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## Estimating Poverty in Burundi

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# Estimating Poverty in Burundi

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## Abstract

In this paper, we evaluate absolute consumption poverty and inequality in rural and urban Burundi after more than 5 years of civil war. Using the *cost of basic needs* method, we find a poverty incidence of 71.5% in rural areas and 36.5% in Bujumbura, and a Gini-coefficient of inequality of respectively 34.9 and 44.5%. In analysing the main correlates and determinants of rural poverty, we identify the very low levels of education and the intensity of the civil war as key factors explaining the high incidence of rural poverty.

## 1 Introduction

By the start of the 1990s, poverty in Burundi was more or less in line with average poverty in Sub-Saharan Africa: an estimated 45.6% of people was living below the World Bank's *dollar a day* line, compared to 44.5% in Sub-Saharan Africa<sup>1</sup>. In 2001, both figures had risen to respectively 57.0% and 46.4%, showing the particularly bad performance of Burundi during its civil war period. The civil war which started in 1993 and from which Burundi is now slowly emerging has left the country's economy debilitated and its infrastructure ruined, while the economic embargo imposed by the international community in August 1996 starved the economy of inputs and caused tremendous levels of inflation. Per capita GDP (in purchasing power

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<sup>1</sup>The World Bank fixes the poverty line at one dollar per person per day in 1993 purchasing power parity exchange rates.

parities, constant 1995 dollars) fell from 826 \$ before the crisis to 552 \$ in 2000, a decline of over 33%. According to the Interim Poverty Reduction Strategy paper (I-PRSP), Burundi practically became the poorest country in the world between 2000 and 2002 (The Republic of Burundi, 2003)<sup>2</sup>.

Poverty assessments based on the dollar a day line are, although widely used and useful for cross-country comparison, not fully fit to evaluate absolute income or consumption poverty within a single country. Another way of exploring poverty is to set a poverty line with reference to a certain point of the distribution of income or consumption. The I-PRSP sets this relative poverty line at two-thirds of total annual per capita expenditure, resulting in a poverty headcount of 34.9% in 1990 and 68% in 2001 (The Republic of Burundi, 2003). Although this method has a major advantage -being very easy to determine- it is again ultimately arbitrary and dependent on the chosen ratio of two-thirds (why precisely this ratio?).

In this paper, we will offer a more thorough and founded analysis of poverty in Burundi by estimating an absolute poverty line based on the actually observed behaviour of rural and urban households. It is to be said at the outset that the construction of a poverty line, even an absolute one, depends on several assumptions which all affect the level of the line and, hence, the extent of poverty. Several equally plausible poverty lines can thus be constructed, and we will offer only 1 possibility based on certain assumptions.

All following calculations are based on data gathered during the Priority Survey of 1998-1999, henceforth PS (The Republic of Burundi, 2003). Sample weights, provided for by the survey, are used to extrapolate the results to the total population. For more information on the survey, consult the appendix.

We will proceed as follows: In section 2, we construct the welfare measure which will be used for poverty analysis and show the regional distribution and inequality in this measure. Section 3.1 proceeds by estimating a food poverty line, while section 3.2 allows for basic non-food consumption as well. A poverty profile is constructed in section 4, while section 5 identifies the main correlates of rural poverty in Burundi and estimates its determinants. Section 6 concludes. Finally, the appendix to this paper sketches an *urban* poverty profile, presents some graphs on the distribution of poverty and provides more information on the 1998 PS.

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<sup>2</sup>Although there seems to exist some discussion depending on alternative data sources, which classify Sierra Leoné and Malawi as even more poor.

## 2 Consumption as a measure of welfare

As a measure of welfare, we will focus exclusively on household private consumption. Although welfare and poverty are multi-faceted phenomena, actual consumption is believed to be more closely related to a person's well-being (in terms of having enough to meet basic needs in order to survive) than any other single indicator of welfare. From the PS, we have information on monthly consumption expenditure per household. To get the consumption data right, we needed to make a few adjustments. First, we had to account for inflation. Prices varied markedly during the period of the survey (the 6 months between October 1998 and March 1999), resulting in incomparable consumption figures across months. These consumption figures were made constant by expressing them in October 1998 prices. Second, considerable regional variation in prices could be observed. Since we are estimating separate poverty lines for rural and urban areas, we did not have to account for urban-rural price differences. There was however also considerable price variation among the 14 rural provinces, making a (rural) regional price adjustment necessary. Consumption figures are therefore expressed in constant average (across provinces) October 1998 prices.

The last adjustment to the data controls for household composition. Since most households are incomparable in terms of their size and age-distribution, we express the size of each household in adult equivalents<sup>3</sup>. Dividing the household consumption data obtained after the first 2 adjustments by the size of the household in adult equivalents then gives the welfare measure we will be using in estimating the poverty lines (real consumption expenditure per adult equivalent).

Table 1 shows the provincial disparities in average total consumption expenditure per adult equivalent per month. The rural average monthly consumption expenditure amounted to 6733 BIF (Burundi Francs) per adult equivalent, while in the capital of Bujumbura, this figure increases to 33571<sup>4</sup>. Note that these 2 figures are not directly comparable due to the difference in the cost of living between rural and urban areas which was not corrected for<sup>5</sup>. Accounting for these price differentials would result in an urban mean consumption level of about 24071 BIF, a figure more than 3.5 times that of

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<sup>3</sup>To convert household size into adult equivalents, we use the equivalence scales set by WHO (1985).

<sup>4</sup>This translates respectively into 15.04 USD and 74.97 USD using the 1998 official exchange rate of 1 USD = 447.8 BIF.

<sup>5</sup>This was not necessary given the fact that we are estimating 2 separate poverty lines.

Table 1: Mean monthly consumption expenditure per adult equivalent per province (Constant October 1998 prices - BIF).

Province	Mean	Std dev
Bubanza	5950	4677
Bujumbura rural	7279	3033
Bururi	8684	4916
Cankuzo	8292	6979
Cibitoke	6739	6321
Gitega	4513	3645
Karuzi	5141	3436
Kayanza	6805	4649
Kirundo	6159	3265
Muramvia	9728	6789
Muyinga	7217	5914
Ngozi	7526	4546
Rutana	6071	4231
Ruyigi	4607	2818
Rural	6733	4933
Bujumbura	33571	33018

Source: The Republic of Burundi (1998); author's calculations.

Table 2: Cumulative proportion of consumption per quintile of population.

Quintiles of population	Rural	Urban	Total
20%	5.84%	3.98%	5.31%
40%	17.66%	12.47%	15.99%
60%	34.65%	26.92%	31.55%
80%	58.52%	50.66%	53.49%
100%	100%	100%	100%
Gini-coefficient	0.349	0.445	0.397

Source: The Republic of Burundi (1998); author's calculations.

rural area's<sup>6</sup>. Beside this rural-urban differential, we also observe considerable variation in mean consumption levels across rural provinces (see figure 1 in appendix), with the poorest province Gitega having a mean consumption expenditure less than half of that of the richest province Muramvia (10.01 USD vs 21.72 USD per month).

Next to provincial inequalities in consumption levels, we also observe considerable inequality in the distribution of consumption across individuals. Table 2 shows the cumulative proportion of consumption per quintile of population in different localities. We see that the poorest 20% of people account for a mere 5,84% and 3,98% of total consumption in rural and urban area's, respectively, while the richest 20% proportionally consume 41,48% in rural area's and almost 50% in Bujumbura.

These figures immediately reveal a great deal of inequality, which is formalized by the Gini-coefficient given in table 2<sup>7</sup>. This coefficient amounts to 0,397 for Burundi as a whole, and is higher in the capital city (0,445) than in rural area's (0,349). Comparing this with other African countries is difficult: most country surveys are not comparable due to the fact that other welfare indicators were used (for instance, the use of income data instead of consumption data) or that the data was aggregated in a different way (for instance, per capita consumption instead of per adult equivalent consumption). However, indicators constructed in the same manner seem to suggest

<sup>6</sup>This stark urban-rural difference is typical of developing countries. A poverty analysis in Rwanda conducted between 1999-2001 found consumption levels in Kigali being 3.7 times those in rural area's (Minecofin, 2002).

<sup>7</sup>This indicator of inequality varies between 0 and 1, 0 meaning perfect equality and 1 perfect inequality (i.e. 1 household that consumes everything).

a somewhat higher inequality in Burundi than in Ghana (gini-coefficient of 0,368 in 1998-1999), Uganda (0,358 in 1997) and in the Republic of Congo (urban gini-coefficient of 0,397 in Brazzaville versus 0,445 in Bujumbura), and a lower inequality than in Rwanda (coefficient of 0,451 in 1999-2001)

### 3 Estimating a poverty line

We will estimate an absolute poverty line following Ravallion (1992, 1998) and Ravallion and Bidani (1994) using the *cost of basic needs* method. According to this method, poverty is seen as '*a lack of command over basic consumption needs, and the poverty line [as] the cost of those needs*' (Ravallion and Bidani, 1994). Hence, we will have to specify a consumption bundle deemed adequate to satisfy *basic consumption needs*, and then estimate its cost. Following most of the literature, this overall poverty line will consist of a food poverty line, supplemented by a non-food component.

#### 3.1 Derivation of the food poverty line

In this section, we will stipulate a food consumption bundle considered *sufficient* to maintain good physical health, and then value this bundle. We follow common practice in the literature by tying physical health to energy requirements only, assuming calorific intake to be the sole determinant of physical health<sup>8</sup>. The word 'sufficient', however, is problematic: there is no agreement on which level of food intake (measured in calories) is 'sufficient' to maintain bodily functions, and calorific requirements (i.e. how many calories one requires to make it 'healthy' through the day) tend to vary with age, sex and activity rates of the subjects concerned. An overview of the existing literature illustrates this lack of consensus: While Appleton et al. (1999) base their analysis of poverty in Uganda on a required intake of 3000 calories per adult equivalent per day, a similar analysis for neighbouring Rwanda sets the mark at 2500 calories (again per adult equivalent per day)(Minecofin, 2002). Ravallion and Bidani (1994) use a *per capita* energy requirement of 2100 calories for an Indonesian poverty profile, while more or less recent World Bank assessments of poverty in Sub-Saharan African countries are based on intakes of somewhere between 1700 and 2200 calories

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<sup>8</sup>As noted by Appleton et al. (1999), this is clearly a simplification since the human body requires other vital components as well.

per capita<sup>9</sup>.

The question is now what level of energy intake we should assume to be sufficient to meet basic food-related needs in Burundi. Obviously, the choice of a minimum required calorific intake effects the construction of the poverty line and therefore the number of people considered poor. Hence, we have to be very careful in specifying this minimum requirement.

Since we expressed total consumption per household in adult equivalents, we need to set a per adult equivalent calorie requirement. Since Burundi is very similar, in terms of ethnicity and agriculture as well as climate and environment, to its neighbour Rwanda, we follow the Rwandan Ministry of Finance (2002) in setting the treshold on 2500 kilocalories per adult equivalent per day<sup>10</sup>. When accounting for the age-distribution of the population in Burundi, we find that this treshold corresponds to a *per capita* requirement of about 1992,6 calories per day, which seems reasonable compared to other studies<sup>11</sup>.

Next, we have to specify a certain food basket that satisfies this 2500 calories a day requirement. Obviously, many different combinations of food items could meet this treshold. Therefore, it is most relevant to construct a basket based on the *actually observed* consumption patterns of the poor.

Of course, we first have to know who the poor actually are. Since the poverty line has not yet been estimated, we cannot know this exactly and therefore have to use some alternative data source indicating the extent of poverty at the time of the survey<sup>12</sup>. Based on the figures mentioned in the introduction to this paper and on the fact that the civil conflict caused rapid deterioration in the standards of living (The Republic of Burundi, 2003), we assume 50%

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<sup>9</sup>This description of disparities can go on and on as it seems that for nearly every country a different calorific intake is deemed 'adequate'.

<sup>10</sup>WHO sets forth a recommended energy intake of 3000 calories per adult equivalent (that is the age interval [18-29]) per day for persons performing moderate work (WHO assumes subsistence farming to correspond with moderate work). However, we generally feel this level to be too high and fear too much people would be classified as poor using this requirement.

<sup>11</sup>This per capita requirement is obtained by multiplying the 2500 calories per adult equivalent by the total number of adult equivalents in the country (4802698,002), divided by total population (6025657).

<sup>12</sup>Ravallion and Bidani (1994) for instance base their setting of the Indonesian poverty line on the consumption patterns of the poorest 15% of the population, since another studie using another method had found 15% of Indonesians to be poor. Appleton et al. (1999) focus their attention on the bottom 50% of Ugandan population, since that was the proportion considered 'poor' by the World Bank.



Table 3: Derivation of the rural food poverty line

Food item	monthly consumption per AE (kg)	Calories	Calories per month	calories per day	scaled quantities (kg)	avg prices (Oct 1998)	minimum expenditures (BIF)
Beans	2,54	3230	8220,16	270,25	5,21	289,77	1509,76
Sweet potatoes	4,55	960	4369,52	143,66	9,32	148,75	1386,11
Bananas	2,89	1160	3347,25	110,05	5,91	63,65	376,02
Irish potatoes	1,45	710	1028,89	33,83	2,97	101,87	302,23
Manioc tubercule	2,36	1100	2600,81	85,51	4,84	108,75	526,41
Manioc farine	2,95	3440	10155,64	333,88	6,04	140,21	847,43
Rice	0,07	3600	265,47	8,73	0,15	412,39	62,26
Petit pois	0,05	3390	181,74	5,97	0,11	368,64	40,46
Maize	1,29	3570	4615,36	151,74	2,65	170,54	451,38
Sugar	0,02	3800	79,20	2,60	0,043	488,69	20,85
Kitchen oil	0,13	8570	1143,60	37,60	0,27	585,7	160,01
Colocase	0,37	860	321,27	10,56	0,76	69,11	52,86
Bread	0,01	2610	18,32	0,60	0,01	266,67	3,83
Ndagala et autre poissons	0,03	490	16,22	0,53	0,07	2077,24	140,81
Meat	0,03	2370	63,86	2,10	0,06	1024,5	56,51
Milk	0,05	780	39,37	1,29	0,10	4636	479,00
Choux	0,31	290	91,29	3,00	0,64	100,8	64,96
Tomatoes	0,12	200	24,42	0,80	0,25	80,44	20,11
Carrots	0,0006	400	0,25	0,01	0,001	55,9	0,07
Oignons	0,06	390	23,65	0,78	0,12	210,13	26,09
Poireaux	0,07	610	40,82	1,34	0,14	210,64	28,86
Aubergines	0,15	380	58,05	1,91	0,31	75,36	23,57
Ananas	0,03	310	8,91	0,29	0,06	78,83	4,64
Avocats	0,55	610	335,50	11,03	1,13	50,72	57,11
Citrons	0,0001	300	0,03	0,001	0,0002	230,8	0,05
Mango	0,06	650	39,93	1,31	0,13	133,97	16,85
Beer and alcoholic drinks	0,03	1730	52,17	1,72	0,06	543,03	33,53
Limonades	0,004	300	1,08	0,04	0,007	500	3,67
<b>Total</b>				<b>1221,13</b>			<b>6695,46</b>

of people to be poor at the time of the survey, both in rural and in urban area's. Consequently, we will examine the actual consumption habits of the poorest 50% of households (ranked by real consumption expenditure per adult equivalent) to set the food poverty line.

Table 3 shows the food items typically consumed by a 'poor' household in rural Burundi. This food basket consist of 28 items and is dominated (in quantity) by sweet potatoes, flour of cassava, bananas, beans and cassava roots, respectively, which are also the major sources of calorific intake (albeit not in the same sequence). We estimate that this basket delivers a little over 1221 kilocalories a day, which clearly falls short of the required intake of 2500 calories per adult equivalent<sup>13</sup>. Scaling the actually consumed quantities by a factor of 2,047 (2500/1221) gives the quantities which should be consumed in order to reach the specified treshold (reported in column 6 of table 3). Based on average October 1998 prices per product, we calculate the minimum consumption expenditure required to reach an intake of 2500 calories a day. We estimate this food poverty line (henceforth  $z^f$ ) to amount to 6695.5 BIF (around 14.95 USD). This is the amount of money an adult has to use (per month) for food consumption purposes to satisfy basic fysical needs. This food-component estimate has to be supplemented by an allowance for non-food spending to construct the actual poverty line.

### 3.2 Estimating non-food requirements

Ideally, we should estimate the required non-food expenditure in exactly the same way as the food component. We could specify a certain level of non-food consumption considered *absolutely necessary*, and then cost the different items that satisfy this requirement. It is, however, very difficult to specify non-food components which are '*absolutely necessary*'. There does not seem to exist a certain treshold of non-food consumption below which one absolutely cannot survive. In the words of Ravallion and Bidani (1994):

*'Although food energy requirements are the obvious anchor for food consumption, there is no analogous basis for setting basic nonfood consumption.'*

Since there is no fixed or universally accepted treshold for non-food consumption levels, we follow the approach developed by Ravallion 1993. This

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<sup>13</sup>Data on calorific content per food item were taken from Minecofin (2002).

approach builds on the observation that even households whose total consumption expenditure is below the food poverty line (i.e. below that to satisfy basic energy requirements) will almost certainly spend a part of their budget on non-food products. Those households are willing to forgo a basic food consumption need to purchase a certain non-food good. Hence, this non-food good must be considered essential by the household.

Ravallion proceeds by looking at the non-food spending of households whose total consumption expenditure is exactly equal to the food poverty line. At this level of expenditure, the household is just able to meet its nutritional requirements, but generally chooses not to do so by spending some money on non-food goods. This amount of non-food spending is then considered to be *essential* and is used as an estimate for basic non-food needs.

This amount of basic non-food spending can be estimated by a regression of the food share ( $s_i$ ) of household  $i$  on the log ratio of total consumption expenditure per adult equivalent ( $y_i$ ) to the food poverty line ( $z_j^f$ ), provincial dummy variables ( $D_{ij}$ ) and a vector of demographic variables controlling for the composition of the household ( $C_i$ ):

$$s_i = \alpha + \beta \ln \frac{y_i}{z_j^f} + \gamma (\ln \frac{y_i}{z_j^f})^2 + \sum_j \pi_j D_{ij} + \Phi C_i + u_i \quad (1)$$

where  $u_i$  is a random error term<sup>14</sup>. When the total consumption expenditure of the household  $i$  ( $y_i$ ) equals the food poverty line ( $z_j^f$ ), both log ratio's turn to zero, and the food share of the household is given by

$$s_i = \alpha + \pi_j + \Phi C_i \quad (2)$$

Consequently, the total poverty line in location  $j$  is calculated as:

$$z_j = z_j^f (2 - \alpha - \pi_j - \Phi C_i) \quad (3)$$

Table 4 shows the results of the regression<sup>15</sup>. To calculate the predicted food share for each province, we use equation (2), holding the household variables  $C_i$  constant at their mean values for the poorest 50% of population (since this was the proportion of people who were, a priori, considered poor to construct the poverty line). Based on those predicted food shares, we can calculate the non-food allowance for each province ( $1 - s_i$ ) and construct

<sup>14</sup>We included the squared log ratio to improve overall goodness of fit.

<sup>15</sup>Note that the variables controlling for the age-sex composition of the households are expressed as proportions to total household size.

Table 4: Regression of food shares

Variables	Coefficients
Constant	0,827***
Log ratio of total expenditure to food poverty line	0,036***
Squared log ratio	-0,031***
Provincial dummies	
Bubanza	-0,146***
Bujumbura rural	-0,131***
Bururi	-0,114***
Cankuzo	-0,269***
Cibitoke	-0,175***
Gitega	-0,022**
Karuzi	0,056***
Kayanza	-0,116***
Kirundo	-0,105***
Muramvia	-0,187***
Muyinga	-0,127***
Ngozi	-0,015
Rutana	-0,065***
Household characteristics	
Size	0,009***
female headed household	0,026***
Education of head	-0,039***
Household composition	
under 5 male	0,060***
under 5 female	0,038*
5 to 9 male	0,051***
5 to 9 female	0,021
10 to 14 male	0,080***
10 to 14 female	0,047**
15 to 59 male	-0,023
15 to 59 female	-0,006
over 59 male	-0,006
over 59 female	-0,022
Adjusted $R^2$	0.33

Table 5: Rural poverty lines (BIF)

Province	Predicted food share	Poverty line
Bubanza	0,7285	8513,2814
Bujumbura rural	0,7435	8412,8494
Bururi	0,7605	8299,0265
Cankuzo	0,6055	9336,8233
Cibitoke	0,6995	8707,4498
Gitega	0,8525	7683,0439
Karuzi	0,9305	7160,7978
Kayanza	0,7585	8312,4175
Kirundo	0,7695	8238,7674
Muramvia	0,6875	8787,7953
Muyinga	0,7475	8386,0676
Ngozi	0,8595	7636,1757
Rutana	0,8095	7970,9488
Ruyigi	0,8745	7535,7437
<b>Rural</b>	<b>0,7793</b>	<b>8173,1518</b>

the final absolute poverty lines according to equation (3). Table 5 does this exercise. We estimate a rural absolute poverty line of 8173.1518 BIF per adult equivalent per month<sup>16</sup>. Any household with a per adult equivalent expenditure less than this figure is considered poor.

## 4 A poverty profile

To construct a poverty profile for rural Burundi, we will focus mainly on the P- $\alpha$  poverty indices developed by Foster et al. (1984) . The general formula for this class of poverty measures is given by

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right)^{\alpha} \quad (4)$$

and results in indicators measuring distinct dimensions of poverty depending on the chosen value of  $\alpha$ <sup>17</sup>:

<sup>16</sup> About 18.25 USD using the 1998 official exchange rate.

<sup>17</sup>  $n$  = total number of households;  $q$  = number of poor households;  $z$  = absolute poverty line;  $y_i$  = consumption per AE for household  $i$

- $\alpha = 0$ : incidence of poverty (poverty headcount). Gives the share of the population (households) whose consumption expenditure (per AE) is below the poverty line.
- $\alpha = 1$ : depth of poverty (poverty gap). This measure shows how *far off* households are from the poverty line. It is obtained by summing all the shortfalls of the poor (i.e. the deviation between their expenditure and the poverty line) and dividing this by the total population, giving the poverty deficit of the entire population. Stated differently, it gives the resources needed to bring all the poor to the level of the poverty line.
- $\alpha = 2$ : poverty severity. This is the squared poverty gap, taking into account not only the distance separating the poor from the poverty line, but also the amount of inequality among the poor. Since it is the square of the poverty gap, a bigger weight is placed on those households who are further away from the poverty line.

Table 6 shows the different poverty indicators per province. We see that,

Table 6: Poverty statistics per province

Province	Poverty headcount (percent)	Poverty gap (percent)	poverty severity (x 100)
Bubanza	76,2	42,62	27,29
Bujumbura rural	67,5	21,62	8,37
Bururi	56,8	18,50	8,78
Cankuzo	62,4	22,49	11,00
Cibitoke	77,8	35,06	19,39
Gitega	89,9	49,86	32,42
Karuzi	81,4	42,96	27,75
Kayanza	67,7	32,28	19,56
Kirundo	72,1	31,90	18,77
Muramvia	50,7	17,57	8,62
Muyinga	72,6	30,74	17,26
Ngozi	59,9	26,23	15,48
Rutana	78,4	35,07	20,19
Ruyigi	91,0	46,88	28,99
<b>Rural</b>	<b>71,5</b>	<b>32,50</b>	<b>19,02</b>

using the poverty line constructed above, 71,5% of the rural population

are identified as poor. This figure is higher than rural poverty headcounts in Rwanda (65,7%) and Uganda (53,0%) (Minecofin, 2002; Appleton et al., 1999), but nevertheless seems plausible taking into account both the already high incidence of poverty before the civil war and the fact that the conflict had a detrimental impact on (in particular) rural standards of living (André, 1997; The Republic of Burundi, 2003). The poverty gap and poverty severity in rural Burundi amount to respectively 32,50% and 19,02.

In every province, the proportion of the population living below the poverty line is over 50%. We observe considerable differences in poverty prevalence among provinces (see figure 2 appendix), with Muramvia and Bururi showing a headcount of 'only' 50,7% and 56,8% respectively, while Ruyigi and Gitega have poverty figures as high as 91,0% and 89,9%. Generally, the provinces with the highest incidence of poverty (Ruyigi, Gitega, Karuzi, Rutana, Cibitoke and Bubanza) also show the greatest magnitude of poverty, as measured by the poverty gap. Poverty seems to be most severe in Gitega, Ruyigi, Karuzi and Bubanza, and least severe in Bujumbura rural, Bururi and Muramvia.

Table 7 shows the distribution of poverty by gender, education and economic sector of the head of the household. We see that a higher percentage of female-headed households is poor, and that the depth and severity of poverty is worse than in the case of male headed households. The extent, gap and severity of poverty decreases with increasing levels of education of the household head. Poverty prevalence is highest among farmers cultivating cash crops (mainly coffee, but also tea and cotton), while poverty is most severe among cultivators of food crops. Note that the private sector has a poverty headcount only slightly higher than that of the public sector, but that poverty severity is much higher within the former sector.

## 5 Correlates of rural poverty

In this section we will identify possible correlates of rural poverty in Burundi based on a sample of 3908 rural households. Table 8 shows differences in human capital, physical capital and community characteristics across poverty groups. The figures are not surprising: poor households are generally larger in size than non-poor families and are relatively more often lead by females. They are also characterized by lower levels of education of the household's head, low levels of maternal literacy and poor health outcomes for the household's children (measured by their height-for-age z-scores, which is generally

Table 7: Poverty statistics per gender, education and economic sector of the household's head

	Poverty headcount (percent)	Poverty gap (percent)	poverty severity (x 100)
<b>Gender</b>			
Male	69,0	29,78	16,79
Female	78,6	40,09	25,26
<b>Education</b>			
No education	74,4	34,94	20,84
Primary	67,3	28,55	15,96
Secondary (at least 1 cycle)	45,3	13,06	5,64
Higher	0,00	0,00	0,00
<b>Economic sector</b>			
Cash crops farmer	73,3	32,95	19,17
Food crops farmer	72,6	34,16	20,20
Public sector	57,3	17,51	6,64
Private sector	60,9	29,36	17,97
Informal sector	63,7	28,20	16,13
Unemployed	66,0	31,36	20,19
Other	50,4	21,8	13,37

accepted as a good indicator for young children's health status; see for instance D. Thomas et al. (1996) and Alderman et al. (2004)). The total production of all crops (in kg) is about 59% higher for non-poor households compared to poor ones, which suggests larger land-endowments for the former group<sup>18</sup>.

The value of livestock, which represents the main form of capital accumulation in rural Burundi, differs sharply across poverty groups: 48604.4 BIF (108.5\$) per adult for non-poor households vs. 19495.5 BIF (43.5\$) per adult for poor households. The proportion of households managing one or more small enterprises is higher for the non-poor subgroup compared to the poor one. The access to key infrastructure assets and community services also differs significantly between welfare groups: availability of electricity and medication is generally low in rural Burundi (6.4% and 5.6% respectively), though is significantly higher for non-poor households, with 7.8% and 6.6%. A higher proportion of non-poor households compared to poor ones has to

<sup>18</sup>The PS does not contain information on land holdings of households; therefore we proxy farm size by calculating the total household production of all crops.



Table 8: Descriptives per poverty group

	Poor	Non-poor	test on equality of means
<i>Household demographics</i>			
Children	1.82	1.18	t=-13.2***
Male adults	1.05	0.92	t=-5.1***
Female adults	1.29	1.14	t=-5.6***
Elderly	0.20	0.23	t=2.0**
Female-headed (%)	26.5	21.8	
Age HH	43.65	42.45	t=-2.0**
<i>Human capital</i>			
Educated HH (%)	28.6	39.5	U=1393174***
mother literate(%)	26.4	40.8	
Children's health (z-scores)	-2.35	-2.11	t=2.46**
<i>Physical capital</i>			
Total production (kg)	1287.59	2049.22	t=9.6***
Livestock per adult (BIF)	19495.5	48604.4	t=7.5***
Commerce	13.9%	21.2%	t=5.2***
<i>Community infrastructure</i>			
Road			
Access to Electricity (%)	5.8	7.8	
Distance to market (less than 15 minutes %)	28.4	34.8	U=1413284***
Distance to health center (less than 15 minutes %)	22.8	28.5	U=1388610***
Distance to drinking water (%) (less than 15 minutes %)	66.7	72.5	U=1466798***
Access to medication (%)	5.3	6.6	
<i>Civil war</i>	1,46	1,72	U=275683***

Note: \*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%

walk less than 15 minutes on foot to reach basic community services such as drinking water, health care and local markets. The supply of public goods thus seems biased towards richer communities. Finally, the *civil war* variable is based on a self-reported measure in the PS indicating the extent to which the household has been affected by the conflict<sup>19</sup>. Higher values of the civil war variable indicate lower conflict-related problems reported by the household. As can be seen in table 9, the civil war variable has a higher value within the non-poor subgroup (1.72) compared to the poor one (1.46), the difference being significant at the 1% level. Poor household thus reported to have suffered more from the conflict than richer ones.

Table 10 shows the results of a binary logistic regression explaining a household's poverty status based on the variables identified in table 9. The econometric specification is

$$Prob[y_i = 1] = \alpha + \sum_j \beta_{ij} X_{ij} + \sum_k \gamma_{ik} Z_{ik} + \epsilon_i \quad (5)$$

which is a reduced form representation of the standard household utility maximization model with household expenditure per adult equivalent as a measure of utility.  $X_{ij}$  is a vector of household-level characteristics, including human and physical capital endowments and characteristics of the household's head, and  $Z_{ik}$  a vector of community-level variables including access to basic infrastructure and community services as well as the reported intensity of the civil war. To equation 5 we add a series of 13 provincial dummy variables.

The first analysis in table 10 (R1) estimates equation 5 for the full sample of rural Burundi (3908 households minus 8 for whom data was missing). The goodness-of-fit statistics and the percentage of correct predictions at the bottom of the table suggest that the data fits the model quite good. As expected, larger households are more likely to be poor, and this relationship appears to hold for every age group. On the contrary, a higher educational level of the household's head sharply reduces the likelihood of being poor, as does a male head of household. The high poverty-reducing potential of education is important: school enrollment rates in rural Burundi are low, and have been falling ever since the onset of the civil war<sup>20</sup>. Augmenting

<sup>19</sup>This variable has three possible values: 1 if the household reported to have suffered a lot from the conflict, 2 if the household was only moderately affected and 3 if the household reported absolutely no conflict-related problems.

<sup>20</sup>Gross primary school enrollment in Burundi fell from 72.8% in 1991 to 43.0% in 1997, following four years of civil war. By 2000, this figure had risen to 60.8%, compared to a Sub-sahara African average of 94.7% (The World Bank, 2000).

the stock of human capital in the countryside could thus possibly be an important vehicle towards poverty reduction. We also observe a pronounced life-cycle effect on poverty: the probability to be poor increases with age up to about age 42 of the head of household, and then declines. This could imply that older households, who had the opportunity to accumulate wealth or assets (livestock) over a longer period of time, were more able to cope with the consequences of the civil war than younger ones.

Focusing on physical capital endowments, we find that land ownership, proxied by total crop production per household, is indeed a critical variable in explaining household poverty status. Households with higher land holdings are much less likely to be poor compared to households with a small amount of land. This strong poverty-reducing effect of land will be an important issue during the coming months, with scores of refugees and internally displaced people returning to their villages and reclaiming their land which was lost during the civil war. Land holdings already are highly fragmented in Burundi (on average less than one hectare per family (Cochet, 2004)), so a fair redistribution of land will be key in preventing violence from flaring up again. Note that we excluded the running of small enterprises and the rearing of livestock from the analysis, as these can be deemed endogenous to the household.

Finally, some comments on the influence of various government services and community infrastructure. The poverty-alleviating effects of the availability of key infrastructure assets have been documented in several studies (see for instance Glewwe (1991) for Cote d'Ivoire and Deininger and Okidi (2003) for Uganda). We find that a higher distance to both the nearest market and the nearest drinking water point are associated with a higher likelihood of being poor, while access to medication is correlated with a lower probability to be poor<sup>21</sup>. It begs the question, however, to what extent these infrastructure variables can be treated as exogenous to the household: richer households will probably live in communities where access to basic services is better. Consequently, the results on these variables should be viewed as correlates, not determinants, of poverty.

R2 in table 10 performs the same analysis as R1, with the exception that two variables are added in the second regression: literacy of the mother in the household (1 if yes, 2 if no) and the self-reported civil war measure. Since both variables suffer from considerable underreporting, sample size drops to 1589 in the second regression, which was precisely the reason for excluding

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<sup>21</sup>However, only very few households profit from access to medication.

them from the basic specification.

As can be seen in table 10, results of R2 are broadly similar to those in R1. The biggest difference occurs amongst the community characteristics, with the distance to the nearest drinking water point being the sole variable which remains statistically significant in the second analysis. The two 'new' variables both show up strongly significant: a literate mother sharply reduces the probability to be poor, a finding which stresses once again the importance of education as a means of rural poverty reduction (this effect adds to the poverty-effects of the education of the household's head), while households who were, according to their own opinion, adversely affected by the civil war are more likely to be poor<sup>22</sup>.

One could argue that the civil war-variable in R2 is in fact endogenous to the household's poverty status, in the sense that the civil war only occurred within poor regions, and as such is not a factor causing poverty. However, readings of detailed accounts of the crisis suggest otherwise: the civil war actually started in those provinces which were on the top of the welfare ladder in 1993, thus it seems the civil war-variable can be viewed as a genuine *determinant* of poverty in rural Burundi (Chrétien and Mukuri, 2000; UN, 1996).

The results presented in table 10 suggest that the most effective way to reduce poverty in rural Burundi is to focus on increasing the very low levels of education in the countryside and putting an end to the ongoing conflict which prevents the population from engaging in 'normal' economic activities. These two variables are in fact the only ones which can be and are being manipulated by policy-makers in order to alleviate poverty in the relatively short run<sup>23</sup>: the newly elected president of Burundi has pledged to offer free basic education to every citizen in the country and to put an end to the civil war by including the last remaining rebel group in the peace process. Simulations based on the model estimates reported in table 10 (R2) show that this would reduce the rural poverty rate by over 11.5%, which indeed suggests the crucial importance of these variables for the goal of poverty reduction<sup>24</sup>.

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<sup>22</sup>Remember that higher values of the civil war-variable denote less conflict-related problems.

<sup>23</sup>Since Burundi is a land-scarce, densely populated country, increasing the amount of land available for cultivation is not an option.

<sup>24</sup>This simulation was carried out based on the estimates reported in R2 by changing the level of education from its median value in 1998 (no education at all) to a median value of primary (basic) education, and by changing the value of the civil war-variable

Table 9: Correlates of rural poverty

	R1	R2
<i>Human capital</i>		
Children	.392*** (.032)	.331*** (.051)
Male adults	.403*** (.067)	.433*** (.107)
Female adults	.251*** (.058)	.308*** (.098)
Elderly	.358*** (.134)	.521** (.232)
Gender head	.436*** (.115)	.423** (.211)
Education HH mother literate	-.556*** (.076)	-.458*** (.119)
Age HH	.023* (.013)	.036* (.022)
Age sq.	-.0003** (.000)	-.0004** (.000)
<i>Physical capital</i>		
Total production (proxy for land size)	-2.672*** (.235)	-2.276*** (.355)
<i>Community infrastructure</i>		
Acces to Electricity	-.220 (.177)	.963 (.852)
Distance to market	.169*** (.046)	.037 (.074)

from 1 (suffers a lot from the conflict) to 3 (no conflict-related problems), holding all other variables constant at their mean values.

Table 9: *continued*

Distance to health center	.006 (.041)	.022 (.068)
Distance to drinking water	.074** (.030)	.163*** (.057)
Access to medication	-.394** (.188)	1.355 (1.092)
Civil war		-.419*** (.084)
<i>Provincial dummies</i>		
Bubanza	-1.561*** (.427)	-1.808*** (.632)
Buja rural	-2.405*** (.423)	-2.161*** (.652)
Bururi	-2.814*** (.296)	-2.689*** (.420)
Cankuzo	-2.098*** (.329)	-1.556*** (.479)
Cibitoke	-1.555*** (.328)	-1.697*** (.444)
Gitega	-.378 (.307)	-.126 (.450)
Karuzi	-.783** (.318)	-.854* (.452)
Kayanza	-1.945*** (.291)	-2.394*** (.405)
Kirundo	-1.392*** (.298)	-1.364*** (.415)
Muramvia	-2.840*** (.290)	-2.757*** (.403)
Muyinga	-1.361*** (.295)	-1.512*** (.406)
Ngozi	-2.120*** (.287)	-1.984*** (.396)
Rutana	-.967*** (.328)	-1.054** (.483)
Constant	.989** (.431)	.739 (.680)
N	3900	1589
Chi squared	875.8***	363.9***
% correct pred.	75.4	77.3
Pseudo $R^2$	28.7	29.3

## 6 Conclusions

In this paper we have constructed an absolute poverty line for rural Burundi based on the cost of basic needs method. Using an energy requirement of 2500 calories per adult equivalent per day, we estimated the food poverty line to amount to 6695 BIF (about 11.8\$ )per adult equivalent per month. This is the amount which is absolutely necessary to satisfy basic nutritional needs, to survive. We found that in 1998, after 5 years of civil war, 60% of rural households were not able to meet this bare minimum.

Adjusting this food poverty line for essential non-food spending, we calculate an estimated total poverty line of 8173 BIF per adult equivalent per month. Using this treshold, 71.5% of rural households can be considered poor, in the sense of not having enough to meet basic food and non-food needs. Although poverty incidence is over 50% in all rural provinces, we observe considerable regional differences, ranging from poverty headcounts of 50.7 in Muramvya to 91.0 in Ruyigi.

Analysing the correlates of poverty, we found that poverty is, as expected, associated with low levels of education, extended families, low ownership of land and other forms of physical capital, poor provision of public goods and a high intensity of the civil war. As main *determinants* of poverty, we identified the size of farm land, proxied by total production, the low levels of human capital and the civil war. Finally, we concluded that policy makers should concentrate on the latter two variables as means to reduce rural poverty.

## A Absolute poverty in Bujumbura

In this section I will propose an absolute poverty line for the capital city of Bujumbura, using the same method as for rural areas. First, a calorie-based food poverty line is estimated, followed by an approximation for non-food requirements.

### A.1 The food poverty line in Bujumbura

Table 10 shows the derivation of the urban food poverty line, which is estimated to amount to 11713,94 BIF per adult equivalent per month in constant October 1998 prices. This translates into 26.16\$ using the 1998 official exchange rate. The average urban food basket delivers 2375,22 calories per AE per day and is dominated in quantity by flour of cassava, bananas, beans and rice, which are also the major sources (albeit not in the same sequence) of calorific intake. Note the big difference between the calorific content of the rural (1221,13 calories) and urban food basket (2375,22 calories).

### A.2 The non-food allowance

We will estimate the non-food component in Bujumbura by running equation (1) without the provincial dummies. The food share will be calculated according equation (2). Table shows the results of the regression. Using equation (2), it is easy to verify that the average urban food share amounts to 0,555. The total poverty line is calculated following equation 3:  $z_j = 11713,94(2 - 0,555) = 16928,44$  BIF per AE per month (37.8\$). Note that the urban poverty line is more than 107% higher than the rural one (8173,15 BIF), due to the elevated cost of living in the city.

### A.3 An urban poverty profile

In this section I will sketch a poverty profile for Bujumbura focussing on the same indicators as in the main text. Using the poverty line of 16928,44 BIF, 36,5% of urban households are deemed poor (vs 71,5% of rural households). The poverty gap and poverty severity for Bujumbura amount to respectively 15,45% and 8,64 (compared to 32,5% and 19,02 for rural areas). Poverty headcount in Bujumbura is higher than in Kigali (14,3%) and urban areas of Uganda (16,3%)(Minecofin, 2002; Appleton et al., 1999).



Table 10: Derivation of the urban food poverty line

Food item	monthly consumption per AE (kg)	Calories	Calories per month	calories per day	scaled quantities (kg)	prices (Oct 1998)	minimum expenditures (BIF)
Beans	3,99	3230	12887,74	423,71	4,20	384	1612,66
Sweet potatoes	1,82	960	1743,05	57,31	1,91	100	191,11
Bananas	4,33	1160	5019,48	165,02	4,55	97	441,78
Irish potatoes	1,81	710	1282,94	42,18	1,90	191	363,26
Manioc tubercule	1,82	1100	1999,91	65,75	1,91	118	225,81
Manioc farine	4,78	3440	16456,61	541,04	5,04	178	896,26
Rice	3,07	3600	11051,54	363,33	3,23	342	1105,05
Petit pois	0,42	3390	1422,85	46,78	0,44	373	164,78
Maize	0,28	3570	997,36	32,79	0,29	177	52,05
Sugar	1,09	3800	4162,83	136,86	1,15	348	401,25
Kitchen oil	0,54	8570	4650,68	152,90	0,57	858	490,07
Colocase	0,43	860	372,07	12,23	0,46	111	50,55
Bread	1,27	2610	3309,58	108,81	1,33	396	528,52
Ndagala et autre poissons	0,43	490	209,77	6,90	0,45	1941	874,59
Meat	0,69	2370	1623,93	53,38	0,72	1125	811,35
Milk	0,16	780	126,84	4,17	0,17	5875	1005,55
Miel	0,03	3120	84,32	2,77	0,03	1444	41,07
Choux	0,70	290	202,74	6,67	0,74	134	98,60
Tomatoes	2,05	200	410,26	13,49	2,16	271	585,11
Carrots	0,25	400	99,64	3,27	0,26	121	31,72
Oignons	0,46	390	181,36	5,96	0,49	521	255,00
Poireaux	0,31	610	187,31	6,16	0,32	207	66,90
Aubergines	0,35	380	134,18	4,41	0,37	238	88,45
Ananas	0,25	310	78,50	2,58	0,27	171	45,57
Avocats	0,72	610	437,65	14,39	0,76	172	129,89
Citrons	0,05	300	14,64	0,48	0,05	408	20,95
Mango	0,35	650	228,06	7,50	0,37	186	68,69
Beer and alcoholic drinks	1,56	1730	2692,44	88,52	1,64	488	799,38
Limonades	0,59	300	178,02	5,85	0,62	429	267,94
<b>Total</b>				<b>2375,22</b>			<b>11713,94</b>

Table 11: Regression of urban food shares

Variables	Coefficients
Constant	0,697***
Log ratio of total expenditure to food poverty line	-0,051***
Squared log ratio	-0,026***
Household characteristics	
Size	-0,020***
female headed household	0,004
Education of head	-0,029***
Household composition	
under 5 male	0,144***
under 5 female	0,140***
5 to 9 male	0,061***
5 to 9 female	-0,001
10 to 14 male	0,051**
10 to 14 female	0,012
15 to 59 male	-0,018*
15 to 59 female	0,023**
over 59 male	-0,001
over 59 female	-0,047*
Adjusted $R^2$	0.44
Predicted food share	0,555
<b>Poverty line</b>	<b>16928,44</b>

Table 12: Poverty statistics per gender and education of the household's head (Bujumbura)

	Poverty headcount (percent)	Poverty gap (percent)	poverty severity (x 100)
<b>Gender</b>			
Male	33,4	13,63	7,37
Female	48,5	22,69	13,67
<b>Education</b>			
No education	73,0	37,70	23,79
Primary	55,3	21,93	11,31
Secondary (at least 1 cycle)	22,3	6,9	3,16
Higher	2,3	0,55	0,21

Table 12 shows the distribution of poverty according to the gender and education of the household's head. As expected, the incidence and severity of poverty is higher for female-headed households compared to male-headed ones. Note the overwhelming importance of education as a vehicle to escape poverty in the city, as all three poverty indicators consistently decrease as the level of education of the household head increases.

Table 13 presents poverty statistics per economic sector of the household's head. Compared to the rural analysis, we exclude the sector of the cash crops farmers, since only 2 households in Bujumbura reported to belong to that category. The figures show the particularly dramatic situation in terms of poverty of those households whose livelihoods depend on the cultivation of small plots of land at the outskirts of the city: 85,9% of those households are deemed poor, with an enormous poverty gap of over 47%. The best insurance against poverty in the city is the securing of a public sector job (which probably corresponds closely with the level of education), and, to a lesser extent, finding a job in the formal private sector.

## B The 1998 Priority Survey

The 1998 Priority Survey (henceforth PS) was conducted between October 1998 and March 1999, and had as principal objectives(The Republic of Burundi, 2003):

Table 13: Poverty statistics per economic sector of the household's head (Bujumbura)

	Poverty headcount (percent)	Poverty gap (percent)	poverty severity (x 100)
Food crops farmer	85,9	47,07	30,56
Public sector	16,6	5,48	2,52
Private sector	29,0	11,08	5,65
Informal sector	52,0	20,43	11,30
Unemployed	49,5	23,20	13,62
Other	59,4	22,50	11,26

- To analyze the socio-economic situation in the country
- To help formulate an efficient poverty-alleviating policy
- To produce recent and reliable socio-economic data
- To strengthen local capacities for survey-design

The PS was designed as a nationally representative survey, with a total sample size set at 7200 households: 2680 in the city Bujumbura and 4520 in rural area's. Due to widespread insecurity in the countryside, certain regions could not be reached, what led to the exclusion of the provinces of Makamba (completely) and Bujumbura rural (partly) and a total sample size of 6668 households<sup>25</sup>. The sample weights were adjusted to address this situation.

Table 9 shows information on sample size and extrapolation of demographic data. Total population in Burundi is, based on the PS, estimated at 6025657 people, which corresponds to 1227910 households. The overwhelming majority of the population lives in rural area's (rural population of 5717098 vs. urban population of 308559).

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<sup>25</sup> Apparently, 2760 instead of the stated 2680 households were surveyed in the city of Bujumbura. However, we could not find an explanation for this in the survey manual.

Table 14: Demographic data

Province	sample size (households)	number of households (extrapolated)	Population (extrapolated)
Bubanza	60	56243	279154
Bujumbura rural	50	92669	448802
Bururi	320	76826	429229
Cankuzo	140	31831	167841
Cibitoke	180	72164	369950
Gitenga	490	133699	659263
Karuzi	280	73577	345704
Kayanza	410	95494	472050
Kirundo	340	106850	486762
Muramvia	410	89837	474487
Muyinga	370	98364	468588
Ngozi	440	128547	583176
Rutana	200	48654	237488
Ruyigi	218	59391	294604
Rural	3908	1164145	5717098
Bujumbura city	2760	63765	308559
<b>Burundi</b>	<b>6668</b>	<b>1227910</b>	<b>6025657</b>

## **C Provincial distribution of the welfare measure**

Figure 1 shows average consumption levels per adult equivalent for the rural provinces (constant October 1998 prices). This figure is based on table 1 in the main text.

## **D Provincial distribution of poverty**

Figure 2 shows the incidence of poverty per province.

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Figure 1: Average consumption expenditure per month (BIF), Oct. 1998 prices

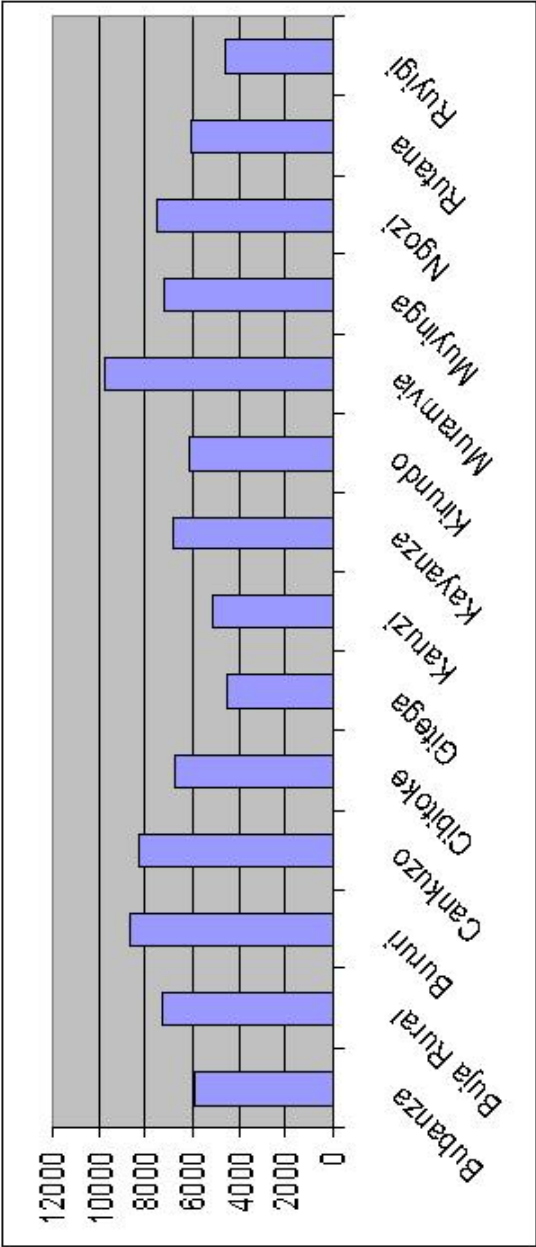


Figure 2: Poverty chart

