PPG measures should use appropriate and distinctive price deflators for the poor and the non-poor. Hence, we proposed simple methods how inflation inequality can be incorporated into PPG measures.

We further illustrated that these alternative methodologies are not only of theoretical relevance, but that they might also significantly alter our perception of the participation of the poor in economic growth. For the case of Burkina Faso between 1994 and 2003, we showed that ‘ignoring’ relative price changes can considerably bias pro-poor growth measures.
We think that from a methodological perspective, this paper can be a useful contribution to the measurement of pro-poor growth, as the issue of inflation inequality across income groups, although widely recognized, has so far been ignored in these types of dynamic welfare measures. Certainly, one might question whether ‘more than one price index number can be tolerated without confusion’ (Prais, 1958). However, we think that in case of large income (and hence also consumption pattern) disparities, as they persist in developing countries, and in case where we are interested in growth rates across the entire income distribution and not only in the growth rate in mean, ‘complexity’ should rule over ‘simplicity’.

This paper might therefore also add to the extensive literature on whether a ‘plutocratic’ or a ‘democratic’ price index is appropriate for the measurement of wellbeing over time (for an overview see e.g. Ley, 2005). We have shown that even if from a macro-perspective the difference of the two indices might in some cases be rather small (which would justify applying a simpler and more transparent ‘plutocratic’ price index), the difference can still be substantial from a micro-perspective.

From a policy perspective, our findings have clearly shown that only if we consider the changes in the cost-of-living of the poor relative to the non-poor, we appropriately measure how successful countries were in achieving pro-poor growth. In addition, when estimating the pro-poorness of certain policies, besides their impact on economic growth and inequality, their impact on relative price changes should also be carefully analyzed. Last, from an empirical perspective, including the aspect of inflation inequality in PPG measures might also considerably alter the obtained results from cross-country PPG studies.