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Understanding Poverty Dynamics in Rwanda

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Alfred Bizoza, Philipp Jäger, and Alexandre Simons[1]

Understanding Poverty Dynamics in Rwanda

Abstract

Poverty rates in Rwanda have fallen substantially in the last decades. So far, however, it is not well understood what has driven this poverty decline. Thus, in this paper, we rely on a newly available household panel dataset collected in 2010/11 and 2013/14 to investigate poverty and poverty trajectories in Rwanda. According to our estimates increased labor market participation among originally poor households – especially off-farm employment – has facilitated poverty escape. Even though overall poverty rates have declined, our analysis reveals that a non-negligible part of originally non-poor households have fallen below the poverty line between the two survey waves. The estimates suggest that lower educated households are more vulnerable of becoming impoverished.

JEL Classification: I32

Keywords: Poverty; Rwanda; EICV

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1 Alfred Bizoza, IPAR-Rwanda; Philipp Jäger, RWI; Alexandre Simons, IPAR-Rwanda & Université catholique de Louvain. – *This research was funded by the Chronic Poverty Advisory Network of the Overseas Development Institute. The authors are grateful to NISR for their contribution in sharing the panel dataset.* – *All correspondence to: Philipp Jäger, RWI, Hohenzollernstr. 1-3, 45128 Essen, Germany, e-mail: philipp.jaeger@rwi-essen.de*

1. Introduction and Background

No more poverty! This target, formulated as one of the Sustainable Development Goals, is very ambitious. Even though global poverty has declined substantially in the past decades, the way to the 2030 UN target is still long. Rwanda has contributed to the global poverty reduction: its poverty rate fell by more than 15 percentage points since 2005. However, poverty remains a big challenge in Rwanda. Based on the national poverty line, 39.1% of the population was still classified as poor in 2013/14 (NISR, 2015). Identifying the determinants of poverty and poverty escape is crucial to enable policy-makers to continuously fight poverty. Thus, in this paper, we analyze factors that are associated with poverty and poverty dynamics using the third and fourth wave of a large household survey (Enquête Intégrale sur les Conditions de Vie des ménages (EICV)) collected by the National Institute of Statistics (NISR). To our knowledge, this is the first study that uses the EICV sub-group of panel households to investigate factors associated with poverty trajectories in Rwanda.

The literature on poverty and poverty dynamics has been significantly growing since the 2000's. The first to review the literature on the subject were Baulch and Hoddinott (2000) at a time where the lack of data in developing countries, and more specifically the lack of panel data, was resulting in a poor understanding of the determinants of poverty dynamics in these countries. Since then, panel data became increasingly available and a range of approaches to analyze poverty dynamics has been developed. Authors have subsequently investigated several poverty states, among others, chronic poverty (McKay and Lawson (2003)), poverty traps (Carter and Barret (2006)), transient poverty (Duclos et al. (2010); Jalan and Ravaillon (2000)) and poverty transitions (Azevedo and Bouillon (2009)). In line with previous studies, we investigate the association between poverty dynamics and several household characteristics including education, the labor market status of household members, the household size and composition etc. We find that participation in the labor market is a key factor behind poverty escapes, while education is important to reduce the risk of becoming impoverished (i.e. moving from non-poor to poor).

So far, poverty in Rwanda has been either analyzed for specific sectors only (e.g Ansoms 2010, Justino and Verwimp, 2013) or analyzed using a static or poverty headcount trend analysis. Most

recent examples of the static approach include NISR (2016), Kalisa and Nottmeyer (2017) and Cho and Kim (2017). These three studies rely on cross-sectional data. NISR (2016) and Cho and Kim (2017) look at poverty in the standard expenditure approach while Kalisa and Nottmeyer (2017) employ a Multidimensional Poverty Index using the three common dimensions of poverty (Health, Education, Living standard). While the poverty headcount and other static indicators are helpful to track general poverty trends, they have some drawbacks. First, these snapshots on poverty are by nature static. Hence, they do not indicate whether the poor are permanently stuck in poverty or whether at least a part of them frequently moves in or out of poverty. Understanding poverty dynamics, however, is important when it comes to policy design and evaluation. In some countries, policies favoring poverty escape might be most beneficial while in others preventing impoverishment is crucial for sustainable poverty reduction.

To our knowledge, over the last 20 years, the only large dynamic panel-analysis available on Rwanda consists of a poverty transition matrix (NISR, 2016).[1] This matrix provides the share of households that moved from one poverty status to another between 2010 and 2014. However, NISR (2016) does not investigate which panel factors can explain these poverty transitions. Therefore, this paper will be the first to analyze the determinants of poverty dynamics in Rwanda using a comprehensive household panel.

The rest of the paper is structured as follows. The next section introduces the dataset and provides a descriptive analysis of poverty in Rwanda. In section 3, the determinants of poverty and poverty dynamics are assessed empirically. The last section presents the main conclusions.

2. Data and descriptive statistics

2.1. The household dataset

In order to analyse poverty dynamics in Rwanda, we employ a panel household dataset made available from the National Institute of Statistics Rwanda (NISR). This panel dataset is a subset of the cross-section dataset derived from the Enquête Intégrale sur les Conditions de Vie des ménages (EICV) [2] conducted periodically with an interval of about 3 years. The last two waves of the survey, EICV3 and EICV4, were undertaken in 2010/11 and 2013/14 respectively. From the

[1] Justino and Verwimp (2013) use a panel dataset with waves overlapping the 1994 Genocide against the Tutsi.
[2] Integrated Household Living Conditions Survey

14308 households surveyed in 2010/2011 during EICV3, 1920 were selected to be surveyed again in 2013/14 EICV4. Some of these households split and thus generated new household, e.g. because young family members left and started a new family. In total, 2423 households resulted from the original 1920 households. In order to employ panel techniques we focus on the "original" 1920 households only. We define the "original" household in EICV4 as the one where the majority of people that were re-interviewed live. If the household splits equally, e.g. a six-person household split into two three-person households, we consider the one with the older household members as the original one. Based on this procedure, which follows from our intended research design, our descriptive results differ slightly from the one presented by NISR (2016).

For each panel household, we obtained a range of information including the poverty status as well as price adjusted consumption values per adult equivalent. Unfortunately, our panel does not include all information that is available in the cross-sections. Therefore, we have not yet been able to incorporate resource-based characteristics (e.g. access to electricity, drinking water). Moreover, the urban/rural classification changed across waves, thus, we cannot compare the evolution of poverty in urban and rural areas over time. Otherwise the panel is well balanced, and attrition does not constitute a problem.

2.2. Poverty in Rwanda

In this paper, we focus on monetary poverty. Thus, each household that has a consumption level below the national poverty line is coded as poor, while each household that consumes more than the national poverty line is considered non-poor. The Rwandan poverty line is calculated in a two-step procedure. First, NISR determines the value of a food basket that provides about 2500 Kcal per day per adult equivalent. Second, NISR adds a provision for non-food consumption. The so calculated poverty line hence adds up to 159,375 RwF per adult equivalent in prices of January 2014. The Rwandan poverty line is lower than the international poverty line of 1.90 US$ in Purchasing power parities at prices of 2011, which roughly corresponds to 195,614 RwF.[3]

As we are ultimately interested in drivers of poverty escape, we want to exclude churners– i.e. households that are close to the poverty line and potentially oscillate between poverty and non-poverty. Thus, we exclude the households that are in the range of 5% above or below the poverty

[3] 365 x 1.9 x 246.8 (PPP-exchange rate RWF to US$ in 2011) x 1.14 (Poor Price increase between 2011 and 2014)

line (in EICV3 and/or EICV4). This reduces the number of households in our sample to 1,728. Poverty in Rwanda has also declined substantially according to our sub-sample panel dataset between the two waves. While in the EICV3 35.5% of the sampled households have been poor, in EICV4 only 31.1% of the same households were below the poverty line.[4] Poverty rates also vary across provinces with the capital Kigali typically having much lower poverty rates than the rest of the country.

In the following, we take a deeper look into poverty dynamics. Table 1, shows the poverty transition matrix which indicates that more than half of the population was non-poor and stayed non-poor across the two waves (54.75%). However, it is worth noting that we captured the poverty status in two points of time, 2010 and 2014. What happened between these two points is unknown. That is, we are not able to capture whether some households in the non-poor category are oscillating between the poor and non-poor categories. However, given that we exclude households close to the poverty line, this problem should be smaller in our setting.

Table 1: Poverty transition matrix[5]

		EICV4 (2014)		
EICV3 (2010)		Not Poor	Poor	Total
	Not poor	54.75%	9.72%	64.47%
	Poor	14.18%	21.35 %	35.53%
	Total	68.93%	31.07%	

The other status quo category, that is, the poor to poor category, accounts for more than a fifth of the households (21.35%). This category is usually referred to as the chronically poor. However, as above mentioned, it could well be the case that part of the population in this category is actually

[4] Those numbers are significantly lower than the number reported by NISR (46.0% to 39.1%). The difference comes from the use of the panel data, a subset of the full cross section EICV dataset used by the National Institute of Statistics, which is not fully representative of the cross-section dataset. Moreover, we conduct the analysis on the household level instead of the individual level and therefore give more weight to smaller typically more affluent households (given that we do not weight by household size).

[5] Note that the numbers slightly differ from the transition matrix presented in NISR (2016). This is based on three factors, first we exclude households that are close to the poverty line (+- 5%). Second, we focus on the 1920 original households to keep the sample consistent with the empirical analysis in chapter 3. Third, we conduct the analysis on the household level instead of the individual level.

oscillating across the poverty line (e.g. in the years were no data is collected). In that case they might be in fact transient poor.

The last two categories consist of the population which moves from one poverty status to another. These two groups account for almost one quarter of the population (23.90%). The first category, representing 9.72% of the population, was non-poor in 2010 (EICV3) and became poor in 2014 (EICV4). The second category has moved the other way. That is, 14.18% of the population moved out of poverty from 2010 to 2014. The share of households that move-up (15.21 %) or down (10.15%) is similar if we rely on the international 1.90 USD (in PPP) poverty line. However, more households are considered chronically poor (33.51%) and less as never-poor (41.13 %).

3. Determinants of poverty and poverty dynamics in Rwanda

3.1. Poverty determinants

We now move to potential determinants of poverty and poverty dynamics. Before analyzing poverty dynamics, we start by investigating the factors that are associated with a household being poor in the first place. Therefore, we estimate the following logistic equation:

$$\Pr\left(Poverty_{i,t} = 1 | \beta, x_{i,t}\right) =$$

$$f(\beta_0 + \beta_1 H_{it} + \beta_2 Head_{it} + \beta_3 Act_{it} + \beta_4 Edu/HI_{it} + \beta_5 Province_{it} + \beta_6 Time_t + \varepsilon_{i,t})$$

Where *i* and *t* denote the household and time dimension. The dependent variable $Poverty_{i,t}$ is the poverty status of household *i* at time *t*. The household is either poor ($Poverty_{i,t} = 1$) or non-poor ($Poverty_{i,t} = 0$) according to the Rwandan poverty line of 159,375 RWF per adult equivalent per year in prices of January 2014. The determinants include:

- Household characteristics H_{it} (household size, the share of dependents (children: 0-16 years and elderly: 65+ years) and the share of disabled);
- Characteristics of the household head $Head_{it}$ (age, age², and gender);
- Labor market characteristics Act_{it} (share of the household members active in the labor market, four dummies for main area of activity (can be one for more than one category): Household works mainly (=majority of household members) in (i) its own farm, (ii) a farm which is not

his/her own farm, (iii) an off-farm business which is not its own business or (iv) its own off-farm business),

- Education and health insurance characteristics Edu/HI_{it} (highest level of education - from no education (0) to completed tertiary (3) - and whether at least somebody in the household has health insurance)
- Province and time fixed effects.

Summary statistics are provided in Appendix A. Table 2 provides the regression results. As expected larger households and households with more dependents are more likely to be poor. Other risk factors include: having an older or female household head or working mainly on a farm which is not owned by the household. In contrast, households with either high levels of education, or health insurance, or a high share of active people in the labor market, especially if they work in off-farm businesses face a lower risk of being poor.

As a result, we can rank the activities according to their associated risk of being poor. From the highest poverty risk, to the lowest: Employed in a farm, working in its own farm and working in an off-farm business (own or employed).

3.2. Determinants of poverty transitions

After the static analysis, we move to the evaluation of the determinants of poverty dynamics. To do so, we first categorize households and individuals with respect to their poverty trajectories over the two waves of data that we have at hand. The categories are the following:

a) Chronic poor (PP), defines households who were poor in the EICV3 and stayed (chronically) poor in EICV4.
b) Escaper (PN), defines households who were poor in EICV3 but managed to escape poverty and are characterized as non-poor in EICV4.
c) Impoverishment (NP), defines households who were originally non-poor but fell below the poverty line in EICV4.
d) Never poor (NN), defines households who were neither poor in EICV3 nor in EICV4.

Table 2: Determinants of Poverty

	(1) Poverty
Number of HH members	1.227***
	(0.03)
Share of children and elderly	4.200***
	(1.02)
Share of disabled	1.458
	(0.43)
Age of the HH-head	1.092***
	(0.02)
Age of the HH-head squared	0.999***
	(0.00)
Male HH-head	0.742**
	(0.07)
Share of people active in the labor market	0.353***
	(0.09)
Own farm (mainly)	1.381
	(0.27)
Farm Salary (mainly)	2.718***
	(0.29)
Off-farm Salary (mainly)	0.320***
	(0.09)
Off-farm business (mainly)	0.393***
	(0.05)
Education	0.552***
	(0.04)
Health insurance	0.478***
	(0.05)
Southern Province	1.015
	(0.16)
Western Province	0.974
	(0.16)
Northern Province	1.341
	(0.23)
Eastern Province	0.669*
	(0.11)
year=4	0.851
	(0.07)
Observations	3456

Notes: Dependent variable: Poverty (Non-poor=0; Poor=1). Coefficients in relative risk ratios. Standard errors in parentheses.
***,**,* Significance at the 1%,5%,10% Level. Kigali province is the base category

In the following, we empirically assess the risk of being chronically poor or getting impoverished. We use the same explanatory variables as before, but only consider the values from the baseline (EICV3) survey. For the ease of interpretation, we run two binomial regression where we condition on the poverty status in EICV3. Hence, we analyze the risk of being chronically poor relative to the subset of escapers and the risk of falling into poverty compared to the constantly non-poor households[6]. Results are provided in Table 3.

Table 3: Determinants of Poverty transitions (Binominal logit)

	(1) Chronically poor Base: Escapers	(2) Impoverishment Base: Never-poor
Number of HH members	1.057	1.126*
	(0.06)	(0.07)
Share of children and elderly	16.286***	5.014***
	(9.87)	(2.42)
Share of disabled	0.784	4.133**
	(0.55)	(2.22)
Age of the HH-head	1.129**	1.061
	(0.04)	(0.04)
Age of the HH-head squared	0.999***	0.999*
	(0.00)	(0.00)
Male HH-head	1.054	0.875
	(0.24)	(0.21)
Share of people active in the labor market	0.595	1.565
	(0.39)	(0.86)
Own farm (mainly)	0.330	1.553
	(0.20)	(0.58)
Farm Salary (mainly)	1.952**	2.270***
	(0.42)	(0.54)
Off-farm Salary (mainly)	0.437	0.501
	(0.44)	(0.25)
Off-farm business (mainly)	0.812	0.837
	(0.27)	(0.21)
Health insurance	0.639*	0.600*
	(0.13)	(0.14)
Education	0.821	0.343***
	(0.15)	(0.06)
Southern Province	0.220**	0.256***
	(0.11)	(0.08)
Western Province	0.427	0.258***
	(0.21)	(0.08)
Northern Province	0.457	0.528*
	(0.23)	(0.17)
Eastern Province	0.375	0.262***
	(0.19)	(0.08)
Observations	614	1114

Notes: Coefficients in relative risk ratios. Standard errors in parentheses. ***,**,* Significance at the 1%,5%,10% Level. Kigali province is the base category

[6] The results are similar if we estimate a multinomial logit model using escapers and never-poor as base categories.

The poverty transition analysis confirms the results from the static poverty regression. The risk of being chronically poor or getting impoverished is higher for households that have a larger share of dependents (children and elderly) in EICV3 and that work on a farm that is not owned by the household[7]. In contrast education and having health insurance is associated with a lower risk of being chronically poor/getting impoverished. In general, the directions of the effects are similar across the two models. However, the risk of being chronically poor compared to escapers is increased substantially more by a high share of dependents–the coefficient is more than three times higher than for impoverishment. On the other side, having a higher share of disabled people in the household results in a higher risk of getting impoverished, but does not increase the chance of remaining poor.

After having identified the baseline characteristics that affect the risk of staying/becoming poor, we go deeper and investigate whether changes in the explanatory variables help us to explain poverty transitions. So far, we aimed to answer questions like: Is a household that was mainly working on its own farm in ECIV3 more likely to be poor in EICV4 (either PP or NP). In the following we want to also have a look at whether household that e.g. shifted to mainly working off-farm are more or less likely to remain poor/ or become impoverished. Therefore, we also include the first difference of the explanatory variables together with the baseline values in the regression. The results in Table 4 show that the direction of the significant determinants are mostly the same for the baseline and change variables. For instance, a household is more likely to remain poor if the members worked mainly on a farm not owed by the household in 2010 (EICV3), but it is also more likely to remain poor if the household switched to working mainly on a farm not owned by the household between EICV3 and EICV4. Similarly, a household is less likely to be poor in EICV4 if it had a health insurance in EICV3 already, or if it decides to obtain health insurance[8] in between EICV3 and EICV4. Note, given that many decisions e.g. to obtain health insurance, are endogenous, we do not claim causality.

[7] This effect is only to a very small extent reduced by the inclusion of the urban/rural variable. Urban/rural differences can only be included for EICV3, because the classification changes in EICV4.

[8] Health insurance in Rwanda is mandatory and most households are insured, however, a substantial part is not (around 20% of households in our sample lack a person with health-insurance). Insurance prices differ by income. For the poorest households insurance is essentially free, because the fee of 2000 Rwf is paid by the state or donors, middle-income households pay 3000 RwF per year, and the richest (about one percent of the population) has to contribute 7000 RwF to the system (Chemouni, 2018).

Table 4: Determinants of Poverty transitions including first differences (Binominal logit)

	(1) Chronically poor Base: Escapers	(2) Impoverishment Base: Never-poor
Number of HH members	1.115	1.284***
	(0.08)	(0.09)
Share of children and elderly	8.045**	2.113
	(5.80)	(1.41)
Share of disabled	0.409	9.941***
	(0.37)	(6.75)
Age of the HH-head	1.169***	1.077
	(0.05)	(0.04)
Age of the HH-head squared	0.999***	0.999*
	(0.00)	(0.00)
Male HH-head	0.856	0.558*
	(0.22)	(0.15)
Share of people active in the labor market	0.120*	0.178*
	(0.10)	(0.14)
Own farm (mainly)	0.206	1.344
	(0.17)	(0.75)
Farm Salary (mainly)	2.964***	5.022***
	(0.89)	(1.67)
Off-farm Salary (mainly)	0.200	0.212*
	(0.27)	(0.16)
Off-farm business (mainly)	0.498	0.248***
	(0.21)	(0.10)
Health insurance	0.366***	0.360**
	(0.11)	(0.12)
Education	0.710	0.229***
	(0.17)	(0.05)
Change Number of household members	1.283*	1.483***
	(0.13)	(0.13)
Change Share of children and elderly	1.579	1.088
	(1.20)	(0.83)
Change Share of disabled	0.879	3.140
	(0.75)	(2.36)
Change Share of people active in the labor market	0.104***	0.132**
	(0.06)	(0.09)
Change Own farm (mainly)	0.832	1.968
	(0.49)	(0.93)
Change Farm Salary (mainly)	1.793*	2.917***
	(0.46)	(0.77)
Change Off-farm Salary (mainly)	0.662	0.296*
	(0.54)	(0.18)
Change Off-farm business (mainly)	0.496	0.213***
	(0.18)	(0.08)
Change Health insurance	0.515**	0.573*
	(0.11)	(0.14)
Change Education	0.861	0.382***
	(0.18)	(0.08)
Province dummies	yes	yes
Observations	614	1114

Notes: Coefficients in relative risk ratios. Standard errors in parentheses. ***,**,* Significance at the 1%,5%,10% Level.

All in all, the poverty transition regressions point to a range of robust risk factors presented in Table 5. Moreover, increasing the level of education between EICV3 and EICV4 reduces the risk of getting impoverished.

Table 5: Poverty risk factors

Risk of staying poor (relative to poverty escape) **increased by**	**Risk of becoming impoverished** (relative to remain non-poor) **increased by**
High share of dependents in EICV3	High share of dependents in EICV3
Household mainly works on farms that are not owned by the household in EICV3	Household mainly works on farms that are not owned by the household in EICV3
No health insurance in EICV3	No health insurance in EICV3
	High share of disabled in EICV3
	Low levels of education in EICV3
Increase in household size between EICV3 and EICV4	Increase in household size between EICV3 and EICV4
Reduction in the share of persons active in the labor market between EICV3 and EICV4	Reduction in the share of persons active in the labor market between EICV3 and EICV4
Switch to mainly work on farms that are not owned by the household between EICV3 and EICV4	Switch to mainly work on farms that are not owned by the household between EICV3 and EICV4
	Stop working mainly at off-farm businesses
Loss of health insurance between EICV3 and EICV4	Loss of health insurance between EICV3 and EICV4

Using our regression results we can also predict which factors were most important in reducing the risk of remaining/becoming poor. Therefore, we use our model (1) and (2) presented in Table 4 and predict the probability of remaining poor or getting impoverished. We base this on the estimated coefficients as well as on values for the average household in the sample with the same poverty status in EICV3. Specifically, first we estimate the probability of remaining poor relative to poverty escape for a household that has the characteristics of an average poor household in EICV3. Second, we predict the probability of becoming poor relative to staying non-poor for a household that has the characteristics of an average non-poor household in EICV3.

The data suggests that the probability of staying poor for a household with the characteristics of an average poor household in EICV3 is predicted at around 63%. In contrast, the model predicts a very low probability of becoming poor of around 6% for an average non-poor household. Thus, the estimated model is consistent with the findings from the poverty transition matrix (Table 2), that falling into poverty is less likely (around 15%[9] of originally non-poor households fell into poverty) than remaining poor (around 60%[10] of originally poor household remained poor).

We also evaluate which household characteristics have contributed most to a lower probability of remaining/becoming poor between EICV3 and EICV4 according to our model. Therefore, for each statistically significant change variable we compare the difference in the predicted probabilities of remaining/becoming poor for households that experienced no change in the significant variable with a household that has seen a change in line with average change between EICV3 and EICV4 for the respective sub-group (originally poor/non-poor). We keep all remaining explanatory fixed at the sample averages.

The analysis reveals that among the four significant change variables, the increase in the share of economically active people between EICV3 and EICV4 is predicted to be the most important variable in reducing the probability of being stuck in poverty[11] (probability of chronically poor reduced by -2.6 percentage points). The decline of the number of households mainly active in

[9] 9.72%/64.47%.
[10] 21.35 %/35.53%
[11] Note that the overall increase in labor force participation was limited in the sample (+0.4 percentage points). However, the average increase masks diverging trends among originally poor and non-poor households. While activity increased by around 5 percentage points for originally poor households, it declined by approximately 2 percentage for originally non-poor households, who form a bigger part of the sample.

farms not owned by the household contribute 1.1 percentage points to the reduction of the share of chronically poor, and the decline in average (ß) household size contributes another 0.7 percentage points. Health insurance coverage, on the other hand, has decreased slightly for originally poor households in EICV3, increasing the probability of being poor (+ 0.2 percentage points).

The probability of falling into poverty for households that have been non-poor in EICV3 is substantially reduced by the increase in average education which is predicted to have reduced the probability of falling into poverty by 1.6 percentage points. The increase of off-farm employment as well as the decline in households mainly active in farming activities in farms not owned by the household are predicted to have slightly reduced the probability of getting impoverished (each -0.2 percentage points). The other variables have not moved in a beneficial direction between EICV3 and EICV4, e.g. average household size of formerly non-poor household has increased, and the share of economically active person has decreased.

3.3. Robustness checks

The results from the previous regressions are robust to other definitions of poverty, too. Instead of using poverty as dependent variable, we have also estimated a fixed effects regression with annual consumption per adult equivalent in prices of January 2014 as the dependent variable. For the ease of interpretation, we expressed consumption in logarithmic values. Table 6 provides the results, which are in line with the poverty estimates even though we use a slightly different sample than before because we do not exclude households close to the poverty line. For instance, an increase in the household size decreases consumption of the household by 6.6% or 10% respectively depending on the sample. Similarly, switching to farm salary reduces consumption by 6.3% or 8%, whereas switching to off-farm employment increases consumption on average between 10.9% and 25%.

Moreover, the results remain broadly the same if the international poverty is used to define poverty (see Table B1 in the appendix). An analysis conditional on the sex of the household head points to interesting differences (see Table B2-B3). The regressions suggest that having disabled person in the household is a greater risk for female headed households than for male headed households. Also female headed households are more vulnerable to the absence of labor market activity, low

education, no health coverage and farm employment than male headed households. However, given the limited sample size these results have to be treated with caution.

Table 6: Determinants of Household consumption (fixed effects model)

	(1) All households	(2) Excluding Never-poor
Number of HH members	-0.066***	-0.100***
	(0.01)	(0.02)
Share of children and elderly	-0.157*	-0.177
	(0.08)	(0.14)
Share of disabled	-0.057	-0.076
	(0.09)	(0.15)
Age of the HH-head	0.010	0.017
	(0.01)	(0.02)
Age of the HH-head squared	-0.000	-0.000
	(0.00)	(0.00)
Male HH-head	-0.001	-0.037
	(0.04)	(0.06)
Share of people active in the labor market	0.416***	0.520***
	(0.07)	(0.11)
Own farm (mainly)	0.040	-0.014
	(0.05)	(0.07)
Farm Salary (mainly)	-0.063*	-0.080*
	(0.03)	(0.04)
Off-farm Salary (mainly)	0.243***	0.250*
	(0.05)	(0.11)
Off-farm business (mainly)	0.109***	0.170**
	(0.03)	(0.05)
Education	0.059**	0.063
	(0.02)	(0.03)
Health insurance	0.035	0.052
	(0.02)	(0.03)
Constant	12.086***	11.651***
	(0.26)	(0.43)
Observations	3836	1834

Dependent variable: ln(annual consumption per adult equivalent in prices of January 2014).Fixed effect regression. Standard errors in parentheses. ***,**,* Significance at the 1%,5%,10% Level.

4. Conclusion

Poverty rates in Rwanda have declined substantially in the last decades. However, so far it is not well understood what has driven this poverty decline. In this paper, we have used a newly available households panel dataset of two waves collected in 2010/11 and 2013/14 to investigate which factors are associated with poverty and poverty trajectories in Rwanda. Within our set of explanatory variables, increased labor market participation among originally poor households– especially off-farm employment– has facilitated poverty escape. Even though overall poverty rates have declined, our analysis also reveals that a non-negligible part of originally non-poor

households has fallen below the poverty line between the two survey waves. Lower educated households tend to be more vulnerable of becoming impoverished. Thus, our findings confirm the role of structural transformation in the economy and the increase in education levels as important factors behind the overall poverty decline.

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Annex A: Summary statistics

	N	Mean	S.D.	min	max
Poverty headcount ratio	3456	0.33	0.47	0	1
Number of HH members	3456	4.82	2.22	1	22
Share of children and elderly	3456	0.47	0.24	0	1
Share of disabled	3456	0.06	0.16	0	1
Age of the HH-head	3456	45.89	15.77	17	99
Age of the HH-head squared	3456	2354.97	1649.01	289	9801
Male HH-head	3456	0.68	0.47	0	1
Share of people active in the labor market	3456	0.54	0.24	0	1
Own farm (mainly)	3456	0.80	0.40	0	1
Farm Salary (mainly)	3456	0.20	0.40	0	1
Off-farm Salary (mainly)	3456	0.14	0.34	0	1
Off-farm business (mainly)	3456	0.17	0.38	0	1
Education	3456	0.72	0.81	0	3
Health insurance	3456	0.79	0.41	0	1
Change Number of household members	1728	0.10	1.41	-9	7
Change Share of children and elderly	1728	0.02	0.19	-1	1
Change Share of disabled	1728	-0.00	0.14	-1	1
Change Share of people active in the labor market	1728	0.00	0.23	-1	1
Change Own farm (mainly)	1728	-0.02	0.33	-1	1
Change Farm Salary (mainly)	1728	-0.05	0.44	-1	1
Change Off-farm Salary (mainly)	1728	0.02	0.29	-1	1
Change Off-farm business (mainly)	1728	-0.02	0.43	-1	1
Change Health insurance	1728	-0.01	0.52	-1	1
Change Education	1728	0.23	0.66	-2	3
N	3456	4.82	2.22	1	22

	EICV3		EICV4	
	N	Mean	N	Mean
Poverty headcount ratio	1728	0.36	1728	0.31
Number of HH members	1728	4.77	1728	4.87
Share of children and elderly	1728	0.46	1728	0.47
Share of disabled	1728	0.06	1728	0.05
Age of the HH-head	1728	44.35	1728	47.44
Age of the HH-head squared	1728	2215.81	1728	2494.12
Male HH-head	1728	0.72	1728	0.63
Share of people active in the labor market	1728	0.54	1728	0.54
Own farm (mainly)	1728	0.81	1728	0.79
Farm Salary (mainly)	1728	0.23	1728	0.18
Off-farm Salary (mainly)	1728	0.13	1728	0.15
Off-farm business (mainly)	1728	0.18	1728	0.16
Education	1728	0.61	1728	0.84
Health insurance	1728	0.79	1728	0.79
N	1728		1728	

	Kigali		Southern Province		Western Province		Northern Province		Eastern Province	
	count	mean	count	mean	count	mean	count	mean	count	mean
Poverty headcount ratio	648	0.18	830	0.38	746	0.37	526	0.42	706	0.31
Number of HH members	648	5.08	830	4.66	746	4.85	526	4.79	706	4.75
Share of children and elderly	648	0.39	830	0.47	746	0.48	526	0.51	706	0.48
Share of disabled	648	0.03	830	0.07	746	0.07	526	0.07	706	0.04
Age of the HH-head	648	41.56	830	48.68	746	46.16	526	47.70	706	44.97
Age of the HH-head squared	648	1903.10	830	2609.70	746	2390.41	526	2582.74	706	2263.10
Male HH-head	648	0.73	830	0.63	746	0.71	526	0.68	706	0.65
Share of people active in the labor market	648	0.52	830	0.55	746	0.54	526	0.55	706	0.54
Own farm (mainly)	648	0.35	830	0.91	746	0.88	526	0.92	706	0.90
Farm Salary (mainly)	648	0.07	830	0.22	746	0.24	526	0.21	706	0.24
Off-farm Salary (mainly)	648	0.49	830	0.05	746	0.06	526	0.04	706	0.06
Off-farm business (mainly)	648	0.31	830	0.14	746	0.16	526	0.09	706	0.15
Education	648	1.30	830	0.56	746	0.60	526	0.67	706	0.55
Health insurance	648	0.83	830	0.74	746	0.77	526	0.81	706	0.82
Change Number of household members	324	0.14	415	0.05	373	0.10	263	-0.01	353	0.19
Share of children and elderly	324	0.03	415	0.01	373	0.01	263	0.00	353	0.03
Share of disabled	324	0.01	415	-0.01	373	-0.01	263	0.02	353	-0.01
Share of people active in the labor market	324	-0.03	415	0.01	373	0.02	263	0.00	353	0.01
Change Own farm (mainly)	324	-0.05	415	0.00	373	-0.02	263	-0.02	353	0.00
Change Farm Salary (mainly)	324	-0.01	415	-0.03	373	-0.09	263	-0.09	353	-0.02
Change Off-farm Salary (mainly)	324	0.08	415	0.01	373	0.02	263	0.00	353	0.00
Change Off-farm business (mainly)	324	-0.01	415	-0.03	373	-0.02	263	-0.03	353	-0.03
Change Health insurance	324	-0.04	415	0.04	373	-0.06	263	-0.01	353	0.01
Change Education	324	0.27	415	0.21	373	0.21	263	0.25	353	0.20
Observations	648		830		746		526		706	

Annex B: Robustness checks

Table B1: Determinants of Poverty transitions (Binominal logit) & international poverty line

	(1) Chronically poor Base: Escapers	(2) Impoverishment Base: Never-poor
Number of HH members	1.207**	1.152*
	(0.08)	(0.08)
Share of children and elderly	3.269	3.426*
	(2.01)	(2.09)
Share of disabled	0.606	4.067*
	(0.46)	(2.76)
Age of the HH-head	1.105**	1.077
	(0.04)	(0.04)
Age of the HH-head squared	0.999**	0.999*
	(0.00)	(0.00)
Male HH-head	0.879	0.873
	(0.19)	(0.24)
Share of people active in the labor market	0.195*	0.364
	(0.14)	(0.26)
Own farm (mainly)	0.422	0.769
	(0.28)	(0.41)
Farm Salary (mainly)	4.280***	2.531**
	(1.23)	(0.86)
Off-farm Salary (mainly)	0.104*	0.245*
	(0.10)	(0.17)
Off-farm business (mainly)	0.441*	0.398*
	(0.16)	(0.15)
Health insurance	0.345***	0.359**
	(0.10)	(0.12)
Education	0.808	0.320***
	(0.16)	(0.07)
Change Number of household members	1.286**	1.267**
	(0.11)	(0.11)
Change Share of children and elderly	1.386	1.077
	(0.91)	(0.74)
Change Share of disabled	1.215	2.765
	(0.90)	(1.99)
Change Share of people active in the labor market	0.160***	0.103***
	(0.09)	(0.07)
Change Own farm (mainly)	0.740	0.827
	(0.38)	(0.36)
Change Farm Salary (mainly)	2.435***	1.959*
	(0.60)	(0.54)
Change Off-farm Salary (mainly)	0.368	0.330*
	(0.24)	(0.18)
Change Off-farm business (mainly)	0.368***	0.362**
	(0.11)	(0.12)
Change Health insurance	0.568**	0.735
	(0.12)	(0.19)
Change Education	0.826	0.485***
	(0.15)	(0.10)
Province dummies	yes	yes
Observations	818	910

Notes: Coefficients in relative risk ratios. Standard errors in parentheses. ***,**,* Significance at the 1%,5%,10% Level. Kigali province is the base category

Table B2: Determinants of Poverty transitions including first differences for male household head (Binominal logit)

	(1) Chronically poor Base: Escapers	(2) Impoverishment Base: Never-poor
Number of HH members	1.202*	1.175
	(0.11)	(0.11)
Share of children and elderly	9.789*	1.968
	(9.37)	(2.16)
Share of disabled	0.673	5.606
	(0.78)	(5.84)
Age of the HH-head	1.118*	1.075
	(0.06)	(0.06)
Age of the HH-head squared	0.999*	0.999
	(0.00)	(0.00)
Share of people active in the labor market	0.393	0.142
	(0.44)	(0.17)
Own farm (mainly)	0.369	0.998
	(0.42)	(0.75)
Farm Salary (mainly)	3.182**	5.999***
	(1.15)	(2.45)
Off-farm Salary (mainly)	1.005	0.212
	(1.85)	(0.20)
Off-farm business (mainly)	0.605	0.200**
	(0.37)	(0.11)
Health insurance	0.390**	0.305**
	(0.14)	(0.12)
Education	0.766	0.278***
	(0.21)	(0.07)
Change Number of household members	1.394**	1.369**
	(0.18)	(0.15)
Change Share of children and elderly	0.782	1.820
	(0.84)	(2.08)
Change Share of disabled	0.389	0.613
	(0.48)	(0.80)
Change Share of people active in the labor market	0.239	0.257
	(0.18)	(0.26)
Change Own farm (mainly)	0.618	1.210
	(0.47)	(0.81)
Change Farm Salary (mainly)	2.372**	3.043***
	(0.76)	(0.97)
Change Off-farm Salary (mainly)	1.215	0.271
	(1.43)	(0.20)
Change Off-farm business (mainly)	0.418	0.119***
	(0.20)	(0.06)
Change Health insurance	0.460**	0.532*
	(0.12)	(0.15)
Change Education	0.956	0.506**
	(0.25)	(0.13)
Province dummies	yes	yes
Observations	426	823

Notes: Coefficients in relative risk ratios. Standard errors in parentheses. ***,**,* Significance at the 1%,5%,10% Level. Kigali province is the base category

Table B3: Determinants of Poverty transitions including first differences for female household head (Binominal logit)

	(1) Chronically poor Base: Escapers	(2) Impoverishment Base: Never-poor
Number of HH members	0.935	2.188***
	(0.15)	(0.42)
Share of children and elderly	8.987	2.291
	(12.41)	(2.80)
Share of disabled	0.035	128.969***
	(0.07)	(159.86)
Age of the HH-head	1.440***	1.255*
	(0.15)	(0.12)
Age of the HH-head squared	0.997***	0.998*
	(0.00)	(0.00)
Share of people active in the labor market	0.004**	0.202
	(0.01)	(0.29)
Own farm (mainly)	0.047	2.596
	(0.08)	(2.90)
Farm Salary (mainly)	2.018	16.814***
	(1.31)	(13.78)
Off-farm Salary (mainly)	0.010	0.000
	(0.02)	(0.00)
Off-farm business (mainly)	0.206	0.681
	(0.17)	(0.58)
Health insurance	0.096**	0.618
	(0.08)	(0.50)
Education	0.312*	0.078***
	(0.18)	(0.05)
Change Number of household members	1.232	2.290***
	(0.26)	(0.50)
Change Share of children and elderly	2.549	0.662
	(3.72)	(0.96)
Change Share of disabled	3.371	61.707**
	(5.12)	(86.98)
Change Share of people active in the labor market	0.003***	0.079*
	(0.00)	(0.10)
Change Own farm (mainly)	1.989	4.196
	(2.24)	(3.77)
Change Farm Salary (mainly)	0.608	4.703*
	(0.32)	(3.05)
Change Off-farm Salary (mainly)	0.723	0.000
	(1.13)	(0.00)
Change Off-farm business (mainly)	0.524	1.991
	(0.34)	(1.49)
Change Health insurance	0.421	0.973
	(0.22)	(0.72)
Change Education	0.610	0.159***
	(0.28)	(0.09)
Province dummies	yes	yes
Observations	188	291

Notes: Coefficients in relative risk ratios. Standard errors in parentheses. ***,**,* Significance at the 1%,5%,10% Level. Kigali province is the base category