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Understanding the dynamics of poverty in Rwanda

The Institute of Policy Analysis and Research (IPAR-Rwanda)
&
The Chronic Poverty Advisory Network (CPAN)

A quantitative panel data analysis 2010/11-2016/17

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Acronyms

CPAN	Chronic Poverty Advisory Network
IPAR	Institute of Policy Analysis and Research
RwF	Rwandan franc
VUP	Vision 2020 Umurenge Programme

Abstract

While poverty rates in Rwanda have fallen significantly since the 2000s, the latest estimates reveal a slowdown in the poverty reduction rate. This calls for a better understanding of poverty and poverty dynamics in the country. In this paper, we use the latest three waves of Rwandan panel data, collected in 2010/11, 2013/14 and 2016/17, to characterise the dynamics of poverty in Rwanda and explain the slowdown in poverty reduction. Our results show that education, health insurance, diversification of occupations within households and savings all promote escape out of poverty and prevent impoverishment. The Girinka Programme acts as a lift out of poverty, while business creation has protective effect against impoverishment. Observed trends of these variables, especially the increase in households depending on agriculture wages and the reduction of business owners at the household level, appear as important factors in the slowdown in poverty reduction in Rwanda.

1. Introduction

Eradicating poverty is at the core of the international development agenda. It is part of the Sustainable Development Goals (SDGs) – to be reached by 2030 – and of the Agenda 2063 for Africa. It is also a common goal in the agenda of many countries. Over the last decades, the world has performed well in reducing the poverty rates from 42% in 1981 to 10% in 2015.[1] On average, poverty has reduced by almost 1 percentage point per year over the last 30 years. The reduction has been evolving at (roughly) this constant pace, with the exception of some slowdowns (in 1987–1990 and 1996–1999). If this trend continues, this would mean that poverty would be eradicated in ten years from now, thus achieving the SDG goal by 2030. However, while poverty rates have fallen almost everywhere, there are still pockets of poverty in Africa, where we find the 22 countries with the highest poverty rates in the world.[2] If one wants to eradicate poverty, there is a need to focus on these countries.

Rwanda is one of these countries. On the one hand, it has experienced a drastic reduction in poverty rates since 2000. Looking at the national poverty line,[3] poverty was at 60.3% in 2000 (Direction de la statistique, 2002) and fell to 38.2% in 2016 (NISR, 2018a).[4] On the other hand, Rwanda ranks ninth in the list of countries with the highest poverty rates. This means that the way to poverty eradication might still be long, and that more research is needed to better understand poverty and its trends in the country.

IPAR and CPAN have undertaken both quantitative and qualitative research to generate a greater understanding of poverty trends in Rwanda, and especially of the 'poverty dynamics' which underlie these trends. So far, the existing quantitative analysis of poverty in Rwanda consists of snapshots of poverty status using budget surveys (Enquête Intégrale sur les Conditions de Vie, or EICV) conducted in 2000/01, 2005/06, 2010/11, 2013/14 and 2016/17.[5] We learn from those studies that poverty rates decreased during the successive first four waves – from 60.3% in 2000 to 56.7% in 2005, 44.9% in 2010 and 39.1% in 2013. For the last wave, between 2013 and 2016, we observe a slowdown in the poverty reduction rate from 39.1% to 38.2%.[6]

In addition to the computation of the poverty rates, these studies also provide interesting descriptive statistics from the time of the interviews on the urban–rural distribution of poverty, the geographic patterns of poverty and the profiles of poverty (i.e. information about household demographics, education, health, housing, asset ownership, and source of income). This information is provided for the poor versus the non-poor and the population as a whole.

Other analyses include NISR (2016) and NISR (2018a and 2018b), which identify the determinants of expenditure poverty using cross-sectional analysis of EICV3 and EICV4 (2010/11 to 2013/14) and EICV4

[1] Based on the World Bank poverty line of 1.90$ a day (2011 purchasing power parity). Source: https://data.worldbank.org/topic/poverty, accessed 6 October 2019.

[2] Based on the latest World Bank data over the period 2012-2016. Source: https://data.worldbank.org/topic/poverty, accessed 6 October2019.

[3] The Rwandan poverty line is two-tier line. First, it determines the value of a food basket that provides about 2,500 Kcal per day per adult equivalent (which is the extreme poverty line). It then adds a provision for non-food consumption. The poverty line hence adds up to 159,375 Rwf per adult equivalent (NISR, 2015).

[4] Based on the World Bank poverty line of 1.90$ a day (2011 purchasing power parity), poverty in Rwanda was at 77.2% in 2000 and 55.5% in 2016. Source: https://data.worldbank.org/topic/poverty, accessed 6 October 2019.

[5] See the successive *Poverty Profile Reports* by the National Institute of Statistics of Rwanda (NISR) on EICV1, EICV2, EICV-3, EICV-4, EICV-5 (NISR, 2012; NISR 2015; NISR2019a).

[6] This reduction is not significant at the 95% level.

and EICV5 (2013/14 to 2016/17). Similarly, Kalisa and Nottmeyer (2017) look at the determinants of multidimensional poverty using the a cross-section of EICV3 and EICV4. These studies do not study the dynamic aspect of poverty, and therefore do not identify whether households are stuck in poverty, escaping it, becoming impoverished, or remaining out of poverty. These patterns are important because they provide an understanding of what is happening to the poor and the vulnerable non-poor – are they remaining at the same level of expenditure, becoming poorer, escaping poverty, falling back into poverty, or becoming poor for the first time? When we have this information, we are in a better position to understand the trends mentioned above, including the slowdown in poverty reduction. Is the slowdown due to there being fewer escapes, more impoverishment or greater chronic poverty, or some combination of these? And what are the causes of these changing dynamics?

Panel data has been recently been collected by NISR which allows a dynamic analysis of poverty. The first wave of the panel was collected during EICV3, the second during EICV4 and the third concurrently with EICV5. So far, the main analysis from the panel dataset consists of transition matrices from the NISR (NISR, 2016; NISR, 2018b) and the evolution of descriptive statistics on key variables. One exception is a paper by Jäger et al. (2017), which studies the determinants of poverty dynamics over two waves of the EICV (EICV3 and EICV4).

The main benefit of an analysis of poverty dynamics using panel data resides in a better identification of the determinants of poverty, as it allows greater disentangling of causes from consequences. Findings from panel analysis hence aim to better inform policy design and evaluation. In addition, the analysis of poverty dynamics enables a focus on the key policy-relevant questions: How can people sustainably escape poverty? And how can impoverishment be prevented? The answers to these questions require a focus on the poverty trajectories of individuals (or in this case, households), which are by nature dynamic, not static.

This paper analyses the dynamics of poverty in Rwanda using three waves of the panel dataset (EICV3, EICV4 and EICV5) and, compared to Jäger et al. (2017), includes new variables in the analysis. It is the first quantitative study in Rwanda that is able to identify the determinants of sustained escapes out of poverty[7] – that is, how households are escaping poverty and remaining out of it.

This paper is part of a wider research project which aims at (1) better understanding the factors of sustained escapes out of poverty and non-impoverishment; and (2) explaining the slowdown in the poverty reduction rate in Rwanda. The wider research project uses both quantitative and qualitative analysis to identify these factors and causes. The research findings of this wider research project will be translated into actionable policy recommendations in order to inform decision makers in Rwanda.

We construct a panel of around 1,800 households that were followed over the three waves. We apply a panel logistic regression to estimate how the probability of being poor in a given period correlates with various household characteristics. We distinguish between basic characteristics – such as age, geography and education – and less common covariates that the rich dataset allows us to include, which capture exposure to antipoverty policies, access to health insurance, household finance, occupation of the household head and amenities of dwellings.

[7] Jäger et al. (2017) carry out a tentative analysis of sustained escapes out of poverty using two waves of the panel (EICV3 and EICV4) by combining poverty escapes and non-impoverishment.

This approach clearly points to the positive effect of education. Household heads who have completed primary educated are around 50% less likely to be poor, while completing secondary or tertiary education virtually eliminates the risk of poverty. Holding health insurance also plays a major role in mitigating the risk of poverty. Additionally, the results confirm the high prevalence of poverty in rural areas, in particular among households relying heavily on the agricultural sector alone and among those with a large share of dependents. There also is a very high correlation between poverty and poor dwelling amenities (no electricity or no piped water).[8]

The second approach we take is to study poverty trajectories. We analyse the determinants of remaining chronically poor and transitorily escaping poverty compared to making a sustained escape from poverty, as well as the determinants of impoverishment compared to remaining above the poverty line. One possible insight of this approach is to disentangle the different roles of anti-poverty policies – namely, alleviating the effects of poverty and pulling people out of it. In this respect, the 'one cow per poor family' programme, Girinka, has had a positive effect on sustained escapes. Education has a positive effect on both sustained escapes and avoiding impoverishment. And while participation in the Vision 2020 Umurenge Programme (VUP) is positively associated with chronic poverty, it is not well targeted at the poor, and participation in itself may not be enough to make a sustained escape out of poverty.

The paper is structured as follows. The next section describes the dataset. Section 3 provides general trends in GDP growth at the aggregate and sector levels, and how this growth is distributed across income groups of the population. Section 4 describes geographical trends of poverty as well as urban–rural differences. Section 5 describes the poverty trajectories across the different waves and analyses the determinants of poverty and of poverty trajectories. Finally, we conclude with a discussion of why poverty reduction has slowed down and identify key areas for consideration by policy-makers.

2. The dataset

In this section, we describe how we constructed the sample that we analyse. It is extracted from the longitudinal section of waves 3, 4 and 5 of the Enquête Intégrale sur les Conditions de Vie (EICV), made available by the National Institute of Statistics Rwanda (NISR). The longitudinal section was initially a subset of the cross-sectional survey, which is conducted periodically every three years or so. From the 14,308 households surveyed in 2010/2011 for EICV3, 1,920 were selected to be surveyed again in 2013/2014 for EICV4 and then in 2017 for EICV5. Some of these households changed in composition, in particular as a result of one or more members moving to live in different households. Our final balanced panel is composed of 1,797 households for which we have very detailed information, on which we will elaborate in Section 5.[9]

3. Growth and poverty in Rwanda

We start off by presenting aggregate trends of poverty and growth in Rwanda for the period of interest. As shown in Figure 1, both poverty and extreme poverty fell significantly between 2010 and 2017 – 44% of the population were poor in 2010/2011, 38% in 2013/2014 and 36% in 2016/2017; extreme poverty fell from 24% to 16% in 2013/14 and then 11% in 2017. One noticeable feature is the slowdown in poverty

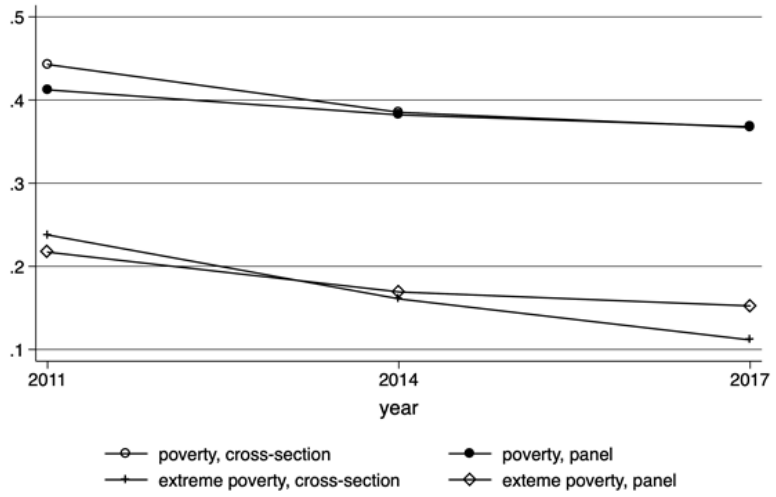
[8] Some amenities (electricity, a flushing toilet) were regressed on a subsample of the dataset.

[9] The dataset contains some key variables made available by the NISR during the two phases of this project. We are grateful to NISR for its contribution. We note that some trends presented in paper report may differ from trends presented in NISR reports for two reasons. First, this paper analyses data at the household level, while some published NISR statistics are at the individual level. Second, our regressions require a balanced panel, which may result in some observations being dropped.

reduction over the second period, which was particularly marked for poverty but also present for extreme poverty.

Figure 1 also presents estimates for poverty rates based on our panel subsample in order to check that these are in line with the overall picture drawn from the cross-sections. The panel performs very well overall, given that it is based on limited subsample, although it does tend to underestimate poverty in the first wave and overestimate extreme poverty in the third.

Figure 1: Evolution of poverty and extreme poverty in Rwanda (comparison of panel and cross-section)[10]



Source: own calculations

In order to identify potential candidates for explaining both the trend in poverty reduction and its recent slowdown, we first present the evolution of household characteristics at the aggregate level before entering into a causal analysis with the restricted number of variables available in the panel sample. Table 2 (see Annex A) suggests a few candidates to focus on more closely:

- **Education of household head**. The share of household heads who had never completed primary school went down sharply from 71 to 66% in the first period, while it decreases to 64% in the most recent wave.
- **Share of dependents/persons with disabilities**. Both shares are associated with a higher likelihood of being poor. They decreased in the first period and remained constant in the second. Part of the slowdown might be due to demographic reasons and an increase in the dependency ratio.
- **Decrease in expansion of VUP and Girinka.** While the share of beneficiaries of the Girinka Programme increased over the first period, this increase slowed in the second period. The same was true for the VUP, take-up of which has also stalled.
- **Smaller decrease in environmental risk**. The share of people who had faced an environmental risk in the previous 12 months went down substantially over the period, with the sharpest

10 Extreme poverty is defined as having a consumption level below two-thirds of the national poverty line. The poverty line in Rwanda lies at 159,375 Rwf in 2014 prices, implying an extreme poverty line of 105,064 Rwf.

decrease occurring during the first period. The impression of a recent stall might therefore be partly due to 2011 being a particularly bad year in terms of environmental risk.

- **Larger decrease in the businesses owned by households**. After a slight decrease in the share of households owning a business in 2014 compared to 2011, there was a stronger decrease in the second period.

- **Increase in the share of agricultural wage workers at household level**. After a decrease in the share of people receiving a wage from the agricultural sector in 2014, the trend reversed in in 2017. It seems that some people who had non-agricultural jobs have had to start working on-farm (again), where wages are low.

- **Decrease in land area and livestock value**. Both land area and livestock value decreased over the two periods.

We now turn to the evolution of economic conditions over the period to analyse how they may have affected the evolution of poverty. Rwanda has experienced high annual gross domestic product (GDP) growth of 7.1% on average over the period 2011–2016, the period covered by the three waves of the panel data.[11] Looking at the sectoral decomposition of GDP, we note that the structure of the economy has remained stable over the period, with around 30% of GDP derived from agriculture, 50% from services and 16% from industry. The industrial sector performed best on average over the period (8.9% growth), followed by services (8.3%) and agriculture (5%). It is worth noting that the agriculture sector, which experienced the lowest growth, employs 68.9% of the working population as their main job (NISR, 2018). Given the size of the services sector (47% of the whole economy in 2016) and its associated growth, the development of services may be seen as the main driver of growth in Rwanda. Overall, economic growth has been solid and has not particularly stalled over the second period.

Table 1:GDP growth (constant prices) and GDP sectoral growth in Rwanda (%)

Sector /year	2011	2012	2013	2014	2015	2016	Average	Share in GDP (2011)	Share in GDP (2016)
All sectors	8.0	8.6	4.7	6.2	8.9	6.0	7.1		
Agriculture	4	7	3	7	5	4	5.0	28	29
Industry	18	8	9	3	9	7	9.0	18	16
Service	8	12	5	7	10	7	8.2	46	47

Source: NISR (2018c)

Looking at the decomposition of growth and poverty across the two periods (2010/11–2013/14 and 2013/14–2016/17), we note that while the average growth rate is similar, the industry and services sectors

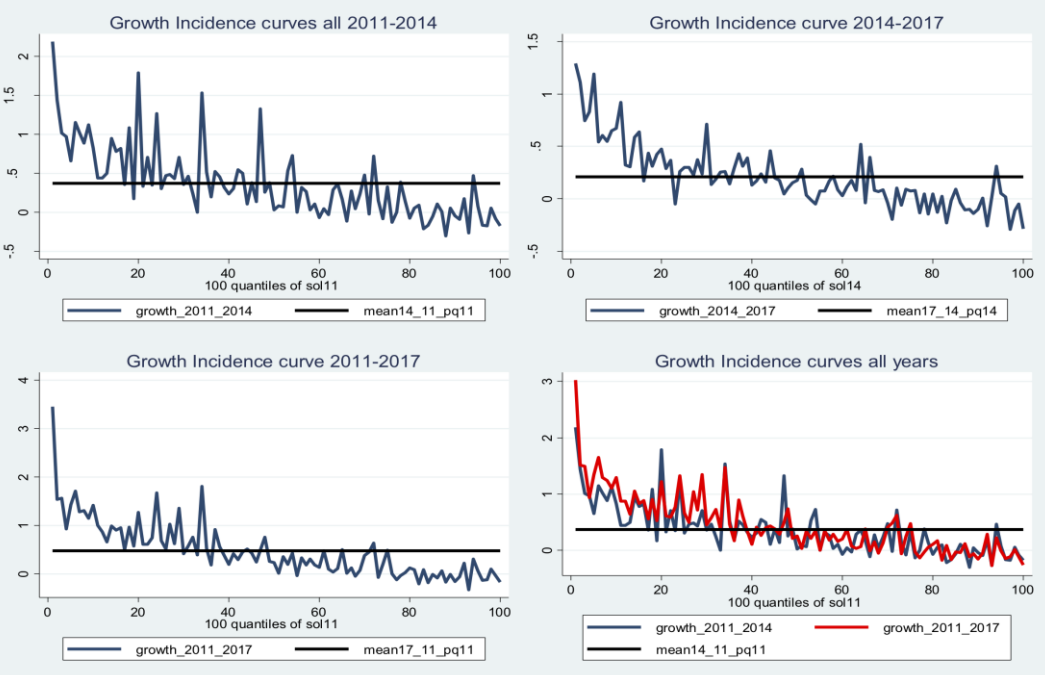
[11] The EICV is collected every three years, over the course of 12 months and covering two calendar years. Since most of the data is collected during the second year of the data collection, we consider the second year as the first year of the period between two waves of the EICV (i.e. 2011 for 2010/2011 and 2014 for 2013/204) and the first year of the next EICV as the final year of the period (i.e. 2013 for 2013/14 and 2016 for 2016/2017). We therefore have the period 2011–2013 corresponding to EICV3 and EICV4 (2010/2011 and 2013/2014) and 2014–2016 corresponding to EICV4 and EICV5 (2013/2014 and 2016/2017).

grew relatively faster in the first period compared to the second period. In contrast, agriculture grew more rapidly in the second period. The slowdown poverty reduction in the second period might therefore be surprising and appear to contradict the widely held idea that agricultural growth is pro-poor (IFPRI, 2012). We now investigate how growth was distributed across the income distribution (percentiles and deciles) over the periods 2010/11–2013/14 (referred as 2011–2013), 2013/14–2016/2017 (referred as 2014–2016) and 2010/11–2016/17 (referred as 2011–2016). Growth incidence curves for the three periods are provided in Figure 1. The trends over the two waves are similar, but the magnitude differs. Between 2011 and 2013 and between 2014 and 2016, the real consumption of households in the lowest deciles increased much faster than in the higher deciles. This means that the average change in real consumption was higher for poorer households. This is illustrated by the fact that the blue curve (average growth rate of real consumption per adult equivalent for each percentile) is above the black line (mean growth rate of real consumption per adult equivalent for the whole population).

The main difference between the two periods is the magnitude of growth, which was much greater during the first period, with an average of 13.1% of real consumption growth versus 2.5% in the second period (NISR, 2018b). The growth of each of the lowest deciles in the first period is (roughly) twice that of the same deciles in the second period. It is worth noting that the lowest decile in 2011 saw an increase in real consumption of 141% over the period 2011-2016. The second, third, fourth, fifth and sixth deciles saw an increase in real consumption of 81%, 77%, 57%, 36% and 22%, respectively (NISR, 2018b).

However, from Figure 2 we can also observe a high volatility of growth within deciles, which means that growth affected the population of Rwanda unevenly. This could be expected to translate into high upward economic mobility, poverty escapes and extreme poverty escapes, which could be coupled with high downward economic mobility and, possibly, impoverishment (provided there is similar volatility within percentiles).

Figure 2:Growth incidence curves (change in real consumption)



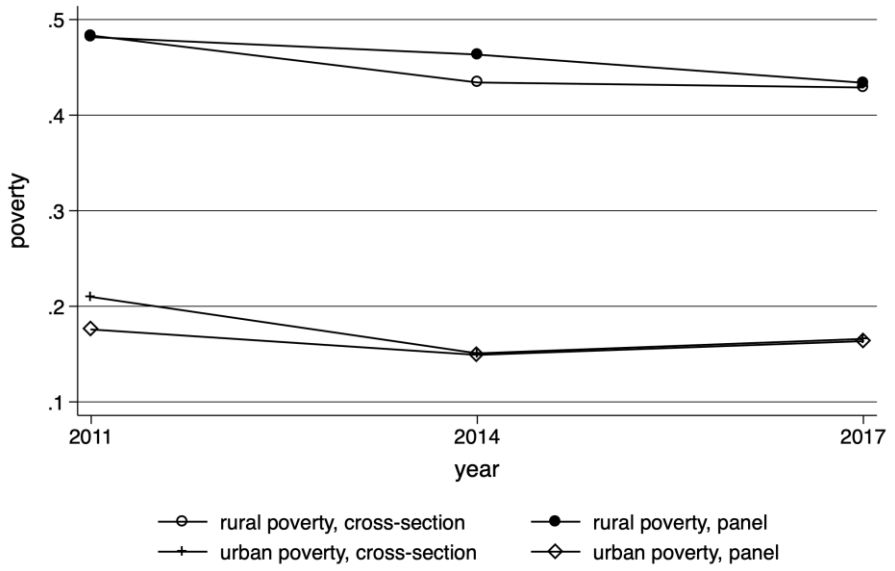
Source: NISR (2018b)

The drop in extreme poverty over the period 2011–2016 and the growth incidence curves point to a reduction in the poverty gap (the ratio by which the mean income of the poor is below the poverty line). The gap fell from 15.12 to 10.77 between 2011 and 2016. However, the main reduction was observed during the first period, which was more than triple the reduction in the second period.[12]

4. Geography of poverty

In this section, we give some indications of the geographic patterns of poverty in Rwanda. Although poverty has declined from 44% to 36%, these aggregate numbers hide some stark geographic disparities. Figure 3 decomposes the overall poverty rate across urban and rural areas. It appears quite starkly that poverty in Rwanda is essentially a rural phenomenon, hovering well over 40% in such areas as opposed to rates as low as 15% in urban areas. It is also interesting to note that both rural and urban poverty rates decreased over the period under scrutiny and both tended to stall in the most recent period, even though this latter feature is not well captured by the panel subsample. [13]

Figure 3:Poverty prevalence by rural/urban status in Rwanda, EICV3, EICV4 and EICV5



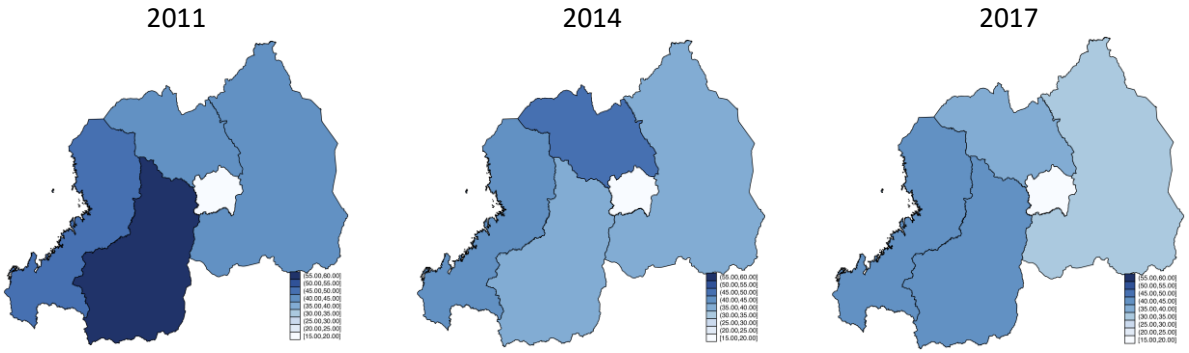
Source: own calculations

Geographic disparities are also apparent when we decompose the poverty rate at the provincial level. Figure 4 shows the evolution of poverty prevalence for the country's five provinces. Kigali has a much lower rate than other provinces, as under 20%, but did not decline over the period; if anything, it spiked in 2014. The Eastern Province comes second, with rates falling from around 40% to just over 30% over the period, while all other provinces are somewhere between 40% and 60%. The Southern Province has historically been the poorest, but it saw a tremendous drop in poverty in the first period from close to 60% to about 40%, before stagnating in the second period.

[12] We note that the reduction in poverty severity (measured by the squared poverty gap) was not significant in the second period.

[13] As noted by the EICV5 thematic report, the panel subsample closely resembles the full cross-section in terms of average consumption (it is only about 2.5% higher in the subsample). However, there are a number of non-negligible geographic variations: the panel subsample underestimates consumption in Kigali and urban areas by about 10%, and overestimates consumption in the Eastern and Western Provinces by over 15%. The geographic implications stemming from the study of the panel therefore should be interpreted with caution.

Figure 4:Poverty prevalence (%) by province in Rwanda, EICV3, EICV4 and EICV5 (%)



Source: own calculations

5. Poverty dynamics

We now turn to the analysis of poverty dynamics. We first look at the transition matrix over the two periods. The first period (P1) covers the interval between EICV3 and EICV4 (2010/11–2013/14) and the second period (P2) covers the interval between EICV4 and EICV5 (2014–2016). We are interested in the evolution of poverty escapes and impoverishment over the two periods, which is provided in Table 2.

Table 2:Poverty transition matrix, period 1 (EICV3 –EICV4) and period 2 (EICV4 –EICV5)

	Non poor		Poor	
Non Poor	P1	P2	P1	P2
	44.60%	50.20%	10.60%	11.70%
Poor	P1	P2	P1	P2
	17.90%	13.40%	26.90%	24.60%

Source: NISR (2018b)

We observe that poverty escapers accounted for 17.9% and 13.4% of the population over the first and second period, respectively. This implies that almost one out of three Rwandans managed to escape poverty over a period of six years.[14] This is irrespective of their previous and subsequent poverty status – poverty escapers may have been previously non-poor or may have fallen back into poverty after escaping. Focusing on poverty escapers, we note that among the 17.9% of the population that escaped poverty during the first period, roughly on third fell back into poverty in the second period, while two third remained out of poverty in the second period (see Table 4). Put differently, roughly one out of three Rwandans who escaped poverty fell back into it, while two out of three Rwandans who escaped poverty managed to sustain their escape.

On the other hand, impoverishment accounted for 10.6% and 11.7% of the population over the first and second period, respectively. This implies that about one out of five Rwandans became poor between 2010/11 and 2016/17, irrespective of their previous and subsequent poverty status (impoverished citizens may have been previously poor or may have re-escaped poverty).

[14] This number should be adjusted for deaths and changes in the population.

Looking at impoverishment again, we note that among the 10.6% of the population who became impoverished (during the first period), half managed to go back to non-poverty in the second period (Table 4). Similarly, about half of the people who became impoverished in the second period had also been poor in 2010/11.

From Table 3, we can extract interesting features of the slowdown in poverty reduction rates. Looking at movements into and out of poverty, the decrease in poverty reduction in the second period (relative to the first period) comes from (1) a lower level of movements out of poverty and (2) a higher level of movements into poverty. In magnitude, the number of poverty escapers fell by 4.5 percentage points and the proportion of impoverished increased by 1.1 percentage points. This adds up to 5.6 percentage points, which is the difference in poverty reduction over the two periods (7.3% in the first period versus 1.8% in the second period). We note that these rates are higher than those derived from the cross-sectional analysis (5.8% and 0.9%, respectively) but the slowdown is similar (5.6% versus 4.9%). Put differently, we observe a relative reduction of 25% in poverty escapes in the second period (from 17.9% of the population in the first period to 13.4% in the second period), and a relative increase of about 10% in impoverishment in the second period compared to the first period (from 10.6% to 11.7%). We also note a relative decrease in economic mobility in the second period (from 28.5% to 25.2%), with more non-impoverished people (44.6% versus 50.2%) and less chronic poor (26.9% versus 24.6%) in the second period.

5.1 The dynamics of poverty: key statistics

In this section, we present some key descriptive statistics of poverty dynamics. As previously described, poverty reduction over a period is the measured as the difference between the movements into and out of poverty – that is, the difference between impoverishment and escapes out of poverty. In this respect, we noted that Rwanda as a whole has seen an increase in impoverishment and a decrease in poverty escapes, resulting in a poverty slowdown. However, the evolution of impoverishment and poverty escapes (and hence of poverty reduction) in the various provinces of the country has been extremely heterogeneous. The dynamics of poverty by province are provided in Figure 5 and Figure 6.

The increase in impoverishment comes from the Southern and Western Provinces, which have recorded high increases in people moving into poverty and are now at much higher levels than the other provinces. Kigali has acted as a force in reducing impoverishment. On the other hand, reductions in escapes have been recorded in the Southern Province, which is now a poor performer in this respect, and in the Northern Province, which is no longer a good performer.

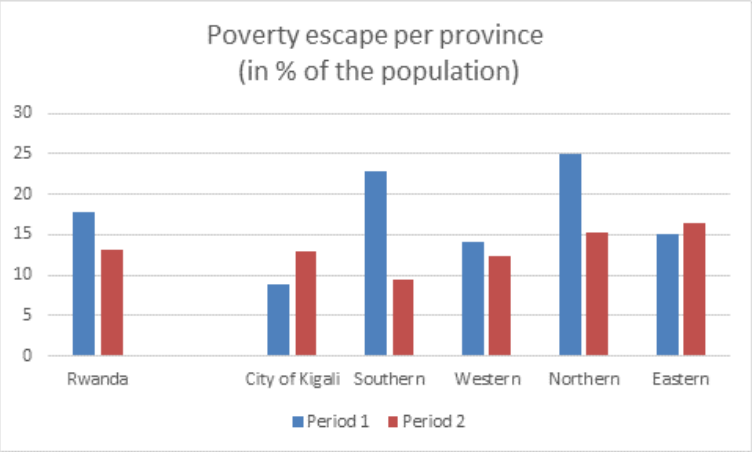
Looking at rural and urban trends, we observe an increase in impoverishment rates in rural areas (from 10.9% to 13.6%) and a reduction in poverty escapes (from 19.4% to 13.8%), resulting in an absence of poverty reduction over the second period in these areas. We note that Kigali has driven the impoverishment rate in urban areas (with a reduction of impoverishment from 9.2% to 2.1%), implying that impoverishment in the remaining urban areas is much higher. Similarly, while escapes have increased in the city of Kigali, they have fallen in the remaining urban areas.

On the one hand, the relatively rate of high poverty reduction over the first period was explained by the good performance of the Southern and Northern Provinces, and of rural areas. The other provinces and urban areas played only a moderate role in this reduction; Kigali even saw poverty increase. Over the second period the trend reversed, with Kigali accounting for the major part of the (relatively low) poverty reduction (together, to a lesser extent, with the Northern and Eastern Provinces), and the Southern and Northern Provinces registering increases in poverty reduction rates. Looking at rural and urban trends,

poverty reduction was driven by rural areas over the first period, and this shifted to urban areas in the second.

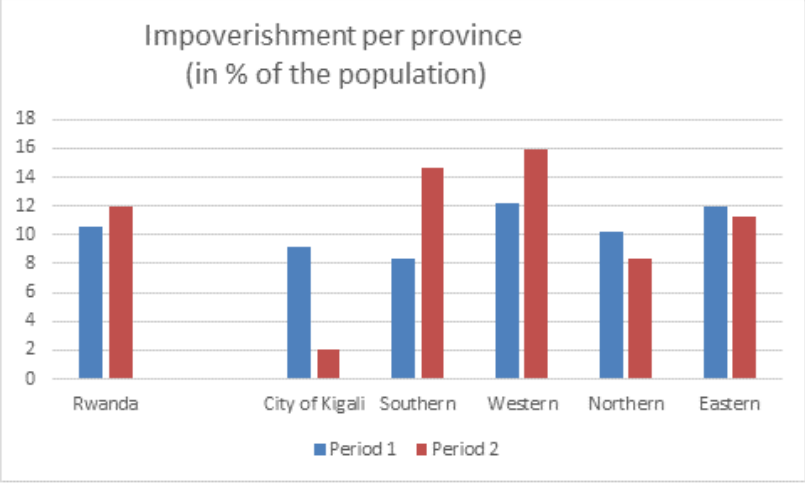
On the other hand, the poverty slowdown is mainly explained by the poverty reduction trends in the Southern and Northern Provinces (a difference of 20 and 8 percentage points, respectively). The Western Province has also performed relatively poorly (less than 6 percentage points of poverty reduction) while the Eastern province has improved a bit (by 2 percentage points) and Kigali has managed to do much better (11 percentage points better). Looking at rural and urban trends, the slowdown is explained by the stall in poverty reduction stall in rural areas, which was somewhat attenuated by double the reduction in urban areas.

Figure 5:Rate of poverty escape by province, EICV3, EICV4 and EICV5



Source: own calculations

Figure 6:Rate of impoverishment by province, EICV3, EICV4 and EICV5



Source: own calculations

Going one step further, from the three EICV waves panel, we can categorise each household according to one of eight possible poverty trajectories. In particular, we focus on sustained escapers ('PNN') and compare them with the chronically poor ('PPP') who, as shown in Table 4, represent slightly under 20% of our sample overall but only around 10% of the households residing in urban areas. We also compare

sustained escapers to other initially poor – namely, late escapers ('PPN') and transitory escapers ('PNP'). In addition, we look at never-poor households ('NNN'), who account for 38% of the sample overall but for over 61% of the urban population and compare them to impoverished households ('NPP' and 'NNP').

Table 3:Distribution of individuals by poverty trajectory, 2011–2017[15]

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**

Source: NISR (2018b)

Another observation from Table 3 is that rural areas contain the largest share of chronically poor, but also a higher share of escapers and impoverished. So, there is more movement into and out of poverty in rural areas than in urban ones.

In terms of provinces, Kigali is the richest with the highest rate of never poor and the lowest rate of chronic poor. However, it also hosts a lower share of impoverished. Second is the Eastern Province, with a rate of chronic poor more than 50% higher than in Kigali, a rate of never poor only about two-thirds that of Kigali (41% compared to 63%) and also a solid share of escapers (20%). The three other provinces have lower rates of never poor (between 27% and 36%) and higher rates of chronic poor (between 20% and 24%). However, the Northern Province differs in that it has a lot more escapers (by about 10 percentage points).

5.2 Composition of expenditures

In this section, we provide general trends in consumption. Table 1b presents levels of expenditure[16] as well as a share of total expenditure by category for the whole population and the poor. We note that the consumption patterns over the three waves are roughly comparable, with the largest share (53%) of household expenditures going on food items (both purchased and own food). This is followed by non-food expenditure (24%), housing (11%) and education (4%). However, we note that the trend in expenditure by category shifted to more purchased food expenditures and less own food expenditures. This trend is observed in the population as a whole and among the poor. Not surprisingly, we observe that poor households spent a lower share of their budget on housing, education and non-food items, and much more on food (both purchased food expenditures and own food expenditures). We also note that

[15] PPP: poor in all waves; PPN: poor in 2010/11 and in 2013/14, exited poverty in 2016/17; PNP: poor in 2010/11, exited poverty in 2013/14, and fell back into poverty in 2016/17; PNN: poor in 2010/11, exited poverty in 2013/14, and remained non poor in 2016/17; NPP: non-poor in 2010/11, fell into poverty in 2013/14, and remained into poverty in 2016/17; NNP: non-poor in 2010/11, remained non poor in 2013/14, and fell into poverty in 2016/17; NPN: non-poor in 2010/11, fell into poverty in 2013/14, and exited poverty in 2016/17; NNN: non-poor in all waves.

[16] Amounts presented are at constant prices (January 2014) at the household level and adjusted for the number of adult equivalents per household. Share are the category share of expenditure.

estimated consumption flows derived from durable goods were much lower for the poor, as well as in-kind benefits.

In Table 5, we provide a breakdown of expenditures in the first period by trajectory. Looking at expenditure on education, we observe that never-poor households spent about 10 times more than the chronically poor, and all other trajectories lie somewhere between the two. We also observe that the highest share of expenditure on education was among the late impoverished, suggesting that investment in education has a return after a lag of one period. It is also striking than the sustained impoverished spent less on education in the first period (in absolute and relative terms) than any other category, yet at that time they were not yet poor and twice as rich as the poor, who decided to spend more on education. Escapers appear to be those who are willing and able to invest their income in education. Education thus emerges as a major differentiator among the different poverty trajectories.

Other observations include the fact that although small, the consumption derived from durable goods is much lower among more vulnerable groups (for the poor and, in particular, the chronic poor – in absolute terms). Transfers received are higher for richer households (in absolute terms).

Table 4:First period expenditures by poverty trajectory, EICV3, EICV4 and EICV 5 (in Rwandan Franks at January 2014 prices)

	full sample	NNN	NNP	NPN	NPP	PNN	PNP	PPN	PPP
Housing expenditures	31,843	58,480	21,123	16,415	21,082	9,835	10,593	9,360	7,799
	(1,681)	(3,633)	(2,294)	(1,600)	(2,250)	(492)	(1,041)	(707)	(388)
Education expenditures	12,945	25,850	7,314	5,358	1,858	2,953	2,762	4,178	2,032
	(1,799)	(4,060)	(3,752)	(1,384)	(504)	(423)	(691)	(815)	(290)
In-kind benefits	13,178	27,123	7,659	3,501	6,802	1,612	482	1,484	1,858
	(2,562)	(5,856)	(2,543)	(1,053)	(2,392)	(661)	(251)	(728)	(434)
Food expenditures	89,410	140,462	97,077	77,399	93,288	35,944	37,159	33,900	34,160
	(2,522)	(4,891)	(7,154)	(5,334)	(7,701)	(1,440)	(2,586)	(2,175)	(1,306)
Own food expenditures	51,772	61,036	61,621	67,990	52,219	43,866	38,628	38,835	33,105
	(1,180)	(2,068)	(4,732)	(8,036)	(5,734)	(1,676)	(2,743)	(2,229)	(1,338)
Non-food expenditures	72,387	134,641	50,072	43,933	46,133	21,558	18,781	17,799	14,587
	(4,251)	(9,329)	(3,314)	(2,711)	(3,544)	(823)	(1,245)	(1,027)	(595)
Consumption derived from durable goods	8,887	19,021	2,271	1,931	1,961	1,821	1,079	1,025	842
	(1842)	(4231)	(285)	(199)	(266)	(143)	(131)	(109)	(71)
Transfer (in-kind)	9,133	12,828	12,499	8,511	10,287	4,342	5,357	4,424	4,471
	(377)	(751)	(1,425)	(1,502)	(1,369)	(412)	(653)	(468)	(312)
Total expenditures	289,555	479,441	259,637	225,039	233,630	121,931	114,840	111,005	98,855
	(10,766)	(22,958)	(10,492)	(9,444)	(10,025)	(2,264)	(3,475)	(2,927)	(2,043)
N	1,797	796	122	101	94	197	93	121	273

Source: own calculations

5.3 Methods for analysing poverty dynamics

In this section, we present the econometric specification used to analyse poverty dynamics. This will get us closer to the determinants of the observed dynamics.

Primary specification

Our first approach consists of using a random-effects logit model where poverty status in a given year is the dependent variable, and household characteristics are the explanatory variables. Specifically, we estimate the following equation in order to explore the factors of poverty:

$$\Pr(poverty\ status_{ht} = 1 \mid X_{ht}) = f(\beta_0 + \beta_1 X_{ht} + \beta_2 \mathbb{I}(T = t))$$

where poverty status is a binary variable equal to one if consumption by adult equivalent in January 2014 prices in household h and year t is below 159,375 Rwf (the poverty threshold), and zero otherwise. X is a vector of household characteristics that will be detailed in the next paragraph and $\mathbb{I}$ is an indicator function for the year of interview.

The household characteristics we consider are the following:

- **Basic characteristics of the household head**: age, age squared, gender, educational attainment, province of residence and urban status as well as household size
- **Anti-poverty policies**: whether the household has received a cow from the government, and whether it has ever received any support through the VUP
- **Health- and risk-related variables**: the share of dependents in the household as well as the share of people with a disability, whether the household has access to health insurance and whether it faced any environmental risk in the past 12 months
- **Household finance proxies**: whether the household has received any remittances and the log value of all remittances received, as well as the log of total savings
- **Occupation**: whether the household head receives a wage from the agricultural sector or from the non-agricultural sector, whether it owns a farm or a business in the non-agricultural sector, as well as the share of household members that work declaring an off-farm activity
- **Amenities**: whether the household has access to piped water and the distance to the closest source of drinking water.

This methodology is particularly suitable if omitted variables are unlikely or if they are uncorrelated to variables included as explanatory variables. While this assumption is generally not easily satisfied, it is more likely to hold when one can control for a large number of characteristics, which is the case in the present study. To address the limitations of this approach, we later move to a fixed-effects logit model that controls for any (observed or unobserved) time-invariant household characteristics.

Table 6 reports the exponentiated coefficients, because they are easily interpretable as odds ratios. Consequently, the numbers reported that are above one indicate a positive association with the probability of being poor in a given period, while numbers below 1 indicate a negative association. For instance, the 0.378 reported in the first column for primary education means that a household whose

head has completed primary education is about 62% less likely to be poor than if the household head had no education whatsoever.

Coefficients associated with categorical variables can be easily compared because the support of the underlying covariate is easily known (0 or 1, no education, completed primary, completed secondary, and so on). As a result, the coefficients are easily interpretable. However, covariates that are monetary amounts or shares are difficult to compare without knowing more about how they vary in the data. To overcome this difficulty, Table 12 shows summary statistics for all explanatory variables.

The various columns in Table 6 represent different regressions. Column (1) is the baseline, as it includes only the household characteristics. Columns (2) to (6) control separately for each set of further explanatory variables identified as potentially important to understand poverty dynamics. Finally, column (7) includes the full set of explanatory variables to check the stability of the associations.

Secondary specification

The second approach we take is to look at poverty trajectories. In particular, in Table 7 we use a multinomial logit model to explore the determinants of sustained poverty escapes as compared to transitory escapers and chronic poverty, while in Table 8 we compare impoverished households to those who remain non-poor.

The unit of observation in this specification is the household and the outcome to be explained is the poverty trajectory. Explanatory variables are of two types: household characteristics, which are taken at baseline or in the period preceding the change in poverty status; and shocks, for which we include the value in the period contemporaneous to the status change.

5.4 Discussion of results

The main lessons from Table 6 are the following:

- 2014 saw a solid decline in poverty which does not seem to have survived until 2017, when poverty levels were not significantly lower than those in 2014, and even higher in some parts of the country.

- Poverty is concentrated in rural areas outside of Kigali, especially in the Northern and Western Provinces. The Eastern Province comes second to Kigali, with a 15% greater chances of being poor than in the capital, while in the three other provinces, the likelihood of being poor is about twice as high as in Kigali.

- Education is strongly linked to non-poverty. Completing just primary education already halves the probability of being poor, while reaching secondary or higher education virtually eliminates all risk consistently across all specifications.

- Poverty relief policies are not always well targeted (VUP beneficiaries are not concentrated in the first quintiles), even if positively associated to poverty status. We note that VUP participation is not associated with pushing people out of poverty.

- The value of total savings is negatively correlated with the probability of being poor and constitutes an effective mitigating mechanism against poverty. The total value of remittances received has a similar association. Interestingly, however, the fact of receiving any remittances is

correlated with a higher probability of being poor. This indicates that many families rely on outside help in order to stay afloat.

- Household size is consistently correlated with a higher risk of poverty. The share of dependents and, to a lesser extent, the share of people with disabilities are important risk factors too. Households with a female household head are also at much greater risk of becoming poor (almost twice as likely).

- Environmental hazards increase the odds of being poor by 14% in the basic specification, although this effect goes down to 6% when controlling for all other factors. Access to health insurance is another strong protector from poverty – it decreases the probability of being poor by 42% to 53%.

- In terms of occupation, household heads working for a wage in the agricultural sector face the highest risk of poverty. Wage workers in the non-agricultural sector come second, while farm owners and in particular business owners outside the agricultural sector are far less exposed. The share of household members working off-farm has a clear protective effect against poverty.

- As regards the characteristics of the dwelling occupied, poverty is correlated with lack of access to piped water (but not strongly correlated with distance to drinking water sources, indicating the widespread availability of healthy/improved drinking water sources).

The second approach we pursue is to study poverty trajectories. We analyse the determinants of remaining chronically poor versus sustainably escaping poverty, as well as those of impoverishment versus remaining above the poverty line. This strategy amounts to focusing on subsamples that started off in a comparable situation but evolved differently in order to understand what made a difference. Again, we control for the usual household characteristics but also add a number of other potential determinants to dig further into the complexities of poverty dynamics.

The unit of observation in these specifications is the household and the outcome to be explained the poverty trajectory. Explanatory variables are of two types: household characteristics, which are taken at baseline or in the period preceding the change in poverty status; and shocks, for which we include the value in the period contemporaneous to the status change. The analysis confirms the main findings from Table 6.

Some additional conclusions can be drawn from Table 5:

- In terms of geography, Southern and Eastern Provinces are home to more escapers on average, but these escapes are more sustained in the Eastern Province.

- It becomes clear that the Girinka Programme is a non-negligible element in poverty escapes, in particular sustained poverty escapes. On the other hand, the VUP is associated with fewer poverty escapes.

Table 8 is a mirror image of Table 7, with the determinants of poverty escapes becoming negative determinants of impoverishment.

Finally, we look at potential heterogeneity in the effect of policies, as all parts of the population may not be affected in the same way. To check whether this is the case, we run the main regression from Table 6 but this time interacting the indicators for whether a household benefitted from either the Girinka Programme or the VUP with some household characteristics – namely, whether the household is female headed, urban status and province. The results are detailed in Table 9.

The Girinka Programme has a protective effect against poverty especially for households with a male head and for rural households, but the association does not hold when the household head is female. It is also associated with poverty reduction in the Southern, Eastern and Western Provinces (but not in Kigali or the Northern Province).

Table 5:Determinants of poverty status (random effect logit), heterogeneous effect of policies

	(1)			(2)			(3)	
	Received a cow from gov.	Received gov. support		Received a cow from gov.	Received gov. support		Received a cow from gov.	Received gov. support
Male hh head	-0.136***	0.599***	Rural	-0.0898***	0.401***	Kigali	1.438***	1.540***
	(-7.38)	(39.55)		(-5.58)	(31.06)		(28.25)	(46.04)
Female hh head	0.215***	0.201***	Urban	0.340***	0.776***	Southern Province	-0.331***	0.0936***
	(8.24)	(10.30)		(9.00)	(23.92)		(-9.21)	(4.47)
						Western Province	-0.148**	0.645***
							(-3.27)	(29.78)
						Northern Province	0.635***	0.223***
							(18.65)	(6.30)
						Eastern Province	-0.478***	0.0471
							(-20.44)	(1.51)
Observations	5389			5389			5389	

Notes: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.5 Robustness checks

In order to check the robustness of the findings in the previous section, we relax the assumptions needed for the random-effects model to estimate unbiased coefficients and move on to a fixed-effect model. Fixed-effect models use only within-household variation (across time) to identify the relationship between explanatory variables and the outcome of interest. In that respect, they allow us to control for any time-invariant household characteristics (such as individuals' ability), whether observed or unobserved, that could have been omitted in the random effects analysis.

The cost of this methodology is that we are unable to identify the relationship between a particular characteristic and poverty unless it varies over time. In particular, the model drops all households whose poverty status does not change over the period, hence the smaller number of observations.

In addition, the effects of characteristics that are generally stable over time, such as gender or education of the household head, are identified solely on the basis of households for which those characteristics change. This leads to some counterintuitive results: for instance, a household head obtaining secondary education predicts a higher risk of falling into poverty. This probably reflects the effect of a household head change due to a premature or unanticipated death, resulting in a younger and generally more educated household head, but also with less resources and experience.

Table 5 shows results that are still generally consistent with those revealed in Table 4. In particular, the share of household members working off-farm, access to health insurance and receiving a cow are strongly negatively associated with falling into poverty. Switching to an urban setting, however, is not strongly associated with poverty reduction – if anything, rather to a slightly higher risk of poverty. Urbanisation may therefore rather be a by-product of poverty reduction rather than a deep-rooted determinant. This suggests that urbanisation is not the driver of poverty reduction in Rwanda that we have seen elsewhere.

Table 11 performs another robustness checks looking at the possible dynamic character of the determinants of poverty. To this end, covariates are included in lags (variables starting with L.) or contemporaneous to the poverty status depending on whether it is a more or less fixed characteristic or a shock variable. Results are very comparable to the baseline.

6. Conclusions and key priority areas for poverty reduction

Based on the results presented in this paper, we are able to identify groups that are vulnerable to poverty in the future as well as key priority policy areas to increase sustained poverty escapes, reduce impoverishment and leave no one behind. Looking back, these key areas also help to explain the reasons behind the poverty slowdown over the last period.

Vulnerable groups

We identified three vulnerable groups. First, **female headed households** are vulnerable as they fail to (sustainably) escape poverty. However, it is worth noting that when non-poor, they are less likely to fall into poverty. Overall, female-headed households are about 1.8 times more likely to be poor. We note a slowdown in the fall in the share of female-headed households from 28% to 26% of households in the first period, and then to 25% by the end of the second period. This fall could explain part of the slowdown in the poverty reduction rate.

Second, households with a **higher share of dependents** are associated with poverty in all its forms. The higher the share of dependents, the lower the probability of escaping sustainably. Similarly, households with more dependents are more likely to become impoverished. We noted a stall in the reduction of the share of dependents from 47% in 2010/11 to 45% in 2013/14 and 2016/17. Given that the share of dependents is strongly associated with being poor, this should explain part of the slowdown in the poverty reduction rate. More efforts in family planning and dependent support should mitigate the risk of being poor.

Third, households (and household members) working for **agricultural wages** are more likely to be poor, more likely to be chronically poor, less likely to sustain escapes and more likely to become impoverished. In other words, this group is at risk, and about three to four times more likely to be poor. After a reduction in the share of households mainly working for agricultural wages over the first period from 35% to 34% of households, this trend reversed in the second period, reaching 38% of households. This largely contributed to the observed slowdown in poverty reduction in the second period. Reduced landholding and few off-farm opportunities could explain this trend.

It is worth noting that government support through the Vision 2020 Umurenge Programme seems to target the poor well (although its scope is far from covering the entire poor population). However, it appears that it fails to enable beneficiaries to escape poverty.

Leave no one behind

Education is a must for poverty eradication. Households heads with a primary education are about 50% less likely to be poor than households with no education. Secondary and tertiary education almost eliminate the risk of being poor. Educated households heads are more likely to see their households making sustained escapes from poverty. Similarly, they are less likely to become impoverished. Education is a long-term investment which has to be prioritised for the future generations. Households who are spending less on education in the first instance are more likely to become impoverished or to not escape poverty. Conversely, we note that future escapers or never poor spend more than the others on education. The positive role of education is clear. Education at no cost should be the first priority for eradicating poverty. In addition, given the high initial enrolment rate, the general effect of education calls for a specific focus on preventing school drop-out. These issues are pursued in greater depth in the companion qualitative paper (Bird et al., 2019).

We observe a slowdown in the reduction of household heads with no education in the second period, which could be explained by children who did not receive any education during and after the genocide now becoming household heads. While this phenomenon may well have a significant impact on the slowdown in poverty reduction in our sample, the result has to be confirmed. We expect this to amplify in the next period. Mitigating measures can be taken through adult education, especially for adults who missed out on education for whatever reason.

Similarly, **health insurance** coverage both increases the likelihood of sustained escapes from poverty and reduces the risk of becoming impoverished. Overall, this results in a positive effect against poverty, with households with health insurance 50% less likely to be poor than those without. Health insurance coverage was constant at 78% of households over the two periods. Promoting and incentivising health coverage is an important factor if one wants to accelerate poverty reduction.

Savings are a key determinant for households to sustain escapes out of poverty as well as to prevent impoverishment. Savings hence have a positive effect for households. Overall, we observe a take-off of savings in the country, especially in the second period. The value of remittances has also increased in the second period, after a fall in the first period. These factors have probably boosted poverty reduction, acting against factors promoting the slowdown.

In terms of occupation at the household level, **diversification of activities outside agriculture** has a preventive effect against poverty, reducing the risk of impoverishment. It also positively affects poverty escapes. After an increase in diversification within household in the first period, we observe a slowdown in this increase in the second period, which could explain part of the slowdown in poverty reduction. To reinvigorate diversification, more efforts in promoting off-farm youth employment should be considered. The **Girinka** Programme is acting as a lift out of poverty for male-headed households. While the programme is still expanding, the expansion has slowed down, which could explain a small part of the poverty reduction slowdown. The programme has the potential to be scaled up as it is far from covering the entire poor population of Rwanda. More efforts are needed to understand the heterogeneous impact of Girinka on gender, on provinces and on rural/urban status.

Finally, **off-farm businesses** owned by households are associated with a lower risk of falling into poverty. Overall, households owning an off-farm business are about two-thirds less likely to be poor. We observe a decrease in the share of households owning an off-farm business in the first period, from 26% to 25%. This reduction accelerated in the second period, with the share of households owning an off-farm business dropping to 20%. This trend could have contributed to the slowdown in poverty reduction. Continued

efforts to facilitate off-farm businesses creation and incentivise household initiatives in this direction should be considered.

In brief, in order to recover previous poverty reduction rates and to possibly accelerate reduction, the government of Rwanda, as well as key stakeholders in the various sectors, should ensure education at no cost, prevent school drop-out and deliver adult education. Government should continue to support and sustain health coverage as well as make efforts to lower the pressures faced by households with a high share of dependents, through family planning. It should strongly incentivise and promote off-farm activities.

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Annex A

Table 6:Determinants of poverty status (random effect logit), heterogeneous effect of policies

	2010/11	2013/14	2016/17
Age of hh head	44.92	44.74	44.70
	(15.85)	(15.88)	(15.61)
hh head has no education	0.71	0.66	0.64
	(0.45)	(0.47)	(0.48)
Urban status	0.15	0.17	0.19
	(0.35)	(0.38)	(0.39)
Female hh head	0.28	0.26	0.25
	(0.45)	(0.44)	(0.43)
hh size	4.78	4.59	4.39
	(2.19)	(2.12)	(2.12)
hh head marital status	0.68	0.70	0.68
	(0.47)	(0.46)	(0.46)
Received a cow from gov.	0.04	0.06	0.07
	(0.19)	(0.24)	(0.25)
Received gov. support	0.01	0.11	0.11
	(0.09)	(0.31)	(0.32)
Share of dependents in hh	0.47	0.45	0.45
	(0.24)	(0.25)	(0.26)
Share of person with disability in hh	0.16	0.13	0.13
	(0.37)	(0.34)	(0.33)
Has health insurance	0.78	0.78	0.78
	(0.42)	(0.41)	(0.41)
hh faced environmental risk in past 12 months	0.34	0.20	0.13
	(0.47)	(0.40)	(0.34)
hh in debt	0.60	0.67	0.67
	(0.49)	(0.47)	(0.47)
log_hh_loantot	7.65	7.25	7.34
	(4.87)	(5.33)	(5.44)
log_hh_sav12m	4.25	4.55	8.02
	(6.02)	(5.31)	(9.86)
log_hh_savtot	3.87	4.93	8.35
	(5.07)	(5.11)	(9.35)
log_hh_assets	10.11	8.23	8.14
	(2.42)	(4.56)	(4.72)
hh received any remittances	0.53	0.52	0.56
	(0.50)	(0.53)	(0.50)
log_hh_remittot	5.05	4.98	5.43
	(4.89)	(5.00)	(5.00)

Share of remittances coming from abroad	0.01	0.01	0.02
	(0.10)	(0.10)	(0.14)
hh head receives wage from agricultural sector	0.35	0.34	0.38
	(0.48)	(0.47)	(0.48)
hh head receives wage from non-agricultural sector	0.34	0.38	0.40
	(0.47)	(0.49)	(0.49)
hh head owns a business in non-agricultural sector	0.26	0.24	0.20
	(0.44)	(0.43)	(0.40)
hh head owns a farm	0.83	0.78	0.73
	(0.38)	(0.41)	(0.44)
Share of hh members working off farm	0.26	0.28	0.29
	(0.26)	(0.27)	(0.28)
Total land area owned by hh	54.98	52.86	48.45
	(127.70)	(124.41)	(234.91)
log_hh_livestockval	6.94	6.58	5.97
	(5.57)	(5.76)	(5.84)
hh has planted a new crop as result of regionalization	0.21	0.29	0.22
	(0.41)	(0.45)	(0.42)
hh has dropped a crop as result of regionalization	0.07	0.24	0.20
	(0.26)	(0.43)	(0.40)
Distance to drinking water source	627.59	775.63	712.98
	(773.89)	(972.95)	(983.79)
hh has access to piped water	0.06	0.08	0.09
	(0.23)	(0.27)	(0.29)
Observations	14308	14419	14580

Table 7:Expenditures categories (cross sections)

All population

Variables	EICV3		EICV4		EICV5		EICV3-5 Variation
	Amount	%	Amount	%	Amount	%	
Housing expenditures	29,512	11%	34,911	12%	31,215	11%	(+)
Education expenditures	12,458	5%	11,625	4%	11,829	4%	()
Wage benefits	12,761	5%	11,291	4%	8,102	3%	(-)
Food expenditures	78,936	30%	89,863	32%	110,306	40%	(+++)
Own food expenditures	50,544	19%	50,826	18%	37,551	13%	(--)
Non-food expenditure	62,516	24%	66,779	24%	62,113	22%	()
Expenditures from durables	11,029	4%	9,862	3%	10,482	4%	()
Transfers expenditures	7,465	3%	7,167	3%	7,228	3%	(-)
Total expenditures	265,221	100%	282,323	100%	278,827	100%	(+)

Poor

Variables	EICV3		EICV4		EICV5		EICV3-5 Variation
	Amount	%	Amount	%	Amount	%	
Housing expenditures	8,686	8%	9,454	9%	7,483	7%	(-)
Education expenditures	2,729	3%	2,662	2%	1,957	2%	(-)
Wage benefits	1,359	1%	1,117	1%	1,198	1%	(-)
Food expenditures	34,924	33%	39,418	36%	51,860	47%	(+++)
Own food expenditures	35,487	33%	35,706	32%	24,441	22%	(--)
Non-food expenditure	17,856	17%	17,656	16%	19,318	17%	(+)
Expenditures from durables	1,109	1%	541	0%	418	0%	(-)
Transfers expenditures	4,210	4%	3,746	3%	3,765	3%	(-)
Total expenditures	106,359	100%	110,299	100%	110,440	100%	(+)

Table 8:Determinants of poverty status (random-effect logit)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Policies	Health	Finance	Occupation	Amenities	All
Poverty status							
Kigali	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Southern Province	2.243***	2.208***	1.962***	1.429***	1.499***	1.701***	0.937***
	(0.0403)	(0.0395)	(0.0345)	(0.0242)	(0.0258)	(0.0308)	(0.0156)
Western Province	2.005***	1.967***	1.770***	1.210***	1.369***	1.528***	0.822***
	(0.0365)	(0.0355)	(0.0314)	(0.0208)	(0.0237)	(0.0280)	(0.0138)
Northern Province	2.018***	2.048***	1.829***	1.198***	1.395***	1.528***	0.884***
	(0.0393)	(0.0397)	(0.0348)	(0.0220)	(0.0259)	(0.0299)	(0.0158)
Eastern Province	1.150***	1.171***	1.018	0.764***	0.819***	0.899***	0.564***
	(0.0208)	(0.0212)	(0.0180)	(0.0131)	(0.0143)	(0.0164)	(0.00961)
Age of hh head	1.047***	1.051***	1.094***	1.039***	1.036***	1.041***	1.070***
	(0.00197)	(0.00197)	(0.00210)	(0.00184)	(0.00185)	(0.00195)	(0.00189)
Sq. age of hh head	0.999***	0.999***	0.999***	1.000***	1.000***	0.999***	0.999***
	(0.0000178)	(0.0000177)	(0.0000183)	(0.0000167)	(0.0000169)	(0.0000177)	(0.0000169)
No educ.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Primary	0.378***	0.381***	0.378***	0.477***	0.449***	0.409***	0.567***
	(0.00386)	(0.00386)	(0.00380)	(0.00467)	(0.00439)	(0.00417)	(0.00539)
Secondary	0.0140***	0.0143***	0.0194***	0.0355***	0.0216***	0.0252***	0.0868***
	(0.000658)	(0.000675)	(0.000889)	(0.00161)	(0.000985)	(0.00122)	(0.00396)
Urban status	0.395***	0.399***	0.410***	0.419***	0.433***	0.494***	0.537***
	(0.00492)	(0.00495)	(0.00506)	(0.00516)	(0.00536)	(0.00621)	(0.00667)
Female hh head	1.874***	1.860***	1.687***	1.895***	1.484***	1.923***	1.492***
	(0.0214)	(0.0211)	(0.0189)	(0.0204)	(0.0163)	(0.0219)	(0.0158)
2011	ref.	ref.	ref.	ref.	ref.	ref.	ref.
2014	0.924***	0.875***	0.956***	1.095***	0.999	0.945***	1.078***

	(0.00713)	(0.00688)	(0.00749)	(0.00855)	(0.00774)	(0.00740)	(0.00880)
2017	1.131***	1.055***	1.256***	1.391***	1.189***	1.168***	1.364***
	(0.00947)	(0.00911)	(0.0107)	(0.0116)	(0.00993)	(0.00994)	(0.0121)
hh size	1.421***	1.419***	1.300***	1.513***	1.404***	1.453***	1.433***
	(0.00368)	(0.00365)	(0.00344)	(0.00383)	(0.00353)	(0.00382)	(0.00371)
Received a cow from gov.		0.975					1.065***
		(0.0148)					(0.0152)
Received gov. support		1.576***					2.042***
		(0.0192)					(0.0246)
Share of dependents			7.786***				4.556***
			(0.143)				(0.0839)
Share of persons with disability			1.218***				1.129***
			(0.0125)				(0.0112)
Has health insurance			0.470***				0.580***
			(0.00393)				(0.00477)
Environmental risk			1.145***				1.062***
			(0.00924)				(0.00847)
Log total hh savings				0.879***			0.899***
				(0.000747)			(0.000784)
Any remittance				31.80***			19.83***
				(0.929)			(0.581)
Log total value of remittance				0.654***			0.690***
				(0.00218)			(0.00231)
Wages from agr. sector					3.892***		3.070***
					(0.0338)		(0.0260)
Wages from non-agr. sector					1.205***		1.016

					(0.0118)		(0.0101)
Business in non-agr. sector					0.640***		0.565***
					(0.00655)		(0.00582)
Owns a farm					0.833***		0.679***
					(0.00940)		(0.00769)
Share working off-farm					0.308***		0.651***
					(0.00568)		(0.0127)
Dist. to drinking water						1.000***	1.000
						(0.00000378)	(0.00000369)
Access to piped water						0.0415***	0.106***
						(0.00135)	(0.00315)
Obs.	5389	5389	5389	5389	5389	5389	5389
Households	1797	1797	1797	1797	1797	1797	1797

Notes: Exponentiated coefficients; standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9:Determinants of chronic poverty versus (sustained) escapers (multinomial Logit)

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	Policies	Health	Finance	Occupation	Amenities
Ref: Sustained escapers						
Transitory escapers						
Kigali	ref.	ref.	ref.	ref.	ref.	ref.
Southern Province	1.184**	1.170**	1.289***	1.495***	1.322***	1.061
	(0.0638)	(0.0632)	(0.0702)	(0.0843)	(0.0731)	(0.0591)
Western Province	0.790***	0.781***	0.928	0.876*	0.859**	0.703***
	(0.0441)	(0.0437)	(0.0528)	(0.0507)	(0.0494)	(0.0405)
Northern Province	0.429***	0.430***	0.514***	0.550***	0.473***	0.362***
	(0.0256)	(0.0257)	(0.0312)	(0.0342)	(0.0290)	(0.0224)
Eastern Province	0.795***	0.797***	0.912	0.948	0.877*	0.727***
	(0.0442)	(0.0445)	(0.0516)	(0.0551)	(0.0502)	(0.0419)
Age of hh head	0.952***	0.953***	0.959***	0.939***	0.948***	0.940***
	(0.00386)	(0.00392)	(0.00392)	(0.00387)	(0.00400)	(0.00392)
Sq. age of hh head	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***
	(0.0000385)	(0.0000390)	(0.0000394)	(0.0000391)	(0.0000397)	(0.0000394)
No education	ref.	ref.	ref.	ref.	ref.	ref.
Primary	0.530***	0.530***	0.526***	0.571***	0.540***	0.513***
	(0.0154)	(0.0154)	(0.0155)	(0.0169)	(0.0162)	(0.0150)
Secondary	Not estimable	Not estimable	Not estimable	Not estimable	Not estimable	Not estimable
	.	.	.	.	.	.
Urban status	1.147**	1.151**	1.112*	0.975	1.322***	1.475***
	(0.0524)	(0.0526)	(0.0506)	(0.0451)	(0.0637)	(0.0703)
Female hh head	0.665***	0.660***	0.646***	0.667***	0.567***	0.701***
	(0.0173)	(0.0173)	(0.0170)	(0.0175)	(0.0159)	(0.0185)
hh size	0.957***	0.957***	0.954***	0.987	1.024***	0.953***

	(0.00610)	(0.00610)	(0.00664)	(0.00640)	(0.00695)	(0.00613)
Received a cow from gov.		0.986				
		(0.0376)				
Received gov. support		1.075**				
		(0.0287)				
Share of dependents			1.316***			
			(0.0646)			
Share of persons with disability			1.621***			
			(0.0408)			
Has health insurance			0.712***			
			(0.0173)			
Environmental risk in past 12 months			1.345***			
			(0.0341)			
Log total hh savings				0.917***		
				(0.00244)		
Any remittances				1.075		
				(0.0999)		
Log total value of remittances received				1.018		
				(0.0106)		
Wages from ag. sector					2.830***	
					(0.0685)	
Wages from non-ag. sector					1.057	
					(0.0328)	
Owns a business in non-ag. sector					0.642***	
					(0.0193)	

hh head owns a farm					1.105*	
					(0.0437)	
Share of hh members working off-farm					2.056***	
					(0.0989)	
Distance to drinking water source						1.000***
						(0.00000958)
hh has access to piped water						2.81E-10
						(0.000000656)
Chronically poor						
Kigali	ref.	ref.	ref.	ref.	ref.	ref.
Southern Province	0.437***	0.426***	0.407***	0.261***	0.403***	0.346***
	(0.0181)	(0.0177)	(0.0185)	(0.0122)	(0.0176)	(0.0152)
Western Province	0.615***	0.602***	0.627***	0.314***	0.660***	0.482***
	(0.0260)	(0.0255)	(0.0289)	(0.0149)	(0.0294)	(0.0216)
Northern Province	0.516***	0.526***	0.473***	0.292***	0.584***	0.440***
	(0.0223)	(0.0227)	(0.0224)	(0.0141)	(0.0265)	(0.0202)
Eastern Province	0.404***	0.414***	0.400***	0.204***	0.388***	0.285***
	(0.0173)	(0.0178)	(0.0188)	(0.00988)	(0.0177)	(0.0130)
Age of hh head	0.895***	0.898***	0.951***	0.873***	0.878***	0.881***
	(0.00325)	(0.00328)	(0.00385)	(0.00332)	(0.00346)	(0.00331)
Sq. age of hh head	1.001***	1.001***	1.000	1.001***	1.001***	1.001***
	(0.0000349)	(0.0000351)	(0.0000387)	(0.0000363)	(0.0000376)	(0.0000360)
No education	ref.	ref.	ref.	ref.	ref.	ref.
Primary	0.536***	0.538***	0.530***	0.578***	0.565***	0.473***
	(0.0113)	(0.0113)	(0.0122)	(0.0131)	(0.0129)	(0.0103)
Secondary	Not estimable	Not estimable	Not estimable	Not estimable	Not estimable	Not estimable

	.	.	.	.	.	.
Urban status	0.726***	0.729***	0.764***	0.703***	0.839***	0.865***
	(0.0264)	(0.0266)	(0.0301)	(0.0280)	(0.0347)	(0.0338)
Female hh head	2.490***	2.446***	1.969***	2.563***	1.802***	2.941***
	(0.0530)	(0.0523)	(0.0460)	(0.0578)	(0.0439)	(0.0660)
hh size	1.734***	1.734***	1.461***	1.898***	1.808***	1.793***
	(0.00945)	(0.00945)	(0.00846)	(0.0114)	(0.0109)	(0.0102)
Received a cow from gov.		0.855***				
		(0.0253)				
Received gov. support		1.165***				
		(0.0254)				
Share of dependents			85.25***			
			(4.338)			
Share of persons with disability			0.732***			
			(0.0179)			
Has health insurance			0.522***			
			(0.0108)			
Environmental risk in past 12 months			1.356***			
			(0.0301)			
Log total hh savings				0.884***		
				(0.00201)		
Any remittances				204.8***		
				(17.07)		
Log total value of remittances received				0.524***		
				(0.00515)		
Wages from ag. sector					7.044***	

					(0.151)	
Wages from non-ag. sector					1.072**	
					(0.0278)	
Owns a business in non-ag. sector					0.961	
					(0.0241)	
hh head owns a farm					0.466***	
					(0.0148)	
Share of hh members working off farm					0.121***	
					(0.00661)	
Distance to drinking water source						0.999***
						(0.0000119)
hh has access to piped water						9.53E-11
						(8.52E08)
Observations	564	564	564	564	564	564

Notes: Exponentiated coefficients; standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10:Determinants of (sustained) impoverishment versus never-poor (multinomial logit)

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	Policies	Health	Finance	Occupation	Amenities
Ref: Never poor						
Late impoverished						
Kigali	ref.	ref.	ref.	ref.	ref.	ref.
Southern Province	4.642***	4.637***	4.642***	3.857***	4.335***	4.333***
	(0.215)	(0.215)	(0.215)	(0.181)	(0.205)	(0.203)
Western Province	8.113***	8.010***	8.693***	6.585***	7.681***	7.998***
	(0.370)	(0.367)	(0.397)	(0.306)	(0.357)	(0.370)
Northern Province	4.760***	4.891***	5.036***	3.904***	4.380***	4.415***
	(0.232)	(0.238)	(0.246)	(0.193)	(0.217)	(0.217)
Eastern Province	3.926***	4.012***	4.148***	3.373***	3.737***	3.639***
	(0.184)	(0.189)	(0.195)	(0.161)	(0.179)	(0.173)
Age of hh head	1.081***	1.078***	1.089***	1.079***	1.079***	1.073***
	(0.00374)	(0.00374)	(0.00394)	(0.00376)	(0.00377)	(0.00378)
Sq. age of hh head	0.999***	0.999***	0.999***	0.999***	0.999***	0.999***
	(0.0000343)	(0.0000344)	(0.0000363)	(0.0000345)	(0.0000348)	(0.0000348)
No education	ref.	ref.	ref.	ref.	ref.	ref.
Primary	0.535***	0.532***	0.560***	0.657***	0.538***	0.563***
	(0.0113)	(0.0113)	(0.0119)	(0.0143)	(0.0114)	(0.0121)
Secondary	0.147***	0.152***	0.157***	0.265***	0.158***	0.186***
	(0.00941)	(0.00986)	(0.0102)	(0.0173)	(0.0103)	(0.0120)
Urban status	0.510***	0.549***	0.508***	0.537***	0.568***	0.619***
	(0.0153)	(0.0166)	(0.0153)	(0.0164)	(0.0176)	(0.0190)
Female hh head	0.436***	0.443***	0.443***	0.438***	0.410***	0.451***
	(0.0105)	(0.0107)	(0.0108)	(0.0107)	(0.0103)	(0.0111)
hh size	0.787***	0.793***	0.782***	0.838***	0.779***	0.788***

	(0.00397)	(0.00402)	(0.00454)	(0.00439)	(0.00425)	(0.00406)
Received a cow from gov.		1.457***				
		(0.0430)				
Received gov. support		2.117***				
		(0.0538)				
Share of dependents			1.242***			
			(0.0481)			
Share of persons with disability			1.845***			
			(0.0490)			
Has health insurance			0.554***			
			(0.0113)			
Environmental risk in past 12 months			0.746***			
			(0.0160)			
Log total hh savings				0.901***		
				(0.00174)		
Any remittances				2.273***		
				(0.157)		
Log total value of remittances received				0.912***		
				(0.00699)		
Receives wages from ag. sector					1.002	
					(0.0208)	
Receives wages from non-ag. sector					1.093***	
					(0.0240)	
Owns a business in non-ag. sector					0.781***	

					(0.0174)	
Owns a farm					1.222***	
					(0.0325)	
Share of hh members working off-farm					0.687***	
					(0.0263)	
Distance to drinking water source						1.001***
						(0.00000988)
hh has access to piped water						0.724***
						(0.0408)
Transitory impoverished						
Kigali	ref.	ref.	ref.	ref.	ref.	ref.
Southern Province	0.114***	0.118***	0.120***	0.0750***	0.0966***	0.0938***
	(0.00439)	(0.00460)	(0.00471)	(0.00302)	(0.00383)	(0.00367)
Western Province	0.318***	0.316***	0.400***	0.215***	0.280***	0.272***
	(0.00998)	(0.0101)	(0.0128)	(0.00710)	(0.00912)	(0.00869)
Northern Province	0.533***	0.566***	0.609***	0.341***	0.440***	0.440***
	(0.0164)	(0.0177)	(0.0193)	(0.0112)	(0.0141)	(0.0138)
Eastern Province	0.252***	0.271***	0.285***	0.171***	0.216***	0.208***
	(0.00764)	(0.00835)	(0.00881)	(0.00549)	(0.00689)	(0.00644)
Age of hh head	1.095***	1.087***	1.128***	1.092***	1.085***	1.081***
	(0.00392)	(0.00392)	(0.00442)	(0.00398)	(0.00397)	(0.00393)
Sq. age of hh head	0.999***	0.999***	0.999***	0.999***	0.999***	0.999***
	(0.0000339)	(0.0000342)	(0.0000379)	(0.0000345)	(0.0000347)	(0.0000344)
No education	ref.	ref.	ref.	ref.	ref.	ref.
Primary	0.389***	0.388***	0.412***	0.440***	0.422***	0.416***
	(0.00901)	(0.00904)	(0.00985)	(0.0104)	(0.00995)	(0.00971)

Secondary	Not estimable	Not estimable	Not estimable	Not estimable	Not estimable	Not estimable
	.	.	.	.	.	.
Urban status	0.185***	0.213***	0.212***	0.170***	0.252***	0.250***
	(0.00577)	(0.00671)	(0.00668)	(0.00547)	(0.00828)	(0.00793)
Female hh head	0.594***	0.615***	0.641***	0.652***	0.502***	0.638***
	(0.0141)	(0.0147)	(0.0158)	(0.0158)	(0.0125)	(0.0153)
hh size	0.956***	0.965***	0.914***	1.029***	0.961***	0.979***
	(0.00459)	(0.00469)	(0.00487)	(0.00527)	(0.00492)	(0.00487)
Received a cow from gov.		1.436***				
		(0.0439)				
Received gov. support		2.739***				
		(0.0714)				
Share of dependents			3.428***			
			(0.144)			
Share of persons with disability			3.510***			
			(0.0821)			
Has health insurance			0.404***			
			(0.00874)			
Environmental risk in past 12 months			0.394***			
			(0.0109)			
Log total hh savings				0.919***		
				(0.00180)		
Any remittances				7.495***		
				(0.577)		
Log total value of remittances received				0.761***		
				(0.00650)		

Receives wages from ag. sector					1.391***	
					(0.0318)	
Receives wages from non-ag. sector					1.155***	
					(0.0299)	
Owns a business in non-ag. sector					0.417***	
					(0.0127)	
Owns a farm					1.501***	
					(0.0419)	
Share of hh members working off farm					0.234***	
					(0.0124)	
Distance to drinking water source						1.000***
						(0.0000110)
hh has access to piped water						2.90E-10
						(0.000000447)
Sustained impoverished						
Kigali	ref.	ref.	ref.	ref.	ref.	ref.
Southern Province	0.499***	0.506***	0.487***	0.324***	0.341***	0.403***
	(0.0161)	(0.0164)	(0.0158)	(0.0112)	(0.0114)	(0.0133)
Western Province	0.452***	0.438***	0.430***	0.277***	0.291***	0.365***
	(0.0150)	(0.0146)	(0.0146)	(0.00983)	(0.0101)	(0.0124)
Northern Province	0.665***	0.674***	0.683***	0.429***	0.440***	0.524***
	(0.0226)	(0.0229)	(0.0236)	(0.0155)	(0.0156)	(0.0181)
Eastern Province	0.375***	0.399***	0.397***	0.247***	0.240***	0.303***
	(0.0120)	(0.0129)	(0.0129)	(0.00850)	(0.00813)	(0.00987)

Age of hh head	1.118***	1.116***	1.174***	1.115***	1.096***	1.104***
	(0.00470)	(0.00471)	(0.00549)	(0.00480)	(0.00471)	(0.00468)
Sq. age of hh head	0.999***	0.999***	0.998***	0.999***	0.999***	0.999***
	(0.0000426)	(0.0000428)	(0.0000476)	(0.0000437)	(0.0000436)	(0.0000430)
No education	ref.	ref.	ref.	ref.	ref.	ref.
Primary	0.317***	0.319***	0.309***	0.397***	0.342***	0.323***
	(0.00735)	(0.00741)	(0.00723)	(0.00953)	(0.00814)	(0.00750)
Secondary	Not estimable	Not estimable	Not estimable	Not estimable	Not estimable	Not estimable
	.	.	.	.	.	.
Urban status	0.315***	0.331***	0.364***	0.286***	0.463***	0.373***
	(0.00941)	(0.00999)	(0.0111)	(0.00900)	(0.0145)	(0.0114)
Female hh head	0.992	1.011	0.944*	0.997	0.800***	1.022
	(0.0234)	(0.0239)	(0.0233)	(0.0241)	(0.0199)	(0.0240)
hh size	1.040***	1.049***	0.953***	1.157***	1.089***	1.061***
	(0.00487)	(0.00492)	(0.00525)	(0.00594)	(0.00551)	(0.00506)
Received a cow from gov.		0.851***				
		(0.0313)				
Received gov. support		2.157***				
		(0.0617)				
Share of dependents			6.342***			
			(0.279)			
Share of persons with disability			1.588***			
			(0.0437)			
Has health insurance			0.567***			
			(0.0124)			
Environmental risk in past 12 months			1.554***			
			(0.0312)			

Log total hh savings				0.855***		
				(0.00180)		
Any remittances				7.363***		
				(0.541)		
Log total value of remittances received				0.814***		
				(0.00655)		
Receives wages from ag. sector					3.381***	
					(0.0716)	
Receives wages from non-ag. sector					0.793***	
					(0.0192)	
Owns a business in non-ag. sector					1.049*	
					(0.0250)	
Owns a farm					2.021***	
					(0.0622)	
Share of hh members working off-farm					0.822***	
					(0.0368)	
Distance to drinking water source						1.000
						(0.0000146)
hh has access to piped water						0.121***
						(0.00847)
Observations	1113	1113	1113	1113	1113	1113

Notes: Exponentiated coefficients; standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

Table 11:Determinants of poverty (fixed-effect logit)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Policies	Health	Finance	Occupation	Amenities	All
Poverty status							
Age of hh head	1.091***	1.087***	1.109***	1.086***	1.109***	1.091***	1.116***
	(0.00435)	(0.00438)	(0.00454)	(0.00435)	(0.00456)	(0.00437)	(0.00480)
Sq. age of hh head	0.999***	0.999***	0.999***	0.999***	0.999***	0.999***	0.999***
	(0.0000369)	(0.0000374)	(0.0000380)	(0.0000374)	(0.0000386)	(0.0000371)	(0.0000408)
Primary	0.910***	0.913***	0.851***	0.880***	0.899***	0.876***	0.814***
	(0.0172)	(0.0173)	(0.0163)	(0.0169)	(0.0174)	(0.0166)	(0.0163)
Secondary	2.748***	2.757***	3.098***	2.200***	3.084***	2.138***	1.994***
	(0.236)	(0.237)	(0.282)	(0.193)	(0.277)	(0.193)	(0.198)
Urban status	1.040*	1.048**	1.071***	1.028	0.996	1.050**	1.018
	(0.0163)	(0.0165)	(0.0168)	(0.0165)	(0.0160)	(0.0166)	(0.0169)
Female hh head	2.296***	2.294***	1.790***	2.287***	1.932***	2.262***	1.731***
	(0.0740)	(0.0741)	(0.0591)	(0.0730)	(0.0658)	(0.0731)	(0.0599)
2011	ref.	ref.	ref.	ref.	ref.	ref.	ref.
2014	0.901***	0.908***	1.014	0.996	0.938***	0.931***	1.146***
	(0.00849)	(0.00877)	(0.00996)	(0.00960)	(0.00899)	(0.00889)	(0.0120)
2017	1.000	1.015	1.269***	1.144***	1.061***	1.046***	1.506***
	(0.0127)	(0.0134)	(0.0171)	(0.0147)	(0.0136)	(0.0135)	(0.0216)
hh size	1.611***	1.616***	1.598***	1.682***	1.590***	1.630***	1.681***
	(0.00977)	(0.00983)	(0.00983)	(0.0103)	(0.00986)	(0.00996)	(0.0108)
Received a cow from gov.		0.856***					0.898***
		(0.0180)					(0.0199)
Received gov. support		1.009					1.065***
		(0.0139)					(0.0156)

Share of dependents			6.484***				4.726***
			(0.203)				(0.161)
Share of persons with disability			0.988				0.973*
			(0.0129)				(0.0131)
Has health insurance			0.704***				0.690***
			(0.00698)				(0.00707)
Environmental risk in past 12 months			1.255***				1.252***
			(0.0117)				(0.0120)
Log total hh savings				0.949***			0.954***
				(0.00106)			(0.00112)
Any remittance				5.937***			5.173***
				(0.211)			(0.191)
Log total value of remittance received				0.791***			0.805***
				(0.00325)			(0.00345)
Wages from ag. sector					1.539***		1.419***
					(0.0174)		(0.0166)
Wages from non-ag. sector					1.105***		0.998
					(0.0139)		(0.0132)
Business in non-agr. sector					0.631***		0.561***
					(0.00871)		(0.00816)
Owns a farm					0.541***		0.479***
					(0.00927)		(0.00868)
Share of hh members working off-farm					0.382***		0.577***
					(0.00916)		(0.0148)

Distance to drinking water source						1.000*	1.000***
						(0.00000412)	(0.00000438)
Access to piped water						0.0656***	0.0926***
						(0.00516)	(0.00742)
Obs.	2177	2177	2177	2177	2177	2177	2177
Households	726	726	726	726	726	726	726

Notes: Exponentiated coefficients; standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 12:Dynamic determinants of poverty (random-effect logit)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Policies	Health	Finance	Occupation	Amenities	All
Poverty status							
Kigali	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Southern Province	0.809***	0.792***	0.727***	0.589***	0.646***	0.655***	0.483***
	(0.0179)	(0.0174)	(0.0152)	(0.0123)	(0.0134)	(0.0145)	(0.00948)
Western Province	0.955*	0.925***	0.888***	0.662***	0.759***	0.786***	0.553***
	(0.0212)	(0.0203)	(0.0186)	(0.0138)	(0.0158)	(0.0174)	(0.0108)
Northern Province	0.929**	0.968	0.847***	0.639***	0.765***	0.748***	0.591***
	(0.0223)	(0.0231)	(0.0193)	(0.0145)	(0.0172)	(0.0179)	(0.0125)
Eastern Province	0.542***	0.572***	0.504***	0.408***	0.457***	0.453***	0.395***
	(0.0120)	(0.0126)	(0.0106)	(0.00856)	(0.00957)	(0.0100)	(0.00787)
L.age of hh head	1.068***	1.071***	1.114***	1.048***	1.054***	1.064***	1.079***
	(0.00257)	(0.00255)	(0.00264)	(0.00231)	(0.00233)	(0.00252)	(0.00227)
L.sq.age of hh head	0.999***	0.999***	0.999***	0.999***	0.999***	0.999***	0.999***
	(0.0000233)	(0.0000231)	(0.0000231)	(0.0000213)	(0.0000214)	(0.0000230)	(0.0000206)
L.no education	ref.	ref.	ref.	ref.	ref.	ref.	ref.
L.primary education	0.285***	0.294***	0.294***	0.381***	0.348***	0.312***	0.465***
	(0.00376)	(0.00384)	(0.00372)	(0.00470)	(0.00428)	(0.00407)	(0.00536)
L.secondary education	0.0129***	0.0136***	0.0178***	0.0329***	0.0205***	0.0222***	0.0763***
	(0.000737)	(0.000778)	(0.000987)	(0.00180)	(0.00112)	(0.00128)	(0.00410)
Urban	0.218***	0.226***	0.249***	0.251***	0.272***	0.291***	0.382***
	(0.00364)	(0.00375)	(0.00400)	(0.00406)	(0.00439)	(0.00486)	(0.00598)
L.female hh head	1.517***	1.500***	1.339***	1.558***	1.310***	1.534***	1.273***
	(0.0216)	(0.0211)	(0.0181)	(0.0205)	(0.0177)	(0.0215)	(0.0159)
2017	ref.	ref.	ref.	ref.	ref.	ref.	ref.

2014	0.754***	0.768***	0.745***	0.733***	0.729***	0.784***	0.758***
	(0.00627)	(0.00641)	(0.00616)	(0.00599)	(0.00590)	(0.00664)	(0.00624)
L.hh size	1.255***	1.258***	1.122***	1.326***	1.241***	1.266***	1.227***
	(0.00380)	(0.00379)	(0.00348)	(0.00381)	(0.00360)	(0.00382)	(0.00355)
Received a cow from gov.		0.937***					0.983
		(0.0170)					(0.0155)
Received gov. support		2.014***					2.241***
		(0.0277)					(0.0285)
L.share of dependents			9.173***				6.106***
			(0.219)				(0.143)
Share of persons with disability			1.330***				1.205***
			(0.0176)				(0.0147)
L.has health insurance			0.580***				0.686***
			(0.00608)				(0.00675)
Environmental risk in past 12 months			1.293***				1.233***
			(0.0145)				(0.0130)
Log total hh savings				0.883***			0.889***
				(0.000943)			(0.000942)
L.any remittances				16.00***			8.242***
				(0.574)			(0.285)
L.log total value of remittances received				0.729***			0.785***
				(0.00297)			(0.00309)
L.wages from ag. sector					2.695***		2.121***
					(0.0290)		(0.0215)

L.wages from non-ag. sector					1.340***		1.091***
					(0.0165)		(0.0130)
L.business in non-ag. sector					1.000		0.813***
					(0.0125)		(0.00982)
L.owns a farm					1.041**		0.822***
					(0.0149)		(0.0113)
L.share working off farm					0.505***		1.172***
					(0.0119)		(0.0282)
L.distance to drinking water source						1.000***	1.000***
						(0.00000546)	(0.00000497)
L.hh has access to piped water						0.0831***	0.201***
						(0.00309)	(0.00680)
Obs.	3592	3592	3592	3592	3592	3592	3592
Households	1797	1797	1797	1797	1797	1797	1797

Notes: Exponentiated coefficients; standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13:Summary statistics of explanatory variables (panel)

	2010/11	2013/14	2016/17
Age of hh head	44.13	46.61	48.90
	(0.36)	(0.32)	(0.35)
hh head has no education	0.68	0.61	0.66
	(0.01)	(0.01)	(0.01)
Urban status	0.21	0.25	0.23
	(0.01)	(0.01)	(0.01)
Female hh head	0.27	0.23	0.28
	(0.01)	(0.01)	(0.01)
hh size	4.86	4.91	3.85
	(0.05)	(0.05)	(0.04)
Received a cow from gov.	0.04	0.08	0.11
	0.00	(0.01)	(0.01)
Received gov. support	0.01	0.10	0.15
	0.00	(0.01)	(0.01)
Share of dependents	0.46	0.44	0.40
	(0.01)	(0.01)	(0.01)
Share of persons with disability	0.16	0.13	0.17
	(0.01)	(0.01)	(0.01)
Has health insurance	0.79	0.78	0.81
	(0.01)	(0.01)	(0.01)
Environmental risk in past 12 months	0.32	0.22	0.16
	(0.01)	(0.01)	(0.01)
Log total hh savings	4.17	5.67	4.92
	(0.12)	(0.12)	(0.11)
Any remittances	0.52	0.54	0.52
	(0.01)	(0.01)	(0.01)
Log total value of remittances received	4.67	4.98	4.70
	(0.11)	(0.11)	(0.11)
Wages from ag. sector	0.30	0.23	0.28
	(0.01)	(0.01)	(0.01)
Wages from non-ag. sector	0.35	0.35	0.32
	(0.01)	(0.01)	(0.01)
Owns a business in non-ag. sector	0.26	0.27	0.23
	(0.01)	(0.01)	(0.01)
hh head owns a farm	0.80	0.77	0.79
	(0.01)	(0.01)	(0.01)

Share of hh members working off farm	0.27	0.28	0.28
	(0.01)	(0.01)	(0.01)
Distance to drinking water source	542.20	746.67	814.16
	(14.05)	(22.95)	(24.10)
hh has access to piped water	0.08	0.12	0.10
	(0.01)	(0.01)	(0.01)
N	**1797**	**1797**	**1797**