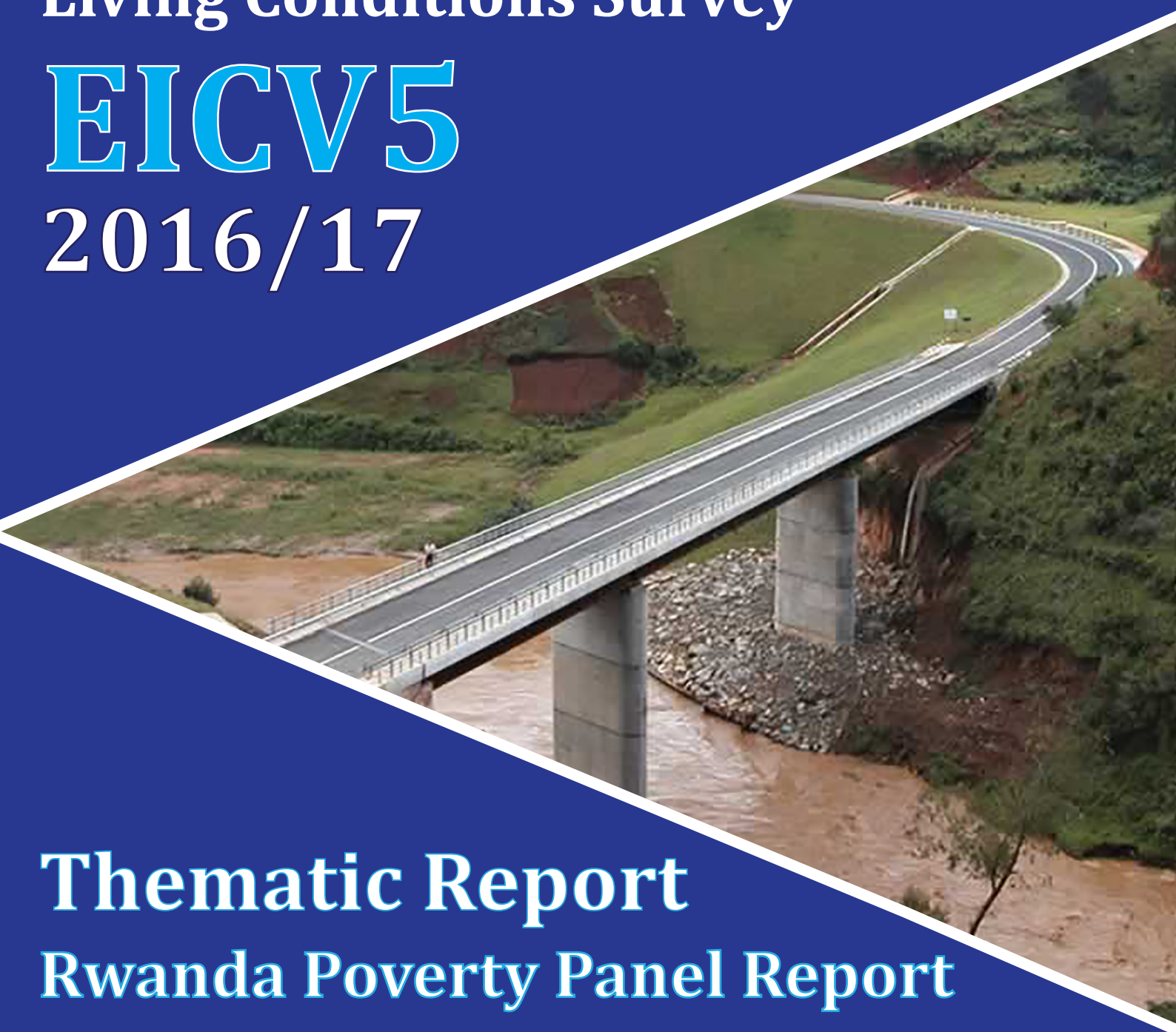
Republic of Rwanda

NATIONAL INSTITUTE OF STATISTICS OF RWANDA

The Fifth Integrated Household Living Conditions Survey

EICV5

2016/17



Thematic Report

Rwanda Poverty Panel Report

EICV5

Integrated Household Living Conditions Survey
(Enquête Intégrale sur les Conditions de Vie des Ménages)

-2016/2017 -

Rwanda Poverty Panel
Thematic Report

December 2018

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The Rwanda Poverty Panel Report is produced by the National Institute of Statistics of Rwanda (NISR).

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Recommended citation:

National Institute of Statistics of Rwanda (NISR), Rwanda Poverty Panel Report, December 2018

Acknowledgement

The Fifth Integrated Household Living Conditions Survey (EICV5) was conducted from October 2016 to October 2017, and is designed to provide accurate and up-to-date information that are useful to goverment, analysts, and the public as they seek to monitor and evaluate efforts to reduce poverty.

The NISR now conducts EICV surveys every three years, and this has been made possible by strong collaboration and support from our stakeholders, who are as interested as we are in supporting evidence-based decision making, and planning processes that are grounded on reliable and valid statistics.

We sincerely appreciate the support given by the Government of Rwanda for the development of statistics in the country, and are grateful for the help that we continue to receive from all government institutions.

We are most grateful to our development partners for the support that they have given for the collection and development of statistics in Rwanda, and especially for EICV5. They include UK Aid, the European Union, the World Bank, and the UN partners in the country.

The measurement and analysis of poverty and living standards is an exercise that requires considerable tecnical skills. We would like to thank NISR technical and management team for their work - from the planning and implementation of EICV5 through the analysis and publication of the results. We further appreciate the valuable technical support provided by the international experts. The generation and use of complex survey data can only be achieved through teamwork.

Yusuf Murangwa
Director General, NISR

Executive Summary

The focus of this report is household mobility dynamics among poverty status. Results of this report depend on EICV panel data. Households in panel sample were interviewed in 2010/11, 2013/14 and 2016/17. 1998 households in EICV3 were re-interviewed in EICV4, some households cannot be re-interviewed and some were split, thus Panel sample in EICV4 consists of 2423 households. Those were also interviewed in EICV5 and the sample size is 2427 households.

Rwanda adopts a basic-needs approach to measuring monetary poverty. Accordingly, poverty is defined as insufficient consumption to satisfy food and non-food basic needs. Real annual consumption per adult equivalent (in January 2014 prices) is used as the welfare measure. Households are classified into poor and non-poor depending on their welfare relative to a poverty line of RWF 159,375; a measure of extreme poverty is also computed, using a poverty line of RWF 105,064.

Throughout this report, we distinguish between short-term and medium-term mobility of the same households or individuals over time. Short--term mobility examines survey-to-survey changes, with 3 years differences, and medium-term mobility typically compares surveys at the beginning and end of time period under consideration (i.e. over a 6-year interval). Accordingly, for the analysis of short-term mobility, households are classified into "Stay poor", "Move out of poverty", Move into poverty" or "Never poor".

For multiple time periods (medium-term mobility), the population are grouped into "always poor", "transient poor (poor in certain periods and non-poor in others)", or the population who stayed out of poverty all years under consideration.

While real consumption per adult equivalent increased during the period under investigation, some households experienced much faster growth, while other were exposed to large losses. Many households in Rwanda experienced very large swings in their living standards. The detailed analysis of the panel data shows that average growth rates do not represent a reality for some groups in Rwanda. For half of the population, these changes were positive; the other half experienced losses or stayed poor. This likely increase in transient poverty calls for special attention to the safety nets.

- ✓ ***Short term Dynamics between 2013/14and 2016/17***

Although net poverty reduction between 2013/14 and 2016/17 is only 1.73 percentage points and this change is statistically insignificant, large movements in and out of poverty have occurred. Data shows that 24.6 percent stayed in poverty in the two surveyed years (2013/14 and 2016/17) and 11.7 percent moved into poverty in 2016/17 while they were non poor in 2013/14 and 13.4 percent are non-poor in 2016/17, while they were poor in 2013/14. Moreover, half of population remained non-poor during the years under investigation. In sum, one quarter of persons stayed in poverty, another quarter were transient poor (either moved in or out of poverty) and the remaining half were never poor.

Table ES.1: Poverty Transition Matrix 2013/14 -2016/17

		2016/17 (EICV5)			2016/17(EICV5)		
		Not poor	Poor	Total	Not poor	Poor	Total
		% of population			**% of group in 2013/14**		
2013/14	Not poor	50.2	11.7	61.9	81.1	18.9	100
(EICV4)	Poor	13.4	24.6	38.1	35.3	64.7	100
	Total	**63.7**	**36.3**	**100**	**63.7**	**36.3**	**100**
		% of group in 2016/17					
2013/14	Not poor	78.9	32.2	61.9			
(EICV4)	Poor	21.1	67.8	38.1			
	Total	**100**	**100**	**100**			

In each year households are grouped by deciles (poorest 10%, next poorest 10%, as measured by real consumption per adult equivalent), using the cutoff levels from the large cross-section surveys. Only 24.4 percent of the total population remained in the same decile during the period of 2013/14 to 2016/17, a proportion very similar to that over-served in the previous three-year period. Almost one person in five (19.6%) was in the same decile in 2016/17 as they were in 2010/11, six years earlier.

Table ES.2. Summary of mobility across deciles

Relative spending per adult equivalent:		% of population: 2010/11 to 2013/14		% of population: 2013/14 to 2016/17		% of population: 2010/11 to 2016/17	
Rose a lot:	> 2 deciles	14.93		12.67		17.48	
Rose moderately:	by 2 deciles	9.35	38.92	9.57	38.11	10.18	42.36
Rose slightly:	by 1 decile	14.64		15.77		14.71	
Did not change		23.75	23.75	24.4	24.4	19.61	19.61
Fell slightly:	by one decile	15.35		14.28		12.27	
Fell moderately:	by 2 deciles	9.37	37.33	9.57	37.49	9.64	38.03
Fell a lot:	> 2 deciles	12.6		13.63		16.11	

Note: Totals may not sum exactly due to rounding.

✓ ***Medium-term mobility***

The rapid economic growth in Rwanda during 2010/11-2016/17 was broad-based, as it affected positively most sectors of the economy and all regions, but to differing degrees. The proportion of individuals who were poor in 2010/11 and moved out of poverty in 2016/17 reached 45 percent, while 21 percent of the non-poor fell into poverty during the same period. Moreover, 19.2 percent of population remained poor in both years; this persistent poverty requires structural strategies in terms of aiming at enhancing human capabilities rather than just temporary measures to tide households over.

Table ES.3. Distribution of Individuals by poverty spells 2010/11-2016/17 (three waves), %

	Poverty Spells[1]								
	PPP	**PPN**	**PNP**	**NPP**	**PNN**	**NPN**	**NNP**	**NNN**	**Total**
Rwanda	19.16	7.76	5.34	5.13	12.52	5.47	6.57	38.05	**100**
urban/rural									
Urban	8.98	5.14	2.28	3.48	9.92	5.99	3.35	60.86	**100**
Rural	21.85	8.45	6.14	5.56	13.21	5.33	7.43	32.02	**100**
Provinces									
City of Kigali	10.79	7.94	1.54	4.11	7.26	5.07	0.54	62.76	**100**
Southern Province	20.37	6.14	7.85	4.94	14.95	3.35	6.76	35.65	**100**
Western Province	20.97	6.55	5.31	6.43	8.83	5.8	10.61	35.49	**100**
Northern Province	24.46	9.18	4.68	4.13	20.34	6.11	3.66	27.45	**100**
Eastern Province	15.73	9.5	4.72	5.07	10.45	6.94	6.57	41.02	**100**

[1] **PPP:** Poor in all years
PPN: Poor in 2010/11 and 2013/14 but exit poverty in 2016/17
PNP: Poor in 2010/11, exit in 2013/14 and returned to poverty in 2016/17
PNN: Poor in 2010/11, exit in 2013/14 and stayed non-poor in 2016/17
NPP: Non-poor in 2010/11 but poor in 2013/14 and 2016/17
NNP: Non-poor in both 2010/11 and 2013/14 but fell in poverty in 2016/17
NPN: Non-poor in 2010/11, fell into poverty in 2013/14, and moved out of poverty in 2016/17
NNN: Non-poor in all years.

Poverty mobility is higher in rural areas, but winners outnumber losers. Almost one quarter of rural population experienced poverty in some years and ended up being non-poor. High transient poverty in rural economies is due in large part to income fluctuations that depend on climatic conditions, variations in the prices of farm products, and lack of access to financial services and insurance arrangements, which leave farm households vulnerable to income risk. On the other hand, persistent poverty in urban areas represents only 9% of the urban population, and 61 percent are never poor.

Mobility is highly correlated with changes in household characteristics, especially employment characteristics of the head, as well as changes in household size. Households that expand are more likely to fell into poverty. On the other hand, households that got smaller are relatively more likely to move out of poverty.

Given that a high proportion of the persistent and transient poor are employed in farm activities, productivity and flexibility in agriculture has to be improved, with agricultural extension services being made available to the poorest farmers. Insurance schemes to cushion income fluctuation due to unfavorable climate conditions should be considered.

To ensure that growing regional disparities in incomes, opportunities and services are reduced; rural areas in general, and Northern Province in particular, need a continued push in terms of effective development investments.

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Chapter 1: Introduction

Over the past two decades, Rwanda's GDP has increased almost fourfold, far outpacing the growth of the population. This has been reflected in a rising standard of living, and improvements in a wide array of social indicators. The Rwanda Vision 2020, as articulated in 2000 and revised in 2012, established ambitious targets for further economic and social development over the years ahead.

Longitudinal or cross-section surveys may be used to gather data in order to compare welfare differences over time among representative samples of the Rwandan population. Repeated cross section surveys, including EICV3 (2010-11), EICV4 (2013-14) and EICV5 (2016-17) have been used to measure changes in poverty and other socio-economic indicators over time, most recently in Poverty Profile Report (EICV5).

However, successive cross-sectional data do not allow us to detect changes in the poverty experience of individual households. In order to identify who stays in or move out of poverty over time – the gross movements[2] – we need panel data that survey the same households at two or more points in time.

Panel surveys have some other advantages. By allowing the use of paired comparisons, they provide an efficient way to measure mobility among poverty status over time. They also allow one to model the determinants of poverty while controlling for unobserved individual characteristics ("heterogeneity"), which removes much of the bias that otherwise bedevils such research (Haughton and Khandker 2009).

Living conditions and human capital appear to have improved over time in Rwanda, despite the persistence of deprivations, and gaps in many dimensions of human well-being. But the improvements are uneven: some households may have experienced improvements in their economic status, while others may have fallen into poverty. These dynamics cannot be tracked using the cross-sectional EICV data but require panel data. This study uses panel data collected from the same households in 2010-11, 2013-14, and 2016-17, to explore more in depth the dynamics of well-being in Rwanda during the past several years.

Addressing the gross movements of households across poverty categories over time is extremely important if one is to design appropriate interventions to improve welfare. Individuals who moved into poverty or moved out of it are more likely to need short-term relief, through insurance or income stabilization interventions. Individuals who stayed in poverty are more likely to need structural changes in terms of their education, employment, health status, and assets. Cash transfers may alleviate their situation in the short-run, but the impact will be temporary unless they can build their human capacities to be able to maintain sustainable income, and hence get and stay out of poverty.

The Report focuses on four basic questions:

- What is the likelihood of entering, exiting, or staying in poverty over a period of years?
- To what extent to households move up and down the income distribution scale over time?
- How has economic growth affected the well-being of different groups?
- What are the main factors that increase a household's likelihood of staying in, entering, or exiting poverty?

This report consists of six main sections besides the introduction. In section two, the main methodology. Section three discusses different methodologies to assess poverty dynamics. Section

[2] Suppose we have two populations A and B and in both populations poverty reduced from 20% to 15%. Repeated cross section data shows that changes in poverty rates for the two populations are the same, i.e. poverty reduction efforts are similar, where poverty changed from 20% to 15%, while panel survey shows that the two populations are different. Population "A" which has 10% of individuals stayed poor in both survey years and 10% moved out of poverty while 5% slipped into it, is different-in terms of welfare- than population "B" which has 15% of individuals stayed in poverty in both years and 5% moved out of poverty but no one slipped into it.

four presents the short-term dynamics of poverty categories and identifies their relative importance with respect to location, different socio-economic household characteristics and housing conditions. The impact of social services on the poverty dynamics are assessed in section five. Medium term mobility and its correlates to poverty status are analyzed in section six, and we offer some concluding comments in section seven.

Chapter 2: Methodology

2.1. Welfare aggregate and poverty line

The measurement of poverty requires a measure of well-being (the "welfare aggregate") and a poverty line, Rwanda measures well-being using consumption per adulty equivalent. The measure of the consumption aggregate largely follows international practice on what items to include and exclude. The EICV questionnaires collect detailed information on household expenditures, as well as on consumption obtained from non-purchased sources (such as food crops grown by the household) and in-kind wages and transfers. In addition, the measure includes out-of-pocket spending on education, and routine health expenses. The expense of housing (actual or imputed rent) as well as utilities (water, electricity) are also major components in the consumption aggregate, as are the estimated consumption flows derived from durable goods (based on current value and estimated depreciation rates). In order to ensure comparability, the method used to construct the consumption aggregate has not changed since at least 2010. A household's annual consumption is deflated to the prices of January 2014 and divided by the number of adult equivalents in the household to get real consumption per adult equivalent. Thus, consumption per adult equivalent as a welfare measure reflects real measure of welfare that accounts for household age and composition as well as differences in prices across time and space. Further details of how consumption is measured may be found in poverty profile reports of EICV4 and EICV5.

Rwanda adopts a basic-needs approach to measuring monetary poverty. Accordingly, poverty is defined as insufficient consumption to satisfy food and non-food basic needs. Households are classified into poor and non-poor depending on their real annual consumption per adult equivalent (in January 2014 prices) relative to a poverty line of RWF 159,375; a measure of extreme poverty is also computed, using a poverty line of RWF 105,064.

2.2. Methodology for Measuring Poverty Dynamics

Throughout this report, we distinguish between short-term and medium-term mobility of the same households or individuals over time. Short--term mobility examines survey-to-survey changes, with 3 years differences, and medium-term mobility typically compares surveys at the beginning and end of time period under consideration (i.e. over a 6-year interval). In section 4, we focus on short-term mobility, while section 6 examines medium-term mobility from 2010/11 to 2016/17.

Mobility is examined from absolute and relative perspectives for the period 2010/11-2016/17.

Absolute Mobility

Absolute mobility examines movements across poverty status, where households are classified according to poverty groups (their income or expenditure is below or above a pre-determined poverty line). There are two approaches in this regard. The **first** approach is the *spells approach*, which focuses on the number of spells of poverty experienced over a given number of time periods. Accordingly, for the analysis of short-term mobility, households may:

- Stay poor, meaning they were poor in successive surveys, or "persistently poor";
- Move out of poverty, because they were poor in the first survey but not the second;
- Move into poverty, because they were not poor in the first survey, but were poor in the second; or be
- "Never poor", in that they were poor in neither survey.

For multiple time periods (medium-term mobility), one can calculate the population that is "always poor" and the population that is transient poor (poor in certain periods and non-poor in others), and the population who stayed out of poverty all years under consideration. The spells approach tends to find that transient poverty is much more common than persistent poverty (Glewwe and Gibson 2011).

The **second** approach, sometimes referred to as the *permanent approach",* complements the spells approach, and classifies households into:

- The *chronically poor*, whose average consumption per adult equivalent over time is below the poverty line. Clearly one of the priorities in such cases is to help raise average consumption levels above the poverty line.
- The *persistently poor*, who constitute a subset of the chronically poor, and are those who never emerge from poverty, not even for a year or two. In this respect, they may be distinguished from those chronically poor who have an occasional good year when they escape from poverty for a while.
- The *transient poor*, who are poor from time to time, but who are not poor on average. With better smoothing of their consumption stream they could, in principle, avoid all spells of poverty. And
- The *never poor*, who do not ever drop into poverty, (Haughton and Khandker 2009, chapter 11)

Relative Mobility

Relative mobility is commonly shown using a transition matrix, which shows the movement of individuals between income groups over time. Typically, for a transition matrix, households or individuals are grouped into *n* equally sized income classes (e.g. deciles or quintiles) which are endogenously determined by the data for each year, and the percentage of households or individuals who remain in the same position or moved to better or worse position can be derived. The advantage of the transition matrix is that it can nicely summarize mobility at various points in the distribution, which is harder to gauge from a single index; it may also be somewhat robust to measurement error (Cowell and Schluter 1998, cited by Glewwe and Gibson 2011).

Mobility Indices

Economic mobility may also be measured using a single index that covers the entire distribution at two successive data points. The mobility index is defined as one minus the correlation coefficient of the logarithms of expenditure of the two dates under consideration. This mobility index can be corrected for measurement errors using a rigidity index. These mobility measures lie between 1 (complete mobility, in that expenditure in the two time periods is uncorrelated) and 0 (no mobility). Mathematical formulas of these indices and their interpretations are outlined in Annex 2.

Chapter 3: Data sources and sample design

3.1. Sample design

The main objective of the EICV5 Panel Survey is to measure the trends in key socioeconomic indicators over time for a nationally representative sample of panel households. The EICV3 was based on a stratified two-stage sample design, and the sampling frame was stratified by the 30 districts of Rwanda. This resulted in a total sample size of 1,230 villages and 14,310 households for EICV3.

For the EICV4 Panel Survey, a subsample of 14 "EICV3" villages was selected for each of the three districts of Kigali, and 5 "EICV3" sample villages were selected for each of the remaining 27 districts, for a total of 177 sample panel villages. Within each of these sample villages the panel consisted of all the households that were interviewed in EICV3. Since the three districts of Kigali have 9 sample households per cluster and the other 27 districts have 12 sample households per cluster, the total potential sample size for the Panel Survey was 1,998 households. The EICV4 Panel Survey consists of all the households inside or outside the panel clusters who have at least one EICV3 person tracked and interviewed.

The EICV4 Panel Survey was included as a component of the large EICV4 cross-section survey. It consists of all the sample households interviewed inside the panel sample clusters (including any replacements households and panel split households inside the clusters). However, the main sample component of the EICV cross-section survey was a new sample of clusters based on the 2012 Rwanda Census frame of enumeration areas (EAs).

In contrast to the EICV4 surveys, the 2016/17 cross-section and panel samples were treated separately. For EICV5, the Panel Survey includes the panel households that remained in the original sample villages, the EICV4 split households, and new split households in EICV5 that include at least one eligible member from EICV3.[3] A "split" is a new household that is formed when a member of one of the original households in the sample leaves, and establishes a household of their own. The inclusion of splits ensures, in principle, the continued representativeness of the sample, but most panel surveys do not include splits, because of the difficulty of locating the newly-formed household units.

Additional EICV4 splits that include eligible members of the corresponding EICV3 household are also tracked, so weights need to be calculated for all these eligible households that are successfully interviewed. Any new household members in the original panel household or the split household of tracked eligible members are also included in the panel data, and weighted appropriately. The sample sizes of the cross-section surveys, and the panel components, are summarized in Table 1.

Table 1. Sample size for cross-section and panel surveys EICV3 – EICV5

Sample size	EICV3 (2010/11)	EICV4 (2013/14)	EICV5 (2016/17)
Cross-section survey	14,308	14,419	14,580
Panel	1,998	2,423	2,427
of which: splits	0	504	694

Note: Panel observations in EICV3 and EICV4 are also included in the cross-section numbers; for EICV5 the panel sample is in addition to the cross-section sample.

3.2. Weighting Procedures

The weighting procedures for the EICV5 Panel Survey are similar to those used for the EICV4 Panel Survey. In order to account for the split households, the weight of each original sample panel household was divided among the split households according to the proportion of EICV3 eligible household members who were tracked in each household. In this way the adjusted panel weights for the original and corresponding split households will sum to the original household weight.

[3] Only household members who were aged 12 or more in EICV3 (2010/11), and were the head, our spouse or child of the head, were followed over time.

At the same time, it is necessary to take into account the fact that some of the new household members in the split households also had a chance of being selected separately in EICV3, so they have two chances of being tracked and included in the panel sample. Therefore it is necessary to have a "fair share" correction of the weights to take into account the new household members; further details may be found in Himelein (2013). It should be noted that in dynamics analysis weights for the beginning period were used.

3.3. Robustness checks of panel and cross section results

In order to test whether the panel and cross-section samples are representative, we test the hypothesis that they generate the same mean values, using three key indicators; real consumption per adult equivalent (which is the welfare measure of which we base our poverty analysis), adult equivalents, and household size. The results of these tests for the samples of 2010/11 (EICV3) showed no significant differences, while the same tests applied to the 2013/14 (EICV4) data did show significant differences between the panel and cross-sectional data. The results of applying these tests to the 2016/17 (EICV5) data are shown in

Table 2. The results in Panel A show significant difference in consumption per adult equivalent at the national, urban and rural level, or in provinces; this may be judged by observing that the confidence intervals of the mean values do not overlap. In the same way, the data on household size and number of adult equivalents for the EICV5 panel data are statistically different from the EICV5 cross-section data. It is not unusual for panels of households to become, over time, less representative of the population at large (Haughton and Khandker 2009).

Table 2. Cross section and panel surveys key indicators, EICV5

A: Consumption per adult equivalent (000 RWF p.a., Jan 2014 prices)

	Cross-section survey				Panel Survey			
	Mean	Standard Errors	95% Confidence Intervals		Mean	Standard Errors	95% Confidence Intervals	
			Lower Bound	Upper Bound			Lower Bound	Upper Bound
Rwanda	278.9	0.1	278.7	279.1	285.8	0.1	285.6	286.1
Urban/rural								
Urban	570.3	0.5	569.4	571.3	509.6	0.5	508.7	510.4
Rural	215.9	0.1	215.8	216.0	217.3	0.1	217.1	217.4
Provinces								
City of Kigali	596.6	0.6	595.5	597.8	545.5	0.7	544.2	546.8
Southern	230.2	0.1	229.9	230.4	228.2	0.1	227.9	228.5
Western	219.1	0.1	218.9	219.4	268.2	0.3	267.7	268.7
Northern	230.3	0.2	230.0	230.7	221.7	0.2	221.3	222.0
Eastern	241.7	0.1	241.5	241.9	288.6	0.3	288.0	289.1

* All means are statistically different at 5% level of significance

*B: Household size**

	Cross-section survey				Panel Survey			
	Mean	Standard Errors	95% Confidence Intervals		Mean	Standard Errors	95% Confidence Intervals	
			Lower Bound	Upper Bound			Lower Bound	Upper Bound
Rwanda	**4.4**	**0.001**	**4.4**	**4.4**	**4.9**	**0.002**	**4.9**	**4.9**
Urban/rural								
Urban	**4.2**	**0.003**	**4.2**	**4.2**	**5.2**	**0.004**	**5.2**	**5.2**
Rural	**4.4**	**0.001**	**4.4**	**4.4**	**4.8**	**0.002**	**4.8**	**4.8**
Provinces								
City of Kigali	**4.0**	**0.004**	**4**	**4**	**5.3**	**0.005**	**5.3**	**5.3**
Southern	**4.4**	**0.003**	**4.4**	**4.4**	**4.6**	**0.003**	**4.6**	**4.6**
Western	**4.7**	**0.003**	**4.7**	**4.7**	**5.1**	**0.003**	**5.1**	**5.1**
Northern	**4.4**	**0.003**	**4.4**	**4.4**	**4.9**	**0.004**	**4.8**	**4.9**
Eastern	**4.4**	**0.003**	**4.4**	**4.4**	**4.8**	**0.003**	**4.8**	**4.8**

* All means are statistically different at 5% level of significance

*C: Number of adult Equivalent per household**

	Cross-section survey				Panel Survey			
	Mean	Standard Errors	95% Confidence Intervals		Mean	Standard Errors	95% Confidence Intervals	
			Lower Bound	Upper Bound			Lower Bound	Upper Bound
Rwanda	4.0	0.00	4.0	4.0	4.5	0.001	4.5	4.5
Urban/rural								
Urban	3.8	0.00	3.8	3.8	4.8	0.003	4.8	4.8
Rural	4.0	0.00	4.0	4.0	4.4	0.002	4.4	4.4
Provinces								
City of Kigali	3.7	0.00	3.6	3.7	4.9	0.005	4.9	4.9
Southern	4.0	0.00	4.0	4.0	4.2	0.003	4.2	4.2
Western	4.2	0.00	4.2	4.2	4.6	0.003	4.6	4.6
Northern	3.9	0.00	3.9	4.0	4.4	0.004	4.4	4.4
Eastern	4.0	0.00	4.0	4.0	4.4	0.003	4.4	4.4

*All means are statistically different at 5% level of significance.

Chapter 4: Short term Living standards mobility

4.1. Poverty status and inequality overview

We start by providing trends in poverty and inequality measures across the period of 2010/11 to 2016/17 using only the panel data, and summarize the information in Table 3. In 2016/17, the overall poverty rate among households who were followed since 2010/11 (as well as split households) stood at 36.7 percent; this represented a decline from 38.1 percent in 2013/2014 and 44.8 in 2010/11. However, the change in the poverty rate between 2013/14 and 2016/17 was not statistically significant, in contrast to the large and significant change between 2010/11 and 2013/14.

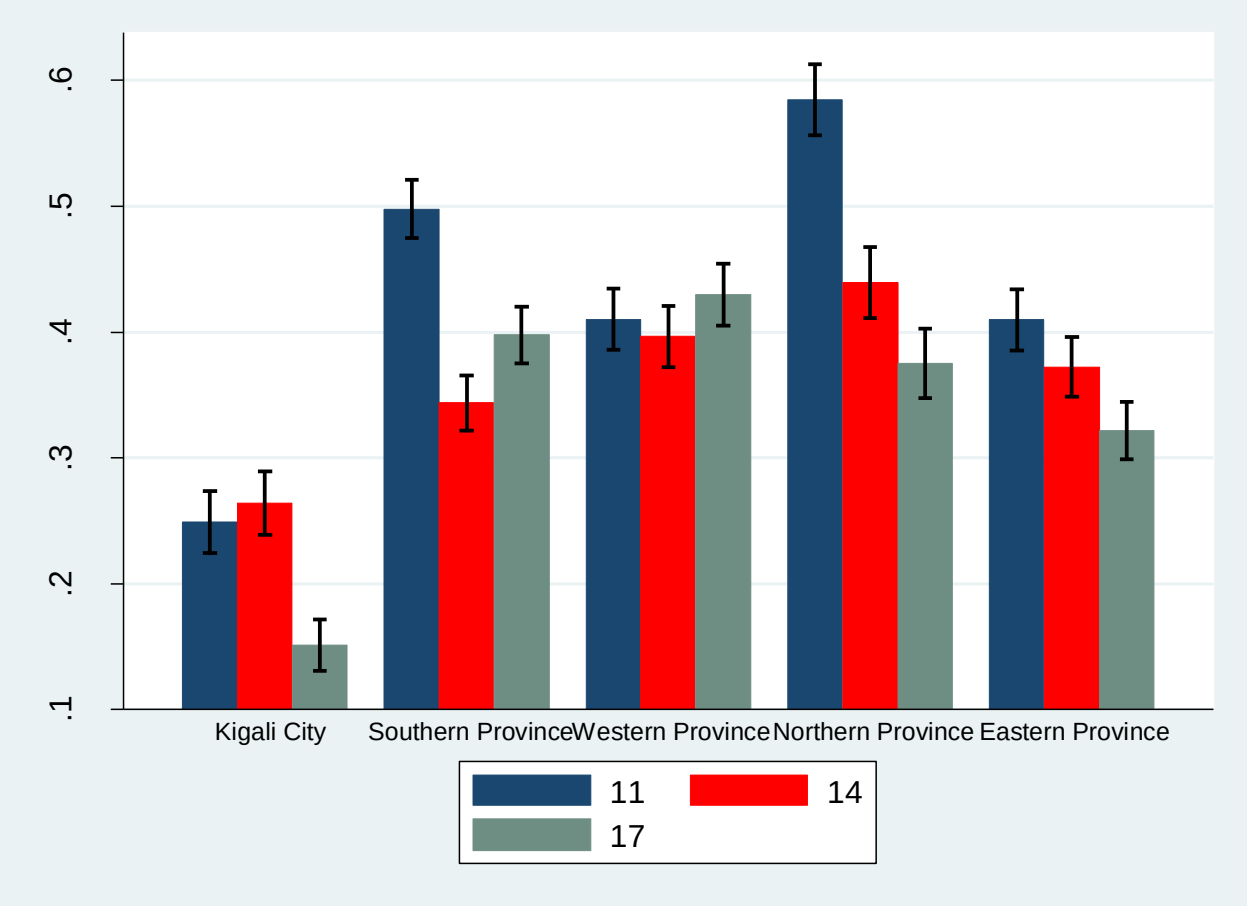
Although the percentage of people who are poor did not change significantly between 2013/14 and 2016/17, the panel data indicate that the poor in 2016/17 were relatively better off compared to 2013/14. The drop in the poverty gap rate was statistically significantly lower in 2016/17 than in 2013/14 – and the fall in the squared poverty gap measure was close to being significant – indicating that living standards of the poor and the poorest of the poor improved, even though they are still poor.

Table 3. Poverty measures in 2010/11, 2013/14 and 2016/17

	Estimate	Std.Error	95% Conf. Interval	
Headcount Poverty Rate *poverty rate*				
2016/17	36.70	0.63	35.47	37.93
2013/14	38.07	0.61	36.86	39.27
2010/11	44.77	0.60	43.59	45.95
Poverty gap				
2016/17	10.77	0.24	10.29	11.24
2013/14	11.73	0.24	11.26	12.21
2010/11	15.12	0.26	14.61	15.62
Squared poverty gap ("poverty severity")				
2016/17	4.59	0.14	4.33	4.86
2013/14	5.07	0.14	4.80	5.34
2010/11	6.82	0.15	6.52	7.11

Figure 1 presents the information on the headcount poverty rate visually, for Rwanda as a whole, and by province. The small lines show the confidence intervals, and when they overlap then there is no significant difference in the poverty rate. The graph shows that while poverty appears to have fallen between 2013/14 and 2016/17 in Kigali, Northern Province, and Eastern Province, it remained unchanged in Western Province and rose in Southern Province.

Figure 1. Headcount Ratio by Provinces for 2011, 2014 and 2017



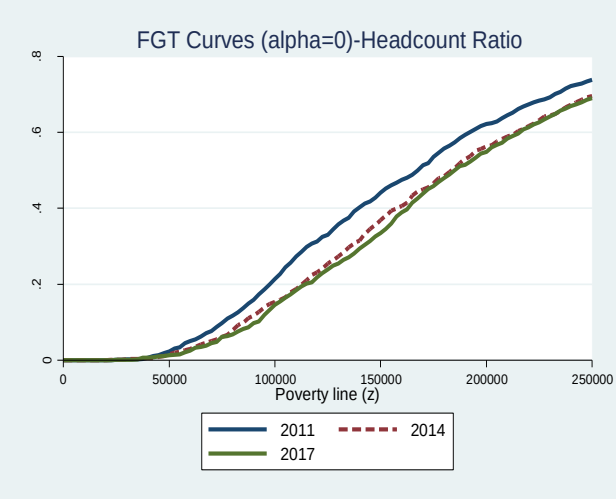
To assess the robustness of the poverty measurements to the poverty lines used, dominance analysis is carried out to examine whether or not the same conclusions are obtained if the poverty line is changed. Incidence curves for the poverty headcount and poverty gap measures were plotted using a wide range of values for the poverty line. If the more recent poverty incidence curve lies everywhere below another, then we may conclude that poverty has fallen, for any plausible poverty line; if the curves intersect, then poverty has fallen using some poverty lines, but not others, and we cannot reach a robust conclusion about the trend in poverty.

As shown in Figure 2, the incidence curves for the headcount index (Panel A) and the poverty gap index (Panel B) for 2010/11 are everywhere above the curves for 2013/14 and 2016/17. Thus, for both poverty measures and at any poverty line, poverty rates were lower in 2013/14 and 2016/17 than in 2010/11.

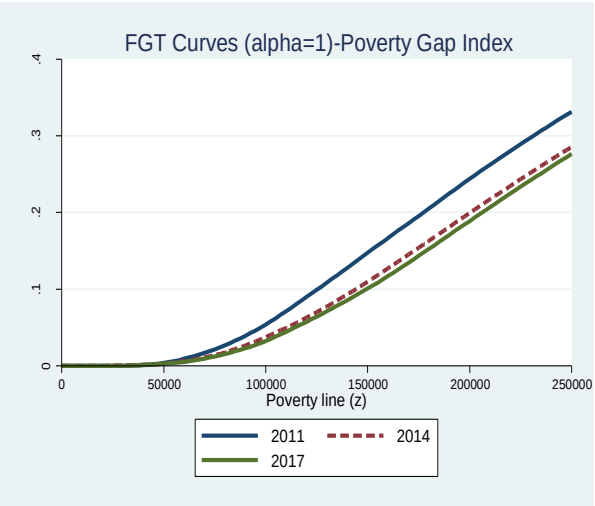
However, the incidence curves for the headcount poverty rates in 2013/14 and 2016/17 are very close to each other (Figure 2, Panel A), and even intersect, but the differences between the curves are not statistically significant. On the other hand, the incidence curve for the poverty gap index for 2016/17 is below that of 2013/14 (Figure 2, Panel B), so there is less ambiguity using this measure.

Figure 2. Poverty Incidence curves

Headcount ratio



Depth of Poverty

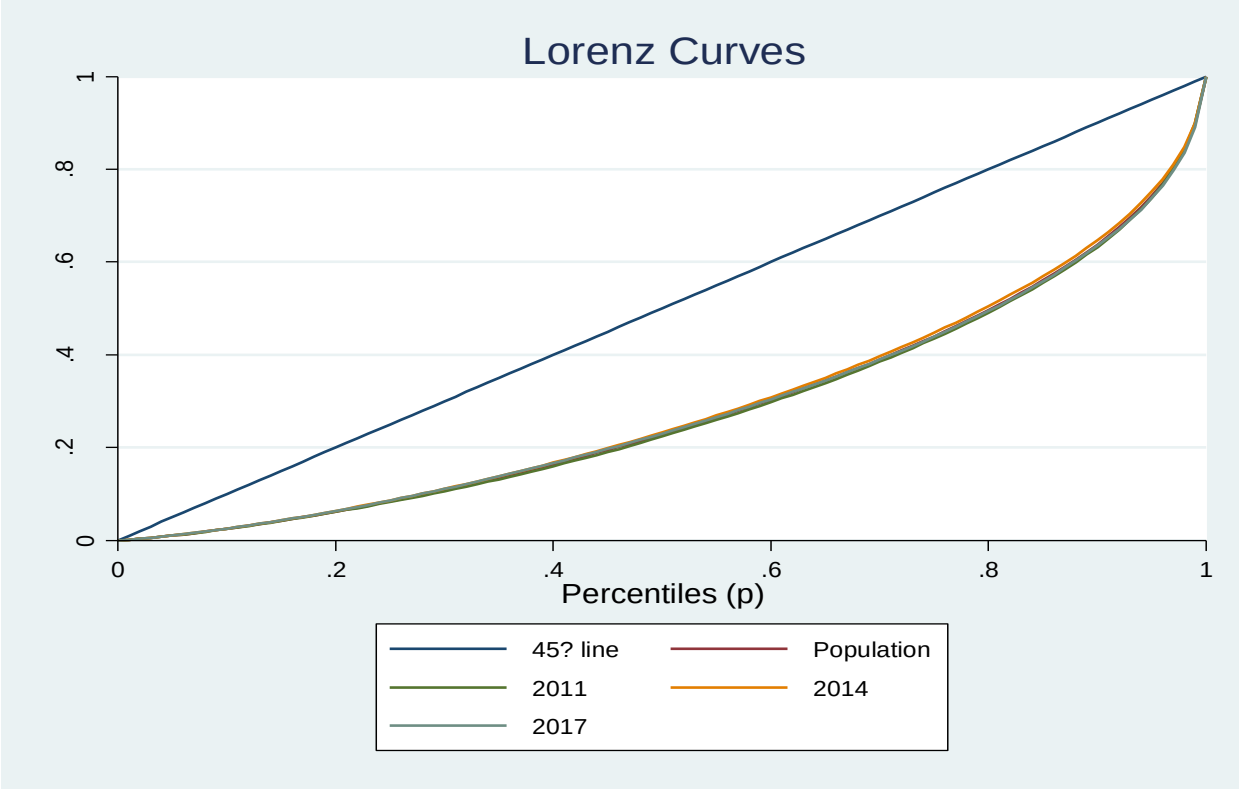


Based on the panel data, inequality – as measured by the Gini coefficient, and using real consumption per adult equivalent – did not change significantly during the time period (2010/11 to 2016/17) in question. The Gini coefficient ranges from 0 (perfect equality) to 1 (complete inequality), and is measured as the area between the Lorenz curve (pictured in Figure 3) and the line of perfect equality, divided by the area under the line of perfect equality. The Lorenz curve shows the cumulative proportion of individuals, sorted from poor to rich, on the horizontal axis, and the cumulative proportion of consumption on the vertical axis. Not surprisingly, the Lorenz curves for the three periods are very close together.

Table 4.Gini Coefficient for different panel surveys

	Estimate	Std. Error	95% Confidence Interval	
EICV5: 2016/17	0.4309	0.0236	0.3843	0.4775
EICV4: 2013/14	0.4222	0.0157	0.3913	0.4532
EICV3: 2010/11	0.4379	0.0168	0.4048	0.4711

Figure 3. Lorenz curves for different panel surveys



4.2. Short term dynamics of poverty; Absolute poverty dynamics

This section deals with short term dynamics between two successive surveys, with more focus on dynamics between 2013/14 and 2016/17. As explained above, short term poverty dynamics examines movements into and out of poverty between the two survey years, thus there are four categories: poor in both years (stayed in poverty), moved into poverty (non-poor in first survey and poor in the end survey), moved out of poverty (poor in first survey and non-poor in the end survey), and always non-poor (non-poor in both surveys).

Poverty Dynamics between 2013/14 and 2016/17

Although net poverty reduction between 2013/14 and 2016/17 was only 1.37 percentage points and this change is statistically insignificant (Table 3), large movements in to and out of poverty occurred. The data in Table 5 show that about a quarter (24.6%) of persons stayed in poverty between 2013/14 and 2016/17, and one out of nine (11.7%) fell into poverty. On the other hand, more than one in eight (13.4%) came out of poverty; and the remaining half (50.2%) were non-poor in neither period. In sum, one quarter of persons stayed in poverty, another quarter were transient poor (either moved in or out of poverty) and the remaining half were never poor. Looking at the poor in 2013/14, 35% of them moved out of poverty, while 19% of the non-poor slipped into poverty.

Economic growth between 2013/14 and 2016/17 as well as improvements in human capital had positive impact on 35 percent of the poor who became non-poor, but if insurance and income-stabilization schemes were well targeted, there would not be non-poor who became poor and poverty would have been reduced remarkably.

In 2010/11, 44.7 percent of individuals surveyed in the panel survey were poor, and in 2013/14, 26.9 percent stayed poor and 17.9 percent were able to move out of poverty, as Table 6 shows. But during the same period 10.6 percent fell into poverty, thus the net impact was a reduction in the headcount poverty rate of 7.3 percentage points. Mobility in the period 2010/11 -2013/14 was larger than the period 2013/14-2016/17, affecting 28.5 percent of population who moved out of in

poverty, while during the period 2013/14-2016/17, 25.1 percent moved from one poverty status to the other.

Table 5. Poverty Transition Matrix 2013/14 -2016/17

		EICV5: 2016/17			EICV5: 2016/17		
		Not poor	Poor	Total	Not poor	Poor	Total
		% of population			*% of group in 2013/14*		
2013/14	Not poor	50.2	11.7	61.9	81.1	18.9	100.0
(EICV4)	Poor	13.4	24.6	38.1	35.3	64.7	100.0
	Total	63.7	36.3	100.0	63.7	36.3	100.0
		% of group in 2016/17					
2013/14	Not poor	78.9	32.2	61.9			
(EICV4)	Poor	21.1	67.8	38.1			
	Total	100.0	100.0	100.0			

Note: Sampling weights are from EICV4. Totals may not sum due to rounding errors. Data refer to 7277 individuals tracked in the panel data.

Table 6. Poverty Transition Matrix 2010/11-2013/14

		EICV4: 2013/14			EICV4: 2013/14		
		Not poor	Poor	Total	Not poor	Poor	Total
		% of population			*% of group in 2010/11*		
2010/11	Not poor	44.6	10.6	55.2	80.8	19.2	100.0
(EICV3)	Poor	17.9	26.9	44.8	39.9	60.1	100.0
	Total	62.5	37.5	100.0	62.5	37.5	100.0
		% of group in 2013/14					
2010/11	Not poor	71.4	28.2	55.2			
(EICV3)	Poor	28.6	71.8	44.8			
	Total	100.0	100.0	100.0			

Note: Sampling weights are from EICV3. Totals may not sum due to rounding errors. Data refer to 7277 individuals tracked in the panel data.

There were also some movements between extreme and moderate poverty within the "stayed in poverty" category. Table 7 shows that one third of individuals who stayed poor in both years were in extreme poverty in both years, another third were in moderate poverty in both years, and the remaining third moved from (to) extreme poverty to (from) moderate poverty. Another way to look at this is to note that even with economic growth, almost two thirds (64.7%) of those who were poor in 2013/14 were still poor in 2016/17.

Table 7. Dynamics of poverty; extreme poverty, moderate poverty and non-poor; 2013/14 and 2016/17

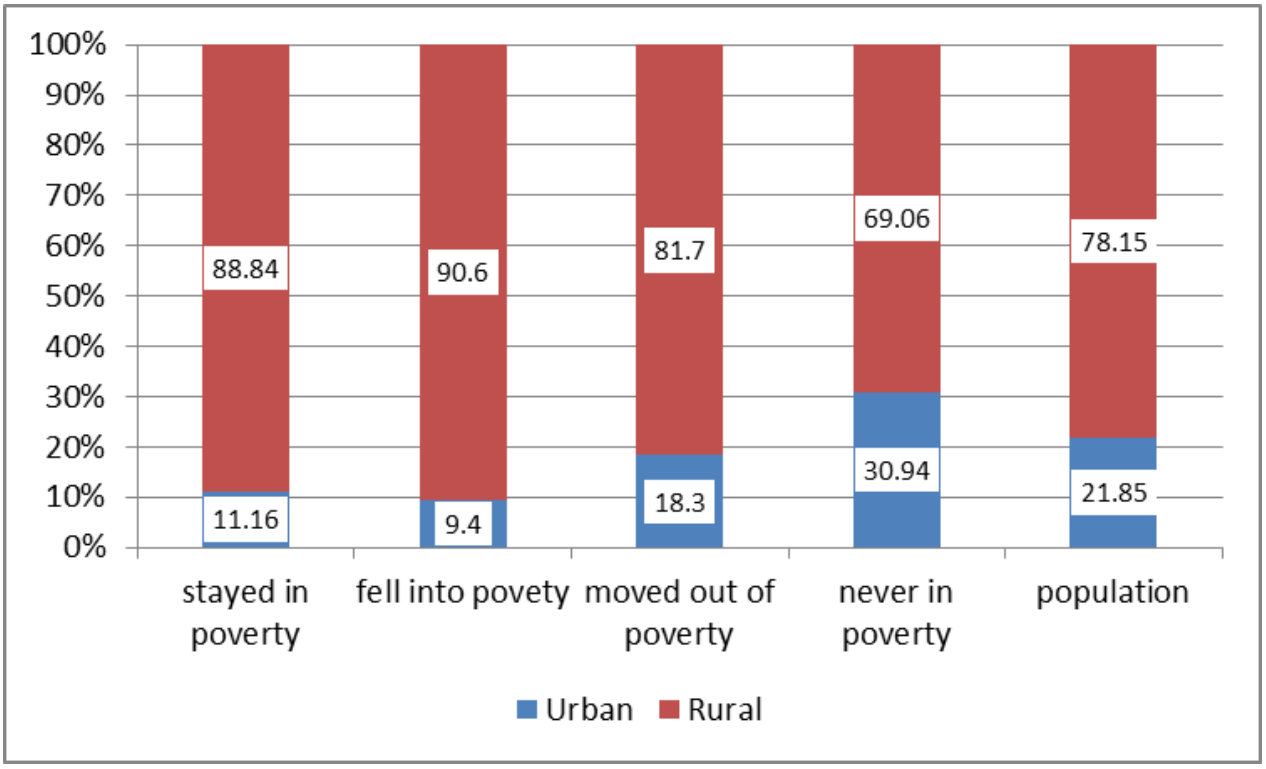
Poverty Status	Extreme poor in 2016/17	Moderate poor in 2016/17	Non poor in 2016/17	Total
Extreme poor in 2013/14	8.2	3.2	4.0	15.3
Moderately poor in 2013/14	4.0	9.3	9.5	22.8
Non poor in 2013/14	2.5	9.2	50.2	61.9
Total	**14.7**	**21.7**	**63.6**	**100**

Changes in consumption per adult equivalent help explain the observed dynamics. While growth in consumption per adult equivalent between 2013/14 and 2016/17 was 2.5 percent, households who escaped poverty experienced very high growth rate (94 percent). On the other hand, households who slipped into poverty exhibited a large deterioration in their living standards by (-45 percent), as Table 8 shows.

The movement of households into and out of poverty followed different patterns in urban and rural areas, and among provinces. Only 12.6 percent of the urban population stayed in poverty in both

2013/14 and 2016/17, the majority are never poor (71 percent), and there were more winners than losers (5 percent became poor and 11.3 percent moved out of poverty). As a result, the net reduction in poverty in urban areas was 6.3 percentage points. By way of contrast, the percentage of individuals who stayed poor in rural areas was markedly larger, at 28 percent, and the proportions of winners and losers was similarly high (amounting to 27.6 percent). Figure 4 shows that 89 percent of total persons who stayed in poverty live in rural areas, and 91 percent of persons who fell into poverty live in rural areas, even though the rural population constitutes only 78 percent of the total population.

Figure 4. Distribution of poverty dynamics by urban and rural area; 2013/14 to 2016/17



Most (71%) of those in City of Kigali were "never poor" (at least not in 2013/14 or 2016/17). The experience in the other provinces was quite different: More than one quarter of persons living in Southern and Western provinces remained poor during the same period, while one out of seven persons was newly poor (fell in poverty). Southern and Western provinces experienced increases in net poverty rate between 2013/14 and 2016/17 (by 4.7 and 3.6 percentage points, respectively). The percentage of individuals who moved out of poverty (winners) is higher than those who fell in poverty (losers) in City of Kigali, Northern and Eastern provinces, indicating declining poverty rates.

For the subset of households that split, relatively few stayed poor (17% vs. 25% for the whole panel), and there was more mobility, with a higher proportion exiting poverty (18% vs. 13%) as well as a higher proportion becoming poor (14% vs. 12%), as Table 8 shows.

Table 8. Short term mobility 2013/14-2016/17, by location and Provinces, %

	Stayed poor	Became poor	Exited poverty	Never poor	Total across	% population within group
Nationally						
Rwanda	24.6	11.7	13.4	50.2	100.0	100.0
Area of Residence in 2017						
Urban	12.6	5.0	11.3	71.1	100.0	21.8
Rural	28.0	13.6	14	44.4	100.0	78.2
Province						
City of Kigali	14.5	1.9	12.5	71.2	100.0	10.0
Southern Province	26.9	14.10	9.4	49.6	100.0	24.0
Western Province	27.9	15.7	12.1	44.3	100.0	24.0

Northern Province	29.9	8.2	15.9	46.0	100.0	16.8
Eastern Province	19.9	11.9	17.3	51.0	100.0	25.2
Panel sub-sample						
Split households	16.9	13.6	17.7	51.7	100.0	7.6
Non-split households	25.3	11.6	13.1	50.1	100.0	92.4
% change in consumption per adult equivalent	2.77	-45.41	94.31	1.40	2.49	

Note: "Split households" refer to households in 2013/14 that split into two or more households by 2016/17. Sampling weights from 2013/14 (EICV4) survey were used.

4.3. Relative Mobility

Decile Transition Matrix for 2011/14, 2014/17 and 2011/2017

Table 9 presents a decile transition matrix for the period of 2013/14 to 2016/17. In each year households are grouped by deciles (poorest 10%, next poorest 10%, as measured by real consumption per adult equivalent).

These numbers confirm the pattern discussed above: there is a substantial amount of mobility. The numbers in Table 9 show that more than half of individuals (59 percent) that found themselves in the poorest 10 percent of the population in 2013/14 were no longer in the poorest 10 percent in 2016/17. Symmetrically, about 76 percent of the population that was in the highest decile in 2013/14 was no longer in that decile 2016/17. Moreover, there is high degree of mobility in the middle (fourth to seventh) deciles, where only between 8 and 16 percent of individuals remained in their decile for the two periods. The extent of these movements may also be visualized with the help of

Figure 5.

More generally, as indicated by Table 10, only 24.4 percent of the total population remained in the same decile during the period of 2013/14 to 2016/17, a proportion very similar to that overserved in the previous three-year period. Almost one person in five (19.6%) was in the same decile in 2016/17 as they were in 2010/11, six years earlier.

Table 9. Decile transition matrix, total %. 2013/14-2016/17

Decile in 2013/14	Decile in 2016/17										Total	Fell	Rose
	1 (poor)	2	3	4	5	6	7	8	9	10 (rich)			
1 (poor)	4.22	2.69	0.99	0.72	0.59	0.29	0.41	0.23	0.11	0.09	10.35	0	6.13
2	1.97	1.38	1.36	1.16	1.25	0.47	0.72	0.43	0.07	0.02	8.83	1.97	5.48
3	1.11	1.65	2.45	1.2	0.85	0.82	1.04	0.29	0.21	0.05	9.66	2.76	4.46
4	0.57	1.35	1.72	1.57	1.16	1.49	1	0.67	0.33	0.13	9.99	3.63	4.78
5	0.87	1.02	1.05	1.13	1.54	2.04	0.95	0.65	0.6	0.17	10.00	4.06	4.41
6	0.23	0.74	1.22	1.44	1.67	0.86	2.5	1.66	0.61	0.21	11.13	5.3	4.98
7	0.14	0.73	0.61	1.55	1.41	1.48	1.24	1.7	1.89	0.57	11.33	5.92	4.16
8	0.13	0.23	0.55	0.76	1.23	1.47	1.57	2.21	1.45	0.58	10.18	5.94	2.03
9	0.12	0.26	0.28	0.48	0.55	0.71	0.87	1.31	3.41	1.68	9.67	4.58	1.68
10 (rich)	0	0	0.04	0.04	0.11	0.24	0.24	0.89	1.77	5.54	8.86	3.33	0
Total	9.35	10.04	10.26	10.06	10.35	9.86	10.55	10.04	10.46	9.03	100	37.49	38.11

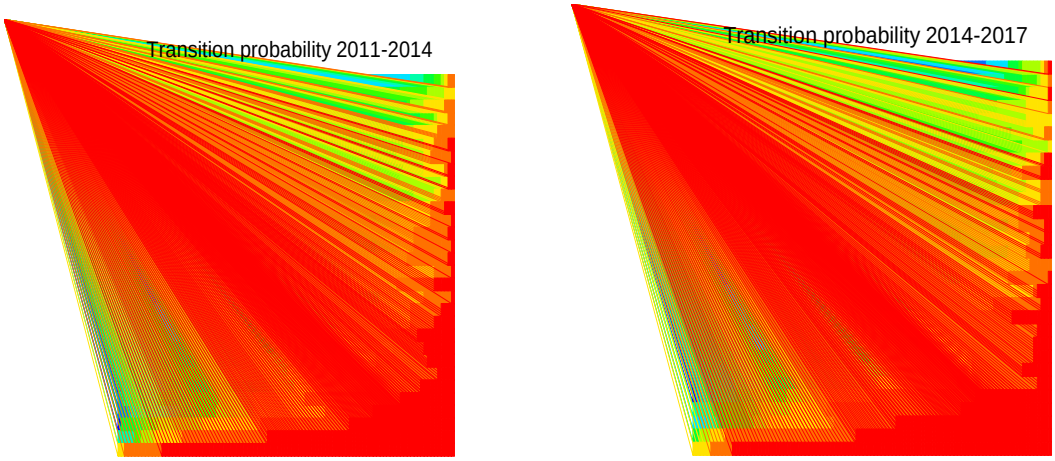
Table 10. Summary of mobility across deciles

Relative spending per adult equivalent:		**% of population: 2010/11 to 2013/14**		**% of population: 2013/14 to 2016/17**		**% of population: 2010/11 to 2016/17**	
Rose a lot:	> 2 deciles	14.93		12.67		17.48	
Rose moderately:	by 2 deciles	9.35	38.92	9.57	38.11	10.18	42.36
Rose slightly:	by 1 decile	14.64		15.77		14.71	
Did not change		23.75	23.75	24.4	24.4	19.61	19.61

Fell slightly:	by one decile	15.35		14.28		12.27		
Fell moderately:	by 2 deciles	9.37	37.33	9.57	37.49	9.64	38.03	
Fell a lot:	> 2 deciles	12.6		13.63		16.11		

Note: Totals may not sum exactly due to rounding.

Figure 5. Visualizing short-term transitions between two successive surveys



4.4. Mobility and reliability indices

As noted above, if there is a high correlation between what households spend in one period and the next, then this suggests low mobility. The mobility index is defined as one minus this correlation, and so if mobility is low the index is close to zero, while high mobility would imply a mobility index close to 1.

Table 11 presents some information on mobility for the periods under consideration. In all periods, mobility was higher in rural than in urban areas, with the highest levels (over the longer period 2010/11 to 2016/16) observed in Northern and Southern Regions. This likely overstates mobility, and so in Table 11 we show estimates of the reliability index and estimate a corrected mobility index, using the approach suggested by Glewwe and Gibson (2009). The result of this correction is substantially lower mobility indexes in all areas. However, it remains true that mobility is higher in rural areas and in Northern and Southern Regions.

Table 11. Mobility indices for different periods by location and provinces

	Basic mobility index			Reliability index	Corrected mobility index
	2011/14	2014/17	2011-17		
Rwanda	0.320	0.283	0.407	0.907	0.279
Location					
Urban	0.232	0.199	0.290	0.931	0.180
Rural	0.352	0.314	0.456	0.904	0.335
Province					
City of Kigali	0.201	0.170	0.266	0.951	0.188
Southern	0.345	0.317	0.507	0.953	0.458
Western	0.359	0.266	0.433	0.911	0.316
Northern	0.421	0.344	0.501	0.872	0.344
Eastern	0.316	0.345	0.398	0.863	0.191

4.5. Was growth in real consumption pro-poor?

A major question that is always asked in welfare studies is the extent to which economic growth reaches all income groups, and especially if it raises the wellbeing of the poor as much as or even higher than it does that of more affluent groups.

We do this by constructing individual-specific growth incidence curves. First, we sort everyone in the sample from poorest to richest, using their level of real consumption per adult equivalent in the

initial year. Then for each decile or centile (i.e. one percent) of the distribution we compute the proportionate change in the real consumption of these households between the two periods in question. Table 12 shows these growth rates for deciles, and Figure 6 graphs the growth incidence curves.

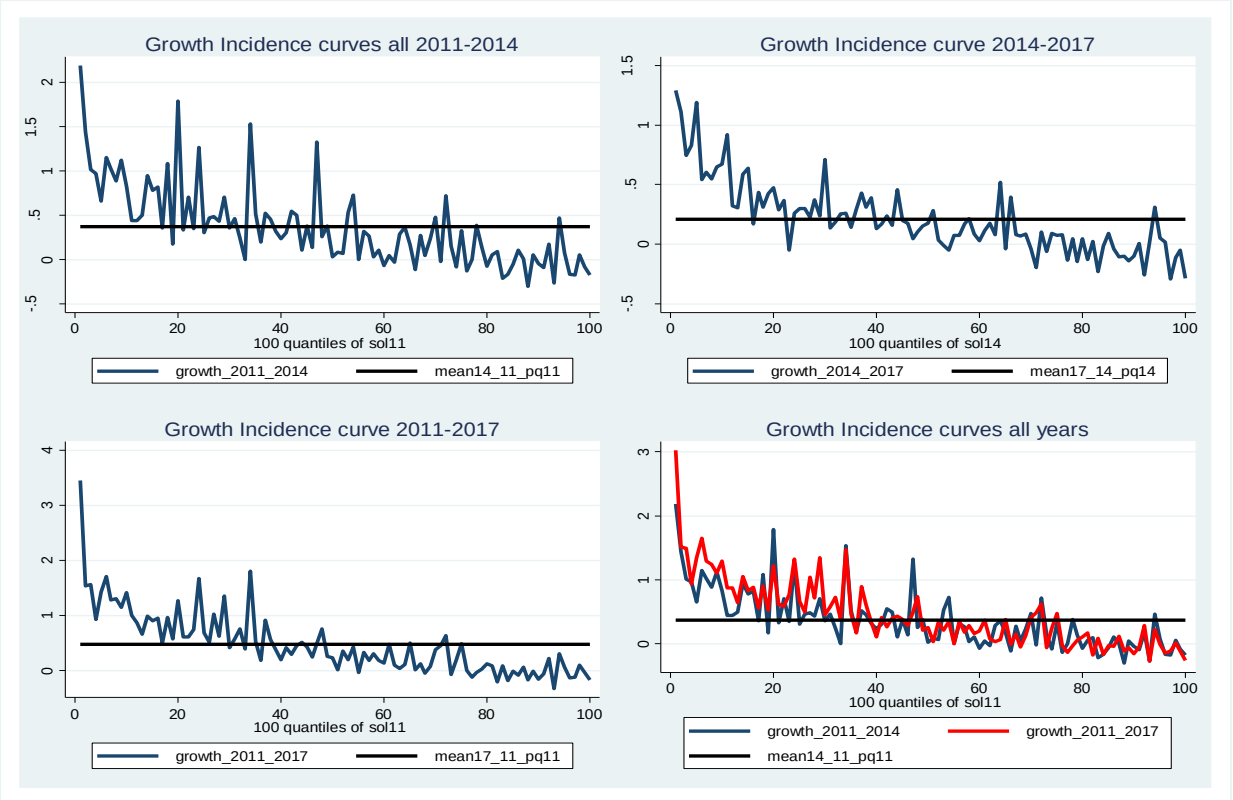
Between 2010/11 and 2013/4, and again between 2013/14 and 2016/17, the real consumption of households in the lowest deciles rose substantially faster than in the top deciles, as Table 12 shows. Based on this, we conclude that growth during these six years was pro-poor.

This pattern is clear in Figure 6, where the growth incidence curves slope down to the right; the horizontal lines show the average growth rates of real consumption per adult equivalent for the relevant time periods, and serve as useful points of reference.

Table 12. Growth Rates by Deciles of starting survey (%)

Decile	2010/11-2013/14	2013/14-2016/17	2010/11-2016/17
1 (poorest)	109.4	71.7	141.1
2	75.4	43.6	81.1
3	52.4	26.7	77.2
4	44.3	28.1	57.0
5	36.6	16.6	36.0
6	17.9	8.4	22.0
7	21.8	7.7	14.2
8	6.1	-7.2	7.0
9	-6.6	-7.1	-4.1
10 (richest)	-7.9	-13.0	-16.5
Rwanda	13.1	2.5	13.0

Figure 6. Growth incidence curve, tracing absolute change in real consumption for the same percentiles across years



4.6. Who stayed in poverty and who moved out of poverty in two years' span

We now investigate the characteristics of those who moved into or out of poverty between 2013/14 and 2016/17.

Individuals who stayed poor in both 2013/14 and 2016/17 are over-represented among female headed households, households whose head was aged 40-49, and households with 6 members or more, as Table 13 and Figure 7 show. An estimated 28% of female heads remained poor, compared to 24% for male head. While 32% of households whose head was aged 40-49 remained poor, the figure was just 13% for the case where the head was in their twenties. On the other hand, households where the head was aged 50 or more were the most likely to move out of poverty over time.

Households whose head worked as a farm laborer exhibited the highest likelihood of staying in poverty (45 percent). The number of farm laborers is increasing over time, pointing to the presence of a growing socio-economic problem. This is in contrast with those who have a non-farm business: 64% of households whose heads have such an activity work as non-farm business for cash are in the "never poor" category. There appears to be a need for social protection that targets female-headed households, and farm laborers.

Education was the strongest correlate of poverty in Rwanda, determining the command of individuals over income-earning opportunities through access to employment. While households whose heads have completed at most some primary years of education represented 63.5 percent of the panel sample in 2014, they are over-represented in "stayed poor" category: they represented 79 percent of those who stayed poor and 77 percent of those who fell into poverty, as Table 13 shows. On the other hand, households whose head has a secondary education or higher are very heavily represented in the "never poor" category.

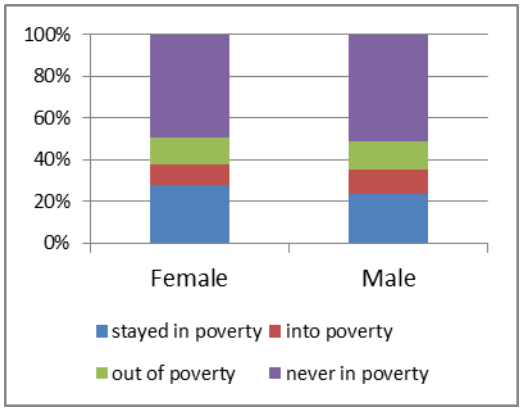
Table 13. Poverty Mobility in 2013/14 – 2016/17, by 2014 Socio-Demographic Characteristics

	stayed poor	into poverty	out of poverty	never poor	stayed poor	into poverty	out of poverty	never poor	Tot al
	Row percentage				*Column percentage*				
Rwanda	24.6	11.7	13.4	50.2	100	100	100	100	100
Sex of person									
Female	25.1	11.5	13.3	50	54.2	52.3	52.8	52.9	53.1
Male	24.1	11.9	13.5	50.4	45.8	47.7	47.2	47.1	46.9
Sex of household head									
Female	28.0	9.9	12.5	49.5	23.5	18	19.6	20.1	20.6
Male	23.7	11.8	13.3	51.2	76.5	82	80.4	79.9	79.4
Age of person in 2014									
0 – 9	30.3	12.2	12..0	45.4	29.6	25.1	21.5	21.7	24
10 – 19	28.2	10.1	15.3	46.4	28.6	21.6	28.6	23.1	25.1
20 – 29	12.6	14.9	14.0	58.4	7.3	18.2	14.9	16.6	14.3
30 – 39	24.9	12.2	11.1	51.8	15.9	16.4	12.9	16.2	15.7
40 – 49	27.3	8.1	13.1	51.5	9.2	5.8	8.1	8.5	8.3
50 - 59	20.9	12.7	15.5	51	6	7.7	8.2	7.2	7.1
60 – 69	14.4	12.4	13.0	60.2	1.9	3.3	3.1	3.8	3.2
70+	15.3	9.2	16.0	59.5	1.5	1.9	2.8	2.8	2.3
Age of household head in 2014									
15-19	0.0	35.7	0.0	64.3	0.0	0.2	0.0	0.1	0.1
20 – 29	13.2	19.3	10.9	56.6	4.0	12.6	6.2	8.3	7.5
30 – 39	24.7	13.6	10.6	51.1	29.5	35	23.7	29.5	29.4
40 – 49	31.5	7.9	12	48.6	30.5	16.4	21.6	22.8	23.8
50 – 59	26.0	10.8	16.9	46.2	23.9	21.4	29	20.5	22.6
60 - 69	16.8	10.8	15.4	57.0	7.4	10.3	12.8	12.3	10.9
70+	19.6	8.0	15.4	57.0	4.6	4.0	6.8	6.5	5.8
Household size in 2014									
1 – 2	10.7	13.5	8.2	67.6	6.4	14.2	7.5	18.7	14.1
3 – 5	21.8	13.7	12.8	51.7	53.9	63	57.2	55.7	56.4
6 – 8	31.0	9.0	14.5	45.4	34.2	19.3	28.5	21.4	24.7
≥ 9	24.4	9.0	17	49.6	5.5	3.5	6.8	4.2	4.7
Education of household head in first and end years									

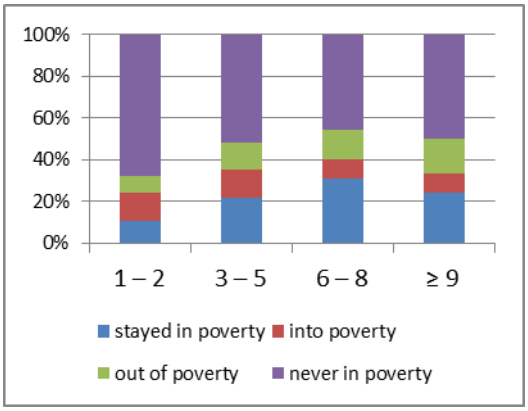
No formal	32.7	12.8	14.5	40	31.1	26.3	25.7	18.4	23.4
Some primary	29.1	14.6	13.5	42.9	48.0	51.7	41.5	34.2	40.6
Completed primary	19	9.5	13.6	57.8	17.7	19.1	23.6	26.0	22.9
Some post-primary	7.2	3.0	11.3	78.6	3.1	2.8	9.2	16.6	10.7
Some university	0.0	0.2	0.0	99.8	0.0	0.1	0.0	4.7	2.4
Head is a farmer in first and end years									
Yes	26.3	12.4	14.3	47	87.9	88.9	89	75.9	82.1
No	16.6	7.1	8.1	68.3	12.1	11.1	11	24.1	17.9
Head is farm wage worker in first and end years									
Yes	45	14.1	16	24.9	47.8	32.3	31.7	12.8	26.1
No	17.4	10.5	12.2	60	52.2	67.7	68.3	87.2	73.9
Head is non-farm wage worker in first and end years									
Yes	24.6	12.0	12.8	50.6	34.3	36.0	33.3	34.2	34.3
No	24.6	11.1	13.4	50.9	65.7	64.0	66.7	65.8	65.7
Head works in non-farm in first and end years business									
Yes	18.7	10.9	6.7	63.6	20.4	25.6	13.6	33.4	26.7
No	26.7	11.6	15.5	46.2	79.6	74.4	86.4	66.6	73.3
Head is economically active in first and end years									
Yes	27.4	9.7	16.7	46.2	5.0	3.8	5.7	4.1	4.5
No	24.5	11.5	13.0	51	95.0	96.2	94.3	95.9	95.5

Figure 7. Distribution of individuals by Mobility categories (2013/14-2016/17) and household characteristics in 2013/14

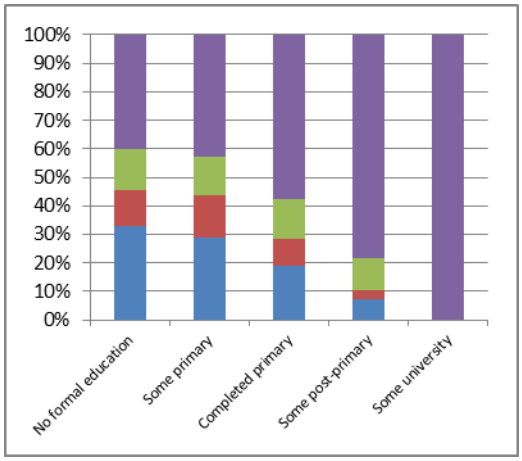
A. Sex of the head



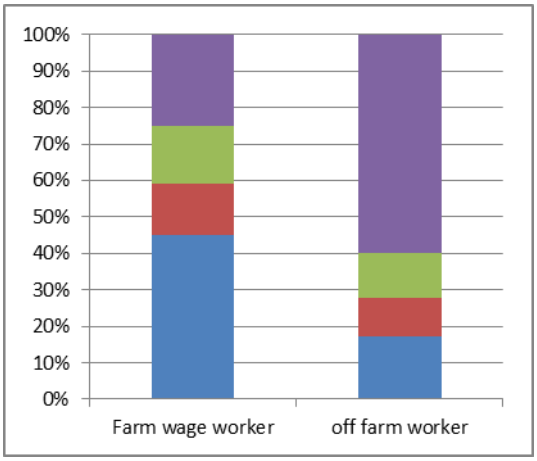
B. Household size



C. Education of the Head



D. Head's economic activity

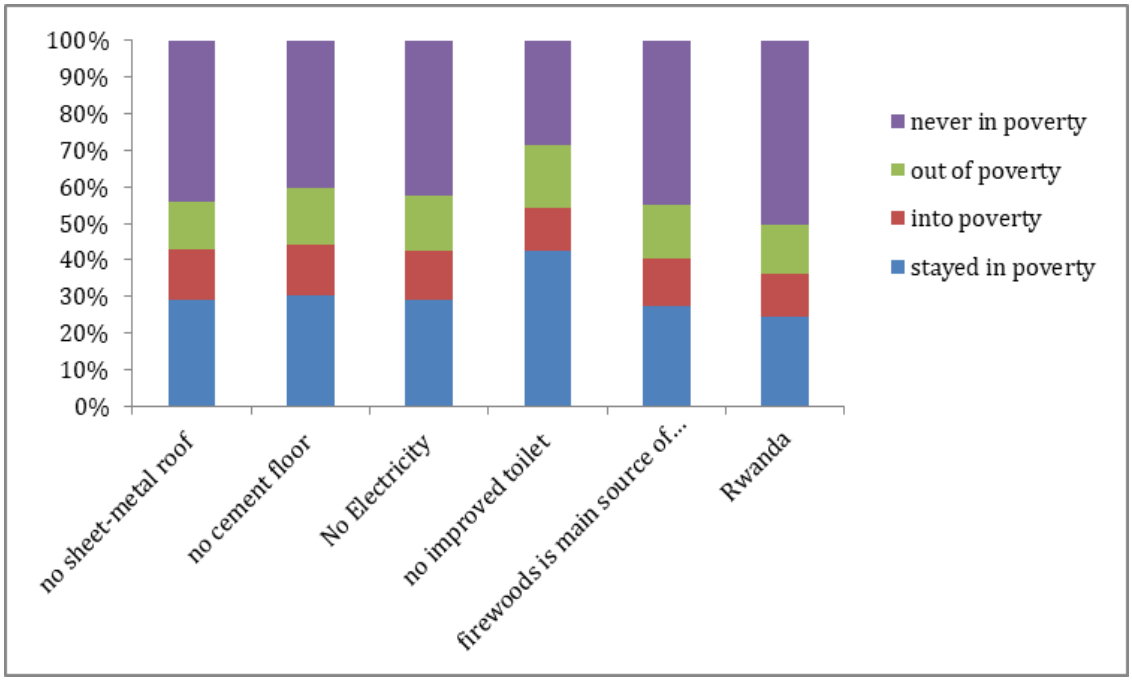


Poverty, and especially persistent poverty, is highly correlated with housing conditions. Some evidence of this is provided in Table 14 and Figure 8: as in poverty profiles elsewhere, individuals who stayed poor are over-represented among households live in houses without a corrugated iron roof, with no cement flooring, with no electricity, with no toilet, and among those who use firewood (rather than charcoal or gas or electricity) as their main cooking fuel.

Table 14. Poverty Mobility 2013/14 – 2016/17 by 2014 Housing Characteristics

	row %				Column %				
	stayed in	into	out of	never in	stayed in	into	out of	never in	Total
Rwanda	24.6	11.7	13.4	50.2	100	100	100	100	100
Living in Umudugudu in 2014									
Yes	25.8	12.7	14.6	46.9	50.6	52.5	52.5	45.2	48.4
No	23.6	10.8	12.4	53.3	49.4	47.5	47.5	54.8	51.6
House has sheet-metal roof in 2014									
Yes	21.7	10	13.7	54.6	52.2	50.5	60.4	64.3	59.2
No	28.9	14.2	13	43.9	47.8	49.5	39.6	35.7	40.8
House has cement floor in 2014									
Yes	2.5	2.7	5.9	88.9	2	4.7	8.9	35.7	20.2
No	30.2	14	15.3	40.5	98	95.3	91.1	64.3	79.8
Electricity main lighting source in 2014									
Yes	3.9	2.7	5.7	87.7	2.8	4.1	7.5	30.8	17.6
No	29.1	13.6	15.1	42.2	97.2	95.9	92.5	69.2	82.4
Firewood is main cooking fuel in 2014									
Yes	27.5	12.7	15	44.8	97.9	95.4	97.9	78.2	87.7
No	4.3	4.4	2.3	89	2.1	4.6	2.1	21.8	12.3
Has an improved toilet in 2014									
Yes	21.7	11.7	12.9	53.7	75.8	85.6	82.2	92	85.9
No	42.4	12	17	28.6	24.2	14.4	17.8	8	14.1

Figure 8. Distribution of individuals by Mobility categories (2013/14-2016/17) and housing condition in 2013/14



4.7. Determinants of Poverty Dynamics

It is well known that poverty is a complex and multidimensional phenomenon that is related to several factors like household size, employment, and the quality of one's housing. In this section we

investigate how changes in those factors affected the movement of households into and out of poverty ("poverty dynamics").

Table 15 shows that households that grow in size are more likely than others to stay in poverty (28 compared to 25% overall) or to fall into poverty (13% vs. 12%).

The effect is symmetric: households that got smaller are more likely to move out of poverty or to stay out of poverty.

A change in the type of occupation from farm wage labor to any other occupation has a moderate impact on poverty mobility. Households whose heads moved to farm labourer jobs are somewhat more likely to stay in poverty (28%), but also had a slightly higher-than-average probability of moving out of poverty (15.4%), as shown in Table 15.

Participation in health insurance is correlated with the dynamics of poverty. The results of Table 15 shows that people who participated in health insurance in 2013/14 but not in 2016/17 are more likely than other groups to have remained in poverty, and had an above-average chance of falling into poverty. On the other hand, households that had in health insurance in both years represented 82.8 percent of individuals who were never poor, while their population share was 76.5 percent.

Improvements in living standards are highly correlated with improvements in environmental conditions. Table 15 shows that 18.4 percent of the households that had no access to improved water facilities in 2013/14 but had improved water facilities in 2016/17 moved out of poverty. On the other hand, households that had access to improved water facilities in 2013/14 but not in 2016/17 experienced a deterioration in their welfare (16.4 percent fell into poverty and 27.5 percent stayed in poverty).

Similarly, the availability of electricity as a source of lighting is strongly correlated with the dynamics of poverty. Table 15 shows that most individuals who stayed in poverty did not have electricity as a source of lighting in either year; (93%), compared to 73% for the population as a whole. their population share is 73pecent. On the other hand, 90% of those who had electricity as their main source of lighting in both years remained out of poverty too.

Using improved toilet facilities is common in Rwanda, where 81 percent of individuals in the panel sample used improved sanitation in both years. However, the availability of improved sanitation is clearly associated with poverty dynamics. Table 15 shows that 89 percent of those who were "never poor" had improved sanitation in both years never poor people live in dwellings connected to improved sanitation source in both years.

This analysis indicates that better housing conditions, as well health insurance, wage income and household size are strongly correlated with the movement of households out of poverty.

Table 15. Poverty Mobility by Changes in Household and housing characteristics, 2013/14 – 2016/17

	row %					Column %			
	stayed in poverty	into poverty	out of poverty	never in poverty	stayed in poverty	into poverty	out of poverty	never in poverty	Total
Rwanda	24.6	11.7	13.4	50.2	100	100	100	100	100
Change in household size									
No change	22.2	10.4	16.3	51.1	25.7	25.5	34.6	29.1	28.6
Decreased	19.5	10.2	18.9	51.3	17.8	19.6	31.6	22.9	22.4
Increased	28.4	13.1	9.3	49.2	56.6	54.9	33.8	48.0	49.0
Change in the number of children									
No change	20.9	11.5	12.8	54.7	33.8	39	38	43.4	39.8
Decreased	26.3	9.9	18.8	45	39.7	31.4	52.2	33.3	37.2
Increased	28.3	15.1	5.7	50.8	26.5	29.6	9.8	23.3	23
Change in the number of working age persons									
No change	23.4	13.9	11.6	51.1	44.4	55.3	40.3	47.6	46.7
Decreased	17.8	9.2	15.1	57.9	13.6	14.8	21.1	21.7	18.8

	row %					Column %			
	stayed in poverty	**into poverty**	**out of poverty**	**never in poverty**	**stayed in poverty**	**into poverty**	**out of poverty**	**never in poverty**	**Total**
Increased	30	10.2	15.0	44.8	42	29.9	38.6	30.7	34.5
Change in the number of elderly persons									
No change	24.8	11.6	13.3	50.2	94.8	93.2	93.4	94	94
Decreased	22.2	15	14.6	48.3	1.6	2.3	2	1.8	1.8
Increased	21	12.7	14.9	51.4	3.5	4.5	4.6	4.2	4.1
Head has health insurance									
In both years	21.9	10.1	13.7	54.4	68	65.8	77.9	82.8	76.5
In 2013/14, not	34.7	17.7	12	35.6	30.5	32.7	19.3	15.4	21.7
In 2016/17, not	23	9.1	21.5	46.4	0.6	0.5	1	0.6	0.6
In neither year	27.4	26.8	3.7	42.1	0.2	0.4	0	0.1	0.2
Head is wage worker in agriculture									
In both years	23.5	13.6	14.3	48.6	39.6	47.9	44.1	40.1	41.4
In 2013/14, not	20.5	12.9	9.3	57.2	4	5.3	3.3	5.5	4.8
In 2016/17, not	28.2	11.2	15.4	45.2	13.4	11.2	13.4	10.5	11.7
In neither year	25.2	9.9	12.5	52.4	43	35.5	39.1	43.9	42.1
Have improved water source									
In both years	23.4	10.4	12.6	53.6	72.4	67.7	71.6	81.3	76.2
In 2013/14, not	27.5	16.4	11.9	44.2	8.3	10.4	6.6	6.6	7.4
In 2016/17, not	25.9	13.7	18.4	42	9.2	10.2	12	7.3	8.8
In neither year	32.7	17.9	17.4	31.9	10.1	11.6	9.9	4.8	7.6
Have electricity as main source of lightening									
In both years	2.8	2.4	5.1	89.7	1.9	3.4	6.2	29.7	16.6
In 2013/14, not	21.4	7.8	16.2	54.6	0.9	0.7	1.2	1.1	1
In 2016/17, not	12.3	8.1	20.3	59.3	4.7	6.5	14.2	11.1	9.4
In neither year	31.2	14.3	14.4	40	92.5	89.4	78.4	58.1	73
Have improved toilet									
In both years	20.2	11.3	13	55.5	66.1	77.7	78.1	89	80.6
In 2013/14, not	44.6	17.2	10.3	27.8	9.7	7.9	4.1	3	5.4
In 2016/17, not	40.4	11.1	18.7	29.7	17.9	10.4	15.2	6.5	10.9
In neither year	49.2	15.1	11.1	24.6	6.3	4	2.6	1.5	3.1

Chapter 5: Impact of social services on the poverty dynamics

The EICV surveys provide data on access to several services. However, the availability and affordability of these services may hinder some population groups from using them.

This section assesses the impact of these services on poverty dynamics.

5.1. Who benefits from social services, and by how much?

Table 16 provides the percentage of individuals using government services, broken down into those who stayed poor, the transient poor, and the never poor between 2013/14 and 2016/17. It shows that poor segments of population benefitted more from public services compared to the better off, except for secondary schools and internet services.

Table 16. % of individuals who use public services by Poverty Dynamics groups, 2013/14 and 206/17

	Stayed in poverty	moved into poverty	moved out of poverty	Never in poverty	All Rwanda
Main Drinking/clean Water source	86.17	84.72	86.88	82.95	84.35
Food market/ shop	95.77	98.45	95.84	96.82	96.66
Market for selling farm produce	52.40	56.51	47.90	49.04	50.41
Public transport stage	80.12	88.29	88.84	92.88	89.26
All-weather roads	100	99.48	99.65	99.91	99.84
Pre-primary	21.83	20.17	14.65	20.88	20.09
Primary schools	80.39	69.74	57.10	52.46	60.63
Secondary schools	15.96	11.04	15.23	16.61	15.63
District hospital	81.72	80.80	80.95	82.48	81.92
Health center	98.64	99.45	97.40	94.99	96.57
Sector office	97.27	96.38	96.38	97.66	97.25
Cellule office	99.12	99.24	98.19	98.86	98.86
Internet services	0.26	0.87	1.66	6.76	4.07
Public telephone	0.73	0.96	1.56	3.28	2.26
Secretarial services	55.94	56.50	56.67	64.92	60.99

Benefit Incidence Curve

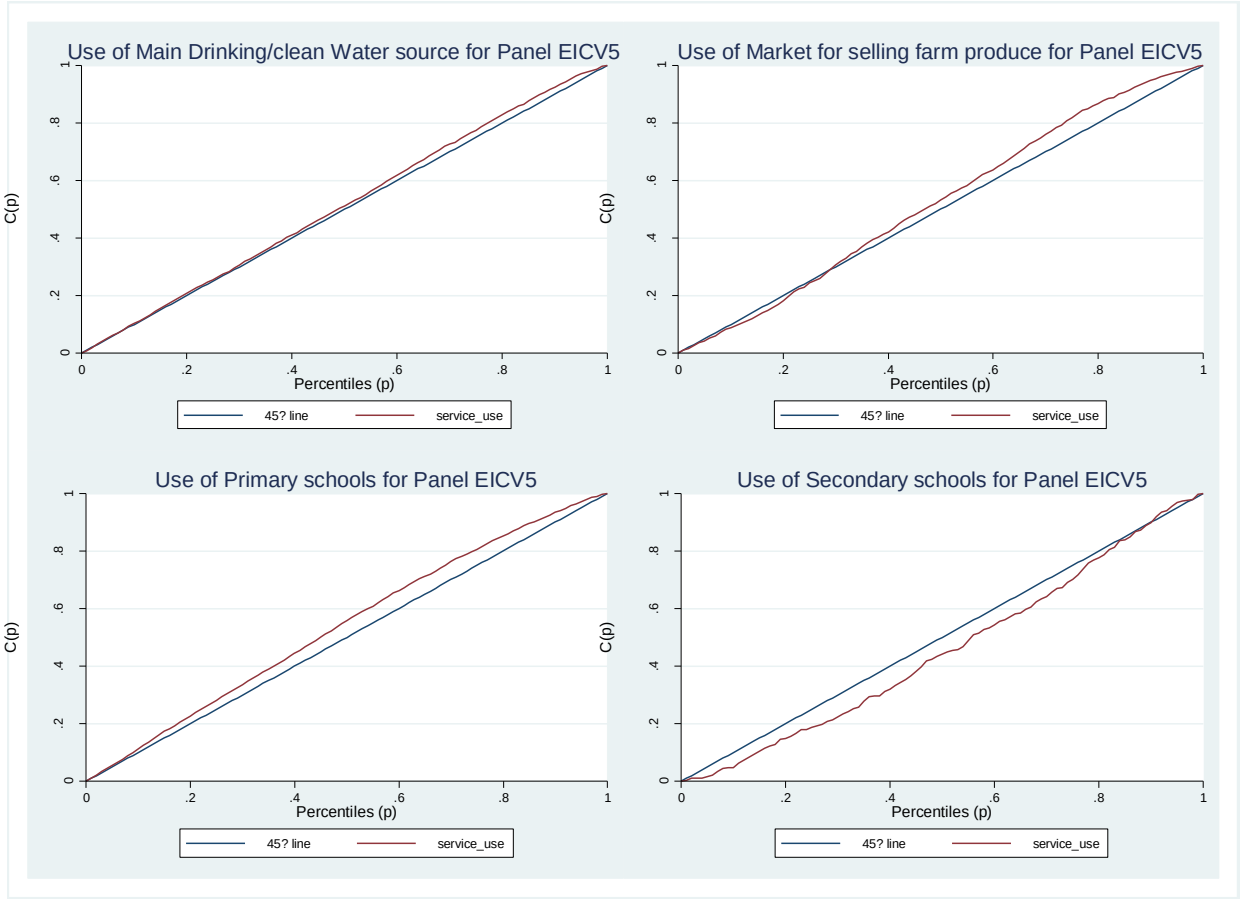
A benefit incidence curve is a popular tool for assessing who benefits from public services. It plots the cumulative percentage of beneficiaries from the variable of interest (such as public works, or primary education) on the vertical axis against the cumulative percentage of the sample, ranked from poorest to richest, on the horizontal axis.

If all groups, irrespective of their living standards, use exactly the same value of public services, the benefit incidence curve will be a 45^0 line, running from the bottom left-hand corner to the top right-hand corner. This is the line of equality. If, by contrast, the variable takes higher (lower) values amongst poorer people, the benefit incidence curve will lie above (below) the line of equality.

The further the curve is above the line of equality, the more concentrated the use of public services is amongst the poor, and the more "progressive" the distribution of the benefits. If the variable takes on smaller values amongst the poor, the benefit incidence curve will lie below the line of equality, and the benefits will be distributed in a "regressive" manner.

The graphs shown in Figure 9 show that in 2016/17, all population segments used improved drinking water on an equal basis. Access to markets, and participation in primary education, are to some extent progressive (pro-poor) while use of secondary schools is more targeted to the well-off, as the bottom right panel in Figure 9 clearly shows.

Figure 9. Benefit incidence curves for use of public services, 2016/17



Chapter 6: Living standards between 2010/11 and 2016/17; Medium-term mobility

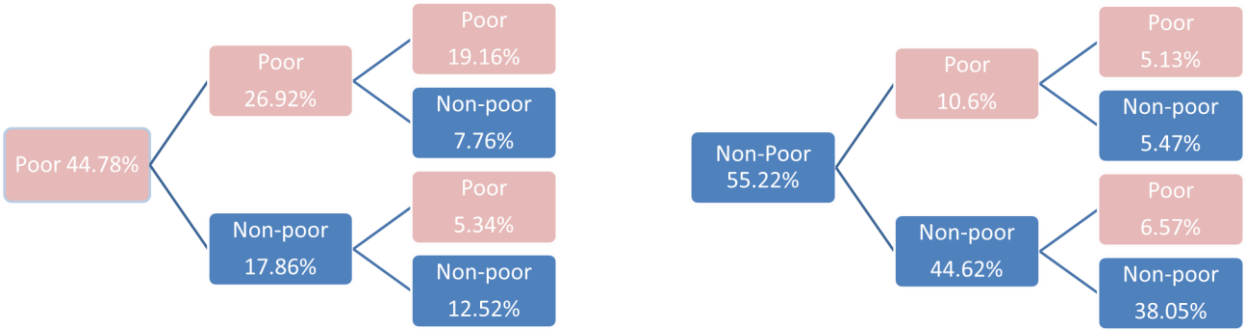
We now examine poverty dynamics using the spells approach for the six-year span between 2010/11 and 2016/17, which encompasses EICV3, EICV4 (for 2013/14), and EICV5. Every household in each survey is classified as poor or non-poor depending on its welfare aggregate (i.e. real consumption per adult equivalent) in its relation to the poverty line.

6.1. Medium term dynamics of poverty using spell approach

Over the whole period, individuals may be classified into eight categories that arise in a three-wave panel. These are set out in Figure 10 below; households may be sorted as follows:

- Poor in all years (PPP);
- Poor in 2010/11 and 2013/14 but exit poverty in 2016/17 (PPN);
- Poor in 2010/11, exit in 2013/14 and returned to poverty in 2016/17 (PNP);
- Poor in 2010/11, exit in 2013/14 and stayed non-poor in 2016/17 (PNN);
- Non-poor in 2010/11 but poor in 2013/14 and 2016/17 (NPP);
- Non-poor in both 2010/11and 2013/14 but fell in poverty in 2016/17 (NNP);
- Non-poor in 2010/11, fell into poverty in 2013/14, and moved out of poverty in 2016/17 (NPN); and
- Non-poor in all years (NNN).

Figure 10. Scheme of poverty classification in three waves



Other classifications are also possible. Households can be grouped according to the number of spells of poverty experienced, which ranges from 0 (always non-poor, NNN) to 3 (always poor, PPP). One spell indicates that households experienced poverty in one survey and was not in poverty in the other two surveys (PNN, NPN, NNP), regardless of the year in which it was in poverty. Two spells means that a household was in poverty in two surveys out of three (PPN, PNP, NPP).

Households also can be classified into 4 categories according to their poverty status in first, end and in between surveys.

Thus, categories are always poor (PPP), poor in 2017 but was not poor in any other year (PNP or NNP or NPP), non-poor in 2017 but was poor in any other year (PPN or NPN or PNN), and always non-poor (NNN).

When households were classified into 8 categories, 19.2 percent of individuals in Rwanda were in poverty in all three years (2010/11, 2013/14 and 2016/17), while 38.1 percent did not experience poverty at any of these times (never poor). About one person out of five persons experienced two spells of poverty over the three waves and about one of four persons fell into poverty in one spell out of three. More precisely, 42.8 percent changed their poverty status at some point between 2010/11 and 2016/17, as Table 17 shows. These results are confirmed by the information on the number of spells of poverty that are shown in Table 17.

Disaggregating the above figure by urban and rural areas reveals large disparities in population distribution across poverty dynamics categories. Three-fifths of the urban population was never poor in the course of the three surveys, compared to less than one third in rural areas. In rural areas, the percentage of people in the "always poor" category (22%) is two and a half times the corresponding figure in urban areas (9%). Mobility is larger in rural areas as the share of households in transient poverty across the three waves is higher. This may be due to the fluctuations in agricultural income experienced during the 2011-2017 period.

The panel data also shows that 45.3 percent of the poor in 2010/11 were out of poverty in 2016/17 and 21.2 percent of the non-poor in 2010/11 fell into poverty in 2016/17. In urban areas 57.2 percent moved out of poverty compared to only 9.1 percent who fell into poverty, while rural areas exhibited larger proportion of individuals who fell into poverty (losers) and smaller percentage of movers out of poverty (winners), as Table 19 shows.

Table 17. Distribution of Individuals by poverty spells 2010/11-2016/17 (three waves), %

Medium-term Mobility; Living standards between 2010/11 and 2016/17	Poverty Spells								
	PPP	PPN	PNP	NPP	PNN	NPN	NNP	NNN	Total
Rwanda	19.16	7.76	5.34	5.13	12.52	5.47	6.57	38.05	**100**
urban/rural									
Urban	8.98	5.14	2.28	3.48	9.92	5.99	3.35	60.86	**100**
Rural	21.85	8.45	6.14	5.56	13.21	5.33	7.43	32.02	**100**
Provinces									
City of Kigali	10.79	7.94	1.54	4.11	7.26	5.07	0.54	62.76	**100**
Southern Province	20.37	6.14	7.85	4.94	14.95	3.35	6.76	35.65	**100**
Western Province	20.97	6.55	5.31	6.43	8.83	5.8	10.61	35.49	**100**
Northern Province	24.46	9.18	4.68	4.13	20.34	6.11	3.66	27.45	**100**
Eastern Province	15.73	9.5	4.72	5.07	10.45	6.94	6.57	41.02	**100**

It is no surprise that among all the provinces, City of Kigali experienced the highest living standards: only 10.8 percent of its residents were always poor, while 62.8 percent of its population were never recorded as being poor.

Northern Province is arguably the poorest region: it has the largest percentage of the population in the "always poor" category (24%) and the smallest percentage in the "always non-poor" category (27%), as Table 20 shows.

Figure 11.Urban/rural shares among different dynamics categories

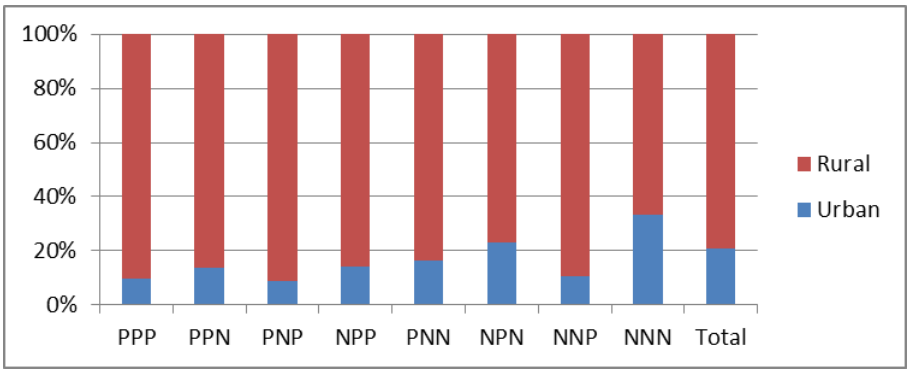


Table 18.Number of spells of poverty 2010/11-2016/17 (three waves)), %

Location	Number of poverty spells				
	0	1	2	3	Total
Rwanda	38.05	24.56	18.22	19.16	100
			urban/rural		
Urban	60.86	19.25	10.91	8.98	100
Rural	32.02	25.97	20.16	21.85	100
			Provinces		
City of Kigali	62.76	12.86	13.59	10.79	100
Southern Province	35.65	25.06	18.92	20.37	100
Western Province	35.49	25.24	18.3	20.97	100

Northern Province	27.45	30.11	17.99	24.46	100
Eastern Province	41.02	23.96	19.3	15.73	100

Table 19. Dynamics of poverty (4 categories of spells) 2010/11-2016/17 (three waves), %

	stayed poor all years	poor in 2017 but was not poor in any other year	non-poor in 2017 but was poor in any other year	always non-poor	Total
Rwanda	19.16	17.04	25.75	38.05	**100**
	urban/rural				
Urban	8.98	9.11	21.05	60.86	**100**
Rural	21.85	19.13	26.99	32.02	**100**
	Provinces				
City of Kigali	10.79	6.19	20.26	62.76	100
Southern Province	20.37	19.54	24.44	35.65	100
Western Province	20.97	22.36	21.19	35.49	100
Northern Province	24.46	12.47	35.63	27.45	100
Eastern Province	15.73	16.36	26.89	41.02	100

6.2. Permanent approach for medium poverty dynamics

The "permanent approach" to poverty dynamics considers average per-adult equivalent expenditure over all the years under consideration, as well as year by year expenditure. According to this approach, a household is defined as "chronically poor" when its average per-adult equivalent expenditure (over the time period under consideration) is below the poverty line. This does not necessarily mean that these households are always poor, only that they are poor on average. Moreover, a household whose mean expenditure is above the poverty line cannot be chronically poor, even if it experiences poverty in some years.

With these distinctions in mind, the permanent approach classifies households into four groups:

- The "persistently poor", who are poor in every year of the survey;
- The "transient but chronically poor", who are poor on average, but not poor in every year of the survey;
- The "transient but not chronically poor", who are poor from time to time, but are not poor on average; and
- The "never poor", who are not poor in any year of the survey.

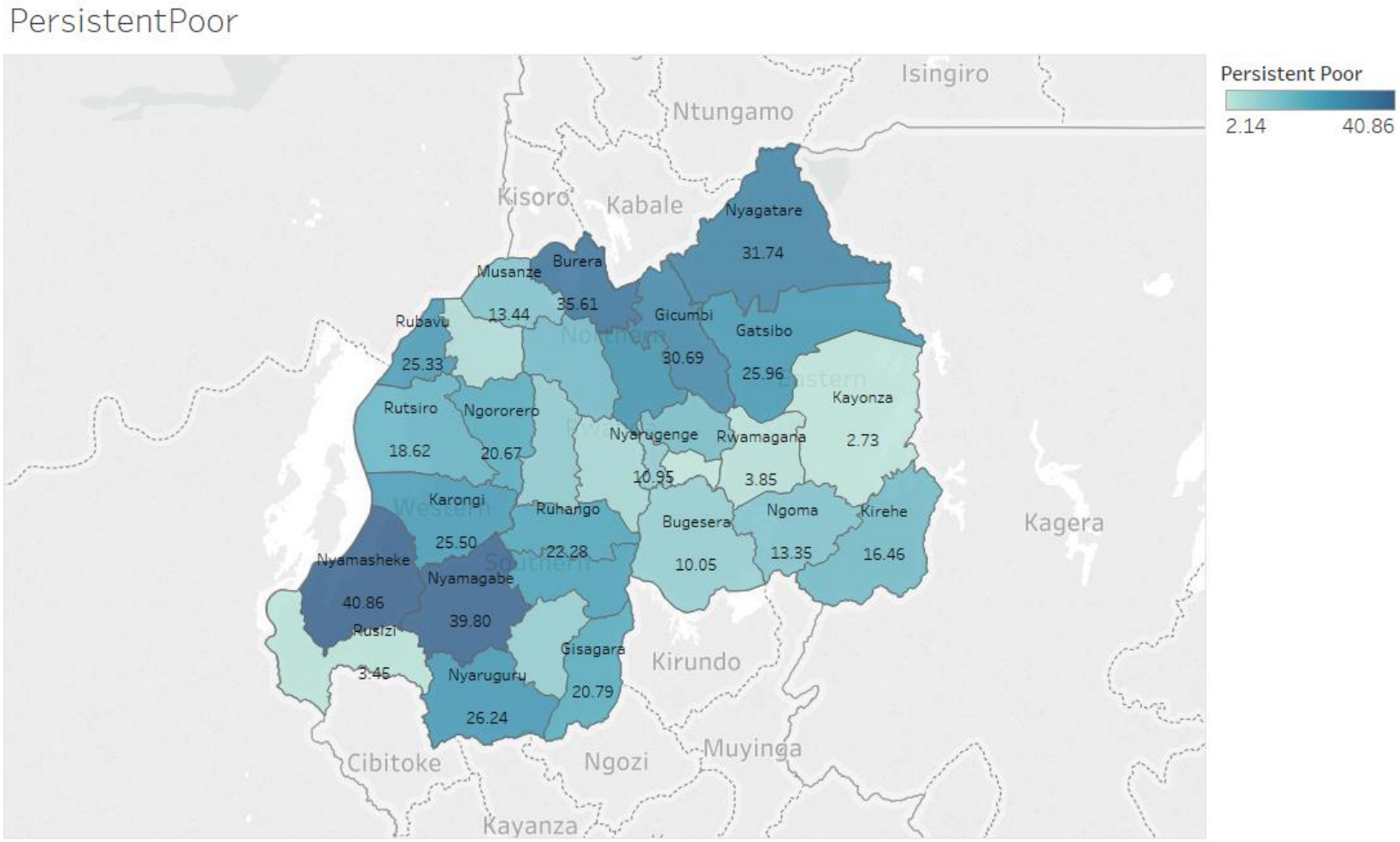
The breakdown of households into these four categories is shown in Table 20: almost a fifth of the population (19%) were persistently poor between 2010/11 and 2016/17, while nearly two-fifths (38%) were never poor; the remaining two-fifths of the population was split between the transient but chronically poor (15%) and the transient but not chronically poor (28%). Most (85%) of transient but chronically poor exhibited two spells of poverty, while four out of five of the transient but not chronically poor experienced one spell of poverty.

Consistent with the patterns seen earlier, chronic and transient poverty are more common in rural areas, where more than one third of the population is chronically poor (as Table 20 shows). Northern Province has the largest proportions of chronically and transient poor. In all provinces, about half of chronically poor individuals are persistently poor, except for Northern and western provinces where the proportion exceeds 60%. The spatial variations in poverty dynamics are shown, at the district level, in the maps in Figure 12.

Table 20. Dynamics of poverty using permanent approach, 2010/11-2016/17 (three waves), %

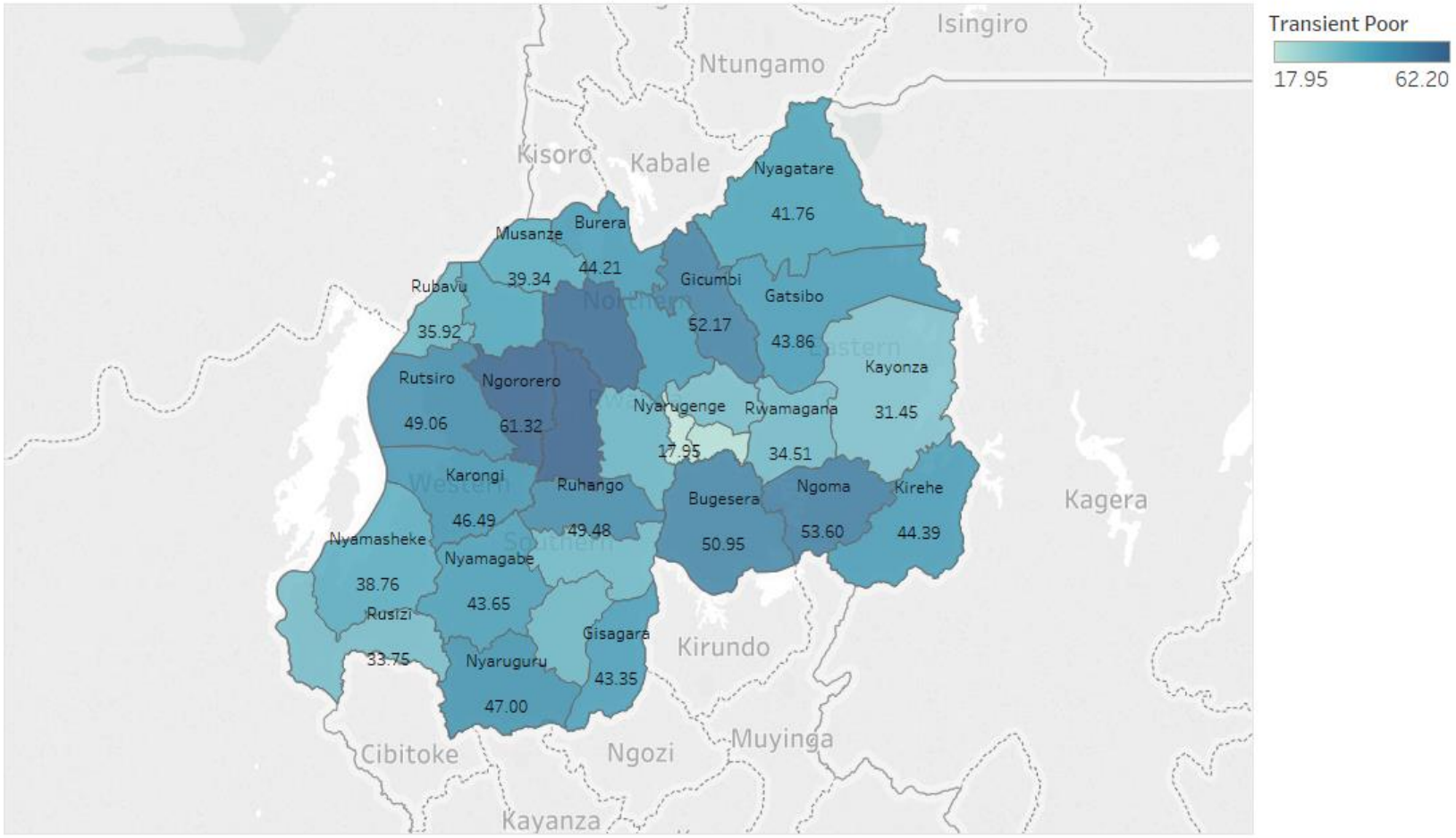
	Chronically poor		transient but not chronic	never poor	Chronically poor		transient but not chronic	never poor	All Population
	persistent	transient but chronic			persistent	transient but chronic			
	Row %				Column %				
Rwanda	19.16	15.04	27.75	38.05	100	100	100	100	100
Urban/rural									
Urban	8.98	7.76	22.39	60.86	9.79	10.78	16.86	33.42	20.9
Rural	21.85	16.96	29.16	32.02	90.21	89.22	83.14	66.58	79.1
Provinces									
City of Kigali	10.79	11.07	15.37	62.76	5.11	6.68	5.03	14.98	9.08
Southern Province	20.37	17.28	26.7	35.65	26.02	28.13	23.55	22.93	24.5
Western Province	20.97	14	29.54	35.49	26.88	22.87	26.16	22.92	24.6
Northern Province	24.46	14.27	33.83	27.45	21.36	15.88	20.4	12.07	16.7
Eastern Province	15.73	15.82	27.44	41.02	20.63	26.44	24.86	27.1	25.1

Figure 12. Permanent poverty dynamics by district



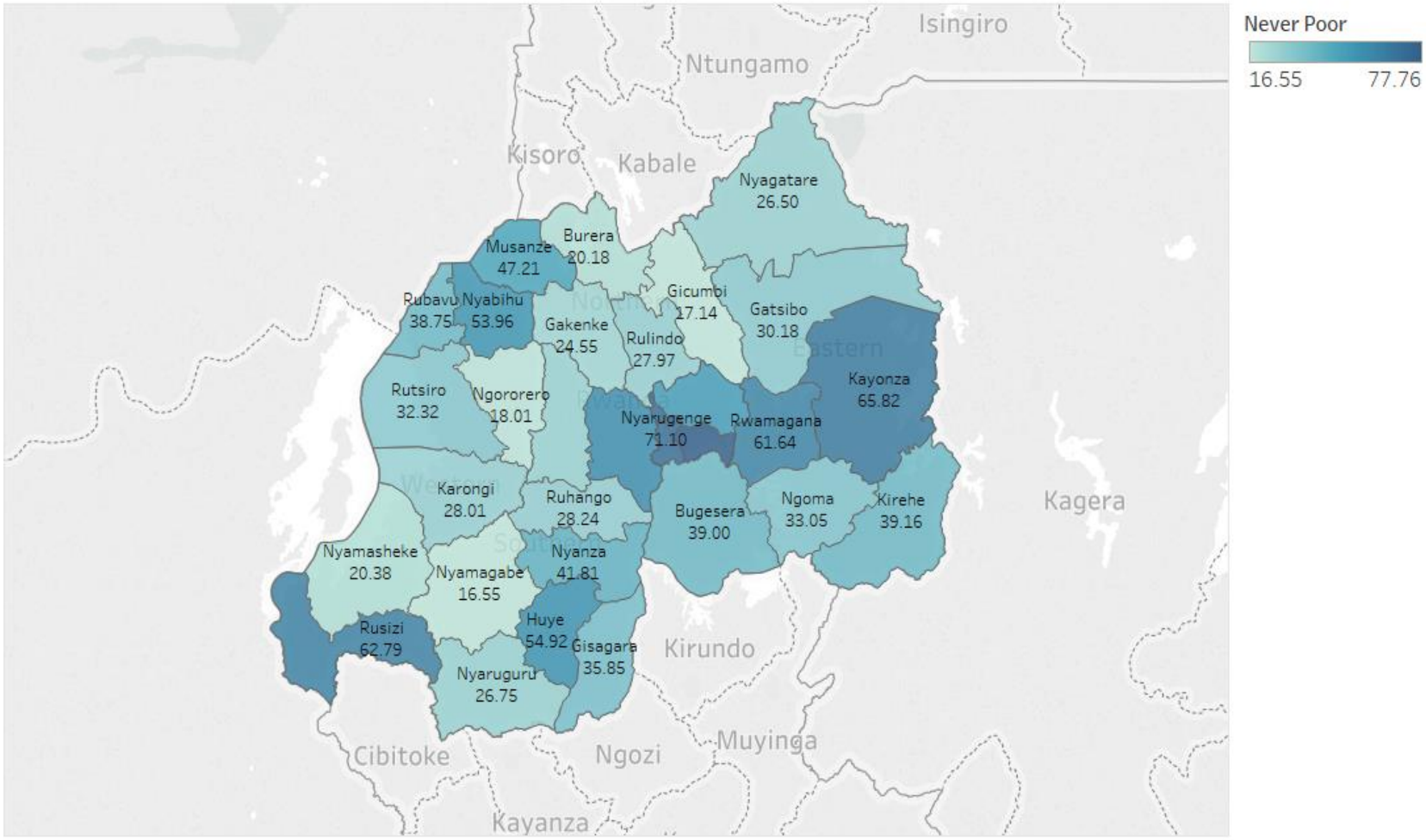
Map based on Longitude (generated) and Latitude (generated). Color shows sum of Persistent Poor. The marks are labeled by District and sum of Persistent Poor. Details are shown for Country, Province and District.

TransientPoor



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Transient Poor. The marks are labeled by District and sum of Transient Poor. Details are shown for Country, Province and District.

Never poor



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Never Poor. The marks are labeled by sum of Never Poor and District. Details are shown for Country, Province and District.

Chapter 7: Correlates of Poverty Mobility

In Table 21 we set out some of the key correlates of poverty mobility. Individuals living in households headed by female are somewhat more likely to stay in poverty than those in male-headed households (21% vs. 19%), but they were also more likely to rise out of poverty, and less likely to fall into poverty.

Households that increased in size during the period were disproportionately likely to stay in poverty or move into poverty. The effect also works in the other direction, so that households that became smaller were relatively more likely than the sample at large to move out of poverty (Table 21).

Mobility is highly correlated with changes in household characteristics, especially the occupation of the head of household. A change in occupation from farming to any other activity has a great impact on poverty mobility. Half of the individuals whose heads changed their economic activity from farm to non-farm activities were never poor, and they represented 20.7 percent of the non-poor, compared to the national average of 15.3 percent.

The panel data show a high correlation between housing characteristics and the dynamics of poverty. Table 21 shows that people who experienced improvements in their drinking water source, an improved source of lighting, and better toilet facilities were relatively more likely to move out of poverty.

The above analysis indicates that improving housing conditions as well as controlling household size can be key factors of lifting poor households out of poverty.

Table 21. Correlates of medium-term poverty dynamics

	stayed poor all years	poor in 2017 but was not poor in any other year	non-poor in 2017 but was poor in any other year	always non-poor	stayed poor all years	poor in 2017 but was not poor in any other year	non-poor in 2017 but was poor in any other year	always non-poor	All population
	Row%				column %				
Rwanda	**19.2**	**17.0**	**25.8**	**38.1**	**100**	**100**	**100**	**100**	**100**
Sex of head in 2011									
Male	18.6	17.5	25.0	38.9	76.6	81.1	76.8	80.8	79.0
Female	21.3	15.3	28.4	34.9	23.4	18.9	23.2	19.3	21.0
change in household size									
increased	20.8	13.0	25.2	41.1	44.3	35.3	37.1	44.2	40.9
unchanged	20.0	17.0	26.2	36.8	25.7	27.9	23.2	23.8	24.6
decreased	16.7	16.1	31.9	35.4	30.0	36.9	39.7	32.1	34.5
Change in number of elderly									
increased	15.1	10.2	34.7	40.0	5.9	5.1	9.4	7.9	7.5
unchanged	19.8	15.5	27.0	37.7	92.3	92.4	87.0	88.6	89.5
decreased	11.2	12.3	32.9	43.6	1.8	2.5	3.6	3.5	3.0
Change in number of children									
increased	17.7	12.6	25.6	44.1	28.9	26.1	28.7	36.2	31.2
unchanged	17.2	13.7	28.9	40.1	20.1	20.3	23.2	23.5	22.3
decreased	21.1	17.3	28.7	33.0	51.1	53.6	48.1	40.3	46.5
Change in number of working age persons									
increased	24.3	15.6	25.2	35.0	49.8	40.7	35.6	36.1	39.3
unchanged	18.6	16.0	27.3	38.1	33.3	36.6	33.9	34.5	34.4
decreased	12.3	13.0	32.2	42.6	16.9	22.7	30.5	29.4	26.3
remain in farm activity									
change farm activity	13.6	12.3	22.8	51.3	10.8	12.5	12.6	20.7	15.3
remain in farm activity	20.2	15.5	28.6	35.7	89.2	87.5	87.4	79.3	84.7
change non-farm activity									
change	19.18	17.1	29.01	34.71	33.92	38.54	35.43	30.91	33.89

non-farm activity remain in non-farm activity	19.15	13.98	27.1	39.76	66.08	61.46	64.57	69.09	66.11
change housing type									
not Umudugudu type in both years	18.2	14.0	25.3	42.5	32.9	32.3	31.6	38.6	34.6
change from Umudugudu to other types	16.2	19.8	24.5	39.5	6.0	9.3	6.2	7.3	7.1
change from other types to Umudugudu	23.2	16.6	28.4	31.7	33.6	30.6	28.4	23.1	27.7
Umudugudu type in both years	17.3	13.7	30.7	38.5	27.6	27.8	33.9	31.0	30.7
change flooring type									
not earth or dung floor in both years	1.9	3.6	11.0	83.5	1.7	4.0	6.6	36.5	16.6
change from earth or dung floor to other types	9.7	9.0	30.0	51.3	5.5	6.5	11.7	14.7	10.9
change from other types to earth or dung floor	9.1	8.7	47.2	35.1	1.2	1.5	4.3	2.3	2.5
earth or dung floor type in both years	25.1	18.9	30.7	25.3	91.6	88.0	77.4	46.6	70.0
change in water source									
improved water source in both years	16.8	13.3	27.6	42.4	59.6	60.2	67.8	76.1	68.2
change from unimproved to improved water source	24.9	15.5	29.9	29.7	21.1	16.8	17.5	12.7	16.2
change from improved to unimproved water source	19.5	20.9	25.8	33.8	5.8	7.9	5.3	5.1	5.7
unimproved water source in both years	26.3	23.0	26.7	24.1	13.5	15.1	9.5	6.2	9.9
change in lightning source									
electricity in both years	0.8	3.3	5.8	90.1	0.4	2.1	1.9	21.9	9.3
change from other	6.7	6.4	29.5	57.3	5.7	6.9	17.2	24.4	16.2

sources to electricity									
change electricity to other source	0.0	8.9	1.3	89.8	0.0	0.3	0.0	1.2	0.5
other source in both years	24.3	18.4	30.3	27.0	93.9	90.7	80.9	52.5	74.1
change in source of cooking fuel									
improved source in both years	1.5	2.2	7.7	88.6	0.7	1.2	2.3	19.6	8.4
change from firewood source to improved sources	3.6	4.7	27.1	64.6	1.1	1.9	5.8	10.1	5.9
change improved sources to firewood	25.1	14.9	19.0	41.0	5.8	4.4	3.1	4.8	4.5
firewood in both years	21.8	17.1	30.4	30.7	92.4	92.5	88.9	65.6	81.2
change in toilet facilities									
improved toilet facilities in both years	15.5	13.4	26.6	44.5	58.2	64.0	69.0	84.3	72.0
change from unimproved to improved toilet facilities	26.0	18.9	32.1	23.0	26.4	24.5	22.5	11.8	19.5
change from improved to unimproved toilet facilities	35.0	13.8	32.0	19.2	9.2	4.6	5.8	2.5	5.0
unimproved toilet facilities in both years	34.0	29.4	21.1	15.5	6.3	6.9	2.7	1.4	3.6

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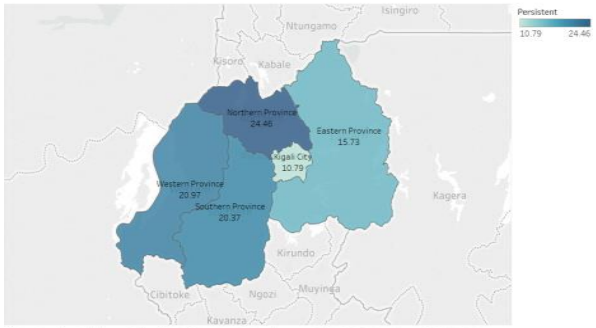
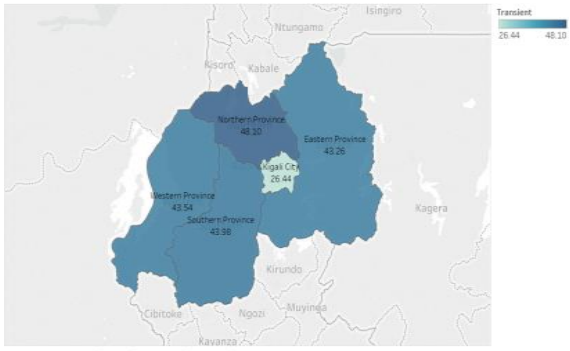
Annex I Maps

Persistent



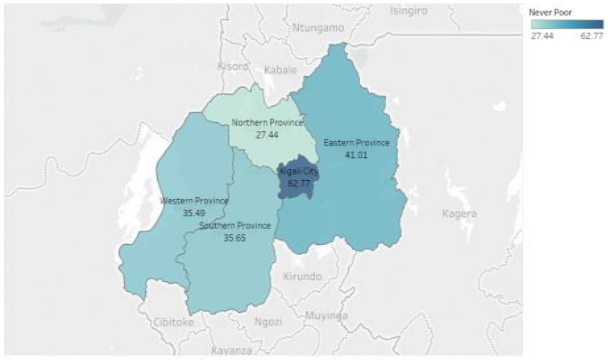
Map based on Longitude (generated) and Latitude (generated). Color shows sum of Persistent. The marks are labeled by Province and sum of Persistent. Details are shown for Country and Province.

Transient



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Transient. The marks are labeled by Province and sum of Transient. Details are shown for Country and Province.

Never Poor



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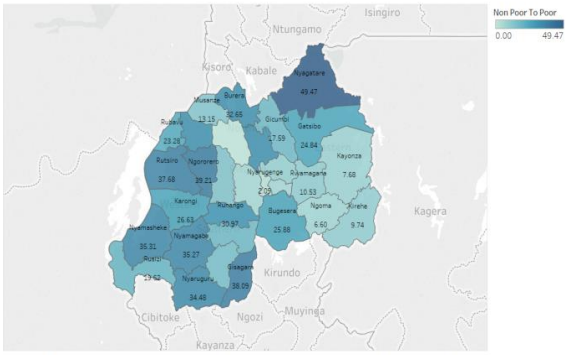
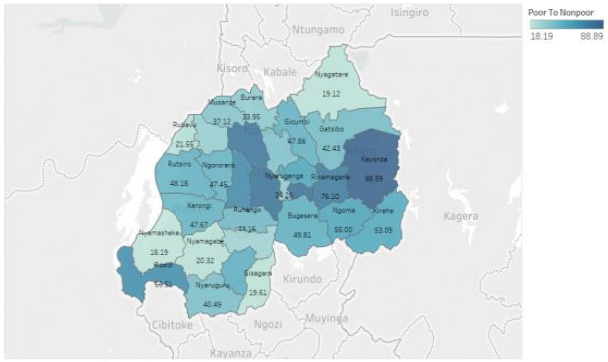
NonPoorToPoor



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Non Poor To Poor. The marks are labeled by District and sum of Non Poor To Poor. Details are shown for Country, Province and District.

PoorToNonPoor



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Poor To Nonpoor. The marks are labeled by District and sum of Poor To Nonpoor. Details are shown for Country, Province and District.

Annex 2

This annex explains how to construct the mobility and reliability indexes, and draws heavily on the work by Glewwe and Gibson (xxx).

A.1 Mobility Index

The *Mobility Index*, denoted by $m(y_t, y_{t+1})$, is given by one minus the correlation coefficient **$\rho(y_t, y_{t+1})$,** where **ρ** measures the correlation between real consumption per adult equivalent of the same households in the first and second survey periods.

Let y_t and y_{t+1} be the measure of welfare in time periods t and t+1, respectively. Then:

$$m(y_t, y_{t+1}) \equiv 1 - \rho(\ln(y_t), \ln(y_{t+1})) \qquad (a.1)$$

Accordingly, no mobility at all would give a value of zero, and full mobility, in the sense of no correlation of expenditure over time, would give a mobility index of 1.

A.2 Reliability Index

Overall, there are serious problems with using panel data to measure income and poverty dynamics because of measurement error in the welfare measure (such as consumption or expenditure). In general, measurement error will exaggerate the extent of income mobility and thus will exaggerate movements into and out of poverty. The appropriate statistical procedure to evaluate measurement errors depends on the data available. When there are panel data for three or more points in time, it is possible to evaluate measurement error using simple correlations and a minimum of assumptions, following an approach developed by Heise (1969).

A correlation of less than one for the consumption of the same household in two periods does not necessarily indicate measurement error since the true values of income or consumption fluctuate over time and thus may reflect an inability to smooth consumption over time. However, if there are at least three waves in a longitudinal survey, it is possible to separate real dynamics from measurement error by the reliability index. The reliability index shows the share of the standard deviation of an observed variable that is due to the true phenomenon

Let Y_{t-1}, Y_t, and Y_{t+1} be the observed consumption for households in the survey in each of t-1, t and t+1. The true but unknown consumption is X_{t-1}, X_t, and X_{t+1}, which differs from the observed values due to measurement errors that are independent of each other, of time, and of the underlying variable: $Y_{t=} X_{t+} u_t$, for all t .If the reliability of measuring consumption does not vary over time, the correlation between observed consumption in two years is:

$$\rho(Y_t, Y_{t+1}) = (\lambda_{Yt})(\lambda_{Yt+1})\rho(X_t, X_{t+1}) = (\lambda_Y)^2 \rho(X_t, X_{t+1}). \qquad (a.2)$$

So, the correlation between observed expenditures in year t and t+1 understates the correlation in actual consumption by a factor of $(\lambda_Y)^2$. These assumptions also imply that $\rho(Y_t, Y_{t+1}) = (\lambda_Y)^2 \rho(X_{t-1}, X_t)$.

If realizations of the true values of consumption come from a first-order autoregressive model (that is, if $X_t = a + bX_{t-1} + e_t$), then the relationship between correlation coefficients is:

$\rho(X_t, X_{t+1}) \times \rho(X_{t-1}, X_t) / \rho(X_{t-1}, X_{t+1}) = 1$. Substituting in the results for the correlation in observed consumption, the reliability index is estimated as

$$\lambda_Y = \sqrt{\frac{\rho(Y_{t-1}, Y_t) * \rho(Y_t, Y_{t+1})}{\rho(Y_{t-1}, Y_{t+1})}} \qquad (a.3)$$

A.3 Corrected Mobility Index

The basic mobility index uses at the correlation between the observed level of real consumption per capita of households over time, but to the extent that there are measurement errors, this correlation is lower than the true correlation that one would get if it were possible to eliminated the measurement errors. However, Glewwe and Gibson (xxx) show that one can correct for the measurement error if information is available on households for three or more time periods, which is the case with the EICV panel data. An estimate of the true correlation ($\rho(X_{t-1}, X_t)$.) may be obtained using Equations a.2 and a.3, to get

$$\rho^* \equiv \frac{\rho(Y_{t-1}, Y_t)}{\lambda_Y^2},$$

This "corrected" correlation can then be used to obtain a corrected mobility index, given by

$$m^*(Y_t Y_{t+1}) \equiv 1 - \rho^*,$$

which is considered to be a better single-index measure of mobility than the uncorrected version.

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