Prices and poverty in urban Ethiopia

Abstract
Poverty is an ongoing issue in Ethiopia. The identification of policy options to address the problem primarily requires that poverty be measured accurately. One of the most important ingredients in the measurement of poverty are prices. The magnitude of poverty is affected by how cost of living differences across time and regions are adjusted. This paper derives a set of price indices for Urban Ethiopia using data from four urban household surveys conducted in 1994, 1995, 1997, and 2000. The results show that the cities of Dire Dawa and Mekelle are the two most expensive cities, while Jimma and Bahir Dar are the least expensive. The findings also confirm that poverty is indeed high in urban Ethiopia with poverty head count of over 40 percent. Poverty estimates derived using country level consumer price indexes, which do not adjust for spatial cost of living differences, are misleading. But using poverty lines as deflators to account for price differences does not affect the poverty estimates obtained.

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Introduction:

Ethiopia is one of the world's poorest countries by any standard. According to a recent World Development Report, the country has the lowest GNP per head in the world, and its purchasing power parity adjusted GNP is ranked 200th out of 206 countries (World Bank 2000). Human development indicators of the United Nations Development Program (UNDP) also attest to the seriousness and extent of poverty in the country. For instance, the Human Development Index (HDI) of Ethiopia is the sixth lowest out of 175 countries in the world. Similarly, the Human Poverty Index (HPI) ranks Ethiopia 91st out of 94 developing countries.

The poverty experienced by many Ethiopians is reflected in a range of well being measures of the population. For example, the life expectancy at birth in the country is approximately 46 years, which is substantially lower than the average 77 and 67 years recorded for countries with high and medium human development indices respectively. Moreover, three quarters of the population do not have access to an adequate water source, a figure that is amongst the highest for countries experiencing a low measure of human development. The percentage of population with access to suitable sanitation, which stands at 12 per cent is significantly lower that the 53 per cent average for the sub-Saharan Africa (UNDP 2003, pp. 237-257). On the other hand, the adult illiteracy rate at around 60 percent is significantly higher than the average for sub-Saharan Africa and other developing countries.

Previous analyses of poverty in Ethiopia have generally focused on rural rather than urban areas (see Dercon and Krishnan (1998), Dercon and Krishnan (2000), and Dercon (2001)). This is understandable in light of the fact that around 85 per cent of the population lives in rural areas. Unfavourable weather fluctuations usually take a heavy toll on the lives of rural farmers and bring them to the brink of starvation. It is the plight of urban Ethiopians, however, that is the focus of the analysis in this paper. Although urban Ethiopians generally enjoy a higher standard of living when compared to their rural counterparts, poverty remains a problem in urban areas (Tadesse 1999).

To understand the extent of the problem and develop viable policy options for its alleviation requires primarily that poverty be measured accurately. One of the most important ingredients

in the measurement of poverty is price. The effect of prices on poverty measurement has received little attention in the wider poverty literature. Prices are used to calculate the rate of inflation so that nominal measures of welfare can be compared across time. Inaccuracy in measuring the rate of inflation will lead to erroneous poverty estimates. Overestimation of a price increase, for instance, would lead to an overestimation of the level of poverty. Consequently, any reduction in poverty would be underestimated (Deaton and Tarozzi, 2000).

Besides measuring inflation, price indexes are also required to compare cost of living differences between different regions of a country. It is imperative that nominal measures of welfare also be adjusted for spatial cost of living differences because the overall magnitude and geographic dimension of poverty could be very sensitive to how and whether such adjustments are made (Hentschel and Lanjouw, 1996). The need to have a robust and accurate regional poverty profile is evident as it would influence decisions regarding the transfer of resources designed to alleviate poverty.

In Ethiopia, the price index that had been widely used for over three decades for measurement purposes was the Addis Ababa Retail Price Index (RPI) of the Central Statistical Authority (CSA). The RPI was a Laspeyres price index with weights derived from a survey of 600 households taken from the Addis Ababa Household Consumption and Expenditure Survey of 1962/63. This index was, however, inadequate to capture the true picture of inflation in Ethiopia due to several limitations. Firstly, the coverage of the survey was very small as the survey had not been designed to cover all the urban enumeration areas and take sufficient number of sample households (CSA, 1996). As a result, the expenditure shares used to weight the basket of goods were distorted. Secondly, the ability of the index to reflect true inflation was undermined because the classification of household goods and services in the final basket was flawed. For instance, items like transport and communication had been lumped with items on personal care and effects. The index, thus, used the relative price of dissimilar items making the identification of price movement of certain groups of items less transparent (CSA, 1996).

Another caveat of the Addis Ababa RPI was that the basket of goods and expenditure shares in 1963 were used until 1995/96. The items included in the original basket become increasingly

unrepresentative as the availability of goods and services in the market changed over time. In turn, the weights used to calculate prices changes had become long out of date. As Deaton and Tarozzi (2000) point out, "… whether or not the price indexes are seriously affected is ultimately an empirical question, though it is often supposed (for example in the comparable debate over the CPI in the United States) that Laspeyres indexes will increasingly overstate inflation as the base period recedes into the past, a tendency that will be exacerbated by the failure to pick up new goods (whose prices are often falling rapidly) and discard old ones (whose prices may be stagnant or ever rising)".

The above limitations prompted the CSA to construct a new consumer price index (CPI) from the 1995/96 Household Income, Consumption and Expenditure Survey. This survey is greater in scope and covers the whole country, unlike its 1963 counterpart. One advantage of this CPI is the possibility of calculating urban and rural consumer price movements. Although this has proven to be a major improvement over the Addis Ababa RPI, the CSA still does not issue inflation figures further disaggregated by urban and rural centres. Moreover, they don't issue figures showing spatial cost of living differences, which usually cannot be obtained from published sources. As a result, previous studies of poverty in Ethiopia used poverty lines as cost of living deflators to circumvent this problem (see for instance Tadesse (1999), Dercon and Krishnan (1998)). No study, other than Kedir (2003) [1], has attempted to make explicit calculation of price indexes for poverty analysis.

A general misgiving that could be expressed against the CSA prices concerns quality of the data and collection process. As Kedir (2003) notes, "…the enumerators of the CSA price surveys are often recruited from a pool of high school drop outs with little knowledge of the use of the price information they were collecting". There is also some anecdotal evidence suggesting that enumerators may have avoided visiting markets to collect price information (Kedir, 2003). Together, these issues present a strong case for deriving prices from other surveys for use in the calculation of price indexes.

[1] Kedir (2003) derived price indexes for urban Ethiopia using the first round of the Ethiopian Urban Household socioeconomic survey (EUHS).

The contribution of this paper is to derive a set of price indices for Urban Ethiopia using data from four urban Household Surveys conducted in 1994, 1995, 1997 and 1999. We provide estimates of the rates of inflation over the six year period for seven urban centres of the country. Estimates of price levels between the seven urban centres are also provided for each of the four periods. The price indices developed are used to calculate poverty rates between 1994 and 2000. The implications on poverty of using alternative sources of consumer price indices are discussed. The benefit of such an approach is to provide additional insight into the nature and patterns of poverty in urban Ethiopia during the study period. Moreover, it highlights the role played by price measures on the evaluation of poverty.

This paper is organized as follows. In the next section, the data set used in the study is briefly described. Subsequently, the different techniques and methodologies employed to do the analysis will be laid down. Specifically, issues related to the construction of the measure of welfare, the poverty line and the price indexes will be discussed. Next, summaries of the results will be reported and discussed. The final section will set out some concluding remarks.

Data

This study uses the 1994, 1995, 1997 and 2000 household survey data obtained from the Ethiopian Urban Socio-economic Surveys (EUHS) conducted by the Department of Economics, Addis Ababa University. The1994 round was collected in collaboration with the Department of Economics, Goteborg University.

The surveys were conducted over a period of four successive weeks during a month considered to represent average conditions so that seasonal factors affecting the patterns of household consumption and prices will be least operative. Seven cities and towns thought to reflect the major socio-economic characteristics of the urban population were selected for the survey. These were Addis Ababa (the capital city), Awassa, Bahir Dar, Dessie, Dire Dawa, Jimma, and Mekele. A total sample size of 1,500 households were allotted in proportion to the size of the population residing in the selected urban centres in 1992. Thus, 900 households were drawn from Addis Ababa, 126 from Dire Dawa, 73 from Awassa, 101 from Dessie, and 100 from each of the remaining three cities (Mekonnen, 1999). Proportional samples were then taken

from all woredas (Districts) in each of the urban centres and half of the kebeles (the lowest administration units) selected randomly from each woreda. Finally, using the registration of residential houses at the kebele administrative offices as the sampling frame, systematic sampling was used to select households from each of the kebeles. Using such a frame captures households living in own residences, government and kebele houses and tenants in registered private housing. It should be stressed, however, that such an approach fails to capture homeless individuals and family units. As a result, the level of poverty measured may be underestimated.

In all survey rounds, information was collected on a multitude of socioeconomic variables of interest including the structure and composition of the household, educational and health status, employment and income, consumption and expenditure, and credit.

Methodology

Constructing the measure of welfare

In this paper, a combination of methods is used to analyse the data. In measuring welfare at the household level, consumption based measures rather than income are used. This approach is used due to the volatility of income, making it a relatively noisy indicator of welfare. Consumption, on the other hand, tends to be less volatile than income due to the availability of consumption smoothing opportunities such as saving, borrowing and community based risk sharing. In general, the poverty literature identifies current consumption a better indicator of both current and long term standard of living (Ravallion, 1994; Lipton and Ravallion, 1995; Deaton, 1997).

The definition of consumption used is comprehensive as it incorporates the consumption of all food, non-food and durable items. The value of food produced at home, obtained as a gift or loan was also imputed and included in consumption. The need for imputation arose because EUHS does not provide the value of food obtained from such sources. The procedure used in Hentschel and Lanjouw (1996) in the analysis of poverty in Ecuador was adopted for imputation purposes. The approach required a number of steps. First, it was checked whether a household had purchased from the market the particular item it reported as producing or

receiving as a gift or loan. If so, the price the household paid for the item in the market, which is a 'unit value' obtained by dividing total expenditure by quantity consumed, was used to value the gift, loan or home production. If the item had not been purchased in the market, the median unit value will be calculated for households living in the same region (cluster) as the particular household and used for valuation. This same procedure was used to value the consumption of food items whose values were missing. If the unit value couldn't be calculated, for example because no household in the cluster had consumed the item in question, then price information was taken from CSA to value consumption.

Another group of items usually neglected in poverty analysis but no less significant to household welfare, is durable goods. It is the value of services that flows from ownership of durable goods, rather than their purchase value that should enter the definition of consumption. But the imputation of this flow is problematic and most studies take food and non-food items as the most aggregate measure of welfare. Given the information on durable goods in the EUHS, the following procedure, as prescribed in Deaton (2002) and Hentschel and Lanjouw (1996), has been adopted to impute the user cost accruing from ownership of durable goods.

First, the average age of each durable good ($\bar{T}$) is calculated. Next, the average life time of each durable good is estimated as twice the average age ($2\bar{T}$), under the assumption that purchases are uniformly distributed through time. The expected remaining life of good is calculated as the difference between the average life time of each durable good ($2\bar{T}$) and the number of years the good has been in service *(t)*. Finally, a rough estimate of the flow of services is derived by dividing the current replacement value by its expected remaining life.

A limitation of the consumption definition used in the study is that rent has been excluded. This was necessitated by the absence of a housing module for the 1995 and 1997 EUHS rounds. As a result, rent information is missing for a large number of households and imputation proved to be difficult. Since including rent for one round and excluding it from another would distort the welfare ranking of households, it was decided to omit rent altogether. Work is progressing on this issue.

To make welfare comparisons between households with different size and structure, aggregate household expenditure has to be adjusted. This well recognized issue in the poverty literature acknowledges that the needs of a small child are generally less than that of an adult. Further, households exhibit economies of scale in that a couple in a household have lower needs than two households with single adults in each. The usual method for adjusting for these issues is the use of Adult equivalence scales (AES). The AES used in the study attaches the same weight to all household members. Thus, aggregate household consumption is converted into consumption per capita. This may understate the welfare people who live in households with high fraction of children. It may also understate the welfare of big households relative to small ones. Nevertheless, no other method of adjusting aggregate household consumption has received universal assent (Deaton, 2002). It, therefore, becomes essential to carry out the analysis with per capita measures and test the sensitivity of the results to the adult equivalent scales chosen. This will be done in subsequent analysis.

Poverty line

In the study, the cost of basic needs approach is used to estimate a poverty line (Ravallion and Bidani, 1994). A food poverty line is constructed by valuing a basket of food items that meets a stipulated minimum energy requirement in terms of Kilo calories (Kcal). The calorie contribution of the food items is adjusted to attain 2200 kcal of energy per person per day[2], following past practices in urban Ethiopia (see for instance Taddesse (1999), Taddesse and Dercon (1999)). The food basket is anchored to the consumption pattern of the bottom 50 per cent of the urban population, when ranked according to expenditure per capita in 1994. Looking at the bottom half of the population ensures that expensive, luxury food items are not heavily represented in the basket making it consistent with local tastes.

To estimate the non-food share of the poverty line, the non-food expenditure of people whose total expenditure is equal to the food poverty line is determined through estimation of an Engel curve for each of the seven urban centres (Ravallion and Bidani, 1994). The dependent variable

[2] The minimum energy requirement for a typical person to keep up normal activities that is stipulated by the World Health Organization (WHO) (1985) is 2200 Kcal per day.

is the share of total expenditure devoted to food by each household *(i*) in each urban centre *(j)* (i.e. S_{ij}). On right hand side, we have the logarithm of total consumption per capita (y_{ij}) normalized by the food poverty line in each region ($z^f{}_j$) (i.e. $\log\left(y_{ij}/z^f{}_j\right)$) and its square as the consumption variables. At the food poverty line, these two variables assume a value of zero. Moreover, to control for household characteristics variables such as the age of the household head, number of children under the age of 15, number of male adults, number of female adults and number of working individuals in the household were included as regressors. The total poverty line is then calculated as $\left(2-S_{ij}\right)z^f{}_j$. The parameter estimates of the Engel curve regressions run for each of the urban centers in each round are given in Appendix 1 (tables 1b-e).

Unit values and Prices Indices

In the study, price information on commodities is obtained from EUHS. In the expenditure module of the EUHS questionnaire, households are asked about consumption expenditure and the physical quantity of food items consumed. The ratio of consumption expenditure to quantity consumed gives unit values, which are taken as a measure of price. These unit values have an advantage over prices from external sources (like CSA) or prices reported by shops in that they relate to actual transactions as they are obtained from sampled households. This also makes it possible to stratify prices by socioeconomic characteristics of households (Deaton and Tarozzi, 2000).

An evident disadvantage of using unit values comes from that fact that not all goods and services may have readily defined quantities, which is the case with transportation. Moreover, the EUHS doesn't collect quantity information for all goods. For instance, it doesn't have quantity information for non-food goods. As a result, it is impossible to obtain unit values for such items from the survey. Another major disadvantage has to do with the fact that unit values may not correspond exactly with prices. Hence, unit values may vary from one household to another in a way that is not related to prices. For instance, there might be quality differences between commodities sold in different cities. In this case, unit values would be higher in the

city where the quality of the commodity is superior. A similar difference can also be noted between the unit value reported by richer and poorer households. Similarly, many goods may not be purely homogeneous but a compound of different kinds of items. The unit values, consequently, would reflect not only price, but also the amalgamation of different items in a commodity. This problem, along with the quality problem, can be abated by choosing fairly homogenous goods or disaggregating the goods to the maximum extent the data permits (Deaton and Tarozzi, 2000).

In the study, unit values were calculated across all households. As noted above, the food consumption module allows the calculation of unit values. But not all food items in the consumption module are included in the basket. There are consumption items that belong to residual categories, such as 'other food items' and 'other liquor', which had to be discarded because they don't have clearly defined units. For non-food items, unit values couldn't be calculated for the reason noted above. But attempt was made to work with the module on non-food consumption rather than discard it totally. This was done by taking price information for selected non-food goods from CSA. This exercise is in agreement with the procedure used in cleaning the data in that external price sources were used only in instances in which unit values could not be calculated to value consumption.

An important issue that needs due consideration in the calculation of unit values concerns the units in which items are measured in. It is apparent that not all households report purchases in standard units, such as kilograms and liters. For instance, the purchase of Teff, which is a staple crop in Ethiopia, could be reported in kilograms or other localized units such as quintals, Dawla, Tassa. Unless the units are standardized, it is impossible to compare unit values across households. Looking only at the subset of households that report in standard units is an option as the majority of households report purchases in standard units in the EUHS. However, attempt was made to increase the sample by using relative conversion factors to standardize non-standard units. These relative conversion factors were derived by comparing median unit values of purchases reported in standard and non-standard units. If, for instance, the median unit value for 1 Tassa and kilogram (kg) of Teff, in a particular city, are 0.5 and 2 birr respectively, then 1 Tassa is equivalent to one quarter of a kg in that city.

The unit values calculated were checked for the presence of gross outliers and plausibility. In instances in which outliers are caused by reporting errors, like misplacing of a decimal place, they were identified and corrected. An automatic method for identifying outliers described in Deaton and Tarozzi (2000) was also used. Thus, unit values whose logarithms are more than 2.5 standard deviations from the mean of logarithms eliminated. The unit values were further inspected for plausibility. Then, median unit values were calculated by item, city and year for all seven urban centers. Median, rather than mean, unit values are chosen to mute the effect of extreme values.

The budget share of each good was then calculated for each household and averaged by city and round. Deaton (2003) argues that using the average of the budget shares, as opposed to the budget shares of the averages, creates 'democratic' price indexes which are more suited to calculate the cost of living for the poor. Whereas the budget shares of the averages, which leads to 'plutocratic' price indexes, is not suitable for this purpose because it gives more weight to the rich. The average budget shares and the median unit values were subsequently used to compute four kinds of prices indexes. Namely; the Laspeyres, Paasche, Fisher's Ideal and Tornqvist price indexes.

The Laspeyres price index uses base period weights and is calculated as:

$$P^{L}{}_{10} = \sum_{k=1}^{n} w_{0k}\left(\frac{P_{1k}}{P_{0k}}\right) \qquad (1)$$

where w_{0k} is the average household budget share of good *k* in period 0 whereas P_{1k} and P_{0k} stand for its prices in period 1 and 0 respectively.

The Paasche price index, on the other hand, uses current period weights and is given by the formula $P^{P}{}_{10} = \sum_{k=1}^{n} w_{1k}\left(\frac{P_{1k}}{P_{0k}}\right)^{-1}$ (2)

where w_{1k} is the average household budget share of good *k* in period 1.

Fisher's Ideal price index is the geometric mean of the Laspeyres and Paasche price indexes. That is,

$$P^{F}_{10} = \sqrt{P^{L}_{10} \cdot P^{P}_{10}} \qquad (3)$$

The Tornqvist price index uses the average of the budget shares in the two periods as weights. It can be expressed as:

$$\ln P^{T}_{10} = \sum_{k=1}^{n} \frac{w_{1k} + w_{0k}}{2} \ln\left(\frac{P_{1k}}{P_{0k}}\right) \qquad (4)$$

The Lapeyres price index is the most common price index and it measures the changes in the cost of a fixed basket of goods from a base period or region. Thus, it usually is an overestimate of a true cost of living index. The Paasche price index, at the other extreme, is likely to overstate consumer substitution, that when faced with differences in relative prices, consumers are likely to adjust their consumption patterns towards relatively cheap goods. But it understates the change in the cost of living index. Laspeyres and Paasche price indexes do not account for consumer substitution among commodities adequately.

Superlative indexes, such as Fisher's Ideal and Tornqvist index, use both sets of budget shares and as result minimize the bias that might arise from using either Laspeyres or Tornqvist. This makes superlative indexes more suitable for comparing prices across cities or states. Moreover, these indexes satisfy the reversal test. If prices are 20 percent higher in region A than B, then prices in B are lower by 20 percent than A. This is a property satisfied by neither the Laspeyres nor the Paasche index (Deaton and Tarozzi, 2000).

The basket of goods used to construct the price indexes, with the weights and median unit values used in the calculation are given in Appendix 2 (tables 2a-d). There are 37 items in the basket used to derive the spatial cost of living index for 1994, 42 in 1995, 37 in 1997 and 39 in 2000. An attempt was made to make the most out of the available consumption information in each round when calculating a spatial cost of living index. For instance, the 1994 EUHS collected consumption information on teff, barley and wheat. In subsequent rounds, however, these cereals were subdivided into white, black and mixed types. Thus, the disaggregated

information was used to calculate a spatial cost of living index for the latter three rounds. With respect to the non-food items used, the price availability from CSA dictated which items get included in which round. For instance, CSA does not provide prices for fuel wood in the 1994 and 1995 rounds for most of the cities in the survey. Hence, fuel wood is not used in the calculation of spatial cost of living index in these two rounds but latter rounds. Still, most of the items used to calculate the spatial cost of living indexes are the same between the four rounds. Moreover, the same basket of goods was used in calculating the rate of inflation from 1994 to 2000. A description of this is provided in Appendix 2 (table 2e).

Poverty Measures

The class of additively decomposable poverty measures developed in Foster, Greer and Thorbecke (1984) is used to measure poverty. This class of measures (commonly known as FGT measures) is given by:

$$P_\alpha(y;z) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{g_i}{z}\right)^\alpha \qquad (5)$$

where α is the poverty aversion parameter, g_i is the income shortfall of the i^{th} individual or household, and z is the poverty line. The poverty aversion parameter (α) reflects the concern attached to the proportionate shortfall from the poverty line. When α is equal to zero, the FGT measure in (5) corresponds to the head count index in which no concern for the depth of the shortfall is shown. When α is equal to unity, the FGT measure collapses to the poverty gap ratio and is consistent with a uniform concern for the depth of the poverty shortfall at different points of the distribution. When α is greater than unity, the poverty measure becomes more sensitive to the poorest of the poor. The most commonly used value of α (greater than 1) is 2, which measures the severity of poverty. In this case, the FGT measure is simply the weighted sum of poverty gaps, as a proportion of the poverty line, where the weights are the poverty gaps themselves (Ravallion 1994).

Results

Tables 1a and 1b present the food and total poverty lines (in Birr per person per month) for each of the urban centers for each round. As noted above, the food poverty lines are obtained by valuing a basket of goods that gives 2200 Kcal of energy per person per day. The basket is valued at the median unit values of each of the items in the basket in each of the urban centers in each round. The basket of goods used, with the calorie content of each item, is given in Appendix 1 (table 1a). Information on calorie content was obtained from food composition tables compiled by the Ethiopian Health and Nutrition Institute (EHNRI)[3].

In 1994, the food basket is the most expensive in Dire Dawa, followed by Dessie, Mekelle, Addis Ababa, Awassa, Bahir Dar and Jimma. The picture changes slightly in 1995 and 1997 with Mekelle becoming the most expensive city followed by Dire Dawa. Jimma remained the least expensive followed by Bahir Dar. In 2000, Dire Dawa again took over as the most expensive followed by Mekelle. Prices in Addis Ababa and Dessie were also high. Across time, we see a decrease in the cost of the food basket between 1994 and 1995 in all cities with the exception of Mekelle, where it increased by 9 percent. Prices further decreased between 1995 and 1997 in all cities, with the highest declines recorded in Jimma and Bahir Dar, where the cost of the food basket fell by 10 and 11 percentage points, respectively. But prices increased in all cities between 1997 and 2000.

The total poverty lines in Table 1b are obtained by scaling up the food poverty lines. As noted above, this is done through Engel curve estimations as per the prescription in Ravallion and Bidani (1994). It can be seen from Table 1b that the ranking of cities is similar when the cost of basic non-food items is added to the food poverty line. The cities of Dire Dawa and Mekelle still remain the most expensive cities whereas Bahir Dar and Jimma are the least expensive cities throughout. We see price declines between 1994 and 1997, with the exception of Mekelle where it increased between 1994 and 1995. A price rise was recorded in all cities between 1997 and 2000.

[3] EHNRI has been regularly compiling tables since 1968. These tables include information on 180 food types checked by the Institute of Medical Chemistry in Uppsala with the assistance of Swedish International Development Agency (SIDA).

Table 1a: Food Poverty Lines (Birr, per person, per month)

City	**1994**	**1995**	**1997**	**2000**
Addis Ababa	63.715	61.525	56.901	70.607
Awassa	61.045	57.049	54.537	65.221
Bahir Dar	58.831	56.748	50.256	61.619
Dessie	64.667	59.427	57.972	69.069
Dire Dawa	73.756	68.058	63.994	77.290
Jimma	58.027	53.111	47.673	62.890
Mekelle	63.973	69.840	64.835	74.264

Table 1b: Total Poverty Lines (Birr, per person, per month)

City	**1994**	**1995**	**1997**	**2000**
Addis Ababa	81.400	79.491	75.153	91.213
Awassa	79.260	73.788	71.803	84.585
Bahir Dar	72.450	71.199	61.146	75.799
Dessie	79.575	74.202	74.269	85.467
Dire Dawa	89.680	86.935	82.026	96.260
Jimma	72.923	67.972	58.022	77.552
Mekelle	79.359	86.999	82.744	92.945

For calculation of the spatial cost of living indexes, the capital city Addis Ababa has been taken as the reference city against which prices in all the other cities will be measured. One of the reasons for choosing Addis Ababa as a reference is that around 60% of the sampled households in each round came from there. An equally important factor is that the city contains diverse cultures and ethnic groups. At least in this respect, it is representative of other cities in terms of consumption patterns (Kedir, 2003).

Table 2a below gives the spatial cost of living index for 1994. The first column indicates the percentage of the total budget the items included in the basket used to calculate the spatial cost of index represent. The next four columns provide the four types of price indexes calculated. The last column is an index derived by taking the differences between the poverty lines as an indicator of price differences between the cities. As already noted, it is a common practice in the applied poverty literature to use poverty lines as cost of living deflators. Thus, it would be

interesting to see how the ranking of the price indexes of cities would change when poverty lines are used as deflators. Summary of the rankings of price indexes are given in table 2b.

The result shows that all the price indexes identify Dire Dawa as the most expensive city in Urban Ethiopia in 1994. The Fisher and Tornqvist price indexes, which are our preferred indexes, are approximately 1.2 and 1.18, respectively, for this city. Fisher and Laspeyres indexes rank Mekelle as the second most expensive city followed by Dessie, while Tornqvist index reverses this ranking. Paasche index and the poverty line rank Addis Ababa as the second most expensive city followed by Dessie. There seems to be divergence with the ranking of Addis, which is ranked the fifth most expensive by the Laspeyres, Fisher and Tornqvist price indices. All indexes identify Jimma and Bahir Dar as the least expensive cities in 1994.

Among the indexes, the Laspeyres price index seems to give the closest ranking to our preferred indexes, Fisher and Tornqvist. In fact, its spearman's rank correlation coefficient with the Fisher index is 1, while it is 0.96 with Tornqvist. The Paasche index has rank correlation coefficient of 0.67 with the Fisher index. The poverty line seems to do slightly better than the Paasche index with a spearman's rank correlation coefficient of 0.71. There seems to be a general agreement in the ranking of cities by the different price indexes as the spearman's rank correlation coefficients are high.

Table 2a: Spatial cost of living index 1994

City	**Budget 94**	**Laspeyres**	**Paasche**	**Fisher**	**Tornqvist**	**Index from PL**
Addis Ababa	0.605	1.000	1.000	1.000	0.605	1.000
Awassa	0.653	1.030	0.979	1.004	0.653	1.030
Bahir Dar	0.678	0.937	0.880	0.908	0.678	0.937
Dessie	0.636	1.052	0.991	1.021	0.636	1.052
Dire Dawa	0.631	1.255	1.145	1.199	0.631	1.255
Jimma	0.596	0.936	0.874	0.904	0.596	0.936
Mekelle	0.668	1.146	0.949	1.042	0.668	1.146

Table 2b: Summary of Rankings of city price indices 1994

City	**Laspeyres**	**Paasche**	**Fisher**	**Tornqvist**	**Poverty line**
Addis Ababa	5	2	5	5	2
Awassa	4	4	4	4	5
Bahir Dar	6	6	6	6	7
Dessie	3	3	3	2	3
Dire Dawa	1	1	1	1	1
Jimma	7	7	7	7	6
Mekelle	2	5	2	3	4

The spatial cost of living indexes and summary of city rankings for 1995, 1997 and 2000 are given in Appendix 3 (tables 3a-3e). The results indicate that the cities of Mekelle, Dire Dawa and Addis Ababa are the most expensive while Jimma and Bahir Dar are the least. Our preferred indexes have been consistent in the classification of these five cities in 1995, 1997 and 2000. Dessie and Awassa have been classified as the fourth and fifth most expensive cities alternately.

The results also reveal there is high correlation between the rankings given by the different price indexes. The rank correlation coefficient between our preferred indexes and the Laspeyres index is 0.96 in 2000, while it is 1 with the Paasche index and 0.93 with the poverty line. The ranking across time is also found to be consistent. The rank correlation between the ranking in 1994 and 1995 is 0.86, while it is 0.96 between 1995 and 1997 and 1997 and 2000.

The Eastern city of Dire Dawa, located in one of the driest parts of the country, has been found to be the most expensive city. Prices in the Northern city of Mekelle, which is also located in a dry region that suffers from recurrent droughts, are also high. It should not come as a surprise that prices are high in these cities as there is little food production there. Prices also seem to be quite high in capital city Addis Ababa, as it has been ranked the third most expensive by our preferred indexes in 1995, 1997 and 2000. Overall, Jimma and Bahir Dar, which are cities located in the fertile and wet regions of the country, are the least costly cities. These results are consistent with the findings of kedir (2003), who noted "….Fertility surrounding the areas and access (transport costs) appear to be the key determinants of urban price differences" .

The discussion below shifts to the rate of inflation in the seven urban centers between 1994 and 2000. Table 6 gives price indices for 1995 relative to 1994. The results show that price decreased in five of the urban centers. The increase in Addis Ababa, at 0.01 percent, was negligible. But the increase in the Northern city of Mekelle, at around 10 percent as measured by the Fisher index, was quite significant. All indexes, with the exception of the poverty line, showed the largest price decline to be in Dire Dawa. The Fisher index for this city fell approximately by 10 percent. The poverty line, on the other hand, showed the largest decline to be in Awassa.

The indexes paint a similar picture with respect to price rise between the two periods. The correlation coefficient between the Fisher index and the Paasche index is 0.98 while it is 0.97 with the Laspeyres index. The correlation coefficient between the Fisher and the index from the poverty line is 0.83.

Table 6: Price indices for 1995 relative to 1994

City	Budget 94	Budget 95	Laspeyres	Paasche	Fisher	Tonrqvist	Index from PL
Addis Ababa	0.571	0.613	1.007	1.013	1.010	1.013	0.977
Awassa	0.625	0.536	0.981	0.916	0.948	0.951	0.931
Bahir Dar	0.645	0.620	0.971	0.963	0.967	0.970	0.983
Dessie	0.611	0.633	0.977	0.944	0.960	0.962	0.932
Dire Dawa	0.567	0.468	0.931	0.888	0.909	0.915	0.969
Jimma	0.572	0.564	0.976	0.954	0.965	0.967	0.932
Mekelle	0.648	0.668	1.130	1.076	1.102	1.111	1.096

It can be seen from Table 7 that prices, in all cities, were lower in 1997 than 1994. Our preferred indexes reveal that the highest decline was recorded in Bahir Dar, followed by Dessie. The lowest decline was recorded for Mekelle. Comparing the indexes in Table 6 and 7 further reveals that prices were higher in 1995 than 1997.

Table 7: Price indices for 1997 relative to 1994

City	**Budget 94**	**Budget 97**	**Laspeyres**	**Paasche**	**Fisher**	**Tornqvist**	**Index from PL**
Addis Ababa	0.571	0.588	0.935	0.919	0.927	0.928	89.305
Awassa	0.625	0.582	0.922	0.871	0.896	0.892	89.339
Bahir Dar	0.645	0.647	0.848	0.840	0.844	0.842	85.425
Dessie	0.611	0.606	0.893	0.805	0.848	0.850	89.647
Dire Dawa	0.567	0.498	0.926	0.819	0.871	0.883	86.765
Jimma	0.572	0.619	0.869	0.842	0.855	0.854	82.157
Mekelle	0.648	0.637	1.075	0.887	0.977	0.995	101.348

Table 8 shows that prices had increased in 2000, relative to 1994, in all cities with the exception of Dire Dawa. A 10 percent rise in prices was recorded in the capital Addis Ababa and Mekelle. Dire Dawa experienced a 6 percentage fall in prices, as measured by the Fisher index. It can also be discerned that prices in 2000 were higher in all cities than 1997. Prices in 2000 were also higher than 1995, except in Mekelle where they were more or less the same.

Table 8: Price indices for 2000 relative to 1994

City	Budget 94	Budget 2000	Lapeyres	Paasche	Fisher	Tornqvist	Index from PL
Addis Ababa	0.571	0.543	1.126	1.077	1.101	1.102	110.816
Awassa	0.625	0.532	1.102	1.024	1.063	1.065	106.841
Bahir Dar	0.645	0.611	1.068	1.011	1.039	1.038	104.740
Dessie	0.611	0.678	1.122	1.048	1.084	1.085	106.808
Dire Dawa	0.567	0.518	1.004	0.895	0.948	0.963	104.791
Jimma	0.572	0.559	1.075	0.963	1.018	1.020	108.382
Mekelle	0.648	0.625	1.148	1.057	1.102	1.109	116.088

Poverty Estimates

Poverty estimates for urban Ethiopia are given below. Poverty levels are presented using different deflators to identify what effect the choice of a deflator has on the estimated level of poverty. In particular, comparison will be made between the poverty estimate obtained using Fisher index and poverty lines as deflators. More importantly, the poverty profile derived by

using a country level consumer price index, which doesn't account for spatial cost of living differences, is compared with that obtained from Fisher index.

Table 9 below presents the estimated levels of poverty for the seven urban centers, in particular, and for urban Ethiopia, in general, using Fisher Ideal Indexes to take account of price differences across time and urban centers. The findings confirm that the incidence of poverty in urban Ethiopia is indeed high with a head count index of 47 percent in 1994, 49 percent in 1995, 46 percent in 1997 and 40 percent in 2000. All estimates of poverty have been found to be highly significant at 1 percent level of significance. The largest proportion of poor in 1994 was found in the city of Mekelle. This is consistent with a priori expectations because the economy and residents of Mekelle had to directly bear the brunt of the civil war and its ensuing isolation from the rest of the country. The second poorest city in 1994 was Dessie, followed by Awassa and Addis Ababa. The high poverty levels in Dessie and Addis Ababa may be associated with the influx of demobilized soldiers and migrants into the two cities at the end of the civil war. Poverty was found to be lowest in Dire Dawa in 1994 (a head count index of just 28.6 percent), which may in part be attributed to the booming contraband trade in the city at the time. Bahir Dar, with a head count of 40 percent, also did relatively better than the other cities. Being the main grain producing area of the country, it may have benefited from the liberalisation in grain trade that had been put into effect as part of recent economic reform programs.

Between the period 1994 and 1995, we observe a marginal increase in the overall poverty head count. Further inspection of the poverty levels by city reveals that poverty had marginally increased in the cities of Addis Ababa and Mekelle. In these cities, poverty incidence increased by approximately 2.9 and 4.5 percentage points respectively. However, in Dessie and Dire Dawa, we see a significant rise in poverty. The head count rose by 9.5 percent from 0.535 to 0.585 in Dessie, and by 35 percent from 0.286 to 0.387 in Dire Dawa. The poverty incidence in Awassa remained the same, while a decrease of approximately 7.5 and 4.5 percentage points was recorded in the cities of Bahir Dar and Jimma, respectively.

It can also be seen that poverty had decreased between 1995 and 2000. The poverty head count in 1997, at 0.462, similar with its 1994 value. However, it had further declined between 1997 and 2000 to 0.4. The picture in Addis Ababa is similar, with the poverty incidence in 1997 decreasing to its 1994 level before further decreasing to 0.436 in 2000. Poverty significantly decreased in the Northern city of Mekelle. There was a 32 percentage decline in poverty incidence between 1995 and 1997 and a further 14 percentage decline between 1997 and 2000. This improvement may be a result of the reconstruction efforts in the city after the end of the civil war. There has been a steady flow of investment into the city during the period. There was also a significant decline in poverty in Awassa. The head count, which had declined from a level of 0.514 to 0.493 between 1995 and 1997, fell by a remarkable 44 percentage points between 1997 and 2000. Awassa had become a seat of a regional government, which resulted in more professionals moving into the city. This may have had a positive contribution in reducing poverty in Awassa. In addition, the booming coffee trade in the late 1990's may have boosted the economy of Awassa, which is mainly a coffee growing area. This may also have benefited Jimma, another mainly coffee growing region. The poverty head count in Jimma decreased by 11 percentage points between 1997 and 2000, although it had remained almost the same between 1995 and 1997.

Poverty is lowest in the city of Bahir Dar. The poverty incidence in Bahir Dar is the lowest in 1995, 1997 and 2000. It had decreased from a level of 0.37 in 1995 to 0.27 in 1997 and 0.26 in 2000. The city of Bahir Dar, as a city located in a fertile region, may have benefited from favourable weather conditions in the late 1990's. The city with the highest proportion of poor in 2000 is Dessie. This is the case despite the poverty situation in the city improving over the period 1997 to 2000. The poverty head count had decreased from 0.579 to 0.465. In the Eastern city of Dire Dawa, where poverty was the lowest in 1994, we observe a rise in poverty incidence between 1995 and 1997, and then a fall between 1997 and 2000. The worsening situation may in part be explained by the decline in the contraband trade, which used to be widespread in the area.

In appendix 4 (table 4a), the poverty estimates obtained using Tornqvist price indexes as deflators is given. As noted above, the Fisher Ideal and the Tornqvist price indexes are our

preferred indexes. It was established above that these two indexes rank the cities similarly in terms of cost of living differences and also show the same price movement across time. A priori, we don't expect to see much difference in the poverty estimates derived using these two indexes. This is confirmed by the findings in the table. This is confirmed by the poverty estimates reported in table 4a (appendix 4), which are the same with that reported in table 9.

Table 10 below gives the poverty estimates obtained using the price differences implicit in the poverty lines as deflators. As noted earlier, the practice of using poverty lines to account for spatial and inter-temporal price differences is common in the poverty literature. Thus, it becomes essential to check whether using poverty lines would distort the poverty profile in urban Ethiopia. The fact that all previous studies in Ethiopia use poverty lines as deflators makes this exercise all the more important.

The findings in table 10 show that using poverty lines as deflators does not distort the poverty profile in urban Ethiopia. The poverty estimates calculated are similar to the estimates previously obtained using the preferred price indexes. The preferred indexes, as shown in table 9, lead to an overall poverty incidence of 0.47 in 1994, while the poverty lines lead to 0.467. The corresponding figures for 1995 are 0.49 and 0.476. In fact, the two figures assume the same value of 0.46 in 1997, and 0.40 and 0.41 in 2000. Thus, the difference between the two estimates is marginal. Comparison of the poverty levels by city also reveals the same picture. This is also corroborated when the poverty gap and squared poverty gap measures are used to measure poverty.

The poverty estimates given in table 11 are derived after taking account of inflation using country level consumer price indexes for Ethiopia taken from the International Financial Statistics (IFS) of the IMF. Thus, no adjustment is made for spatial cost of living differences across different cities. It is documented in the poverty literature that poverty estimates are sensitive to such adjustments. This is confirmed by the findings in table 11.

Table 9: Poverty levels in Urban Ethiopia

	1994			1995			1997			2000		
City	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**
Addis	0.490	0.214	0.122	0.504	0.229	0.133	0.483	0.209	0.120	0.436	0.184	0.101
	(0.017)	(0.009)	(0.007)	(0.017)	(0.010)	(0.007)	(0.017)	(0.009)	(0.007)	(0.017)	(0.009)	(0.006)
Awassa	0.514	0.253	0.158	0.514	0.241	0.142	0.493	0.230	0.144	0.276	0.089	0.048
	(0.059)	(0.036)	(0.029)	(0.059)	(0.034)	(0.025)	(0.061)	(0.037)	(0.029)	(0.051)	(0.023)	(0.017)
Bahir Dar	0.400	0.155	0.085	0.370	0.173	0.109	0.273	0.133	0.080	0.263	0.077	0.036
	(0.049)	(0.025)	(0.018)	(0.048)	(0.028)	(0.021)	(0.047)	(0.027)	(0.018)	(0.044)	(0.017)	(0.011)
Dessie	0.535	0.265	0.170	0.586	0.246	0.138	0.579	0.258	0.150	0.465	0.233	0.151
	(0.050)	(0.032)	(0.026)	(0.050)	(0.028)	(0.022)	(0.051)	(0.030)	(0.022)	(0.050)	(0.031)	(0.025)
Dire	0.286	0.085	0.036	0.387	0.134	0.067	0.426	0.147	0.073	0.389	0.148	0.085
	(0.040)	(0.015)	(0.009)	(0.044)	(0.020)	(0.014)	(0.045)	(0.021)	(0.013)	(0.043)	(0.022)	(0.018)
Jimma	0.440	0.155	0.080	0.424	0.182	0.100	0.429	0.167	0.085	0.381	0.141	0.072
	(0.050)	(0.024)	(0.017)	(0.050)	(0.026)	(0.018)	(0.050)	(0.024)	(0.016)	(0.049)	(0.023)	(0.017)
Mekelle	0.551	0.236	0.130	0.576	0.310	0.219	0.389	0.198	0.126	0.333	0.103	0.048
	(0.050)	(0.028)	(0.021)	(0.050)	(0.035)	(0.031)	(0.050)	(0.030)	(0.023)	(0.047)	(0.019)	(0.014)
Overall	0.472	0.202	0.115	0.490	0.221	0.130	0.462	0.200	0.115	0.404	0.164	0.090
	(0.013)	(0.007)	(0.005)	(0.013)	(0.008)	(0.006)	(0.013)	(0.007)	(0.005)	(0.013)	(0.007)	(0.005)

In 1994, we observe the overall poverty level estimated is similar to the estimate obtained using our preferred indexes. But looking at the poverty levels by city reveals some differences. By construction, the poverty levels in Addis Ababa are the same because Addis is used as a base. Since spatial cost of living differences are not taken account of, we expect the estimates in table 11 to understate poverty in cities where prices are higher and overstate where prices are lower relative to the base. This seems to be the case as the poverty head count in Dire Dawa, where prices are higher by almost 20 percent than the capital, is estimated to be 0.206. But the proportion of poor in Dire Dawa is actually 0.286, 39 percent higher, as shown in table 9. In Bahir Dar, where prices are lower than the capital by around 10 percent, the poverty head count is estimated to be 0.46 when a country level CPI is used. This is an overstatement of the poverty situation in Bahir Dar. The poverty incidence goes down to 0.40 when its lower price levels are taken account of. The same holds true for Jimma, where the poverty incidence is reported to be 0.47. This figure is reduced to 0.40 when price differences are incorporated.

The discrepancy between the poverty estimates under the two scenarios becomes more evident in subsequent years. When the national CPI is used, overall poverty is found to have increased by 13.4 percentage points between 1994 and 1995 as opposed to 3.8 percentage points if our preferred indexes are used. Thus, the increase in poverty over the period is grossly overstated. On the other hand, the decrease in poverty registered between 1995 and 1997 is understated. Table 9 shows there was about a 5.7 percentage decline in the poverty head count while table 11 shows a mere 1 percent. There is a similar understatement of the improvement in the overall poverty situation between 1997 and 2000.

Table 10: Poverty Estimates using poverty line deflators

	1994			1995			1997			2000		
City	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**
Addis	0.490	0.214	0.122	0.491	0.220	0.127	0.479	0.208	0.119	0.442	0.189	0.104
	(0.017)	(0.009)	(0.007)	(0.017)	(0.010)	(0.007)	(0.017)	(0.009)	(0.007)	(0.017)	(0.009)	(0.006)
Awassa	0.514	0.245	0.153	0.500	0.234	0.136	0.478	0.222	0.139	0.276	0.091	0.049
	(0.059)	(0.036)	(0.028)	(0.059)	(0.034)	(0.024)	(0.061)	(0.037)	(0.028)	(0.051)	(0.023)	(0.017)
Bahir Dar	0.390	0.150	0.082	0.350	0.161	0.101	0.250	0.124	0.073	0.273	0.079	0.036
	(0.049)	(0.024)	(0.018)	(0.048)	(0.027)	(0.021)	(0.046)	(0.026)	(0.017)	(0.045)	(0.017)	(0.011)
Dessie	0.535	0.253	0.162	0.556	0.223	0.124	0.611	0.270	0.158	0.465	0.232	0.151
	(0.050)	(0.031)	(0.026)	(0.050)	(0.027)	(0.021)	(0.050)	(0.030)	(0.023)	(0.050)	(0.031)	(0.025)
Dire	0.254	0.069	0.028	0.379	0.130	0.065	0.484	0.159	0.079	0.405	0.154	0.088
	(0.039)	(0.014)	(0.008)	(0.044)	(0.020)	(0.014)	(0.045)	(0.021)	(0.014)	(0.044)	(0.023)	(0.018)
Jimma	0.430	0.152	0.079	0.424	0.175	0.096	0.388	0.141	0.069	0.412	0.155	0.080
	(0.050)	(0.024)	(0.016)	(0.050)	(0.026)	(0.018)	(0.049)	(0.022)	(0.014)	(0.050)	(0.024)	(0.017)
Mekelle	0.541	0.214	0.117	0.545	0.295	0.208	0.389	0.194	0.124	0.333	0.097	0.045
	(0.050)	(0.027)	(0.020)	(0.050)	(0.035)	(0.031)	(0.050)	(0.030)	(0.023)	(0.047)	(0.019)	(0.013)
Overall	0.467	0.198	0.112	0.476	0.211	0.123	0.462	0.198	0.113	0.411	0.168	0.093
	(0.013)	(0.007)	(0.005)	(0.013)	(0.007)	(0.006)	(0.013)	(0.007)	(0.005)	(0.013)	(0.007)	(0.005)

Table 11: Poverty Estimates using National price indices

	1994			1995			1997			2000		
City	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**
Addis	0.490	0.214	0.122	0.549	0.254	0.150	0.536	0.250	0.148	0.472	0.204	0.115
	(0.017)	(0.009)	(0.007)	(0.017)	(0.010)	(0.007)	(0.017)	(0.010)	(0.007)	(0.017)	(0.009)	(0.006)
Awassa	0.514	0.252	0.158	0.569	0.286	0.176	0.507	0.269	0.174	0.355	0.123	0.063
	(0.059)	(0.036)	(0.029)	(0.058)	(0.036)	(0.027)	(0.061)	(0.039)	(0.031)	(0.055)	(0.025)	(0.018)
Bahir Dar	0.460	0.180	0.099	0.480	0.211	0.133	0.432	0.186	0.114	0.434	0.139	0.065
	(0.050)	(0.026)	(0.019)	(0.050)	(0.030)	(0.023)	(0.053)	(0.030)	(0.022)	(0.050)	(0.022)	(0.014)
Dessie	0.535	0.260	0.166	0.626	0.287	0.166	0.684	0.329	0.197	0.566	0.267	0.173
	(0.050)	(0.032)	(0.026)	(0.049)	(0.029)	(0.023)	(0.048)	(0.031)	(0.024)	(0.050)	(0.032)	(0.026)
Dire	0.206	0.052	0.021	0.387	0.138	0.069	0.557	0.180	0.089	0.405	0.156	0.089
	(0.036)	(0.012)	(0.007)	(0.044)	(0.020)	(0.014)	(0.045)	(0.022)	(0.015)	(0.044)	(0.023)	(0.018)
Jimma	0.470	0.183	0.096	0.505	0.245	0.145	0.520	0.245	0.141	0.588	0.229	0.121
	(0.050)	(0.025)	(0.018)	(0.050)	(0.029)	(0.022)	(0.051)	(0.029)	(0.020)	(0.050)	(0.027)	(0.020)
Mekelle	0.551	0.223	0.122	0.556	0.302	0.213	0.389	0.204	0.131	0.343	0.107	0.050)
	(0.050)	(0.027)	(0.020)	(0.050)	(0.035)	(0.031)	(0.050)	(0.031)	(0.023)	(0.048)	(0.020)	(0.014)
Overall	0.471	0.202	0.115	0.534	0.248	0.148	0.528	0.242	0.143	0.474	0.196	0.109
	(0.013)	(0.007)	(0.005)	(0.013)	(0.008)	(0.006)	(0.013)	(0.008)	(0.006)	(0.013)	(0.007)	(0.005)

The use of the national CPI, not only leads to poverty estimates far off from our preferred estimates, but also distorts the poverty profile among the cities. For instance in 1997, Dessie is ranked as the poorest followed by Awassa, Addis Ababa, Jimma, Dire Dawa, Mekelle and Bahir Dar by our preferred estimates. The ranking is changed when the country level CPI is used. Dessie is again the poorest, followed by Dire Dawa, Addis Ababa, Jimma, Awassa, Bahir Dar and Mekelle. A distortion of a poverty profile is a serious transgression as it is important in the channelling of resources from the center to the cities.

Conclusion

This paper derives a set of price indices for Urban Ethiopia using data from four urban household surveys conducted in 1994, 1995, 1997, and 2000. We provide estimates of the rate of inflation over the six year period for seven urban centers of Ethiopia. Estimates of price levels across the seven urban centers are also provided for each of the four periods. The price indices developed are used to calculate poverty rates between 1994 and 2000. The implications on poverty of using alternative consumer price indices are also discussed.

The findings of the study show that the city of Mekelle, in the North, and Dire Dawa, in the east, are the two most expensive cities in urban Ethiopia. These two cities are located in the driest parts of the country, where much production of food does not occur. Conversely, the cities of Bahir Dar and Jimma, which are located in wet and fertile regions, have been consistently ranked as the least costly by all price indexes. Prices also seem to be quite high in capital city Addis Ababa, as it has been ranked the third most expensive in 1995, 1997 and 2000, by the Fisher Ideal and Tornqvist prices indexes, which are our preferred indexes. It seems fertility in the environs of a city and access to transportation are key determinants of urban price differences.

The poverty estimates obtained, after accounting for price differences across time and between cities using our preferred indexes, show that poverty in Urban Ethiopia is indeed high. The poverty head count is 47 percent in 1994, 49 percent in 1995, 46 percent in

1997 and 40 percent in 2000. The study established that poverty estimates obtained using price differences implicit in the poverty lines are similar to the ones obtained using our preferred price indexes. This is an important finding since poverty lines are commonly used as deflators in poverty analysis. It was also established that the use of a country level CPI, which does not account for spatial cost of living differences, gives incorrect poverty estimates. Even more serious is the fact that it would distort the poverty profile, which would guide in the channelling of resources from the center to different cities.

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Appendix 1

Table 1a: Food Basket Composition for the Ethiopian Urban Poverty Line

Food item	Grams/day	Edible share	calories/gram	Total Kcal	Food basket (grams/day)	Kg per month
Teff	216.052	1.000	3.576	772.524	202.060	6.062
Barley	68.135	0.830	3.716	210.119	63.722	1.912
Wheat	79.792	0.980	3.573	279.371	74.625	2.239
Maize	96.473	0.930	3.793	340.308	90.225	2.707
Lentils	21.230	1.000	3.551	75.387	19.855	0.596
Cow peas	31.552	1.000	3.538	111.630	29.508	0.885
Chick peas	17.841	1.000	3.776	67.367	16.685	0.501
Horse beans	18.087	0.770	3.531	49.177	16.916	0.507
Shiro	32.647	1.000	3.622	118.236	30.532	0.916
Pepper	11.449	0.490	0.913	5.122	10.708	0.321
Milk	53.328	1.000	0.737	39.303	49.875	1.496
Salt	9.528	1.000	0.000	0.000	8.911	0.267
oil	10.063	1.000	8.964	90.205	9.411	0.282
Sugar	28.482	1.000	3.850	109.655	26.637	0.799
Potato	39.296	0.630	1.037	25.673	36.751	1.103
Tomato	17.453	0.740	0.307	3.965	16.323	0.490
Carrot	19.274	0.720	0.420	5.829	18.026	0.541
Onion	14.249	0.900	0.713	9.143	13.326	0.400
Garlic	7.289	0.690	1.383	6.955	6.816	0.204
Orange	36.055	0.520	0.339	6.356	33.720	1.012
banana	28.427	0.580	0.878	14.476	26.586	0.798
Coffee	10.462	1.000	1.103	11.540	9.784	0.294
				2352.340		

Table 1b: Food share regression for 1994

	Addis Ababa	Awassa	Bahir Dar	Dessie	Dire Dawa	Jimma	Mekelle
Constant	0.769674	0.5562166	0.80864	0.6342282	0.871918	0.8498982	0.6385904
	(0.0223378)	(0.0900753)	(0.059871)	(0.0867624)	(0.0474624)	(0.0605504)	(0.0805329)
log real consumption per capita	-0.0113355	0.0331453	-0.0254779	0.0755264	-0.0319965	0.0361872	-0.0579234
	(0.0063576)	(0.0209673)	(0.0149905)	(0.021014)	(0.0253907)	(0.0176657)	(0.0178105)
log real consumption per capita sq	-0.0295543	0.024052	0.0244447	-0.0489929	-0.004618	-0.0663045	-0.0486222
	(0.0043169)	(0.0152427)	(0.0093932)	(0.0096977)	(0.0133921)	(0.0103624)	(0.0066223)
Age of household head	-0.0006519	0.0016619	-0.0001063	0.0019446	-0.0004037	-0.0003881	0.0026562
	(0.000395)	(0.001633)	(0.0011358)	(0.0012512)	(0.0007901)	(0.001151)	(0.0013604)
number under 15	0.0016189	0.0243034	-0.0008078	-0.0052624	-0.0053655	-0.0179785	0.0034919
	(0.0030657)	(0.0103011)	(0.0079654)	(0.0099581)	(0.0068463)	(0.0089984)	(0.0101588)
number of male adults	-0.0034214	-0.0160122	0.0093529	0.016698	0.0023884	-0.0208645	-0.0078815
	(0.0037453)	(0.0136547)	(0.0115925)	(0.0159252)	(0.0086366)	(0.0130919)	(0.0171166)
number of female adults	-0.0040522	-0.0045786	0.0007491	0.0125471	-0.0205831	-0.0142424	-0.0176096
	(0.0038758)	(0.0161056)	(0.0142501)	(0.0154411)	(0.0092623)	(0.0136345)	(0.0193621)
number working	-0.0017793	0.0193599	-0.0349029	-0.0130674	-0.0115025	0.0161033	0.0237336
	(0.0045338)	(0.0202221)	(0.0155255)	(0.0196615)	(0.0140009)	(0.018788)	(0.0212519)
Prob > F	0	0.1752	0.0151	0	0.0699	0	0
R-squared	0.0865	0.1429	0.1681	0.4732	0.1038	0.3506	0.418
Adj R-squared	0.0793	0.0491	0.1048	0.4318	0.0502	0.3012	0.3728

Table 1c: Food share regression for 1995

	Addis Ababa	Awassa	Bahir Dar	Dessie	Dire Dawa	Jimma	Mekelle
Constant	0.7768677	0.5831967	0.7229786	0.69269	0.830078	0.8341285	0.6298089
	(0.0259369)	(0.0752454)	(0.0685462)	(0.063543)	(0.0652433)	(0.0745826)	(0.0908152)
log real consumption per capita	0.0254819	-0.0207281	0.0180187	-0.0081324	0.0305088	-0.0468096	-0.0834804
	(0.0073729)	(0.0198684)	(0.017771)	(0.0193684)	(0.0206339)	(0.0229232)	(0.0192617)
log real consumption per capita sq	-0.0246301	0.0362459	0.0259345	-0.0128022	-0.0306228	-0.0164579	-0.0365632
	(0.0047042)	(0.0082926)	(0.0105706)	(0.0112278)	(0.0120719)	(0.0137091)	(0.0066391)
age of household head	-0.0010519	0.0021364	-0.0009435	0.0009646	-0.0009959	-0.0010025	0.0016521
	(0.0004477)	(0.0013527)	(0.0012461)	(0.000921)	(0.0010634)	(0.0013075)	(0.0015475)
number under 15	0.0029865	0.0150332	0.0363293	0.0063065	-0.0022265	-0.0237754	0.002408
	(0.0038062)	(0.0085391)	(0.0097424)	(0.00821)	(0.0103313)	(0.0110552)	(0.0127074)
number of male adults	0.0020115	0.0080497	0.005709	0.0210321	-0.0072869	0.0008042	0.0240133
	(0.0043969)	(0.0111291)	(0.0139071)	(0.0140174)	(0.0129702)	(0.0159482)	(0.0179948)
number of female adults	-0.0080723	-0.0037599	-0.0006879	-0.0243229	-0.0154521	-0.0121518	-0.0036645
	(0.004325)	(0.011795)	(0.014955)	(0.0125276)	(0.01292)	(0.014028)	(0.0188449)
number working	-0.0054402	-0.0202434	-0.0284334	0.0101361	-0.0092251	0.0145954	0.0188804
	(0.0053385)	(0.0163659)	(0.0182097)	(0.0170437)	(0.0188763)	(0.0202192)	(0.0223531)
Prob > F	0	0.0002	0.0053	0.3522	0.1226	0.0927	0
R-squared	0.053	0.3491	0.194	0.0799	0.0917	0.1228	0.3021
Adj R-squared	0.0449	0.2779	0.132	0.0091	0.0368	0.0554	0.2484

Table 1d: Food share regression 1997

	Addis Ababa	Awassa	Bahir Dar	Dessie	Dire Dawa	Jimma	Mekelle
Constant	0.6382501	0.5319075	0.8021705	0.6716506	0.699993	0.7795018	0.6759018
	0.0253733	0.1085722	0.0670086	0.069449	0.0663176	0.0630684	0.0936507
log real consumption per capita	0.0403084	0.0519063	-0.027193	0.0113999	0.0924898	-0.010508	-0.014586
	0.0071458	0.0239813	0.0248822	0.0182088	0.0278472	0.0234319	0.0210796
log real consumption per capita sq	-0.0229364	0.0053081	-0.0183417	-0.0162456	-0.0597078	-0.0385334	-0.0076236
	0.0038777	0.0103764	0.0161031	0.0133599	0.0174152	0.0141162	0.0157785
age of household head	0.0009269	0.0020346	-0.0002051	0.0003812	0.000109	0.0002315	-0.000056
	0.0004313	0.0017808	0.0011878	0.0010035	0.0011105	0.00109	0.0013676
number under 15	0.0048709	0.0330345	-0.0002167	0.0016444	-0.0026981	-0.0109359	-0.0039275
	0.0041535	0.0144778	0.0109039	0.0099929	0.0114203	0.0106337	0.0138367
number of male adults	0.0048765	0.0207905	0.0333247	0.0243972	0.0182653	-0.000203	0.0106185
	0.0043403	0.0163918	0.0172777	0.0154179	0.0130083	0.0106798	0.0175332
number of female adults	-0.0074963	-0.0230537	-0.0273591	0.0005243	-0.0217943	-0.0019188	0.0194981
	0.0042685	0.0169465	0.0196728	0.011657	0.0144818	0.0109685	0.0184483
number working	-0.0040925	-0.0103391	0.0039853	-0.0029437	0.0279535	0.0150706	0.0097647
	0.005369	0.0252235	0.0201414	0.0187561	0.0220942	0.018647	0.026364
Prob > F	0	0.046	0.0787	0.7813	0.0093	0.0057	0.58
R-squared	0.0594	0.2078	0.1432	0.0436	0.148	0.1941	0.7736
Adj R-squared	0.0517	0.1138	0.0682		0.0957	0.1314	

Table 1e: Food share regression 2000

	Addis Ababa	Awassa	Bahir Dar	Dessie	Dire Dawa	Jimma	Mekelle
Constant	0.7887871	0.7621213	0.8835483	0.8019981	0.8477033	0.845188	0.8350585
	(0.0204936)	(0.0738736)	(0.0545747)	(0.0681034)	(0.0538771)	(0.0663391)	(0.057381)
log real consumption per capita	-0.0116496	-0.0298247	0.033853	0.0325125	0.0126235	0.008741	0.001126
	(0.0068005)	(0.022764)	(0.025917)	(0.0149411)	(0.0144636)	(0.0250217)	(0.0169089)
log real consumption per capita sq	-0.0235249	-0.0161626	-0.0232263	-0.0172784	-0.0490768	-0.0722274	-0.0404565
	(0.0040106)	(0.0119062)	(0.0154714)	(0.0099227)	(0.0061054)	(0.0174052)	(0.0064607)
age of household head	-0.0008806	0.0013363	-0.0011712	-0.0004421	-0.0012598	-0.000903	0.0006309
	(0.0003602)	(0.0012145)	(0.0010486)	(0.0009667)	(0.0009161)	(0.0011923)	(0.0009384)
number under 15	0.0002513	-0.0077215	-0.0005485	0.0079561	-0.0152066	-0.0014526	-0.0232873
	(0.0035613)	(0.0101129)	(0.0083361)	(0.0092869)	(0.0096842)	(0.0111173)	(0.0087072)
number of male adults	-0.0050428	-0.0246854	0.0085077	0.0111512	-0.0066347	0.0057834	-0.0015319
	(0.0035697)	(0.0137221)	(0.0114595)	(0.0154348)	(0.0115154)	(0.0147678)	(0.0114537)
Number of female adults	-0.0132558	-0.0347922	-0.0226266	-0.0222512	0.0015589	-0.0131866	-0.0302568
	(0.003655)	(0.0136056)	(0.0108443)	(0.0125375)	(0.0127201)	(0.0131335)	(0.0112395)
number working	0.0034684	0.0217027	-0.0191235	-0.0024691	-0.000453	-0.0165757	0.0049727
	(0.0040956)	(0.0146975)	(0.0144775)	(0.0213733)	(0.0180611)	(0.0201858)	(0.0174735)
Prob > F	0	0.0955	0.1012	0.0338	0	0.0019	0
R-squared	0.1006	0.1585	0.1203	0.1499	0.4479	0.2206	0.3557
Adj R-squared	0.0933	0.0719	0.0527	0.0845	0.4151	0.1593	0.3062

Appendix 2

Table 2a: Basket of goods used to derive Spatial Cost of living index for 1994

	Budget shares							Median Unit Values						
Item code	Addis Ababa	Awassa	Bahir Dar	Dessie	Dire Dawa	Jimma	Mekelle	P1	P2	P3	P4	P5	P6	P7
Teff	0.330682	0.229755	0.353935	0.345871	0.237685	0.302267	0.239525	2.5	2.6	2.35	2.56	3	2.38	2.58
Barley	0.00992	0.006127	0.02507	0.014149	0.006338	0.016457	0.022455	1.96	1.94	1.5	1.8	2.31	1.76	1.6
Wheat	0.056216	0.055141	0.013273	0.084896	0.019015	0.04534	0.194614	2	1.8	1.79	1.95	2	2	1.7
Maize	0.024801	0.137853	0.038343	0.018866	0.003169	0.063812	0.007485	1.1	1.05	1.31	1.51	2.5	0.95	1
Sorghum	0.00496	0.000306	0.019171	0.006289	0.079228	0.015113	0.01497	1.91	1.67	1.25	1.8	2.29	2.28	2
Lentils	0.00496	0.004595	0.008848	0.018866	0.003169	0.003359	0.01497	3.28	3.5	2	2.18	3	3.5	2
Cow Peas	0.003307	0.00919	0.042767	0.007861	0.025353	0.025189	0.005988	2.94	2	1.97	2.14	3	2.13	2.5
Chick Peas	0.006614	0.001532	0.002949	0.004716	0.000634	0.003359	0.001497	2.25	2.48	2.04	2.47	2.5	2.5	3
Horse Beans	0.00496	0.01838	0.004424	0.028299	0.003169	0.010076	5.99E-05	2	2.23	2	1.6	2.26	2	2.17
Shiro	0.042989	0.01838	0.008848	0.040876	0.015846	0.013434	0.037426	3.06	3.25	2	3.51	3	3.53	2.86
Berbere	0.033068	0.030634	0.029495	0.040876	0.044368	0.028547	0.029941	7.04	7.94	4.5	7	10	4.5	8
Milk	0.013227	0.015317	0.014747	0.011005	0.023769	0.015113	0.004491	2	1.33	1.52	1.68	3	1.5	1.54
Butter	0.041335	0.091902	0.029495	0.029871	0.031691	0.083963	0.011976	22	24	16	17	26	20	22
Beef	0.033068	0.036761	0.05604	0.020438	0.079228	0.050378	0.04042	13	12	10	10	14	10	12
Egg	0.003307	0.004595	0.005899	0.003144	0.003169	0.008396	0.002994	0.33	0.38	0.25	0.29	0.34	0.33	0.33
Pasta	0.006614	0.010722	0.004424	0.003144	0.022184	0.008396	0.005988	4	4	4.5	4.5	7	4	5
Salt	0.008267	0.010722	0.008848	0.011005	0.007923	0.010076	0.007485	1.1	1.6	1.43	1	2	1.5	1.5
Oil	0.056216	0.058205	0.057514	0.051881	0.066552	0.04534	0.062875	8.5	9	8	8	10	8	6.02
Sugar	0.049602	0.055141	0.039818	0.025154	0.063383	0.026868	0.041917	7.5	8	8	8	6.5	8	7.5
Honey	0.002976	0.00291	0.010323	0.000786	0.003169	0.005038	0.002994	12	20	9	17	24	12	20
Potato	0.016534	0.022975	0.02802	0.018866	0.026938	0.020151	0.019461	1.49	1	1.25	1	2	1.43	2
Tomato	0.008267	0.004595	0.001327	0.006289	0.020599	0.001679	0.019461	2	3.19	1.5	1.08	2.5	1.25	3
Carrot	0.003307	0.004595	0.000737	0.001572	0.001585	0.001679	0.000898	1.67	0.9	2	2	1.5	1.5	2
Onion	0.021494	0.022975	0.023596	0.015721	0.026938	0.02183	0.013473	2	2	2.27	3.75	2.27	2.5	3
Garlic	0.003307	0.004595	0.004424	0.004716	0.004754	0.006213	0.006886	2.86	1.75	2.5	4	3.03	3.57	4
Orange	0.010913	0.005514	0.002949	0.004716	0.006338	0.004534	0.008234	1.13	2	2.5	2	1.5	1	2.5
Banana	0.002645	0.00046	0.00059	0.001258	0.001585	0.001679	0.002545	2.5	2	2	2.75	1.88	1.96	2.5
Soft Drink	0.00496	0.001532	0.002949	0.000157	0.001585	0.010076	0.001497	1	1.5	1.5	1.25	1	1.38	2
Coffee	0.081017	0.045951	0.101756	0.086468	0.083982	0.083963	0.104792	20	12.5	20	20	18	12.5	20
Tea	0.009259	0.010416	0.006931	0.003773	0.023769	0.005038	0.006437	2	2.25	2	2	2.5	2	2
Torch	0.000281	0.000414	4.42E-05	0.000236	1.11E-05	0.001679	7.49E-05	6.5	7.17	8	5.25	6.33	5.67	6.17
Matches	0.004299	0.002604	0.002212	0.005817	0.004437	0.003862	0.002844	0.34	0.27	0.3	0.25	0.28	0.23	0.25

Candles	0.001075	0.000766	0.000826	4.09E-05	0.000951	0.001175	0.001048	0.88	1	1	1	1	1	1
Light Bulbs	0.001306	0.002451	0.001475	0.000629	0.000444	0.002687	0.000599	3.08	3.42	3.75	2.5	3	3.33	3.5
Charcoal	0.014881	0.022975	0.02802	0.007861	0.015846	0.028547	0.041917	1.42	2.03	0.99	2.44	1.56	0.8	1.07
Electricity	0.046296	0.036761	0.017697	0.031443	0.019015	0.015113	0.011976	0.18	0.18	0.15	0.2	0.15	0.15	0.16
Kerosene	0.033068	0.012254	0.002212	0.042448	0.022184	0.009572	0.007785	1	1.71	1.35	1.5	4.16	1.47	4.92

* P1= Price in Addis, P2=Price in Awassa, P3=Price in Bahir Dar, P4= Price in Dessie, P5= Price in Dire, P6= Price in Jimma and P7= Price in Mekelle

Table 2b: Basket of goods used to derive Spatial Cost of living index for 1995

	Budget Shares							Median Unit Values						
Item code	Addis Ababa	Awassa	Bahir Dar	Dessie	Dire Dawa	Jimma	Mekelle	P1	P2	P3	P4	P5	P6	P7
White Teff	0.043862	0.074751	0.046475	0.083779	0.075334	0.05838	0.033685	2.7	2.43	1.83	2.3	2.83	2.2	2.7
Black Teff	0.111494	0.038079	0.065329	0.076612	0.039633	0.07551	0.096356	2	1.8	1.75	2.04	2.29	1.76	2.2
Mixed Teff	0.123819	0.127115	0.166637	0.141772	0.099581	0.142048	0.082375	2.4	2.2	1.72	2.2	2.7	1.88	2.4
White Barley	0.003092	0.007315	0.010845	0.015364	0.00716	0.007045	0.015008	1.75	1.5	1.6	1.6	2	1.68	1.43
Mixed Barley	0.002269	0.002334	0.008851	0.002487	0.003453	0.001249	0.000641	1.5	1.3	1.53	1.78	2	1.71	1.2
White Wheat	0.027104	0.038446	0.006181	0.0299	0.025817	0.019906	0.073792	1.8	1.7	2	2	2.5	1.9	2.2
Black Wheat	0.010827	0.010922	0.008427	0.012892	0.000952	0.006043	0.013075	1.7	1.2	2	1.9	1.2	1.71	2
Mixed Wheat	0.011768	0.010949	0.003238	0.036902	0.003473	0.02247	0.009916	1.7	1.46	2	1.86	2	1.76	1.9
Maize	0.016727	0.091296	0.049232	0.016168	0.001004	0.03804	0.000706	1.1	1	1	1	1.26	0.71	1.8
Lentils	0.005008	0.001386	0.009837	0.018261	0.002583	0.006884	0.007078	3.5	3.5	2.5	2.28	3	4	3.5
Cow Peas	0.00387	0.027896	0.03371	0.0077	0.023587	0.019749	0.006263	3.5	2.5	2	2.17	2.78	2.12	3
Chick Peas	0.003966	0.002731	0.001536	0.002444	0.001617	0.004028	0.003273	2.32	2.5	1.8	2.14	3	2.13	2.5
Horse Beans	0.003363	0.00232	0.020986	0.032974	0.00382	0.010857	0.002882	2.25	2.5	1.76	2.4	2.5	2.12	3
Shiro	0.037893	0.005311	0.004576	0.012841	0.022235	0.016065	0.041475	3.5	4.5	3.4	3.77	3	2.54	3.75
Berbere	0.102513	0.047416	0.096502	0.070397	0.084704	0.051051	0.142362	10	8.33	8	10	12.75	6	12.5
Milk	0.012397	0.021495	0.007787	0.005589	0.011812	0.013572	0.00337	2	1.67	1.31	1.5	4	1.66	2.65
Butter	0.027671	0.027284	0.027693	0.018261	0.022331	0.057032	0.006112	26	29.5	20	23.5	29	26	30
Beef	0.024823	0.05274	0.042529	0.011082	0.07251	0.048633	0.011745	14	14	10	10	14	12	12
Egg	0.001823	0.003948	0.00362	0.003695	0.002956	0.006004	0.001667	0.35	0.33	0.29	0.3	0.33	0.33	0.4
Pasta	0.006135	0.005494	0.008491	0.003169	0.013138	0.007524	0.001729	4.5	5	5	5	5	4.5	9
Salt	0.013408	0.010262	0.011767	0.016213	0.012693	0.013524	0.021863	1	1.5	1.09	1.5	1.5	1.5	1.5
cooking oil	0.090132	0.097563	0.093862	0.083087	0.0949	0.089545	0.092275	13	13	12	12	11.75	12	11
Sugar	0.039712	0.032772	0.02931	0.027291	0.056659	0.026322	0.044888	4.5	5	5	4.9	5	5	5.5
Potato	0.014973	0.038714	0.022451	0.012046	0.029312	0.022414	0.018104	1.25	0.46	2	1	1.67	2	2
Tomato	0.007306	0.005883	0.003032	0.006778	0.019482	0.003787	0.018194	2	2.62	2	1.87	2	4.18	2.5
Carrot	0.002915	0.002082	0.001327	0.002242	0.001397	0.005343	0.000622	2	1.71	1.5	0.9	1.11	1	1.5
Onion	0.023012	0.030608	0.022028	0.017257	0.032282	0.024986	0.023771	2.5	2.48	2.5	2	1.62	2.44	3
Garlic	0.003423	0.010919	0.008328	0.005234	0.007098	0.009234	0.007099	3.5	3.28	2.5	4.26	2.5	2.97	4
Orange	0.005861	0.004147	0.005358	0.00554	0.002455	0.005181	0.003944	1	2.5	2.5	2.5	1.5	1	2.2
Banana	0.002015	0.001256	0.000617	0.002598	0.000543	0.004217	0.000917	2.5	1.31	3	3	3	1	2.5
Soft Drink	0.003004	0.002847	0.001774	0.001152	0.006826	0.006932	0.000356	1.25	1.75	2	1.5	1.25	1.5	2
Beer	0.000949	0.00369	0.002619	0.001938	0.00603	0.003836	0.00067	3	3	3.25	3	2.5	2.5	3
Coffee	0.058754	0.044147	0.070707	0.081479	0.049782	0.058462	0.106002	16	11.1	17.86	16	16.67	9.19	20

Tea	0.006278	0.007524	0.005627	0.007402	0.015503	0.004969	0.006687	2	2	2	1.75	2.5	2	2
Torch	0.000196	3.11E-06	3.71E-05	0.000411	0.00017	0.00044	6.99E-05	6.5	7.25	7.08	6.67	6.33	6.17	6
Matches	0.007148	0.007736	0.002304	0.004342	0.008963	0.006228	0.005743	0.28	0.25	0.27	0.22	0.28	0.23	0.25
Candles	0.002295	0.001585	0.000764	0.001059	0.000441	0.001757	0.002057	0.87	1	1	0.93	1	1	1
Bulbs	0.003262	0.004705	0.002221	0.001947	0.002172	0.004057	0.002019	2.92	3.13	3.08	2.35	3.17	3.17	3.17
Charcoal	0.014234	0.024412	0.039916	0.006341	0.022859	0.04413	0.020072	1.85	1.77	1.15	1.67	1.35	1	1.48
Electricity	0.06069	0.026467	0.027715	0.048802	0.041943	0.022326	0.016683	0.18	0.18	0.15	0.15	0.15	0.15	0.16
Kerosene	0.040134	0.018266	0.002477	0.036585	0.036259	0.010091	0.018996	1	1.45	3.78	1.25	1.63	1.53	2.04
Detergent	0.019872	0.025185	0.023279	0.027967	0.034532	0.020129	0.03546	0.96	0.83	1.08	1.06	1.13	1	1.02

Table 2c: Basket of goods used to derive Spatial Cost of living index for 1997

	Budget shares							Median Unit Values						
Item code	Addis Ababa	Awassa	Bahir Dar	Dessie	Dire Dawa	Jimma	Mekelle	P1	P2	P3	P4	P5	P6	P7
White Teff	0.044029	0.0861	0.038591	0.053844	0.064496	0.057493	0.045087	2.28	1.83	1.5	2	2.5	1.47	2.5
Black Teff	0.094889	0.029305	0.064225	0.101551	0.047224	0.033397	0.101618	1.6	1.6	1.3	1.6	2	1.18	1.88
Mixed Teff	0.122868	0.123713	0.16245	0.137915	0.089259	0.096567	0.118171	1.9	1.8	1.4	1.75	2.19	1.31	2.2
White Barley	0.006092	0.005405	0.008072	0.011333	0.006364	0.006325	0.006656	1.5	1	1.2	1.45	2	1.53	1.75
Mixed Barley	0.002989	0.000669	0.000839	0.004197	0.002363	0.00163	0.000264	1.4	1.6	1.21	1.66	2.4	1.29	0.8
White Wheat	0.028986	0.035066	0.018803	0.030261	0.011058	0.03314	0.061148	1.5	1.4	1.45	1.7	2.23	1.44	2.37
Mixed Wheat	0.007255	0.003274	0.001557	0.011197	0.006381	0.021359	0.016917	1.5	2	1.2	1.8	2.25	1.26	2.07
Lentils	0.005544	0.003496	0.008724	0.015675	0.000468	0.002355	0.008222	3.25	3.5	3.03	2.6	3.25	3.38	3.5
Cow Peas	0.002695	0.024395	0.038877	0.006362	0.013879	0.013573	0.005042	2.88	2.5	2	3.02	2.5	1.88	2.25
Chick Peas	0.003757	0.003809	0.002186	0.000641	0.002161	0.000956	0.00103	1.75	2.75	1.3	3.78	2	2.5	2.83
Horse Beans	0.003535	0.005094	0.003465	0.043516	0.003458	0.010986	0.006052	2	2	1.75	2.15	2	1.88	2.75
Shiro	0.039207	0.004936	0.006457	0.020535	0.032959	0.030716	0.029079	3.5	2.4	4.5	4.75	2.75	3	4
Berbere	0.045423	0.034414	0.064159	0.051123	0.052988	0.031462	0.030092	10	10	7	9	13	7	12
Milk	0.011572	0.029526	0.008065	0.004676	0.007852	0.010549	0.002541	2	1.75	1.8	1.5	3	1.86	2.5
Butter	0.052599	0.090351	0.063283	0.020682	0.025736	0.103769	0.01303	25	25.5	21	22	29	26	30
Beef	0.049666	0.086951	0.083228	0.021947	0.0726	0.05081	0.035516	14	14	10	10	16	12	12
Egg	0.004729	0.0089	0.006386	0.011053	0.00526	0.008738	0.002851	0.4	0.4	0.33	0.25	0.33	0.33	0.33
Pasta	0.007278	0.007884	0.004463	0.004328	0.029916	0.009722	0.009719	4.5	5	5	5	5	4.5	5.5
Salt	0.017524	0.008975	0.008776	0.018935	0.022468	0.015473	0.016304	1	1.5	2	1.3	1.5	1.4	1
Cooking oil	0.108991	0.067032	0.095257	0.075692	0.116405	0.117289	0.110015	11	10	10	11	11	11	11
Sugar	0.055688	0.037672	0.027417	0.048062	0.055796	0.047675	0.063791	5	5	5.25	5	5.2	5.25	5.5
Potato	0.014612	0.026504	0.023705	0.010639	0.02613	0.026483	0.013185	1.49	0.76	1	1.04	1	1	2
Tomato	0.008502	0.013435	0.005866	0.00501	0.023691	0.010693	0.010352	2	2.38	1.5	1.09	3.85	3.24	2
Carrot	0.003812	0.00342	0.01114	0.001772	0.001174	0.002586	0.000589	2	0.75	1.75	0.54	0.69	1.49	2
Onion	0.034693	0.022809	0.032797	0.032528	0.043093	0.046508	0.027807	3.45	5	3.33	1.64	4	2.57	3
Garlic	0.00516	0.006526	0.007237	0.003452	0.005925	0.012654	0.006498	4	4.64	2.5	3.85	4.7	5.94	4
Orange	0.005134	0.002314	0.004423	0.004165	0.002567	0.001326	0.004119	2	2.5	2.2	3	2	2	3
Banana	0.003335	0.002158	0.002646	0.001644	0.000921	0.003672	0.001461	2.5	2	3	3	1	1	2.5
Soft Drinks	0.006568	0.003736	0.005169	0.001425	0.001645	0.005532	0.000509	1.25	1.63	2	1.75	1.25	1.5	2
Coffee	0.066918	0.050207	0.061315	0.075948	0.052023	0.067057	0.081787	12	11.75	12	11	15	9	12
Tea	0.008206	0.00457	0.006444	0.005962	0.005582	0.009413	0.00632	2	2	2	1.6	2.5	2	2
Matches	0.006937	0.012369	0.002585	0.004615	0.006116	0.004597	0.004598	0.21	0.25	0.25	0.25	0.25	0.22	0.23
Candles	0.001639	0.003789	0.00647	0.000439	0.0006	0.000864	0.004999	0.88	1	0.93	0.75	1	1	0.92
Charcoal	0.012549	0.031019	0.036135	0.009676	0.029559	0.033006	0.023964	1.47	1.49	1.3	1.74	1.13	1.25	1.82

Fuel Wood	0.02378	0.05358	0.052806	0.066503	0.042748	0.043232	0.071797	94	148.88	107	117.9	36.6	60	168
Kerosene	0.059839	0.035076	0.009043	0.055428	0.046703	0.00783	0.030018	1.4	1.45	1.53	1.31	1.27	1.49	1.3
Detergent	0.022999	0.031525	0.01694	0.02727	0.042432	0.020563	0.02885	1.25	1.25	1.4	1.35	1	1.21	1.13

Table 2d: Basket of goods used to derive Spatial Cost of living index for 2000

Item code	Addis Ababa	Awassa	Bahir Dar	Dessie	Dire Dawa	Jimma	Mekelle	P1	P2	P3	P4	P5	P6	P7
White Teff	0.041693	0.042384	0.08542	0.066296	0.066119	0.05633	0.155858	3	2.6	2.33	2.46	3	2.4	3
Black Teff	0.099078	0.030556	0.064345	0.116093	0.065681	0.02665	0.096293	2.3	2.4	2	2.3	2.5	2.13	2.5
Mixed Teff	0.185565	0.135647	0.220217	0.123255	0.091275	0.197257	0.077817	2.6	2.5	2.09	2.4	3	2.12	2.8
Whte Barley	0.00637	0.014582	0.010826	0.007539	0.006876	0.002918	0.007937	2	2	2	3.5	2.3	2.24	1.63
White Wheat	0.032486	0.031319	0.026105	0.027281	0.010721	0.028936	0.119715	2	2	2	2	2.5	1.88	2.15
Black Wheat	0.010326	0.006866	0.007444	0.018935	0.006147	0.00512	0.017038	2	2	2	3.48	2	2.02	1.8
Mixed Wheat	0.006639	0.001505	0.001281	0.012577	0.005024	0.018677	0.005231	2	2	1.2	3	2.5	2.12	2.2
Maize	0.014415	0.084818	0.027467	0.017105	0.012667	0.044268	0.016789	1.5	1.25	1.4	1.6	2.5	1.18	2.3
Lentils	0.006841	0.003174	0.017917	0.009023	0.004823	0.006085	0.007254	4	4.5	3.33	4.25	5	5	2.75
Cow Peas	0.003013	0.011091	0.038557	0.005624	0.004394	0.009456	0.002422	3.63	3	2.3	3	3	2.5	2.5
Chick Peas	0.005332	0.002181	0.004669	0.002158	0.001153	0.001831	0.004016	2.25	2.5	2.6	1.66	3	2.9	3
Horse Beans	0.004224	0.00161	0.013438	0.037958	0.001226	0.006571	0.001365	2.5	2.5	2.2	3	3	2.6	2.5
Shiro	0.051143	0.029398	0.030448	0.017276	0.044467	0.050666	0.045207	4	3	3.13	2.4	3.33	2.35	3
Berbere	0.065145	0.045304	0.06081	0.060186	0.080018	0.046034	0.045268	15	11	8.93	14	20	10	16
Milk	0.010788	0.016072	0.009893	0.005183	0.010129	0.003425	0.004997	2.5	2.14	1.5	1.5	3	1.75	2.5
Butter	0.036099	0.084634	0.022829	0.024889	0.0185	0.06668	0.009261	26	30	20	24	30	25.33	27.5
Beef	0.057976	0.071752	0.05608	0.034941	0.08363	0.067954	0.014433	14	14	10	11	16	10	12
Egg	0.004392	0.007143	0.007315	0.004181	0.006971	0.009413	0.002926	0.4	0.33	0.33	0.33	0.5	0.4	0.37
Pasta	0.014324	0.0136	0.008883	0.016313	0.028401	0.008058	0.010772	5	5	4.25	5	5	5	5.75
Salt	0.004358	0.007213	0.003643	0.021969	0.008875	0.008062	0.006466	1.4	2	1.5	1.9	1.5	2	2
Cooking Oil	0.032852	0.03493	0.032273	0.123424	0.081244	0.0254	0.05628	12	12	13	12	10	12	12
Sugar	0.050778	0.045544	0.050575	0.030157	0.04542	0.050045	0.053652	5	5	5	5	4.5	5	5.5
Potato	0.015296	0.024025	0.01836	0.009395	0.031943	0.019004	0.01819	2	2	1.25	1.75	1.75	0.97	2.5
Tomato	0.011029	0.007907	0.005629	0.00764	0.027726	0.007997	0.0165	2	2	1.5	1.82	2	2.13	2.5
Carrot	0.004162	0.004414	0.003356	0.001633	0.001565	0.002367	0.001831	1.77	2	1.5	1.13	1.14	2.06	0.94
Onion	0.02319	0.022729	0.017738	0.002744	0.034279	0.026564	0.015649	1.85	2.27	2.5	2.7	2	3.33	3
Garlic	0.004318	0.010909	0.005011	0.000444	0.004418	0.003923	0.004623	4	3.33	3	4.5	5	3.45	4
Orange	0.004966	0.001118	0.003209	0.005191	0.005035	8.89E-05	0.003753	2.5	2.5	2.5	3	2.4	2.5	3
Banana	0.004804	0.002078	0.001914	0.002693	0.004729	0.001263	0.003854	2.5	2	3	3	2.5	4	3
Soft Drinks	0.007817	0.011041	0.001364	0.000232	0.007558	0.00872	0.000385	1.5	2	2	2	1.5	1.75	2.5
Coffee	0.055401	0.065992	0.045681	0.064356	0.046267	0.057156	0.060078	14	10	14	12	16	10	16
Tea	0.009281	0.011673	0.010267	0.006493	0.005314	0.010601	0.004767	2	2	2	2	3.5	2.25	2.5
Matches	0.004754	0.003087	0.00407	0.004359	0.014611	0.008096	0.003106	0.19	0.2	0.25	0.23	0.19	0.2	0.25
Candles	0.001418	0.003872	0.00047	0.000201	0.001057	0.00061	0.001085	0.78	1	1	0.88	0.92	1	1

Bulbs	0.00159	0.001935	0.000889	0.000691	0.001188	0.000322	0.000243	3.43	3	3.5	2	3.38	3	2.5
Charcoal	0.020464	0.023964	0.028241	0.018717	0.02313	0.042945	0.025608	1.56	1.08	1.81	1.34	0.99	0.55	0.97
Fuelwood	0.021923	0.04223	0.039577	0.0445	0.036001	0.043566	0.033816	73	58.88	37.61	62.81	54.19	41.11	108.9
Kerosene	0.043898	0.017707	0.002788	0.030261	0.044508	0.007088	0.015287	1.55	1.59	1.62	1.6	1.35	1.67	1.58
Detergent	0.021852	0.023998	0.011003	0.018085	0.026908	0.019853	0.030227	1.07	1.25	1.25	1.4	1.43	1.13	1.75

Table 2e: Basket used in calculating inflation relative to 1994

Cereals:	**Pulses:**	**Vegetables:**	**Animal Products:**	**Fruits:**	**Stimulants:**	**Other Food:**	**Non-food:**
Teff	Lentils	potato	milk	orange	Coffee	pepper	matches
Barley	Cow peas	tomato	butter	banana	Tea	Pasta	candles
Wheat	Chick peas	carrot	beef			salt	charcoal
Maize	Horse eans	onion	egg			cooking oil	kerosene
	Shiro	garlic				sugar	
						soft drink	

Appendix 3

Table 3a: Spatial cost of living index 1995

City	**Budget 95**	**Laspeyres**	**Paasche**	**Fisher**	**Tornqvist**	**Index from PL**
Addis Ababa	0.668	1.000	1.000	1.000	1.000	1.000
Awassa	0.569	0.970	0.877	0.922	0.927	92.826
Bahir Dar	0.655	1.021	0.831	0.921	0.894	89.569
Dessie	0.689	0.979	0.953	0.966	0.965	93.347
Dire Dawa	0.512	1.106	1.042	1.073	1.073	109.365
Jimma	0.592	0.887	0.812	0.849	0.847	85.510
Mekelle	0.703	1.144	1.106	1.125	1.120	109.446

Table 3b: Summary of Rankings of city price indices 1995

City	**Laspeyres**	**Paasche**	**Fisher**	**Tornqvist**	**Poverty Line**
Addis Ababa	4	3	3	3	3
Awassa	6	5	5	5	5
Bahir Dar	3	6	6	6	6
Dessie	5	4	4	4	4
Dire Dawa	2	2	2	2	2
Jimma	7	7	7	7	7
Mekelle	1	1	1	1	1

Table 3c: Spatial cost of living index 1997

City	**Budget 97**	**Laspeyres**	**Paasche**	**Fisher**	**Tornqvist**	**Index from PL**
Addis Ababa	0.602	1.000	1.000	1.000	1.000	1.000
Awassa	0.562	1.000	0.962	0.981	0.983	95.542
Bahir Dar	0.671	0.919	0.830	0.873	0.870	81.362
Dessie	0.643	0.961	0.933	0.947	0.947	98.823
Dire Dawa	0.537	1.104	0.987	1.044	1.055	109.145
Jimma	0.627	0.872	0.835	0.853	0.854	77.204
Mekelle	0.693	1.113	1.122	1.118	1.120	110.101

Table 3d: Summary of Rankings of city price indices 1997

City	**Laspeyres**	**Paasche**	**Fisher**	**Tornqvist**	**Poverty Line**
Addis Ababa	4	2	3	3	3
Awassa	3	4	4	4	5
Bahir Dar	6	7	6	6	6
Dessie	5	5	5	5	4
Dire Dawa	2	3	2	2	2
Jimma	7	6	7	7	7
Mekelle	1	1	1	1	1

Table 3d: Spatial cost of living index 2000

City	**Budget 97**	**Laspeyres**	**Paasche**	**Fisher**	**Tornqvist**	**Index from PL**
Addis Ababa	0.566	1.000	1.000	1.000	1.000	1.000
Awassa	0.570	0.951	0.922	0.936	0.937	92.734
Bahir Dar	0.640	0.871	0.804	0.837	0.837	83.101
Dessie	0.718	0.957	0.956	0.957	0.955	93.701
Dire Dawa	0.552	1.084	1.014	1.049	1.050	105.534
Jimma	0.593	0.870	0.769	0.818	0.823	85.024
Mekelle	0.664	1.080	1.046	1.063	1.063	101.899

Table 3e: Summary of Rankings of city price indices 2000

City	**Laspeyres**	**Paasche**	**Fisher**	**Tornqvist**	**Poverty Line**
Addis Ababa	3	3	3	3	3
Awassa	5	5	5	5	5
Bahir Dar	6	6	6	6	7
Dessie	4	4	4	4	4
Dire Dawa	1	2	2	2	1
Jimma	7	7	7	7	6
Mekelle	2	1	1	1	2

Appendix 4

Table 4a: Poverty Estimates using Torqvist Price Indexes

	1994			1995			1997			2000		
City	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**	**P0**	**P1**	**P2**
Addis	0.48998	0.21447	0.1222	0.50417	0.2302	0.13355	0.48495	0.20958	0.12037	0.43628	0.1843	0.10118
	(0.01668)	(0.00921)	(0.00654)	(0.01726)	(0.0098)	(0.00709)	(0.01700)	(0.00941)	(0.00682)	(0.01680)	(0.00878)	(0.00594)
Awassa	0.51389	0.2524	0.1579	0.51389	0.24309	0.14321	0.49254	0.23041	0.14459	0.27632	0.08964	0.04842
	(0.05890)	(0.03617)	(0.02867)	(0.0589)	(0.03418)	(0.02492)	(0.06108)	0.03696	(0.0286)	(0.0513)	(0.0231)	(0.0169)
Bahir Dar	0.4	0.15461	0.08442	0.35	0.1679	0.10573	0.27273	0.13296	0.08015	0.26263	0.07719	0.03565
	(0.04899)	(0.02460)	(0.01827)	(0.0477)	(0.02785)	(0.02105)	(0.04748)	0.02664	(0.01811)	(0.0442)	(0.0173)	(0.0111)
Dessie	0.53535	0.26495	0.16998	0.58586	0.24658	0.13884	0.57895	0.2581	0.15018	0.46465	0.23261	0.15105
	(0.05013)	(0.03175)	(0.02588)	(0.04951)	(0.02808)	(0.02177)	(0.05066)	0.02966	(0.02233)	(0.0501)	(0.0313)	(0.0246)
Dire	0.28571	0.08126	0.03422	0.3871	0.13467	0.06746	0.44262	0.15003	0.07476	0.38889	0.14861	0.08524
	(0.04025)	(0.01480)	(0.00864)	(0.04374)	(0.01994)	(0.0139)	(0.04497)	0.02070	(0.01342)	(0.0434)	(0.0224)	(0.0175)
Jimma	0.44	0.15504	0.08018	0.42424	0.18192	0.10008	0.42857	0.16736	0.08524	0.39175	0.14288	0.07273
	(0.04964)	(0.02369)	(0.01656)	(0.04967)	(0.02601)	(0.0187)	(0.04999)	0.02417	(0.01563)	(0.04956)	(0.02322)	(0.01661)
Mekelle	0.55102	0.22629	0.12379	0.56566	0.31004	0.21893	0.38947	0.19842	0.12669	0.33333	0.10334	0.04761
	(0.0502)	(0.0272)	(0.0206)	(0.04982)	(0.03522)	(0.03117)	(0.05003)	0.03032	(0.02310)	(0.04738)	(0.01931)	(0.01358)
Overall	0.4715346	0.2011903	0.114424	0.488128	0.22154	0.130325	0.464658	0.200342	0.115128	0.404227	0.16416	0.09052
	(0.01292)	(0.00704)	(0.00511)	(0.01321)	(0.00753)	(0.00562)	(0.01319)	0.00724	(0.00523)	(0.01281)	(0.00658)	(0.00462)