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ARE WE CONFUSING POVERTY WITH PREFERENCES?

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ABSTRACT

Modifying the national poverty line to the context of observed consumption patterns of the poor is becoming popular. A context-specific poverty line would be more consistent with preferences. This paper provides theoretical and empirical evidence that the contrary holds and that the national poverty line is more appropriate for comparing living standards among the poor, at least under prevailing conditions in Mozambique and Ghana. The problem lies in the risk of downscaling the burden associated with cheap-calorie diets and the low nonfood component of the rural poor. The paper illustrates how observed behavior may neither reveal preferences nor detect heterogeneous preferences among the poor. Rather, the consumption pattern is the upshot of the poverty condition itself. Poverty is confused with preferences if observed cheap-calorie diets are seen as a matter of taste, whereas in fact they reflect a lack of means to consume a preferred diet of higher quality, as food Engel curve estimates indicate. Likewise, a smaller nonfood component is not a matter of a particular distaste, but an adaptation to the fact that various nonfood items (such as transport) and basic services (such as electricity and health) are simply absent in rural areas.

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Are We Confusing Poverty with Preferences? *

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1 Debate on poverty lines

Recent evidence for Mozambique has re-opened the debate on the choice for a poverty line suitable for national poverty assessments (MPD-DNEAP, 2010; Arndt and Simler, 2010; Boom 2011; Alfani et al 2012; Boom et al., 2012). The choice is between a single national poverty line and a context-specific poverty line (CSPL) that is adapted to locally observed consumption and price patterns.

Whether a national poverty line or a CSPL is the preferred approach is an important question, because opting for either of the two tends to have important implications for poverty assessments and targeting. For example, in a seminal article on the subject for Indonesia, Ravallion and Bidani (1994) compare a CSPL that is adjusted to rural and urban consumption with a national line that is the same for rural and urban poor alike. Among others, they find that rural poverty exceeds urban poverty under the national poverty line (respective headcount of 24% and 11%) but, surprisingly, the rural-urban gap completely disappears under the context-specific poverty line. Rural poverty even becomes lower than urban poverty (respective headcount of 14% and 17%), an effect due to a far higher urban poverty line. A similar drastic impact is found in a recent paper on Congo, where the comparison of a national line with a CSPL implies: "*instead of being twice as high, the welfare level of urban dwellers seems to be barely 6 percent higher on average compared to the welfare level of their rural compatriots*" (Marivoet and De Herdt, 2103:19).

By the same token, trends can be extremely responsive to the poverty line. For example, using a CSPL that is adapted to the consumption and the prices in 13 different regions of Mozambique, the reduction of poverty in during 1997-2003 and 2003-2009 is entirely concentrated in the first period with a spectacular decrease from 70% to 54%, while there is a slight upward trend in poverty in the second period, with a small and fluctuating urban-rural gap of 10, 4 and 7 percentage points in the respective years 1997, 2003 and 2009 (MPD-DNEAP, 2010). Under a national line, poverty came also down in the first period, though less spectacularly from 70% to 61%, while continuing to decrease to 57%, with a large rural-urban gap that shows a consistent decline from 34 to 31 to 26 percent points in the respective years (Boom et al., 2012).

The appeal of a CSPL is that it may accommodate for substitution behavior and heterogeneity of preferences. In standard microeconomics, a household can adapt to the price vector by substituting away from expensive items in an effort to maintain the same utility (revealed preferences). Likewise, two households with the same preferences can consume different bundles in response to local market

conditions and still be equally well off. By the same token, utility equivalence under heterogeneous preferences implies that a household with a taste for relatively cheap items needs less money than a household with a taste for relatively expensive items.

The issue whether adjustments to observed consumption and price patterns are improving the utility-consistency of a poverty line, rests on the fundamental premise that an income at the poverty line should bring all households to the same minimum standard of living. In a case study, Ravallion and Lokshin (2006) question the utility consistency of Russia's official poverty lines, using a test based on revealed preferences. The test aims at verifying the existence of a scalar correction that can equalize baskets in terms of utility, but warn that "*there is no guarantee that such a scalar adjustment exists*".

The concept of a utility-consistent poverty line is theoretically straightforward, its construction though remains an intricate matter in practice. The complication arises from two angles. On the one hand, consumption and price pattern for market goods (basic food) may fail to detect poor people preferences because the observed differences may be associated to the poverty condition itself rather than with substitution or heterogeneity. In other words, as argued by Ravallion and Lokshin (2006), one would need a strong *a priori* presumption that basic needs vary across the poor. On the other hand, non-market goods (basic services) are difficult to account for, because observations often reflect prohibitive cost or rationed access for which imputed prices, if any, have a large margin of uncertainty. As Hentschell and Lanjouw (2000) show for the case of Ecuador, the inclusion of the implicit cost of basic services in the poverty line has large effects on the poverty incidence, notably in terms of a sharp widening of the urban-rural gap.

From a more empirical angle, there is a trade-off between the potential advantages of a CSPL and the robustness of a national poverty line. While revealed preference theory offers testable implications on utility-consistent choices by a single household, it remains challenging to find two relevant basic needs bundles on the same utility-compensated Hicksian demand function. Moreover, the validity of the test hinges on the coverage and accuracy of reported consumption and prices. Among the factors that may cause a bias are the changes in recall period and in measurement units, the seasonality of data collection, and the changes in the level of aggregation in the commodity list (Pradhan and Raballion, 2000; Deaton and Kozel, 2004; Capéau and Dercon 2006; Beegle et al., 2012).

In this paper we investigate the choice of a poverty line for national poverty assessments and provide novel arguments and evidence that the move from a single national line to a CSPL comes at a

considerable risk. First, in section 2, we consider a food poverty line for households with a taste for variety but facing dilemmas in opting for a diet that meets its calorie requirements in full compliance to that taste. Within the confines of given calorie requirements, we subsequently discuss the adaptation of a chosen diet to the price vector (revealed preferences) and to local tastes (heterogeneous preferences). We will conclude that observed behavior may neither reveal preferences nor detect heterogeneity among the poor. Section 3 extends the analysis in order to include the use of non-food and basic services, focusing on the urban-rural dimension of utility equivalence under an implicit price vector that is driven by rationed supply. The results in sections 2 and 3 urge caution on the use of a CSPL for national poverty assessments and, in section 4, we illustrate this with evidence from Mozambique and Ghana. In the penultimate section, we briefly discuss the broader social-choice argument against the adaptation of a poverty line to individual preferences. Section 6 concludes.

2 The food poverty line

Food is by far the most important consumption category of the poor, covering three-quarters and more of their total expenditures (see Banerjee and Duflo, 2007, inter alea). Ideally, the construction of a food poverty line requires the fulfillment of both utility maximization conditions and minimum calories intake criteria. In this section, we show the intricacies involved for the two to be at par. In terms of utility, a household opting for a diet composed mainly of cheap food items can hardly be compared with a household opting for a diet with similar calorie contents but more variety and more expensive items in it. We argue that the fact that poor households tend to opt for cheaper calories has to do more with their need to meet a calories requirement than with their preferences for the chosen food basket.

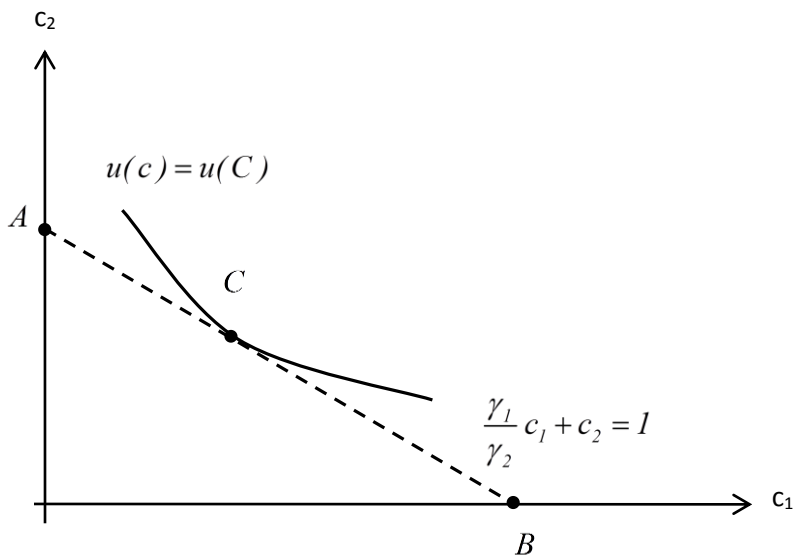
2.1 Mono-diet and most-preferred-diet

Consider a simple illustrative model of the food consumption of a poor household. Its diet is composed of two types of food, one luxury food c_1, say filet, and one staple food c_2, say cassava or millet. Both types of food will be of interest, also to the poor, although the staple food has a much higher caloric content per unit, $\gamma_2 > \gamma_1$, where for convenience we set the quantity of the staple food c_2 such that one unit is precisely sufficient to fulfill the calorie requirements. For example, $\gamma_2 = 2000$ Kcal reflects a level close to the minimum calorie requirements per capita per day of a typical poor household.[1]

[1] Household energy requirements are commonly based on a requirement of 3,000 Kcal for an 18 to 35 years old male and applying an adult equivalent scale for other household members (James and Schofield, 1990). The equivalent

The various possible diets, their calorie contents and their corresponding utility are illustrated in Diagram 1, where the dashed line is the diets that exactly meet the calorie requirement and the indifference curve corresponds to the utility level that corresponds to point C, the most-preferred-diet. The mono-diet composed of the staple food only is represented by point $A=(0,1)$ on the y-axis, while point C will include both staple foods and more luxury foods on the x-axis. The latter are generally the more expensive sources of calories, but this will be of later concern. At this point of the argument, only calories matter and the budget plays no role

Diagram 1: 2,000-Kcal mono-diets and 2,000-Kcal most-preferred-diet of the poor



The diagram reflects the idea that households try to meet their calorie requirement, while in addition, striving for a balanced, healthy and tasty diet. In the case depicted, the 2,000 Kcal diet that is best for the household can be identified as follows.

Assumption 1 (taste for variety)

Utility function $u: R^2 \rightarrow R_+$ is increasing, differentiable and strictly quasi-concave, while

$$\frac{\partial u / \partial c_1}{\partial u / \partial c_2} > \frac{\gamma_1}{\gamma_2}$$ for the mono-diet at point $A=(0,1)$.

scale typically averages around 0.7, implying a per capita calorie per day requirement of around 2,100 Kcal. For illustrative purposes we use 2,000 Kcal, but in the empirical part we use more the accurate estimates.

This is a common assumption for preferences. Increasingness is self-evident, differentiability implies that there exists a marginal rate of substitution between the two types of food, while strict quasi-concavity reflects the idea that this substitution rate increases along an indifference curve. Finally, the slope condition states that the substitution rate at the 2,000 Kcal mono-diet of the staple food exceeds the calorie rate. It reflects that households have a taste for variety to meet their calorie requirements.

Proposition 1 (most-preferred diet of the poor)

Consider a household choosing a diet $c^{\bullet}$ that maximizes its utility subject to the calorie-constraint only. Under Assumption 1, the optimal diet is unique and has both types of food in it.

Proof

The result follows from the necessary and sufficient first-order conditions that solve the model at hand: $maximize_{c \geq 0} \quad u(c) \quad subject\ to \quad \frac{\gamma_1}{\gamma_2} c_1 + c_2 = 1$. Convex programming tells us that a strict quasi-concave function attains a unique maximum, while the chosen diet will also be an interior point because of the slope assumption at the mono-diet. The unique most-preferred diet follows from solving the two equations $\frac{\partial u(c^{\bullet}) / \partial c_1}{\partial u(c^{\bullet}) / \partial c_2} = \frac{\gamma_1}{\gamma_2}$ and $\frac{\gamma_1}{\gamma_2} c_1^{\bullet} + c_2^{\bullet} = 1$.

□

The proposition simply states that, under general conditions, households have a most-preferred-diet and that this most-preferred-diet will always be a mix that contains both staple and luxury foods, rather than a mono-diet of the staple food.

2.2 Response to the food budget

Relatively rich households may be at liberty to compose their diet in this manner without being too concerned with their food budget, but the poor definitely are not. Their cash income will be too low to buy the diet that they would prefer, and they will not have the means to produce this diet themselves and auto-consume it.

Therefore, let us see what happens after introducing the budget. We let $p = (p_1, p_2)$ be the price vector for the two types of foods and consider situations in which the staple food on the y-axis is the cheaper source of calories and the luxury food on the x-axis provides more expensive calories. In other words, we will assume that the calorie-ratio exceeds the price-ratio.

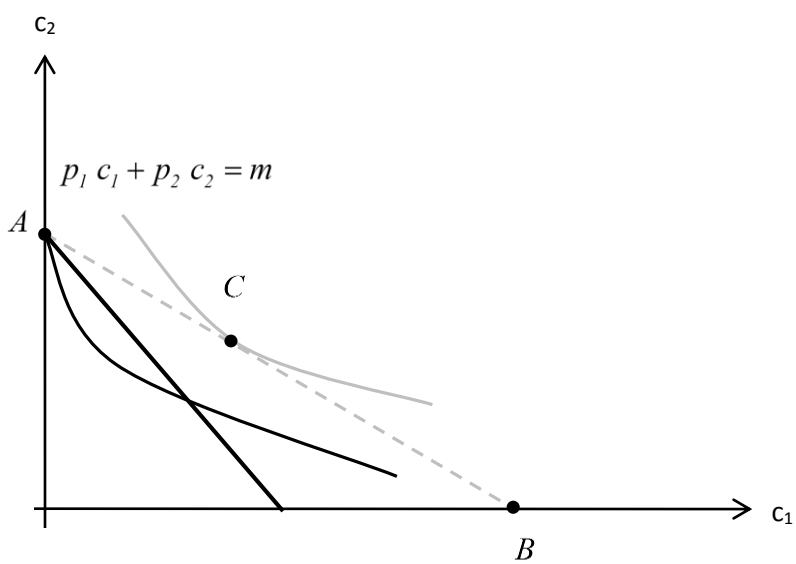
Assumption 2 (high-caloric food is relatively cheap)

$$\frac{p_1}{p_2} < \frac{\gamma_1}{\gamma_2}$$

This is a plausible assumption for broad categories of food items, say, calories from roots are cheaper than those from cereals, which are cheaper than those from meat, which in turn are cheaper than those from fish. For individual within-category items, the cheaper and more expensive sources may change position, but, for the poor, such within-category substitution is of far less importance than the between-category substitution (e.g. Subramanian and Deaton, 1996). Even so, as is apparent from Annex 1, the assumption generally holds through in practice, even at the level of individual food items.

The food budget is denoted by *m* and we start from a candidate food poverty line that would exactly suffice for the household to buy its 2,000 Kcal requirements from the cheapest source, see Diagram 2.

Diagram 2: Mono-diet food poverty line



This is the solid line with $m = p_2$ and reflects the situation that the household has no other option than to buy the mono-diet $A=(0,1)$, irrespective of the shape of its utility function and unless it decides to starve by not meeting its energy requirements. Furthermore, in the case depicted, the price ratio exceeds the rate of substitution of filet for cassava at the mono diet: $\frac{\partial u(0,1)/\partial c_1}{\partial u(0,1)/\partial c_2} < \frac{p_1}{p_2}$. This latter assumption avoids the situation that the calories from filet are excessively expensive to the extent

that the household lacks any room for maneuver towards a mixed diet when its food budget would increase beyond $m = p_2$.

Diagrams A.1 to A.3 in the annex illustrate what happens when m gradually increases until the level that would allow the household to buy its most preferred diet (point C in Diagram 1). The corresponding proposition is as follows.

Proposition 2 (food poverty line)

Consider a household choosing a diet that maximizes its utility subject to a food budget m and a calorie requirement of 2,000 Kcal and suppose that the food poverty line is set at level m. Under Assumptions 1 and 2:

1. The mono-diet food poverty line $m = p_2$ is the absolute minimum; starvation will occur below that level.

2. At food poverty line beyond $m > p_2$, the diet is still driven by calorie concerns (Annex, Diagram A.1), until the utility-consistent food poverty line is reached (Diagram A.2, see also Diagram 3).

3. Above the utility-consistent food poverty line, households can start to reveal preferences. For example, at the most-preferred-diet food poverty line $m = p\ c^{\bullet}$, households will not opt for point C but rather substitute some expensive calories for cheaper ones in order to reach a diet above 2,000 Kcal (Diagram A.3).

Proof

(1) Follows directly from assumption 1. (2) A slight income increase $m > p_2$ will move the budget line to the right and thereby create a feasible space beyond the mono-diet. In Diagram 2 this space will be a triangle above the mono-diet, between the calorie line and the budget line. Because of its taste for variety, the household will move as far as possible to the right along the calorie line, as long as $\frac{\partial u(c_1,c_2)/\partial c_1}{\partial u(c_1,c_2)/\partial c_2} < \frac{p_1}{p_2}$ continues to hold. As long as this is the case, households' main concerns are calories and variety of the diet and their observed behavior is irrespective of possible heterogeneity of preferences. With a further increase of the food budget, the household will reach a point on the calorie line where $\frac{\partial u(c_1,c_2)/\partial c_1}{\partial u(c_1,c_2)/\partial c_2} = \frac{p_1}{p_2}$, i.e. where the poverty line is utility consistent. (3)

Beyond utility-consistent poverty line, preferences start to take over the leading role of the calorie constraint. For the given price vector, calories are no longer binding. Only income matters and, in a sense one might say that the household has started to escape from poverty in terms of being able to express preferences independent of calorie requirements. As Diagram A.3 illustrates, a further income increase will no longer result in a mere move along the calorie line with expensive calories replacing cheap ones. Instead, the household will follow its preferences and increase the total amount of calories with some substitution of cheap for expensive calories. It is only when the poor reach a certain income that the feasible space expands sufficiently for preferences to play a role in the choice of the diet.

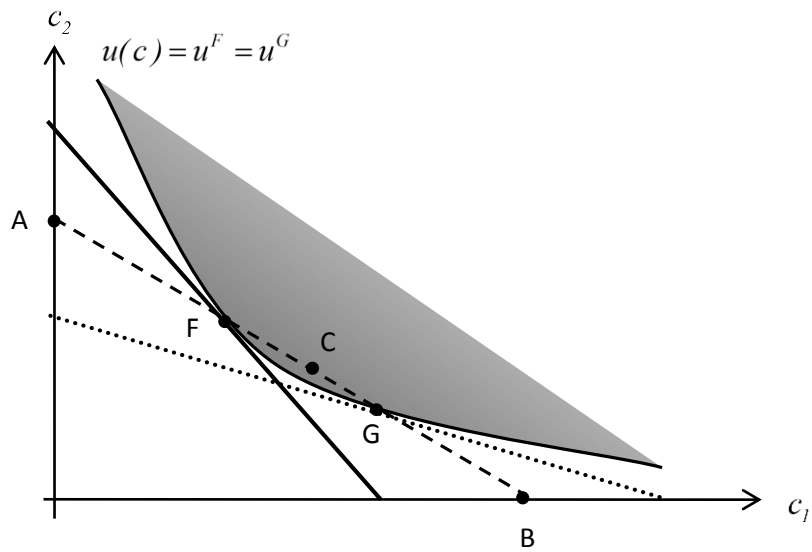
The proposition implies that due to the taste for variety, there is a range of diets with the same food poverty line for all households, notwithstanding the possibility that preferences are heterogeneous. The range starts with the mono-diet of the cheapest source of food and continues until the point that households start to opt for more calories than they need.

This argument is much in line with recent evidence from India, which shows that people do have heterogeneous preferences for certain food, notably culturally, but also that the effect of heterogeneity greatly reduces as poverty comes into play (Atkin, 2013). In particular, although migrants are generally prepared to buy more expensive calories at the expense of total calories consumed, this effect diminishes over time and is completely non-significant in the lowest expenditure quintiles.

2.3 Response to the price-vector (revealed preferences)

Assumptions 1 and 2 have more implications that are worth emphasizing. First, every 2,000-Kcal diet to the upper left of the most-preferred diet at point C has a lower utility. As a diet moves from point C towards point A, the utility gradually decreases due to a decrease of the quality or, for that matter, a concession to the household's taste for variety. A second notable feature is that, corresponding to given relative prices, there can only be one single utility-consistent food poverty line (the solid line in Diagram 3 below, with a corresponding diet at point F). It must be noted though that this diet will have a lower utility than the most-preferred-diet, because it is adapted to the fact that calories from the low-caloric food are more expensive. Hence, point F is on the upper left of point C. Last but not least, the adaptation mechanisms imply that a 2,000-Kcal food poverty line will lose its utility consistency under a change of the relative price. In fact, a lowering of utility will emerge under an increased price of the expensive source of calories, while the 2,000-Kcal food poverty line will give a higher utility if the price of expensive and tasty sources of calories declines.

Diagram 3: Impossibility of two 2,000-Kcal poverty lines when high-calorie food is cheaper



This also leads to an interesting observation regarding the possibility to observe two points with the same utility, points F and G in Diagram 3. Clearly, this would require an inversion of the price vector with the expensive and the cheap food interchanging position, which is in contradiction with Assumption 2. In other words, a household that has to accommodate its calorie-constraint under a given budget will opt for bundle *F* and a change to bundle *G* cannot be observed because of an unrealistic inversion of the price vector. It appears impossible to observe two utility equivalent bundles on the same calorie line. This also implies that in the prevailing case of two types of food, different diets will reflect different levels of utility, albeit under homogeneous preferences.

The underlying premise here is that two basic diets are of similar quality when they have a similar balance between expensive foods (x-axis) and cheap foods (y). So even to the extent that the poor have heterogeneous taste for basic foods, they tend to consume a similar low cost diet on the calorie-line, starting from the mono-diet of the cheapest source of calories (point A) and trying to move towards expensive calories (point C) as soon as they can afford them.

2.4 Response to local tastes (heterogeneous preferences)

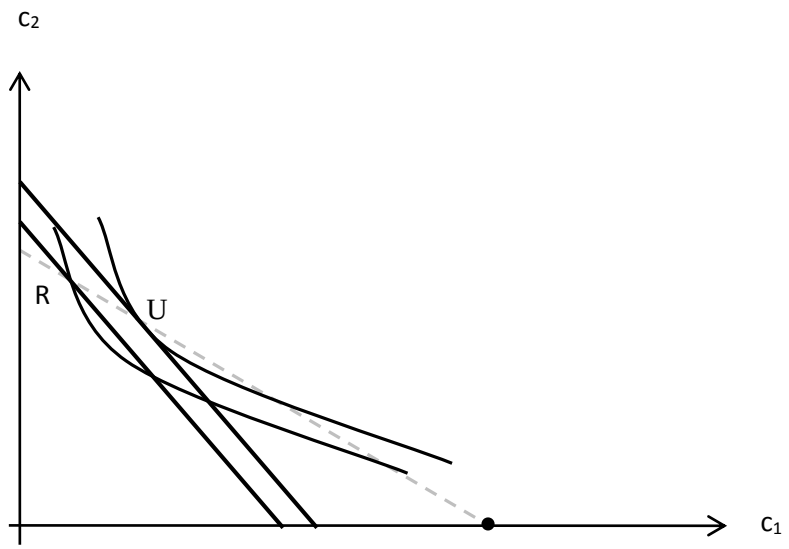
From the previous section, we can conclude that until a certain income is reached all observed choices of the poor are identical irrespective of their preferences. Under homogeneous preferences, the food poverty line that is utility-consistent would be the same for everyone, say m^* and a test of revealed preferences appears void under Assumptions 1 and 2 (see Diagram 3 above).

Yet, under heterogeneous preferences, households may have their own specific poverty line. Suppose that these lines can be ordered such that $p_2 \leq m_1^* \leq m_2^* \leq ... \leq m_N^*$, where the successive households have an increasing taste for the expensive food (filet). Now, our story about identical behavior continues to hold until the lowest food budget m_1^*. Until that level, nutrition rather than preferences drive the choices of all households. At the other end of the scale, when income exceeds m_N^*, the calorie constraint loses its significance for all households, which brings us back into standard micro-economics and away from the realm of the nutrition-poverty nexus. Under heterogeneous preferences $m_N^* > m_1^*$ and how to interpret moves along the calorie line towards a more balanced diet become problematic. The observed behavior can be either due to preferences or to poverty, depending on whether the household has already reached its individual threshold. Below the threshold, diet choices are driven by calories, while above the threshold preferences come into play.

Because of these intricacies to detect heterogeneity of poor households' preferences over basic foods, one may question the pitfalls that may arise if heterogeneity is assumed while homogeneity holds true or vice versa.

Suppose that preferences for basic foods are in fact homogeneous, but assumed to be heterogeneous, the latter resulting in the application of a different food poverty line. Until the point where calories loose significance, actions are all driven by the same poverty condition, but the observed choice for relatively cheap calories is interpreted as a taste preference for cassava. Conversely, an observed diet with more filet would be mistakenly interpreted as a taste preferences for expensive calories. In effect, application of a context-specific food poverty line would lead to an inconsistent poverty ranking. This is illustrated in Diagram 4, where the point R represents the diet of a rural household, while U is the observed diet of an urban household. Now, assume that neither ot the two household has reached budget m^* at which their preoccupation with calories comes to an end. If the two diets are seen as the result of heterogeneous preferences, the urban dweller will be given a higher food poverty line, although in fact the rural poor might be in equal need. In other words, assigning a poverty line that is adapted to observed consumption patterns will correspond to lower living standards in rural area, at odds with the basic premise that a poverty line must correspond to the same utility.

Diagram 4: Food poverty lines under homogeneous preferences, when heterogeneity is assumed



Conversely, what bias will occur if one assumes homogeneous preferences for basic foods, while in in fact they are heterogeneous? Considering again the case of a common food poverty line below the point where calories start to loose significance for the household with the biggest taste for the cheap source of calories, say the rural household. In that case, the application of the food poverty line for urban and rural households alike still leaves both of them poor in the sense that calorie concerns are dominating the choice of their diet. Nonetheless, mistaking heterogeneous preferences for homogeneous ones will render the rural poor at an advantage in terms of utility-equivalence.

It is difficult to say which of these two errors in composing a poverty line is the more serious one. What can be said though is that the inference of heterogeneous preferences for basic food based on observed heterogeneity of chosen diets amongst the poor is cumbersome. As long as nutrition concerns are predominant rather than tastes per se, it is hard to find strong evidence for heterogeneous preferences.

In this context of our example, one may note that heterogeneous preferences for food would translate themselves in a taste for relatively cheap calorie-rich food products in rural area as compared to an urban taste for relatively expensive low-calorie foods. Intuitively, as also argued in the seminal article by Ravallion and Bidani (1994), one would expect that the rural poor would be happy to change their

2,000 Kcal diet for the corresponding urban diet, because the inclusion of more expensive sources of calories in the urban diet is quite likely to add both quality and taste to the food.

3 Basic services and the implicit price-vector between food and non-food

So far we have focused on the food poverty line and employed real expenditure, making the food poverty line dependent on relative prices only. In different locations relative food prices are often quite similar (see Annex, for example), but price levels are not. Notably, the urban food price level tends to be higher than the rural one. Therefore, adjusting the nominal food poverty line to the price level implies an urban food poverty line that exceeds the rural one, albeit relative prices are the same, say, calories from cassava are ten time cheaper than filet in both urban and rural areas.

The final step in constructing a basic-needs poverty line is to incorporate basic services. Though food is the most important component and makes up the lion's share of expenditure of the poor, services like health, education, electricity and drinking water are also important components. As regards their contribution to the poverty line, we focus on the role of the rural-urban price vector for basic foods vis-à-vis basic services.

Unlike food prices that are generally lower in rural areas, the costs of basic services may be expected to be much higher in rural areas than in urban areas. For example, remoteness of health facilities and the poor condition of the roads imply costs for health services in terms of time, transportation and money that are often prohibitive. Also, the absence of electricity makes it more costly to process food and to store medication. Likewise, schooling is much less accessible in rural areas, impeding among others on the knowledge about nutrition and healthy diets.

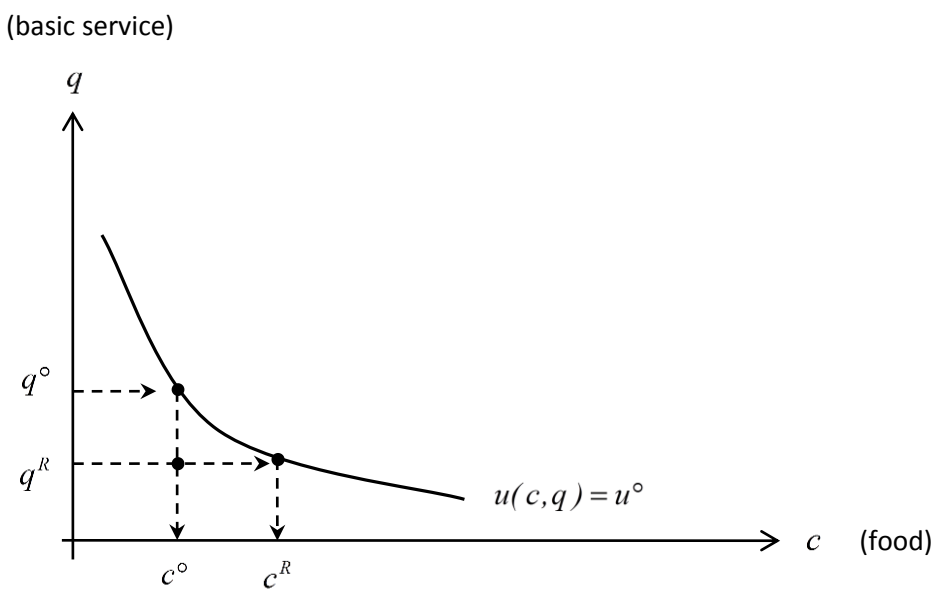
A main difference between basic foods and basic services is that food can usually be bought in markets, while for basic services this is an exception. The actual consumption is mostly driven by rationed access, making the price difficult to impute. Many basic services are hardly available and scarcely used in rural areas, while the use in urban areas is only partly observed and against user prices that are often only a fraction of the full cost.

In the literature, the topic of including basic services in the poverty line seems somehow underrated, possibly because of the challenges to measure the actual consumption and to impute appropriate

prices.[2] The problems involved in the valuation of non-market goods leave unaffected the importance of this consumption category for the living standard and for utility-consistent poverty comparisons.

The issue is illustrated in our final Diagram 5, which as before describes a stylized situation. The diagram describes the implicit trade-off between food consumption c (market goods) and basic services q (non-market goods). The variable c is now interpreted as an index of the two food categories in the previous graphs (c_1, c_2) and accordingly a food price that is an index too.[3] A household lives in either of two environments, the city or the village. For the rural poor, food is cheaper but the provision of basic services is lower in the village than in the city.

Diagram 5: Poverty under rationed basic service provision



The diagram depicts an indifference curve of the poor, consisting of combinations of basic foods and basic services that give a similar minimum standard of living. As before, the curvature reflects the gradual increasing rate of substitution, in this case the substitution of basic foods for basic services.

[2] Hentschell and Lanjouw (2000) is one of the few papers that include basic services in household expenditures. Using survey data from Ecuador, they adjust water and electricity expenses using imputed prices and imputed consumption levels and find a large effect on the poverty incidence. The extreme poverty rate drops by almost 20 per cent points (op. cit. Table 3), an effect that is largely due to a lowering of urban poverty.

[3] In this manner, the utility function takes a nested form, for example, a Gorman Polar Form (Gorman, 1961).

One way to look at the issue at stake is to look at the implicit pricing of basic services. Such implicit prices could be depicted by drawing the tangent to the indifference curve at the respective urban and rural points $(c°,q°)$ and (c^R,q^R). These tangents reflect the implicit price vector that the poor attach to the basic service at the respective level of food consumption.

By way of an illustration, consider a situation where urban food is twice as expensive as rural food: $(p°,p^R)=(2,1)$. At the same time, let us assume that the level of basic service provision to the rural poor is only half of that to the urban poor: $(q°,q^R)=(1,\frac{1}{2})$. Finally, we let the households have a Cobb-Douglas utility function $u(c,q)=c^{\beta}q^{1-\beta}$ with $\beta=\frac{1}{2}$ and we take $u°=4$ as the minimum standard of living.

In this setting the implicit price of basic services will be 2 in the city and 4 in the village, respectively and the implicit poverty line will equal $m=4$ in both rural and urban areas.[4] Hence, the village environment is characterized by a low food price and a high price for basic services, while the opposite holds in the city. The corresponding threshold for urban poverty would be $(c°,q°)=(1,1)$, while the rural poverty threshold is characterized by relatively high food consumption but few basic services $(c^R,q^R)=(2,\frac{1}{2})$.

This numerical calculation with food twice as costly in cities and basic services twice as costly in villages is not taken from reality. Nevertheless, it might not be too far from it. For example, in Mozambique, the cost of a calorie ranges between less than 2 MT in rural areas in the northern provinces to more than 5 MT in the southern cities (Maia and Van den Berg, 2010). Also, whereas health facilities are nearby in all cities, in rural area people must often walk for miles to consult a doctor or receive treatment, while even the nearest safe drinking water can be far away.

As a final remark, we note that the numerical example is illustrative of the risk associated to a context-specific approach to poverty assessment. In this particular case, an approach that tries to adapt to observed consumption patterns would be tempted to scale down the food component in the rural poverty line and to scale up the non-food component in the urban poverty line. As a result, a higher

[4] When the food prices are given, the implicit prices of the basic services follows from the rate of substitution in the two respective points.

urban poverty line and the lower rural poverty line emerge, which would violate utility-consistency in Diagram 5, and may lead to a gross underestimation of poverty in rural areas.

In short, we conclude that the construction of a poverty line is plagued by inherent utility-consistency problems. In this section we argued that, due to rationing of basic services, the identification of thresholds for basic services jointly with thresholds for basic foods is an intricate matter. In the previous section we indicated that it is equally intricate to find different food bundles that give the same nutrition and the same utility level to households, whether it be over time (revealed preferences) or between locations (heterogeneous preferences).

4 Evidence from Mozambique and Ghana

The results of sections 2 and 3 signpost that a context-specific *food poverty line* might downscale the burden associated to low quality food, while a context-specific *overall poverty line* might downscale the burden of unavailable basic services. Therefore, after an evaluation of the intricacies involved in constructing a (food) poverty line, we proceed with the empirical testing of the arguments with survey data from Mozambique and from Ghana.

First, to highlight the significance of quality vis-à-vis quantity of foods, we estimate food Engel-curves, disentangling the calories from their price and looking at diets between 1,000 and 2,500 Kcal per capita per day. Next, to explore the extent to which relatively low prices of basic foods in rural areas might phase out with relatively high (implicit) prices of basic services, we compare poverty patterns under a national poverty line with the patterns that emerge under an urban-rural poverty line and we briefly look at the effects of adding specificity to the poverty line beyond adjustments to rural-urban consumption and price patterns.

Data and poverty line

We employ data from large-scale household surveys in Mozambique and Ghana and refer to INE (1998, 2004, 2010) and to GSS (2014) for a detailed description. For the respective country and the respective years, we list - in Table 1 - the key variables for assessing the diets and the poverty patterns.

Table 1: Selected food consumption and poverty variables, Mozambique 1997-2003-2009 and Ghana 2013 (weighted average[5])

	MOZAMBIQUE			GHANA
	1997	2003	2009	2013
expenditure per capita per day (Metical or Ghana Cedi)	5.52	11.13	23.81	6.07
poverty line (Metical or Ghana Cedi)	5.34	8.47	18.41	2.74
food poverty line (Metical or Ghana Cedi)	4.08	6.02	13.55	1.65
food required per capita per day (1000 Kcal)*	2.154	2.132	2.113	2,258
food consumption per capita per day (1000 Kcal)	1.900	1.739	1.737	3.837
calorie cost (Metical or Ghana Cedi per 1000 Kcal)	2.20	4.48	8.27	0.72
household size	4.84	4.79	4.69	4.05
household adult equivalent scale*	0.68	0.71	0.70	0.76
food in total consumption (%)	56	47	45	49
homegrown in total food (%)	n.a.	46	48	18
children stunted (% of under-fives with HAZ<-2)**	49	41	44	28
household head can read and write (%)	48	49	52	61
household has safe drinking water (%)	7	17	14	59
house has toilet or latrine (%)	37	45	51	81
house has solid roof (%)	18	24	30	86
population below national poverty line (%)	70	60	56	25
urban population (%)	22	32	31	51
sample size (number of households)	7,912	8,461	10,516	16,014

Source: authors computation from INE (1998, 2004, 2010) and GSS (2014).

* Requirement are computed from a gender and age specific equivalent scale for calorie needs of each household members, based on 3,000 Kcal for a 18 to 35 years old male (James and Schofield, 1990).

** Stunting figure for Mozambique 2003 is taken from INE-MdS (2005) and for Ghana from GSS-GHS (2009).

[5] The sampling of the surveys follow a similar stratification of households with one stratum for each province (Mozambique) or region (Ghana) and a further rural-urban stratification within these strata. Application of Census weights (household or population weights) ensures that the sample averages are passable indications of the true average for the respective groups and for the population at large.

The table partly reflects that the two countries are at different stages of development. This is hardly surprising because Ghana enjoys a per capita GDP of about $1,800, three times higher than that of Mozambique (World Bank, 2014). Households with expenditure levels below the national poverty line harbor one-quarter of the Ghanaians as compared to more than half of the Mozambicans. By the same token, child malnutrition is much lower in Ghana (28% stunted in 2008 as compared to 44% in Mozambique 2009).

Yet, both countries also share common challenges, as for example the low literacy rates of the household heads indicate. Likewise, the share of food in total expenditures is close to one-half in both countries and reflects food-based economies. Furthermore, the much higher dependence on homegrown foods in Mozambique (61% of the food as compared to 18% in Ghana) reflects the prevalence of rural conditions. Almost 70% of the population of Mozambique lives in rural areas as compared to less than 50% in today's Ghana.

The differences in food availability are also noteworthy. At an estimated consumption of slightly less than 1,750 Kcal per capita per day, food appears very scarce in Mozambique, even after accounting for underreporting (Alfani et al, 2012). On the contrary, food consumption in Ghana seems rather abundant at an estimated average of slightly more than 3,800 Kcal per capita per day, although here over-reporting may be an issue (GSS, 2014).

The food poverty line in the table is an estimate of the level of expenditure per capita per day that the household needs to meet the food requirements of its members, correcting for equivalence scales. The corresponding calorie cost concerns an average diet at the median price per calorie. Of course, because food consumption baskets are quite diverse in the various population groups and also the prices of foods differ at different locations, the actual cost of the observed diets shows a wide range.

The food poverty line is composed as follows. Letting q_k be the amount calories that the k-th food item contributes to given requirements q_{food} with the corresponding price per calorie p_k (Annex 1), the food line equals:

$$y_{food} = \sum_k p_k q_k = p_{food} q_{food}, \qquad (1)$$

where p_{food} is the calorie cost of the diet (see Table 1).

To arrive at the poverty line, an allocation has to be made for non-food expenditure. In both countries this is done based on the typical share of non-food expenditure of households who are close to the food poverty line. The idea is that at this expenditure level, non-food enters as a basic need, because it competes directly with food itself. Hence, the poverty line can be written as:

$$y_{poverty} = (1+\theta)\, y_{food}, \qquad (2)$$

where θ is the share of basic non-food expenditure.

Looking at the topping up in the two countries, non-food expenditure in Ghana adds two-thirds to the food poverty line and in Mozambique only around one-third (+31, +41, +36% in the respective years 1997-2003-2009). Also here, notable differences occur when looking at the actual shares of non-food expenditure across population groups.

Because observed consumption patterns might reflect preferences or an adaptation to changing prices, one may consider a CSPL, say one poverty line for a rural context and one for an urban context. The fact that the Mozambique survey makes a distinction between 40 basic foods, while the Ghanaian diet is based on 73 foods, offers a window of opportunity to modify the food poverty line. A common upward (downward) adjustment of the urban (rural) food poverty line adjusts for higher (lower) food prices and, possibly, also for urban (rural) preferences for relatively expensive (cheap) foods. The allocation for non-food also usually involves an urban bias, in response to the fact that expenditures for clothing, housing, transport, etcetera are much more common in the cities.

For the purpose of the paper, the urban-rural poverty line is constructed as an adjustment of p_{food} for rural-urban difference in the median calorie cost of a typical diet of the poor, while keeping similar non-food share θ for urban and rural households alike. Adding further specificity by lowering (expanding) non-food share θ in rural (urban) area and by adapting to the calorie cost in the various provinces or regions has also been done, in an attempt to see how adding more context-specificity changes the picture. The resulting details of the CSPL from national to urban-rural to spatial domains are given in Annex 3 and shows that urban lines (Accra; Maputo) exceed rural lines (Upper West; Rural Zambezia and Nampula) by a factor 2 to 3.

Quality vis-à-vis quantity of foods: Flat calorie Engel-curves and elastic calorie prices

Before turning to the poverty patterns corresponding to a different poverty line, we consider the issue of food quality through estimation of food Engel curves. We employ a double-log model and

decompose the impact of expenditure y on the calories q and on the cost p of calories as in Subramanian and Deaton (1996). In other words, specifying the food demand curve as $p\,q = a\,y^{\varepsilon}$, we estimate:

$$\log q = \log a_q + \varepsilon_q \log y \qquad (3)$$

$$\log p = \log a_p + \varepsilon_p \log y,$$

where $a_p\, a_q = a$ and $(\varepsilon_p + \varepsilon_q) = \varepsilon$ constitute the shifter and the elasticity of the food demand curve.

The regression results for three years 1997-2003-2009 of the Mozambican survey and for the Ghana survey 2013 are presented in Table 2. In avoidance of the potential bias due to underreporting in Mozambique and over-reporting in Ghana, we focus on the diets between 1000 and 2500 Kcal per capita per day. This subsample includes households with severe food constraints (less than half of requirements) up to a level where calories are no longer a main concern (20% above requirements).

Table 2: Calorie Engel curve and income elasticity of calorie cost , Mozambique 1997-2003-2009 and Ghana 2013

	MOZAMBIQUE			GHANA
	1997	2003	2009	2013
National				
a	0.88 (99)	1.19 (79)	1.68 (65)	0.74 (157)
ε	0.79 (137)	0.71 (119)	0.66 (125)	0.53 (100)
ε_q	0.06 (12)	0.06 (11)	0.08 (18)	0.09 (18)
ε_p	0.73 (113)	0.65 (104)	0.57 (107)	0.44 (82)
R^2	0.80	0.71	0.66	0.63
Sample size	3596	4059	5229	4466
Rural				
a	0.85 (77)	0.97 (52)	1.05 (44)	0.72 (143)
ε	0.84 (102)	0.83 (85)	0.85 (108)	0.59 (77)
ε_q	0.09 (11)	0.14 (16)	0.19 (26)	0.13 (17)
ε_p	0.75 (80)	0.69 (66)	0.65 (77)	0.46 (56)
R^2	0.77	0.69	0.75	0.64
Sample size	2332	2353	2793	2654
Urban				
a	0.88 (47)	1.38 (49)	2.20 (43)	0.80 (70)
ε	0.77 (79)	0.63 (79)	0.54 (76)	0.48 (49)
ε_q	0.07 (9.6)	0.04 (6.4)	0.03 (5.6)	0.12 (13)
ε_p	0.70 (68)	0.58 (57)	0.51 (71)	0.36 (38)

R^2	0.77	0.71	0.61	0.48
Sample size	1264	1706	2436	1812

Absolute t-score between brackets. All coefficients are significant at 99%.

The table indicates that in both countries the calorie Engel-curve is rather flat, while the cost of calories is highly elastic, across the board in both rural and urban areas and in all provinces and regions. For example, in Ghana 2013, on average 53 cents of an additional Cedi was spent on food of which the lion's share can be attributed to the substitution away from cheap calories ($\varepsilon = 0.53$; $\varepsilon_p = 0.42$). Food demand is more elastic in Mozambique ($\varepsilon = 0.79$, 0.71 and 0.66 in the respective years 1997-2003-2009) and again mainly due to the quest for more expensive calories ($\varepsilon_p = 0.73$, 0.65 and 0.57). In both countries, spatial disaggregation indicates that food demand in rural areas and poorer regions is somewhat more elastic and even more focused on variety of the diet.

Context-specific poverty line: National poverty line outperforms urban-rural poverty line

Our next target is to compare poverty patterns under a national poverty line with the patterns that emerge under an urban-rural context-specific line. If the former is the more comprehensible poverty picture, this could partly reflect that relatively low prices of basic foods in rural areas phase out with relatively high implicit prices of basic services, as illustrated in Diagram 5.

Results are presented in Table 3. Indeed, the national poverty line seems to outperform the rural-urban poverty line. It describes better the trends and the rural dimension of poverty, while the poverty pattern fits better the nexus with nutrition, health and assets. For example, at an overall poverty headcount around 25% in Ghana 2013, the rural-urban gap of 29 percentage points (rural 40%, urban 11%) would seem more plausible than a gap of only 13 percent points emerging under the urban-rural line (rural 31%, urban 18%). Likewise, applying the rural-urban poverty line in Mozambique, the rural-urban gap would decrease from 34 to a mere 8 percent points in 1997, from 31 to a mere 6 percent points in 2003 and from 25 to a mere 9 percent points in 2009. As mentioned in the introduction, such low urban-rural poverty gaps have also been found in other studies that apply CSPL, but would seem to be at odds with common perceptions on the rural dimension of poverty.

Table 3: Poverty patterns under a national and a context-specific poverty line, Mozambique 1997-2003-2009 and Ghana 2013

	MOZAMBIQUE			GHANA
	1997	2003	2009	2013
National headcount				
- National line	69.6	60.5	56.6	25.2
- Rural-urban line	69.8	61.0	56.9	24.0
- Spatial domains	68.6	53.1	53.7	25.6
Rural headcount				
- National line	76.9	70.6	64.4	40.1
- Rural-urban line	71.5	63.1	59.6	30.7
- Spatial domains	70.7	54.2	55.7	29.2
Urban headcount				
- National line	43.0	39.3	38.8	10.5
- Rural-urban line	63.7	56.6	50.9	17.5
- Spatial domains	60.8	50.9	49.1	22.1
Poverty correlates				
Food in total consumption				
- National line	0.24	0.29	0.24	0.27
- Rural-urban line	0.18	0.21	0.19	0.21
- Spatial domains	0.14	0.11	0.11	0.17
% home grown foods				
- National line	n.a	0.32	0.21	0.31
- Rural-urban line	n.a	0.17	0.12	0.22
- Spatial domains	n.a	0.03	0.05	0.12
Underfives stunted				
- National line	0.15	n.a	0.08	n.a
- Rural-urban line	0.07	n.a	0.06	n.a
- Spatial domains	0.06	n.a	0.02	n.a
Literacy				
- National line	-0.19	-0.21	-0.18	-0.28
- Rural-urban line	-0.12	-0.14	-0.14	-0.26
- Spatial domains	-0.10	-0.08	-0.10	-0.20
Safe drinking water				
- National line	-0.25	-0.25	-0.28	-0.35
- Rural-urban line	-0.17	-0.16	-0.21	-0.22
- Spatial domains	-0.17	-0.12	-0.14	-0.14
Sanitation				
- National line	-0.24	-0.28	-0.27	-0.20
- Rural-urban line	-0.16	-0.16	-0.21	-0.17
- Spatial domains	-0.10	-0.00*	-0.17	-0.11
Solid roof				
- National line	-0.37	-0.36	-0.29	-0.18
- Rural-urban line	-0.23	-0.23	-0.22	-0.14
- Spatial domains	-0.15	-0.03	-0.11	-0.08

* All Pearson correlation coefficients are significant at 95%, with the exception of sanitation in Mozambique, 2003, when the spatial domain poverty line is applied.

** The CSPL is listed in Annex 3. In Mozambique the CSPL is based on 13 spatial domains, following MPD-DENEAP (2010). For Ghana, we define 20 levels and distinct a rural and an urban domain in each of the 10 regions.

To investigate the issue further, we look at the consistency of the poverty status of the household with other welfare indicators. We observe that the national poverty line leads to a higher and stronger correlation. For example, the correlation coefficient for access to safe drinking water varies over the three surveys in Mozambique from $\rho = 0.25$ to 0.28 as compared to ranging from 0.12 to 0.17 under the urban-rural line, while in Ghana $\rho = 0.35$ instead of 0.22. In the case of Mozambique, child anthropometrics are part of the 1997 and 2009 survey data, shedding direct light on the poverty-nutrition nexus. The correlation between poverty status of the household and the presence of stunted children is $\rho = 0.15$ in 1997 and $\rho = 0.08$ in 2009 under the national poverty line and falls to 0.07 and 0.06 when poverty rankings are based on the urban-rural line.

The table also shows that adding specificity to the poverty line beyond the rural-urban dimension only aggravates the loss of consistency. For example, the poverty patterns under the spatial domains CSPL indicate that the rural dimension largely disappears. Likewise, the correlation between poverty and stunting in the Mozambique survey falls from 0.15 to 0.06 in 1997 and from 0.08 to 0.02 in 2009. The implication that households, whether poor or not, would be practically equally vulnerable to child malnutrition is counterintuitive.

For the case of Mozambique, a study by Tarp et al. (2002) addresses the same issue, namely the robustness of poverty patterns for the choice of the poverty line. Our results are in line with that paper, although the authors pay little attention to the fact that the association between poverty on the one hand and other provincial-level welfare indicators like child malnutrition and asset ownership on the other hand appears particularly weak (Tarp, op. cit., Table 9 and Table 10).

In summary, the findings in this section concur with the arguments in section 2 and section 3. The high elasticity of calorie prices in Table 2 indicates that the poor try to move along the calorie-constraint to a more balance diet within the limits of their poverty condition, rather than opting for more calories in the prevailing diet. Hence, as argued in section 2, observed diets with low cost calories tend to express poverty rather than a preference for the chosen foods. Likewise, Table 3 shows that one cannot expect a context-specific poverty line that is adjusted to the consumption and price pattern of specific population groups to be an improvement over a national line that applies to all population groups. As discussed in section 3, the better performance of a national unadjusted poverty line over an urban-rural line can partly be explained from the trade-off between a relative affordability of basic foods in rural areas and a relative affordability of basic services in urban areas.

5 Adaptation of basic needs to heterogeneous preferences, is it desirable?

While our focus has been on issues related to the combination of utility theory and the poverty-nutrition nexus, we want to conclude on a somewhat different note and briefly touch upon the broader social choice perspective. In particular, even if there are compelling reasons to believe that preferences of the poor for food and basic services are heterogeneous, should the choice for a particular poverty line be adapted to individual preferences? In other words, the question whether utility theory is the single best guidance for choice of poverty lines might mix two distinct types of issues. One issue is what we could refer to as the "social contract" dimension and the second has to do with the idea of primary goods that are intrinsic to the poverty line construction.

In his discussion of social choice theory, Sen classifies the concept of poverty as a normative indication that is a sort of compromise established by a community to make systematic judgments according to certain well-defined criteria, in our case the poverty line (Sen, 1970). The choice establishes, thus, a sort of social contract that abstracts from individual preferences and aims at producing a norm that judges over time the phenomenon (poverty) independently from individual perceptions. The norm can clearly be changed but, again, this implies a collective decision as if it would concern a constitutional change. For example, as countries develop they tend to change their poverty line, following a broad consensus on the need to adapt norms to a new socio-economic setting.

Alternatively, Arrow's renowned Impossibility Theorem states that under quite general conditions a social welfare function is either imposed or dictatorial (Arrow, 1963). Consequently, as Arrow argues, the choice for optimal social institutions and norms cannot generally be based on individual preferences only, implying that individuals have to give up part of their autonomy and allow for a higher public authority. Again, this is as if it concerns a constitution even before society starts to operate.

A third and final argument for decoupling a poverty line from preferences is the idea of defining a set of primary goods indispensable for people to survive and anchor the overall development in society on the basis of the performance of those below this threshold, the so-called min-max principle (Rawls, 1971).

In either of these cases, the key point is the a-priori definition of the norm and the need to abstract from individual preferences in order to reach consensus on a social contract. One might still argue whether poverty reduction is to be considered part of a country's social contract. In other words, are the poor

entitled to a certain support? The modern history would seem to confirm this. Notably, since Roosevelt's announcement in 1941 of a new world order based on freedoms, among that 'freedom from want', the issue of poverty elimination became a sort of 'constitutional' element in societies, first in developed countries with the creation of welfare-states and after decolonization also in the developing countries.

However, it was not before the debate on the Millennium Development Goals (MDGs) that poverty reduction eventually transformed into a kind of global social contract. Poverty became the central stage of the development debate and, for the first time, this posed the problem of creating a universally valid monitoring system for poverty. The conceptual underpinning and the search for an international poverty lines is just one example of the idea to interpret poverty in terms of a social contract. After a long debate, policy makers, development practitioners and social scientists agreed upon the standard of 1.25$ per day, which has become the most widely used metric to evaluate the effectiveness of economic poverty reduction policies worldwide (World Bank, 2014).

The need for a common standard to evaluate the degree of enforcement of this global social contract implies that poverty assessments must somehow be disconnected from individual preferences and one might say that the same argument applies to assessments at the level of a country. Notwithstanding a certain degree of flexibility, consumption baskets used for international poverty comparisons are similar for all countries irrespective of the context precisely because the priority is comparability and standardization. At the same time, a national poverty line based on a national basket can still be useful to describe poverty patterns and monitor internal improvements, but cross-country comparison requires a relevant effort in homogenizing the measure. The same logic applies to a further disaggregation of poverty assessments over administrative regions and population groups. They can be useful for comparisons within a particular geographical area but tend to defeat the purpose when used for comparisons between geographic areas. The clear trade-off between geographical accuracy of the poverty baskets and the need for a standard norm imposes a tedious choice.

6 Conclusion

In this paper, we investigated the adjustment of the poverty line to observed consumption and price patterns as advocated by context-specific poverty line CSPL approaches. We argued that the consumption of basic foods and basic services of the poor tends to reflect an adaptation to their poverty condition, rather than an adaptation to their preferences. We illustrated that poor households are most likely to prefer a food basket with more expensive calories and that the poverty ranking of households

under an unadjusted national poverty line might outperform the ranking under an adjusted context-specific poverty line.

Our investigation started with a stylized food consumption model with a taste for variety and dilemmas in opting for a diet that meets calorie requirements in full compliance to that taste (section 2). First, we considered the case that observed diets would reflect an adaptation to relative prices (revealed preferences) and showed that two diets with the same calorie contents must represent two different utility levels unless the food price vector is inverted. As the evidence in Annex 1 indicates, expensive and cheap sources of calories rarely change position and, hence, in the context of poverty and given calorie requirements, the revealed preferences argument loses its little significance. Second, we looked at the case that observed diets of the poor would reflect an adaptation to local tastes (heterogeneous preferences). We illustrated that, irrespective of local taste, the poor with a larger share of relatively expensive calories tend to be better off, at least until reaching an income where calorie requirements are no longer constraining the choice of their diet. As the taste for variety will be similar until that point, the same food poverty line applies to all and it is only above that income that households can start consuming more calories than required without compromising on their taste for variety.

Next, we briefly discussed the extension to non-food, basic services in particular (section 3). This time, an inverse price vector would seem plausible and revealed preferences become more relevant. Indeed, as and when food prices are high in cities and (implicit) non-food prices are high in villages, two different bundles could represent a similar utility level. In particular, observed cases of a lower food component among the urban poor might match cases with a lower non-food component among the rural poor.

Together, these results signpost that a context-specific poverty line could carry the risk of downscaling the burden associated with low quality food and unavailable basic services, a burden that is particularly high in rural area. The risk is not imaginary, as the evidence for Ghana and Mozambique showed. In both countries, food demand of the poor focuses more on bringing variety to the diet than on adding more calories per se. Hence, observed food consumption baskets consisting of mainly cheap calories are a matter of adaptation to the poverty condition rather than a matter of taste. Moreover, it appeared that the poverty ranking of households under a single national poverty line outperforms the ranking under a rural-urban poverty line in the sense that the resulting poverty patterns reflect much better the actual developments and disparities of living standards in a country. Also we found that the ranking tends to worsen as further specificity is added.

We conclude that national poverty assessments should be cautious in using a poverty line that is adjusted to the context. The cure is likely to be worse than the disease, essentially because observed behavior may neither reveal preferences nor detect heterogeneous preferences among the poor. Under conditions of poverty, food stress and unavailable basic services, revealed preferences tests and heterogeneous preferences assumptions can easily confuse poverty with preferences. Even so, to the extent that basic needs are a matter of preferences, an adjustment of the poverty line to individual preferences might still be objectionable from a social perspective. As the evidence in this paper suggests, more often than not, a national poverty line - adapted neither to prices nor to preferences – may be expected to give the better picture.

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Annex 1: Staple foods consistently provide cheaper calories

Assumption 2 states that some foods, say staple foods ('cassava') are consistently cheaper per calorie than other foods, say proteins and vegetables ('filet'). In other words,. the calorie ratio of high calorie food over low calorie food exceeds the price ratio. The data below from Mozambique and from Ghana (Diagrams A.1.1 and A.1.2) shows that this holds for all provinces or regions, implying that irrespective of the geographical positioning staples are always the cheapest source of calories.

Diagram A.1.1: Price in Meticais per 1000 Kcal in 13 different regions in Mozambique

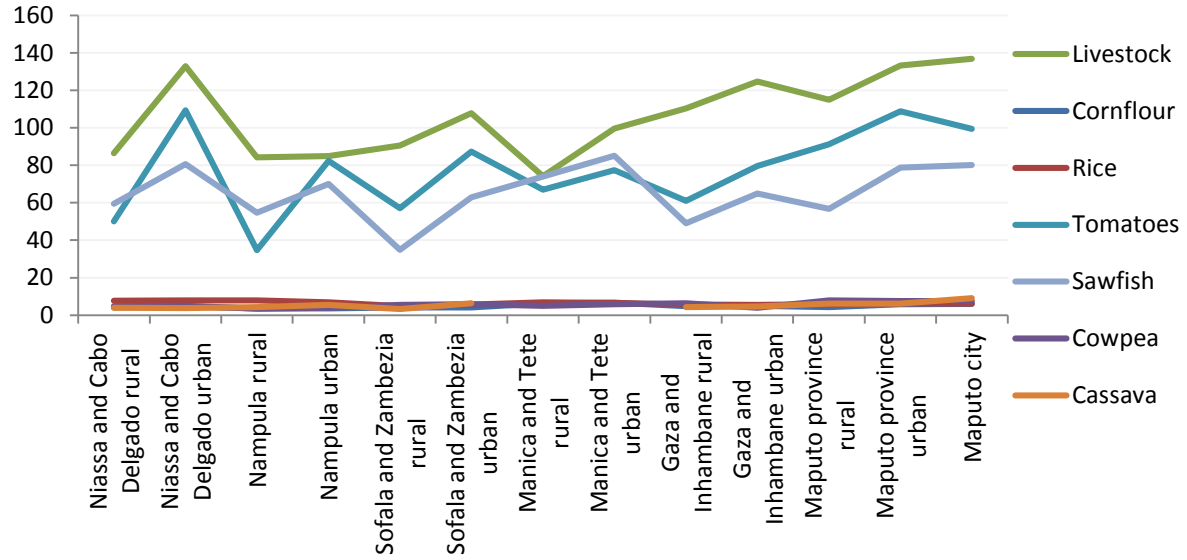
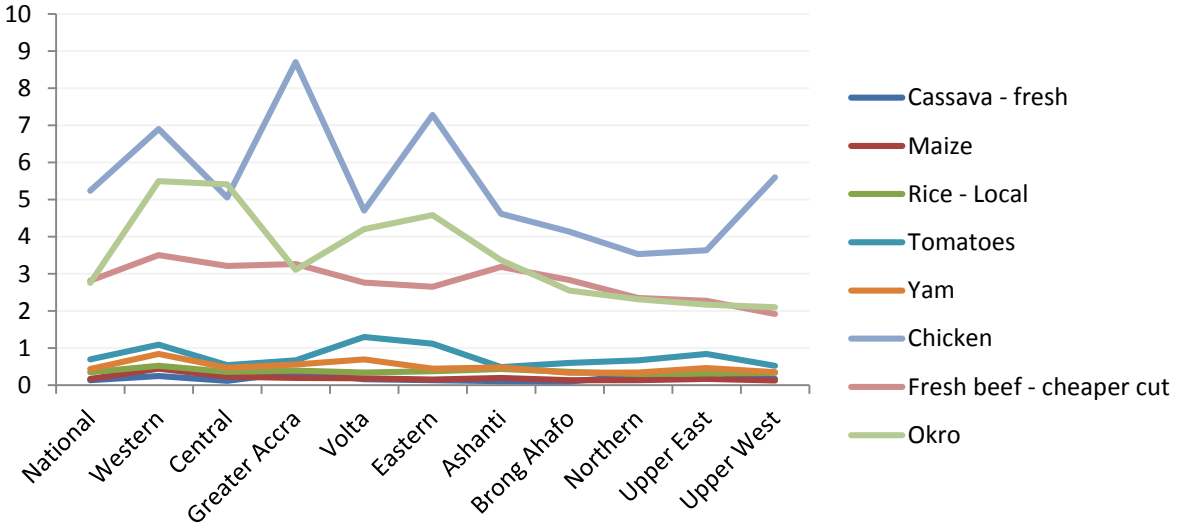


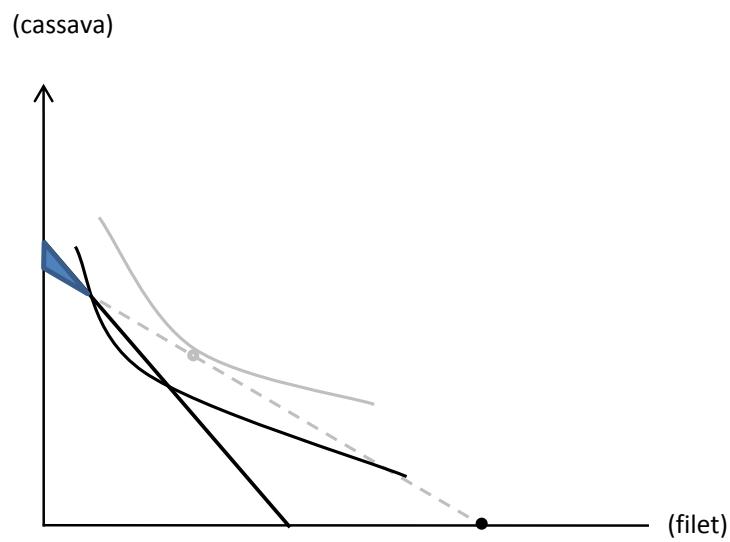
Diagram A.1.2: Price in Cedi per 1000 Kcal in 10 different regions in Ghana



Annex 2: Food poverty line, taste for variety and choice of diet

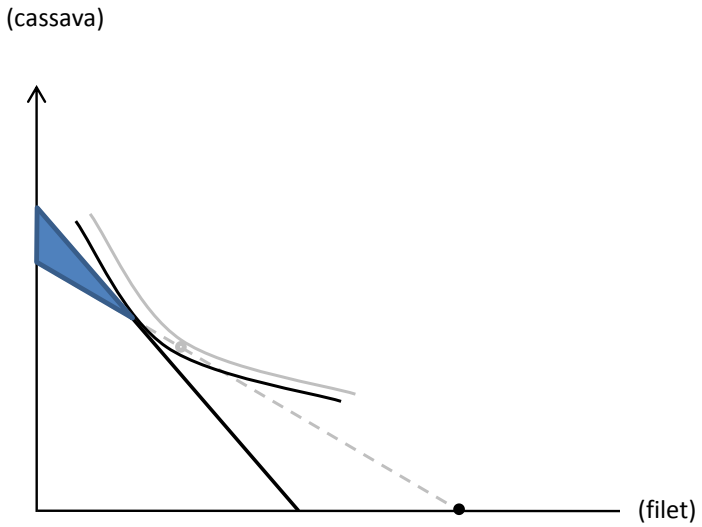
Below we illustrate how a chosen food bundle changes with an increase in budget at a given price vector. The first diagram indicates how very poor households tend to be driven by their taste for diversity, away from the mono-diet that consists of cheap food only. Here the quality of the diet is all that matters and the household is unable to reveal any other aspect of its preferences. The next diagram shows how a utility-consistent food poverty line is reaches, where the calorie constraint is no longer the sole driver of food demand and preferences can come into play too. The third Diagram shows the final phase, where the household starts to trade-off quantity and quality of food.

Diagram A.2.1 Food poverty line above mono-diet, diet still driven by calorie concerns



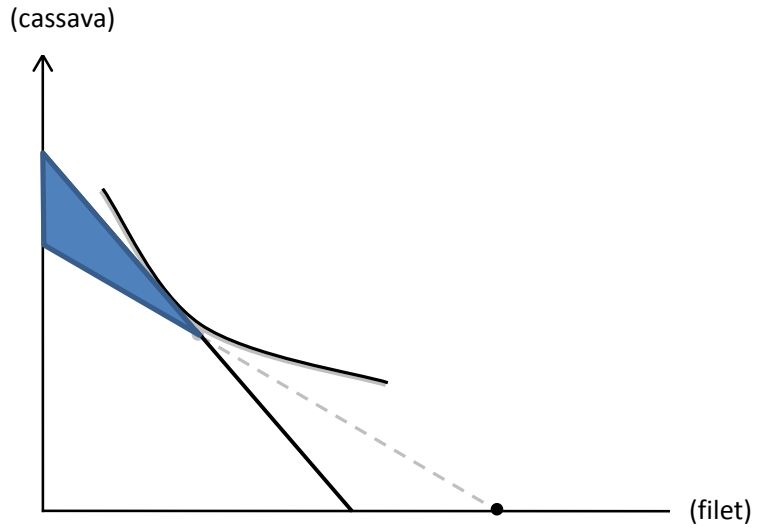
There is some room to choose between products while being able to consume 2,000 Kcal. However, as can be seen the utility function is not tangent to the budget-constraint and the calorie-constraint is binding. In other words it holds that $\frac{\partial u(c_1,c_2)/\partial c_1}{\partial u(c_1,c_2)/\partial c_2} < \frac{p_1}{p_2}$.

Diagram A.2.2 Utility-consistent food poverty line



An increase of the budget such that the utility function is tangent to the budget-constraint while just fulfilling the calorie-constraint is depicted in Diagram A.2.2 – or $\frac{\partial u(c_1,c_2)/\partial c_1}{\partial u(c_1,c_2)/\partial c_2} = \frac{p_1}{p_2}$

Diagram A.2.3 Most-preferred-diet food poverty line



A further increase of the budget, for example to a level that could accommodate the most preferred 2,000 Kcal diet of Diagram 1 of section 2, will not result in consuming the choice of that diet. Instead, trading off quality and quantity, the household may substitute some expensive for cheaper calories.

The indifference curve remains tangent to the budget, while calorie-constraint is no longer binding: $\frac{\partial u(c_1,c_2)/\partial c_1}{\partial u(c_1,c_2)/\partial c_2} = \frac{p_1}{p_2}$ at a diet that contains more than 2,000 Kcal.

Annex 3: Context-specific poverty lines for Mozambique 2009 and Ghana 2103

	Rural	Urban	All
Western	2.76	3.86	3.23
Central	2.12	3.09	2.53
Greater_Accra	2.89	4.49	4.39
Volta	2.05	2.80	2.28
Eastern	2.44	3.66	3.00
Ashanti	1.97	2.87	2.45
Brong_Ahafo	1.72	2.54	2.10
Northern	1.74	2.79	2.08
Upper_East	1.50	2.65	1.72
Upper_West	1.53	2.79	1.74
- Ghana	2.28	3.33	2.74

	Rural	Urban	All
Niassa	15.95	18.91	16.62
Cabo Delgado	15.95	18.91	16.58
Nampula	14.33	16.72	15.03
Zambezia	14.35	19.07	15.08
Tete	19.39	21.47	19.69
Manica	19.39	21.47	19.92
Sofala	14.35	19.07	16.24
Inhambane	18.37	20.31	18.79
Gaza	18.37	20.31	18.90
Maputo provincia	24.84	30.86	29.09
Cidade de Maputo	.	33.14	33.14
- Ghana	16.32	23.11	18.41

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