RWANDA Poverty Assessment

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ABBREVIATIONS AND ACRONYMS

9YBE  9 Years of Basic Education
CAADP  Comprehensive African Agricultural Development Program
CFSVA  Comprehensive Food Security and Vulnerability Analysis and Nutrition Survey
CIP  Crop Intensification Program
CPIA  Country Policy and Institutional Assessment
DFID  Department for International Development
DHS  Demographic and Health Survey
EDPRS  Economic Development and Poverty Reduction Strategy
EH  Environmental Health
EICV  Household Living Conditions Survey
FAO  Food and Agricultural Organization
FG  Focus Group
GDP  Gross Domestic Product
GE  Generalized Entropy
GoR  Government of Rwanda
HOI  Human Opportunity Index
IDA  International Development Association
JMP  Joint Monitoring Programme for Water Supply and Sanitation
MPI  Multi-dimensional poverty index
NISR  National Institute of Statistics of Rwanda
PPP  Purchasing Power Parity
PRSP  Poverty Reduction Strategy Paper
RWF  Rwanda Francs
RIF  Recentered Influence Functions
ROSCA  Rotating Savings and Credit Association
SACCO  Savings and Credit Cooperative
UNICEF  United Nations International Children's Emergency Fund
USD  United States Dollars
VUP  Vision Umurenge Program
WHO  World Health Organization
WPP  World Population Prospects

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Executive Summary

1. **The last poverty assessment for Rwanda was conducted in 1997.** Three years after the genocide, the country was characterized by deep and widespread poverty, rock-bottom health indicators, and pervasive hunger and food insecurity. In real terms, GDP per capita was lower than it had been in 1960. The current poverty assessment has been prepared in very different circumstances. In real terms, the economy quadrupled between 1995 and 2013. Enrolment in primary school is near universal and infant and child mortality are among the lowest in Africa. A large part of the population, including the extreme poor, is covered by public health insurance.

2. **This poverty assessment focuses on the evolution of poverty and other social indicators over the past decade (2000/1-2010/11).** Using data from a variety of sources, mainly the three household living standards surveys (EICV) and the three Demographic and Health Surveys (DHS) conducted during the past decade, the poverty assessment documents trends in monetary and non-monetary dimensions of living standards and examines the drivers of observed trends. The aim of the poverty assessment is to provide policy makers and development partners with information and analysis that can be used to improve the effectiveness of their poverty reduction and social programs.

1. **A Snapshot of Poverty in Rwanda**

3. **Despite solid progress since 2000, poverty remains widespread and pervasive.** In 2010/11 (the most recent living standards survey), 45 percent of the population lived below the national poverty line, and 24 percent was considered extremely poor (lived below the national food poverty line). The national poverty line is frugal, witnessed by the large difference between poverty based on the national poverty line (45 percent) and poverty based on the international $1.25 a day line (63 percent).

4. **As in many countries, poverty has important geographical dimensions.** Half of the rural population lives below the poverty line, compared to 22 percent of the urban population. More than 90 percent of the poor live in rural areas. The rural-urban distribution of poverty closely corresponds to the capital city vs “rest of the country” divide: Outside the capital city of Kigali poverty is invariably high, ranging from 43 percent in the Northern and Eastern Province to 57 percent in the Southern Province.

5. **Poverty is concentrated in the south-west of the country.** Five Districts in the south-west have poverty rates ranging from 60 percent to 73 percent and house 23 percent of the total poor (Figure 1 and Figure 2). The better-off districts are the three districts of Kigali City (poverty ranging between eight and 26 percent) and the three districts in the north-west of the country (poverty ranging between 20 and 35 percent). Gicumbi District in the north, though not among the poorest in terms of poverty rates, accounts for the single largest number of poor people due to its large population size (Figure 2).
Next to poverty, chronic malnutrition or stunting remains high. According to the latest data, 44 percent of children in Rwanda are stunted, jeopardizing their future. Stunting in childhood has consequences that last for a lifetime, with adults who were stunted in childhood attaining on average less education and having worse social and economic outcomes. As such, the high rate of stunting risks jeopardizing the productivity and capacity of the future workforce. Over half of children in the bottom two wealth quintiles are stunted, but stunting remains high even in the upper quintiles: 40 percent of children in the fourth quintile and 26 percent in the fifth quintile are stunted (Figure 3).

Rwanda’s Poverty Profile: The Expected…

6. **The poverty profile is largely unsurprising.** Next to the geographical dimensions, poor households are on average larger, have more children and have a higher child dependency rate. Because poor households have more children, children are overrepresented among the poor: 50 percent of children under 15 live below the poverty line, compared to 40 percent of adults. Household headed by a younger person are less likely to be poor, although this is likely intertwined with the life-cycle effect of family formation (younger households have lower dependency rates).

7. **Lack of education is one of the most salient characteristics of the poor.** Only 20 percent of heads of poor households completed primary education, and less than four percent attained at least some secondary education. Education beyond primary seems to have the highest
correlation with poverty: Poverty headcount among households whose head completed primary is still high at 42 percent, but drops sharply to 20 percent if the head completed a couple of years of secondary education. Only five percent of households with a head who completed secondary education are poor.

8. **The poor depend on agriculture to make a living.** 80 percent of poor household have a main occupation in agriculture, either in subsistence farming or farm wage labor, accounting for 60 percent of household income (Figure 4 and Figure 5). Relative to the second quintile (the poor but not extreme poor), the extreme poor (the first quintile) are more likely to have a main occupation in wage labor on other people’s farms and derive a bigger share of total income from this activity. Agriculture is the main occupation and income-earner for all but the wealthiest 20 percent of households.

**Figure 4: Agriculture is the main occupation for the poor…**

(Main household occupation by consumption quintile, 2011)

Source: EICV, 2011. World Bank Calculations

**Figure 5: …Providing the bulk of household income**

(Relative contribution to household income, 2011)

Source: EICV, 2011; World Bank Calculations

9. **Poor households tend to be more isolated.** The poor live at greater distances from key infrastructure such as markets, public transport facilities, and health centers. Creating an index of isolation based on travel times to key infrastructure assets, we find that the most isolated households are twice as likely to be poor relative to the most connected households (Figure 6).

**Figure 6: Wealthier households are better connected**

(Poverty headcount by isolation quartile)

Source: EICV, 2011. World Bank staff calculations
And the Rather Unexpected ...

10. **Households living close to a land border are significantly better-off.** Even after controlling for a range of individual and household characteristics and for the province of residence, households living in districts that border another country are less likely to be poor. This effect is particularly salient for DRC: Rural households living in districts that border DRC have consumption levels that are 22 percent higher than comparable households living in other districts within the same province (Figure 7). Although hypothetical at this point, it is plausible that this is driven by the potential for cross-border trade, especially given that the border effect does not hold for districts that border a national park or a lake (where opportunities for trade do not exist).

11. **Female-headed households in Rwanda are not at greater risk of poverty.** Though the poverty rate among female-headed households (47 percent) is somewhat higher than the overall poverty rate (45 percent), this can be explained by factors other than the gender of the household head. Controlling for these factors, there is no inherent effect on welfare of having a female household head. This is a marked change from 2001, when having a female head of household was correlated with lower living standards, even after controlling for a range of other characteristics.

12. **The bottom 80 percent of the population are remarkably similar.** The bottom 80 percent engages largely in the same activities to generate income (Figure 4), derives a roughly same share of income though independent farming (Figure 5), and live in households headed by little educated persons (Figure 8). In contrast, the upper quintile is structurally different: Regular non-farm wage jobs are the most frequent main occupation, only a marginal fraction of income is derived through agriculture, and educational attainment is markedly higher. This is also reflected in daily consumption expenditures, which are not all that different for the first four quintiles but substantially higher in the fifth quintile (Figure 9).

![Figure 7: Controlling for everything else, households in districts bordering another country have higher consumption levels](image-url)
The high stunting rates appear to be more an issue of environmental health than an issue of poverty or inadequate food intake. While only a third of children in Rwanda have a minimum acceptable diet, poor diets do not explain the high stunting rates. In contrast, the poverty assessment finds that inadequate environmental health, defined as inadequate access to clean water, improved sanitation, and immunizations, is the most robust predictor of stunting, both by itself and in combination with poor diets and/or inadequate care practices. This is in line with emerging evidence from African countries and beyond, which document a robust link between poor environmental health and high stunting rates.

Inequality is high, driven by location, education, and occupation

Consumption in Rwanda is unequally distributed. The bottom 10 percent of the population accounts for two percent of total consumption, 20 times less than the share captured by the top 10 percent (42 percent). The top 1 percent captures 14 percent of total consumption, which is slightly higher than the share of the bottom 40 percent together. This translates in a Gini coefficient of per capita consumption of 50.8. Inequality is substantially higher in urban (Gini of 58) than in rural areas (Gini of 40).

Education and occupation are the main sources of inequality. Differences in living standards across education subgroups are high and explain 40 percent of total inequality, while differences across occupation account for 31 percent of inequality (occupation and education are of course related). Location is also an important source of inequality: differences in consumption between households in urban and in rural areas are large, explaining almost a quarter of total inequality.

---

1 This should be interpreted with caution, as outliers may overestimate the share accruing to the top 1 percent.
2 The Gini coefficient of consumption per adult equivalent (instead of per capita) amounts to 49.0.
Strong performance in health and basic education

16. **Relative to other low-income countries, Rwanda overperforms in the health domain.** Immunization for children 12-23 months is almost universal, compared to a low-income average of about 80 percent, and a higher fraction of the population has access to clean water and an improved sanitation facility (Figure 10). This translates into significantly lower child mortality: Under-5 mortality in Rwanda is estimated at 52 (per 1,000 live births), considerably lower than the low-income average of 76.

17. **Net attendance in primary school is high and relatively irresponsive to household welfare levels.** 90 percent of children from the poorest 10 percent of households attend primary school, compared to 99 percent of children from the wealthiest 10 percent of households. In contrast, attendance in secondary school remains low and strongly correlated with living standards: Only 11 percent of children from the poorest 10 percent of households attend secondary school (regardless of age), compared to 78 percent for the top 10 percent of households. Overall, gross attendance in secondary amounts to 40 percent. Net attendance amounts to 20 percent.

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**Figure 10: Rwanda performs well on health indicators**

(Immunizations, environmental health, and child mortality for Rwanda and low-income countries, 2012-13)

Source: WDI, 2014.

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2. **2001-2011: Pro-Poor Growth and Strong Poverty Reduction**

18. While poverty in Rwanda still is high, the trends over the past decade have been **firmly positive.** Between 2001 and 2011, Rwanda’s economy grew at more than eight percent per year, earning the country a spot on the list of the ten fastest-growing countries in the world. Strong growth resulted in rapid poverty reduction, with the share of the population below the national poverty line dropping from 59 percent in 2001 to 45 percent in 2011 (Figure 11). The fact that poverty is still high in Rwanda hence is a reflection of where the country came from (the

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3 Based on EICV3
high initial poverty levels) rather than of a lack of progress. Growth in consumption was higher for poor than for non-poor households, resulting in a decrease in inequality, although only modestly (Figure 12).

**Figure 11:** The percentage of people below the poverty line sharply decreased…
*(Percentage of people below the national poverty line)*

![Chart showing percentage of people below the poverty line from 2001 to 2011.](chart.png)

**Figure 12:** …and inequality also decreased modestly
*(The Gini coefficient of consumption per adult equivalent)*

![Chart showing Gini coefficient from 2001 to 2011.](chart1.png)

Source: EICV1, EICV2, EICV3, World Bank staff calculations

19. **The pattern of growth and poverty reduction differed substantially between the first and second half of the previous decade.** In the early years of the 2000s consumption growth was concentrated in Kigali City, where only a marginal fraction of Rwanda’s poor live. The growth in rural areas was weaker and benefited disproportionally the wealthier households (Figure 13). The net result was weak poverty reduction (two percentage points) and an increase in inequality. The experience in the second half of the decade was the exact mirror-image: Growth was stronger in rural areas than in Kigali City and benefited the poor more than the non-poor (Figure 14). The net result was strong poverty reduction (12 percentage points) and a sharp decrease in inequality.
20. **Poverty reduction happened at the borders.** Although the districts that border another country account for less than 30 percent of the total population, they accounted for over half of the reduction in poverty between 2001 and 2011. Overall, poverty headcount dropped by 23 percentage points in districts bordering another country and 8 percentage points in other districts (between 2001 and 2011). The border effect is largely driven by DRC and Burundi: In 2001, bordering DRC did not have an impact on consumption (Figure 15). By 2011 however, households in districts bordering DRC consumed 25 percent more, controlling for all other factors. Similarly, in 2001, bordering Burundi was bad for consumption, being associated with almost 40 percent less consumption. This negative effect had subsided by 2011, explaining the strong poverty reduction in the southern districts bordering Burundi (although these districts remain among the poorest in the country).

**Figure 15: Neighbors are important**
(Percentage impact on consumption from being close to DRC or Burundi, 2001 and 2011)

Source: EICV, 2001 and 2011. World Bank staff calculations
21. **Rwanda made solid progress on the twin goals.** The share of the population living in extreme poverty (below the national food poverty line) decreased by 40 percent between 2001 and 2011, from 40 percent to 24 percent. Growth was widely shared: the mean growth rate of the bottom 40 percent amounted to 3.5 percent per year during the past decade, higher than the overall mean growth rate of 2.9 percent. Living conditions of households that remain in extreme poverty, though still miserable, improved markedly. Compared to the turn of the century, extreme poor households live in better quality housing with better access to clean water, and their children are more likely to attend school and be fully immunized (Figure 16).

**Poverty Reduction was driven by Agriculture and Diversification…**

22. **Agriculture has been the main driver of consumption growth and poverty reduction.** Agricultural productivity sharply increased, in particular in the second half of the previous decade, leading to better harvests and increased rural incomes. In a statistical framework, the increase in household-level agricultural production over the past decade accounted for 20 percent of the total increase in consumption, with the increased commercialization of agriculture (the increased share of harvests being sold on markets) adding another 12 percent (Figure 17). Taken together, the improvements in agriculture accounted for one third of total household consumption growth between 2001 and 2011.

23. **Diversification into non-farm income-generating activities has been the second main driver of growth and poverty reduction.** Over the past decade, Rwandan households have increasingly taken up activities in the non-farm sector next to their traditional agricultural activities. Since 2001, the fraction of Rwandan households engaged in non-farm activities more than doubled to 70 percent, leading to a sharp increase in the average number of income sources per household. The observed diversification has had two positive effects. First, diversification has reduced income risk inherent to engaging in rain-fed agriculture as households now have other income activities to cushion a potential shock. Second, diversification also boosted consumption: The move to self-employment in small informal household businesses accounted for 15 percent of household consumption growth between 2001 and 2011, while the move to non-agricultural wage employment accounted for 12 percent (Figure 17). Increased self-employment has been particularly important in rural areas, while increased wage-employment emerges as the main driver of consumption growth in Kigali. Given the relatively low incidence of poverty in the capital, wage employment has only been of marginal importance for poverty reduction.
...and Helped by a Drop in fertility and a Boost in Transfers and Remittances

24. The drop in fertility and the increase in transfers and remittances also contributed considerably to consumption growth. Fertility rates dropped from 5.8 in 2000 to 4.6 in 2010, leading to a decrease in the child dependency ratio and an increase in household disposable income. The decrease in the dependency ratio accounted for 12 percent of overall consumption growth, similar to the impact of increased transfers and remittances to Rwandan households. Both of these factors were however less important at the lower end of the consumption distribution: Fertility rates dropped less for women in poor households and those households were also less likely to receive transfers and remittances compared to non-poor households.

25. While all provinces experienced a reduction in poverty over the past decade, the Northern Province has been the star performer. Poverty in the Northern Province dropped by 21 percentage points, driven mainly by a more than average increase in agricultural production and an exceptionally sharp decline in fertility. Agriculture emerges as the main driver of growth and poverty reduction in all rural provinces but the Eastern Province. Consumption growth in the east, a province particularly prone to droughts, was mainly driven by diversification into non-farm self- and wage employment.

26. Qualitative focus group discussions conducted in the framework of this poverty assessment largely confirm the results of the statistical analysis. Agriculture was most frequently mentioned as the main driver of poverty reduction, followed by the growth of different kinds of savings and credit vehicles (cooperatives, Village Savings and Loans Associations, etc.) which participants perceived as a main driver of the increased non-farm activity (Figure 18). The increased availability of contraception to limit family size was also a frequently mentioned driver of improved living standards.
Figure 18: Agriculture, cooperatives, and contraception among the main drivers of poverty reduction

(Word cloud of perceived drivers of poverty reduction, 2014)


27. While the focus group participants highlighted agriculture as the main driver of poverty reduction, they perceived the weather as the main obstacle to sustained poverty reduction going forward. This highlights a key vulnerability for Rwanda’s poverty reduction: The performance of agriculture largely determines the pace of poverty reduction, but is in its turn overly dependent on unpredictable weather patterns. Given the concentration of households around the poverty line (both above and below), a bad weather draw could sweep away part of the gains achieved over the past decade.

Education and Income Diversification Drive Drop in Inequality since 2006

28. Inequality in 2011 was a little lower than in 2001 (Figure 27). The modest decrease in inequality was the net result of an increase in inequality between 2001 and 2006 followed by a fairly rapid decrease in the second half of the decade. The decrease in inequality since 2006 boosted poverty reduction: 3.5 percentage points of the observed 12 percentage-point reduction in poverty since 2006 is accounted for by the drop in inequality. In contrast, the increase in inequality between 2001 and 2006 held back poverty reduction.

29. The reduction in inequality since 2006 can largely be explained by population shifts across education and occupation subgroups. Between 2006 and 2011, the share of households headed by an uneducated or little-educated person dropped, while the share headed by persons with some secondary education increased. As a result, a larger share of households now benefit from higher consumption levels associated with higher education levels, pushing down inequality. Similarly, the shift from farm to non-farm occupations increased the share of
households in the higher-earning non-farm category (and decreased the share in the lower-earning agricultural occupations), having a downward influence on inequality.

3. Ending Extreme Poverty and Boosting Shared Prosperity

30. In a highly stylized and simplified fashion, Rwanda experienced a “textbook” episode of poverty reduction during the past decade. The reduction in poverty resulted from a sharp increase in agricultural productivity, combined with (or followed by) a progressive move towards more lucrative non-farm economic activities. The extent to which these twin evolutions can be strengthened and consolidated will determine in large part whether the pace of poverty reduction can be sustained.

31. Agriculture holds the key for sustained poverty reduction in the short term. Over the past ten years the poor have moved closer to the poverty line, which means there is scope for rapid poverty reduction in the years to come. Given that the majority of Rwanda’s poor live in rural areas and still depend on agriculture (both self and wage employment) for the bulk of their livelihood, further improvements in agriculture will likely be the main engine of poverty reduction over the medium term (keeping in mind the crucial role of the weather). In this light it is important that the government keeps up its strong investment in agriculture, including the facilitation of market linkages, building rural infrastructure—not the least irrigation—and enhancing agricultural skills necessary to raise productivity on small landholdings and make the transition to higher-value crops which require greater know-how.

32. Agriculture will however not be able to absorb the rapidly growing labor force. In the coming decade 200,000 working-age adults are expected to join the labor force each year. Given the scarcity of farmland in Rwanda, independent farming, for long the traditional occupation in rural Rwanda, will no longer be a viable option for many of them. Indeed, the proportion of working-age adults with a main occupation in independent agriculture dropped sharply from 85 percent in 2001 to 62 percent in 2011. Given the relatively low skills and education of the labor force, the bulk of the newcomers will not qualify for modern wage employment in the formal economy. This implies that most of the growing labor force will try to make a living in the informal sector, both in wage- and self-employment. This is already reflected in the most recent household data, which shows increasing engagement in agricultural wage labor and employment in small, micro- and household enterprises. Investing in apprenticeships and quality vocational training could provide youth with a way out of unattractive farm wage employment and a pathway to enter the more lucrative and productive non-farm sector.

33. As more and more young Rwandans leave the family farm, the role of household and micro-enterprises in providing employment will continue to grow. In 2011, there were less than 220,000 wage jobs in the formal private sector, catering for less than five percent of working-age population. In contrast, there were 1.27 million household enterprises, providing employment to an even larger number of people. Even if wage employment in the formal private sector would double over the coming five years, its share in overall employment would still remain low in light of the expanding labor force. While the Government should and is undertaking the measures to create a modern economy and attract large formal private

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4 NISR, 2012  
5 NISR, 2012  
6 This is true for Sub Saharan Africa as a whole; see Fox and others (2013).
enterprises (investments in energy, transport, and ICT, business climate reforms, etc.), improving productivity in the informal sector needs to be part of the agenda to provide employment to new labor market entrants. A buoyant informal sector would provide a more attractive alternative than agriculture and could in the longer-run increase domestic revenues if some of the informal firms grow and enter the formal sector.

34. **Access to finance, even only small-scale, will be important in facilitating and sustaining the move towards non-farm livelihoods.** Although the Poverty Assessment does not examine the determinants of the observed move to non-farm activities, the qualitative study highlighted that successful transition to non-farm activities is inextricably linked to the availability of finance. The establishment of sector-level Savings and Credit Cooperatives (SACCOs) appear to have been important in enabling individuals and households to transition to self-employment activities outside farming. Due to relatively high interest rates and the timing of loan repayments, SACCOs however remain out of reach for a large part of the rural poor. Designing and mainstreaming even smaller-scale savings and credit vehicles with modalities more adapted to the agricultural calendar could help the poor make the step towards bigger financing provided by SACCOs.

35. **The high rate of chronic poverty stresses the need for continued investment in an effective social safety net.** Given their low levels of human and physical capital, it is unlikely that the chronic poor will manage to escape poverty by themselves. In addition, the chronic poor’s heavy dependence on agriculture makes them highly vulnerable to weather shocks. Stabilizing and growing the incomes of the poorest will, next to further improvements in agriculture, require an effective, well-targeted, and sufficiently generous safety net. In particular, targeting of the existing social protections programs, which according to available evidence is weak, will need to be improved to make sure social protection benefits reach the poorest.

36. **What would it take for Rwanda to meet the poverty goals set out in its national development plans?** The medium term development plan, EDPRS-II, aims for the national poverty rate to be below 30 percent by 2017/18. Vision 2020, the long-term development strategy, aims to push poverty below 20 percent by 2020. Figure 19 shows the combination of household consumption growth and inequality reduction that would be sufficient to meet the EDPRS-II target (blue curve) and Vision 2020 target (red curve)⁷. Sustaining the pace of growth and poverty reduction observed since 2006 (red square in Figure 19) would suffice to hit the EDPRS-II target, but would not achieve the Vision 2020 poverty target. Extrapolating the past decade trend (blue square) would mean missing both targets. Clearly, making strong progress on poverty reduction will require strong growth in household consumption as well as significant dents in inequality. Progress on education and income diversification will be key, as these factors, next to being correlated with higher consumption growth, also have tended to drive down inequality.

**Figure 19: Repeating the 2006-2011 performance would reach EDPRS-II targets**
*(Combination of growth and Inequality reduction that will meet national targets)*

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⁷ These simulations are based on the isopoverty curves developed by Ferreira and Leite (2003). The simulations are purely mechanical and we present them for illustrative purposes. They should be interpreted with caution.
37. While this poverty assessment uncovers some of the key drivers of the fast reduction in poverty over the past decade, more research is needed to better understand the underlying evolutions. For instance, the diversification into nonfarm activities has been a main driver of poverty reduction, but what has driven this extremely rapid move to nonfarm activities? What kinds of people or households have successfully transitioned to nonfarm activities and what are the specific types of activities they are engaging in? Similarly, what has been the driver of the recent increase in agricultural productivity? Was it the weather, or have the Government programs been so effective. Answering these questions will enable a more comprehensive understanding of Rwanda’s successful poverty reduction story.
The last poverty assessment for Rwanda was conducted in 1997 and published in 1998. The aftermath of the civil war and the genocide was characterized by widespread and deep poverty and severe deterioration of health indicators. The share of the population living in poverty was estimated at 70 percent, up from 47 percent during the 1991 household survey, infant mortality had risen from 87 (per 1,000 live births) before the genocide to 131 in 1997 and maternal mortality had quadrupled. Agricultural output had recovered to only 78 percent of pre-war levels, leaving many households highly food-insecure and dependent on irregular food aid. Real per capita GDP had not caught up with its pre-war level and, even worse, was lower than its level in 1960 (Figure 20).

**Figure 20: Real per capita GDP only surpassed its 1960s level in 2002**

*Index of real GDP per capita, 1960-2011*

The current poverty assessment was prepared in a dramatically different situation. In real terms, the size of the economy has increased four-fold since 1995. Poverty rates have fallen from 59 percent at the start of the 2000s to 45 percent in 2011. Infant mortality stands at 49 per 1,000 live births, one of the lowest in low-income countries. Enrolment in primary school is just shy of universal. 70 percent of births are attended by a skilled health care provider. Food insecurity and hunger, once rampant in the country, have eased substantially. A large fraction of the population, even those in extreme poverty, are covered by public health insurance, which has significantly expanded access to health care. Rwanda has become a poster child of business and investment climate reforms, climbing to the 32nd place on the 2013 World Bank’s Doing Business Ranking, leaving countries such as France and Belgium trailing. It has the highest proportion of female legislators in the world (64 percent).

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9 NISR, 2014.
10 DHS, 2010.
11 The Global Hunger Index, a composite indicator of hunger and food insecurity, dropped from 31 in 1990 to 15 in 2013 (IFPRI and others, 2014).
12 Binagwaho and others, 2012.
Why has Rwanda been able to make such progress? Which are the factors that have facilitated the strong progress on poverty reduction and social indicators? This poverty assessment will shed light on some of the drivers of the impressive social and economic progress at the level of the household, and will highlight areas where progress is lacking or lagging. Based on the findings, the poverty assessment will speculate-in an informed manner-on the sources of future poverty reduction and will make recommendations on how to maintain or even speed up the pace of growth in household living standards and how to address the shortcomings. The poverty assessment will however not focus on the overarching macro conditions that have enabled the progress. Given their importance, we will nevertheless slightly elaborate on them in this introduction.

First, the quality of policies and institutions that are important for development has improved over the past decade. The World Bank’s Country Policy and Institutional Assessment (CPIA) rates the quality of policies and institutions across 16 dimensions grouped in four clusters, and theoretically varies between zero and six (with higher scores indicating better policies and institutions). At the inception of the CPIA in 2005, Rwanda’s score (3.5) was already higher than the IDA-eligible Sub-Saharan average (3.2). Since then, Rwanda has increased the score by 0.4, while the African average has remained unchanged. Rwanda now ranks second in Africa, and among the top performers of all IDA countries (in Africa and beyond). Sound policies and institutions contributed to the strong social and economic progress witnessed since the early 2000s.

Foreign aid has been an important ingredient in Rwanda’s progress. Over the past decade Rwanda has received significantly more aid than other African countries (Figure 22), and has used that aid effectively to boost development. While Rwanda’s ability to attract this level of aid is of course a result of the tangible results on the ground, the high level of dependence on aid (foreign assistance accounted for between 35 and 40 percent of the budget in recent years) makes that progress vulnerable to fluctuations in external assistance.

Next to policies and institutions, Rwanda has been successful in avoiding a return to violence. This is no mean feat. Large-scale violent conflict, not to mention an event as devastating as the 1994 genocide, leaves the economy in shatters, the social fabric torn, and a legacy of atrocities, which together form the ideal breeding ground for further conflict. The typical country emerging from civil war faces a 44 percent risk of returning to violence within five years, creating a so-called conflict trap, whereby countries impoverished by violent conflicts run a high risk of relapsing into conflict exactly because of the sheer extent of poverty (World Bank, 2003). That Rwanda has managed not to do so is an accomplishment by itself, and has undoubtedly played an important role in enabling the progress experienced since the early 2000s.
Despite the progress achieved over the past decade, much more remains to be done. Even after the strong reduction in poverty, Rwanda remains one of the poorest countries in the world. An estimated 63 percent of the population live below the 1.25 US$ international poverty line and over 80 percent below the 2 US$ line (based on EICV3 data). GDP per capita only surpassed the 1960 level in 2002. The score on the Human Development Index remains comparatively low (ranked 151st but steadily moving up) even despite the recent progress. Lack of jobs and the relatively low levels of education mean that decent employment in the formal sector remains well beyond the reach of most Rwandans.

The structure of the economy did not change much over the past decade. Fuelled by strong growth (over 10 percent per annum between 2001 and 2011), the services sector increased its share in GDP from 43 percent in 2001 to 46 percent by 2011 (Figure 23). The industry sector also grew at 10 percent per annum, although from a low base, and increased its share in the economy by two percentage points to 16 percent by 2011. Agriculture, which grew at an average rate of 5 percent per annum, decreased its share in GDP from 37 percent to 32 percent (Figure 23). By and large, the structure of the economy by 2011 was not very different from the one in 2001.
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Figure 23: Modest changes in the structure of the economy
(Sectoral share in GDP, 2001-2011)

Source: NISR, 2012

Compared to other countries in Africa and low-income countries in general, the share of agriculture in the economy remains high. The share of agriculture in GDP (32 percent) is higher than the average for low-income countries (27 percent) and higher than the average in Sub Sahara Africa (12 percent – see Figure 24). The share of industry is small, even in comparison to other low-income countries.

This Poverty Assessment consists of five chapters. The first chapter presents the main trends in poverty, inequality, and assets since the turn of the century and zooms in on the geographical and temporal differences in the pace of poverty reduction. The second chapter sketches a profile of poverty based on the most recent household survey data (2011) and examines if and how the face of poverty has changed since the start of the 2000s. Chapter 3 abandons the descriptive angle to examine in depth the drivers of consumption growth and poverty reduction, focusing in particular on four key evolutions witnessed over the past decade: the increase in agricultural productivity, the rapid diversification into non-farm activities, the sharp drop in fertility, and the jump in transfers and remittances. The fourth chapter focuses on the high incidence of chronic malnutrition (stunting) in Rwanda and examines the determinants of poor childhood nutritional outcomes. Finally, Chapter 5 explores the structure of inequality and examines the driving forces behind the strong drop in inequality since 2006. Given the importance of education as a source of inequality, this chapter also explores the distribution of public expenditures on education.

Figure 24: Agriculture remains a big part of the economy
(Sectoral share in GDP, 2011)

Source: WDI, 2014
The main data sources used in this Poverty Assessment are the Integrated Household Living Conditions Surveys (known by the French acronym EICV) and the Demographic and Health Surveys (DHS). We draw on the three EICVs implemented since 2000: EICV1 (2000/1), EICV2 (2005/6) and EICV3 (2010/11). The EICVs are LSMS-style multi-topic household surveys that collect a wealth of information on household demographics, education, health, agriculture, economic activities and income, assets, and consumption and are conducted over a period of 12 months to control for seasonality. We also use the three DHS surveys conducted over the past decade: DHS2 (2000), DHS3 (2005) and DHS4 (2010). In the framework of the Poverty Assessment, a qualitative study based on focus group discussions was commissioned to contextualize the findings and insights from the statistical analysis. The main results from the qualitative study are presented in Chapter 3.

Given the availability of several rounds of the different surveys, the Poverty Assessment is able to focus on trends and the determinants of the observed trends. The first three chapters focus on the longer-term trends by comparing the 2010/11 data with the 2000/1 data. Chapter 4 focuses on malnutrition in 2010 and is largely cross-sectional. The final chapter examines the inequality dynamics between 2006 and 2011, a period during which there was a rapid decrease in inequality.
Chapter I.
A Decade of Poverty Reduction
1. Introduction

Rwanda posted a strong macroeconomic growth performance during the first decade of the 2000s. Between 2001 and 2011 Rwanda’s economy grew at a rate of 8 percent per annum, earning the country a spot on the list of the 10 fastest-growing economies in the world. The strong growth was accompanied by substantial improvements in living standards, as witnessed by a two-thirds drop in child mortality and the attainment of near-universal primary school enrolment. Poverty headcount followed the general trend, with the share of population living below the national poverty line dropping from 59 percent in the early 2000s to 45 percent in 2011.

This chapter will use several sources of data to paint a detailed picture of the evolution of poverty and household living standards in Rwanda in the first decade of the 2000s. The chapter has three parts. In the first part we will offer a detailed description of the evolution of poverty using data from the three most recent “Integrated Household Living Conditions Surveys” (henceforth EICV, its French acronym), implemented in 2000/1 (EICV1), 2005/6 (EICV2) and 2010/11 (EICV3). In the second part we will examine whether the Demographic and Health Surveys (DHS), implemented in 2000, 2005, and 2010, corroborate the trend in household living standards as measured by the EICVs. The third part will present the geographic distribution of the reduction in poverty.

2. Strong Household Consumption Growth and Poverty Reduction

Household consumption in Rwanda increased by 28 percent in real terms over the past decade, resulting in a drop of 14 percentage points in the poverty headcount, from 59 percent in 2001 to 45 percent in 2011. In 2011, the average adult in Rwanda lived on US$2.5 a day, with a significant disparity between Kigali (US$7.6) and the rest of the country (US$1.9). Consumption growth over the past decade has been higher for poor households than for non-poor households, resulting in a decrease in inequality. In Kigali however, inequality slightly increased over the past decade due to slow growth of the middle class compared to the growth recorded by both the poor and the rich. Despite the impressive reduction in the poverty headcount, the number of people in Rwanda who live in poverty declined by only 1 percent due to high population growth.

2.1. Strong Reduction in the Poverty Headcount

The solid GDP growth in the last decade was associated with a substantial increase in average household consumption as measured from the EICV surveys. Total household consumption expenditures per adult equivalent recorded an increase of 28 percent between 2001 and 2011, translating into an annual growth rate of 2.5 percent. While the average household spent RwF 210,000 per adult per year in 2001 (PPP US$ 707), this had risen to 270,000 in 2011 (PPP US$ 912). Consumption growth was a little lower in Kigali (27 percent) than in the other

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13 Based on the 2011 Purchasing Power Parity exchange rate of 1=Rwf 336.3 (WDI, 2012).
14 Expenditures are expressed in constant 2011 prices. For a detailed description on how the consumption aggregates were constructed and made comparable across survey years, consult NISR (2012a).
four provinces combined (30 percent)\(^{15}\). Despite the slower growth in Kigali, average consumption in 2011 was still more than four times higher in Kigali (Rwf 844,000 or US$ 2,842) than in the poorest province (average consumption expenditures of Rwf 184,000 or US$ 619 in Southern Province) – see Table 1.

The growth in household consumption translated into impressive poverty reduction. Poverty headcount—the share of the national population living below the national poverty line (see Box 1) -dropped from 59 percent at the start of the decade to 45 percent in 2011. In Kigali City, home to approximately 10 percent of Rwanda’s population, the incidence of poverty decreased with six percentage points, from 22.7 percent in 2001 to 16.8 percent in 2011. Starting from a much higher base, all other provinces experienced strong drops in poverty (Table 1): 9 percentage points in the Southern Province, 14 percentage points in Western Province, 21 percentage points in Northern Province and 17 percentage points in Eastern province. The poverty gap ratio, which takes into account the distance separating the poor from the poverty line, dropped by almost 10 percentage points, from 24.4 percent in 2001 to 14.8 percent in 2011. This means that next to the reduction in the proportion of people living in poverty, those who still live below the poverty line are now closer to it than they were in 2001, which bodes well for future poverty reduction (see Section 2.2).

### Table 1: Solid Household Consumption Growth and Poverty Reduction Between 2001 and 2011

<table>
<thead>
<tr>
<th></th>
<th>Expenditures per AE (2011 RWF)</th>
<th>Poverty Headcount (%)</th>
<th>Poverty Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kigali City</td>
<td>661,609</td>
<td>844,257</td>
<td>22.7</td>
</tr>
<tr>
<td>Southern Province</td>
<td>158,065</td>
<td>183,915</td>
<td>65.5</td>
</tr>
<tr>
<td>Western Province</td>
<td>172,109</td>
<td>207,754</td>
<td>62.3</td>
</tr>
<tr>
<td>Northern Province</td>
<td>153,322</td>
<td>225,167</td>
<td>64.2</td>
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<tr>
<td>Eastern Province</td>
<td>166,749</td>
<td>232,091</td>
<td>59.5</td>
</tr>
<tr>
<td>Rwanda</td>
<td>210,043</td>
<td>270,921</td>
<td>59</td>
</tr>
</tbody>
</table>

Source: EICV1, EICV2 and EICV3

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## Box 1 Hanging by a Thread Rwanda’s Poverty Line

To measure the incidence of poverty, Rwanda uses an absolute poverty line defined as a minimum food consumption basket that offers the required number of calories for a Rwandan adult involved in physically demanding work. The required number of calories is set at 2,500 per adult equivalent per day, and the cost of a minimum food basket that provides this calorie requirement is the food poverty line, also called the extreme poverty line. The food poverty line amounts to 83,000 RWF per adult equivalent per year in 2011 prices (about US$ 0.68 per adult per day in PPP prices). When augmented with an allowance for basic non-food consumption, the overall poverty line equals 118,000 RWF (about US$ 0.96 per adult per day). When we refer to the “poor”, we refer to the people living in households with per adult equivalent expenditures below this amount\(^{16}\). The poverty line was estimated based on data from the EICV1 survey (1999-2001) and may be obsolete. A new poverty line will be estimated based on the EICV4 survey currently under implementation (2013/14).

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\(^{15}\) The reclassification of enumeration areas following the 2002 census meant that some enumeration areas that were rural in the 2001 survey were classified as urban following the 2002 census. This implies that the urban-rural classifications in the 2001 and 2011 EICVs are not comparable and would lead to misleading representations. As a result, we cannot use the rural/urban dichotomy to compare the 2001 and 2011 data. We can however compare the 2006 and 2011 urban and rural data.

\(^{16}\) Conversions to US$ use the 2011 Purchasing Power Parity exchange rate of US$ 1=Rwf 336.3 (WDI, 2012).
The Rwandan poverty line is low compared to international standards. Figure 25 shows the cumulative distribution of per capita consumption in 2011 (in 2005 PPP US$) together with three different poverty lines. The solid red line is the national poverty line, which corresponds to approximately 0.91 US$ a day in 2005 PPP. 45 percent of the population falls below this line. The dashed line represents the World Bank’s international poverty line of 1.25 US$. More than 60 percent falls below this line. Finally, the dotted-dashed line marks the US$ 2 a day threshold. In 2011, over 80 percent of the population fell below this threshold.

Despite the strong poverty reduction over the last decade, poverty in Rwanda was relatively irresponsible to growth. While consumption increased by 28 percent, the incidence of poverty decreased by 24 percent, resulting in a growth-elasticity of poverty of -0.82. The growth elasticity of poverty measures the percentage change in the poverty headcount for each percentage change in consumption. Over the past decade in Rwanda, a one percent increase in average household consumption was associated with a 0.8 percent decrease in the poverty headcount, which compares poorly with an estimated average global elasticity of -2 (see Ravallion, 2001 and 2004). For the sake of comparison, Table 2 shows the growth elasticity of poverty in a selection of countries for the decade between the early 1990s and the early 2000s. Only two countries in the table had growth elasticities lower than Rwanda’s over the past decade (the high inequality countries of Bolivia and Brazil). If Rwanda had had the growth elasticity of Ghana during the 1990s (-1.19), poverty headcount would have dropped by 20 percentage points instead of the observed 14 percentage points.

As argued by Bourguignon (2003) and Klasen and Misselhorn (2008), comparing growth elasticities across countries can give misleading results. The growth elasticity of poverty is notoriously sensitive to the baseline level of development and the location of the poverty line relative to mean consumption. More specifically, if initial levels of consumption are low, growth rates in consumption will be relatively high for a same absolute change, which will lead to an underestimation of the growth-elasticity of poverty. As such, growth elasticities tend to be higher in richer countries. As an alternative measure of the sensitivity of poverty to growth, Klasen and Misselhorn (2008) propose the “semi-elasticity” of poverty reduction. This measures the percentage-point reduction in poverty for a one percent growth in consumption and does not automatically increase when a country grows richer (rather to the contrary). Table 2 shows that the semi-elasticity of poverty in Rwanda was relatively high: A 1 percent increase in consumption in Rwanda was associated with a 0.5 percentage point reduction in the poverty headcount. Only three countries in the list had a higher semi-elasticity than Rwanda’s (Bangladesh, Burkina Faso and Bolivia).
Despite the strong poverty reduction over the last decade, poverty in Rwanda was still significant. Bourguignon (2003) and Klasen and Misselhorn (2008) pointed out that growth elasticities can underestimate the growth rates in consumption, which will lead to an underestimation of the growth elasticity relative to mean consumption. Growth elasticities tend to be higher for countries with lower initial levels of consumption, and growth elasticities across countries can give misleading results.

Table 2: Was Poverty in Rwanda Elastic or Inelastic to Growth?

<table>
<thead>
<tr>
<th>Country</th>
<th>Growth Elasticity of Poverty</th>
<th>Semi-Elasticity of Poverty</th>
<th>Rate of Pro-Poor Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vietnam</td>
<td>-1.41</td>
<td>-0.41</td>
<td>4.3</td>
</tr>
<tr>
<td>El Salvador</td>
<td>-1.04</td>
<td>-0.43</td>
<td>4.1</td>
</tr>
<tr>
<td>Uganda</td>
<td>-1.04</td>
<td>-0.40</td>
<td>2.7</td>
</tr>
<tr>
<td>Ghana</td>
<td>-1.19</td>
<td>-0.33</td>
<td>2.1</td>
</tr>
<tr>
<td>India</td>
<td>-2.38</td>
<td>-0.43</td>
<td>1.2</td>
</tr>
<tr>
<td>Tunisia</td>
<td>-1.79</td>
<td>-0.09</td>
<td>1.2</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>-1.56</td>
<td>-0.51</td>
<td>0.7</td>
</tr>
<tr>
<td>Senegal</td>
<td>-0.95</td>
<td>-0.37</td>
<td>1.8</td>
</tr>
<tr>
<td>Brazil</td>
<td>-0.78</td>
<td>-0.31</td>
<td>3.2</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>-2</td>
<td>-0.89</td>
<td>1.0</td>
</tr>
<tr>
<td>Bolivia</td>
<td>-0.73</td>
<td>-0.65</td>
<td>1.9</td>
</tr>
<tr>
<td>Romania</td>
<td>-2.03</td>
<td>-0.34</td>
<td>-2.6</td>
</tr>
<tr>
<td>Rwanda</td>
<td>-0.82</td>
<td>-0.48</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Source: World Bank, 2005

2.2. No Change in the Number of Poor

High population growth during the past decade meant that the absolute number of people living in poverty declined only marginally despite the large drop in the poverty headcount. The absolute number of people living below the poverty line increased from 4.79 million in 2001 to 5.26 million in 2006 and fell back to 4.73 million in 2011 (see Figure 26 and Figure 27). While poverty headcount dropped by 24 percent between 2001 and 2011, the number of people living in poverty dropped by only 1 percent (see Box 2).

Figure 26: The Percentage of people Below the Poverty Line Sharply Decreased

(Percentage of People Below the Poverty Line)

Figure 27: Though the Absolute Number of People in Poverty Declined only Marginally due to Population Growth

(Number of people Below and Above the Poverty Line, '000)

Source: EICV1, EICV2, EICV3, 2002 Census, 2012 Census and World Bank Calculations
The 2012 Population and Housing Census put Rwanda’s population at 10.5 million, up from 8.1 million in 2002. The annual population growth rate of 2.6 percent is just short of the annual pace of poverty reduction between 2001 and 2011 (2.7 percent). As a result, the absolute number of people living in poverty (which combines the poverty headcount with population figures) declined by only 1 percent between 2001 and 2011 despite the 14 percentage point reduction in the poverty headcount (Figure 26).

The small drop in the number of people living below the poverty line can almost entirely be accounted for by the Northern Province. While the number of people living in poverty increased by 10 percent in Kigali and Eastern province and by 9 percent in Southern Province, it dropped by 26 percent in the Northern Province (Figure 28). Not only did the Northern Province have the strongest pace of poverty reduction of all Regions (annual drop of 4 percent compared to 2.7 percent globally), it also had the slowest population growth (annual growth rate of 1 percent compared to 2.6 percent globally). The net result was a drop in the number of people below the poverty line from 1 million in 2001 to 0.74 million in 2011.

Table 3 shows the relationship between population growth, the rate of poverty reduction and the percentage change in the number of people below the poverty line. The absolute number of poor people increased in regions where the rate of population growth was higher than the rate of poverty reduction. The two regions with the largest increase in the absolute number of poor (Eastern Province and Kigali) are the regions with the highest population growth rates: 4.3 percent for Eastern province and 4.0 percent for Kigali. The high population growth in Eastern Province can be explained by immigration due to the relatively low population density there, and hence the availability of the scarcest of all assets: land (population density in Eastern Provinces amounted to 180 persons per km² during the 2002 census, compared to the national average of 321).

Despite the stagnation in the number of people in poverty, there is hope on the horizon. If current trends in poverty reduction persist, there will likely be a substantial drop in the absolute number of poor over the next ten years. Data from the 2005 and 2010 Demographic and Health Surveys showed that total fertility rates are dropping fast, from 6.1 in 2005 to 4.6 in 2010. This drop in fertility combined with strong reduction in the poverty headcount will—if sustained-translate into sharply falling poverty numbers over the coming decades.
2.3. Absolute Gains for Everyone, but Largest for the Very Poor

Figure 29 summarizes average growth rates in consumption at every percentile of the distribution. As can be seen from the Figure, called the “growth-incidence curve”, the average growth rate is positive at every percentile, indicating a net gain in consumption between 2001 and 2011 for all wealth categories. From the shape of the curve, we learn that average growth rates were highest for the poorest households (left-hand side of the figure) before dropping to about three percent at approximately the 25th percentile. The mean growth rate remained at three percent up until the 35th percentile, after which it dropped and oscillated around 2.5 percent until the 90th percentile. At the top end of the distribution mean growth rates increased again.

Poor households recorded on average higher growth rates between 2001 and 2011 compared to better-off households. Casual examination of the growth-incidence curve suggests that average growth rates for the households to the left of the vertical red line were on average higher than those to the right of the vertical line. The vertical red line depicts the poverty headcount in 2001 (59 percent). The average growth rate for the poor households amounted to 3.1 percent, which is higher than the 2.9 percent growth rate for the whole distribution and the 2.5 percent for the non-poor. The rate of pro-poor growth, which Ravallion and Chen (2003) define as the average growth rate for the poor, amounted to 3.1 percent per annum between 2001 and 2011. Table 2 compares Rwanda’s rate of pro-poor growth with that of 12 other countries. Only three of the 12 countries have higher rates of pro-poor growth than Rwanda (Vietnam, El Salvador and Brazil), highlighting Rwanda’s strong performance in shared growth over the past ten years (see Box 3).

Box 3 Sharing is Caring

Steady Progress on Both of the Twin Goals

In 2013, the World Bank Group established two overarching goals to anchor its mission of a world free of poverty: end extreme poverty and promote shared prosperity. Rwanda has made strong progress on both goals over the past 10 years. The incidence of extreme poverty dropped from 40 percent in 2001 to 24 percent in 2011. The government’s goal is to push extreme poverty below 9 percent by 2018 and eliminate it altogether by 2020. Shared prosperity, as defined by the income growth of the bottom 40 percent, is on the rise too: the mean growth rate of the bottom 40 percent amounted to 3.5 percent per year between 2001 and 2011, compared to 3.1 percent for the poor and 2.9 percent for all households.

The pro-poor nature of growth between 2001 and 2011 can entirely be accounted for by the exceptionally strong growth rates for the extremely poor. The average growth rate of the bottom 20 percent of the distribution amounted to 3.7 percent per annum and was substantially higher than the overall average growth rate of 2.9 percent. Beyond this, mean growth rates for the poor are actually lower than those for the non-poor (Figure 29). This pattern may reflect the impact of the policies that were adopted in Rwanda’s Second Poverty Reduction Strategy.
The distribution of growth was different in Kigali City than in the rest of the country. The growth-incidence curve for Kigali shows a clear U-shaped pattern, with strong growth for the very poor and in particular those at the top of the consumption distribution (see Figure 30). The urban “middle class”, the part of the distribution roughly between the 40th and the 80th percentile recorded relatively slow growth, with mean growth rates between 1 and 2.5 percent per annum (except for a peak around the 75th percentile). The growth-incidence curve for the rest of the country (the 4 provinces combined) mirrors that for Rwanda as a whole, with a U-shaped pattern that is less pronounced than in Kigali (Figure 31)\(^\text{17}\). The rate of pro-poor growth was higher in the rest of the country (3.1 percent per annum) than in Kigali (2.7 percent per annum).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure30.png}
\caption{High Growth for the Very Poor and Very Rich in Kigali}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure31.png}
\caption{Strong Growth for the Extremely Poor in the Rest of the Country}
\end{figure}

\(^{17}\) Given that the rest of the country accounts for 90 percent of Rwanda’s population, the growth pattern for Rwanda as a whole will always mirror that of the rest of the country.
The increasing consumption shares of the poor resulted in a decrease in inequality, especially among the poor. Inequality as measured by the Gini coefficient increased between 2001 and 2006 but fell back to 0.490 in 2011, lower than the 2001 level (0.507—see Figure 34). Inequality remains however high, and substantially higher than the average in Sub Sahara Africa. The Atkinson index of inequality, which is more sensitive to inequality among the poor, shows a larger drop from 0.52 in 2001 to 0.48 in 2011. A more thorough examination of inequality confirms that the drop in the Gini is entirely due to decreasing inequality among the poor: While inequality among the poor decreased from 0.21 in 2001 to 0.16 in 2011, inequality among the non-poor remained stable at 0.46. Inequality in Kigali City was a little higher in 2011 (0.57) than in 2001 (0.56).

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18 We set the inequality aversion parameter at 2 to calculate the Atkinson index.
Given the small decrease in inequality, almost all of the poverty reduction in Rwanda between 2001 and 2011 can be accounted for by the growth in consumption. Of the 14 percentage point reduction in poverty, 98.7 percent can be explained by growth in mean consumption and 1.3 percent by redistribution in favor of the poor (the decrease in inequality). In Kigali the increase in inequality held back poverty reduction: While poverty fell by six percentage points in Kigali between 2001 and 2011, it would have fallen by 7.8 percentage points if inequality had not changed.

3. Different Patterns in Both Parts of the Decade

The reduction in poverty over the past decade can largely be attributed to the strong performance during the last five years. In the first half of the previous decade, household consumption grew at two percent per year but that growth did not translate into significant poverty reduction. Between 2006 and 2011 however, consumption growth of three percent per year translated into a reduction in poverty by 12 percentage points. The difference between the two sub-periods can be explained by changes in the patterns of growth between and within rural and urban areas. First, while growth in the first half of the decade was concentrated in Kigali, where only a marginal fraction of Rwanda’s poor live, growth since 2006 was largely concentrated in rural areas. Second, while growth was pro-rich in the first half of the decade, holding back poverty reduction and increasing inequality, growth in the second half of the decade disproportionately benefited the poor. This led to a substantial decrease in inequality which provided an extra boost to poverty reduction. The absolute number of people living in poverty decreased by over half a million during the second half of the decade.

The graphs in the preceding sections suggest a different pattern of growth and inequality in the first and in the second half of the decade. Figure 32 and Figure 33 show that consumption shares of the poorest households decreased between 2001 and 2006 while the shares of the wealthiest households increased, resulting in a rise in inequality (see Figure 34). Between 2006 and 2011 however, the consumption share of the wealthiest fell back to below their 2001 level while the share of the poorest quintile rose quite substantially (by 15 percent) to end the decade higher than where it started.

Figure 35 and Figure 36 confirm that the patterns of growth differed substantially between the first and second halves of the previous decade. Between 2001 and 2006, consumption growth was higher for the non-poor than for the poor households (Figure 35). The richest households grew particularly fast during this period. The growth pattern in the second half of the decade is almost the exact mirror-image: Growth was higher for poor households than for non-poor households and was particularly strong for the extremely poor: Average growth per annum for the poorest 20 percent of households amounted to 6.2 percent between 2006 and 2011 (Figure 36).
The different rate and distribution of growth between both parts of the decade are reflected in the pace of poverty reduction. This is illustrated in Figure 37\(^{19}\): while poverty decreased only slightly between 2001 and 2006 or even increased (Southern Province), it dropped sharply between 2006 and 2011\(^{20}\). In the aggregate, poverty decreased by two percentage points in the first half of the decade and 12 percentage points in the second half. In this subsection we explore in more detail the different patterns in both sub-periods.


**Between 2001 and 2006 consumption expenditures per adult equivalent grew at a respectable rate of 2 percent per annum.** Poverty headcount however dropped by only two percentage points (from 58.9 percent to 56.7 percent), as did the poverty gap (from 24.4 percent in 2001 to 22.3 percent in 2006). Growth and poverty reduction were relatively strong in Kigali and Eastern Province but weak in the other Provinces (see Table 4). Consumption grew at an annual rate of 3.1 percent in Kigali compared to 2.2 percent in the rest of the country. In relative

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\(^{19}\) Kigali not pictured due to scale issues.

\(^{20}\) The exception is Eastern Province, which experienced a steady decline in poverty since 2001.
terms poverty reduction was twice as strong in Kigali (reduction of 8.4 percent) than in the other areas (reduction of 4.4 percent in the 4 Provinces combined).

### Table 4: Consumption Growth but Little Poverty Reduction between 2001 and 2006

(Consumption per Adult Equivalent in 2011 Prices, Poverty Headcount and Poverty Gap Ratio, 2001-2006)

<table>
<thead>
<tr>
<th></th>
<th>Expenditures per AE (2011 RWF)</th>
<th>Poverty Headcount (%)</th>
<th>Poverty Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kigali City</td>
<td>660,112</td>
<td>768,553</td>
<td>22.7</td>
</tr>
<tr>
<td>Southern Province</td>
<td>158,065</td>
<td>165,250</td>
<td>65.5</td>
</tr>
<tr>
<td>Western Province</td>
<td>172,109</td>
<td>196,565</td>
<td>62.3</td>
</tr>
<tr>
<td>Northern Province</td>
<td>153,322</td>
<td>159,062</td>
<td>64.2</td>
</tr>
<tr>
<td>Eastern Province</td>
<td>166,749</td>
<td>210,464</td>
<td>59.5</td>
</tr>
<tr>
<td>Rwanda</td>
<td>210,043</td>
<td>231,871</td>
<td>59</td>
</tr>
</tbody>
</table>

Source: EICV1 and EICV2.

**Household consumption growth between 2001 and 2006 was pro-rich.**

The growth-incidence curve (Figure 35) shows that average growth rates were higher for the non-poor (to the right of the vertical line) than for the poor, resulting in an increase in inequality. The increase in inequality negatively affected poverty reduction: Poverty would have decreased by 5.3 percentage points instead of the 2 percentage points actually observed if inequality had not changed. The pattern of growth in this period was different in Kigali than in the other Provinces: While growth in Kigali was pro-poor, growth in the rural areas was strongly pro-rich (see Figure 38).

**Taken together, the disappointing performance in terms of poverty reduction in the first half of the decade was related to the urban-rural difference in both the magnitude and the distribution of growth.** Growth in Kigali was strong and pro-poor but benefited only a marginal fraction of the poor (in 2001 Kigali accounted for only 3.9 percent of the national poor). Outside Kigali, where over 96 percent of the poor lived, growth was relatively slow and disproportionally benefited the wealthier households. The net result was weak poverty reduction despite moderate consumption growth.

#### 3.2.2006-2011: Strong Growth, Decreasing Inequality and Impressive Poverty Reduction

Between 2006 and 2011 consumption grew at a rate of 3 percent per annum compared to 2 percent in the five years before. During the same period the incidence of poverty decreased by an impressive 12 percentage points and the poverty gap ratio fell from 22 percent to 15 percent.
(see Table 5). In contrast to the first half of the decade, consumption growth between 2006 and 2011 was higher in the Provinces outside Kigali (3.1 percent per annum in the 4 Provinces combined) than in Kigali (1.9 percent per annum). Growth in consumption was particularly fast in the Northern Province (7.2 percent per annum).

**Table 5: Strong Growth and Poverty Reduction between 2006 and 2011**

*(Consumption per Adult Equivalent in 2011 Prices, Poverty Headcount and Poverty Gap Ratio, 2006 and 2011)*

<table>
<thead>
<tr>
<th></th>
<th>Expenditures per AE (2011 RWF)</th>
<th>Poverty Headcount (%)</th>
<th>Poverty Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2006</td>
<td>2011</td>
<td>2006</td>
</tr>
<tr>
<td>Kigali City</td>
<td>768,553</td>
<td>825,927</td>
<td>20.8</td>
</tr>
<tr>
<td>Southern Province</td>
<td>165,250</td>
<td>183,915</td>
<td>66.7</td>
</tr>
<tr>
<td>Western Province</td>
<td>196,565</td>
<td>207,754</td>
<td>60.4</td>
</tr>
<tr>
<td>Northern Province</td>
<td>159,062</td>
<td>225,167</td>
<td>60.5</td>
</tr>
<tr>
<td>Eastern Province</td>
<td>210,464</td>
<td>232,091</td>
<td>52.1</td>
</tr>
<tr>
<td>Rwanda</td>
<td>231,871</td>
<td>270,921</td>
<td>56.7</td>
</tr>
</tbody>
</table>

Source: EICV2 and EICV3

**Consumption growth between 2006 and 2011 was pro-poor.** The growth-incidence curve in Figure 36 is downward-sloping, with higher average growth rates for the poor. The decrease in inequality during the second half of the decade gave an extra boost to poverty reduction. Consumption growth alone accounted for 8.5 percentage points (71 percent) of the 12 percentage-point reduction in poverty, while the decrease in inequality added another 3.5 percentage points (29 percent). While the decrease in inequality clearly facilitated the strong poverty reduction between 2006 and 2011, the relationship is far from clear-cut: the bulk of the reduction in poverty came from a province where inequality actually increased (Box 3).

**The extent to which poverty responded to growth in consumption was radically different in the first than in the second half of the decade.** Between 2001 and 2006 a 10 percent increase in consumption was associated with a three percent (two percentage points) decrease in poverty, translating into a growth elasticity of -0.32 and a semi-elasticity of -0.2, lower than any elasticity listed in Table 2. In the second half of the decade however, poverty decreased by 21 percent (12 percentage points) following a 17 percent increase in consumption. The resulting elasticity of -1.25 and semi-elasticity of -0.71 are among the highest of those listed in Table 2.

**In sum, the different poverty performance between the first and second halves of the decade can largely be explained by differences in the magnitude and nature of growth.** The first half of the decade (2001-2006) was characterized by high growth in Kigali and low pro-rich growth in the rest of the country (except Eastern province), leading to an increase in inequality and modest poverty reduction. The second half of the decade (2006-2011) experienced higher overall growth, mainly concentrated outside of Kigali City, and recorded an exceptionally strong growth rate for the poor, reducing inequality. The net result is a decade of strong growth and poverty reduction during which welfare gains were realized at each point in the distribution and in particular for the poor. Despite decreasing inequality, poverty reduction has almost exclusively been the result of growth.

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21 Only Tunisia had a lower semi-elasticity than Rwanda.
Inequality dynamics matter for poverty reduction. All else being equal, a given growth rate will lead to more poverty reduction if inequality falls than if inequality stays the same or increases. The importance of inequality is illustrated by Rwanda’s experience over the past decade: If inequality had remained the same between 2001 and 2006 (instead of increased), poverty would have decreased by more than 5 percentage points instead of the two points actually observed. If inequality had remained the same between 2006 and 2011 (instead of decreased), poverty would have decreased by 8 percentage points instead of the 12 points actually observed.

Despite the importance of inequality, the single biggest contribution to poverty reduction in Rwanda comes from a Province where inequality increased. In the Northern Province, the non-poor grew faster than the poor, resulting in a modest increase in inequality between 2001 and 2011. This Province accounted nonetheless for one-third of national poverty reduction, despite it being only the third largest province in terms of population (Figure 39). This pattern can be explained by the Northern Province’s superior growth rates, which made that consumption of the poor in this province grew faster than that of the poor in other Provinces, despite growth in the Northern Province being biased towards the non-poor (Figure 40). This situation highlights an oft encountered finding in cross-country regressions: high growth tends to be good for everyone, including the poor.\(^{22}\)

It is worth mentioning that the two sub-periods largely coincide with Rwanda’s two latest poverty reduction strategies. The first Poverty Reduction Strategy (PRSP I) was implemented from 2002 to 2005 and focused largely on the transitional period of rehabilitation and reconstruction, which may explain the higher growth rate in Kigali during this period. Though progress had been made during PRSP I, assessments showed that productive sectors, in particular agriculture, infrastructure and the private sector, were lagging behind in terms of performance (Republic of Rwanda, 2011). In response, the second poverty reduction strategy elaborated ambitious programmes to boost the productive sectors, in particular agriculture, and reduce extreme poverty. This stronger focus on extreme poverty and on the rural areas is reflected in the second-period data, when growth was higher outside Kigali and benefited the extremely poor more than it did the less poor and the non-poor. Although the data do not allow attribution, it

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\(^{22}\) See, for instance, Dollar, Kleineberg, and Kraay (2013).
appears the focus on agriculture and rural development in the second poverty reduction strategy paid off in terms of poverty reduction and raising the living standards of the extremely poor.

4. How Real is the Reduction in Poverty?

Since the EICV3 survey coincided with an exceptionally good harvest, it is possible that the true extent of poverty reduction is exaggerated. Evolution of asset holdings and health and education indicators measured by the DHS however corroborate the consumption trends measured by the EICVs. There have been substantial improvements in material living standards and social indicators between 2000 and 2010, and the improvements have followed the same trend as consumption: timid improvements or even reversals in the first half of the decade, followed by strong gains in the second half.

Rwanda’s record of poverty reduction over the past decade has been closely linked to its agricultural fortunes. The weak reduction in poverty between 2001 and 2006 is often explained by the disappointing harvest during the EICV2 survey (NISR, 2012). In a similar fashion, the strong reduction in poverty in the subsequent five-year period can be tied to the exceptionally good harvest during the EICV3. Except for cereals, harvested quantities of main crops (grouped in pulses and roots and tubers) hardly increased between 2000/1 (index 100) and 2005/6 (Figure 41). In 2010/11 however, harvested quantities of cereals were more than three times higher than in 2000/1, the harvest of pulses was 50 percent higher and that of roots and tubers was almost double.

**Did the windfall harvest during the EICV3 survey exaggerate the “true” extent of poverty reduction?** Agricultural production has an immediate influence on the consumption aggregate used to measure poverty. First, households with a good harvest can consume more of their own production, which would show up in the consumption aggregate. Second, more surplus can be sold on markets, resulting in extra income that can be spent on other things. As such, it is possible that a windfall harvest results in a temporary increase in household consumption and a reduction in transient poverty. In this section we will examine whether the patterns observed in the EICV surveys can be replicated using data on assets and non-income dimensions of poverty from the 2000, 2005 and 2010 Demographic and Health Surveys.

4.1. Assets Increase and Human Development is Improving

The DHS asset data broadly confirm the improvements in household living standards since the early 2000s. The ownership of household durables increased substantially, in particular for radios (increase in ownership of 27 percentage points), bicycles (ownership doubled to 15
percent in 2010) and mobile phones (less than 5 percent in 2005 and more than 40 percent in 2010—panel A of Figure 42)\textsuperscript{23}. The increase was also notable for rare assets: in 2010, 5 percent of households owned a television set, up from 2 percent in 2000. The quality of households’ homes also improved over the last decade, witnessed by the rising fraction of households living in houses made of better-quality materials (roof made of aluminum sheeting or tiles, walls made of brick, floor made of tiles or cement). Access to electricity increased between 2000 and 2010, but remained very low (less than 10 percent of households).

Sanitation indicators followed the general positive trend. The use of an improved pit latrine increased almost ten-fold and the percentage of households with an ordinary latrine plummeted from 87 percent in 2000 to 23 percent in 2010 (panel C of Figure 42). The indicators related to water are the only ones that do not give a clear picture. The percentage of households who use piped water (either at home or from a public tap) for drinking purposes decreased, while use of spring water increased substantially (due to changes in the DHS questionnaires over time, we cannot make the distinction between protected and unprotected springs). As a clear positive sign, the use of surface water decreased (panel D of Figure 42). A household’s source of drinking water is however more determined by the type of infrastructure available in the community than by the household’s own living standards. As such, the source of drinking water may be a rather poor indicator of a household’s idiosyncratic wealth levels.

The most salient observation in Figure 42 is that the evolution of asset indicators is similar to that of poverty and consumption: smaller improvements in the first half of the decade followed by larger improvements in the second half. This is reflected in Figure 42 by a steeper increase (in case of a positive wealth indicator) or decrease (in case of a negative wealth indicator) in the second half of the decade than in the first half. To illustrate, ownership of radios increased by 10 percentage points between 2000 and 2005, and by 17 percentage points over the subsequent five years. Similarly, the percentage of households with a tin or tiled roof increased by 3 percentage points between 2005 and 2010 and by 10 percentage point thereafter. This pattern is evident for household durables, all housing and energy indicators and all sanitation indicators, and confirm the trend in consumption poverty observed in the previous section.

\textsuperscript{23} In all likelihood, the explosion of mobile phone ownership stems in large part from the progressive availability of ever more affordable devices, rather than from an increase in household wealth. No mobile phone data in 2000 DHS.
Figure 42: Asset holdings and living conditions improved between 2000 and 2010 (Evolution of selected household characteristics, % of households with asset/characteristic)

A. Household Durables

B. Housing/Energy

C. Sanitation

D. Water

Source: DHS, 2000, 2005, 2010;
Human development indicators also improved between 2000 and 2010. The fraction of children between 12 and 23 months with full vaccination coverage increased from 76 percent in 2000 to 90 percent in 2010, while the percentage of children under five who are stunted modestly decreased from 48 percent to 44 percent (but remains high). Child mortality rates dropped spectacularly: under-five mortality more than halved from 196 (per 1,000 live births) in 2000 to 76 in 2010 and infant mortality decreased from 107 to 50 (Figure 43). Access to education improved at both the primary and secondary level, though net attendance in secondary school remains low at 20 percent (despite having doubled since 2000).

The health and education indicators largely follow the same trend as the assets and poverty indicators. This trend is characterized by modest improvements or even reversals during the first half of the past decade (2000-2005), followed by strong improvements in the second half (2005-2010). To illustrate, the percentage of children stunted increased between 2000 (48 percent) and 2005 (51 percent) but dropped to 44 percent by 2010. The percentage of children with full vaccination coverage shows a similar pattern, marked by an initial worsening followed by a large improvement. Child mortality rates displayed a similar trend, with improvements being bigger in the second than in the first half of the decade (Figure 43).

To summarize, the evolution of asset and human capital indicators corroborate the poverty and consumption dynamics set out earlier. Between 2000 and 2010, household consumption levels increased, asset holdings increased, and physical housing and sanitation conditions improved. Indicators of child health improved substantially and access to education broadened. In addition, both the asset indicators and the non-income dimensions of poverty displayed the same general trend as monetary poverty, characterized by modest or no improvements in the first half of the previous decade and strong improvements in the second half.
5. How Did the Extreme Poor Fare?

The share of people living in extreme poverty (below the food poverty line) dropped by 40 percent over the past decade. For those still in extreme poverty, living conditions have markedly improved. More than 90 percent of children from extreme poor households attend primary school, up from less than 70 percent in 2000, and almost all extremely poor children are fully immunized (compared to less than half in 2000). Literacy rates and education have recorded strong gains and housing quality has improved. Despite the gains, important challenges remain: the extreme poor have largely missed out on the ongoing fertility transition and while their children are in school, they are typically several grades behind children from better-off households.

Between 2001 and 2011, the extreme poor grew faster than both the “non-extreme poor” and the non-poor (Figure 29). This led to a reduction in the extreme poverty headcount from 40 percent of the population in 2001 to 24 percent in 2011. In contrast to the number of people living in poverty, the number of people living in extreme poverty dropped substantially: from 3.25 million in 2001 to 2.53 million in 2011, a drop of 22 percent. But are the extreme poor better-off now than they were at the turn of the century?

Living conditions of the extreme poor improved substantially over the past decade. Figure 44 summarizes the evolution of living conditions of the extreme poor along five dimensions: housing, water, consumption, health and education. The percentage of extreme poor households with improved housing (defined as having brick walls and a tiled or iron-sheeted roof) doubled from 25 percent in 2001 to 50 percent in 2011, while the use of an improved water source increased from 60 percent to 67 percent24. Real consumption expenditures of the extreme poor increased by 12 percent over the past decade, but remain extremely low at RwF 77,400 per adult per year (US$ 0.63 per adult per day in 2011 PPP)25.

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24 We define durable housing materials as brick walls (oven-fired, cement or adobe bricks) in combination with a roof made of tiles or corrugated iron. Improved water sources include piped water (both in dwelling and on public tap), protected well, protected spring, tubewell or borehole, and rainwater (WHO/UNICEF Joint Monitoring Programme).

25 Based on PPP conversion rate of US$ 1= Rwf 336.3 (WDI, 2012).
Figure 44: Physical and social living conditions of the extreme poor improved since 2000
(\% of extreme poor with improved water source, improved housing, full immunizations)

Children in extremely poor households experienced strong improvements in basic health and education. According to the EICV surveys, the percentage of extremely poor children between 1 and 5 years of age who are fully immunized (received full doses of BCG, DPT, polio and measles vaccines) jumped from less than 50 percent in 2001 to almost universal in 2011 (98 percent). 90 percent of extremely poor children of primary school age attended primary school in 2011, up from 68 percent in 2001\(^{26}\). The net attendance rate for extremely poor children is only marginally lower than the overall rate (93 percent in 2011).

Living conditions of the extreme poor improved along other dimensions as well. Relative to 2001, extremely poor households are more likely to be headed by a literate person (although more than half of extremely poor household heads were still illiterate in 2011—Table 6). The highest level of education found in extreme poor households increased by three years from the second grade of primary school in 2001 to the fifth grade in 2011. The fraction of extremely poor households owning cattle almost doubled, and an increasing proportion is engaged in non-farm activities, which typically have higher payoffs than agricultural work. Curiously, more than 40 percent of extremely poor households had a bank account in 2011, compared to less than 1 percent in 2001.

Table 6: The extreme poor improved on other dimensions as well
(Means of selected variables in 2001 and 2011 for the extreme poor)

<table>
<thead>
<tr>
<th>Variable</th>
<th>2001</th>
<th>2011</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head of Household Female (% yes)</td>
<td>37.6</td>
<td>29.2</td>
<td>-8.4***</td>
</tr>
<tr>
<td>Household Head Literate (% yes)</td>
<td>35.4</td>
<td>48.4</td>
<td>13***</td>
</tr>
<tr>
<td>Household Size</td>
<td>5.5</td>
<td>5.5</td>
<td>0</td>
</tr>
<tr>
<td>Dependency Ratio</td>
<td>1.19</td>
<td>1.19</td>
<td>0</td>
</tr>
<tr>
<td>Highest Education Level in Household</td>
<td>2nd grade of Primary</td>
<td>5th grade of primary</td>
<td></td>
</tr>
<tr>
<td>Household has Cattle (% yes)</td>
<td>11.3</td>
<td>20.9</td>
<td>9.6***</td>
</tr>
<tr>
<td>Engaged in Independent Farming (% yes)</td>
<td>97.9</td>
<td>97.4</td>
<td>-0.5</td>
</tr>
<tr>
<td>Engaged in Farm Wage Work (% Yes)</td>
<td>18.9</td>
<td>75</td>
<td>56.1***</td>
</tr>
<tr>
<td>Engaged in Independent Non-Farm Business (% yes)</td>
<td>8.8</td>
<td>31.5</td>
<td>22.7***</td>
</tr>
<tr>
<td>Engaged in Non-Farm Wage Work (% yes)</td>
<td>13.5</td>
<td>43.5</td>
<td>30***</td>
</tr>
<tr>
<td>Household has Bank Account (% yes)</td>
<td>0.9</td>
<td>40.8</td>
<td>39.9***</td>
</tr>
</tbody>
</table>


\(^{26}\) Own calculations based on EICV surveys.
Over the past decade, the extreme poor increasingly took up wage employment. The percentage of extremely poor households engaged agricultural wage labor, a typically precarious and low-wage activity, increased from 19 percent in 2001 to 75 percent in 2011. Although hypothetical, the move to agricultural wage labor is likely related to the ever increasing pressure on land: between 2001 and 2011, average land size per working-age adult decreased by more than 30 percent in extreme poor households. On a more positive note, engagement in non-farm wage activities and non-farm self-employment, which are typically better paid, also increased.

Extremely poor households diversified their income-generating portfolio. In 2001, more than 65 percent of extremely poor households engaged in only one income-generating activity (among the four broad activity categories listed in Table 6: independent farming, farm wage labor, independent non-farm business, non-farm wage labor). By 2011, less than 10 percent of extremely poor households had only one income activity. The majority (42 percent) engaged in two of the four broad income-generating categories while 37 percent engaged in three. As a result, the average number of income sources of the extreme poor increased from 1.4 in 2001 to 2.5 in 2011, reducing the inherent risk of relying on one single source of income.

Despite the improvements in the lives of the extreme poor since 2001, many challenges remain. While enrolment in primary school among extremely poor children is almost at par with the national average, access to secondary schooling remains problematic: Net attendance in secondary school amounts to 9 percent for girls and boys from extremely poor households, less than half the national average of 21 percent. The disparity is even bigger looking at gross attendance: 17 percent for the extreme poor vs. more than 40 percent nationally. The inability of extremely poor households to pay secondary school fees risks reproducing poverty across generations.

For primary education, the large increase in enrolment masks other difficulties, mainly related to late entry and excessive repetition of grades. To illustrate, Figure 45 plots the probability of a 12-year-old (who is theoretically supposed to be in sixth grade) being in the different grades of primary school. A 12-year-old from an extremely poor household is almost seven times more likely to be in Primary 1 than in Primary 6. In contrast, a 12-year-old from a non-extremely poor household is more likely to be in Primary 6 than in Primary 1 (although the likelihood of being in P6 is still low at 7 percent). 72 percent of 12-year-olds from extremely poor households are in the first three grades of primary (compared to 36 percent for non-extreme poor children), which highlights the difficulties extremely poor children face in school.

![Figure 45: Extremely poor children are likely to be several grades behind](RWANDA Poverty Assessment April 2015)
The extreme poor are also lagging on the fertility transition. While total fertility rates dropped by more than 1.5 children per woman in the three upper quintiles, the two bottom quintiles experienced relatively marginal declines in fertility. As a result, the demographic composition of extremely poor households did not change between 2000 and 2010: average household size remained at 5.5 and youth dependency ratios—the number of dependent children per working-age adult—stagnated at 1.19 (Table 6). To compare, average household size in Rwanda in 2011 was 4.8 while the average youth dependency ratio amounted to 0.87. Extreme poor households remain demographically burdened.

6. The Geography of Poverty Reduction

The reduction in poverty over the past decade has largely happened at the borders. Districts that share a land border with another country experienced strong growth and poverty reduction, while districts in the hinterland or districts that have a natural border lagged behind. Poverty reduction was particularly rapid in the northern districts bordering DRC and the southern districts bordering Burundi. Overall, poverty declined by 23 percentage points in the border districts vs 8 percentage points in the other districts.

Over the past decade, the incidence of poverty decreased substantially in all of Rwanda’s provinces. The pace of the decrease differed across provinces, ranging from 13 percent in the Southern Province to 33 percent in the Northern Province (Table 1). Given that there only five provinces, it is likely that there was substantial within-province variation in the pace of poverty reduction. In this section we take a closer look at the evolution of poverty at the level of lower administrative units.

Examining the geography of poverty reduction in Rwanda is complicated by the administrative reorganization of 2006. Until 2006, Rwanda consisted of 12 so-called Prefectures, and all surveys (including EICV1 and EICV2) were representative at the level of the Prefecture. Following the reorganization, Rwanda was divided into 5 new Provinces, subdivided into 30 Districts. All surveys since are representative at the level of the Districts (such as EICV3). This means that there is no consistent geographic basis to monitor the evolution of poverty.

For this exercise, we will explore the evolution of poverty at the level of the new Districts. Following the administrative reorganization, households sampled for the EICV1 and EICV2 surveys were retroactively mapped to the new Districts, making a District-level comparison possible. This comes however with a health warning: the EICV1 and EICV2 surveys were representative at the level of the old Prefectures, not the new Districts. As there are more Districts than there were Prefectures, District-specific sample sizes in EICV1 and EICV2 are too small to give a representative picture (next to other potential biases). As such the District poverty headcounts from EICV1 and EICV2 need to be treated with caution.
Keeping the caveats in mind, the spatial distribution of poverty changed considerably over the course of the previous decade. At the turn of the century, poverty was concentrated in the South, South-West and North of the country (darker colors indicate a higher poverty headcount in Figure 47). The Southern Districts of Bugesera and Nyaruguru had poverty headcounts above 84 percent. By 2006, poverty was still largely concentrated in the Southern and Western parts, while in the Districts up North the incidence of poverty had somewhat declined (Figure 48). The 2011 poverty map looks substantially different: first, the map is dominated by brighter colors, a result of the strong poverty reduction between 2006 and 2011, and second, the districts up North that were among the poorest in 2001 are now among the least poor (Figure 49). Poverty in 2011 remained concentrated in the South-Western pocket of Rwanda bordering Burundi (to the South) and Lake Kivu (to the West).

Visual inspection of the poverty maps suggests that the reduction in poverty was concentrated in the northernmost and, to a lesser extent, southernmost parts of the country. In contrast, the central and some of the eastern and western parts seem to have experienced only modest decreases in poverty. This comes out clearly in Figure 50 and Figure 51, which show the reduction in poverty between 2001 and 2011 and 2006 and 2011, respectively. Districts in the north and south of the country recorded exceptionally strong poverty reduction (especially between 2006 and 2011), while districts bordering Lake Kivu and on eastwards towards Kigali experienced only modest decreases, and in some cases even increases, in poverty. Southern districts experienced strong poverty reduction too, but they remain among the poorest in the country.

Poverty reduction in Rwanda seems to have happened at the borders. The northern districts bordering Uganda and DRC (Burara, Musanze, Nyabihu, Rubavu) experienced record declines in poverty, as did the southern districts bordering Burundi (Bugesera, Gisagara, Nyaruguru). In contrast, the districts in the hinterland achieved only minor declines in poverty, with poverty headcounts even increasing in several districts (keeping in mind the caveat of representativeness). Curiously, border districts that do not border another country (such as those bordering Lake Kivu to the west or Akagera national park to the east) did not experience the same “border-effect” (poverty hardly changed there). Overall, poverty headcount dropped by 23 percentage points in districts bordering another country and 8 percentage points in other districts (between 2001 and 2011). The next chapter will elaborate more on the border effects.

To summarize, Rwanda experienced an episode of exceptionally strong growth and poverty reduction during the past decade, and in particular since 2006. Consumption growth was pro-poor, resulting in a modest drop in inequality that gave an extra push to poverty reduction. While the increase in living standards was broad-based, the Northern Province experienced the strongest consumption growth and fastest poverty reduction, and accounted for one-third of the national reduction in poverty between 2001 and 2011. Trends in non-monetary dimensions of welfare confirm the positive evolution, witnessed by substantial improvements in household assets and strong improvements in child health and education. The next chapter will explore in depth the characteristics of the poor and how or if these characteristics have changed over time.
Figure 47: 2001 - Poverty concentrated in the southwest and north of the country
(District-level incidence of poverty, 2001)

Source: EICV1, 2001

Figure 48: 2006 – Poverty concentrated in the south and west, less poverty up north
(District-level incidence of poverty, 2006)

Source: EICV2, 2006

Figure 49: 2011 - Northwest among the least poor districts, poverty remains pervasive in the southwest
(District-level incidence of poverty, 2011)

Source: EICV3, 2011
Figure 50: Poverty reduction lagged in the central and western parts of the country…
(District-level poverty reduction, 2001-2011)

Source: EICV, 2001; 2011

Figure 51: …while the southern and northern districts experienced strong poverty reduction
(District-level poverty reduction, 2006-2011)

Source: EICV, 2006; 2011
Chapter II.
Who are the Poor?
1. Introduction

The previous chapter summarized the poverty and inequality dynamics over the past decade. This chapter will focus on profiling the poor in terms of a range of characteristics and will examine the key correlates of poverty. As we are interested in the “current” characteristics of the poor, this chapter will use data from the EICV3 survey (2011) to construct the poverty profile. In examining the main correlates of poverty, we will however also explore if and how these correlates have changed over time.

2. The 2011 Poverty Profile

Rwanda has a traditional poverty profile. The poor tend to live in rural areas in large households with high dependency rates, headed by an older and little-educated household head. Poor households are relatively isolated from key infrastructure and depend heavily on agriculture, deriving the bulk of total income though subsistence and wage farming. Female-headed households are somewhat more likely to be poor, though the difference is small and has narrowed significantly since 2001. Poverty disproportionately affects the young: 50 percent of children (under 15) are poor, compared to 40 percent of adults. A salient finding is that the correlates of poverty are remarkably flat up until the fourth consumption quintile: in absolute terms, the bottom 80 percent of the population looks relatively similar.

2.1. Poverty has a strong regional dimension

Poverty in Rwanda is concentrated in the southwest. The Southern and Western Provinces have the highest poverty rates (57 percent and 48 percent, respectively) and account for more than half (56 percent) of national poverty. Kigali by contrast is the least poor province, contributing only 3 percent to overall poverty, substantially lower than its population share (approximately 10 percent—see Annex Table 1).

Poverty is predominantly rural. Close to half of the rural population lives below the poverty line, compared to 22 percent of the urban population. 93 percent of the poor live in rural areas. The spatial dimension of poverty is closely linked to the rural-urban divide: Outside the main urban agglomeration (Kigali Province), poverty is high, ranging from 43 percent in the Northern and Eastern Provinces to 57 percent in the Southern Province (Annex Table 1).

The spatial distribution of the poor largely corresponds to the distribution of poverty. Poverty rates are highest in the districts in the southwest (Figure 52), which also house the largest number of poor people (Figure 53). There is one exception: Gicumbi district in Northern Province is not among the poorest in terms of poverty rates, but nevertheless accounts for the single largest poor population (6 percent of the national poor live in Gicumbi). Four districts in Rwanda account for over 20 percent of the poor population: Gicumbi, Nyamasheke, Nyamagabe, and Karongi (Figure 51).
2.2. The poor live in large households with high dependency rates

Poor households tend to be larger than non-poor ones. In 2011, extreme poor households had an average one family member more than non-poor households (Table 7). This difference is driven entirely by the higher number of children in poor households: while the average extremely poor household had 2.8 children (below the age of 15), the average non-poor household only had 1.7. Given that the number of adults does not differ significantly across welfare groups, this means that the strain on household resources is higher for poor households. This is illustrated by the dependency ratio (the number of dependent children per working-age adult in the household), which is more than 60 percent higher for poor than for non-poor households (Table 7).

Table 7: Poor households are larger and have higher dependency ratios

<table>
<thead>
<tr>
<th>Household size</th>
<th>Number of children</th>
<th>Dependency ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely poor</td>
<td>5.52</td>
<td>2.75</td>
</tr>
<tr>
<td>Poor</td>
<td>5.26</td>
<td>2.54</td>
</tr>
<tr>
<td>Non-poor</td>
<td>4.45</td>
<td>1.71</td>
</tr>
<tr>
<td>Overall</td>
<td>4.78</td>
<td>2.04</td>
</tr>
</tbody>
</table>

Source: EICV, 2011. World Bank staff calculations

Dependency ratios are strongly correlated with poverty. Households with less than 0.5 dependent children per working-age adult have an average poverty rate of 30 percent, while households with dependency rates in excess of 2 have poverty rates of more than 60 percent (Figure 54). More than 20 percent of the poor have dependency rates in excess of 2, compared to 16 percent of the overall population.
While dependency rates have dropped significantly since 2001, the poor are lagging behind. The average dependency ratio decreased from 1.0 in 2001 to 0.9 in 2011, a decline driven by the non-poor households. Dependency rates among extremely poor households remained unchanged at 1.2, while it declined insignificantly (by 0.02) for the poor (but not extremely poor) households. Given the strong correlation between poverty and dependency ratios, the stalling decrease in dependency rates among the poor may be a cause for concern.

Because poor households tend to be larger, children are overrepresented among the poor. While children under the age of 15 account for 43 percent of total population (according to the EICV3 survey), they make up 48 percent of the poor (Figure 55). 50 percent of children live below the poverty line, compared to 40 percent of people aged 15 or more. Children are also more likely to be extremely poor (28 percent of children live below the extreme poverty line, compared to 21 percent for people aged 15 or more).

Figure 55: Off to a bad start
(Number of people living above and below the poverty line, by age)
2.3. Younger and male-headed households less likely to be poor

Looking at the characteristics of the household head, we find that households with younger heads are less likely to be poor. Poverty among households with a head aged 14 to 30 amounts to 34 percent and this increases to approximately 50 percent for households with a head aged 38 to 58 (Annex Table 1). Poverty then decreases again among households with older heads (older than 58). The age-effect is probably partly explained by its relation to household composition: young households usually have lower dependency rates (family formation is only just beginning), while households with a head aged 38-58 typically have many mouths to feed. Dependency rates decrease again for older households as children get married and form their own households.

Female-headed households are somewhat more likely to be poor, though the gap has narrowed since 2001. In 2011, 47 percent of female-headed households lived below the poverty line, compared to 44 percent of male-headed ones. This is a marked improved from 2001, when 65 percent of female-headed households were below the poverty line (compared to 56 percent for male-headed ones).

The relation between age and poverty is different for female- and male-headed households. While poverty rates among male-headed households peak at the age of 48-57, poverty rates among female-headed households peak earlier, at the age of 30-37 (poverty of 55 percent), and decrease after (Figure 56). At younger ages, male-headed household are less likely to be poor than female-headed ones. At older ages however (48 or older), poverty rates are actually significantly lower for female-headed households. This different age-effect suggests that the reasons for the higher overall poverty rates among female-headed households are more related to the specific reason why the household is female-headed than to any inherently negative effect of having a female head of household (Box 5).
Box 5  Poverty among female-headed households

Female-headed households are worse-off only if there was a man involved

Households headed by women are worse-off only if the women are young (Figure 56). Why is it that households headed by young women perform badly, both in comparison with men of the same age and with older women? One part of the answer can be found by looking at the reason why these women are heads of household.

Overall, the most common reason for a household to be headed by a woman is the death of the husband. Households headed by widows do not seem to be particularly disadvantaged: 46 percent of these households live below the poverty line, not significantly higher than the overall poverty rate of 45 percent (Figure 57). Young women however are disproportionately more likely to be household heads as a result of their man running off. Over 30 percent of young women heads of household are separated or divorced, compared to 13 percent of older women. This group of households does seem particularly disadvantaged: poverty headcount in households headed by a separated woman amounts to 55 percent, significantly higher than the overall poverty rates and the rates for other types of female-headed households (Figure 57).

Household headed by single women are significantly less likely to be poor. Needless to say, this finding is far from causal but driven by several selection effects: Single female heads of household are on average more educated, younger and live in smaller families than the average household head. They are also more likely to live in urban areas. And they are still a lot worse off than households headed by single men, where poverty amounts to only 10 percent.

Figure 57: Different kinds of female-headed households
(Poverty headcount for female-headed households, by reason)

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2.4. The poor are largely unskilled

A salient characteristic of the poor all around the world is their general lack of education and skills. In Rwanda, lack of education is a general characteristic of household heads, not only of the poor: 67 percent of all household heads are unskilled (did not complete primary education), and this increases to 77 percent for poor households. There is a strong link between education and poverty: Poverty is highest among households with a head who never went to school, and decreases with each extra level of education (Figure 58). Education beyond the primary level seems to have the biggest returns in terms of poverty reduction: Households whose head has some education beyond primary have poverty rates that are less than half of those of households whose head completed primary but did not start secondary.

Educational attainment of household heads is low and largely flat for the bottom 80 percent of households. 18 percent of household heads in the bottom quintile (the extreme poor) completed primary education, and this increases modestly to 23 percent in quintiles two and three and 29 percent in the fourth quintile (Figure 59). 55 percent of household heads in the top quintile completed at least primary education, double the percentage in the fourth quintile but still low. Secondary education is even flatter: slightly more than one percent of household heads in the fourth quintile completed secondary education, compared to 0.3 percent in the first three quintiles. In the top quintile secondary completion shoots up sharply but remains below 20 percent.
Overall, lack of education is not only an attribute of the poor but rather a general characteristic of the bottom 80 percent of the population. This is unsurprising given the low living standards even in the upper quintiles. Converted to 2005 PPP, daily per capita expenditures are below the international poverty line for the first three quintiles (Figure 60). While average expenditures in the fourth quintile exceed the $1.25 a day line, households in this quintile are hardly living large (daily expenditures of USD 1.6). Only the households in the top 20 percent of the consumption distribution seem to live on a reassuring distance from the poverty line. Over 80 percent of the population lives below PPP USD 2 a day.

Educational attainment of household heads increased modestly between 2001 and 2011. The percentage of household heads who completed primary school increased from 26 percent to
31 percent, though the median level of education remained unchanged at the third grade of primary school. As household heads typically stay on for long, the slow pace of the increase in average educational attainment is not surprising.

2.5. The poor depend on agriculture

While agriculture is the mainstay of employment in Rwanda as a whole, it is particularly important for the livelihoods of the poor. Overall, 71 percent of households in Rwanda have their main occupation in agriculture (independent agriculture of wage farming), but this increases to well over 80 percent for the bottom two quintiles (Figure 61). Similar to the findings on education and consumption, the occupational structure of the bottom 80 percent of households is remarkably similar: 70 percent of households in the fourth quintile still engage in agriculture as a main occupation and the percentage engaged in wage employment in the non-farm sector as main occupation (16 percent) is not that much higher than in the bottom quintile (11 percent). Again, the top quintile seems structurally different: Almost 70 percent of households in this quintile have a main occupation outside agriculture (Figure 61).

While the bottom 80 percent of households are largely agricultural, there is a difference in the type of agricultural work they engaged in. Agricultural wage labor is most common among the poorest, being the main occupation for 15 percent of households in the bottom quintile (red bars in Figure 61). The prevalence of this type of labor decreases in each successive consumption quintile. Independent farming in contrast follows an inverted-U pattern, increasing from the first to the second quintile (probably because of the small landholdings in the first quintile) and gradually decreasing after. The percentage of households engaging in independent farming as main occupation is approximately the same in the first as in the fourth quintile.

Non-farm occupations are most common in the upper consumption quintiles. About 15 percent of households in the bottom two quintiles have a main occupation outside agriculture, and this rises to 20 percent in the third quintile, 30 percent in the fourth quintile, and 70 percent in the top (Figure 61). In each quintile, wage employment is more prevalent that self-employment in the non-farm sector. Having a main occupation outside farming is strongly related to better living standards: Households with a main occupation outside agriculture have poverty rates of 22 percent (self-employment) or 28 percent (wage employment), compared to 52 percent or 75 percent for independent farming or wage farming, respectively.

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27 Main occupation defined as the occupation that earns the household the largest part of its income.
Looking at total household income, agriculture accounts for the bulk of income, in particular for the poor. The share of total income earned through agriculture amounts to about 60 percent in the three bottom quintiles, and drops slightly to 50 percent in the fourth quintile (Figure 62). In the top quintile (Q5), agriculture only accounts for 10 percent of total income. The share of income earned through non-farm wage employment is relatively stable across the first four quintiles, but is, unsurprisingly, a lot higher in the top quintile. The share of income gained through non-farm business activities increases in each quintile, while the share gained through agricultural wage labor consistently decreases with higher consumption levels.

2.6. The poor are relatively isolated

The poor tend to live in remote areas. Approximately 60 percent of households in the bottom quintile have to walk for at least one hour to reach the closest market, health center, or public transport stop (Figure 63). In the top quintile, less than 30 percent of households are that remote. The biggest differences in accessibility between the bottom and top quintile are observed for markets, health centers, and public transport. Access to all weather roads is fairly evenly distributed, as is access to primary schools (not shown in Figure 45).
Remote infrastructure can potentially have adverse effects. Remoteness from markets and public transport may induce farmers to sell at lower farm-gate prices to traders, thereby foregone the premium of getting a higher price either on the local market or in a nearby bigger (urban) market. It also increases the costs of purchased goods because of higher transport costs. Remoteness from health centers may result in individuals not seeking care when needed (because of transportation costs) or urgent care administered belatedly, with potential detrimental health consequences, particularly for children and pregnant women.

Access to infrastructure is relatively similar in the first four consumption quintiles. While households in the fourth quintile are generally closer to key infrastructure than households in the previous quintiles, the differences are small. The top quintile is different, with much better connectivity. This is partly because households in the top quintile are more likely to live in urban areas: 35 percent of households in the top quintile are urban, compared to less than 9 percent in the four other quintiles. This however does not jeopardize the basic message: Even focusing only on rural areas, we find that access to infrastructure is significantly better for wealthier than for poorer rural households.

Isolation from infrastructure is strongly related to poverty. Based on a factor analysis of the distance to infrastructure variables in the EICV3 we create an isolation index, with higher values on the index proxying remoteness from key infrastructure. Poverty headcount in the most connected quartile (lowest scores on the index) amount to 27 percent and increases to 45 percent in the second most connected quartile (Figure 64). In the least connected quartiles, poverty rates average 54 percent.
To summarize, the poor in Rwanda are largely concentrated in the south and west of the country and are likely to live in large households with high dependency rates. Poor households are likely to be headed by uneducated and older heads of households and are somewhat more likely to have a female household head. The poor largely depend on agriculture for their livelihood, which also earns them the biggest share of their incomes, and are relatively isolated from key infrastructure. While 45 percent of households fall below the poverty line, the characteristics of the bottom 80 percent of the population are remarkably similar.

All figures presented so far are merely bivariate correlations and do not control for the influence of other characteristics. For instance, it is possible that households in the southwest of the country are not more likely to be poor just because of their location, but because of other characteristics that may be more prevalent there (such as low education levels, poor connectivity, etc.). Similarly, the finding that poverty rates are higher in female-headed households may not be due to a pure gender effect, but due to women having other characteristics that correlate with higher poverty (such as lower education). The next section will provide a more robust analysis of the correlates of poverty by controlling for the effects of confounding factors in a regression framework.

3. Correlates of poverty

Education, occupation, and location are the main correlates of poverty. In terms of consumption, returns to education are high, especially at post-primary levels. While a household headed by someone who completed primary education has consumption levels that are 19 percent higher relative to a similar household with no education, this increases to over 50 percent for households headed by someone with some secondary education. Having a main occupation in agriculture significantly decreases consumption, in particular for agricultural wage employment. Effects of location are important and have changed substantially during the past decade. In particular, the effect of sharing a border with DRC or Burundi has strengthened tremendously over the past decade, resulting in strong consumption growth and poverty reduction in the border districts, possibly due to the improved regional security situation. Finally, controlling for other factors, having a woman head of household is unrelated to household consumption levels.

We conduct a number of analyses with various explanatory variables (“covariates”) of consumption classified into two broad groups: (i) one set of covariates that summarize the non-geographic attributes of a household, such as age, level of education, demographic composition, occupation, etc., denoted by vector D; and (ii) a set of variables that summarize the geographic attributes of a household, denoted by vector G.

Specifically, the set of covariates summarized by vector D consists of variables characterizing the demographic composition of the household are listed below.
**Dependency ratio**: number of economically dependent children per working-age adult;

**Gender of the household head**: Dummy (1 if female, 0 if male);

**Age of the household head (years)**.

**Education**: binary variables identifying the highest education level attained by the household head (primary incomplete, primary complete, post-primary incomplete, post-primary complete, secondary incomplete, secondary complete, and superior education);

**Occupation**: binary variables for the income source of the household: farm wage employment, non-farm wage employment, independent farm employment, independent non-farm wage employment.

**Infrastructure access**: Dummies for distance to key infrastructure (primary school, secondary school, health center, public transportation, main road, main market). For each infrastructure variable, three categories are defined: near, far and very far, with the first variable left out of the regressions as reference variable. In EICV3 data, “far” implies a travel time of 1-2 hours, and “very far” implies a required time of at least two hours to reach a destination. In EICV1 sample, “far” implies a distance 10-20 kms to nearest health center or market, and “very far” implies a distance of more than 20 kms. There is no information on distance to secondary schools in 2001, and the variables on primary school as well as on transportation were omitted due to a limited number of observations.

The covariates summarized by vector G include the following geographic attributes of the household:

**Province**: Dummies for province (Southern province is left out as reference);

**Border district**: Chapter I showed that poverty reduction in Rwanda was driven by the border districts. To examine whether this holds when also controlling for other factors, we create a series of dummies indicating whether the district has a land border with another country. Districts that border a natural barrier (lake, national park) are not considered border districts in the analysis. To explore the importance of the neighboring country, we create separate dummies for districts bordering Burundi (Gisagara, Nyaruguru and Bugesera, but not Ngoma due to small size of land border), DRC (Rubavu, Rusizi and Musanze), Tanzania (Kirehe), Uganda/Tanzania (Nyagatare), and Uganda (Buruera, but not Gicumbi due to small size of land border);

The model can be specified as follows:

\[
\ln C_R = \alpha_R + \delta_R D_R + \gamma_R G_R + \varepsilon_R \tag{1}
\]

\[
\ln C_U = \alpha_U + \delta_U D_U + \gamma_U G_U + \varepsilon_U \tag{2}
\]

where \(C\) is the vector of household consumption per adult equivalent (in Rwandan Franc using 2001 prices), \(\alpha\) is the intercept, and \(\varepsilon\) is the error term. The regressions are performed separately for rural (denoted \(R\) ) and urban (denoted \(U\) ) households to rule out potential structural differences that could result in different determinants of poverty.

Models (1) and (2) are based on data from EICV3, i.e. calendar years 2010/2011. Due to a reclassification of enumeration areas following the 2002-census, the urban-rural distinction of households surveyed in 2011 is not directly comparable with the 2001 survey (EICV1). Instead, data at the provincial level, comparing Kigali to the rest of the country, provides a rough estimate of the urban-rural difference in 2001 and 2011. Due to comparatively few observations for Kigali
in 2001, the comparison of the poverty correlates in 2001 and 2011 is only presented for rural areas. In the regression summary presented in Annex 2, Models (3) and (4) represent different versions of (1), using Kigali as a rural/urban divider for 2011, and 2001, respectively.

While the dependent variable in the specifications presented above is the logarithm of consumption, some regressions in the literature on poverty are based on probit regressions to analyze the determinants of poverty. The disadvantage of analyzing poverty as a binary (poor/non-poor) variable is that relevant information (the distribution of consumption) is thrown away, making the results difficult to interpret, should there be a change in the poverty line. Therefore, we use the probit regressions only as robustness checks. The models are defined as follows:

\[ P(Poor)_R = a_U + \delta_U D_U + \gamma_U G_U + \varepsilon_U \]  
\[ P(Poor)_U = a_U + \delta_U D_U + \gamma_U G_U + \varepsilon_U \]

Again, Model (5) is repeated using Kigali as the rural/urban divider to define Model (7) for 2011 data, and Model (8) using 2001 data. Detailed regressions outcomes are presented in the Annex 2.

In the following sections, we discuss and compare the findings on the main poverty correlates for two different strata: (i) rural versus urban Rwanda in 2011, and (ii) rural Rwanda 2011 versus rural Rwanda in 2001. Finally, note that the analysis only sheds light on the factors that are closely correlated with poverty, without necessarily implying causality.

### 3.1. Demographic correlates

**Controlling for other variables, dependency ratios are significantly correlated with consumption levels.** Each 0.1 increase in the dependency ratio is associated with 2 percent less consumption in rural areas and 3 percent less consumption in urban areas (Figure 65). Though dependency ratios significantly decreased over the past decade (Table 7), its effect on consumption has increased. In rural areas, the negative effect of high dependency ratios almost doubled from 10 percent in 2001 to 18 percent in 2011 (Figure 66). As noted earlier, this may be explained by the fact that the poor have lagged behind in the demographic shift towards lower dependency ratios.

**Next to dependency rates, larger households in general have lower living standards.** The association, while statistically significant, is however modest: In rural areas, one extra household member reduces consumption levels by slightly more than four percent while in urban areas, it reduces consumption by three percent (Figure 65). This suggests that it is really the age composition of the household, rather than its size, that matters for living standards.

**When controlling for the influence of other variables, the gender of the household head does not matter for household consumption level.** While poverty among female-headed households (47 percent) is somewhat higher than the average, this does not appear to be caused by having a female head but rather by other variables that are controlled for in the analysis (Figure 65). This is a sharp change compared to 2001, when households headed by women had average consumption levels that were 11 percent lower, even after taking account of other factors such as education and occupation (Figure 66).
Figure 65: The correlates of consumption in 2011
(Percentage impact on consumption expenditures per adult equivalent)

Source: EICV3; World Bank staff calculations. “Far” implies a travel time of 1-2 hours, and “very far” implies a required time of at least two hours to reach a destination.

The easing of the negative gender effect may be explained by a number of efforts over the past decade close the gender gap. In 2003 for instance, Rwanda adopted one of the world’s most progressive constitutions in terms of its commitment to equal rights for all, gender equality and women’s representation. With 64 percent female representation in Parliament—Rwanda far exceeded the 30 percent constitutional requirement and became the first country in the world with the highest female representation in decision making institutions. Rwanda is one of few economies in the world that have established quotas for women on boards of publicly listed
companies: the constitution sets a minimum of 30 percent for women and men on boards of publicly listed companies. Women today are also more educated than in 2001.

**Figure 66: Impact of different characteristics on consumption in rural Rwanda in 2001 versus 2011.**

(Percentage impact on consumption expenditures per adult equivalent)

Source: EICV3; World Bank staff calculations. “Far” implies a travel time of 1-2 hours, and “very far” implies a required time of at least two hours to reach a destination. In the 2001 sample, “far” implies a distance 10-20 kms to nearest health center or market, and “very far” implies a distance of more than 20 kms. There is no information on distance to secondary schools in 2001, and the variable on primary school and transportation were omitted due to a limited number of observations.

Age of the household head does not matter for consumption. The descriptive finding in the previous section that households with younger heads are less likely to be poor can thus be
explained by other variables that are correlated with age, most likely education (younger heads of household tend to be more educated) and dependency ratios (household with younger heads have lower dependency ratios).

3.2. Returns to education are high

Education is by far the main correlate of poverty, both in rural and urban areas. In urban areas, each higher level of education is associated with larger consumption gains. While having completed only a few years of primary school adds 4 percent to consumption, a full cycle of primary education already adds 27 percent (Figure 65). The returns are even bigger at the secondary level: Having completed a couple of years at the secondary level adds 70 percent to consumption, while having completed secondary school basically doubles consumption (relative to households with an uneducated head). Households headed by someone who enjoyed higher education (whether completed or not) have the highest consumption levels, all else being equal.

Returns to education (in terms of consumption) are lower in rural than in urban areas. The effect of different levels of education is generally larger for urban areas, with two notable exceptions: First, incomplete primary education is significantly related to higher consumption levels in rural areas but not in urban areas. This suggests that increasing the levels of education in rural areas by only a couple of years could have substantial welfare effects. Second, vocational and technical training (‘post-primary education’ in Figure 65) seems twice as effective in raising consumption levels in rural than in urban areas. In rural areas, household headed by a person who completed post-primary education have consumption levels that are 128 percent higher than households with an educated head. General secondary education in rural areas seems to pay off less than technical and vocational education (although the difference is not significant due to the small number of people who have completed technical and vocational training).

Focusing on the changes since 2001, we find that returns to education in rural areas have somewhat decreased. In 2011, a rural household with a head having completed primary school had an expected consumption that was 15 percent higher than a similar household with an uneducated head, down from 34 percent in 2001 (Figure 66). This pattern holds for every education level except complete post-primary education, for which returns four-folded between 2001 and 2011. However, this effect is insignificant in a statistical sense due to the small sample size.

3.3. Agriculture is correlated with lower living standards

The occupation of the household head has a large impact on consumption and poverty. Even controlling for the fact that farmers are typically little educated, having an occupation in agriculture is associated with poverty: Households with a head engaged in agriculture have consumption levels that are approximately 30 percent lower (in rural areas) compared to households who do not engage in agriculture, with wage labor being particularly harmful: households that are engaged in agricultural wage labor are 27 percent more likely to be poor, compared to 9 percent for independent farming.

Rural households whose head has a wage job in the non-farm sector are not discernibly better-off. These households have consumption levels that are only 3 percent higher compared to households not engaging in non-farm wage employment, and are only one percent less likely to be poor. In rural areas, households engaged in nonfarm self-employment are among the best-
off, with consumption levels that are 15 percent higher, all else being equal. Those households are 11 percent less likely to be poor compared to households without a nonfarm business activity (Figure 65).

**The negative effect of being employed in agriculture is even higher in urban areas.** Urban households that are engaged in agriculture have consumption levels that are between 30 percent and 40 percent lower depending on the type of employment (self-employment or wage-employment). In urban areas, households with wage employment in the non-farm sector are the least likely to be poor (associated with a 16 percent increase in consumption), followed by those with non-farm self-employment.

The consumption payoffs from different occupations have changed since 2001. In particular, the negative effect of being employed in agriculture seems to have increased between 2001 and 2011. While being engaged in independent agriculture was associated with 14 percent less consumption in 2001, it was associated with 33 percent less consumption by 2011 (Figure 66). The reasons behind this evolution are unclear since agricultural productivity has improved greatly since 2001 (see next Chapter). At the same time, the positive effect of having a nonfarm occupation has diminished too. This can potentially be explained by the large increase in the proportion of households engaged in nonfarm activities (the proportion of households with a nonfarm activity more than doubled between 2001 and 2011), which has tended to decrease average incomes in the nonfarm sector (which are however still a lot higher than in agriculture).

### 3.4. Land – size matters, but only marginally

**Ownership of land is pretty equally distributed in Rwanda.** 96 percent of households in rural Rwanda own farmland and this proportion does not vary much between poor (97 percent) and non-poor households (95 percent). As such, it is no surprise that land ownership is not associated with consumption levels (Figure 65). Land size however is more unequally distributed. While the extreme poor in rural areas owns on average less than 0.4 hectares, the poor (but not extreme-poor) own 0.5 hectares and the non-poor 0.7 hectares (according to the EICV3). Bigger landholdings are associated with higher consumption levels: Each extra hectare of land is associated with six percent more consumption and a six-percent drop in the likelihood of being poor. Since average landholdings are so small however, this effect is only of marginal importance.²⁸

**In urban Rwanda, ownership of farmland is strongly associated with consumption.** Urban households that own farmland have consumption levels that are 26 percent higher than similar households without farmland. This result may seem counterintuitive given that the best-off households in urban areas are typically those who have stable well-paid formal non-farm employment and do not engage in agriculture whatsoever. This is confirmed by the data: Urban households without any farmland consume on average 40 percent more compared to households with farmland. However, controlling for the influence of all other variables (such as education, age, occupation, etc.), having farmland is associated with higher consumption in urban areas.

²⁸ In the Rwandan context, quality of land may be more important than land size. We do however not have data that allow examining the effects of land quality.
3.5. Isolation is associated with lower consumption levels

Isolation from infrastructure tends to be associated with lower levels of consumption, though the size of the association is generally modest. In rural Rwanda, living far from a health center (‘far’ defined as a walking time of between one and two hours) is associated with four percent less consumption, living far from markets is associated with two percent less consumption, and being far for public transportation with seven percent less consumption (Figure 67). For health centers and public transportation, living very far (“very far” defined as at least a two-hours walk) exacerbates the negative impact on consumption. This is not the case for markets. Access to public transportation seems to matter most for poverty: Being very far from public transportation increases the likelihood of poverty by eight percent (Figure 67).

Figure 67: In rural areas, isolation and living standards are correlated, though only weakly
(Percentage impact on consumption from living far/very far from infrastructure in rural areas, 2011)

Comparing the effects with 2001 is complicated by the different units of measurement. In 2001, the questions on distance to infrastructure were asked in kilometers, while in 2011 they were asked in terms of travel time (by foot). For the 2001 survey, we defined “far” as a distance of between 10 and 20 kilometers and “very far” as a distance of more than 20 kilometers. Keeping this caveat in mind, we find that distance to public transportation did not influence consumption in 2001 (while it does in 2011). This finding is perhaps best explained together with the effects of accessibility to the nearest market. While being close to the market was associated with a large increase in consumption in 2001 (boosting consumption by 33 percent compared to those very far away), the effect in 2011 was 10 times smaller. This may indicate that with increased access over the past decade to public transportation, people may no longer be dependent on the closest market, but may instead choose markets further away from the household.

29 It is important to note that the measures are not strictly comparable over time: in 2011, distance was measured in terms of time (minutes) to reach the destination, whereas in 2001, the geographic distance (kilometers) was measured.
Isolation from infrastructure is a better predictor of poverty in urban than in rural areas. In urban areas, living far from a health center is associated with 8 percent less consumption and living very far even with 28 percent less consumption (Figure 68). In a similar fashion, living far from public transportation brings down consumption levels by 12 percent in urban areas, compared to seven percent in rural areas. Urban households that are relatively isolated from infrastructure are typically among the poorest, living on the outskirts of the city underserved by public infrastructure.

Figure 68: In urban areas, the correlation between isolation and living standards is stronger
(Percentage impact on consumption from living far/very far from infrastructure in urban areas, 2011)

Access to other types of infrastructure, such as schools and roads, is either insignificant in explaining consumption or difficult to interpret. Distance to roads is not significant in explaining household consumption, perhaps due to the collinearity with access to public transportation. The results on access to schools—primary as well as secondary—are not clear-cut. For instance, urban households living far from a primary school have consumption levels that are 23 percent lower, while those living very far have consumption levels that are 60 percent higher (relative to households living within one hour’s walk).

3.6. Location matters – even after controlling for other factors

Geographic location of households is strongly associated with consumption levels, even after controlling for the influence of other household characteristics. Relative to similar households living in the Southern Province, rural households living in Kigali and the Eastern province consume 16 percent more, while those in the Northern and Western Province consume 12 percent and 6 percent more, respectively. In urban areas, location is even more important: relative to urban households in the Southern Province, urban households in Kigali and the Eastern Province consume 30 percent more, and households in the Western province consume 17 percent less (Figure 65). Compared to 2001, living in the Eastern Province has become more

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30 Because of the insignificant contribution in explaining the variation in consumption, this variable has been omitted from the regression results presented in the Annex.
advantageous in terms of living standards, while living in the west has become less advantageous (Figure 66).

It is important to note that the effects of geography remain strongly significant after controlling for differences in education, occupation, demographic characteristics, etc. The implication is that provincial differences in household living standards, and hence in the vulnerability to poverty, are not only a consequence of different educational attainment levels, demographic differences across geographic areas, and access to services. They can also be explained by other factors that are related to the specific geographical location of a household.

As shown in Chapter I, the pace of poverty reduction in Rwanda was substantially higher in districts that border another country. A simple sectoral decomposition shows that the border districts accounted for over half of overall poverty reduction, despite housing less than 30 percent of the total population. The beneficial effect of borders is confirmed by Figure 69: even after controlling for the effect of the Province and all household characteristics, rural households in districts bordering DRC have consumption levels that are 22 percent higher than similar households living in districts in the same Provinces that do not share a border with DRC. Those households are 18 percent less likely to live in poverty (Annex Table 3). We find similar effects for districts bordering Uganda (5 percent less likely to be poor) and Tanzania and Uganda (13 percent less likely to be poor), though the effects are smaller than they are for DRC.

Looking at the changes since 2001, we can start to understand why the border districts accounted for so much of the reduction in poverty. In 2001, household in districts neighboring DRC did not experience any particular advantages from this. In fact, neighboring DRC was associated with an insignificant 1 percent reduction in consumption. This was the period of the Second Congo War (1998-2002). By 2011 however, neighboring DRC was associated with a 25 percent higher consumption level (Figure 70). Informal cross-border exports may explain this positive effect: Informal exports to DRC account for over 80 percent of all informal cross-border exports, and recently accounted for nearly one fifth of formal trade (National Bank of Rwanda, 2013). Globally, agriculture products and livestock (including dried beans, bovine cattle, maize flour and beef) are the major commodities traded in informal cross-border exports. Households in districts bordering DRC appear to have been able to improve their living standards by exploiting the proximity of a big market and the relative calm reigning during the 2010/11 period.
The story for Burundi is different. Controlling for other factors, household in districts bordering Burundi were substantially worse-off in 2001. Sharing a border with Burundi was associated with 38 percent less consumption, likely owing to the large scale civil war raging in Burundi at that time, which disrupted cross-border trade and potentially had negative spillovers on the Rwandan side of the border. By 2011, the war in Burundi had subsided, and so had the negative effect of proximity to Burundi (Figure 70). As the negative border effect disappeared between 2001 and 2011, the districts bordering Burundi experienced strong poverty reduction (but remain among the poorest in the country).

4. Conclusions

Overall, the poverty profile for Rwanda is unsurprising. As in most low-income countries in the world, the poor are poorly educated, depend on agriculture despite having small landholdings, live in large households with high dependency rates, and tend to be further away from key infrastructure. Children are most likely to be poor: 50 percent of children younger than 15 live below the poverty line, compared to 40 percent for people 15 and older.

Education, occupation and location are the main correlates of poverty. Each higher level of education of the household head is associated with an increase in household consumption, and households with a head who completed secondary education consume twice as much than households with an uneducated head, all else being equal. Engaging in farm wage labor is a strong predictor of poverty, increasing the probability of living below the poverty line by 27 percent in rural areas and 15 percent in urban areas. Location is important too, with especially households living in Kigali and the Eastern Province getting a substantial consumption bonus just from living where they live.

Two of the most interesting findings are the effect of the household’s head gender and the effect of living in districts with a land border. While in 2001 consumption levels for households with a female head were lower, controlling for a range of other characteristics, this...
was no longer the case in 2011, when the gender of the household head did not matter for consumption. Concerning location, we find that households living in districts with a border to another country are substantially better-off, after controlling for the effect of the Province and the effects of household characteristics. This is particularly the case for districts bordering DRC, the hub of informal cross-border exports.

The beneficial border effects make the case for one of the interventions planned for in the EDPRS-2, improving the domestic connectivity in Rwanda. Currently, it seems that only the households that are physically close to the borders are able to take advantage of the opportunities offered by them. Increasing the domestic transport infrastructure (and getting transport costs down) could enable households from ‘landlocked’ districts to participate in the trading opportunities offered by the borders, particularly in light of increasing agricultural production that is creating tradable surpluses.
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1. Introduction

The previous chapters showed that Rwanda experienced a strong episode of growth and poverty reduction and sketched the characteristics of poverty. In this chapter we will take a closer look at some of the factors that have been associated with the reduction in poverty, focusing in particular on four key evolutions over the past decade: the boom in agriculture, the progressive move towards non-farm occupations, the sharp drop in fertility, and the large increase in transfers and remittances. This chapter will also summarize the results of the qualitative study conducted in the framework of this Poverty Assessment and will explore whether the people’s verdict corresponds with the statistical analysis.

This chapter proceeds as follows. In the first section, we describe some of the key evolutions in Rwanda over the past decade, focusing in particular on. Section 3 uses data from the EICV1 and EICV3 surveys to examine how these evolutions have been associated with consumption growth at various points of the distribution.

2. What were the Key Evolutions during the Past decade?

The improvements in household consumption described in Chapter I came amidst a period of rapid changes in the economic and socio-demographic structure of the Rwandan economy. Agricultural productivity increased rapidly from a low base, mainly driven by policies in the second half of the previous decade. At the same time, households diversified massively into non-farm activities, reducing overall income risk. Fertility rates, which have traditionally been high, started dropping rapidly, resulting in a significant decrease in household size and dependency ratios. Finally, both remittances from abroad and within-country transfers increased substantially, boosting disposable income at the household level.

2.1. Increased Agricultural Production and Commercialization

Agriculture is the backbone of the Rwandan economy. Although the share of agriculture in GDP has fallen from 45 percent in 2001 to 34 percent in 2011, agriculture remains the main occupation for over 70 percent of working Rwandans. Of the 1.4 million new people working in Rwanda between 2001 and 2011, the largest increase in new jobs is in agriculture (430,000). In terms of income, agriculture accounts for almost half of aggregate household income and much more for poor households (see Chapter II). The proportion of Rwandan households cultivating at least one plot of land has remained stable throughout the previous decade at 90 percent.

Increasing agricultural productivity and transforming agriculture from subsistence-based to market-based was one of the priorities for both the first PRSP (2001-2005) and the EDPRS (2007-2012). Rwanda was the first signatory of the African Union’s Comprehensive African Agricultural Development Program (CAADP) and has steadily increased the proportion of its total budget devoted to agriculture. Public expenditures on agriculture reached 10 percent of the national budget as of 2009, as committed to in the CAADP. The increased public and donor-funded investments in agriculture have been associated with a stark increase in aggregate production (see Figure 71): Production of cereals more than tripled between 2000 and 2010, while production of pulses and roots increased by 58 percent and 79 percent respectively. This is also reflected in the household data (see
Table 9): The average value of agricultural production more than doubled in real terms between 2001 (Rwf 105,000 per household) and 2011 (Rwf 223,000 in 2011 prices)\textsuperscript{31}. The percentage of farmers who reported having purchased fertilizers also increased sharply, from 7 percent in 2001 to 30 percent in 2011. Since agriculture is the single most important income source for poor households, the increase in agricultural production is believed to have contributed substantially to consumption growth and poverty reduction. At the same time, commercialization of agriculture by households-defined as the share of harvest sold on the market- also increased: In 2011, the average household sold 21.4 percent of its total produce on the market, up from 13.4 percent in 2001.

**The jump in agricultural production and productivity is a recent phenomenon.** As shown by Table 8, the increase in agricultural production was a lot higher in the second half of the decade than in the first half: Aggregate production of cereals increased by 135 percent between 2006 and 2011, compared to 28 percent in the preceding five-year period. While the production of roots and tubers actually declined between 2001 and 2006, it almost doubled during the past five years. Same goes for the increase in agricultural productivity: While average yields grew timidly between 2001 and 2006, they sharply increased during the last five years (see Figure 72). The boom in agriculture coincides with the roll-out of the Crop Intensification Program (CIP), a comprehensive program of land consolidation, regionalization and intensification phased in in late 2007\textsuperscript{32}.

| Table 8: The Boom in Agricultural Production Happened in the Last Five years
<table>
<thead>
<tr>
<th>(Production levels of Selected Crops in 2001, 2006 and 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Level (tons)</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Cereals</td>
</tr>
<tr>
<td>Pulses</td>
</tr>
<tr>
<td>Roots/Tubers</td>
</tr>
</tbody>
</table>

\textsuperscript{31} Annex Table 4 and Annex Table 5 show the descriptive statistics by welfare group.

\textsuperscript{32} According to data from the Ministry of Agriculture there were large productivity gains in CIP areas: Production of maize and wheat increased six-fold, production of cassava and Irish potatoes tripled while that of rice and beans increased by 30 percent (MINAGRI, 2011).
Table 9: Significant Changes in Household Consumption, Income Activities, and Human Capital during the Past Decade
(Means of Key Variables in 2001 and 2011 with Differences in Means and Significance Levels)

<table>
<thead>
<tr>
<th></th>
<th>2001 (EICV1)</th>
<th>2011 (EICV3)</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consumption and Poverty</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption Expenditures per AE (2011 Rwf)</td>
<td>210,043</td>
<td>270,921</td>
<td>60,878***</td>
</tr>
<tr>
<td>Poverty Headcount (%)</td>
<td>58.9</td>
<td>44.9</td>
<td>-14.0***</td>
</tr>
<tr>
<td><strong>Agriculture and Livestock</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of Agricultural Production (2011 RwF)</td>
<td>104,720</td>
<td>222,998</td>
<td>118,278***</td>
</tr>
<tr>
<td>Share of Harvest Sold</td>
<td>13.4</td>
<td>21.4</td>
<td>8.0***</td>
</tr>
<tr>
<td><strong>Income Activities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm Self Employment (% of households)</td>
<td>90.7</td>
<td>91.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Farm Wage Employment (% of households)</td>
<td>13.7</td>
<td>48.8</td>
<td>35.1***</td>
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<tr>
<td>Non-Farm Self Employment (% of households)</td>
<td>15.3</td>
<td>41.5</td>
<td>26.2***</td>
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<td>Non-Farm Wage Employment (% of households)</td>
<td>21.8</td>
<td>48.4</td>
<td>26.6***</td>
</tr>
<tr>
<td>Any Non-Farm Activity (% of households)</td>
<td>29.9</td>
<td>69.7</td>
<td>39.8***</td>
</tr>
<tr>
<td>Receive Transfers/Remittances (% of Households)</td>
<td>60.8</td>
<td>96.6</td>
<td>35.8***</td>
</tr>
<tr>
<td>Value of Transfers/Remittances (2011 RwF)</td>
<td>16,035</td>
<td>56,009</td>
<td>39,974***</td>
</tr>
<tr>
<td><strong>Education and Demographics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household Size in Adult Equivalents</td>
<td>4.48</td>
<td>4.24</td>
<td>-0.24***</td>
</tr>
<tr>
<td>Dependency ratio</td>
<td>0.98</td>
<td>0.87</td>
<td>-0.11***</td>
</tr>
<tr>
<td>Household Head Educated (% Yes)</td>
<td>60.2</td>
<td>72.6</td>
<td>12.4***</td>
</tr>
<tr>
<td>Household Head Literate (% Yes)</td>
<td>45.0</td>
<td>61.4</td>
<td>16.4***</td>
</tr>
<tr>
<td>Proportion of Adults Educated (%)</td>
<td>66.6</td>
<td>79.1</td>
<td>12.5***</td>
</tr>
<tr>
<td>Proportion of Literate Adults (%)</td>
<td>50.0</td>
<td>66.6</td>
<td>16.6***</td>
</tr>
</tbody>
</table>

Source: EICV1 and EICV3; ***: Difference statistically significant at the 1 percent level.

2.2. Diversification of Income Portfolios Marked by a Move towards Non-Farm Activities

The changing composition of households’ economic activities is one of the most remarkable evolutions in Rwanda over the past decade. While engaging in non-farm income activities was still relatively rare at the start of the previous decade (less than 30 percent of households had a non-farm activity in 2001), 70 percent of households had an activity of this kind in 2011 (see Table 9). Given the strong correlation that is found in empirical literature between non-farm activities and household welfare, the increased engagement in non-farm economic activities seems to have contributed to the observed consumption growth. Both non-farm wage employment and non-farm self-employment in small businesses substantially increased between 2001 and 2011; 48 percent of households earned income through non-agricultural wage employment in 2011, up from 22 percent in 2001. Non-farm self-employment in 2011 stood at 42 percent, compared to 15 percent in 2001 (Table 9).

The progressive move to non-farm activities was broad based. As presented by Figure 73, the percentage of households engaged in non-agricultural self- and wage employment in Kigali City increased in an almost linear fashion between 2001 and 2011. In 2011, three-quarters of households in Kigali City earned income through non-agricultural wage employment and half
through self-employment in small non-agricultural businesses. Starting from a lower base, the percentage of households in the mainly rural areas outside of Kigali that earn income through non-farm self-employment tripled to 40 percent in 2011. Non-agricultural wage employment among rural households also increased significantly, from 18 percent of households in 2001 to 45 percent in 2011. Importantly, the poor have not stayed behind: the proportion of poor households engaging in nonfarm occupations increased from 21 percent in 2001 to 62 percent in 2011.

**Figure 73: Non-Agricultural Self- and Wage Employment Increased Across the Board**

*(Percentage of Households Deriving Income from Non-Agricultural Self- and Wage Employment, 2001-2006-2011)*

A salient feature of the shift in households’ activity portfolios is that households did not abandon one income activity to take on another but rather diversified and took up more income activities (both as main and secondary occupations). The average number of income activities increased from 1.4 per household in 2001 to 2.3 per household in 2011. As shown by Figure 74, the share of non-farm activities in the total portfolio was higher in 2011 (36.4 percent) than in 2011 (19.4 percent). In other words, the increase in the number of income sources can mainly be explained by households’ take-up of non-farm activities in addition to their traditional agricultural occupations.

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33 Throughout this chapter we maintain the distinction between Kigali and the “Rest of the Country”. Although it would be more straightforward to use the urban-rural distinction, the reclassification of enumeration areas following the 2002 census meant that some enumeration areas that were rural in the 2001 survey were classified as urban following the 2002 census. This implies that the urban-rural classifications in the 2001 and 2011 EICVs are not comparable and would lead to misleading representations. As a result, we use the distinction between Kigali and the Rest of the Country (which corresponds closely to the urban-rural difference).

34 We consider four broad income activities: Farm self-employment, farm wage employment, non-farm self-employment and non-farm wage employment.

35 This share is calculated as the number of non-farm activities of the household divided by the total number of income activities.
Regardless of whether or not it contributed to growth and poverty reduction, the observed diversification is a positive evolution. By taking up additional activities in the non-farm sector, rural households have diminished the risk inherent to engaging in rain fed agriculture. In 2001, 74 percent of rural households were fully dependent on agriculture to generate income. In 2011, this had dropped to 33 percent. This suggests that rural households have lowered their income risk and are now better equipped to deal with adverse agricultural circumstances than they were ten years ago.

2.3. A Sharp Drop in Fertility

With a population density of 416 persons per squared kilometer, Rwanda is one of the world’s most densely populated countries. The total fertility rate remained stable at a high level (more than six children per woman) between the early 1990s and the mid-2000s, resulting in high population growth and increased pressure on land (Figure 75)\(^{36}\). Since 2005 however total fertility rates started dropping rapidly, from 6.1 in 2005 to 5.5 in 2007/8 and 4.6 in 2010 (Figure 75), partly driven by improvements in women’s education\(^{37}\). Figures from the 2012 Population and Housing Census suggest the fertility transition is continuing unabated: Total fertility rates dropped further to 4.0 in 2012, although the DHS and Census figures may not be fully comparable.

Lower fertility can have positive effects on household living standards in both the short and longer run. In the short run, lower fertility rates translate into smaller households and lower child dependency rates. As evident from Table 9, average household size in Rwanda decreased from 5 in 2001 to 4.7 in 2011, while the child dependency ratio, the number of economically dependent children (under 15) for each adult (between 15 and 64) in the household, dropped from 1 in 2001 to 0.87 in 2011. Fewer dependent children in a household mean less strain on household resources and a mechanical increase in per capita income or consumption expenditures.

\(^{36}\) The total fertility rate is defined as the average number of children a hypothetical cohort of women could be expected to have at the end of the reproductive period.

\(^{37}\) Bundervoet (2014).
In the longer-run, sharp drops in fertility tend to lead to increased female labor market participation and better human capital outcomes for the young generations. Women with fewer children are more likely to enter the labor market, increasing household-level labor supply. Because the opportunity cost of having extra children is higher when women participate in the labor market, employed women typically choose to have fewer children, leading to a virtuous circle of falling fertility and wealth creation. When families have fewer children, they also tend to invest more in the education their children, laying the foundations for improved household living standards in the next generation.  

The sharp drop in fertility will have dramatic consequences for the age structure of the population. Currently, Rwanda is characterized by a youth bulge (43 percent of the population is below 15) and a relatively small labor force (53 percent of adults are of working age). The 2010 population pyramid reflects the typical pattern of a developing country—wide at the bottom and narrowing fast as one moves up the age distribution (Figure 76). By 2050 however, the population pyramid will look completely different (Figure 77). It will be bell shaped and characterized by a bulging labor force rather than a youth bulge (working-age adults will account for more than 64 percent of the population, and the share of youth will drop to 29 percent in the medium-fertility scenario). In the logic of the demographic dividend, these age structure changes hold significant economic promise.

**Figure 76: Bursting at the bottom in 2010…**  
(Rwanda’s population by age-group and sex, 2010)

![Population pyramid for Rwanda in 2010](image)

**Source:** WPP 2013.

**Figure 77:…means thicker in the middle by 2050**  
(Rwanda’s projected population by age-group and sex, 2050)

![Population pyramid for Rwanda in 2050](image)

**Source:** WPP 2013. Medium fertility.

### 2.4. The Boom in Transfers and Remittances

The value of remittance inflows in Rwanda increased exponentially over the past decade. In nominal terms international remittances shot up from eight million US$ in 2001 to over 100 million US$ in 2011 (Figure 78). As a share of GDP, remittances four-folded from 0.4 percent in 2001 to 1.6 percent in 2011. This is reflected in the household data (Table 9): the proportion of households receiving transfers or remittances increased from 61 percent in 2001 to 97 percent in 2011, while the average value of transfers more than tripled to RWF 56,000 per household in

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38 Bloom, Canning, and Sevilla 2003; Bloom and others 2009; Becker, Murphy, and Tamura 1990; Galor 2006
2011 (188 PPP US$)\textsuperscript{39}. This stark increase in private transfers and remittances could have had substantial impacts in terms of poverty reduction. Research on the household-level impacts of remittances shows that incoming transfers and remittances reduce the risk and depth of poverty, enable households to smooth consumption and relax credit-constraints for households engaged in small business activities (World Bank, 2006).

The increase in transfers and remittances has benefited poor and non-poor households in urban and rural areas. There are however notable differences in both the level of and the change in remittances across location and poverty status (see Table 10 and Table 11). First, the average value of private transfers and remittances received is more than three times higher for non-poor than for poor households and for households in Kigali City compared to households in the rest of the country. In 2011, the average non-poor household received 232 US$ in transfers and remittances compared to 69 US$ for poor households\textsuperscript{40}. Households in Kigali received on average 424 US$ in transfers and remittances, more than three times the 138 US$ received by households in the rest of the country\textsuperscript{41}. Second, over the past decade transfers and remittances have grown faster for non-poor (increase of 216 percent) than for poor households (158 percent increase) and for households in Kigali City (increase of 300 percent compared to 234 percent in the rest of the country)\textsuperscript{42}.

Table 10: Transfers and Remittances are Higher and Increased More for Non-Poor Households…

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>9,020</td>
<td>23,292</td>
</tr>
<tr>
<td>Non-Poor</td>
<td>24,683</td>
<td>78,018</td>
</tr>
</tbody>
</table>

Table 11: …and for Households in Kigali City

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kigali City</td>
<td>35,399</td>
<td>142,652</td>
</tr>
<tr>
<td>Rest of Country</td>
<td>13,927</td>
<td>46,468</td>
</tr>
</tbody>
</table>

Although we pool transfers and remittances in the analysis, we acknowledge the important differences between the two. While transfers are common (over 96 percent of households received private transfers from within the country), remittances are rare: Less than five percent of households received remittances (from other countries) during the EICV3 survey. Remittances are also strongly biased towards the rich: 70 percent of all remittances flowed to households within the top two consumption quintiles, and only seven percent to the bottom quintile.

\textsuperscript{39} Transfers and remittances include money or items received from family members living either abroad or in Rwanda. It does not include public transfers received from Government or aid organizations.

\textsuperscript{40} PPP exchange rate of US$1=Rwf 336.3 (WDI, 2012).

\textsuperscript{41} For the sake of comparison, GDP per capita in PPP valuation amounted to 1,251 US$ in 2011 (WDI, 2012).

\textsuperscript{42} According to the EICV3 data, transfers are a lot more common and important than remittances. Over 96 percent of households receive private transfers from within the country, but less than five percent receive remittances. Remittances are heavily biased towards the non-poor: 90 percent of households.
Transfers in contrast are relatively neutral (only slightly biased towards the upper quintiles). Although remittances only account for 15 percent of total transfers (both domestic and foreign), the average value of remittances (for the few households that receive them) are far higher than the average transfer value.

To summarize, the last decade has witnessed significant changes in a number of key economic and demographic variables, as shown by Table 9. The increase in household consumption was accompanied by rising levels of agricultural production and commercialization at the household level and the diversification of income portfolios. Average household size diminished due to falling fertility, resulting in lower child dependency ratios. More households are receiving transfers, and the average value of those transfers has increased. In the next section, we explore how these evolutions have been related to the observed growth in welfare and the reduction in poverty.\footnote{Other important evolutions over the past decade include the introduction of a social protection program (Vision Umurenge Program –VUP) in 2007/8 and the roll-out of community-based health insurance. These can however not be included in the decomposition analysis because they did not yet exist in 2001. While the VUP was still very small-scale in 2011 (less than 1 percent of households in EICV3 had received social protection benefits), 65 percent of the population was covered by community-based health insurance.}

### 3. And How Have they been related to Consumption Growth and Poverty Reduction?

Increased agricultural production and the move from a traditional production mode to a more market-oriented model emerge as the main drivers of the growth in consumption of Rwandan households, explaining one third of total consumption growth. Increased self-employment in small non-farm businesses has been the second main driver of consumption growth, while the observed move to non-farm wage employment emerges as the single most important driver of consumption growth in Kigali. The rapid fall in fertility rates in recent years has changed the demographic composition of Rwandan households and has lowered the child dependency ratio, which has been associated with increased consumption both in Kigali and in rural areas. Transfers and remittances were a main driver of consumption growth for the wealthy households but were only of marginal importance for the poor.

To examine to what extent the factors mentioned above were associated with growth in household consumption we will use a statistical decomposition method based on recentered influence functions\footnote{Firpo, Fortin, and Lemieux (2007, 2009)}. The method is detailed in Annex 3. In simple terms, the method decomposes the observed change in consumption at a particular point of the distribution into a part that can be explained by changes in covariates (the “explained” part) and a part that can be explained by changes in coefficients, that is, changes in the returns to those covariates (the “unexplained” part). The explained part can further be decomposed into the contribution of each single covariate. In our case we will for instance examine how much of the increase in median consumption between 2001 and 2011 can be explained by changes in covariates (such as increased agricultural production, the move to non-farm activities, etc.). We will carry out the decompositions at five points of the distribution, representing five different welfare groups: The 10\textsuperscript{th} percentile, the 25\textsuperscript{th} percentile, the 50\textsuperscript{th} percentile (median), the 75\textsuperscript{th} percentile and the 90\textsuperscript{th} percentile.
percentile. Given the different structure of economic activity in Kigali than in the rest of the country, we will carry out separate decompositions for the two regions.\footnote{\textsuperscript{45}}

**The changes in covariates between 2001 and 2011 explain to a large extent the observed increase in consumption.** 85 percent of the growth in median consumption in rural areas can be explained by the evolution of covariates (Figure 79). Growth in consumption at the lower part of the distribution however is under-explained by the change in covariates: Poor rural household grew by more than what would be expected based on the growth in their covariates\footnote{\textsuperscript{46}}. In Kigali City consumption growth is over-explained by the change in covariates: Consumption in Kigali grew less than what the changes in covariates would predict, especially at the middle of the distribution. This suggests that the returns to certain activities or endowments decreased between 2001 and 2011. Detailed results of the decompositions can be found in Annex 4.

**Figure 81 summarizes the main results of the decompositions for the areas outside of Kigali City.** For these areas, which are predominantly rural, agriculture emerges as the main driver of growth in median consumption. Increased agricultural production explains 22 percent of consumption growth, while the increased commercialization explains another 14 percent. Taken together, advances in agriculture account for 36 percent of the growth in median consumption in rural areas between 2001 and 2011. Diversification into small-scale self-employment in non-farm activities emerges as the second main driver of consumption growth, explaining 15 percent of the increase in consumption.

While there has been a move to non-farm wage employment in the rural areas over the past decade, this has not been associated with significant gains in consumption.

**In contrast to the rural areas, the move to wage employment has been the single main driver of consumption growth in Kigali City, explaining 77 percent of growth in median consumption (see Figure 82).** The decrease in child dependency ratios caused by falling fertility

\footnote{\textsuperscript{45} It should be stressed that the decomposition exercises only identify the main correlates of consumption growth. The results do not automatically imply causality.}

\footnote{\textsuperscript{46} The under-explanation of growth of the rural poor may be explained by omitted variables. Since 2008 the Government of Rwanda has introduced and progressively rolled-out social protection programmes that provide benefits to the extreme poor. If these programmes were successful in raising consumption levels of the poor, their omission from the analysis will lead to an under-explanation of consumption growth. The social protection variables can however not be included in the model since they did not yet exist in 2001 (the baseline year in the analysis).}
rates emerges as the second contributor to growth in Kigali City. Increased self-employment has in relative terms been less important for households in Kigali City than for those in rural areas.\footnote{47 Since consumption growth in Kigali City is overexplained by the growth in covariates, the sum of the individual covariates’ contributions to observed consumption growth is higher than 100 percent.}

3.1. Agriculture Main Driver of Rural Consumption Growth

The increase in agricultural production over the past decade emerges as the main driver of consumption growth for all but the richest rural households. Increased production has made a bigger contribution to the growth in consumption of wealthier households compared to poorer ones: The boost in agricultural output explains 11 percent of consumption growth at the 10th percentile and one quarter of growth at the 75th percentile. This can potentially be explained by the larger landholdings of wealthier households, as a result of which they have benefited most from the boost in agricultural production. After the 75th percentile the importance of increased production falls back but remains well above its median contribution of 19 percent. The contribution of increased commercialization of agriculture (the increased shares of harvests sold on the market) to consumption growth is fairly uniform across the distribution, explaining between 10 and 13 percent of growth between the 10th and the 75th percentile. The importance of increased commercialization is smallest for the wealthiest households.

\textbf{Figure 80: Agriculture The Main Driver of Rural Consumption Growth, Except for the Weakest Households}

\textit{(Contribution of Growth in Agriculture to Growth in Consumption of Rural Households, percent)}

\begin{center}
\includegraphics[width=\textwidth]{figure80.png}
\end{center}

Source: EICV1 and EICV3 and World Bank Calculations

3.2. Diversification into Non-Farm Activities Boosted Growth for both Rural and Urban Households

The diversification of income portfolios has been an important driver of growth, both in rural areas and in Kigali. The increased self-employment in small non-farm business activities (so-called household enterprises) has been particularly important for households outside of Kigali and emerges as the second main driver of growth (Figure 81). The contribution of increased non-farm self-employment to consumption growth is higher for non-poor than for poor households and peaks at the 75th percentile (Figure 84). For the wealthiest rural households the...
importance of self-employment falls back, presumably due to their relatively high levels of education and skills which allow these households to access the better wage jobs. This is confirmed by the contribution of increased wage employment, which is very low or even non-existent at the lower end of the distribution but shoots up sharply for the wealthiest rural households: Increased engagement in non-agricultural wage employment explains 4 percent of growth in the median but 23 percent of growth in the 90th percentile. Note that non-farm wage employment did not contribute at all to the growth in consumption of poor households, despite poor households’ increased engagement in this type of activity (see Box 6).

**Figure 81: Agriculture and Increasing Self Employment in Non-Farm Activities Explain The Bulk of Consumption Growth in Rural Areas…**
*(Contribution of Selected Covariates to Growth in Median Consumption in Rural Areas, 2001-2011)*

![Chart showing contributions to growth in rural areas](image.png)

**Figure 82:…While the Move to Non-Farm Wage Employment Emerges as the Single Main Driver of Consumption Growth in Kigali City**
*(Contribution of Selected Covariates to Growth in Median Consumption in Kigali City, 2001-2011)*

![Chart showing contributions to growth in Kigali City](image.png)

Source: EICV1 and EICV3 and World Bank Calculations
Box 6  A Hard Day’s Work
Wage Employment Has Not paid Off for the Poor

The creation of jobs was one of the Government’s priorities under the 2008-2012 EDPRS. Between 2001 and 2011, wage employment grew by 13 percent per annum, resulting in the creation of an estimated 939,000 wage jobs (Republic of Rwanda, 2012). 578,000 of the new jobs were in the non-farm sector, while the remaining 361,000 were created in the farm sector (Figure 83).

Poor rural households have increasingly taken up non-farm wage employment between 2001 (14 percent of poor households) and 2011 (43 percent of poor households), but this has not been associated with higher consumption growth (Figure 84). Employment data from the EICV3 show that the bulk of non-farm wage employment for the poor consist of construction works (35 percent), wage employment in basic agricultural processing (11 percent), and retail trade and domestic services (both accounting for 8 percent of poor people’s non-farm wage employment). While construction is also the dominant sector for non-poor rural workers (26 percent), 20 percent of them have wage employment in local government services (compared to 4 percent of poor workers).

Next to poor workers’ overrepresentation in less desirable sectors, the nature of their employment seems more precarious. 67 percent of poor wage-workers in the non-farm sector are paid on a daily basis, usually indicative of more casual forms of day labor, compared to 47 percent of non-poor workers. Poor workers work on average 14 hours per week, 10 hours less than non-poor wage workers in the nonfarm sector. The average wage a poor worker takes home at the end of the day amounts to RWF 817 (2.4 US$ in 2011 PPP terms), compared to RWF 2,004 for non-poor workers (6.0 US$).

Poor rural households have also increasingly taken up agricultural wage employment on other people’s farms, from 17 percent in 2001 to 69 percent in 2011. Agricultural wage employment is an unstable and low-paid activity typically reserved for the poorest households with small or no landholdings. Average daily wage for agricultural wage laborers amounts to 1.7 US$ in the EICV3 data. If we take the move to farm wage employment into account, the net effect of wage employment on the rural poor has been largely negative, holding back consumption growth for all but the richest rural households.
In contrast to rural areas, the progressive move to wage employment has been the main driver of consumption growth in Kigali City. Increased wage employment emerges as the main driver of growth across the distribution, explaining 32 percent of consumption growth at the 10th percentile, 78 percent at the median and 33 percent at the 90th percentile (Figure 86). Increased self-employment has been far less important for households in Kigali City, and was only associated with consumption growth of the poorest half of households. The predominant importance of wage employment in Kigali may be explained by lower barriers of entry to wage employment, as the poor in Kigali have on average completed primary school, and of course the higher availability of non-farm wage jobs in urban agglomerations.

3.3.Fertility Drop Associated with Consumption Growth across the Board

The rapid drop in fertility over the past decade has brought down child dependency rates, and this has been associated with consumption growth in both in Kigali and in the rest of the country. In the rural areas, dependency ratios have been falling more for the non-poor than for the poorer households: The average child dependency ratio in poor households declined only marginally from 1.14 in 2001 to 1.10 in 2011 (drop of 3.5 percent), while in non-poor households it declined by 10 percent (from 0.8 in 2001 to 0.72 in 2011). This explains the relatively higher contribution of decreased dependency ratios to growth in consumption for better-off households: decreased dependency ratios explain 11 percent of growth at the 75th percentile compared to seven percent at the bottom quartile (see Figure 85).

The child dependency ratio in Kigali fell from 0.81 in 2001 to 0.68 in 2011. This accounted for 32 percent of growth in consumption of the median household (see Figure 87). In Kigali we find a significant negative correlation between dependency ratios and engagement in wage employment: The move to wage employment in Kigali seems to have been accompanied by...
falling fertility\(^{48}\). Although this is consistent with economic theory, we cannot establish causality with the data at hand (that is, did fertility decline because there were more people in wage employment, or did people take up wage employment because fertility declined and there were fewer children to take care of?).

**Figure 86: Increased Wage Employment the Main Driver of Consumption Growth in Kigali City**

*(Contribution of Growth in Non-farm Activities to Growth in Consumption in Kigali, %)*

![Figure 86: Increased Wage Employment the Main Driver of Consumption Growth in Kigali City](chart)

**Figure 87: Transfers Boost Consumption of the Wealthy While Falling Dependency Ratios Benefit Mainly the Households in the Middle**

*(Contribution of Decrease in Dependency Ratio and Increase in Transfers to Growth in Consumption in Kigali, %)*

![Figure 87: Transfers Boost Consumption of the Wealthy While Falling Dependency Ratios Benefit Mainly the Households in the Middle](chart)

Further decreases in the dependency ratio have the potential to boost consumption growth and poverty reduction in the coming decades. As illustrated by Figure 76 and Figure 77, working-age population in Rwanda is projected to grow fast over the coming decades (faster than the economically dependent population), which means dependency ratios are expected to progressively decrease over the coming years. The decomposition results suggest that this could be associated with further improvements in household living standards and poverty reduction.

\(^{48}\) This correlation is also found in rural areas, albeit a lot weaker.
3.4. Transfers and Remittances Major Driver of Consumption Growth, Especially for the Wealthiest Households

The exponential increase in transfers and remittances over the past decade emerges as the main driver of consumption growth at the top end of the distribution. 27 percent of the increase in consumption at the 90th percentile in rural areas can be explained by transfers and remittances, a contribution higher than that of any other covariate. At the lower end of the distribution the importance of transfers and remittances has been marginal, explaining respectively 4 and 6 percent of consumption growth at the 10th and 25th percentiles (see Figure 85). This does not imply that the increase in transfers and remittances has been unimportant for the poor: At the 63rd percentile (the proportion of the rural population below the poverty line in 2001), transfers and remittances explain over 13 percent of the growth in consumption, making it the third main contributor to consumption growth below the poverty line. Consumption growth of wealthy rural households has largely been driven by wage employment and transfers, two factors that are marginal in explaining growth of poor rural households.

A similar pattern emerges in Kigali City. The increase in transfers and remittances has been less important in terms of consumption growth for poor than for wealthier urban households. The increase in transfers and remittances explains 12 percent of growth at the first quartile and 30 percent at the 90th percentile (see Figure 87).

Figure 88 pulls the rural and urban findings together to summarize the contribution of various factors to growth in consumption at the national level. Agriculture has been the main contributor to growth in median consumption in Rwanda between 2001 and 2011. The increase in agricultural production explains 20 percent of national consumption growth while increased commercialization explains another 12 percent. Taken together, these two factors account for close to one-third of consumption growth over the past decade. The increased engagement in non-agricultural household businesses emerges as the second main correlate of consumption, explaining 15 percent of its increase between 2001 and 2011. Although increasing wage employment in the non-farm sector has not been an important driver of consumption growth outside of Kigali City, its preponderance in Kigali means that the move to wage employment accounted for 12 percent of national consumption growth. The decrease in child dependency ratios spurred by rapidly falling fertility rates and the increase in transfers and remittances have been equally important, each explaining 12 percent of national consumption growth.

Different factors have been associated with growth at different points of the consumption distribution. Both in and outside of Kigali City, growth in consumption for better-off households can largely be explained by non-farm wage employment and transfers and remittances. At the lower half of the rural distribution, growth in agriculture and increased commercialization of agricultural produce has been most important, together with increased engagement in household enterprises. Consumption growth at the lower end in Kigali City was correlated with increased engagement in wage employment and, to a lesser extent, self-employment. The drop in child dependency ratios has been associated with consumption growth across the distribution, though less so for the poorest households who experienced only a marginal drop in dependency ratios.
A similar pattern emerges in Kigali City. Factors that are marginal in explaining growth of poor rural households. The drop in child dependency ratios has been associated with consumption growth and, to a lesser extent, with the increased engagement in wage employment. The decrease in child dependency ratios has been associated with consumption growth at the 90th percentile (the proportion of the rural population below the poverty line in 2011, that was no longer the case. As a result, the returns to having a female head moved from being negative to being non-significantly positive, explaining in part why the growth in consumption in rural areas is not fully explained by the observed changes in covariates.

Figure 88: Agriculture Accounted for One-Third of the Growth in Consumption in Rwanda over the Past Decade

(Contribution of the Various Factors to Growth in Consumption in Rwanda 2001-2011, percent)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Agricultural Production</td>
<td>20%</td>
</tr>
<tr>
<td>Increased Commercialization</td>
<td>12%</td>
</tr>
<tr>
<td>Decreased Dependency Ratio</td>
<td>12%</td>
</tr>
<tr>
<td>Non-Farm Self-Employment</td>
<td>15%</td>
</tr>
<tr>
<td>Transfers and Remittances</td>
<td>12%</td>
</tr>
<tr>
<td>Non-Farm Wage Employment</td>
<td>12%</td>
</tr>
<tr>
<td>Other Factors and Unexplained Part</td>
<td>17%</td>
</tr>
</tbody>
</table>

The graphs in the previous section show the part of consumption growth that can be explained by changes in covariates between 2001 and 2011. As shown by Figure 79, growth in Kigali is over-explained by the changes in covariates (consumption grew by less than what would be expected), while growth in rural areas is under-explained (consumption grew by more than what would be expected), especially at the lower part of the distribution. In the logic of the decomposition exercise, this means that returns to activities or endowments have decreased in Kigali while they have increased in rural areas. What can a closer look at the unexplained part of consumption growth tell us?

In Kigali, consumption growth was held back due to decreasing returns to non-farm employment, in particular wage employment. While the observed move to non-farm wage employment has been a main driver of the growth in consumption, the influx of workers in this segment appears to have put downward pressures on average returns. This is confirmed by data on wages and incomes: The average income of a wage job in the non-farm sector has decreased over the past decade.

In rural areas, the returns of having a female head of household increased or, more precisely, the negative effect of having a female head subsided. This mirrors the finding of the previous chapter: In 2001, having a female household head dragged down consumption. By 2011, that was no longer the case. As a result, the returns to having a female head moved from being negative to being non-significantly positive, explaining in part why the growth in consumption in rural areas is not fully explained by the observed changes in covariates.
4. Drivers of Growth at the Province Level

The increase in agricultural production has been the main driver of consumption growth in all Provinces except for the Eastern Province, where diversification into non-farm activities accounted for the bulk of growth. The Northern Province has experienced the strongest growth in agriculture and the largest drop in fertility, explaining this province’s exceptionally strong poverty reduction. The Southern Province, which has lagged compared to other provinces, experienced the same underlying evolutions as the other provinces, though the magnitude of the changes were more modest there, explaining the comparatively slow growth.

So far we have lumped together all Provinces outside Kigali City as “rural areas”. However, as highlighted in the previous chapters, the pace of consumption growth and poverty reduction differed substantially across provinces, and geographic variables are important in explaining household consumption levels even after controlling for a wide range of other observables. In this section we will explore to what extent the drivers of consumption growth differed across Provinces, focusing on the same key evolutions highlighted above.

4.1. The Northern Province: Agriculture and Fertility

With a drop of more than 20 percentage points, the Northern Province was the star performer on poverty reduction over the past decade (see previous chapters). Looking at the underlying evolutions, The Northern Province performed particularly well on agriculture and also experienced the strongest drop in fertility. While household-level agricultural output in the north was below average in 2001, it exceeded the national average by 2011, corresponding to an almost three-fold increase in agricultural production (Figure 89). The same is true for fertility: The total fertility rate in the north amounted to 6.4 in 2005 (compared to a national average of 6.1) but fell to 4.1 by 2010 (compared to a national average of 4.6)\(^49\). As a result, child dependency rates dropped by 20 percent in the Northern Province, faster than in any of the other provinces (Figure 89).

Needless to say, the expansion of agriculture has been the main driver of growth in the Northern Province. In absolute terms, the contribution of agriculture to consumption growth was higher in the Northern Province than in any of the other Provinces. The decrease in dependency rates, which was the fifth main driver of overall consumption growth in rural areas (Figure 81), has been more important for consumption growth in the north: It emerges as the

\(^{49}\) DHS, 2005; 2010.
second main driver of growth in the north, explaining over 15 percent of growth in median consumption (compared to the average of 10 percent – see Figure 81).

4.2. The Eastern Province: Diversification

The rapid diversification into non-farm activities over the past decade was associated with substantial consumption gains. Nowhere has this diversification been more salient than in the Eastern Province. The proportion of households with a wage or independent activity in the non-farm sector both increased fourfold in the Eastern Province, from approximately 10 percent in 2001 to 40 percent by 2011. Overall, 66 percent of households in the east had a nonfarm income activity in 2011, up from 19 percent in 2001.

The Eastern Province is the only Province where agriculture was not the main driver of consumption growth. The move to nonfarm activities explains 40 percent of the growth in consumption in the east, with the largest part (28 percent) being accounted for by the move to non-farm self-employment (Figure 90). Even nonfarm wage employment, which is marginal in explaining overall consumption growth in rural areas, has been important in the east, explaining 12 percent of growth. The contribution of decreased dependency rates is substantially lower in the east, owing to the fact that dependency rates only declined modestly (by five percent) in this province.

Figure 90: The uptake of nonfarm activities is the main driver of consumption growth in the east

(Percentage contribution to the growth in consumption between 2001-2011)

Source: EICV1 and EICV3; World Bank staff calculations

4.3. The Southern Province: Improving but Lagging

The Southern Province experienced the slowest consumption growth and poverty reduction of all. Household consumption grew by 1.5 percent per year between 2001 and 2011 and the poverty headcount dropped by nine percentage points. While this performance is not bad as such, it is below the average performance of Rwanda over the past decade. In 2011, poverty headcount in the south was 57 percent, significantly higher than overall headcount of 45 percent.
As far as the drivers of growth are concerned, the Southern province is close to a perfect reflection of the overall picture. Agriculture has been the main driver of consumption in the south, followed by diversification in nonfarm self-employment, transfers and remittances, and decreased dependency rates. The underlying evolutions have however been less salient in the south than in the other provinces: Household-level agricultural output increased by less than the average, engagement in non-farm wage and self-employment increased by less than the average, and dependency rates decreased by less than the average Figure 91). While by itself the situation in the south improved markedly since 2001, the fact that the improvements have been slower than in the other provinces goes a long way in explaining the slower pace of growth and poverty reduction.

4.4. The Western Province: Agriculture, Dependency Rates, and Small Businesses

Compared to the average, the Western Province experienced a large increase in agricultural production and a rapid move towards nonfarm self-employment. Together, these evolutions explain half of total consumption growth in the west (Figure 92). Households in the Western Province also experienced a large decline in child dependency rates, explaining another 16 percent of the increase in consumption. Though the west did experience a strong move to nonfarm wage employment as well, this did not at all contribute to increasing consumption levels.

To summarize, the increase in agricultural production over the past decade has been the main driver of growth in all rural Provinces except for the Eastern Province, where diversification to nonfarm activities was the main driver. Decreasing dependency rates have especially been important for consumption growth in the north and the west, while the move to small nonfarm business activities was particularly important in the east and west. The south experienced the same evolutions as all other provinces, but the magnitude was substantially smaller, resulting in slower consumption growth and poverty reduction.

![Figure 91: The underlying evolutions were less salient in the south](Percentage change in agricultural production, dependency rates, and non-farm employment, 2001-2011)

Source: EICV1 and EICV3; World Bank staff calculations
5. Drivers of Poverty Reduction: The People’s Verdict

The findings of the focus group discussions correspond with those of the statistical analysis. Participants identified agriculture as the main driver of improved living standards, followed by cooperatives and other kinds of savings and credit vehicles. Social protection and contraception were also frequently mentioned as having contributed to better living conditions. The most important drivers of progress were at the same time identified as the main obstacles. Unpredictable weather and, related to this, the volatile performance of agriculture was considered the main obstacle to continued poverty reduction, together with the difficulty of accessing financial services. Participants in high-poverty little-dynamic areas were more concerned with adverse effects of bad weather, while dynamic areas with strong poverty reduction stressed the need for finance to facilitate their transition to non-farm activities.

The focus group discussions that were held in the framework of this poverty assessment elicited participants’ opinions about the drivers of poverty reduction, both positive and negative. To summarize the research design (the full methodological approach can be found in Annex 5), 40 focus groups discussions were held in eight districts of the country, covering all rural Provinces. Districts were selected based on their current (2011) poverty levels (below average vs above average) as well as their recent poverty reduction experiences (strong vs slow poverty reduction). Within each district, two sectors were selected based on their level of connectivity: One isolated sector (far from key infrastructure) and one more connected sector. One cell was selected in each of the sectors. Finally, in each cell, one male and one female focus group were conducted. In each District, there was also one focus group with youth (18-25).
5.1. The Drivers of Poverty Reduction

Figure 93: Agriculture, cooperatives, and contraception among the main drivers of poverty reduction

(Word cloud of perceived drivers of poverty reduction, 2014)

Agriculture the Main Driver of Poverty Reduction

Participants in the focus groups (FGs) most commonly mentioned agriculture and livestock as the main positive driver of change, confirming the findings of the quantitative analysis. Participants listed a number of specific changes, including improved agricultural techniques, such as land consolidation, the use of improved inputs, such as chemical fertilizer, and the increased availability of large livestock. These techniques were used by participants to improve their harvest, which was both a source of increased food and income. Many of these changes were strongly linked to government policy and programmes. Land consolidation, extension services and subsidized inputs were seen by most groups as having a direct impact on their agricultural yields. The vast majority of groups saw land consolidation as a positive change, leading to improved harvests that can be sold in bulk and receive a better price, as well as improved security of crops due to the sharing of land and growing of the same crops.

Although agricultural inputs were seen as important positive drivers, inaccessibility of these inputs, particularly in the case of selected seeds and fertilizer, was seen as a negative driver of change in poverty status. This inaccessibility often forced participants to revert to traditional cultivation methods, which produced lower yields than those using improved inputs. This was particularly true for groups that had used chemical fertilizer while it was subsidized, but then had to abandon its use when the price increased.

While agriculture was considered the main driver in most FGs, there was notable variation across groups. The Eastern Province was the only Province where participants did not mention agriculture as a positive driver but rather noted negative impacts of terracing and land consolidation. Participants in FGs in the Eastern Province explained that their crops were uprooted prematurely due to terracing of the land done through VUP. This resulted in the loss of their harvest during that season. Although the positive impact of these methods may be realized at a later time, the participants were concerned about their current livelihood situation. The Northern Province, in contrast, was all about agriculture, which again confirms the quantitative findings (see section 4.1). Focusing on gender, male FGs were a lot more likely to consider the improvements in agriculture as the main driver of poverty reduction. Female FGs attached more importance to the increasing availability of financial services (see below).

**Financial services, businesses and cooperatives deemed important, especially by youth and women**

Drivers related to access to financial services revolved around saving in banks, accessing loans from banks such as SACCOs, and informal saving groups. The increased availability of savings vehicles and access to credit was discussed frequently as having a direct impact on improved household conditions. In particular, participants linked financial services directly to diversified income sources as external credit provided necessary capital for investment in small-scale non-farm businesses and agricultural activities (in particular investment in livestock). The increased availability of savings and credit vehicles seems to have facilitated the transition to non-farm activities (see quote).

“Before I started my small business, I farmed on a very small plot. I could grow a few kilos of maize and beans, but never enough to save anything. I opened a business selling phone credit. My husband and I decided to get a loan from a SACCO. We sat down together and figured out a good plan. When we got the loan, we used the money exactly as planned and made enough money to repay the loan. Because we repaid on time, I was able to ask for another loan, which I used to buy fertilizer for our farm. Taking a loan from a SACCO helped us a lot. We had a little land that we were able to use as collateral. My husband came up with the idea to buy phone credit and we were able to go from there. Compared to before, I would say my family has improved its conditions at least 3 times.”

*Woman in Gakenke District*

Credit through formal channels such as banks and SACCOs was however only available to certain groups. Most groups felt they lacked the required collateral or loan guarantee necessary to receive a commercial loan. Financial literacy was also a challenge, as many groups felt uncomfortable with or did not comprehend loan conditions. As a result, most focus group participants gave more importance to cooperatives and informal sources of finance, such as IBIMINA (a type of ROSCA) and village savings and loans associations. Savings groups with rotating pools were frequently mentioned by male, female and youth participants as important sources of capital that would normally be out of reach, and got many votes as an important driver of change (see quotes).
Many participants used the savings group capital for consumption smoothing or to make household investments in materials, furniture or for school fees and health insurance. Some participants were also able to invest in productive activities or small businesses. Commercial loans were more often used in this manner, as the potential for defaulting provided a strong disincentive to using credit for household spending. Nonetheless, participants also discussed using informal sources for investing in small businesses. In terms of small business, participants’ involvement in petty commerce was often heavily linked to agriculture. Selling produce in markets was one of the most commonly discussed types of small business. Selling non-perishables in kiosks or boutiques was a more lucrative source of income, but required larger investment. Younger participants expressed a greater interest in non-agricultural types of petty commerce, such as bicycle transport and hair-dressing.

Financial services through banks and SACCOs were seen across all provinces as positive drivers of change. Similarly, informal savings groups were seen as having had a positive impact, and ranked highly as a key cause of positive change. The Northern Province in particular highlighted the positive effect of credit and loans from banks and SACCOs as drivers that helped people to move out of poverty. In the Western and Eastern provinces, by contrast, a lack of capital to start businesses and inability to pay loans were identified as negative drivers regarding financial services.

Social protection important for women and youth in poorer Districts

Social protection support, in particular through VUP, was also perceived as having had a positive impact on improving household conditions. Participants in lower Ubudehe categories felt the programme provided a key source of employment for youth, who have been employed in terracing programmes and road construction thorough Public Works. It has also provided an income source for the vulnerable and elderly, particularly through Direct Support. Social protection was however only mentioned as an important driver in the poor Districts of Nyaruguru and Gakenke. Male FGs did not mention social protection as often as female and youth FGs.

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For reasons explained before, social protection programs (VUP) are not included in the quantitative analysis.

"For me, what helped were the savings groups. I my life I never have had good conditions. I do now, and I owe this to the savings groups. That’s how I get clothes, or buy clothes for my kids. I eat well when I get money from savings groups. I will stay in them."

*Woman in Kayonza District*

"When other people told me about savings cooperatives, I decided to do the same thing. I got a hundred people from the village to contribute 100 RwF into a rotating fund. 2 years later, we each contribute 1,000 RwF. It’s really helped a lot of people here, especially since the cooperatives oblige you to spend part of your funds on Mutuelle."

*Man in Ngoma District*
Health insurance, in Rwanda known as *Mutuelle de Santé*, was also highly ranked by participants as a strong contributor to poverty reduction. Participants explained that insurance minimized their health care costs, which previously would have made health care out of reach or required sale of important assets. Participants also noted that prior to community based health insurance community members were less likely to access health facilities and treatment as a result of financial barriers to access.

**Although Mutuelle was considered important, many participants stated that financial barriers to health insurance still existed.** As health insurance is paid for each member of the household, large households usually cannot afford insurance. Without health insurance, the high cost of health care remains a challenge. Even more concerning is that some of the FGDs in the Eastern province also stated that community members who did not purchase their Mutuelle membership in time faced stiff penalties, including seizure of assets or detention.

5.2. The Obstacles to Poverty Reduction

**Figure 94: Bad weather and lack of capital main obstacles to poverty reduction**

*(Obstacles to poverty reduction, 2014)*

*Adverse weather the main barrier to escaping poverty*

Households in rural Rwanda remain all too dependent on the vicissitudes of unpredictable weather patterns. The majority of FG participants engaged in agriculture as an important part of their livelihoods, and unpredictable rainfall and droughts were the most commonly cited obstacles to sustained poverty reduction. Groups in five districts, especially in the east and south of the country (Figure 94), explained that their current harvest was significantly reduced by a long dry season this year. As a result, food availability for their households has significantly decreased. Likewise, wage farm opportunities have been significantly curtailed due to poor weather and resulting bad harvests.
Next to insufficient rainfall and droughts, FG participants also frequently mentioned the opposite phenomenon, flooding. Flooding was especially a problem in the isolated sectors, which are often located in flood-prone valleys. In addition to causing considerable damage to housing, flooding also often resulted in a loss of their harvests. Curiously, lack of land, a pervasive issue in Rwanda, was only mentioned sporadically and only in the north of the country (Figure 94).

**Lack of capital and banking barriers constrain the transition to more lucrative activities**

The second most frequently mentioned barrier was a lack of capital and inadequate access to financial services. While there has been a growth in informal sources of credit, such as Ibimina (ROSCAs), the available capital within these sources is limited, as they rely on small contributions of usually a few hundred francs per member per week. Participants also mentioned that credit from these sources is often consumed by household expenses. As a result, there is often little leftover to invest in productive assets or petty commerce.

Banking barriers are closely tied to a lack of capital, as external financing was often seen as required to enable a household to start a more lucrative non-farm business. Issues related to banking identified as barriers by participants included delays in receiving loans, the lack of collateral or guarantee to be approved for a loan and the high interest rates on loans. Interestingly, participants mentioned that the existing loan arrangements in Savings and Credit Cooperatives (SACCOs) do not match their income-earning schedule, and hence were concerned about their ability to repay a loan (see quote).

“People tell us to go to the SACCO but it’s difficult. Say I want to get money for fertilizer and planting. They want loan payments every month, and we don’t have income until the harvest. I can’t make those payments.”

*Woman in Musanze District*

Lack of capital and banking barriers were far more frequently mentioned in the areas with lower poverty and those that have experienced strong poverty reduction in recent years. The Provinces that have experienced the strongest poverty reduction over the past decade (Northern and Eastern Province) are transitioning faster to non-farm activities, and need access to finance to facilitate this transition. This comes out clearly in the FGs, where inadequate access to finance is a far more important barrier in the better-off districts (Figure 94). In contrast, the poor districts in the south of the country are more concerned with the effects of adverse weather and only sporadically mention issues related to finance and external capital.

**Family conflict main obstacle according to women**

Women mentioned family conflict and poor gender dynamics as the main negative driver. The discussion on this driver was considerably gendered. Male participants described negative household dynamics as an outcome of poverty, whereas women FG participants discussed poverty as an outcome of negative household dynamics. Women participants described family conflict as domestic violence, including verbal and physical violence, as well as limited control of women over household finances. Family conflict was seen as a negative driver as it resulted in loss of income due to health care related expenses or time not spent on income generation (see quote).
Alcohol use was often related to family conflict, and mismanagement of funds, and was only mentioned as an activity engaged in by men. It was frequently discussed in relation to household dynamics, as women indicated that they had limited control over household finances and thus were unable to prevent their husbands from spending household earnings or savings on alcohol.

5.3. Salient differences across groups

Overall, the drivers and barriers mentioned by the participants were relatively similar across focus groups. There did however emerge a number of interesting nuances, related in particular to the difference between adults and youth and between districts with high and districts with low poverty reduction.

Optimistic, and with a firm eye on the non-farm sector

Rapid expansions in education in recent years as well as scarcity of land makes that youth are structurally different than their parents. While independent farming was the main livelihood in all adult FGs, youth were much more likely to engage in non-farm activities. Most youth mentioned mining, construction, brick-making, bicycle-transport and hairdressing as activities frequently engaged in by youth in their communities. In contrast, when adults mentioned non-farm activities, this tended to refer to the commercialization of agricultural products. While youth acknowledged the importance of agriculture in their communities, there was a notable desire of youth to work in the non-farm sector. Youth also felt that the availability of non-farm opportunities had been increasing.

Consistent with their focus on non-farm activities, youth FGs mentioned lack of capital and financial services as the main obstacle to better living standards. As regular non-farm wage jobs are scarce in rural communities, youth participants emphasized the importance of non-farm self-employment to earn a living. Starting a non-farm activity was perceived to be inextricably linked to obtaining external capital (loans), and the difficulty of obtaining loans for youth without collateral was seen as the main obstacle. Despite their higher levels of education as compared to adults, youths were the only ones to mention education as an obstacle, as they believed successful entry into the non-farm sector required technical skills and vocational training they do not currently have.

Despite the many challenges they face, youth FG participants were remarkably optimistic. Youth FGs emphasized the importance of hard work and “having a good mindset” to get ahead in life, and were a lot more likely to ascribe failure to escape poverty to a lack of personal responsibility. They were also more likely to value personal responsibility as a positive driver than either male or female groups, focusing in particular on the importance of setting goals and objectives as the first step to improving the household situation.
Different priorities for different types of Districts

Districts that experienced strong poverty reduction in recent years were considerably more concerned with barriers to finance than those with slow poverty reduction. Districts with rapid poverty reduction are progressively transitioning to non-farm activities (although agriculture still remains the dominant activity), and, as a result, require access to loans to support this transition. Barriers to finance, in particular prohibitive interest rates, were particularly salient in the better-off districts of Musanze and Nyabihu. Districts with low poverty reduction mentioned adverse weather and natural disasters as the cause of their low poverty reduction, and were also considerably more concerned about health shocks (in particular the poor districts of Nyamagabe and Gakenke).

It is interesting to note the synergy between agricultural improvements and the move to non-farm activities: while participants in high poverty reduction districts considered agriculture and the public programmes in agriculture as the main driver of poverty reduction, they considered inadequate access to finance as the main obstacle to any further improvement in living standards (through the development of non-farm businesses). Youth FGs also noted this synergy, by stating that the availability of non-farm employment in their communities is heavily linked to agricultural growth. At least in this specific context, rapid growth in agriculture seems to be a prerequisite for the development of a more lucrative non-farm sector.

6. Conclusions

Agriculture has been the main driver of Rwanda’s strong poverty reduction over the past decade. Driven by public investments in improved farming practices, improved input use, and more efficient land use, the productivity of agriculture increased substantially in the second half of the past decade, resulting in strong household consumption growth. Together with the increased market-orientation of agriculture (as more and more households have surpluses to be sold), increased agricultural production accounted for about one third of the increase in median consumption between 2001 and 2011.

Rural households’ consumption levels were further buoyed by the progressive uptake of non-farm activities. The share of rural households with a non-farm activity almost tripled since 2000, and this has had a positive effect on consumption, in particular for self-employment in small non-farm businesses. While the quantitative analysis did not examine the reasons behind this impressive adoption of non-farm activities, findings from the focus group discussions suggest that this has been closely linked to the increased availability of formal (SACCOs) and informal (ROSCAs, VSLAs) savings and credit vehicles. For households in Kigali City, the growth of non-farm wage employment has been the single most important driver of consumption growth.

Diminishing household sizes have increased disposable incomes. The total fertility rate dropped from 5.8 in 2000 to 4.6 in 2010, leading to a decrease in child dependency rates. The effect of decreased dependency rates has been higher in Kigali than in rural areas and has been more important for the better-off households, largely because the drop in fertility was weakest for the poor: total fertility rates dropped from 6.0 in 2000 to 5.3 in 2010 for the bottom 40 percent of the population and from 5.7 to 3.9 for the top 40 percent. In the qualitative study, lack of family planning was also mentioned as an obstacle to escaping poverty. Curiously, men seemed to be more concerned with this than women.

Improvements in agriculture, the move to non-farm self-employment, and, to a lesser extent, declining dependency rates have been the main drivers of consumption for the poor.
This is confirmed with the findings from the focus groups discussions, which frequently mentioned agriculture, non-farm work (closely tied to external capital) and to a lesser extent family planning as drivers of change. The drivers of consumption are different at the other end of the distribution, which mostly benefited from an increase in transfers and remittances and expanded wage employment in the non-farm sector. As these drivers mainly affected the better-off, they were not mentioned in the focus group discussion (as participants came from the bottom Ubudehe categories).

**Findings from the qualitative study suggest that the development of non-farm activities depends strongly on the performance of agriculture.** For adults this link is straightforward, as their main non-farm activity consisted of selling agricultural produce on the market. Youth FG participants however also noted that the availability of non-farm activities was closely linked to the performance of agriculture in the community. The overall picture is that when and where agriculture performs well, there is money in the community that facilitates the development of non-farm activities. If agriculture performs poorly, the development of other activities is stunted given the dearth of external capital required for initial investment.
Chapter IV.
Stunted Outlooks
1. Introduction

Buoyed by strong growth, rapid poverty reduction and increases in agricultural production, hunger levels in Rwanda dropped sharply since the turn of the century. Rwanda’s score on the Global Hunger Index—a composite indicator of undernourishment and child mortality—almost halved between 2000 and 2013, making Rwanda one of the best performers on the global stage during this period (IFPRI, 2013). In line with this, average per capita calorie intake in the country increased by almost 20 percent over the past decade (FAOSTAT, 2014).

Yet despite these positive evolutions, the incidence of child malnutrition remains stubbornly high. The 2010 DHS and the 2012 Comprehensive Food Security and Vulnerability Analysis and Nutrition Survey (CFSVA) found that 44 percent of children under five years of age in Rwanda suffer from chronic malnutrition (stunting), putting Rwanda on the 11th spot in the global malnutrition league table (UNICEF, 2013). Stunting decreased by a modest 4 percentage points over the past decade, a disappointing drop given the large improvements in other areas. Though Rwanda has among the highest stunting rates in Africa, relative to GDP per capita it does not perform particularly badly: Stunting in Rwanda is somewhat higher than what would be expected based on GDP (the observation is slightly above the regression line), but only marginally so (Figure 95).

Figure 95: Given low GDP per capita, Rwanda’s stunting rate is not exceptionally high
(Stunting and GDP per capita in Sub-Saharan Africa)

Source: DHS StatCompiler. Graph includes 30 SSA countries with a DHS survey during the period 2006-2012. World Bank staff calculations

On the other hand, acute malnutrition or wasting is low at 3 percent.

Of course, the strong reduction in child mortality over the past decade may be one of the reasons why malnutrition did not decrease much: some of the malnourished children may not have survived in the past.
Chronic malnutrition in early childhood has consequences that last for a lifetime. Poor nutrition in early childhood, and indeed even in utero, is causally linked to increased mortality, disease and disability, worse educational outcomes, and lower productivity and income as adults. The first 1,000 days of a child last forever, and as such the high incidence of malnutrition in Rwanda risks jeopardizing human capital outcomes of the future labor force, with negative implications for productivity and economic growth.

This chapter takes a closer look at the incidence, evolution and underlying factors of stunting in Rwanda, using data from the 2010 DHS survey. The chapter proceeds as follows: Section 2 presents the stylized facts about malnutrition in Rwanda, while Section 3 presents and quantifies the UNICEF framework that will be used to analyze the causes of stunting. The empirical results are presented in Sections 4 and 5. The final section wraps up.

2. Stylized Facts about Malnutrition in Rwanda

The rate of chronic malnutrition in Rwanda has declined from 48 percent in 2000 to 44 percent in 2010. The decrease in stunting was concentrated among the wealthier households, while stunting rates among poor households have stagnated at above 50 percent. About 16 percent of children are already stunted at birth, but the real damage is done between 6 and 24 months of age, when the prevalence of stunting jumps from 18 percent to well over 50 percent. In poor and non-poor households alike, higher birth-order children are significantly more likely to be stunted than their older siblings, suggesting a strain on household resources and/or time. Stunting is not merely a manifestation of poverty. 25 percent of children in the top wealth quintile are stunted and the district-level stunting map diverges considerably from the district-level poverty map.

2.1. Stunting is on the Decline, but the Poor are Lagging

The high level of stunting masks the progress that was made over the past decade. Between 2000 and 2010, stunting rates decreased modestly from 48 percent to 44 percent, but since 2005 the drop was more pronounced. The level of stunting actually increased between 2000 (48 percent) and 2005 (51 percent), but dropped by 7 percentage points since. In line with this, the percentage of children who are severely stunted (height for age z-score below -3 standard deviations) decreased from 23 percent in 2000 to 17 percent in 2010.

The progress on stunting has however been uneven and has largely bypassed the poor. Between 2000 (blue line in Figure 96) and 2010 (green line in Figure 96), the incidence of stunting dropped by a mere 1 percentage point in the bottom two wealth quintiles, while it dropped with seven, 10 and eight percentage points in respectively the third, fourth and fifth quintile. Since 2005 however, progress on stunting has included the bottom quintiles: Stunting in these quintiles increased between 2000 and 2005 (red dashed line in Figure 96) but decreased significantly since. Progress in the higher quintiles remained however substantially stronger.

2.2 Stunting is High Even among Newborns, but the Real Damage is done Between 6 and 24 Months

Height for age is an indicator of long run nutritional status and reflects cumulative (past and current) investments or shortfalls in nutrition. In harsh socioeconomic environments stunting increases with age, as older children have had more time to accumulate nutrition deficits. Despite this, stunting in Rwanda is high even among newborns. About 16 percent of newborns (less than 1 month of age) were stunted during the 2010 DHS, and this rate stays more or less stable until 5 or 6 months (Figure 97).

For children older than 6 months, the stunting rate increases rapidly with age (Figure 97). While approximately 16 percent of children aged 0-6 months are stunted, this increases to 30 percent for children aged 11-12 months, 46 percent for children aged 17-18 months and 55 percent for two-year-olds. After this, stunting decreases somewhat and stabilizes at a high level of about 50 percent. This is consistent with the literature on child development, which suggests the critical period for nutrition investments is the first 1,000 days of life, and that only limited catch-up growth is possible after that.

The stunting pattern presented in Figure 97 suggests that the underlying causes of stunting are diverse. The high stunting rates at birth point towards factors that affect child nutrition and development in the womb, such as poor maternal nutrition and health during pregnancy and...
insufficient prenatal care. The stable stunting rates between 0 and 6 months suggest that children are shielded during this period by good breastfeeding practices (exclusive breastfeeding below 6 months is high in Rwanda), while the sharp increase in stunting between 6-24 months is likely the result of cumulative nutrition and micronutrient deficits as complementary foods are introduced (and additional exposure to infections and diseases as children are weaned off breast milk). The analysis in this chapter will cater for this by focusing on the separate and cumulative impacts of food intake, care practices and environmental health conditions.

2.3. Poverty isn’t the Only Culprit

**Poverty and nutrition are closely related.** Children in the poorest quintile are more than twice as likely to suffer from chronic malnutrition than children in the wealthiest quintile, and more than three times as likely to be severely stunted (Figure 96). Despite this, stunting is high even among children in better-off households: 25 percent of children in the top wealth quintile are stunted and this increases to 40 percent in the next-to-upper wealth quintile. While poverty and stunting are certainly related, poverty is not the whole story.

**Geographically too, the incidence of stunting is only partially related to poverty.** Poverty is concentrated in the south-western part of Rwanda, with five districts having poverty rates between 61 and 80 percent (Nyamasheke, Nyamagabe, Karongi, Nyaruguru and Ruhango, see Figure 98). Stunting however is most pervasive in the north-western part of the country, particularly in the districts of Rubavu, Rutshuru, Karongi and Gakenke (Figure 99). While there are important overlaps between the two maps (Karongi, for instance, is both poor and stunted), the differences are obvious too (one of the poorest districts in Rwanda, Ruhango, has stunting levels similar to the ones in Kicukiro, Rwanda’s richest district).
Figure 98: Poverty is concentrated in the southwest…
(Poverty rates by district – 2010/11)

Source: EICV3, 2011

Figure 99: …while stunting is most pervasive in the northwest
(Stunting rates by district, 2010)

2.4. Higher Birth-Order Children are More Likely to be Stunted

Having extra children puts an additional strain on the household budget. As poor households get more children, household resources get increasingly stretched, which may result in worse nutrition for children of higher birth-order (that is, children born later than their siblings). Care practices may also suffer as the number of children increases, because the mother’s time and attention needs to be divided between many children (especially if the interval between births is short). As a result, first-borns may be advantaged both from a nutritional and a care point of view.

First-born children in Rwanda are significantly less likely to be malnourished. Stunting rates among the first-born children in the 2010 DHS amount to 36 percent, compared to 43 percent among second-borns, 47 percent among third-borns and more than 50 percent for children with birth order higher than five (Figure 100). Intriguingly, the same pattern holds for households in the two top wealth quintiles as well (labeled “non-poor” in Figure 100): 24 percent of first-borns in non-poor households are stunted, but this increases rapidly to 32 percent for second-borns and 40 percent for children with birth order higher than five. This pattern is even more salient for the wealthiest 20 percent of households (stunting rates jump by 60 percent between the first- and second-born). Assuming that these households are not constrained with respect to quality and quantity of food, this suggests that factors other than nutrition alone are at play. This calls for a more holistic analysis of the causes of malnutrition.

Figure 100: First come, first served?
(Percentage of children stunted, by birth order and household wealth)

Source: DHS, 2010. Poor households defined as households in bottom 3 wealth quintiles. Non-poor households in top 2 wealth quintiles. World Bank staff calculations

If children of higher birth-order are more likely to be stunted, then the high level of fertility may an important factor contributing to the high incidence of stunting. Indeed, in each wealth group, average stunting rates are lower in households with up to three children than in households with more children (Figure 101, although the difference is not statistically significant for the third and fifth quintile). In this light it is possible that the rapid decline in fertility
currently underway in Rwanda will have a positive effect on the rate of stunting over the coming five to ten years\textsuperscript{54}. 

**Figure 101: Controlling for wealth, children in smaller households are less likely to be stunted**

(Average stunting rates by quintile and number of children)

![Figure 101: Controlling for wealth, children in smaller households are less likely to be stunted](image)

Source: DHS, 2010. World Bank staff calculation

The data presented in this section suggest that stunting is the result of a complex interaction between many risk factors. The high incidence of stunting at birth points towards the importance of proper prenatal care and maternal nutrition during pregnancy. The rapid increase in stunting between 6 and 24-months of age suggests a problem of insufficient quantity or quality of complimentary food intake during this critical period. The finding that stunting is high even among wealthier households implies that stunting in Rwanda cannot be analyzed by concentrating only on poverty-related determinants. This calls for a multisectoral approach to stunting, taking into account issues related to poverty but also issues related to sanitation, pre-and post-natal care, child care practices and behaviors.

3. A Multi-Sectoral Framework of Child Malnutrition

The UNICEF framework considers three underlying causes of malnutrition: Inadequate food intake, inadequate environmental health, and inadequate care. Quantifying this framework for Rwanda, we find that access to the three underlying components is low: One third of children 0-24 months have adequate food intake, 44 percent have access to adequate environmental health, and 18 percent to adequate care. Only 4 percent of children have adequate access to all three underlying components. Adequacy in the underlying components is associated with stunting. Children 0-24 who are adequate in nothing have the highest stunting rates (46 percent), while children who have a minimum acceptable diet (but nothing else) already have far lower stunting rates (31 percent). The lowest stunting rates (20 percent) appear in children who have both adequate access to food and environmental health, defined as having a minimum acceptable diet, clean water, improved sanitation, and full immunizations.

More than two decades ago, UNICEF outlined a conceptual framework of the determinants of child nutrition. According to the framework, malnutrition is caused not only by a lack of

\textsuperscript{54} The total fertility rate dropped from 6.1 in 2005 to 4.6 in 2010 and 4.0 in 2012 (see Bundervoet, 2014).
adequate quantity and quality of food, but also by frequent illnesses, poor maternal and child care practices and substandard access to health services. The framework defines inadequate food intake and frequent diseases as the immediate causes of malnutrition, while food insecurity at the household level, inadequate care and feeding practices, and poor environmental health are considered to be the underlying causes (Figure 102). According to the framework, good nutritional status will prevail if children have access to adequate quantity and quality of foods, receive age-appropriate care, live in a healthy environment with access to safe water and sanitation and have access to adequate health services.

**Figure 102: The UNICEF framework of malnutrition**

A key premise of the framework is the non-substitutability between the underlying causes of malnutrition. Increasing the access to, say, safe water and sanitation will not have a sizable impact on the likelihood of being stunted, unless it is accompanied by improved food intake and improved care practices as well. Likewise, increases access to more and better-quality food will not do much for malnutrition if it is not complemented by improvements in care practices and environmental health. This makes intuitive sense for a country like Rwanda, where large improvements in household food security have yet to be translated in a commensurate improvement in stunting rates.

While the UNICEF framework is intuitively appealing, most research on stunting tends to focus on one of the underlying causes in isolation. This is understandable given the difficulty in convincingly quantifying the different components of the framework. In this chapter we will attempt to quantify the framework drawing on the methodology proposed by Skoufias, Cuesta and Tiwari (2014). Using the 2010 DHS data, we will explore to what extent the high rate of stunting in Rwanda can be explained by inadequate access to food, health and care practices.
3.3. Quantifying the Framework: Adequate Food

To define adequate food intake, we adopt the recommendations for infant and young child feeding practices developed by the World Health Organization (WHO). For babies under 6 months, the adequate food intake consists of exclusive breastfeeding (WHO, 2008). For children between 6 and 23 months, we proxy adequate food by WHO’s “minimum acceptable diet” indicator. A child is considered to have a minimum acceptable diet if (a) s/he is fed a minimum number of times a day and (b) is fed with at least four different food groups (has the minimum dietary diversity)\(^{55}\).

While exclusive breastfeeding in Rwanda is high, most children between 6 and 23 months do not have adequate food intake. Almost 85 percent of children 0-5 months are exclusively breastfed and have, according to the WHO standards, an acceptable diet. However, this drops to only 18 percent for children 6-23 months (Table 12). Looking at the separate components of a “minimum acceptable diet”, about half of children 6-23 months are fed with the minimum frequency, but less than 30 percent of children eat sufficiently varied foods (have the minimum dietary diversity). The figures in Table 12 correspond with the pattern in Figure 97, where stunting rates are stable between 0 and 5 months (exclusive breastfeeding is high) and increase rapidly thereafter (since only a small fraction of children 6-23 have a minimum acceptable diet). Overall, one in three children 0-23 months have adequate food intake.

<table>
<thead>
<tr>
<th>Adequate Food Intake indicators, children 0-23 months</th>
<th>%</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children &lt; 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Child exclusively breastfed</td>
<td>84.7</td>
<td>366</td>
</tr>
<tr>
<td>Children 6 – 23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Child has minimum meal frequency</td>
<td>51.8</td>
<td>1,214</td>
</tr>
<tr>
<td>2. Child has minimum dietary diversity</td>
<td>27.7</td>
<td>1,214</td>
</tr>
<tr>
<td>3. Child receives minimum 2 milk feedings per day</td>
<td>29.7</td>
<td>130</td>
</tr>
<tr>
<td>Minimum acceptable diet</td>
<td>18.2</td>
<td>1,214</td>
</tr>
<tr>
<td>All Children 0-23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate Food Intake</td>
<td>33.5</td>
<td>1,580</td>
</tr>
</tbody>
</table>

Source: DHS, 2010; WHO, 2008. World Bank staff calculations

How does adequate food intake or the lack thereof relate to stunting? Overall, there is a large difference in stunting rates between children with and without access to adequate food. 25 percent of children who have a minimum acceptable diet are stunted, compared to 39 percent of children who do not have an acceptable diet. These descriptive statistics are however misleading: children who have an acceptable diet are significantly younger (8.2 months) than children who have not (13.5 months), which drives down stunting in the former group due to the natural effect of age (younger children are less likely to be stunted). Within each age group (0-5 months and 6-23 months), children with an acceptable diet are still less likely to be stunted, but the differences

---

\(^{55}\) Minimum meal frequency is 2 times for breastfed children between 6 and 8 months and 3 times for breastfed children between 9 and 23 months. For non-breastfed children, minimum meal frequency is 4 times a day. Non-breastfed children need to have at least 2 milk feedings per day to have a minimum acceptable diet (next to having a minimum meal frequency and dietary diversity).
are small (Figure 103). This suggests that while having adequate food is certainly important, it is not sufficient for sound nutritional outcomes.

The geographic variation in acceptable diets does a better job than poverty in explaining the spatial incidence of stunting. Ruhango district for instance, with one of the highest poverty rates, has the highest fraction of children 6-23 months with a minimum acceptable diet (43 percent), which partly explains its relatively low stunting rate of 21 percent. Similarly, Musanze district, one of the wealthiest districts in the country, has high stunting rates (45 percent) despite its relatively low poverty rate (20 percent). This can be partly explained by the low fraction of children with an acceptable diet (only 15 percent of children 6-23 have a minimum acceptable diet).

To fully capture adequate food intake, we would also need to include information about food security at the household level and, for young children, nutritional status of the mother. Unfortunately, the 2010 DHS does not include questions on household food security or food intake of the mother. In the analysis, we will proxy for the mother’s nutritional status by including mother’s body mass index at the time of the survey. This is of course an imperfect proxy, as it does not necessarily correspond with the body mass index in the immediate postnatal period.

### 3.4. Quantifying the Framework: Adequate Environmental Health

We define adequate environmental health as having access to a clean water source, an improved sanitation facility, and having received all age-relevant immunizations. According to the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, a household has access to an adequate water source if it gets its water from one of the following sources: piped water, either into the household’s dwelling, yard or from a public tap; tubewell or borehole; protected dug well; protected spring; or rainwater. A household has adequate sanitation if the type of toilet the household uses is a flush toilet (flushed to sewer system, septic tank, or pit latrine), a ventilated improved pit latrine, a pit latrine with slab, or a composting toilet.

For the age-specific immunizations, we use the recommendations by WHO (2014). WHO guidelines stipulate that to be fully immunized, children should receive one dose of BCG (against tuberculosis), three doses of DPT (against diphtheria, pertussis and tetanus), three doses of oral polio vaccine, and one dose of measles vaccine. Based on WHO (2014), we adopt following schedule for age-specific immunizations: 0-2 months: none; 3 months: BCG; 4 months: BCG, DPT 1, polio 1; 5 months: BCG, DPT 1 and 2, polio 1 and 2; 6-11 months: BCG.

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DPT 1, 2 and 3, polio 1, 2 and 3; 12 months and older: BCG, DPT 1, 2 and 3, polio 1, 2 and 3, measles.

In general, access to the underlying components of environmental health is relatively high. 70 percent of children 0-23 in the DHS sample have access to an improved water source, approximately the same as the proportion with access to improved sanitation (71.5 percent). More than 83 percent of children are fully immunized. However, less than half of children (44 percent) have access to all three components at the same time, and are classified as having adequate environmental health (Table 13).

Table 13: Less than half of children are fully immunized and at the same time have access to improved water and sanitation

(Conversion to adequate water, sanitation, and immunizations, by age group)

<table>
<thead>
<tr>
<th>Adequate Environmental Health</th>
<th>%</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children &lt; 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Adequate water source</td>
<td>71.8</td>
<td>366</td>
</tr>
<tr>
<td>2. Adequate sanitation</td>
<td>72.1</td>
<td>366</td>
</tr>
<tr>
<td>3. Fully immunized</td>
<td>96.4</td>
<td>366</td>
</tr>
<tr>
<td>Adequate environmental health</td>
<td>53.4</td>
<td>366</td>
</tr>
<tr>
<td>Children 6 - 23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Adequate water source</td>
<td>69.4</td>
<td>1,214</td>
</tr>
<tr>
<td>2. Adequate sanitation</td>
<td>71.3</td>
<td>1,214</td>
</tr>
<tr>
<td>3. Fully immunized</td>
<td>79.4</td>
<td>1,214</td>
</tr>
<tr>
<td>Adequate environmental health</td>
<td>41.5</td>
<td>1,214</td>
</tr>
<tr>
<td>All Children 0-23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Adequate water source</td>
<td>69.9</td>
<td>1,580</td>
</tr>
<tr>
<td>2. Adequate sanitation</td>
<td>71.5</td>
<td>1,580</td>
</tr>
<tr>
<td>3. Fully immunized</td>
<td>83.3</td>
<td>1,580</td>
</tr>
<tr>
<td>Adequate environmental health</td>
<td>44.2</td>
<td>1,580</td>
</tr>
</tbody>
</table>

Source: DHS, 2010; WHO, 2008. World Bank staff calculations

Environmental health is strongly related to stunting. The incidence of stunting among children with access to adequate water and sanitation and age-specific immunizations amounts to 27 percent, compared to 40 percent for children who lack adequate access. This difference is not biased by age: stunting among children 0-5 months with adequate environmental health amounts to 14 percent, compared to 20 percent for those without adequate access. For children 6-23, the proportions are 33 percent and 45 percent, respectively (Figure 104).

The spatial variation in adequate environmental health is strongly related to stunting. The stunting and environmental health maps largely correspond, and the spatial correlation coefficient amounts to -0.77. In fact, based on bivariate correlations, environmental health correlates more with stunting than having an adequate food intake. Districts that have

Figure 104: Having adequate environmental health helps a lot

(Incidence of stunting by adequate environmental health, by age group)
exceptionally low stunting rates despite high poverty typically do well on environmental health: 66 percent of children in Ruhango (poverty headcount of 60 percent) have adequate environmental health, compared to less than 42 percent of children in “wealthy” Musanze (wealthiest district outside Kigali).

3.5. Quantifying the Framework: Adequate Care

Adequate care applies to both mothers and children and relates to practices such as breastfeeding, timely introduction of appropriate complimentary feeding, hygiene and health seeking behaviors, ante- and postnatal care etc. The care component of the UNICEF framework partly overlaps with the food intake component: Exclusive breastfeeding in the first six months is an adequate care practice, but also represents the recommended diet for newborns. Similarly, timely introduction of complimentary foods is a good care practice, but is also part of the minimum acceptable diet for children 6-23 months. To avoid overlaps, we decided to classify everything related to feeding practices in the “adequate food” component, except for rapid initiation of breastfeeding, which we consider as an adequate care practice.

To define adequate care, we adopt a number of WHO guidelines on ante- and postnatal care, use of mosquito nets, and a selection of feeding practices. Following WHO (), adequate antenatal care consists of minimum four visits during pregnancy, attended by trained personnel. It is recommended that delivery takes place in a health facility and that postnatal checkups for both mother and child happen within the first two days of delivery (WHO, 2014). On feeding practices, WHO recommends that children are put to the breast within one hour of birth (early initiation of breastfeeding).

The prevalence of good care practices varies widely. While 80 percent of children 0-23 months in the sample were born in a health facility, only 4 percent received a postnatal checkup within the first two days of birth. 36 percent of mothers benefitted from at least four antenatal consultations, but less than 20 percent had a checkup within the first two days of delivery. 75 percent of children slept under a mosquito net the night preceding the interview, and 70 percent of children were put to breast within one hour of birth (Table 14).

Table 14: Care is largely inadequate

(Prevalence of a selection of good care practices)

<table>
<thead>
<tr>
<th>Adequate Care</th>
<th>%</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 4 or more antenatal consultations</td>
<td>36.3</td>
<td>1,545</td>
</tr>
<tr>
<td>2. Born in health facility</td>
<td>80.1</td>
<td>1,545</td>
</tr>
<tr>
<td>3. Postnatal child care within first 2 days</td>
<td>4.3</td>
<td>1,545</td>
</tr>
<tr>
<td>4. Postnatal maternal care within first 2 days</td>
<td>19.1</td>
<td>1,545</td>
</tr>
<tr>
<td>5. Slept under net last night</td>
<td>75.1</td>
<td>1,545</td>
</tr>
<tr>
<td>6. Early initiation of breastfeeding</td>
<td>70.3</td>
<td>1,545</td>
</tr>
<tr>
<td>Adequate care (all six included)</td>
<td>0.6</td>
<td>1,545</td>
</tr>
<tr>
<td>Adequate care (postnatal child care excluded)</td>
<td>3.5</td>
<td>1,545</td>
</tr>
<tr>
<td>Adequate care (postnatal child and mother care excluded)</td>
<td>17.8</td>
<td>1,545</td>
</tr>
</tbody>
</table>

Source: DHS, 2010; World Bank staff calculations

If we define adequate care as the combination of the six selected care practices, its prevalence is close to zero (0.6 percent). Excluding postnatal child care, which is very low in Rwanda, from the adequate care definition increases the fraction of children with adequate care to 3.5 percent, still very low. Further excluding the postnatal maternal check-up from the
definition increases the incidence of adequate care to 18 percent (Table 14). We will use this specification of adequate care “light” in the analysis.

A number of care practices are strongly related to stunting. Children born in a health facility are 12 percentage points less likely to be stunted than children born home, and children who slept under a mosquito net have stunting rates that are six percentage points lower than other children (Table 15). Children who received a postnatal check within the first two days of birth are less likely to be stunted, but the difference is not statistically significant (only 72 children in the sample received postnatal care). Early initiation of breastfeeding is also related to lower stunting rates. Antenatal visits do not seem to be related to the risk of being stunted. Note that children with positive care practices (such as being born in a hospital or having had a postnatal check) are on average somewhat younger than children without the positive practices, which means the differences observed in Table 15 could be biased by the natural age-effect.

Table 15: Care practices are related to stunting

<table>
<thead>
<tr>
<th>Incidence of stunting (%)</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 4 or more antenatal consultations</td>
<td>33.0</td>
<td>35.3</td>
</tr>
<tr>
<td>2. Born in health facility</td>
<td>32.1</td>
<td>44.0</td>
</tr>
<tr>
<td>3. Postnatal child care within first 2 days</td>
<td>27.3</td>
<td>34.8</td>
</tr>
<tr>
<td>4. Postnatal maternal care within first 2 days</td>
<td>29.9</td>
<td>35.5</td>
</tr>
<tr>
<td>5. Slept under mosquito net</td>
<td>32.7</td>
<td>38.2</td>
</tr>
<tr>
<td>6. Early initiation of breastfeeding</td>
<td>32.2</td>
<td>39.9</td>
</tr>
<tr>
<td>Adequate care (all six included)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Adequate care (postnatal child care excluded)</td>
<td>27.3</td>
<td>34.3</td>
</tr>
<tr>
<td>Adequate care (postnatal child and mother care excluded)</td>
<td>26.9</td>
<td>36.0</td>
</tr>
</tbody>
</table>

Source: DHS, 2010; World Bank staff calculations

The most stringent composite adequate care variable (including all six components) is of no use for analytical purposes. If we include all six criteria, only nine children in the sample have adequate care\(^{58}\). If we exclude postnatal child care, still only 55 children (out of 1,545) have adequate care. Even in the third specification (without postnatal child and maternal care), only 271 children classify as having adequate care. The stunting rate for these children amounts to 27 percent, nine percentage points lower than that of children without adequate care (and statistically significant).

To summarize, access to adequate food intake, adequate environmental health and adequate care is relatively low in Rwanda. Based on the 2010 DHS, 34 percent of children 0-23 months have a minimum acceptable diet, 44 percent have adequate environmental health, and 18 percent received adequate care. Only 4 percent of children have adequate access to all of the three components (food, environmental health, and care). Preliminary correlations show that cross-district variation in the three components is significantly related the district-level incidence of stunting, with the correlations being stronger than the one between stunting and poverty (Box 7). The next section will examine to what extent the incidence of stunting can be explained by the combination of any or all of the three components.

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\(^{58}\) For the reason of small sample size we do not present stunting rates in Table 4 (na).
Box 7

What’s happening in Ruhango?
One of Rwanda’s poorest districts performs exceptionally well on stunting

Based and poverty and education statistics, Ruhango district does not seem particularly privileged. Over 60 percent of people in this district of southern Rwanda live below the poverty line, making Ruhango one of the poorest districts in the country. Households in Ruhango are more likely to be headed by an illiterate head, and enrolment in secondary school is significantly lower than the average. Yet stunting rates in Ruhango are low: 21 percent of children in Ruhango are stunted, less than half the national average and lower than the stunting rates in the well-off districts in Kigali. A statistical fluke, or is there something special about Ruhango?

Despite it being poor, Ruhango performs exceptionally well on the underlying causes in the UNICEF framework (Figure 105). Almost half of children in Ruhango have a minimum acceptable diet (national average is 33 percent), two-thirds have access to improved water and sanitation and are fully immunized (national average of 44 percent), and 35 percent had adequate care before, during and after birth (national average of 18 percent). These remarkable figures likely explain, at least in part, the low stunting rates in Ruhango. It remains unclear, however, what is driving the particularly strong performance on the underlying causes in this district.

Figure 105: Punching above its weight?
(% of children with access to adequate food, care, and environmental health)

Source: DHS, 2010; World Bank staff calculations.

3.6. Applying the Framework: How does Adequacy Relate to Stunting?

For the UNICEF framework to be of any practical value, stunting rates should decrease as adequate access to the underlying components increases. In particular, children with inadequate access to all three components should have the highest rates of stunting, while children with adequate access to all three should have the lowest rates. This is indeed largely the case: stunting rates for children with inadequate access to all components amount to 45.7 percent (compared to the average of 34.5 percent59), compared to 28 percent for children with perfect adequate access (Figure 106). Only 62 children however (4 percent of the sample) have adequate access to all three components.

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59 Note that the analysis is restricted to children 0-23 months. 34.5 percent of children below 24 months in Rwanda are stunted, compared to 44 percent of children below 60 months.
Figure 106: Children with both adequate food intake and adequate environmental health are least likely to be stunted

(Stunting rate by adequacy categories, 0-23 months)

Stunting rates go down as adequacy in the three components goes up. Children with adequate food intake (but inadequate environmental health and care) have stunting rates of 31 percent, significantly lower than those for children with inadequate access across the board but still high. Environmental health and care are important too: Children with adequate environmental health (but none of the other two components) have stunting rates of 34 percent, while children with adequate care have stunting rates of 35 percent (Figure 106).

The real impact on stunting seems to happen when children have both adequate food intake and adequate environmental health. 14 percent of children in the sample have adequate access to both food and environmental health, and their stunting rates (20 percent) are lower than any other of the possible combinations (although not always in a statistically significant fashion). As argued by the UNICEF framework, there are substantial synergies and complementarities between the components: While having adequate access to only one of the components (say, food) definitely helps, the larger effects are observed when children have adequate access to at least two of the components: children with both adequate food intake and adequate care have stunting rates of 21 percent (although only 36 children have this particular combination) and stunting for children with both adequate care and adequate environmental health amounts to 22 percent.

While the figures and correlations presented so far are informative, they do not account for other factors that also influence child health. In the next sub-section, we estimate a number of multivariate models to examine the contribution of the different adequacy categories and their interaction while controlling for the influence of other important determinants such as age and sex of the child, birth order, various characteristics of the mother, regional effects, etc. For the sake of clarity, only the main results are presented in the text, while the regression estimates are put in annexes. The analysis focuses on both the underlying height for age z-scores (linear regression) and the binary stunting category (logistic regression).
4. The Determinants of Chronic Malnutrition

Examining the correlates of malnutrition in a regression framework, we find that adequate food by itself does not matter for stunting. The only factor that is consistently related to stunting is environmental health. Environmental health matters both in isolation and in combination with any of the two other underlying causes. Depending on the specification, children with adequate environmental health are 9 to 10 percentage points less likely to be stunted. Combining environmental health with adequate food reduces the risk of being stunted by 12 percentage points, while combining it with adequate care reduces the risk by 15 percentage points. Boys are more likely to be stunted than girls, and children with educated mothers are less likely to be stunted.

The results presented in this section are based on four specifications. The first two specifications include three dummy variables on whether the child has adequate food intake (regardless of adequacy in the two other components), adequate environmental health or adequate care, controlling for the influence of a set of child, mother and household characteristics. This specification yields the partial correlation coefficients between a child’s height for age z-score or his/her probability of being stunted and adequacy in the three categories. This simple specification does not cater for potential synergies and interactions between the underlying causes of malnutrition and can be written as:

\[ HAZ_i = \alpha_i + \sum_{i=1}^{3} \beta_i D_i + \gamma X_i + \varepsilon_i \]  

for the height for age z-scores as dependent variable and

\[ P(Stunted)_i = \alpha_i + \sum_{i=1}^{3} \beta_i D_i + \gamma X_i + \varepsilon_i \]  

when the dependent variable is the probability of being stunted. \( D_i \) is a series of three indicator variables to capture adequacy in the three components regardless of adequacy in the other components. The only difference between specifications (1) and (2) is the dependent variable: the continuous height for age z-scores in specification (1) and the discrete stunting indicator in specification (2). \( X_i \) is a vector of child, mother and household characteristics such as age, sex and birth order of child, education, age and body mass index of mother, sex and age of the household head and household wealth.

The third and fourth specifications include a full series of mutually exclusive adequacy categories and their interactions, and controls also for the influence of child, mother and household characteristics. These specifications can be written as:

\[ HAZ_i = \alpha_i + \sum_{i=1}^{7} \beta_i D_i + \gamma X_i + \varepsilon_i \]  

for the height for age z-scores as dependent variable and

\[ P(Stunted)_i = \alpha_i + \sum_{i=1}^{7} \beta_i D_i + \gamma X_i + \varepsilon_i \]  

when the dependent variable is the probability of being stunted. \( D_i \) is a series of seven indicator variables to account for all possible combinations of the three adequacy categories:

- \( D_{11} \) is 1 if the child is adequate in food only and 0 otherwise
- \( D_{12} \) is 1 if the child is adequate in environmental health only and 0 otherwise
- \( D_{13} \) is 1 if the child is adequate in care only and 0 otherwise
- \( D_{14} \) is 1 if the child is adequate in food and environmental health only and 0 otherwise
- \( D_{15} \) is 1 if the child is adequate in food and care only and 0 otherwise
- $D_{le}$ is 6 if the child is adequate in environmental health and care only and 0 otherwise
- $D_{fg}$ is 1 if the child is adequate in food, environmental health, and care and 0 otherwise

The only difference between specifications (3) and (4) is again the dependent variable.

4.1. Simple Specification: How do the Underlying Causes Relate to Stunting?

This section presents the results from estimating specification (1) (height for age z-scores as dependent variable) and specification (2) (the probability of being stunted as dependent variable). Figure 107 summarizes the results of the logistic regression in specification (2) and shows the impact of each variable on the probability of being stunted. Full regression results are presented in Annex Table 10.

Adequate food intake does not seem to matter…

Counter to intuition, having a minimum acceptable diet is not significantly related to stunting. Controlling for other factors, having adequate food intake (regardless of adequacy in care or environmental health) lowers the probability of being stunted by two percentage points, though this effect is not statistically discernible from zero (Figure 107). Using the continuous height for age z-scores as dependent variable, having a minimum acceptable diet actually lowers the child’s height for age z-score, though the coefficient is small and statistically insignificant (Annex Table 10).

Figure 107: Environmental health matters; food intake strangely not

(Impact of variable on the probability of being stunted)

Source: DHS, 2010; World bank staff calculations. Black horizontal lines are 95% confidence intervals. Wealth index expressed in standard deviations.
...While environmental health seems to matter a lot

Of the three underlying causes, environmental health correlates most strongly with the incidence of stunting. Fully immunized children with access to both an improved source of water and an improved sanitation facility have, all else being equal, stunting rates that are nine percentage points lower than that of other children, an effect statistically significant at the 1%-level. This finding is mirrored by the results of the OLS, which shows children with adequate environmental health have average height for age z-scores that are 0.22 standard deviations higher compared to other children.

To appreciate the importance of environmental health, it is illustrative to compare its impact with that of wealth. As expected, children in wealthier households, as measured by the household’s score on the wealth index, are less likely to be stunted. The estimation results indicate that an increase of one standard deviation on the wealth index lowers the probability of being stunted by 4 percentage points (Figure 107). This means that having adequate environmental health equals an increase of two standard deviations on the wealth index in terms of its impact on stunting. This corresponds to moving from a house with an earth floor and dung walls to one with brick walls and a concrete floor.

Good care practices positively affect nutritional outcomes, though the evidence is mixed

In both the OLS and the logit regression, adequate care is related to lower stunting rates, though statistically significance depends on the specification. According to the logit regression (Figure 107), having had adequate care before, during, and just after childbirth lowers the probability of being stunted five percentage points (60). This effect is however not statistically significant at conventional levels. In the OLS however, having had adequate care increased the average z-score by 0.26 standard deviations, statistically significant at the 1%-level (Annex Table 10).

Control variables have the expected signs and magnitudes

All control variables included in specifications (1) and (2) have the expected impacts on child nutrition, though the level of statistical significance varies across specifications. We observe the typical age-pattern of stunting, with older children more likely to be stunted (to have lower z-scores) than young children. Height for age is a measure of long-run nutritional status and includes the cumulative effect of all past and present nutritional deficits, which explains why older children have lower z-scores (they have had more time to accumulate nutrition deficits). Boys are more likely to be stunted than girls, and higher birth-order children have lower z-scores, although the effect is only statistically significant in the OLS. Age of the mother and the sex and age of the household head do not seem to matter much for child nutritional outcomes (although there are a number of significant terms when higher order polynomials are included; their magnitude is however small).

Mother’s education is the main determinant of a child’s nutritional status. Relative to a child whose mother never went to school, a child whose mother completed primary has a probability of being stunted that is eight percentage points lower. Children whose mother attained incomplete secondary or complete secondary have stunting rates that are 15 or 24

60 A child is considered as having had adequate care if (i) the mother had at least four antenatal visits, (ii) the mother gave birth in a hospital, (iii) the child was put to breast within one hour of birth, and (iv) the child slept under a bednet the night preceding the survey.
percentage points lower, respectively (Figure 107). As such, the increasing primary school completion rates and expanding access to secondary education (although still low) can be expected to drive down stunting rates through improved education outcomes for the future generations of mothers. This is however an effect that will only materialize in the medium to longer run. Note the mother’s education is likely to be correlated with the underlying causes and hence may impact the estimated coefficients (for instance, educated mothers likely have more knowledge about proper nutrition, impacting the “minimum acceptable diet” category).

4.2. Full Specification: What are the Synergies between Food, Care and Environmental Health?

In this section we present the results of specifications (3) and (4). These specifications contain seven mutually exclusive categories indicating the adequacy of a child in the three underlying causes separately, in two of the three causes, or in all three. Full regression results are presented in Annex Table 11, while Figure 108 summarizes the results of the logit analysis (specification (4)).

Adequate food alone does not matter; combined with environmental health though, it matters a lot

Having access to an acceptable diet does not matter for stunting if it is not accompanied by adequacy in care or environmental health. By itself, being adequate in food intake reduces the probability of being stunted by four percentage points, insignificant from a statistical point of view (Figure 108). In the OLS (specification (3)), having adequate food intake is negatively related to height-for-age $z$-scores, though the coefficient is small and insignificant. This finding confirms a fundamental premise of the UNICEF framework: increasing access to food security alone will not substitute for inadequate levels of the other factors.

When adequate food intake is combined with adequate environmental health however, the impact on stunting is large. All else being equal, children with adequate access to both food and environmental health have a probability of being stunted that is more than 12 percentage points lower than other children (Figure 108). In the OLS (specification (3)), children who are adequate in food and environmental health have an average height for age $z$-score that is 0.21 standard deviations higher than that of other children. In this specification however, the effect misses statistical significance (p. = 0.14).
Figure 108: The combination of adequate food and environmental health has the biggest impact on stunting

(Impact of variable on the probability of being stunted)

Environmental health matters most, both in isolation and in combination with adequate food or care

Having adequate environmental health seems to be crucial for stunting. Children with adequate access to only environmental health (and inadequate access to food and care) are significantly less likely to be stunted than other children (10 percentage points less likely). This is confirmed by the OLS results, which show children with good environmental health have significantly higher z-scores than other children (0.23 standard deviations higher). Further expanding the provision of clean water and improved sanitation may well lead to lower rates of chronic malnutrition, next to being important for health in general.
Environmental health has important synergies with the other underlying causes. When combined with adequate food, the impact on stunting amounts to 12 percentage points, making it a powerful combination to drive down stunting rates (at least in the logit regression). Combined with adequate care, stunting rates are 15 percentage points lower than for other children (Figure 108). The OLS results paint a different picture: while the combination of food intake and environmental health improves height for age z-scores, the coefficient is not statistically significant and considerable smaller than the care-health interaction: The combination of adequate environmental health and care increases z-scores by 0.69 standard deviations, a large effect that is strongly statistically significant\(^{61}\).

**Adequate care by itself is also significantly related to stunting.** According to the logit specification, having adequate care (but inadequate food intake and inadequate environmental health) is significantly related to lower stunting rates (Figure 108). This finding is confirmed by the OLS specification, where the coefficient of adequate care is positive (associated with better z-scores) and marginally statistically significant. The combination of adequate care and adequate environmental health is strongly related to improved nutritional outcomes, both in the logit and in the OLS specification. The care-food combination has the expected sign, but is never statistically significant\(^{62}\).

**Adequacy in all three underlying causes is not related to improved nutrition outcomes.** Only 62 children in the sample are adequate in food, care and environmental health, as a result of which the effect is imprecisely estimated. A child who is adequate in all three underlying causes is two percentage points less likely to be stunted, insignificant from both a statistical and economical point of view. The magnitude of the effect is small, which suggests other combinations may be more effective in reducing stunting rates in Rwanda.

**To summarize, although the logit and the OLS results differ in certain respects, they agree on the crucial importance of environmental health and adequate care.** In particular, environmental health is the only underlying cause that matters consistently across specifications. Environmental health is important in isolation and is the key component in the synergy with the other underlying causes. While a minimum acceptable diet is of marginal importance by itself, it is of crucial importance if accompanied by access to improved water and sanitation and full immunizations. Environmental health is however most effective in lowering stunting rates if combined with adequate care. The combination of adequate food and care is the only combination that is consistently statistically insignificant across specifications.

5. **Can the Underlying Causes Explain Differences in Stunting Across Groups?**

Using a decomposition framework, we examine whether differences in stunting between poor and non-poor households and between high-stunting and low-stunting districts can be explained by differences in access to the underlying causes. Most of the differences between groups remain unexplained, meaning that differences in coefficients (returns to characteristics) are more important than differences in the characteristics themselves. Nevertheless, environmental health is the only variable that is capable of explaining a statistically significant part of the difference in stunting rates.

\(^{61}\) Note that the effects of the synergies are estimated from small samples: 14 percent of children have both adequate food and environmental health, 5 percent have both adequate environmental health and care, and 2 percent have adequate food and care (while being inadequate in the third factor).

\(^{62}\) Only 46 children in the sample have the combination of adequate food and care (and inadequate environmental health), which may explain the lack of a statistically significant relationship.
in stunting between groups. Non-poor households and households in low-stunting districts both have better access to environmental health and appear to make better use of it (have a bigger return to environmental health). While there are differences in adequate food and care across groups, these differences do not explain the differences in stunting.

The analysis in the previous section showed that certain underlying causes as defined by the UNICEF framework are significantly related to stunting in Rwanda. To what extent can differences in underlying causes across groups explain differences in stunting rates? To answer this question, we decompose stunting rates by groups defined in terms of poverty (comparing children in households with low wealth scores and those in households with high wealth scores) and in terms of geographical location (comparing low stunting districts and high stunting districts).

To decompose differences in stunting rates across groups, we use the well-known Oaxaca-Blinder (OB) decomposition. The OB decomposition decomposes differences in a variable (in our case: stunting) across groups into a part that can be explained by differences in independent variables (for instances, higher adequacy in any of the underlying causes, higher education levels, etc.) and a part that can be explained by differences in returns (differences in coefficients). We are particularly interested to see whether differences in stunting across groups can be explained by different level of adequacy in the underlying causes or differences in the returns to the underlying causes.

5.1 Decomposition by Wealth

For the decomposition by wealth, we divide households in the sample into two groups, depending on their score on the wealth index. Households in the bottom 60 percent of the wealth index are classified as poor, while the other households are considered non-poor. This largely corresponds to Rwanda’s poverty headcount using the international US$ 1.25 a day line (63 percent).

Stunting rates amount to 38 percent for children in poor households and 28 percent for children in non-poor households (children 0-23). Unsurprisingly, adequacy in all three underlying causes is consistently higher in non-poor households. Children in non-poor households are 20 percentage points more likely to be fully immunized and to have access to improved water and sanitation, 5 percentage points more likely to have adequate care, and 6 percentage points more likely to have adequate food (Figure 109). These comparisons however do not control for the influence of other factors, such as mother’s education, sex and age of the child, etc.

Two main messages emerge from the full decomposition results (Annex 8). The first is that more than half (60 percent) of the difference in stunting rates across poverty groups remains
unexplained by the differences in covariates (although the part that is explained by the covariates still is strongly statistically significant). This means that most of the difference in stunting between poor and non-poor households can be explained by differences in coefficients or “returns to endowments”. Although difficult to capture intuitively, this suggests that non-poor households make better use of certain important inputs in child health (such as mother’s education, clean water and sanitation, etc.) which explains the better nutritional outcomes of their children.

The second message is that environmental health is the only underlying factor that is capable of explaining the difference in stunting rates across poverty groups. Children from non-poor households are 20 percentage points more likely to have adequate environmental health (Figure 109), and this explains approximately 10 percent of the difference in stunting rates between poor and non-poor households.\(^63\) Taken together, differences in environmental health between poor and non-poor households (both in levels and in returns) explain roughly 26 percent of the difference in stunting rates.\(^64\)

While adequacy in food and care is also higher for children in non-poor households, these differences do not explain differences in stunting rates. Although a usual suspect, poor children’s inferior diets thus do not seem to blame for their worse nutritional status (Box 1). Next to environmental health, one more variable is significantly related to the different stunting rates between poor and non-poor households: mother’s education, which is significantly higher in non-poor households.

5.2 Decomposition by District

For this decomposition, we divide all 30 districts in Rwanda into two groups depending on their average stunting rates. Districts with below-average stunting rates are classified as “low stunting districts” while districts with above-average stunting rates are classified as “high stunting districts”. The classification was based on stunting rates for children 0-23 months and hence differs somewhat from the district-level stunting rates shown in Figure 99 (which is based on stunting rates for children 0-59 months).

Average stunting rates for children 0-23 amount to 23 percent in low-stunting districts and 41 percent in high stunting districts. Adequacy in all three underlying causes is consistently higher in low stunting districts, although only for environmental health is the difference really big (Figure

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\(^{63}\) The difference in adequate environmental health between poor and non-poor households explains 0.011 of the total difference in stunting of 0.112, hence approximately 10 percent.

\(^{64}\) 10 percent is explained by differences in levels (covariates) and 16 percent by differences in returns (coefficients).
Children in low stunting districts are 24 percentage points more likely to have access to improved water and sanitation and be fully immunized, 3 percentage points more likely to have adequate care, and 6 percentage points more likely to have adequate food. Note that the distribution of adequacy across districts is largely similar as the one by poverty group (Figure 109).

**Box 8**  
**Should we get rid of kitchen gardens?**  
*Probably not, but they won’t do much good by themselves*

The use of kitchen gardens is increasingly being advocated as a means to provide households with cheap and nutritious fruits and vegetables to complement staple-rich diets. The argument is that although children eat a sufficient quantity of food, the main staples (such as bananas and cassava) have low nutritional value, which means children still end up malnourished. Kitchen gardens can improve the quality of diets by introducing a more diverse mix of foods and drive down the high rates of chronic malnutrition. In Rwanda too, kitchen gardening is included as an intervention in the draft Food and Nutrition Policy and the EDPRS-2.

**According to the results of the analysis, kitchen gardens are unlikely to substantially affect stunting rates.** About one third of children in the 2010 DHS have a minimum acceptable diet (which combines diversity and quantity of food), but this is not related to lower stunting rates. While children in better-off households are more likely to be adequately nourished, this does not appear to explain their better nutritional outcomes. In short, the widely-heard claim that the high rates of chronic malnutrition in Rwanda can be explained by low quality diets is not supported by the data (at least not by the DHS).

**Does this mean kitchen gardens are useless?** The answer is no. While kitchen gardens, or having access to a more diverse diet, will not do much good in isolation, there are important synergies with other underlying causes of malnutrition. In particular, the results show that when combined with improved environmental health or adequate care, having an acceptable diet helps a lot, more than only having adequate environmental health or adequate care. This highlights the need for a multi-sectoral approach to combating malnutrition, combining interventions that tackle food security, diversity, and environmental health.

**The decomposition by districts is similar to the one by poverty group.** Most of the difference in stunting rates across districts (almost 70 percent) can be explained by differences in coefficients or “returns to endowments”. Interestingly, this is almost entirely driven by the different returns to adequate environmental health: in high stunting districts, having adequate environmental health lowers the probability of being stunted by only 1 percentage point. In the low stunting districts, it lowers the probability by 11 percentage points. Although difficult to capture intuitively, this suggests that households or caretakers in the low stunting districts make better use of clean water and sanitation (or there are complementary factors present) which explains the better nutritional outcomes of their children. This could for instance happen if households in low stunting areas have superior knowledge on various aspects of child health, which makes them to adopt better behaviors and practices (such as handwashing behaviors).

**Similar to the decomposition by poverty status, environmental health is the only underlying cause that explains a significant part of the difference in stunting across districts**. The effect is however small: the higher proportion of children in low stunting districts who have access to improved water and sanitation and immunizations explains approximately 7 percent of the difference in stunting across districts. Taken together, differences in environmental health (both in levels and in returns) between low and high stunting districts explain more than 37 percent of the difference in stunting.

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65 Comparing stunting rates in Africa and India, Spears (2013) also finds that sanitation, and in particular open defecation, explains much of the excess stunting rates in India.
Although adequate diets are more prevalent in the low-stunting provinces, differences in food intake do not explain differences in stunting rates (coefficient of zero in Annex Table 12). The same is true for differences in adequate care, which do not explain the different stunting rates between low- and high-stunting districts. Households in low-stunting districts are on average wealthier than those in high-stunting districts, and this explains approximately seven percent of the difference in stunting. Finally, the results show that mother’s education is higher in low-stunting districts, also partly explaining the lower stunting rates there.

6. Conclusions

Despite a decline since the turn of the century, the incidence of chronic malnutrition or stunting in Rwanda remains high. In 2010 and also in 2012, 44 percent of children under age five were stunted, potentially jeopardizing their long-run human capital accumulation. While stunting has decreased over the past decade, and especially since 2005, the poor are lagging behind. Stunting rates in the bottom two wealth quintiles remain higher than 50 percent, and have hardly changed since 2000.

A counterintuitive finding of the analysis is that poor diets, although common in Rwanda, do not seem to explain the high incidence of chronic malnutrition. About one third of children have a minimum acceptable diet, but this does not appear to be linked to better nutritional outcomes. In a similar fashion, the lower stunting rates among children in better-off households are unrelated to those children having better nutritional outcomes.

In contrast, adequate environmental health and adequate care seem to matter a lot for nutritional status. Children who have access to improved water and sanitation and who are fully immunized (the three components of environmental health) are 10 percentage points less likely to be stunted, while children with adequate care (but not adequate food or environmental health) are 9 percentage points likely to be stunted. Children who combine adequate environmental health with adequate care are 15 percentage points less likely to be stunted.

The empirical results confirm a fundamental premise of the UNICEF conceptual framework of malnutrition: that there are substantial synergies between the different underlying causes of malnutrition. While having a minimum acceptable diet may not reduce stunting by itself, when combined with access to clean water and sanitation and complete immunizations, the impact on stunting is large.

While not clear-cut, the results point towards the crucial importance of environmental health. Environmental health is the only underlying cause that is consistently significant in isolation, and is the key ingredient in any combination with the other underlying causes. Based on these results, expanding access to clean water and improved sanitation, both at approximately 70 percent in the 2010 DHS, could do more to bring down stunting than a policy aimed uniquely at improving the quality and diversity of diets.
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The same is true for differences in adequate care, which do not explain the different stunting rates between low- and high-stunting districts. Households in low-stunting districts are on average wealthier than those in high-stunting districts, and this explains approximately seven percent of the difference in stunting. Finally, the results show that mother’s education is higher in low-stunting districts, also partly explaining the lower stunting rates there.

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Chapter V. Inequality and the Distribution of Public Expenditures
1. Introduction

As Rwanda’s experience over the past decade illustrates, what happens to inequality matters for poverty reduction. Between 2001 and 2006, household consumption grew by 10 percent, though poverty decreased by only two percentage points. In the subsequent five years, consumption grew by 16 percent, and poverty fell by 12 percentage points. In the first half of the decade, rising inequality constrained poverty reduction. In the second half, falling inequality boosted it (see Chapter I).

Relative to other African countries and low-income countries in general, consumption inequality in Rwanda is high. In 2011, the top 1 percent accounted for over 14 percent of total consumption, higher than the share captured by the bottom 40 percent together (slightly less than 14 percent)\(^66\). As a result, Rwanda’s Gini index of inequality (50.8) is substantially higher than the average level of inequality in Africa (Gini of 43.3 in 21 African countries with a comparable consumption survey around the same period) and the average inequality in low-income\(^67\). Since 2006, inequality has however decreased faster in Rwanda (decrease of 2.3 percentage points) than in the average African country (average decline of 0.7 percentage points between 2005 and 2010).

Given the importance of inequality dynamics in determining the pace of poverty reduction, this chapter takes a closer look at inequality in Rwanda. The first part of this chapter explores the sources of inequality and the mechanisms that have pushed inequality down-albeit from a high level- since 2006. The second part of the chapter will link inequality in consumption to access to education and will examine the distributional effects of public expenditures on education.

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\(^{66}\) This should be interpreted with caution, as outliers may overestimate the share accruing to the top 1 percent.

\(^{67}\) The reader is advised to treat these comparisons with caution, as different countries have different ways of measuring consumption.
2. Inequality in Rwanda: High but Decreasing

Between 2006 and 2011, the Gini index of consumption per adult equivalent decreased from 52.4 to 49.6, which can be considered a substantial decline (Figure 111). The Lorenz curves for 2006 and 2011 do not cross, which means the consumption distribution was more equal in 2011 than in 2006 for any standard measure of inequality (Figure 112). Inequality is substantially lower in rural areas (40.2) than in urban areas (58.2) and also decreased faster: The Gini index decreased by 4.3 percent in rural areas compared to 2.7 percent in urban areas.

The decrease in inequality has been most salient among both the very poor and the wealthiest. While the Gini coefficient is most responsive to changes in inequality in the middle of the distribution, the so-called generalized entropy (GE) measures of inequality can highlight changes in inequality for different levels of consumption. GE(-1) focuses on inequality at the very bottom of the consumption distribution, while GE(2) focuses on the top of the distribution. GE(0) and GE(1) are the intermediate cases. Inequality decreased most among the very poor (18 percent decrease in GE(-1)) and very rich (22 percent decrease in GE(2)). This pattern is especially salient in rural areas (Table 16).

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Figure 112: ..and the curves do not cross, pointing towards an unambiguous drop in inequality

Lorenz curve of consumption per adult equivalent, 2006 and 2011, zoomed in

Table 16: Inequality decreased across the distribution, but most for the very poor and the best-off

Generalized entropy measures of consumption, 2006 and 2011

<table>
<thead>
<tr>
<th></th>
<th>National GE(-1)</th>
<th>National GE(0)</th>
<th>National GE(1)</th>
<th>National GE(2)</th>
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<tr>
<td>2006</td>
<td>0.577</td>
<td>0.472</td>
<td>0.653</td>
<td>2.213</td>
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<tr>
<td>2011</td>
<td>0.472</td>
<td>0.415</td>
<td>0.568</td>
<td>1.736</td>
</tr>
<tr>
<td>Difference (%)</td>
<td>-18.2%</td>
<td>-12.1%</td>
<td>-13.0%</td>
<td>-21.6%</td>
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<table>
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<table>
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<tr>
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<th>Rural GE(1)</th>
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<tr>
<td>2006</td>
<td>0.36</td>
<td>0.302</td>
<td>0.382</td>
<td>1.197</td>
</tr>
<tr>
<td>2011</td>
<td>0.3</td>
<td>0.269</td>
<td>0.334</td>
<td>0.738</td>
</tr>
<tr>
<td>Difference (%)</td>
<td>-16.7%</td>
<td>-10.9%</td>
<td>-12.6%</td>
<td>-38.3%</td>
</tr>
</tbody>
</table>

Source: EICV2 and EICV3
Between 2006 and 2011, inequality dropped in all Provinces except for the Northern Province. The Gini dropped most in the Southern (12 percent decrease) and Western Province (16 percent decrease), the Provinces with the highest poverty headcount in 2011 (Figure 113). The Northern Province experienced an eight percent increase in inequality, but was nevertheless the Province with the fastest poverty reduction since 2005 (poverty dropped by 18 percentage points). Inequality in Kigali City decreased marginally.

At the district level, there is an inverse relationship between poverty and inequality. Districts with relatively high poverty headcounts tend to have relatively low levels of Gini and vice versa (Figure 114 and Figure 115). Inequality and poverty seem to be inversely linked through urbanization: Districts with a sizable urban population share tend to be better off but have higher inequality, probably owing to the large consumption differences between rural and urban populations.

### Figure 113: Inequality declined in all Provinces except in the north
(Gini coefficient of consumption inequality, 2006 and 2011)

![Graph showing inequality decline across Provinces](source:EICV2 and EICV3; World Bank staff calculations.)

**Table 16**: Inequality decreased across the distribution, but most for the very poor and the best-off (Generalized entropy measures of consumption, 2006 and 2011)

<table>
<thead>
<tr>
<th></th>
<th>GE(-1)</th>
<th>GE(0)</th>
<th>GE(1)</th>
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<td>1.736</td>
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<tr>
<td>Difference (%)</td>
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<td>12.1%</td>
<td>13.0%</td>
<td>21.6%</td>
</tr>
</tbody>
</table>

### Figure 114: Inequality tends to be higher in districts with a sizable urban population
(District-level inequality and urban population share, 2011)

![Map showing inequality and urban population share](source:EICV3)

### Figure 115: Districts with high poverty tends to be more equal
(District-level poverty headcount, 2011)

![Map showing poverty headcount](source:EICV3)

### 3. Sources of Inequality and the Inequality Drop

#### 3.1. The Structure of Inequality

To help understand the factors that account for the high level of inequality, we decompose overall inequality in a within- and between-group component. Within-group inequality measures the contribution to total inequality of inequality within certain groups (such as consumption differences within rural areas, within provinces, within occupations, etc.), and is
also called “unexplained” inequality. Between-group inequality quantifies the contribution to total inequality of consumption disparities between groups, such as differences in consumption between rural and urban areas, between farm and non-farm workers, etc. Between-group inequality, also called “explained” inequality, is particularly important as it indicates convergence or divergence of the welfare of different groups of the population over time.

**To examine the sources of inequality, we focus on six household attributes:** the household’s regional location, whether the household is rural or urban, the main occupation of the household (defined as the occupation that procures the largest part of household income), highest educational attainment in the household, size of household landholdings, and household composition in terms of dependency rates. The variables are defined as follows:

- Regional location: The five Provinces in Rwanda;
- Main occupation of the household: Independent farming (self-employed), wage farming, independent non-farm (self-employed), wage non-farm, or other (mostly transfers and rents), depending on which activity procures the largest part of household income;
- Highest educational attainment in the household: The highest educational attainment of any household member, not necessarily the head, grouped in “no education”, “some primary”, “some vocational”, “some secondary”, and “some tertiary”;
- Size of landholdings: Divided into three categories, whether household landholdings are among the smallest 20 percent, among the middle 60 percent, or among the largest 20 percent; this only refers to rural households;
- Household composition: Households are categorized in five groups depending on the child dependency rate (0; 0-0.5; 0.5-1; 1-1.5; larger than 1.5);

Since the Gini index is not additively decomposable, we use the GE(0) index of inequality (also referred to as the Mean Log Deviation or Theil-L index), which is additively decomposable by subgroup. Annex 9 details the methodology.

**Education and Occupation Main Sources of Inequality**

Among the factors considered, **education was the main contributor to total inequality in 2011.** Differences in consumption between education subgroups explain 40 percent of total inequality in 2011 (Figure 116), up from 30 percent in 2006. Although hypothetical, the increasing share of overall inequality explained by differences between education subgroups may point towards increasing returns to education between 2006 and 2011. As a cautionary note, we cannot infer causality from the statistical decompositions presented in Figure 116. While differences in education can cause disparities in welfare, it is equally likely that past differences in wealth or welfare cause disparities in education.

**Occupation of the household, defined as the activity that procures the household most of its income, emerges as another important source of inequality.** Differences in consumption across occupation subgroups explained over 30 percent of overall inequality in 2011 and have become more important since 2006 (25 percent of total inequality). This can be explained by consumption levels of independent farming growing slower than the average.

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69 In a recent research paper, Montenegro and Patrinos (2014) indeed find that returns to education in Rwanda have increased between 2006 and 2011.
Regional Effects are Substantial but Have Eased Since 2006

Geographical disparities are another important source of inequality. Differences in welfare between urban and rural areas explained 23 percent of total inequality in 2011, the same share as differences between the five Provinces (Figure 116). Isolation from key infrastructure matters too. As noted in Chapter 2, there is a large difference in living standards between connected and isolated households. These differences explained 22 percent of overall inequality in 2011.

Rural and urban areas have converged since 2006, though the difference in living standards remains large. Differences in consumption between rural and urban households accounted for 23 percent of total inequality in 2011, down from 25 percent in 2006. As noted in Chapter I, rural areas grew faster than urban areas over the past decade, narrowing the rural-urban consumption gap (which remains however large). This led to an absolute decrease in between-group inequality (see Figure 117). Inequality between provinces decreased somewhat too, but less than overall inequality, which makes that differences between provinces explained a higher share of total inequality in 2011 (23 percent) than in 2006 (20 percent).

Household Composition and Landholdings of Marginal Importance

Counter to popular perception, differences in landholdings explain only a tiny fraction of overall inequality. Differences in consumption between households with small (bottom 20 percent), medium (middle 60 percent) and larger (top 20 percent) landholdings explain only 6 percent of total inequality (Figure 116), but have slightly increased since 2006 (when they accounted for 4.5 percent of inequality)\(^7\). Differences in consumption between groups of households with different dependency rates explain 10 percent of total inequality, up substantially from 7 percent in 2006 (Error! Reference source not found. and Figure 117).

\(^7\) We can however not account for differences in land quality.


**Figure 117: Between-group inequality mostly increased between 2006 and 2011**
*(Evolution of between-group inequality, 2006-2011)*

Source: EICV2; EICV3. World Bank staff calculations

**Strong Decreases in Within-Group Inequality**

Since the share of between-group inequality mostly increased since 2006, the decrease in overall inequality implies that within-group inequality must have decreased. Indeed, inequality within groups declined almost across the board, with particularly strong drops within educational and occupational categories. Inequality dropped most within agricultural occupations, which already had the lowest levels of inequality to begin with (Figure 118). Inequality also dropped within each education subgroup, though more at the lower levels of education (Figure 119).

**Figure 118: Inequality decreased within each occupation subgroup, but most for agriculture**
*(Gini coefficient of consumption inequality)*

Source: EICV2; EICV3. World Bank staff calculations.

**Figure 119: Inequality decreased within each education subgroup**
*(Gini coefficient of consumption inequality)*

Source: EICV2; EICV3. World Bank staff calculations.

**3.2. The Drivers of the Inequality Decline**

The static decompositions presented in the previous section are useful in getting an overall picture of the structure of inequality, but do not say much about what has driven the decline in inequality since 2006. This section presents the results of dynamic decompositions of inequality to gain more insights into the factors that have been associated with the change in
inequality since 2006. The methodology for the dynamic decompositions is exposed in Annex 10.

**Intuitively, a change in inequality can be decomposed into three components:** a change in within-group inequality, a change in between-group inequality, and changing population shares. In a dynamic analysis, each of these components can change: Total inequality could change if inequality increases faster within some groups (increase in within-group inequality), if average income or consumption growth varies across groups (change in between-group inequality), and/or if there are population shifts between groups. All else equal, a population shift from a low inequality to a high inequality group would push up overall inequality, while a population shift from a low consumption group to a higher consumption group would depress inequality (as a bigger share of the population would enjoy higher consumption).

**Population Shifts Drive Drop in Inequality**

As already mentioned in earlier chapters, Rwanda experienced a number of notable evolutions over the past decade. Among the more salient evolutions were the move to non-farm economic activities, the rapid drop in fertility, and the expansion of access to education. These transitions substantially affected the population shares of each subgroup since 2006. The share of households with a main occupation in independent farming dropped from 74 percent to 61 percent, while the share engaged in non-farm wage employment doubled from 8 percent to 16 percent (Figure 120). In education, the share of households with “some primary” as highest education level dropped by 11 percent, while “some secondary” increased by more than 40 percent (Figure 121). As a result of the decline in fertility, the share of households with low dependency rates (less than 0.5 children per adult) somewhat increased, while the share with high dependency rates (more than 1.5 children per adult) decreased (Figure 122). At the same time, internal migration has affected the population shares of the Provinces: the share of households living in the Southern Province (the poorest Province) decreased, while the share living in the Eastern Province increased (Figure 123). The population share of the other Provinces changed only marginally.

---

Migration towards the Eastern Province can likely be explained by the availability of land: Population density in the Eastern Province (275 people/km²) is substantially lower than the average (416 people/km²), and average landholdings are substantially larger.
The population shifts across subgroups largely explain the decrease in inequality, in particular the educational and occupational shifts. Table 17 shows the results of the dynamic decompositions. Each column shows the net contribution of each component, holding the other components constant. For education for instance, the decrease in equality within education subgroups (see Figure 118) decreased total inequality by 0.0987 (column 1), while the increase in between-group inequality (the divergence of consumption across education subgroups) increased total inequality by 0.1543 (column 4). The larger population share in higher education subgroups increased inequality by 0.0161 (column 2), due to the higher levels of inequality among higher levels of education (Figure 119). The population shift from lower to higher levels of education however strongly decreased inequality (column 3). Overall inequality as measured
by GE(0) dropped by 0.0576, which can largely be explained by population shifts and decreasing within-group inequality.

**Table 17: Population shifts pushed down inequality**  
*(Absolute change in each component of the dynamic decomposition of consumption inequality 2006-2011)*

<table>
<thead>
<tr>
<th></th>
<th>(1) changes in within</th>
<th>(2) pop share affect within</th>
<th>(3) population shift affect between</th>
<th>(4) changes in between</th>
<th>Total change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>-0.0987</td>
<td>0.0161</td>
<td>-0.1293</td>
<td>0.1543</td>
<td>-0.0576</td>
</tr>
<tr>
<td>Occupation</td>
<td>-0.1032</td>
<td>0.0313</td>
<td>-0.1086</td>
<td>0.1229</td>
<td>-0.0576</td>
</tr>
<tr>
<td>Household composition</td>
<td>-0.0712</td>
<td>0.0031</td>
<td>-0.0122</td>
<td>0.0227</td>
<td>-0.0576</td>
</tr>
<tr>
<td>Rural-Urban</td>
<td>-0.0362</td>
<td>0.0011</td>
<td>-0.0039</td>
<td>-0.0186</td>
<td>-0.0576</td>
</tr>
<tr>
<td>Province</td>
<td>-0.0577</td>
<td>0.0012</td>
<td>-0.0108</td>
<td>0.0097</td>
<td>-0.0576</td>
</tr>
</tbody>
</table>

Source: EICV2, EICV3. World Bank staff calculations. See Annex for more details.

**The occupational transitions affected inequality in much the same way as education.** Pure between-occupation inequality (column 4) increased substantially between 2006 and 2011, pointing towards consumption divergence across occupations. The higher share of households engaging in more unequal non-farm occupations also pushed up inequality (column 2). Here too, the population shifts from agricultural to non-agricultural occupations have a strong equalizing effect (column 3), as more households now enjoy the higher consumption levels associated with non-farm occupations. Note that the same dynamic that reduced poverty is also driving the decrease in inequality: the progressive move to non-farm occupations was a main driver of poverty reduction (Chapter III) and also decreased inequality.

**The other subgroup decompositions are qualitatively similar to the ones for education and occupation.** Overall, pure between-group inequality increased (except for rural-urban) and within-group inequality decreased. The population shares and shifts (columns 2 and 3) consistently have opposite effects: The increasing population shares in the higher inequality subgroups tended to increase inequality (column 2), while the population shifts to higher-consuming subgroups tended to push inequality down (column 3). The net effect of the population shifts was to push inequality down.

**4. Access to Education and the Benefit Incidence of Public Spending on Education**

As shown in the previous section, differences in educational attainment are the main source of inequality in consumption. This links back to the literature on inequality of opportunities: if access to important childhood opportunities (such as education) in a country is unequal, and the same childhood opportunities are closely related to living standards later in life, one can expect that those living standards will also be distributed unequally.

In recent years, attention has progressively shifted from focusing on inequality in outcomes (such as consumption or income) to focusing on inequality in opportunities (such as education, health, etc.). One of the reasons behind this shift is the question of which kind of inequality actually matters. Income or consumption inequality, the traditional locus of interest, may well be a result of individual efforts or innate differences in talent which make that some people are better-off than others. Many people would consider this inequality as fair: after all, it is a result of merit or talent. On the other end, inequalities in childhood opportunities which stunt a child’s future prospects would almost universally be considered unfair. After all, these are inequalities that are beyond the control of the individual child and preclude her/him from developing her/his full potential. Research suggests that opportunities for children in Rwanda have increased since 2000, while the opposite is true for infants (Box 9).
Outcome inequality can be decomposed in a part that can be attributed to inequality of opportunity (the unfair part) and a part attributable to factors that are largely within the control of the individual (the ‘fair’ part). Developing the conceptual framework and applying it to seven Latin American countries, the World Bank (2009) finds that between 27 percent and 52 percent of overall inequality in household consumption can be explained by inequality of opportunity. In Rwanda, based on the EICV2 data, about 25 percent of inequality is due to an uneven playing field in childhood, roughly the same as in Ghana at the same time (Ferreira and others, 2014). This means that making opportunities more broadly accessible to children from all backgrounds can be expected to drive down inequality among future generations, next to improving aggregate welfare.

Public expenditures are a key instrument in levelling access to opportunities. Public subsidies for, among others, education amount to in-kind transfers to households, and can in particular increase use of education services among poor households who are typically disadvantaged in accessing them. Given the importance of education in explaining Rwanda’s level of inequality, this section will examine the extent to which public expenditures on education benefit different groups of the population in terms of welfare and the extent to which these expenditures affect poverty and inequality.

4.1. Access to Education

Physical access to education facilities in Rwanda is good. The median rural household has a primary school within a 25 minute-walk, while for urban households this decreases to 15 minutes. While the poor tend to live somewhat further from primary schools, the differences are small and insignificant from an economic point of view (Figure 126): Children from rural households in the bottom consumption quintile (the extreme poor) walk on average (on median) 30 minutes to the nearest primary school, ten minutes more than children from households in the top quintile. In urban areas, where infrastructure and households tend to be more clustered, the differences are even smaller. Access to secondary schools is good as well, with children from the poorest rural households walking 15 minutes longer (45 minutes) than children from the upper quintile (30 minutes - Figure 127). Isolation or remoteness hence does not seem to be a crucial barrier to entry to secondary education.

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72 For technical reasons, estimating inequality of opportunity in Rwanda based on the 2010/11 survey is not included in this chapter: there are too few so-called circumstance variables. Even for the 2005 estimation (based on EICV2), the only circumstance variables were gender, religion, and region of residence.

73 At the outset of this chapter, it should be noted that this exercise refers to the 2010/11 fiscal year (same year as the EICV3 survey) and that the distribution of public expenditures may have changed since then. It is however straightforward to replicate this analysis with data from the ongoing EICV4.
Box 9

**Access to Opportunities**

Random circumstances have become more important in determining access to opportunities for infants in Rwanda

To what extent do circumstances beyond your control influence the access you have to a set of important basic services? That is the question that is addressed by the Human Opportunity Index (HOI), developed by the World Bank. In simple terms, the HOI looks at the coverage of an important basic service or “opportunity” in a society (for instance, enrolment in primary education) and combines this with information on the extent to which access to that opportunity is determined by circumstances beyond a child’s control (such as having been born in a rural area instead of the capital, having been born as a girl rather than a boy, etc.). In the ideal society, access to opportunities should not be influenced by random circumstances.

A recently released report on human opportunities in Sub-Saharan Africa considers access to basic opportunities for infants (0–1 years) and children (6–11 years) in a sample of 20 African countries. Human opportunities for children in Rwanda have improved significantly over the past decade, driven in large part by the impressive gains in education (Figure 125). The human opportunity index for infants however decreased (Figure 124). The decrease can be explained by the bigger weight of circumstances in determining whether or not an infant is stunted (as mentioned in Chapter 4, progress in stunting has lagged for the poor) and the decrease in the proportion of infants with access to a clean water source (the report defines clean water as piped, well, or rainwater).

**Figure 124: The HOI has declined for infants 0-1…**

**Figure 125: While it has increased for children 6-11**

(Average annual change in composite HOI)

There is substantial variation in the progress on the different opportunities underlying the composite HOI. In education, Rwanda has made strong progress in increasing net primary school attendance and starting primary school on time, but less on finishing primary school on time (the opportunity on which Rwanda scores lowest of all countries). In basic infrastructure (electricity, water, and sanitation), gains were limited, and access to clean water (defined as in the previous paragraph) actually decreased. In health, strong progress was made on full immunization (the opportunity on which Rwanda scores highest of all countries) but progress on stunting has lagged.

Of course, wealthier countries tend to have higher HOI scores. Countries with more resources can provide basic opportunities to a larger part of their population, resulting in a higher HOI. Therefore, a ‘fairer’ way to compare human opportunities across countries is to control for countries’ per capita GDP, and see what countries perform relatively better or worse conditional on their income level. This exercise reveals that Rwanda slightly underperforms for its level of income, losing one rank in the overall HOI ranking (from 11th to 12th place out of 19 countries).

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74 World Bank (2014).
Attendance in primary school is high and relatively irresponsive to household living standards\(^75\). Net attendance amounts to 90 percent for the poorest 10 percent of households and increases to 99 percent for the richest decile (Figure 128). Girls of primary-school age are somewhat more likely to attend (94.3 percent) primary school than boys (92.7 percent), and attendance rates are marginally higher in urban areas (96 percent) than in rural ones (93.2 percent). Attendance in public and so-called Government-aided schools account for the bulk of overall attendance, except in the richest decile where attendance in public schools drops off sharply (Figure 128). Overall, 51 percent of school-going children of primary school-age go to public schools, 45 percent go to Government-aided schools, and four percent to private schools. Children from poorer households are more likely to attend Government-aided schools, while children from wealthier households are more likely to attend pure public schools (except for the top decile, who are more likely to use private schools).

\(^{75}\) The EICV3 household survey measures attendance rather than enrolment. According to administrative data for the same year (the education MIS), net enrolment in primary school amounted to 95.9 percent (somewhat higher than the net attendance rate of 92 percent).
The equitable access to education is the result of strong Government efforts in expanding access to education in the past ten years. At the turn of the century, before the roll-out of free universal basic education in 2003, there was a clear economic gradient in school enrolment, with attendance rates being 25 percentage points lower in the bottom consumption decile (62 percent) than in the top quintile (87 percent – see Figure 129). The roll-out of free basic education since 2003 (between the EICV1 and EICV2 surveys) substantially increased net attendance, from 73 percent in EICV1 to 87 percent in EICV2, with gains in particular at the lower half of the distribution. Overall, the difference in attendance rates between the bottom and top decile narrowed from 25 percentage points in 2001 to 9 percentage points by 2011.
Figure 129: The roll-out of free basic education substantially increased attendance rates
(Overall net attendance in primary school, EICV1 and EICV2)

In contrast to primary education, attendance in secondary is low and strongly correlated with living standards. Net attendance in secondary school amounts to 20 percent and is lower than six percent for the poorest 10 percent of households (Figure 130). Net attendance is low even at the upper end of the consumption distribution: only 44 percent of children of secondary school-age from the wealthiest 10 percent of households attended secondary school in 2011. Net attendance in secondary school is substantially higher in urban (37 percent) than in rural areas (18 percent), and is higher for girls (23 percent) than for boys (18 percent).

Gross attendance in secondary school is twice as high as net attendance. Gross attendance amounted to 40 percent in 2011 and ranged from 11 percent in the bottom decile to 78 percent in the top decile (Figure 130). The fact that the difference between net and gross attendance rates increases with consumption suggests that low net attendance for the higher deciles is mainly a question of students staying in secondary beyond the normal secondary school-age, while at low consumption levels few children enter secondary school, regardless of age. Most children who attend secondary school go to public or government-aided facilities, except for the top decile where most children go to private schools (Figure 130).

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76 According to the education MIS, net enrolment in secondary school amounted to 25.7 percent in 2011.
77 According to the education MIS, gross enrolment in secondary school amounted to 35.5 percent, actually lower than gross attendance according to the EICV3 survey.
While attendance in secondary school remains low and unequal, important gains have been made over the past decade. Gross attendance in secondary school doubled between 2001 and 2006 (from 10 percent to 20 percent), and then doubled again by 2011 (40 percent). The introduction of the Nine Year Basic Education Program (9YBE) in 2009, which offers six years of primary education and three years of junior secondary free of charge, dramatically expanded access to secondary school at all points of the distribution, in particular for the poorest: between 2006 and 2011, attendance in secondary school increased five-fold in the poorest decile, four-fold in the second-poorest decile, and three-fold in the third-poorest decile (Figure 131). Overall, secondary school attendance among the bottom 40 percent jumped from 3 percent in 2001 to 20 percent by 2011.
Figure 131: Large gains in secondary school attendance since 2006
(Overall gross attendance in secondary school, EICV1, EICV2 and EICV3)

4.2. Benefit incidence of public spending on education

To examine whether public expenditures on education have an equalizing or dis-equalizing effect on the distribution, we perform a so-called benefit incidence analysis. A benefit incidence analysis combines data on public spending on certain services with household survey data on use of those services to estimate which groups of individuals, ranked in terms of welfare, benefit most from public subsidies. The methodology is detailed in Annex. Note that this exercise uses expenditure data from the 2010/11 fiscal year (same year as the EICV3), and that the distribution of expenditures may have changed since.

Overall, public expenditures on primary education are pro-poor. Poor children account for the bulk of enrolments in public and Government-aided primary schools, which means they make more use of public subsidies going to primary education. On a per capita basis, the implied subsidy is three times higher for the poorest (Rwf 2,989) than for the richest decile (974). Poorer children hence benefit disproportionally from public spending on primary education. About 25 percent of total expenditures on primary education (about RWF 40 billion in 2010/11) accrue to the poorest 20 percent, compared to 13 percent for the richest 20 percent (third column in Table 18).

<table>
<thead>
<tr>
<th>Decile</th>
<th>Per capita subsidy (Rwf)</th>
<th>Share of total expenditures</th>
<th>Share of total expenditures</th>
<th>Share of total expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poorest</td>
<td>2,989</td>
<td>13.1%</td>
<td>14.0%</td>
<td>6.9%</td>
</tr>
<tr>
<td>2</td>
<td>2,693</td>
<td>11.8%</td>
<td>12.6%</td>
<td>6.8%</td>
</tr>
<tr>
<td>3</td>
<td>2,769</td>
<td>12.0%</td>
<td>12.7%</td>
<td>6.7%</td>
</tr>
<tr>
<td>4</td>
<td>2,573</td>
<td>11.2%</td>
<td>11.5%</td>
<td>8.8%</td>
</tr>
<tr>
<td>5</td>
<td>2,499</td>
<td>10.8%</td>
<td>11.2%</td>
<td>7.1%</td>
</tr>
<tr>
<td>6</td>
<td>2,311</td>
<td>10.1%</td>
<td>10.1%</td>
<td>9.4%</td>
</tr>
<tr>
<td>7</td>
<td>2,143</td>
<td>9.3%</td>
<td>9.2%</td>
<td>10.0%</td>
</tr>
<tr>
<td>8</td>
<td>2,052</td>
<td>8.9%</td>
<td>8.5%</td>
<td>11.4%</td>
</tr>
<tr>
<td>9</td>
<td>1,957</td>
<td>8.5%</td>
<td>7.3%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Richest</td>
<td>974</td>
<td>4.3%</td>
<td>2.9%</td>
<td>15.4%</td>
</tr>
</tbody>
</table>

While spending on public primary education is pro-poor in rural areas, the opposite is true for urban areas. The bottom 20 percent in urban areas account for 14 percent of total subsidies on public primary education, compared to 27 percent in rural areas (Table 18). At the other end, the top 20 percent captures 29 percent of subsidies in urban areas, compared to 10 percent in rural areas. Figure 132 shows this graphically: the benefit incidence curve for rural areas is located above the line on equality, which means the poor get a proportionally higher share of the subsidy. For urban areas, the benefit incidence curve lies below the line of equality, meaning that the poor capture a proportionally smaller share. This is however a common finding and in large part a reflection of the fact that there are a lot less poor households in urban than in rural areas.

**Figure 132: Spending on primary education is pro-poor**

(Benefit incidence curves for public and government-aided primary schools, rural and urban areas)

While primary spending is pro-poor, spending on secondary education is biased towards the rich. Children from better-off households account for the bulk of the enrolments in public and government-aided secondary education and hence capture the bulk of public subsidies for this level of education. The richest 20 percent account for over 30 percent of total expenditure on secondary education, higher than the share accruing to the bottom 40 percent (Table 19). This is particularly the case for urban areas, where households in the bottom 40 percent account for a mere 12 percent of expenditures on secondary education while households in the top decile account for 38 percent. This can be explained by the fact that there are relatively few poor households in urban areas and, on top of that, they are much less likely to enroll their children in secondary school.
Table 19: The rich benefit most from spending on secondary education

(Benefit incidence analysis of spending on secondary education, 2010-11)

<table>
<thead>
<tr>
<th>Decile</th>
<th>National</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per capita subsidy (RwF)</td>
<td>Share of total subsidy</td>
<td>Share of total subsidy</td>
</tr>
<tr>
<td>Poorest</td>
<td>879</td>
<td>3.5%</td>
<td>4.1%</td>
</tr>
<tr>
<td>2</td>
<td>1,600</td>
<td>6.4%</td>
<td>7.1%</td>
</tr>
<tr>
<td>3</td>
<td>1,766</td>
<td>7.0%</td>
<td>7.8%</td>
</tr>
<tr>
<td>4</td>
<td>2,093</td>
<td>8.3%</td>
<td>9.2%</td>
</tr>
<tr>
<td>5</td>
<td>2,286</td>
<td>9.1%</td>
<td>10.5%</td>
</tr>
<tr>
<td>6</td>
<td>2,568</td>
<td>10.2%</td>
<td>10.7%</td>
</tr>
<tr>
<td>7</td>
<td>3,091</td>
<td>12.3%</td>
<td>12.8%</td>
</tr>
<tr>
<td>8</td>
<td>3,193</td>
<td>12.7%</td>
<td>13.3%</td>
</tr>
<tr>
<td>9</td>
<td>3,890</td>
<td>15.4%</td>
<td>14.6%</td>
</tr>
<tr>
<td>Richest</td>
<td>3,825</td>
<td>15.2%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>


Figure 133 summarizes the benefit incidence of public spending on primary and secondary education. Spending on primary education disproportionately benefits the poorer segments of the population, while spending on secondary is biased towards the rich. However, spending on secondary education is still distributed more equitably than consumption and hence is still relatively progressive: if people who make use of public secondary education were given income instead of the in-kind benefit (government-sponsored education), the consumption distribution would become more equitable.

Figure 133: Spending on primary and secondary education is progressive relative to consumption

(Benefit incidence curves for spending on primary, secondary and tertiary education)

Overall, public spending on primary and secondary education has a modest equalizing and poverty reducing effect. If households had to pay for the education children receive in public and government-aided schools, the poverty rate would increase to about 47 percent (up from the actual rate of 45 percent) and inequality as measured by the Gini would marginally rise to 0.5 (from 0.49 now).

Spending on tertiary education in low-income countries is typically heavily skewed towards the rich. Children from wealthier households tend to be overrepresented among enrolments in higher education, and public spending per student is usually many times higher for tertiary than for primary and secondary education. Rwanda is not an exception: The unit subsidy for public tertiary education amounted to Rwf 737,553 in 2011, 47 times higher than the unit subsidy in primary and 14 times the one in secondary (Annex Table 13). Children from the bottom decile accounted for zero percent of enrolments in public institutes of higher education, while children from the top decile accounted for 70 percent. As a consequence, public spending on tertiary education is pro-rich and distributed more unequally than consumption (Figure 133).

The regressive nature of public spending on higher education begs the question as to how higher education should best be funded. This is an ongoing debate in education research, pitching those who argue that higher education is a private good and as such should not be funded, against those who argue that higher education has important social benefits in the form of higher growth, innovation, and job creation, and as such should be publicly funded 78. While the poverty assessment will not argue in favor of either point-of-views, the high level of funding for higher education (on a per capita basis) and its regressive pattern imply the existence of important trade-offs between spending on the different levels of education.

5. Conclusions

The transitions that have driven the reduction in poverty have also had a downwards impact on inequality. As more and more households moved from agriculture to non-agricultural activities, their average consumption levels increased and overall inequality decreased as the population share of the low-income group (agriculture) got smaller. A similar story applies to the decline in fertility: As fertility rates fell, the share of households in the poorest high dependency category decreased and that in the better-off lower dependency category increased, boosting consumption levels and pushing down inequality.

The largest part of inequality in consumption is accounted for by the inequality in educational attainment across households. Given the recent successful efforts in expanding access to education, inequality in educational attainment can be expected to decrease over the coming decade, with potential effects on consumption inequality. In general, Government’s efforts to make primary education universal had almost eradicated economic gradients in primary school enrolment by 2011. This is good news, both for inequality and consumption growth. Recent research shows that returns to education in Rwanda are amongst the highest in the world, with particular strong returns at the primary level: In 2011, each additional year of primary education increased earnings by 34 percent, up from 17 percent in 2006 79. The rapidly increasing completion rates in primary school thus hold significant promise for future living standards.

78 See Oketch, McCowan and Schendel (2014).
79 Montenegro and Patrinos (2014).
Though progress has been made here too, access to secondary education remains highly dependent on household wealth. While the introduction of 9YBE in 2009 expanded access to secondary education, in particular for the poorest households, a child from the poorest 10 percent of households still was, in 2011, eight times less likely to attend secondary than a child from the richest 10 percent of households. Given that the effect of education on consumption is a lot stronger for education beyond the primary level (see Chapter II), it appears particularly important to get far more children of disadvantaged households in and through secondary school. This would also change the distribution of public expenditures on secondary education and make them more neutral or pro-poor.
Though progress has been made here too, access to secondary education remains highly dependent on household wealth. While the introduction of 9YBE in 2009 expanded access to secondary education, in particular for the poorest households, a child from the poorest 10 percent of households still was, in 2011, eight times less likely to attend secondary than a child from the richest 10 percent of households. Given that the effect of education on consumption is a lot stronger for education beyond the primary level (see Chapter II), it appears particularly important to get far more children of disadvantaged households in and through secondary school. This would also change the distribution of public expenditures on secondary education and make them more neutral or pro-poor.

References


Annexes
### Annex Table 1: Poverty indicators by subgroups, 2011

<table>
<thead>
<tr>
<th>Household Characteristics</th>
<th>Subgroups</th>
<th>Distribution of the Poor</th>
<th>Distribution of Population</th>
<th>Mean Per Capita Consumption Expenditure</th>
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<td>2-</td>
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<td>Waged Farm Income</td>
<td>Waged Non-farm Income</td>
<td>Non-farm Self-employment</td>
<td>Other</td>
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| 2 | 22.1 | 19.4 | 102,007.1 | 51.4 | 17.8 | 8.2 |
| 3 | 2.5 | 2.2 | 91,649.0 | 52.1 | 16.8 | 8.0 |
| 4 | 0.2 | 0.1 | 50,554.0 | 83.7 | 29.4 | 12.6 |

| 0- | 49.9 | 55.1 | 138,111.1 | 40.8 | 13.0 | 5.7 |
| 30- | 36.7 | 34.0 | 93,841.0 | 48.6 | 16.0 | 7.1 |
| 60- | 12.5 | 10.1 | 74,891.8 | 55.6 | 20.7 | 10.1 |
| 120- | 0.9 | 0.8 | 84,086.8 | 47.5 | 15.0 | 6.5 |

| 0- | 26.0 | 32.5 | 169,716.0 | 35.9 | 11.2 | 4.8 |
| 30- | 32.2 | 32.4 | 104,958.9 | 44.6 | 14.2 | 6.2 |
| 60- | 31.5 | 26.6 | 78,118.2 | 53.2 | 18.6 | 8.7 |
| 120- | 10.3 | 8.4 | 75,146.1 | 55.3 | 19.4 | 8.9 |

| 0- | 12.5 | 18.8 | 189,326.2 | 29.9 | 9.4 | 4.0 |
| 30- | 27.1 | 29.5 | 129,306.2 | 41.3 | 13.4 | 5.9 |
| 60- | 42.3 | 37.1 | 85,303.2 | 51.2 | 16.9 | 7.6 |
| 120- | 18.1 | 14.6 | 74,556.0 | 55.7 | 19.3 | 8.9 |

| 0- | 20.1 | 26.2 | 175,502.6 | 34.4 | 10.7 | 4.7 |
| 30- | 25.9 | 27.0 | 116,562.3 | 43.1 | 14.0 | 6.2 |
| 60- | 36.4 | 32.3 | 83,699.2 | 50.6 | 17.1 | 7.7 |
| 120- | 17.6 | 14.5 | 81,342.4 | 54.5 | 18.4 | 8.2 |

| 0- | 22.1 | 31.8 | 186,629.0 | 31.1 | 10.0 | 4.4 |
| 30- | 19.2 | 18.9 | 103,281.8 | 45.6 | 14.4 | 6.3 |
| 60- | 29.0 | 25.5 | 77,594.1 | 51.1 | 17.0 | 7.7 |
| 120- | 29.7 | 23.8 | 74,161.8 | 56.0 | 19.0 | 8.6 |

| 0- | 0.2 | 0.6 | 207,109.9 | 11.4 | 3.4 | 1.5 |
| 1- | 1.4 | 3.0 | 184,947.6 | 21.9 | 5.5 | 2.1 |
| 2- | 8.6 | 12.7 | 143,934.7 | 30.4 | 8.2 | 3.2 |
| 3- | 34.2 | 34.8 | 112,422.7 | 44.1 | 13.8 | 5.9 |
| 5- | 54.1 | 46.9 | 104,834.2 | 51.7 | 18.2 | 8.4 |
| 10- | 16.1 | 2.1 | 146,065.1 | 35.1 | 12.9 | 6.9 |

| 0- | 38.4 | 54.0 | 167,565.6 | 34.5 | 10.9 | 4.7 |
| 5- | 61.6 | 46.0 | 65,099.6 | 65.0 | 23.4 | 10.9 |

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<th>Waged Non-farm Income</th>
<th>Non-farm Self-employment</th>
<th>Other</th>
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Annex 2: Regression results poverty profile

Annex Table 2: Correlates of consumption

(Independent variable is ln(consumption))

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<th>Model Year</th>
<th>(1) Rural 2011</th>
<th>(2) Urban 2011</th>
<th>(3) Rural 2011</th>
<th>(4) Rural 2001</th>
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<td>-0.026*** (0.007)</td>
<td>-0.044*** (0.002)</td>
<td>-0.053*** (0.004)</td>
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<tr>
<td>Dependency ratio</td>
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<td>-0.288*** (0.023)</td>
<td>-0.180*** (0.007)</td>
<td>-0.095*** (0.011)</td>
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<td>Age</td>
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<td>-0.000 (0.001)</td>
<td>-0.002*** (0.000)</td>
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<td>Female Head</td>
<td>-0.013 (0.013)</td>
<td>0.020 (0.039)</td>
<td>-0.009 (0.013)</td>
<td>-0.108*** (0.021)</td>
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<td>Household head/member owns farm land</td>
<td>0.006 (0.033)</td>
<td>0.262*** (0.048)</td>
<td>0.018 (0.031)</td>
<td>0.031 (0.087)</td>
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<td>Hectares of land owned</td>
<td>0.058*** (0.004)</td>
<td>0.077*** (0.014)</td>
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<td>-0.328*** (0.010)</td>
<td>-0.418*** (0.040)</td>
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<td>Household has farm self-employment</td>
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<td>Household has nonfarm wage employment</td>
<td>0.027*** (0.010)</td>
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<td>0.523*** (0.032)</td>
<td>0.702*** (0.069)</td>
<td>0.564*** (0.030)</td>
<td>0.651*** (0.060)</td>
</tr>
<tr>
<td>Complete secondary education</td>
<td>0.761*** (0.047)</td>
<td>0.940*** (0.083)</td>
<td>0.769*** (0.044)</td>
<td>0.932*** (0.106)</td>
</tr>
<tr>
<td>University education</td>
<td>1.451*** (0.050)</td>
<td>1.639*** (0.069)</td>
<td>1.515*** (0.044)</td>
<td>1.705*** (0.210)</td>
</tr>
<tr>
<td>Primary school is far</td>
<td>-0.037* (0.017)</td>
<td>-0.231*** (0.074)</td>
<td>-0.029* (0.017)</td>
<td>-0.009 (0.029)</td>
</tr>
<tr>
<td>Primary school is very far</td>
<td>0.040 (0.054)</td>
<td>0.600* (0.309)</td>
<td>0.058 (0.056)</td>
<td>0.123 (0.084)</td>
</tr>
<tr>
<td>Secondary school is far</td>
<td>-0.032** (0.013)</td>
<td>0.043 (0.053)</td>
<td>-0.028** (0.013)</td>
<td></td>
</tr>
<tr>
<td>Secondary school is very far</td>
<td>-0.025 (0.020)</td>
<td>0.237** (0.119)</td>
<td>-0.010 (0.020)</td>
<td></td>
</tr>
<tr>
<td>Health center is far</td>
<td>-0.036*** (0.012)</td>
<td>-0.081* (0.046)</td>
<td>-0.046*** (0.012)</td>
<td>-0.142*** (0.027)</td>
</tr>
<tr>
<td>Health center is very far</td>
<td>-0.048*** (0.017)</td>
<td>-0.279*** (0.110)</td>
<td>-0.057*** (0.017)</td>
<td>0.037 (0.062)</td>
</tr>
<tr>
<td>Transportation is far</td>
<td>-0.073*** (0.013)</td>
<td>-0.120*** (0.049)</td>
<td>-0.076*** (0.013)</td>
<td>-0.088 (0.132)</td>
</tr>
<tr>
<td>Transportation is very far</td>
<td>-0.085*** (0.014)</td>
<td>-0.114 (0.105)</td>
<td>-0.087*** (0.014)</td>
<td>0.075 (0.148)</td>
</tr>
<tr>
<td>Market is far</td>
<td>-0.023* (0.012)</td>
<td>-0.085* (0.046)</td>
<td>-0.029** (0.012)</td>
<td>-0.014 (0.031)</td>
</tr>
<tr>
<td>Market is very far</td>
<td>-0.008 (0.016)</td>
<td>0.044 (0.081)</td>
<td>-0.018 (0.016)</td>
<td>-0.334*** (0.081)</td>
</tr>
<tr>
<td>Kigali</td>
<td>0.156*** (0.038)</td>
<td>0.312*** (0.043)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Eastern Province</td>
<td>0.164*** (0.015)</td>
<td>0.287*** (0.071)</td>
<td>0.147*** (0.015)</td>
<td>0.062** (0.027)</td>
</tr>
<tr>
<td>Northern Province</td>
<td>0.117*** (0.017)</td>
<td>0.043 (0.083)</td>
<td>0.094*** (0.016)</td>
<td>0.094*** (0.027)</td>
</tr>
<tr>
<td>Western Province</td>
<td>0.060*** (0.016)</td>
<td>-0.166** (0.082)</td>
<td>0.026* (0.015)</td>
<td>0.113*** (0.030)</td>
</tr>
<tr>
<td>District bordering Burundi</td>
<td>0.006 (0.017)</td>
<td>-0.015 (0.017)</td>
<td>-0.375*** (0.030)</td>
<td></td>
</tr>
<tr>
<td>District bordering DRC</td>
<td>0.223*** (0.017)</td>
<td>0.415*** (0.079)</td>
<td>0.255*** (0.016)</td>
<td>-0.008 (0.030)</td>
</tr>
<tr>
<td>District bordering Tanzania</td>
<td>-0.042 (0.029)</td>
<td>-0.049* (0.029)</td>
<td>-0.081 (0.058)</td>
<td></td>
</tr>
<tr>
<td>District bordering Uganda</td>
<td>0.059** (0.028)</td>
<td>0.054* (0.029)</td>
<td>-0.054 (0.044)</td>
<td></td>
</tr>
<tr>
<td>District bordering Tanzania and Uganda</td>
<td>0.160*** (0.026)</td>
<td>0.179 (0.196)</td>
<td>0.157*** (0.026)</td>
<td>0.190*** (0.058)</td>
</tr>
<tr>
<td>Constant</td>
<td>11.834*** (0.046)</td>
<td>11.673*** (0.101)</td>
<td>11.868*** (0.043)</td>
<td>11.122*** (0.112)</td>
</tr>
<tr>
<td>Observations</td>
<td>11899</td>
<td>1855</td>
<td>12687</td>
<td>5131</td>
</tr>
<tr>
<td>r2</td>
<td>0.358</td>
<td>0.611</td>
<td>0.384</td>
<td>0.235</td>
</tr>
</tbody>
</table>

Dependent variable is ln(Yearly consumption expenditure per adult equivalent (2001 prices in RWF)).
Standard errors in parentheses.
Regressions account for complex survey design (clustering and stratification) and population sampling weights.
* p<0.1; ** p<0.05; *** p<0.01
In regressions (3) and (4), “rural” means all Provinces except Kigali City.
### Annex Table 3: The correlates of poverty

(Dependent variable is the probability of being poor)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Size</td>
<td>0.099***</td>
<td>0.107***</td>
<td>0.097***</td>
<td>0.093***</td>
</tr>
<tr>
<td>Dependency ratio</td>
<td>0.352***</td>
<td>0.397***</td>
<td>0.348***</td>
<td>0.195***</td>
</tr>
<tr>
<td>Age</td>
<td>0.005***</td>
<td>-0.002</td>
<td>0.004***</td>
<td>-0.000</td>
</tr>
<tr>
<td>Female Head</td>
<td>0.019</td>
<td>0.007</td>
<td>0.010</td>
<td>0.138***</td>
</tr>
<tr>
<td>Household head/member owns farm land</td>
<td>0.070</td>
<td>-0.596***</td>
<td>0.008</td>
<td>0.272</td>
</tr>
<tr>
<td>Hectares of land owned</td>
<td>-0.156***</td>
<td>-0.281***</td>
<td>-0.156***</td>
<td>-0.204***</td>
</tr>
<tr>
<td>Household has farm wage employment</td>
<td>0.687***</td>
<td>0.796***</td>
<td>0.691***</td>
<td>0.187***</td>
</tr>
<tr>
<td>Household has farm self-employment</td>
<td>0.220**</td>
<td>0.560***</td>
<td>0.274***</td>
<td>0.154</td>
</tr>
<tr>
<td>Household has nonfarm wage employment</td>
<td>-0.037</td>
<td>-0.360***</td>
<td>-0.060*</td>
<td>-0.187***</td>
</tr>
<tr>
<td>Household has nonfarm self-employment</td>
<td>-0.285***</td>
<td>-0.307***</td>
<td>-0.289***</td>
<td>-0.408***</td>
</tr>
<tr>
<td>Some primary education</td>
<td>-0.150***</td>
<td>-0.222*</td>
<td>-0.156***</td>
<td>-0.211***</td>
</tr>
<tr>
<td>Complete primary education</td>
<td>-0.212***</td>
<td>-0.465***</td>
<td>-0.212***</td>
<td>-0.627***</td>
</tr>
<tr>
<td>At least some post-primary education</td>
<td>-0.523***</td>
<td>-0.915***</td>
<td>-0.583***</td>
<td>-0.899***</td>
</tr>
<tr>
<td>At least some secondary education</td>
<td>-1.071***</td>
<td>-1.488***</td>
<td>-1.110***</td>
<td>-1.300***</td>
</tr>
<tr>
<td>Primary school is far</td>
<td>0.060</td>
<td>0.467**</td>
<td>0.065</td>
<td>(0.074)</td>
</tr>
<tr>
<td>Primary school is very far</td>
<td>-0.029</td>
<td>-1.868***</td>
<td>-0.053</td>
<td></td>
</tr>
<tr>
<td>Secondary school is far</td>
<td>0.003</td>
<td>-0.134</td>
<td>-0.006</td>
<td>(0.037)</td>
</tr>
<tr>
<td>Secondary school is very far</td>
<td>-0.013</td>
<td>-0.704***</td>
<td>-0.039</td>
<td></td>
</tr>
<tr>
<td>Health center is far</td>
<td>0.095***</td>
<td>0.114</td>
<td>0.107***</td>
<td>0.258***</td>
</tr>
<tr>
<td>Health center is very far</td>
<td>0.117***</td>
<td>0.707**</td>
<td>0.127**</td>
<td>-0.266*</td>
</tr>
<tr>
<td>Transportation is far</td>
<td>0.121***</td>
<td>0.010</td>
<td>0.117***</td>
<td>-0.169</td>
</tr>
<tr>
<td>Transportation is very far</td>
<td>-0.191***</td>
<td>-0.006</td>
<td>0.177***</td>
<td>0.129</td>
</tr>
<tr>
<td>Market is far</td>
<td>0.014</td>
<td>0.193</td>
<td>0.020</td>
<td>0.079</td>
</tr>
<tr>
<td>Market is very far</td>
<td>0.027</td>
<td>-0.195</td>
<td>0.027</td>
<td>0.700***</td>
</tr>
<tr>
<td>Kigali</td>
<td>-0.156</td>
<td>-0.712***</td>
<td>(0.047)</td>
<td></td>
</tr>
<tr>
<td>Eastern Province</td>
<td>-0.311***</td>
<td>-0.707***</td>
<td>-0.307***</td>
<td>-0.130*</td>
</tr>
</tbody>
</table>
Western Province

District bordering Burundi

District bordering DRC

District bordering Tanzania

District bordering Tanzania and Uganda

Constant

Observations

r2

Dependent variable is the probability of being below the poverty. Marginal effects not shown.

Standard errors in parentheses.

Regressions account for complex survey design (clustering and stratification) and population sampling weights.

* p<0.1;  ** p<0.05;  *** p<0.01

In regressions (7) and (8), “rural” means all Provinces except Kigali City.
Annex 3: Summary Tables of Descriptive Statistics by Welfare Groups (Chapter 3)

Annex Table 4: Significant Changes in all Welfare Groups between 2001 and 2011, Rural Areas

(Means of Explanatory Variables in 2001 and 2011, Rural Rwanda)

<table>
<thead>
<tr>
<th></th>
<th>Poorest 20% of Households</th>
<th>Middle 60% of Households</th>
<th>Richest 20% of Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2001 (EICV1)</td>
<td>2011 (EICV3)</td>
<td>Diff.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2001 (EICV1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2001 (EICV1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2001 (EICV1)</td>
</tr>
<tr>
<td>Consumption Expenditures</td>
<td>52,508</td>
<td>74,254</td>
<td>21,746**</td>
</tr>
<tr>
<td>per AE (2011 Rwf)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of Agricultural</td>
<td>52,458</td>
<td>113,414</td>
<td>60,956**</td>
</tr>
<tr>
<td>Production (2011 Rwf)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of Harvest Sold</td>
<td>9.6</td>
<td>14.8</td>
<td>5.2**</td>
</tr>
<tr>
<td>Farm Self Employment (%</td>
<td>97.9</td>
<td>97.6</td>
<td>-0.3</td>
</tr>
<tr>
<td>of households)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm Wage Employment (%</td>
<td>22.7</td>
<td>76.7</td>
<td>54.0**</td>
</tr>
<tr>
<td>of households)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Farm Self Employment</td>
<td>8.7</td>
<td>31.3</td>
<td>22.6**</td>
</tr>
<tr>
<td>(% of households)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Farm Wage Employment</td>
<td>13.6</td>
<td>43.3</td>
<td>29.7**</td>
</tr>
<tr>
<td>(% of households)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household Size in Adult</td>
<td>5.14</td>
<td>4.99</td>
<td>-0.15*</td>
</tr>
<tr>
<td>Equivalents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependency ratio</td>
<td>1.24</td>
<td>1.20</td>
<td>-0.04</td>
</tr>
</tbody>
</table>

Source: EICV1 and EICV3; **: Statistically Significant at 1%; * Statistically Significant at 10%.

Annex Table 5: Significant Changes in all Welfare Groups between 2001 and 2011, Kigali City

(Means of Explanatory Variables in 2001 and 2011, Kigali City)

<table>
<thead>
<tr>
<th></th>
<th>Poorest 20% of Households</th>
<th>Middle 60% of Households</th>
<th>Richest 20% of Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2001 (EICV1)</td>
<td>2011 (EICV3)</td>
<td>Diff.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2001 (EICV1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2001 (EICV1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2001 (EICV1)</td>
</tr>
<tr>
<td>Consumption Expenditures</td>
<td>234,130</td>
<td>264,451</td>
<td>30,321**</td>
</tr>
<tr>
<td>per AE (2011 Rwf)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Farm Self Employment</td>
<td>17.8</td>
<td>45.3</td>
<td>27.5**</td>
</tr>
<tr>
<td>(% of households)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Farm Wage Employment</td>
<td>23.5</td>
<td>57.5</td>
<td>34.0**</td>
</tr>
<tr>
<td>(% of households)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household Size in Adult</td>
<td>4.90</td>
<td>4.50</td>
<td>-0.40*</td>
</tr>
<tr>
<td>Equivalents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependency ratio</td>
<td>1.03</td>
<td>1.18</td>
<td>0.15*</td>
</tr>
</tbody>
</table>

Source: EICV1 and EICV3; ***: Statistically Significant at 1%; * Statistically Significant at 10%.

Annex Table 4 and Annex Table 5 disaggregate the evolution of consumption drivers by welfare group. We present the descriptive statistics for three distinct groups: The poorest 20 percent of households, the richest 20 percent of households, and the 60 percent of households between the 20th and the 80th percentile. Annex Table 4 shows that there were significant evolutions in drivers of consumption in all welfare groups in rural Rwanda between 2001 and 2011. The most notable findings are that the percentage of households engaged in independent farming did not change between 2001 and 2011, regardless of welfare group, and that the overall decrease in dependency ratios largely bypassed the poorest 20% of rural households, for which fertility rates and dependency ratios remain high.

Annex Table 5 present the descriptives by welfare group for households in Kigali City. Overall, we find significant changes in all welfare groups. The most notable findings are that the average dependency ratio increased significantly for the bottom 20 percent of households, going in against the general trend, and that the richest 20 percent of households did not increase their engagement in self-employment. The richest 20 percent of households in Kigali City are almost uniformly engaged in formal wage employment.
Annex 4: Statistical Decomposition Methods and Results (Chapter 3)

In general terms, statistical decomposition methods decompose changes in the mean of a variable in a part that can be explained by changes in covariates (the “explained” part) and a part that can be explained by changes in coefficients (the “unexplained” part). In this special focus, we are interested in decomposing the change in mean household consumption between 2001 and 2011 into a part that can be explained by changes in the means of the covariates (such as increased agricultural production and commercialization, increased non-farm activity…) and an unexplained part.

The Oaxaca-Blinder method is one of the best-known statistical decomposition methods but only decomposes changes in the mean of a variable (Oaxaca, 1973; Blinder, 1973). From a policy perspective only focusing on the mean is of limited importance. In our case, we would like to know which factors were associated with consumption changes at various points of the distribution. That is, can the same factors explain consumption growth of both the poor and the rich, or were certain factors more important for the poor and vice versa?

To explore this, we apply a novel method that generalizes the Oaxaca-Blinder method to all parts of the distribution instead of just the mean (Firpo, Fortin and Lemieux, 2007 2009). In this fashion we can examine what has driven consumption growth at various points of the distribution. The FFL decomposition procedure includes two steps: In the first step a counterfactual consumption distribution is estimated that shows how consumption in 2001 would have been distributed if covariate parameters were the ones of the 2011 distribution. The difference between the actual consumption distribution in 2011 and this counterfactual distribution is the part of the change in consumption that can be explained by the changes in the covariates between 2001 and 2011 (coefficients are held constant). The difference between the actual consumption distribution in 2001 and the counterfactual distribution is the part of the change in consumption due to changes in coefficients (covariates are held constant). In the second step, recentered influence function regressions are used to decompose the explained and unexplained parts into the contribution of each individual covariate.

We will carry out the decompositions at five points of the distribution: The 10th percentile, the 25th percentile, the 50th percentile (the median households), the 75th percentile and the 90th percentile. In technical terms, we perform the following decomposition:

\[ \alpha(\text{Consumption}(2011)) - \alpha(\text{Consumption}(2001)) = [\alpha(X_{2011}) - \alpha(X_{2001})]\beta_{pooled} + \alpha(X_{2011})(\beta_{2011} - \beta_{pooled}) + \alpha(X_{2001})(\beta_{pooled} - \beta_{2001}) \]

Where \( \alpha(.) \) is a particular percentile, \( X \) is a vector of covariates and \( \beta \) denotes the coefficients of the quantile regressions. The first part of the expression,

\[ [\alpha(X_{2011}) - \alpha(X_{2001})]\beta_{pooled} \]

is the explained part: The part of the difference in consumption between 2011 and 2001 that can be explained by differences in the covariates (the \( X \)'s), using the coefficients from the pooled regression (\( \beta_{pooled} \)). This part can further be decomposed into the contribution of each individual covariate. The second part

\[ \alpha(X_{2011})(\beta_{2011} - \beta_{pooled}) + \alpha(X_{2001})(\beta_{pooled} - \beta_{2001}) \]

is the unexplained part: The part of the difference in consumption between 2011 and 2001 that is due to the difference in regression coefficients (the difference in returns to activities between...
2001 and 2011). In our case, we are interested in the explained part: To what extent can the difference in consumption between 2001 and 2011 be explained by the difference in covariates between 2001 and 2011? In other words, can the higher level of consumption in 2011 be explained by a higher level of consumption-driving covariates in 2011 compared to 2001?

Annex Table 6 shows the results of the decomposition for the rural areas and Kigali City. The first thing to notice is that the growth in consumption mirrors the growth-incidence curves for rural Rwanda (Figure 31 in main text) and Kigali City (Figure 30 in main text): In rural areas growth was higher for the poorest households (10th and 25th percentile) than for the median households (50th percentile) and the better-off households (75th percentile). In Kigali City we find the U-shaped pattern, with growth being highest for the poorest and the richest households and lower in the middle.

On average, 88 percent of the growth in consumption in rural areas can be explained by the “growth” in covariates between 2001 and 2011. The explained part is higher for wealthier than for poorer households. This can potentially be explained by the fact that the model does not include social protection transfers that particularly benefit the extra poor. Since the social protection programs did not yet exist in 2001, they cannot be included in the model.

Focusing on the role of individual covariates, we find that the increase in agricultural production between 2001 and 2011 accounts for the lion’s share of the increase in household consumption. Increased agricultural production explains 13 percent of consumption growth at the 25th percentile, 19 percent for the median households and 25 percent at the 75th percentile. Adding the role of increased agricultural commercialization, improvements in agriculture account for 25 percent of consumption growth at the 25th percentile, 33 percent at the 50th percentile and 35 percent at the 75th percentile.

The move to self-employment in non-agricultural businesses emerges and the second main correlate of consumption growth, explaining 15 percent of consumption growth at the median. Increased non-farm self-employment has been important for poorer and wealthier households alike. In contrast, the increase in non-farm wage employment has only been important for the better-off households, explaining 8 percent of the growth in consumption at the 75th percentile and 23 percent at the 90th percentile. For the poorest households, the move to nonfarm wage employment has actually held back consumption growth.

The decrease in the child dependency ratio spurred by falling fertility rates has also been associated with consumption growth across the distribution. The role of decreased dependency ratios was smallest for the poorest households which experienced the smallest declines in fertility rates and dependency ratios over the past decade.

In Kigali City the growth of consumption is “overexplained” by the changes in covariates. This means that consumption in Kigali grew by less that would be expected by the changes in covariates, suggesting that returns to activities diminished between 2001 and 2011. The increased engagement in non-agricultural wage employment has been the single main driver of consumption growth in Kigali, explaining 78 percent of consumption growth at the median. In contrast to rural areas, self-employment has been less important, especially at the higher ends of the distribution.

The increase in transfers and remittances has been associated with consumption gains at every point of the distribution, both in rural areas and in Kigali City. They have however been more important for consumption growth at the higher end: 4 percent of rural consumption growth at the 10th percentile can be explained by the increase in transfers and remittances, compared to 27
percent at the 90th percentile. Similarly, the proportion of growth in Kigali explained by transfers and remittances is a lot higher for the 90th percentile (30 percent) than for the 10th percentile (5 percent).
### Annex Table 6: Quantile Decomposition of the Growth in Consumption, 2001–2011

<table>
<thead>
<tr>
<th></th>
<th>10th</th>
<th>25th</th>
<th>50th</th>
<th>75th</th>
<th>90th</th>
<th>10th</th>
<th>25th</th>
<th>50th</th>
<th>75th</th>
<th>90th</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ln(Consumption Growth)</strong></td>
<td>0.332</td>
<td>0.301</td>
<td>0.252</td>
<td>0.242</td>
<td>0.276</td>
<td>0.349</td>
<td>0.243</td>
<td>0.184</td>
<td>0.265</td>
<td>0.345</td>
</tr>
<tr>
<td><strong>Part Explained by Changes in Covariates</strong></td>
<td>0.159***</td>
<td>0.178***</td>
<td>0.214***</td>
<td>0.237***</td>
<td>0.309***</td>
<td>0.391***</td>
<td>0.376***</td>
<td>0.374***</td>
<td>0.31***</td>
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</tr>
<tr>
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<td>[0.026]</td>
<td>[0.031]</td>
<td>[0.026]</td>
<td>[0.028]</td>
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<tr>
<td><strong>Unexplained Part</strong></td>
<td>0.173***</td>
<td>0.123***</td>
<td>0.037***</td>
<td>0.005***</td>
<td>-0.033***</td>
<td>-0.042***</td>
<td>-0.133***</td>
<td>-0.19***</td>
<td>-0.045***</td>
<td>-0.031***</td>
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<tr>
<td></td>
<td>[0.001]</td>
<td>[0.001]</td>
<td>[0.001]</td>
<td>[0.001]</td>
<td>[0.003]</td>
<td>[0.014]</td>
<td>[0.018]</td>
<td>[0.018]</td>
<td>[0.014]</td>
<td>[0.01]</td>
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<tr>
<td><strong>Contribution of Individual Covariates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Agricultural Production</td>
<td>0.042***</td>
<td>0.047***</td>
<td>0.056***</td>
<td>0.066***</td>
<td>0.064***</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
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</tr>
<tr>
<td></td>
<td>[0.002]</td>
<td>[0.002]</td>
<td>[0.002]</td>
<td>[0.003]</td>
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<td></td>
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<tr>
<td>Agricultural Commercialization</td>
<td>0.033***</td>
<td>0.036***</td>
<td>0.034***</td>
<td>0.025***</td>
<td>0.019***</td>
<td>na</td>
<td>na</td>
<td>na</td>
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<td>[0.001]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Farm Wage Employment</td>
<td>-0.002***</td>
<td>-0.001**</td>
<td>0.011***</td>
<td>0.019***</td>
<td>0.064***</td>
<td>0.11***</td>
<td>0.135***</td>
<td>0.143***</td>
<td>0.116***</td>
<td>0.113***</td>
</tr>
<tr>
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<td>[0.006]</td>
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<td>[0.006]</td>
<td>[0.006]</td>
<td>[0.007]</td>
<td>[0.013]</td>
<td>[0.016]</td>
<td>[0.017]</td>
<td>[0.014]</td>
<td>[0.013]</td>
</tr>
<tr>
<td>Non-Farm Self Employment</td>
<td>0.021***</td>
<td>0.031***</td>
<td>0.038***</td>
<td>0.041***</td>
<td>0.043***</td>
<td>0.055***</td>
<td>0.057***</td>
<td>0.033***</td>
<td>0.008***</td>
<td>0.006***</td>
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<td></td>
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<td>[0.001]</td>
<td>[0.001]</td>
<td>[0.008]</td>
<td>[0.009]</td>
<td>[0.005]</td>
<td>[0.002]</td>
<td>[0.002]</td>
</tr>
<tr>
<td>Transfers and Remittances</td>
<td>0.012***</td>
<td>0.019***</td>
<td>0.027***</td>
<td>0.046***</td>
<td>0.075***</td>
<td>0.016***</td>
<td>0.028***</td>
<td>0.048***</td>
<td>0.067***</td>
<td>0.104***</td>
</tr>
<tr>
<td></td>
<td>[0.001]</td>
<td>[0.001]</td>
<td>[0.001]</td>
<td>[0.002]</td>
<td>[0.004]</td>
<td>[0.003]</td>
<td>[0.004]</td>
<td>[0.007]</td>
<td>[0.009]</td>
<td>[0.014]</td>
</tr>
<tr>
<td>Dependency Ratio</td>
<td>0.021***</td>
<td>0.021***</td>
<td>0.025***</td>
<td>0.027***</td>
<td>0.028***</td>
<td>0.044***</td>
<td>0.055***</td>
<td>0.059***</td>
<td>0.05***</td>
<td>0.043***</td>
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<tr>
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<td>[0.003]</td>
<td>[0.003]</td>
<td>[0.003]</td>
<td>[0.003]</td>
<td>[0.012]</td>
<td>[0.015]</td>
<td>[0.016]</td>
<td>[0.014]</td>
<td>[0.012]</td>
</tr>
</tbody>
</table>

**Source:** EICV1 and EICV3; ***: Statistically Significant at 1%; **: Statistically Significant at 5%; *: Statistically Significant at 10%.
Annex 5: The qualitative research study

1. Introduction

There is ample statistical data on the evolution of poverty and social indicators in Rwanda. The three EICV surveys, four DHS surveys, and two Population Censuses that have been implemented since the turn of the century point towards substantial social, demographic, and economic progress, some of which will be treated in depth in this Poverty Assessment. In contrast, much less is known about people’s perceptions on the evolution of their living standards and the perceived drivers of this. To address this, the Poverty Assessment complements the statistical analysis of existing survey and census data with a new qualitative research study. The qualitative study examines the perceptions of ordinary citizens, in particular those at the bottom of the welfare distribution, on the evolution of their living standards and the main drivers thereof, both positive and negative.

2. Methodology

2.1. Selection of Study Location

The qualitative study in the framework of the Rwanda Poverty Assessment was carried out in June 2014, through Focus Group Discussions (FGDs) in eight districts in all of the four rural Provinces (Kigali City was not included). In each district, two FGDs were held with male participants and two were held with female participants, for a total of 32 FGDs. An additional 8 FGDs were conducted with mixed groups of male and female youth between the ages of 18 and 25, within the selected districts. Overall, 40 FGDs were conducted. 5 case studies, 3 with men and 2 with women were also conducted to elaborate the findings of the FGDs.

The eight districts were not selected randomly but according to their experiences in growth and poverty reduction, with a focus on districts with comparatively high or low poverty levels and higher or lower rates of poverty reduction. The four selection criteria included the following:

1. High Poverty despite Strong Poverty Reduction (HPHR): Districts with high poverty levels despite rapid recent poverty reduction. These include the southern districts of Nyaruguru and Gisagara (Annex Table 7);

2. High Poverty and Slow Poverty Reduction (HPLR): Districts with high poverty levels and with slow poverty reduction. These include the districts of Nyamagabe (Southern Province) and Gakenke (Northern Province);

3. Low Poverty and Strong Poverty Reduction (HPHR): Districts with lower poverty levels and rapid poverty reduction. These include Musanze (Northern Province) and Nyabihu (Western province);

4. Low Poverty despite Slow Poverty Reduction (LPLR): Districts with lower than average poverty levels despite a slow pace of poverty reduction. These include Ngoma and Kayonza in the eastern Province)
5. Annex Table 7: Poverty dynamics in selected Districts

### Annex Table 7: Poverty dynamics in selected Districts

<table>
<thead>
<tr>
<th>Category</th>
<th>Province</th>
<th>District</th>
<th>% change in poverty level 2006-2011</th>
<th>2011 % below poverty line</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPHR</td>
<td>Southern</td>
<td>Gisagara</td>
<td>-20.3</td>
<td>59.4</td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>Nyaruguru</td>
<td>-23.4</td>
<td>61.6</td>
</tr>
<tr>
<td>HPLR</td>
<td>Southern</td>
<td>Nyamagabe</td>
<td>-2.2</td>
<td>73.3</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>Gakenke</td>
<td>-1.3</td>
<td>56.6</td>
</tr>
<tr>
<td>LPHR</td>
<td>Western</td>
<td>Nyabihu</td>
<td>-26.2</td>
<td>28.6</td>
</tr>
<tr>
<td></td>
<td>Northern</td>
<td>Musanze</td>
<td>-31.8</td>
<td>20.1</td>
</tr>
<tr>
<td>LPLR</td>
<td>Eastern</td>
<td>Kayonza</td>
<td>2.7</td>
<td>42.6</td>
</tr>
<tr>
<td></td>
<td>Eastern</td>
<td>Ngoma</td>
<td>-1.5</td>
<td>47.6</td>
</tr>
</tbody>
</table>

Source: EICV3, 2011.

### Annex Figure 1

Annex Figure 1 shows the geographical distribution of the selected districts.

#### Annex Figure 1: Districts selected for the Focus Group Discussions

Within each of the selected districts, two sectors were selected for the FGDs: one isolated sector (far from infrastructure, urban centers,…) and one more connected sector (near a road, closer to infrastructure, etc.). The criteria for determining a sector’s connectivity considered factors such as distance to a paved road, infrastructure, such as presence of a covered market, and terrain, which considered ease of access to other, more urban, areas. Within each of the sectors, a cell was selected according to whether the sector was designated as isolated or connected. To select the isolated and connected sectors, a heatmap was created to give an approximation of urban density for each district (Annex Figure 2). Sectors outside of the main urban zones were classified by their distance to urban areas or town centers.
To narrow down the selection, a spatial analysis was then undertaken of each sector within the list of potential sectors designated by the heatmap. Satellite imagery was used to gauge a sector’s isolation or connectivity and to select the cell within the sector for the FGD. Distance to paved roads was accounted for and particular emphasis was given to terrain. Given Rwanda’s hilly terrain and the poor quality of roads in many rural sectors, a distance of under 10 km may require over an hour to reach by vehicle, increasing the isolation of the sectors. Connected sectors by comparison were in relative proximity, if not adjacent, to a paved road and had clustered settlements. Isolated sectors were usually located several hills behind a paved road, often in valleys. Settlements were scattered along hillsides and the village center consisted of only a few small buildings. Through this process, the following sectors and cells were selected in each of the chosen districts.
Annex Table 8: Sectors and Cells selected for the focus groups

Annex Figure 2: Heatmap of urban density in Rwanda

Annex Table 8: Sectors and Cells selected for the focus groups

<table>
<thead>
<tr>
<th>Province</th>
<th>District</th>
<th>Sector</th>
<th>Cell</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>East</td>
<td>Kayonza</td>
<td>Nyamirama</td>
<td>Rurambi</td>
<td>Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ruramira</td>
<td>Isolated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nkamba</td>
<td>Isolated</td>
</tr>
<tr>
<td></td>
<td>Ngoma</td>
<td>Remera</td>
<td>Bugera</td>
<td>Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Buriba</td>
<td>Isolated</td>
</tr>
<tr>
<td>North</td>
<td>Gakenke</td>
<td>Gakenke</td>
<td>Rusagara</td>
<td>Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Busengo</td>
<td>Isolated</td>
</tr>
<tr>
<td></td>
<td>Musanze</td>
<td>Muko</td>
<td>Cyivugiza</td>
<td>Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Shingiro</td>
<td>Mwamba</td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>Gisagara</td>
<td>Save</td>
<td>Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kansi</td>
<td>Isolated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Akaboti</td>
<td>Isolated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ngera</td>
<td>Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nyanza</td>
<td>Connected</td>
</tr>
<tr>
<td></td>
<td>Nyarurugu</td>
<td>Cyanika</td>
<td>Karama</td>
<td>Isolated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nyagisoz</td>
<td>Mwoya</td>
</tr>
<tr>
<td></td>
<td>West</td>
<td>Nyabihu</td>
<td>Makamira</td>
<td>Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kanyove</td>
<td>Isolated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kintobo</td>
<td>Gatovu</td>
</tr>
</tbody>
</table>

Source: World Bank, 2014

2.2. Selection of Participants

Participants for the FGDs were selected following the selection of sectors and cells. Lists of household members by Ubudehe category were provided by the Cell Executive Secretary for each of the selected cells. From this list, a random selection of men, women and youth were selected from Ubudehe categories 1-3. In some cases, to facilitate selection and field logistics, local officials were given instructions by the field team to enable them to undertake the random selection of 6-8 participants from the cell lists for each FGD.

Each cell has approximately 4-8 imidugudu (villages), from which 2 men, 2 women and 2 youth (in sectors where a youth FGD was conducted), from each fifth house, were selected, until the total FGD size requirements were met. This selection criteria was used to address selection bias and enable cross-FGD comparison for the analysis, as groups had similar characteristics. Participant lists provided by cell leaders, in the case where selection was done by the cell officials, were cross-checked with the demographic information provided by participants at the start of the FGD and adjustments made as required.

Prior to the finalization of the FGD methodology, a pilot focus group was conducted in Gasura Cell, in the far north of Gasabo District. These selection methods were tested through the pilot FGD and enabled the consulting team to make necessary adjustments prior to the start of the study.

2.3. Focus Group Discussions

The FGDs focused on four main themes:

1. Perceptions of poverty at the household and community levels and changes in living standards experienced in the past 5 years;
2. Perceptions of the positive and negative drivers of changes in living standards;
3. Obstacles to improving living standards;
4. Strategies for improving household living standards and poverty reduction;

---

80 Ubudehe is a social poverty categorization done at the community level for all Rwandan households. Categories 1 to 3 are considered the poorest in the community.
In addition, the youth FGDs also focused on employment opportunities and livelihood strategies for young people in the community.

The FGDs started from a general discussion and moved into more specific exercises. Exercises were developed using Participatory Rural Appraisal (PRA) methodology, which sought to effectively engage participants in identifying responses, as well as analyzing them and evaluating their level of importance. The methodology engaged facilitators to guide the discussion and focused on developing and understanding perceptions within the groups to ensure accurate reflection of responses and improve ownership over the assessment findings. All FGDs were conducted in Kinyarwanda by Rwandan facilitators to improve participation and level of comfort by participants. The exercises and themes covered in each FGD are outlined below.

**Icebreaker**

Participants introduced themselves to the facilitators and identified a song that had their name in it, or another song they wanted to share with the group. The individual or group sang a few lines together, and this helped to put participants at ease and increase their level of comfort with the discussions.

**Description of Poverty**

Participants were asked to describe characteristics of household poverty within their communities, in the format of a group discussion. Characteristics of poor households included lack of basic needs, assets, poor housing quality, type of income sources, and inability to cover costs for health or education. This general discussion set the framework for the following exercises, which discussed poverty changes in more detail.

**Household Level Changes in Poverty Status**

Participants worked together to draw visual representations of their household and surrounding compound today, in 2014, and five years ago, in 2009. Participants included depictions of housing materials, assets and livestock, items in the household and other structures most often found in their own or a similar compound in the community. Once the drawings were completed, participants discussed the changes in poverty status between the two periods, using the drawings as a reference. The visual representations were an important reference for helping participants to think about the changes their communities have experienced.

**Vulnerability and Social Differentials in Experienced Changes**

Following the household drawing exercise, participants were asked whether certain groups had benefited more or less from the changes they had identified that have occurred in the past five years. Facilitators ensured consideration of particular vulnerable groups, such as widows, elderly men and women, orphans, female headed households, households with many children, people living with HIV/AIDS and people with disabilities. Not all groups were considered in all FGDs, as this component of the FGD was an open discussion, and participants raised examples and perceptions without prompting, unless deemed necessary by the facilitator.

**Community Livelihoods and Income Sources**

Participants discussed their main sources of income and those they perceive as the main sources of income for others in the community. They were asked whether these sources of income have changed over the past five years, and if so, for which members of the community. Youth were then asked a second question about the main types of employment available for youth, and their
perceptions of whether this was different than employment previously engaged in by youth in their community.

**Ranking Drivers of Change**

Participants discussed the major drivers of the change in poverty status within their community. The key drivers mentioned were noted on a flipchart along with whether they were positive or negative in nature. After the discussion, participants each received 5 tokens with which to vote on the importance of each driver (Annex Figure 3). They voted and explained their selections. After the voting, participants discussed as a group whether the prioritized drivers reflected their experiences and then ranked the drivers by level of importance, making adjustments to the number of tokens for each driver.

![Annex Figure 3: Ranking the drivers of change in Save sector](image)

**Voting on Obstacles to Change**

Participants were asked to explain the major obstacles to improving their poverty status faced by individuals and households in their community. Based on the discussion, participants then voted through a show of hands on the importance of the obstacles mentioned. Each participant had one vote in order to improve prioritization of the identified obstacles.

**Strategies**

Participants listed strategies that they or others in the community have used to overcome the obstacles to improving poverty status. Once the strategies were listed, a “wall and ladder” exercise was undertaken, in which each listed barrier was drawn as part of a wall and each strategy was drawn on the rungs of a ladder leaning against the wall. Facilitators explained that the strategies were like the rungs of a ladder, helping to overcome the barriers to improving the household living situation. Participants matched the strategies to specific barriers that had been raised, drawing these linkages on the flipchart. However, not all strategies or barriers were linked, and some strategies were linked to more than one barrier.
Case Studies

Case studies were conducted in the form of short interviews with individuals identified through the FGDs. This included either FGD participants themselves, or other community members identified by FGD participants as having had an interesting experience related to change in poverty status. Case study participants were asked to share their experience through a series of open-ended questions. These interviews have been transcribed and included in this report based on their relevance to the thematic areas.

3. Overview of Participant Demographics

A total of 303 participants took part in the 40 FGDs in 8 districts. Of the participations, 150 were men and 153 were women, with 60 youth participants (of whom half were men and half were women). The median age of participants was 44 for female FGDs, 43 for male FGDs and 22 for youth FGDs. Youth FGD participants had attained more years of education than men and women in the other FGDs (Annex Table 9).

Annex Table 9: Participant demographics

<table>
<thead>
<tr>
<th>Category (Median)</th>
<th>Male FGDs</th>
<th>Female FGDs</th>
<th>Youth FGDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>43</td>
<td>44</td>
<td>22</td>
</tr>
<tr>
<td>Education (years)</td>
<td>6</td>
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<td>9</td>
</tr>
<tr>
<td>Number of children</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: World Bank, 2014

Over one third of participants had attended primary school and around one fourth had completed primary education (Annex Figure 4). More women had no formal education than men. Youth were more likely to have completed secondary education and all of the youth had at least some primary education. Older participants tended to be less educated: the average age of participants with no formal education was 56, compared to 25 for participants who had completed primary school.

Annex Figure 4: Education level of participants

(Number of participants by education level)

Source: World Bank, 2014
In terms of Ubudehe categories, although there was an attempt during selection to have equal division of participants by Ubudehe category, over half of the participants were in Category 3 (Annex Figure 5). This may be due to the accuracy of the lists, or suggest that some participants were previously in a lower category and had improved their poverty status. Some participants also could not identify their Ubudehe category with certainty and estimated based on whether or not they were required to pay for health insurance (which is the case for Ubudehe category 3, but not 1 and 2).

Most of the FGD participants were married. None of the male participants were divorced or separated, but a small number of the female participants were. Women FGD participants also included a significant number of widows, which may be due to the predominance of this group in lower social poverty categories. Two-thirds of the widows in the study were in Ubudehe categories 1 and 2, and all were over the age of 40, with more than two-thirds over 50 years of age. Both male and female youth were more likely to be single than other participants.

Most participants identified their primary income source as farming on their own farm, or on rented land (Annex Figure 6). While many, if not most, relied on multiple sources of income, own-farming was the main primary livelihood. A small number of participants also listed farming on other people’s land for wages as their main source of income. Wage non-farm activities included tailoring, masonry and teaching.
### Annex 6: Regression results of “simple” specification (Chapter 4)

#### Annex Table 10: Full regression results simple specification

<table>
<thead>
<tr>
<th></th>
<th>(1) HAZ</th>
<th>(2) P(Stunted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate food intake</td>
<td>-0.112</td>
<td>-0.018</td>
</tr>
<tr>
<td></td>
<td>[0.111]</td>
<td>[0.034]</td>
</tr>
<tr>
<td>Adequate environmental health</td>
<td>0.220**</td>
<td>-0.087</td>
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<tr>
<td></td>
<td>[0.072]</td>
<td>[0.025]</td>
</tr>
<tr>
<td>Adequate care</td>
<td>0.263***</td>
<td>-0.049</td>
</tr>
<tr>
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<td>[0.101]</td>
<td>[0.031]</td>
</tr>
<tr>
<td>Boy</td>
<td>-0.319***</td>
<td>0.099***</td>
</tr>
<tr>
<td></td>
<td>[0.074]</td>
<td>[0.025]</td>
</tr>
<tr>
<td>Birth order of child</td>
<td>-0.062**</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>[0.027]</td>
<td>[0.011]</td>
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<tr>
<td>Incomplete primary</td>
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<tr>
<td></td>
<td>[0.100]</td>
<td>[0.035]</td>
</tr>
<tr>
<td>Complete primary</td>
<td>0.243*</td>
<td>-0.081**</td>
</tr>
<tr>
<td></td>
<td>[0.132]</td>
<td>[0.041]</td>
</tr>
<tr>
<td>Incomplete secondary</td>
<td>0.578***</td>
<td>-0.153***</td>
</tr>
<tr>
<td></td>
<td>[0.199]</td>
<td>[0.044]</td>
</tr>
<tr>
<td>Complete secondary</td>
<td>0.862***</td>
<td>-0.24***</td>
</tr>
<tr>
<td></td>
<td>[0.317]</td>
<td>[0.049]</td>
</tr>
<tr>
<td>Higher</td>
<td>0.915***</td>
<td>-0.232***</td>
</tr>
<tr>
<td></td>
<td>[0.342]</td>
<td>[0.080]</td>
</tr>
<tr>
<td>Age of mother</td>
<td>0.007</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>[0.009]</td>
<td>[0.004]</td>
</tr>
<tr>
<td>Body mass index mother</td>
<td>0.02</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>[0.011]</td>
<td>[0.003]</td>
</tr>
<tr>
<td>Age of household head</td>
<td>0.006</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>0.004</td>
<td>[0.001]</td>
</tr>
<tr>
<td>Household head male</td>
<td>-0.051</td>
<td>0.019</td>
</tr>
<tr>
<td></td>
<td>[0.092]</td>
<td>[0.032]</td>
</tr>
<tr>
<td>Household wealth</td>
<td>0.149***</td>
<td>-0.038**</td>
</tr>
<tr>
<td></td>
<td>[0.052]</td>
<td>[0.016]</td>
</tr>
<tr>
<td>Full set of age-in-month dummies</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Urban dummy</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R squared (or pseudo)</td>
<td>0.17</td>
<td>0.14</td>
</tr>
<tr>
<td>N</td>
<td>1545</td>
<td>1545</td>
</tr>
</tbody>
</table>

Notes: Regressions only include children 0-23 months. First column is OLS on continuous height for age z-scores, second column presents marginal effects of logit estimation of the probability of being stunted. Educational attainment refers to mother of the child. ***: statistically significant at 1%; **: statistically significant at 5%; *: statistically significant at 10%.

Annex 7: Regression results of “full” specification (Chapter 4)

Annex Table 11: Full regression results full specification

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAZ</td>
<td>Adequate food intake only</td>
<td>-0.071</td>
</tr>
<tr>
<td></td>
<td>Adequate environmental health only</td>
<td>0.228**</td>
</tr>
<tr>
<td></td>
<td>Adequate care only</td>
<td>0.259*</td>
</tr>
<tr>
<td></td>
<td>Adequate food and EH</td>
<td>0.181</td>
</tr>
<tr>
<td></td>
<td>Adequate food and care</td>
<td>0.303</td>
</tr>
<tr>
<td></td>
<td>Adequate EH and care</td>
<td>0.692***</td>
</tr>
<tr>
<td></td>
<td>Adequate in food, EH and care</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Boy</td>
<td>-0.324***</td>
</tr>
<tr>
<td></td>
<td>Birth order of child</td>
<td>-0.055**</td>
</tr>
<tr>
<td></td>
<td>Incomplete primary</td>
<td>0.117</td>
</tr>
<tr>
<td></td>
<td>Complete primary</td>
<td>0.277**</td>
</tr>
<tr>
<td></td>
<td>Incomplete secondary</td>
<td>0.557***</td>
</tr>
<tr>
<td></td>
<td>Complete secondary</td>
<td>0.918***</td>
</tr>
<tr>
<td></td>
<td>Higher</td>
<td>0.831**</td>
</tr>
<tr>
<td></td>
<td>Age of mother</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>Body mass index mother</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Age of household head</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>Household head male</td>
<td>-0.032</td>
</tr>
<tr>
<td></td>
<td>Household wealth</td>
<td>0.136**</td>
</tr>
<tr>
<td></td>
<td>Full set of age-in-month dummies</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Urban dummy</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>R squared (or pseudo)</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>1545</td>
</tr>
</tbody>
</table>

Notes: Regressions only include children 0-23 months. First column is OLS on continuous height for age z-scores, second column presents marginal effects of logit estimation of the probability of being stunted. Educational attainment refers to mother of the child. ***: statistically significant at 1%; **: statistically significant at 5%; *: statistically significant at 10%.

### Annex 8: Oaxaca Blinder decomposition (Chapter 4)

#### Annex Table 12: Oaxaca-Blinder decomposition results

<table>
<thead>
<tr>
<th></th>
<th>By household poverty</th>
<th>By district</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference in stunting rate</td>
<td>0.112***</td>
<td>0.179***</td>
</tr>
<tr>
<td></td>
<td>[0.024]</td>
<td>[0.024]</td>
</tr>
<tr>
<td>Part explained by differences in covariates</td>
<td>0.044***</td>
<td>0.054***</td>
</tr>
<tr>
<td></td>
<td>[0.013]</td>
<td>[0.012]</td>
</tr>
<tr>
<td>Unexplained part (explained by differences in coefficients)</td>
<td>0.068***</td>
<td>0.125***</td>
</tr>
<tr>
<td></td>
<td>[0.026]</td>
<td>[0.026]</td>
</tr>
</tbody>
</table>

**Contribution of individual covariates**

<table>
<thead>
<tr>
<th>Covariate</th>
<th>By household poverty</th>
<th>By district</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate food intake</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>[0.001]</td>
<td>[0.001]</td>
</tr>
<tr>
<td>Adequate environmental health</td>
<td>0.011***</td>
<td>0.011**</td>
</tr>
<tr>
<td></td>
<td>[0.004]</td>
<td>[0.005]</td>
</tr>
<tr>
<td>Adequate care</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>[0.001]</td>
<td>[0.001]</td>
</tr>
<tr>
<td>Mother incomplete primary</td>
<td>-0.004</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>[0.003]</td>
<td>[0.002]</td>
</tr>
<tr>
<td>Mother completed primary</td>
<td>0.004</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>[0.003]</td>
<td>[0.002]</td>
</tr>
<tr>
<td>Mother incomplete secondary</td>
<td>0.009**</td>
<td>0.007**</td>
</tr>
<tr>
<td></td>
<td>[0.004]</td>
<td>[0.003]</td>
</tr>
<tr>
<td>Mother completed secondary</td>
<td>0.017***</td>
<td>0.011**</td>
</tr>
<tr>
<td></td>
<td>[0.007]</td>
<td>[0.005]</td>
</tr>
<tr>
<td>Mother more than secondary</td>
<td>0.009*</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>[0.005]</td>
<td>[0.001]</td>
</tr>
<tr>
<td>Wealth scores</td>
<td>NA</td>
<td>0.012*</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>[0.007]</td>
</tr>
</tbody>
</table>

**Notes:** For decomposition by household poverty, household is considered poor if its score on the wealth index is in the bottom three quintiles and non-poor otherwise. For decomposition by district, district is considered "low-stunting" if stunting rates in the district are below the national average. Other covariates included but not presented are: age of mother and father, sex of household head, age and sex of child, birth order of child, body mass index of mother. Figures in the table show the contribution of each covariate to the total difference in stunting rates. ***: statistically significant at 1%; **: statistically significant at 5%; *: statistically significant at 10%.

**Source:** DHS, 2010.
Annex 9: Inequality Decompositions (Chapter 6)

For the static decompositions of inequality across subgroups, we use the GE(0) inequality measure (also referred to as the Mean Log Deviation or Theil-L index), which is additively decomposable by subgroup. The decomposition of the Theil-L index can be written as (Jenkins, 1995)

$$T_L = \sum_{i=1}^{N} \frac{1}{N} \ln \left( \frac{\bar{Y}}{y_i} \right) = \sum_{g=1}^{G} \frac{N_g}{N} I_g + I_B$$

where $y_i$ is the consumption of individual i, $\bar{Y}$ is average consumption, N is the number of individuals, G is the number of subgroups and $N_g$ is the number of individuals in subgroup g. $I_g$ is the inequality in consumption within subgroup g. $I_B$ is the inequality between subgroups, which is essentially the difference in average consumption between different subgroups.

The dynamic decomposition of changes in inequality between two periods can be written as (Jenkins, 1995)

$$\Delta T_L = \sum_{g=1}^{G} f_{g} \Delta L_g + \sum_{g=1}^{G} L_{g0} \Delta f_g + \sum_{g=1}^{G} \ln \left( \frac{1}{k_{g0}} \right) \Delta f_g + \sum_{g=1}^{G} f_{g} \Delta \ln \left( \frac{1}{k_g} \right)$$

where $f_g$, $L_g$ and $k_g$ are respectively the population share, within-group inequality and relative mean of subgroup g. The numeric subscripts refer to periods one (2011) and zero (2006). The four terms capture the following four effects: (1) changes in within-group inequality; (2) how changes in population shares affect within-group inequality for instance, an increase in the population share of a high-inequality group would push up inequality; (3) how population shifts affect between-group inequality (for instance, an increase in the share of a group which has a relatively high mean compared to the overall mean would decrease inequality); (4) changes in between-group inequality.
Annex 10: Benefit Incidence Analysis Methodology (Chapter 5)

For the benefit incidence analysis for public expenditures on education, we follow the methodology outlined by Demery (2000). First, we obtained data on Government spending on different levels of education in the 2010/11 fiscal year. Second, we obtained data on number of children enrolled in the different levels of education in the same year. Third, we calculated a unit subsidy (subsidy per school-going child) for each level of education, by dividing spending by the number of children enrolled. This unit subsidy is then imputed to each school-going child as an in-kind transfer.

Following Demery (2000), we only included recurrent spending on education. While capital spending was a negligible part of total spending on primary education (less than two percent – see Annex Table 13), it was a large part of total spending on secondary (32 percent). As expenditures on secondary education disproportionately benefit the better-off households, including the capital expenditures would bias the analysis by painting an excessively pro-rich pattern of education spending.

### Annex Table 13: Data used for the benefit incidence of education spending

<table>
<thead>
<tr>
<th></th>
<th>Primary education</th>
<th>Secondary education</th>
<th>Tertiary education</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spending (RwF)</strong></td>
<td>40,348,135,878</td>
<td>43,237,051,052</td>
<td>33,225,325,069</td>
</tr>
<tr>
<td>Recurrent</td>
<td>39,698,135,878</td>
<td>29,230,442,695</td>
<td>30,787,148,578</td>
</tr>
<tr>
<td>Capital</td>
<td>650,000,000</td>
<td>14,006,608,357</td>
<td>2,438,176,491</td>
</tr>
<tr>
<td># of children enrolled</td>
<td>2,341,146</td>
<td>486,437</td>
<td>37,902</td>
</tr>
<tr>
<td><strong>Unit subsidy (RwF)</strong></td>
<td>16,957</td>
<td>60,091</td>
<td>812,283</td>
</tr>
<tr>
<td>Ratio of consumption in survey to national accounts</td>
<td>0.908</td>
<td>0.908</td>
<td>0.908</td>
</tr>
<tr>
<td>Adjusted unit subsidy (RwF)</td>
<td>15,397</td>
<td>54,563</td>
<td>737,553</td>
</tr>
</tbody>
</table>


The unit subsidy is obtained by dividing recurrent spending by the number of children enrolled and amounts to about RwF 17,000 (PPP USD 50) for primary schooling and RwF 60,000 (PPP USD 179) for secondary schooling. This unit subsidy is scaled down to account for the difference in household consumption between the survey and the national accounts. The ratio of household consumption as measured by the EICV3 to household consumption as measured by the national accounts was 0.91 in 2010/11, meaning that the survey represented an economy that was 9 percent smaller than the one measured by the national accounts. To avoid overestimating the impact of the subsidy on household consumption, the subsidy is scaled down by 0.91. The adjusted unit subsidies are then used to conduct the benefit incidence analysis.
Annex 10: Benefit Incidence Analysis Methodology (Chapter 5)

For the benefit incidence analysis for public expenditures on education, we follow the methodology outlined by Demery (2000). First, we obtained data on Government spending on different levels of education in the 2010/11 fiscal year. Second, we obtained data on number of children enrolled in the different levels of education in the same year. Third, we calculated a unit subsidy (subsidy per school-going child) for each level of education, by dividing spending by the number of children enrolled. This unit subsidy is then imputed to each school-going child as an in-kind transfer. Following Demery (2000), we only included recurrent spending on education. While capital spending was a negligible part of total spending on primary education (less than two percent—see Annex Table 13), it was a large part of total spending on secondary (32 percent). As expenditures on secondary education disproportionally benefit the better-off households, including the capital expenditures would bias the analysis by painting an excessively pro-rich pattern of education spending.

Annex Table 13: Data used for the benefit incidence of education spending

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</thead>
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<td>30,787,148,578</td>
</tr>
<tr>
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<td>812,283</td>
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<td>0.908</td>
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<td>0.908</td>
</tr>
<tr>
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<td>54,563</td>
<td>737,553</td>
</tr>
</tbody>
</table>

Source: MINEDUC, 2011; 2012.

The unit subsidy is obtained by dividing recurrent spending by the number of children enrolled and amounts to about RwF 17,000 (PPP USD 50) for primary schooling and RwF 60,000 (PPP USD 179) for secondary schooling. This unit subsidy is scaled down to account for the difference in household consumption between the survey and the national accounts. The ratio of household consumption as measured by the EICV3 to household consumption as measured by the national accounts was 0.91 in 2010/11, meaning that the survey represented an economy that was 9 percent smaller than the one measured by the national accounts. To avoid overestimating the impact of the subsidy on household consumption, the subsidy is scaled down by 0.91. The adjusted unit subsidies are then used to conduct the benefit incidence analysis.