



WP/21/215

IMF Working Paper

Intergenerational Social Mobility in Africa Since 1920

by Rasmane Ouedraogo and Nicolas Syrichas

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I N T E R N A T I O N A L M O N E T A R Y F U N D

IMF Working Paper

African Department, and Strategy, Policy & Review Department

Intergenerational Social Mobility in Africa Since 1920**Prepared by Rasmane Ouedraogo and Nicolas Syrichas¹**

Authorized for distribution by Luca Antonio Ricci and Johannes Wiegand

August 2021

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Abstract

The COVID-19 crisis has a severe impact on education and employment and exposed the many social inequities that make some populations more vulnerable to shocks. Despite a vast literature on social mobility in advanced economies, little is known about it in African countries, mainly due to data limitations. Using a large harmonized dataset of more than 72 million individuals, we fill this gap and examine socioeconomic status mobility across generations, measured by educational and occupational attainment. We uncover the substantial geographical variations in the degree of upward/downward educational and occupational mobility across and within African countries, and the gender and rural/urban divide. Additionally, we explore the determinants of social mobility in the African region. We find that social mobility on the continent could be partly explained by observable individual characteristics (gender, marital status, age, etc.), and that educational mobility is a driver of occupational mobility. Lastly, we show that the quality of institutions, the level of public spending on education, social protection coverage, natural resource endowments, and countries' fragility are strong predictors of social mobility in Africa.

JEL Classification Numbers: D63, N9, O10, O55

Keywords: Intergenerational mobility, education, occupation, Africa

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¹The authors would like to thank Allard Celine, Roland Kangni Kpodar, Clara Mina, Monique Newiak, Martha Woldemichael, John Spray, Zhiyong An, Alex Ludwig, Leo Kaas and all participants to AFR Department Seminar and Goethe University Frankfurt. This research is part of a Macroeconomic Research in Low-Income Countries project (Project id: 60925) supported by the UK's Foreign, Commonwealth and Development Office (FCDO). The views expressed in this paper are those of the authors and do not necessarily represent the views of the International Monetary Fund (IMF) or FCDO".

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I. INTRODUCTION

The COVID-19 pandemic and ensuing global economic crisis are on course to reverse years of development gains in many countries and undermine international efforts to reduce poverty. In 2013, The Economist magazine dubbed Africa the “hopeful continent” and not by accident.² An almost uninterrupted sustainable development since the 90s has replaced decades of sluggish growth rates, and the term “Africa Rising” was coined to explain the rapid economic growth in the continent. Young (2012) estimated annual consumption growth rates in Africa to exceed 3 percent on average, much higher than any developed country, describing it as the “African growth miracle”. Nonetheless, despite the rising optimism, a recent report from the United Nations Development Programme (UNDP) (2019) cautioned that the ripples from the economic success are not equally distributed. Economic opportunities for many individuals remain thin, especially for those at the bottom of the income distribution.

Socioeconomic indicators that shed light on the extent of progress across generations are scarce, prone to measurement error or nonexistent for most African countries. Unlike developed economies, African countries lack matched parent-child income tax administrative records, whereas household consumption data by generation are too noisy and available only for a handful of countries. Several studies recently attempted to circumvent the lack of reliable longitudinal datasets by linking parents to the children educational levels, as a proxy of socioeconomic status (see Alesina et al., 2020; World Bank, 2018). As a proxy of economic status, education has the advantage that its level is relatively easy to measure from survey data and is comparable across countries and generations. Building on the literature, we exploit time variation in education attainment to measure absolute intergenerational mobility in education since 1920. We contrast our measures across birth-cohorts, countries and regions but also within sub-populations and demographic groups. In addition to the education mobility indices, we also constructed novel occupational mobility indices. This paper is the first to study occupational attainment across generations in Africa. Occupational mobility represents a good proxy for income mobility and delivers a better proxy of socioeconomic status than educational mobility. We begin by classifying all occupations into white-collar, blue-collar and broadly defined agricultural occupations. The latter is by far, the biggest category and includes all individuals employed into the farming, fishing and forestry sectors but also all other elementary occupations.

We compile our dataset from harmonized cross-country representative census data covering 20 million parents children matched individuals residing in 28 African countries and around 2800 districts. We begin by documenting rising birth-cohorts intergenerational mobility of education, a significant rural-urban divide and a conspicuous but narrowing

² <https://www.economist.com/special-report/2013/03/02/a-hopeful-continent>

cross-generational gender gap. Moreover, we report a staggering heterogeneity in educational intergenerational mobility rates across but also within African countries. Moving into occupational attainment, we illustrate that, in Africa, a child born (or adopted) from parents working in one of the traditional low skilled agricultural sectors has more than 80 percent likelihood to follow the parents' footsteps across all birth cohorts. These findings reflect the persistence of poverty rates and lack of opportunities in many African countries. Disaggregating the data by gender and regions shows that children born in rural areas exhibit a 10 percent lower probability of upward mobility in occupational status than their peers born in urbanized areas. On the other hand, a striking finding is that boys have a significantly higher probability than girls for *downward* occupational intergenerational mobility. Expectedly, we observe a considerable variation on cross-countries and granular district-level occupational mobility.

We also examine the link between literacy and job status for children in which we observe both the parental and own educational and occupational attainment. We demonstrate that while upward mobility across generations in education is rising, upward occupational intergenerational mobility is persistently low over time. On the other hand, looking into downward mobility, the two socioeconomic indicators move hand in hand. This finding suggests that the increase in education level was not translated into better jobs for everyone, thus underscoring the general African unemployment problem. Several factors may drive this divergence, including market and policy failures, the absence of labour opportunities, or the mismatch of skills.

To get further insights into the factors associated with social mobility, we explore the determinants of upward and downward mobility in education and occupations. We regress upward mobility in education/occupation on a set of individual characteristics (age, gender, marital status, place of birth), family characteristics (family size, financial constraints proxied by access to electricity and water), a set of birth-decade for the old generation and time-decade dummies and several macro-variables. We find that higher upward (downward) intergenerational mobility in education and occupation are positively (negatively) associated with access to electricity and water. On the other hand, family size, rural residence and being married are negatively (positively) associated with upward (downward) intergenerational mobility measures in education and occupational attainment. Disaggregating into gender, the results show that women have a higher (lower) probability of upward (downward) mobility in education and occupation attainment, as they start from a low base. We also run the estimates for each country separately and find many heterogeneities between African countries. In general, not only the size of the effects of the different variables on the likelihood of upward and downward social mobility differ between countries, but also some variables (gender status, access to water, etc.) positively affect social mobility in some countries and negatively in other countries.

We then investigate what socioeconomic indicators correlate, at the country level, with upward and downward mobility. We find that after conditioning on individual and family

characteristics, GDP per capita, public spending in education, the quality of institutions and social protection coverage are positively (negatively) associated with upward (downward) education and occupation mobility. On the other hand, the level of fragility of countries and the endowment in natural resources are negatively (positively) associated with upward (downward) education and occupation mobility.

Our overall findings yield three broad lessons. First, the time and place a child lives in in Africa matter markedly. For many children, the place and birth years matter for their future socioeconomic status mostly because of differences in labour market and education opportunities. In this regard, African countries should implement targeted policies to tackle the rural/urban divide, the gender gap and regional inequalities. Sustaining education spending and investing in human and physical capital will be key to bridge the existing gaps, create and share opportunities to all citizens. Second, our analysis shows that opportunities in education and occupation are persistently low for children residing in households who have no access to electricity and water. In many African countries, children are still dropping out of school because of routine household needs such as going to the river to fetch water. This suggests that investment in basic infrastructure could enhance education and employment opportunities in Africa and help lift households out of poverty. Third, our findings imply that good governance and social policies could create educational and employment opportunities for the children. Therefore, African countries should promote good governance, enact policies aiming to extend social protection coverage and reduce the risk of violent conflict, which are all key predictors of social mobility in the continent. The current difficult macroeconomic conditions, the sizeable job loss and the closures of schools following the outbreak of the COVID-19 pandemic could worsen social mobility in Africa and widen the existing gaps.

The paper contributes to the empirical intergenerational social mobility literature in several ways. First, we complement the very limited emerging studies on social mobility in developing countries.³ Until very recently, no empirical cross-country study on intergenerational mobility existed in Africa using high-quality data. Alesina et al. (2020) is the first paper to use a rich set of Census data to develop simple absolute measures of upward and downward intergenerational mobility in education across and within most African countries.⁴ We complement these two studies by constructing intergenerational mobility indicators by 5-year age groups since the 1920s. Second, to the best of our knowledge, for the first time, we develop absolute intergenerational mobility measures for the occupational attainment, a closer proxy to socioeconomic status. Given the enormous unemployment problem in Africa, the occupational attainment mobility indices' availability could benefit policymakers and academics alike. Third, we explore both the micro and macro determinants of intergenerational mobility in education and occupations,

³ See Neidhöfer et al., (2018) for 18 Latin American countries, Asher et al., 2020 for India, Geng, 2018 for China.

⁴ A policy report by Worldbank (2018) also constructed national standards of intergenerational mobility in education and income across the globe.

which were not both covered in previous studies. Additionally, we provide, for the first time, estimates for the association between family and individual background characteristics and social mobility in Africa. Finally, we show the correlation of macroeconomic and political aggregates with our social mobility intergenerational indicators that could be used as an input to future research models.

The remainder of the paper is organized as follows. Section 2 describes data sources and limitations. Section 3 and section 4 present the intergenerational mobility indicators across time and space for educational and occupational attainment at the country and district level, respectively. Section 5 probes further into the results by analyzing the determinants of educational and occupational mobility. Section 6 concludes with the final remarks.

II. DESCRIPTION OF THE DATA

Throughout the paper, we use household census data from the Integrated Public Use Microdata Series (IPUMS) international dataset, a project hosted at the University of Minnesota.⁵ The complete dataset contains 127,243,163 individual records, retrieved from 76 census survey data covering 28 African economies (i.e., Benin, Botswana, Burkina Faso, Cameroon, Egypt, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritius, Morocco, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, South Sudan, Tanzania, Togo, Uganda, and Zambia, Zimbabwe) conducted from the early 1970s up to the beginning of 2010s.⁶ The dataset contains a great deal of other information on individual characteristics such as province/district of birth and current residence, birth year, sex and marital status. Table 1 below lists all the countries and Census used and the total number of Households and individuals of the raw dataset.

⁵ <https://international.ipums.org/international>.

⁶ Of the 76 censuses, all except those from Nigeria, for which only a sequence of labor force surveys are available, are representative samples (typically 10%, but sizes vary) drawn from the full censuses. We did not consider Togo's 1960s, Burkina's Faso 1985, Kenya's 1969, 1979, Rwanda's 1991 and Liberia 1974 Census surveys because the persons were not organized into households or because of missing information regarding both educational and occupational attainment. In Egypt and Ethiopia some geographical regions are missing from the 1986 and 1984 census respectively. In South Africa in 1996 1.3% of the survey is not organized into households. In Morocco's 2014 survey the age is organized into groups.

Table 1. Sample of Countries

No	Country	Census	Individuals	Households
1	Benin	1979,1992,2002,2010	2,524,628	446301
2	Botswana	1981,1991,2001,2010	600,289	151714
3	Burkina Faso	1996,2006	2,498,870	399383
4	Cameroon	1976,1987,2005	3,406,084	681153
5	Egypt	1986,1996,2006	19,983,770	4412601
6	Ethiopia	1984,1994,2007	15,882,990	3483999
7	Ghana	1984,2000,2010	5,669,774	1218677
8	Guinea	1983,1996,2014	2,237,824	366609
9	Kenya	1989,1999,2009	6,323,580	1437197
10	Lesotho	1996,2006	368,003	78814
11	Liberia	2008	348,057	68836
12	Malawi	1987,1998,2008	3,132,039	713882
13	Mali	1987,1998,2009	3,228,570	534229
14	Mauritius	1990,2000,2011	352,737	94021
15	Morocco	1982,1994,2004,2014	7,131,045	1407035
16	Mozambique	1997,2007	3,598,565	830054
17	Nigeria	2006,2007,2008,2009,2010	426,395	96023
18	Rwanda	2002,2012	2,624,679	587221
19	Senegal	1988,2002,2013	2,940,312	343793
20	Sierra Leone	2004	494,298	82518
21	South Africa	1996,2001,2007,2011,2016	16,141,863	4641495
22	South Sudan	2008	542,765	92592
23	Sudan	2008	5,066,530	922816
24	Tanzania	1988,2002,2012	10,541,181	2265160
25	Togo	1970,2010	608,539	125318
26	Uganda	1991,2002,2014	7,552,455	1598844
27	Zambia	1990,2000,2010	3,105,551	566531
28	Zimbabwe	2012	654,688	160728
		Total: 76	127,243,163	27,654,503

Notes: the table shows the number of observations in our dataset. In total there are around 127 million individuals residing in 28 million households. The total number of countries used is 28 across 76 censuses.

A. Data limitations

There are three main limitations of using cross-sectional Census data: (i) a cohabitation bias because we link parents to children residing in the same household; (ii) survivorship bias as some individuals may not be alive since the conduct of the Census; (iii) occupational change in a generation bias due to the fact we do not track the occupation or the education of the parents' children pairs across the life-cycle. The last two biases are relatively small and should not affect the overall intergenerational mobility picture. First, the attrition rates are unlikely to change the overall results so the survivorship bias should be relatively small. As intergenerational mobility indices are measured within households, it is plausible that children who died before the conduct of the Census or the completion of their studies would have the

same level of studies as surviving siblings, assuming that there is no discrimination between kids within the households. Another potential source of attrition concerns household members who have migrated or left the household, but we do not have their data. Second, the occupational change over the lifecycle should also not affect our results as professional training remains limited in many African countries, thus constraining the likelihood of changing occupations vertically or receiving education or formal training later in life. For instance, a farmer may consider switching to an elementary job and vice-versa but is unlikely to receive proper training in mid-life so he/she can switch to a higher skilled job.

The main concern regarding our Census dataset could be considered the cohabitation selection bias. In contrast to administrative data, linking parents to children residing in separate houses is, in our dataset, impossible. One can argue that more educated and better paid children separate from their parents early in adulthood, whereas less privileged children tend to live with their parents. However, while this is a well-known fact for developed economies, in Africa this is more complex. Some disadvantaged African young adults may separate from their parents in search for better job prospects and opportunities. Child brides is also very common in Africa's poorest regions hindering educational and occupational opportunities: 40% of women aged 20-24 years are child brides (UNICEF, 2014). Table 2 compares the educational levels for the young generation, age 45 years or less, with observed parental educational level vs individuals whose parents' education is not observed. Table 3 reports the same results for the occupational attainment. In each table, we present the difference in the percentage of individuals for each attainment level and the p-value of the T-test about the significance of the difference. The fraction of the secondary and tertiary education people whose parents' education is observed is very close to the fraction of those whose parental education status is missing, but the difference is significant. Table 3, on the other hand, suggests that the fraction of individuals occupied in agriculture and whose parent's occupation is observed is larger than the same group of people whose parents' occupational status is unobserved. This difference stands at around 11 basis points. The two tables show that the differences in education and occupation attainment between children with observed and unobserved parental education and occupation data are statistically significant, suggesting there may be a bias in the intergenerational mobility results. However, the direction of the bias is unknown as the intergenerational mobility indices are relative to parents' occupations and education levels, which are unknown for some children.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Educational attainment:	Parents education observed		Parents education unobserved		Difference (3-5)	T-test p-value
	Number	Percent	Number	Percent		
Less than primary completed	8,114,822	39.8	15,428,248	54.2	-14.4	0.0
Primary completed	8,507,298	41.8	8,159,540	28.7	13.1	0.0
Secondary completed	3,246,034	15.9	3,972,114	14.0	2.0	0.0
University completed	510,959	2.5	900,275	3.2	-0.7	0.0
Total	20,379,113	100.0	28,460,177	100.0		

Note: **Table 2** shows the educational level for individuals, aged 14-45, whose own and parental educational level is observed (i.e coresiding with their parents) vs individuals, aged 14-45, whose own and parental is unobserved (no coresidence).

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Occupational attainment:	Parents education observed		Parents education unobserved		Difference (3-5)	T-test p-value
	Number	Percent	Number	Percent		
Agricultural and Elementary	3,423,662	72.3	10,679,883	61.0	11.3	0.0
Blue collars	1,020,271	21.5	4,884,936	27.9	-6.4	0.0
White collars	292,515	6.2	1,942,578	11.1	-4.9	0.0
Total	4,736,448	100.0	17,507,397	100.0		

Note: **Table 3** shows the occupational level for individuals, aged 45 or less, whose own and parental occupational level is observed (i.e coresiding with their parents) vs individuals, aged 45 or less, whose own and parental occupation is unobserved (no coresidence).

B. Educational attainment

We restrict our sample to all individuals, born between 1920-2000, aged 14 years or above for whom we observe their education and parental education, following Alesina et al. (2020). We also dropped households with more than 20 members (approximately 2% of the sample) to reduce dispersion and outliers, and children whose age is very close or exceeds their parents' average age. The final sample consists of around 72 million individuals; 23 million parents-children matched pairs across 28 countries.⁷ Roughly 2/3 (14 million) of the matched parents have not completed primary school and are considered non-educated. Each country's sample size in each survey is given in Table A1 and A2 in Appendix A. The educational levels are classified into four categories: no school certificate, primary, secondary, and tertiary education, with primary education referring to the compulsory education. For the parents education we take the average attainment of individuals one generation older in the household, rounded to the nearest integer. Table 4 summarises the share of educated and non-educated parents and the sample size for each country.

⁷ As robustness, we increase the minimum age to 18 and 25. The results are in Appendix E.

Table 3. Parents' Literacy Rate

Country	Illiterate parents (percent)	Literate parents (percent)	Total
Benin	80.59	19.41	372,130
Botswana	57.34	42.66	110,337
Burkina Faso	92.67	7.33	366,416
Cameroon	58.46	41.54	458,587
Egypt	76.84	23.16	5,635,419
Ethiopia	94.46	5.54	1,372,629
Ghana	58.10	41.90	1,052,808
Guinea	84.39	15.61	337,771
Kenya	50.54	49.46	1,027,329
Lesotho	74.08	25.92	93,114
Liberia	59.40	40.60	59,122
Malawi	71.68	28.32	329,560
Mali	89.74	10.26	509,439
Mauritius	42.26	57.74	96,427
Morocco	87.15	12.85	2,229,031
Mozambique	87.32	12.68	451,955
Nigeria	49.21	50.79	74,474
Rwanda	69.98	30.02	329,988
Senegal	80.16	19.84	608,154
Sierra Leone	75.75	24.25	86,567
South Africa	36.36	63.64	3,506,219
South Sudan	89.74	10.26	88,568
Sudan	87.75	12.25	972,688
Tanzania	52.16	47.84	1,534,897
Togo	67.59	32.41	43,100
Uganda	56.99	43.01	1,072,014
Zambia	44.68	55.32	584,921
Zimbabwe	32.62	67.38	83,844

Note: Table 4 shows the parents' literacy rate for children aged 14 years or older residing with their parents across the 28 countries. Column (2) and (3) report the percentage rate of each category and column (4) the total number of observations. Parent's education comprises the average attainment of parents and extended family members one generation older than the immediately previous generation living in the same household.

C. Occupational attainment

The construction of occupational measures of intergenerational mobility is more challenging. Occupational choice naturally follows the completion of the school studies and in many African countries, it is illegal before age 18. Nevertheless, to maximize coverage

and comparability we maintained the minimum age of 14 to maximize the sample size and better take onboard those individuals who drop out early from school. As robustness, we increase the age limit to 18 and 25 and the results remain broadly unchanged (see Table C4 in Appendix C). Our final dataset includes around 5 million individuals, obtained from 65 harmonized censuses and 27 countries, in which both their occupational status and parents are observed. For a detailed description of samples and countries see tables A3 and A4 in Appendix A. The occupational categories in IPUMS data are classified according to the ISCO-80⁸ which consists of 11 occupational types. To reduce the sparseness of mobility tables we reduced the classified/merged ISCO categories into three groups a) white-collar jobs (high skill jobs), b) blue-collar jobs (medium skill jobs) and c) agricultural/elementary jobs⁹ (low skill jobs) (see Table 5 and 6 for the classification and the size of each category, respectively).

Table 4. Occupational Attainment			
Occupation, ISCO general	White collar (high skill)	Blue collar (medium skill)	Agricultural and Elementary (low skill)
Legislators, senior officials and managers	✓		
Professionals	✓		
Technicians and associate professionals	✓		
Clerks		✓	
Service workers and shop and market sales		✓	
Skilled agricultural and fishery worker			✓
Crafts and related trades workers		✓	
Plant and machine operators and assemble		✓	
Elementary occupations			✓
Note: The table displays the grouping of the nine broad ISCO-08 occupational categories into white collar (high skills), blue collar (medium skills) and agricultural & elementary jobs (low skills). Military and other unclassified professions are excluded.			

⁸ The employment modules of IPUMS international database contain information on the industry of affiliation (based on an adaptation of 3-digit ISIC), occupation (based on ISCO-8), and ownership category (self-employed, working for other households, state-owned economic sector, collective economic sector, private economic sector, foreign-invested sector). ISCO-08 refers to the international standard of classification of occupations endorsed by the international labor organization (ILO) in March 2008.

⁹ We dropped from our sample all military related professions and occupations that are not classified.

Table 5. Parents' Occupational Status

Country	Low skills (percent)	Medium skills (percent)	High skills (percent)	Total (number of individuals)
Benin	61.02	37.25	1.73	134,983
Botswana	51.29	37.23	11.48	12,372
Burkina Faso	96.17	3.74	0.09	115,074
Cameroon	87.29	9.81	2.90	89,794
Egypt	52.88	35.15	11.97	746,259
Ethiopia	95.73	3.97	0.29	643,764
Ghana	69.33	27.05	3.61	431,017
Guinea	75.15	23.04	1.81	140,727
Kenya	85.19	12.96	1.85	46,190
Lesotho	62.83	31.84	5.33	12,581
Malawi	87.52	10.66	1.82	91,951
Mali	86.43	12.09	1.48	201,761
Mauritius	49.37	40.19	10.44	41,334
Morocco	62.26	34.68	3.06	474,017
Mozambique	90.37	8.14	1.49	171,037
Nigeria	80.58	11.62	7.80	10,604
Rwanda	96.96	2.43	0.61	117,068
Senegal	65.34	29.68	4.98	178,450
Sierra Leone	81.33	15.28	3.39	35,275
South Africa	38.67	39.64	21.68	105,924
South Sudan	80.98	15.80	3.22	36,562
Sudan	81.49	9.88	8.63	193,490
Tanzania	92.79	3.86	3.35	607,224
Togo	79.29	20.09	0.61	2,772
Uganda	91.71	6.19	2.10	145,063
Zambia	86.33	11.09	2.58	124,368
Zimbabwe	84.99	10.18	4.84	18,755

Note: Table 6 shows the parents' skill level for children aged 14 years or older that residing with at least one older generation individual across the 27 countries. Columns (1), (2) and (3) report the percentage rate of each category and column (4) the total number of observations. Parent's occupation comprises the average attainment of parents and extended family members one generation older than the immediately previous generation living in the same household.

D. Transition matrices

Figure 1 below provides descriptive transition matrices for educational and occupational attainment in our sample and across two distinctly different countries, Botswana and Guinea (see Appendix B figure B1 for the remaining countries). On the left hand, we show the transition matrices for educational attainment, while on the right hand the transition matrices for occupational attainment. The horizontal axis displays the parents' cohort. The bar width

reflects the fraction of the old cohort in each educational and occupational level respectively. The y-axis displays the average conditional probability of the child to end up in each category.

Considering the top right chart representing education attainment in Africa across 28 countries across all years, around 65% of the old generation is non-educated. Another 20% has finished primary school with only 15% graduated from at least a secondary school. In the first category, kids born from non-educated parents have a 55% probability of following their parents' footsteps and remaining non-educated. In contrast, for children with educated parents, the probability drops down to less than 25%. Disparities across countries are sizable. In Guinea the likelihood that a kid born from non-educated parents completes primary school is less than 25% while for their peers born in Botswana, that probability is more than 70%.

As for occupational attainment on the right-hand side panel of figure 1 the results are more striking. Most African parents are employed in agricultural jobs and 80% of their children end up in the same sector. Again, considerable heterogeneity exists among countries e.g., in Botswana the number drops around 55% while it reaches almost 85% in Guinea. (See in Appendix B figure B2 for the remaining countries).

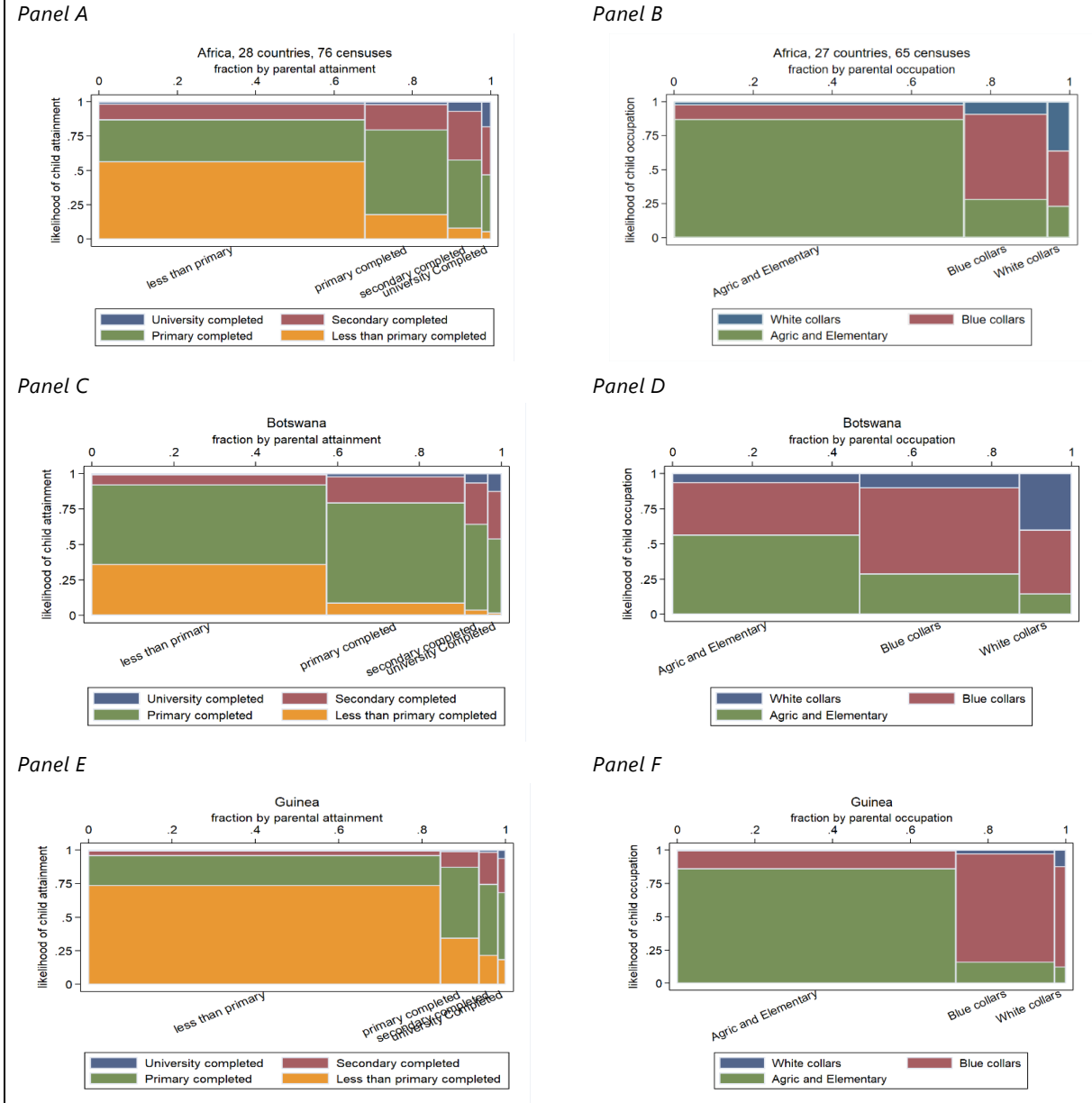
III. MEASURING SOCIAL MOBILITY

Our primary goal is to (i) assess the differences in social mobility across generations in Africa; (ii) contrast the two measures of social mobility, educational and occupational attainment; (iii) compare the evolutions across countries, regions and demographic groups; (iv) uncover the determinants of mobility rates; and (v) exemplify the link between generational social mobility and economic development.

To measure intergenerational social mobility, we must characterize the joint distribution of parental social status and child opportunities. The standard approach in the literature has focused on the joint distribution of child and parent income. The latter was summarized by the intergenerational elasticity of (lifetime) earnings (IGE) (e.g., Zimmerman, 1992, Solon, 1999, Mazumder, 2005, Black and Devereux, 2010) or, more recently, by rank-rank correlations (Dahl and Deleire, 2008). Nonetheless, in Africa income indicators sources are scarce and prone to estimation errors.

Two recent studies use primary educational attainment as a proxy of economic status (Alesina et al., 2020; Azomahou and Yitbarek, 2020). Both studies document a declining cohort trend in the intergenerational persistence of primary education since independence. Nevertheless, the education of parents remains a strong determinant of the educational outcomes of children. Based on these studies, we construct absolute measures of upward and downward mobility in education across countries. Furthermore, we complement the literature by developing absolute measures of upward and downward mobility in occupational status. Occupation is a more reflective indicator of social status than education alone and is correlated with lifetime earnings.

Figure 1. Intergenerational Mobility Transition Matrices



Note: Education (left) and occupation (right) Transition Matrices in social status. The x-axis represents the old generation with the width of bars reflecting the fraction of old individuals in each segment. The y axis displays the likelihood of the young generation to achieve the corresponding social status. The sample consists of individuals aged 14 or older coresiding with at least one older generation individual. The sample for education consists of 28 countries and 76 censuses, whereas the occupation sample includes 27 countries and 65 censuses.

A. Education attainment

We map within a household all the children above 14 with their parents. We describe an individual as educated if they have completed at least primary school and non-educated otherwise. We then construct absolute measures of intergenerational mobility (IM) as follows:

Upward IM: we assign a value of 1 if the child born or adopted from **non-educated** parents has completed primary school and zero otherwise.

Downward IM: we assign a value of 1 if the child born or adopted from **educated** parents has not completed primary school and zero otherwise.

We pool all observations together and we compute means among all individuals from whom we observe the parents' education attainment by the decade of birth. Following Alesina et al., (2020), we maximize coverage by mapping young individuals to the mean educational level (rounded up to the nearest integer) of the generation immediately above within the household and not only with the head of the family. We characterize as parental education the mean educational level of the head of the family, the spouse and the siblings of the head of the family. This helps to better capture orphan and abandoned children who live with the siblings of their biological parents, and the potential impact of other family members on the child development (Mkhize, 2006; Madhavan et al., 2012).

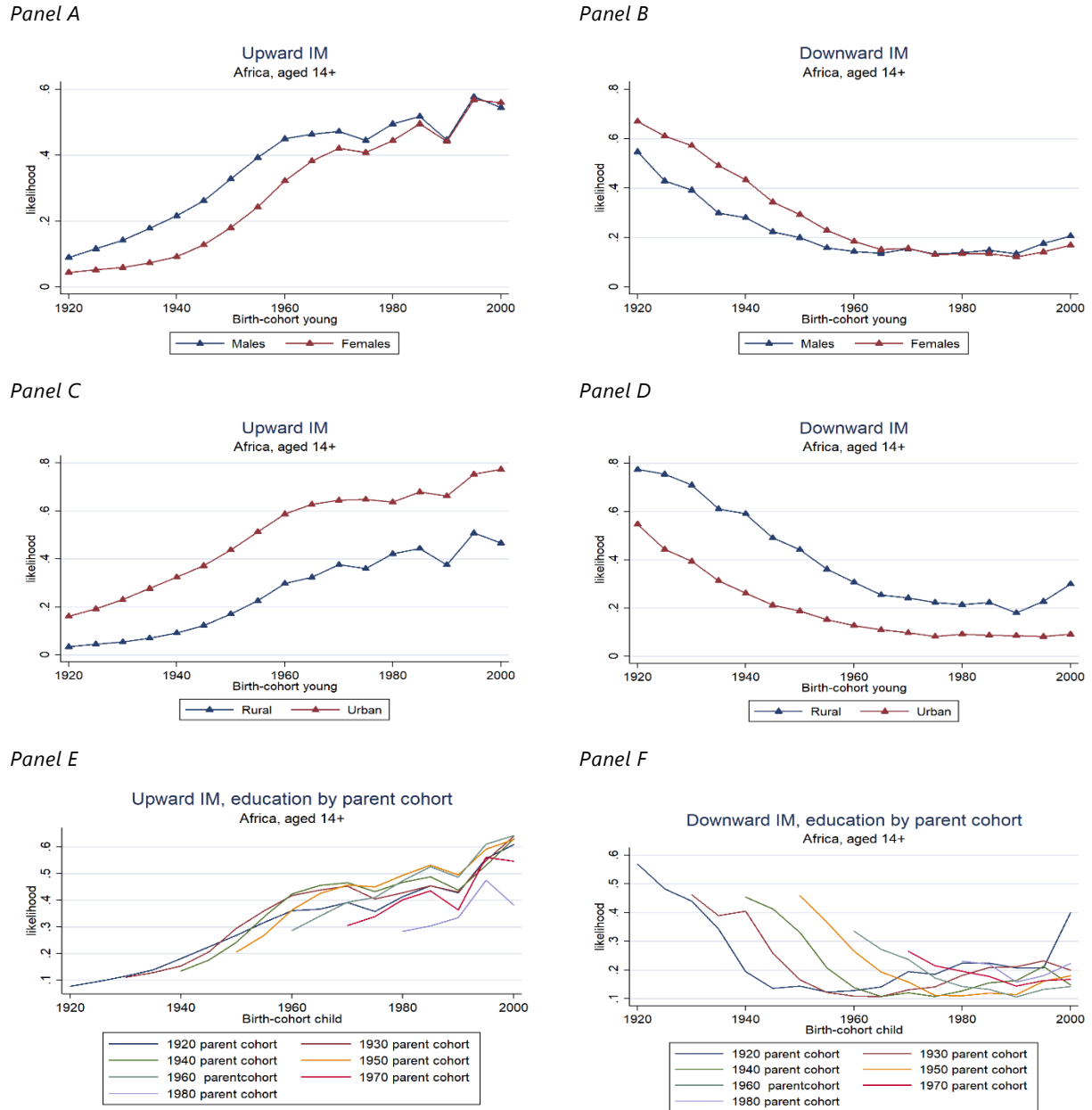
A.1. Intergenerational mobility in education status

We examine heterogeneity across birth cohorts for the entire African region. In this section we report pan-African averages across cohorts and cohort averages across countries. For brevity we report average mobility rates for each country across birth cohorts in Appendix C1. Figure 2 plots the average upward and downward intergenerational mobility in educational attainment for selected cohorts. The birth-cohorts are aged by 5-year intervals, beginning in 1920 up to the last cohort born in the 2000s. The top panel looks at boys and girls' educational mobility separately, while the middle panel contrasts educational mobility in rural and urban areas.

The chart indicates that educational attainment in Africa has improved significantly over the period. The likelihood of upward mobility increases over recent cohorts reaching up to 50% for children born after the millennium. On the other side, downward mobility is falling over time with a small rebound after the 1990s. In general, the unconditional likelihood that a child born from educated parents in Africa does not complete primary education is less than 20%. A striking result is that the gender gap in educational mobility has vanished for kids born in the 1990s, reflecting improved educational opportunities for boys and girls. Nevertheless, the rural-urban divide is strong across all birth-cohorts without signs of shrinkage across time. On average, children living in urban regions have a 10% higher probability of upward mobility than their rural regions' peers. Nonetheless, there is an increasing (decreasing) trend for upward (downward) mobility in both groups of people over the period.

In the bottom panel we distinguish between parents born at different time intervals. We see that parents' age, children's age and year of birth contribute to Africa's intergenerational mobility. If this were the only cohort observed, these effects would be hard to disentangle as time and age evolve in parallel and we only observe one cohort. We could not claim whether the increase in education rate is cohort-specific, a pure age effect, or if it reflects a common time trend that affects all cohorts in all the years.

Figure 2. Intergenerational Mobility Evolution in Africa, Education



Notes: The left panel shows the pan African *upward* intergenerational mobility (IM up) and the right panel the *downward* intergenerational mobility (IM down). The sample consists of 28 countries and 76 censuses. The IM up (down) is the average probability of children, aged 14+ born from non-educated (educated) parents to (fail) complete primary school. The x-axis corresponds to the birth- year of the children in intervals of 5 years. The top panel distinguishes between boys and girls, the middle panel between urban vs rural residence. Finally, the bottom panel shows the intergenerational mobility for different parents age birth cohorts.

A.2. The geography of intergenerational mobility in education

Table 7 shows the intergenerational mobility across countries averaged across all birth-cohorts. The table reveals a variation of intergenerational mobility in education across countries. On average, in Africa, less than 41% of children from non-educated parents have completed primary education. Downward IM is considerable, as approximately one out of four children born to educated parents does not complete primary education. Heterogeneity in mobility across countries is staggering; while the top countries including Botswana, Nigeria, South Africa, Mauritius and Zimbabwe are reporting upward IM above 60%, the bottom countries including Burkina Faso, Ethiopia and South Sudan, upward IM's likelihood is less than 15% on average. In general, all the countries that exhibit higher upward mobility numbers also show significantly lower downward mobility figures. The gender gap is conspicuous, especially for low upward mobility countries. Lastly, urban-rural divide, as expected, is noticeable across all the African countries.

Country	Census years	Upward IM					Downward IM				
		All	Males	Females	Urban	Rural	All	Males	Females	Urban	Rural
Benin	1979,1992,2002,2010	0.31	0.36	0.24	0.45	0.25	0.22	0.17	0.26	0.18	0.31
Botswana	1981,1991,2001,2010	0.64	0.59	0.68	0.69	0.51	0.08	0.09	0.06	0.12	0.23
Burkina Faso	1996,2006	0.15	0.16	0.13	0.52	0.12	0.25	0.24	0.26	0.22	0.55
Cameroon	1976,1987,2005	0.47	0.50	0.43	0.69	0.43	0.13	0.13	0.13	0.08	0.25
Egypt	1986,1996,2006	0.54	0.59	0.47	0.63	0.48	0.10	0.09	0.11	0.09	0.14
Ethiopia	1984,1994,2007	0.15	0.16	0.13	0.58	0.08	0.28	0.28	0.29	0.15	0.67
Ghana	1984,2000,2010	0.49	0.54	0.45	0.64	0.44	0.15	0.13	0.17	0.11	0.22
Guinea	1983,1996,2014	0.26	0.30	0.21	0.53	0.15	0.29	0.24	0.35	0.24	0.51
Kenya	1989,1999,2009	0.53	0.53	0.52	0.65	0.51	0.18	0.19	0.17	0.11	0.21
Lesotho	1996,2006	0.48	0.38	0.61	0.66	0.46	0.24	0.31	0.18	0.13	0.30
Liberia	2008	0.32	0.37	0.27	0.45	0.25	0.44	0.41	0.46	0.36	0.58
Malawi	1987,1998,2008	0.21	0.24	0.17	0.39	0.20	0.46	0.46	0.46	0.30	0.54
Mali	1987,1998,2009	0.18	0.20	0.14	0.41	0.12	0.26	0.24	0.29	0.21	0.43
Mauritius	1990,2000,2011	0.87	0.88	0.86	0.90	0.86	0.03	0.03	0.02	0.02	0.03
Morocco	1982,1994,2004,2014	0.46	0.52	0.40	0.71	0.44	0.09	0.08	0.10	0.05	0.19
Mozambique	1997,2007	0.15	0.18	0.12	0.30	0.08	0.45	0.44	0.47	0.39	0.68
Nigeria	2006,2007,2008,2009,2010	0.67	0.67	0.67	0.77	0.65	0.06	0.06	0.07	0.04	0.08
Rwanda	2002,2012	0.30	0.30	0.29	0.42	0.28	0.46	0.47	0.45	0.25	0.52
Senegal	1988,2002,2013	0.28	0.30	0.26	0.46	0.18	0.22	0.21	0.24	0.21	0.37
Sierra Leone	2004	0.23	0.28	0.18	0.46	0.15	0.35	0.32	0.39	0.26	0.62
South Africa	1996,2001,2007,2011,2016	0.76	0.74	0.78	0.82	0.73	0.05	0.07	0.04	0.04	0.08
South Sudan	2008	0.07	0.09	0.05	0.15	0.06	0.65	0.63	0.68	0.60	0.70
Sudan	2008	0.20	0.18	0.21	0.52	0.13	0.28	0.30	0.27	0.22	0.40
Tanzania	1988,2002,2012	0.61	0.62	0.59	0.70	0.57	0.19	0.20	0.17	0.12	0.23
Togo	1970,2010	0.42	0.47	0.33	0.67	0.38	0.29	0.24	0.34	0.20	0.40
Uganda	1991,2002,2014	0.44	0.48	0.40	0.62	0.43	0.29	0.29	0.28	0.15	0.34
Zambia	1990,2000,2010	0.47	0.51	0.44	0.66	0.39	0.22	0.22	0.23	0.17	0.42
Zimbabwe	2012	0.75	0.75	0.75	0.92	0.72	0.12	0.13	0.10	0.04	0.16
Average		0.41	0.42	0.39	0.59	0.36	0.24	0.24	0.25	0.18	0.36

Notes: the table demonstrates the simple country level estimates of IM up and IM down in education. Columns (1) to (5) measure the IM up, the likelihood a child aged 14+ born from non-educated parents finishes primary school. Column (2) and (3) shows the IM up for boys and girls respectively, whereas (4) and (5) the IM up separated for urban and rural regions. Columns (6) to (10) measure the IM down, the likelihood a child aged 14+ born from educated parents fails to finish primary school. Column (7) and (8) shows the IM up for boys and girls respectively, whereas (9) and (10) the IM down separated for urban and rural regions. The last rows report simple unweighted averages across the 28 countries.

Table 7. Average Intergenerational Mobility from Educated Parents

Country	Census years	Upward IM		Downward IM	
		Secondary	Tertiary	Secondary	Tertiary
Benin	1979,1992,2002,2010	0.05	0.006	0.70	0.93
Botswana	1981,1991,2001,2010	0.13	0.017	0.60	0.88
Burkina Faso	1996,2006	0.02	0.003	0.77	0.93
Cameroon	1976,1987,2005	0.07	0.011	0.75	0.96
Egypt	1986,1996,2006	0.31	0.058	0.43	0.75
Ethiopia	1984,1994,2007	0.03	0.001	0.72	0.96
Ghana	1984,2000,2010	0.10	0.006	0.67	0.92
Guinea	1983,1996,2014	0.05	0.005	0.73	0.94
Kenya	1989,1999,2009	0.10	0.004	0.70	0.91
Lesotho	1996,2006	0.08	0.005	0.61	0.90
Liberia	2008	0.05	0.004	0.85	0.96
Malawi	1987,1998,2008	0.04	0.001	0.72	0.96
Mali	1987,1998,2009	0.02	0.007	0.73	0.88
Mauritius	1990,2000,2011	0.16	0.025	0.58	0.83
Morocco	1982,1994,2004,2014	0.13	0.017	0.51	0.86
Mozambique	1997,2007	0.01	0.001	0.83	0.94
Nigeria	2006,2007,2008,2009,2010	0.28	0.029	0.53	0.81
Rwanda	2002,2012	0.04	0.004	0.76	0.92
Senegal	1988,2002,2013	0.05	0.006	0.74	0.92
Sierra Leone	2004	0.01	0.006	0.89	0.90
South Africa	1996,2001,2007,2011,2016	0.24	0.014	0.57	0.87
South Sudan	2008	0.01	0.003	0.90	0.96
Sudan	2008	0.04	0.035	0.74	0.77
Tanzania	1988,2002,2012	0.08	0.012	0.68	0.88
Togo	1970,2010	0.04	0.005	0.82	0.96
Uganda	1991,2002,2014	0.05	0.009	0.75	0.89
Zambia	1990,2000,2010	0.08	0.008	0.70	0.94
Zimbabwe	2012	0.05	0.011	0.76	0.89
Average		0.08	0.011	0.71	0.90

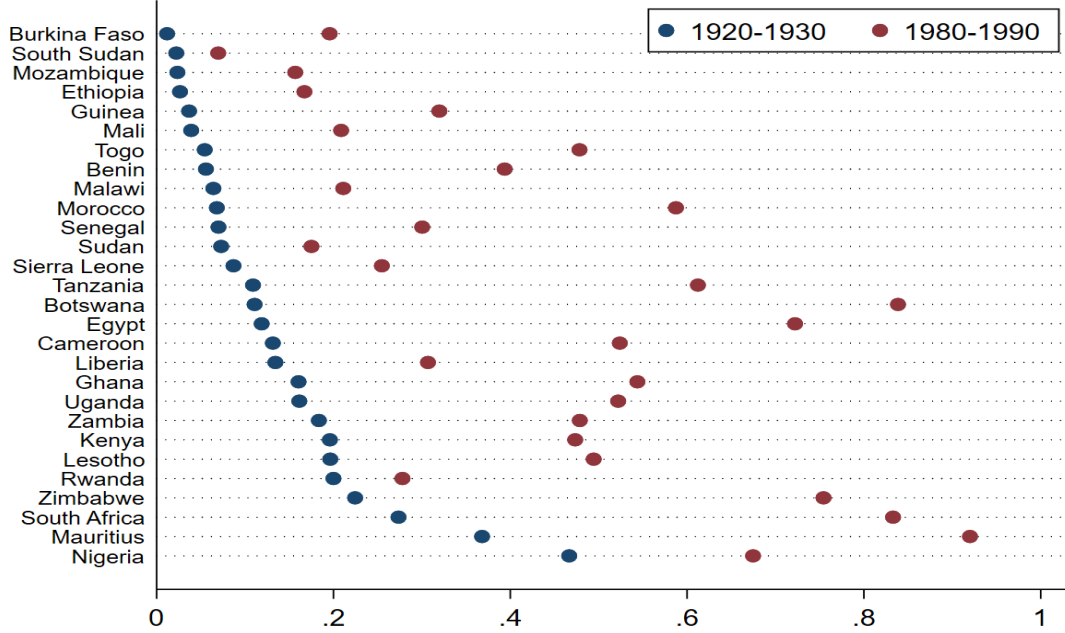
Notes: the table demonstrates the simple country level estimates of IM up and IM down in secondary and tertiary education. IM up in secondary education is the likelihood a child aged 25+ to complete secondary school if the parents' educational level is up to the primary. IM up in the tertiary education is the likelihood a child aged 25+ to complete tertiary education if the parents' educational level is up to secondary school. IM down in secondary education is the likelihood a child aged 25+ to not complete secondary school if the parents' have completed secondary school. IM down in the tertiary education is the likelihood a child aged 25+ to not complete tertiary education if the parents' have complete tertiary education. The last rows report simple unweighted averages across the 28 countries.

The upward and downward intergenerational mobility heterogeneity across countries is much more striking for higher educational attainment. Table 8 shows the average probability of the children's upward and downward educational mobility to complete secondary and tertiary educational levels. It shows that the likelihood of upward mobility to complete secondary and tertiary education is 8% and 1.1% across the 28 African countries, respectively. Egypt, Nigeria and South Africa poses the highest likelihood, standing at around 31, 28% and 24%, respectively. On the other hand, in Burkina Faso, Mali and South Sudan, the likelihood of upward mobility to complete secondary and tertiary is very low, averaging 2% and 1%, respectively. The downward mobility is high exceeding 70%, indicating that lower mobility is much more likely outcome even among the most educated families. These figures contrast with several developed countries in which higher education level is rising among younger generations.

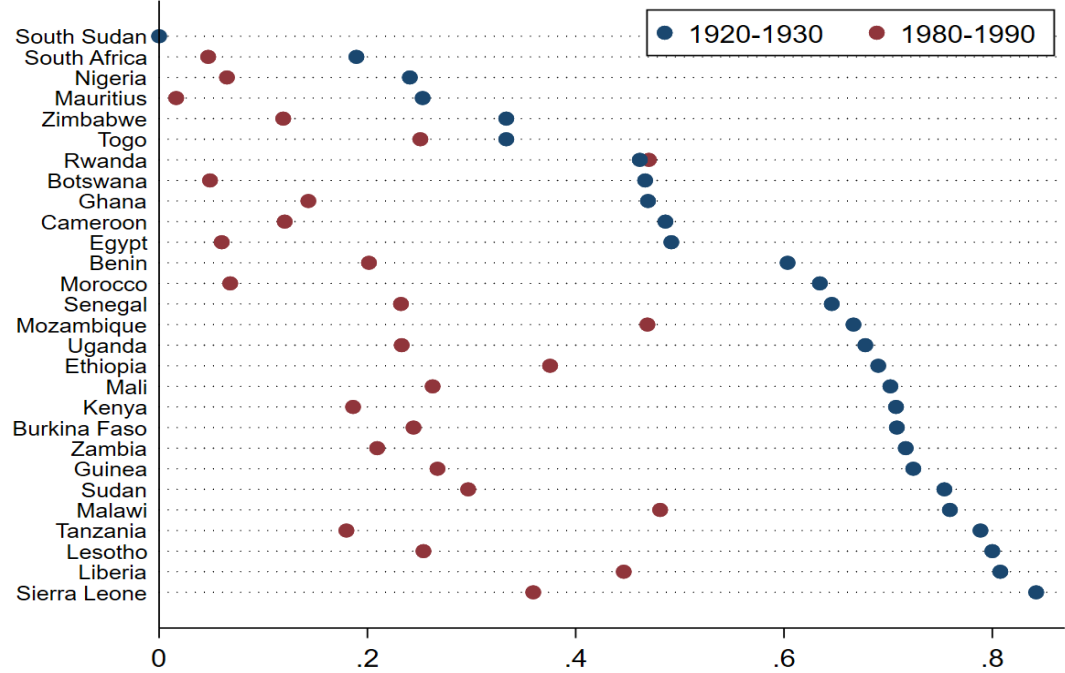
To have a glimpse of intergenerational mobility in education across countries and cohorts in Africa, we compare two age cohorts two generations (start and end period). Figure 3 shows the educational mobility indices for the birth-cohorts 1920-30 and in 1980-90. Two lessons can be drawn from this chart. First, all African countries have made progress towards improving educational mobility in recent decades compared to decades before independence. In general, upward educational mobility of individuals born in recent decades is higher than those born in 1920-30, while downward educational mobility has declined. The implementation of compulsory primary education and free, and the increase in schooling infrastructure in many countries has undoubtedly contributed to this educational mobility improvement. Second, progress has been uneven in Africa. Countries like Burkina Faso, Mozambique, and Ethiopia, who had low educational mobility in 1920-30, have made less progress than Botswana, South Africa, and Tanzania. Upward educational mobility increased from 10% for the birth-cohort 1920-30 in Botswana to 84.7% for the birth-cohort 1980-90, and downward educational mobility declined from 47% to 4.6% between the two birth-cohorts. In Mozambique, upward educational mobility has increased only from 1.6% to 17.5% between the 1920-30 and 1980-90 birth-cohorts, while downward educational mobility has declined from 60% to 45.6% between the two cohorts.

Figure 3. Educational Mobility for Birth-cohorts 1920-30 and 1980-90

Panel A. Upward educational mobility



Panel B. Downward educational mobility



Note: This figure shows the IM up (top panel) and IM down (bottom panel) for two selected birth age cohorts, 1920-30(blue) and 1980-90(red). The countries are sorted in ascending order based on the 1920s estimates.

B. Occupational attainment

Occupational mobility across generations has attracted considerable attention across many countries. Societies where occupations and positions are fixed and set at birth and are transmitted from parents to children through rigid schemes have little room for innovation and fulfilment at either the individual or collective level (Bourdieu et al., 2009). The subject is broadly covered for developed countries by a considerable existing literature (Ferrie, 2005; Hellerstein and Morrill, 2011; Ermisch and Francesconi, 2002). On the contrary, no such measures and studies have been conducted for the African region to our knowledge.

We use our rich dataset to deliver the first set of intergenerational occupational indices across 26 countries.¹⁰ We adopt the same methodology used to construct the educational IM indices. We pool together blue-collar and white-collar professions and we characterize them as higher occupational status, against the remaining agricultural, forestry, fishing and elementary professions. We define absolute measures of **intergenerational occupational mobility (IM)** as follows:

Upward IM: We assign a value of 1 if the child born or adopted from **agricultural occupied** (including the informal sector) parents has taken a blue-collar or white-collar occupation and zero otherwise.

Downward IM: We assign a value of 1 if the child born or adopted from parents working in white-collar or blue-collar professions has an agricultural occupation and zero otherwise.

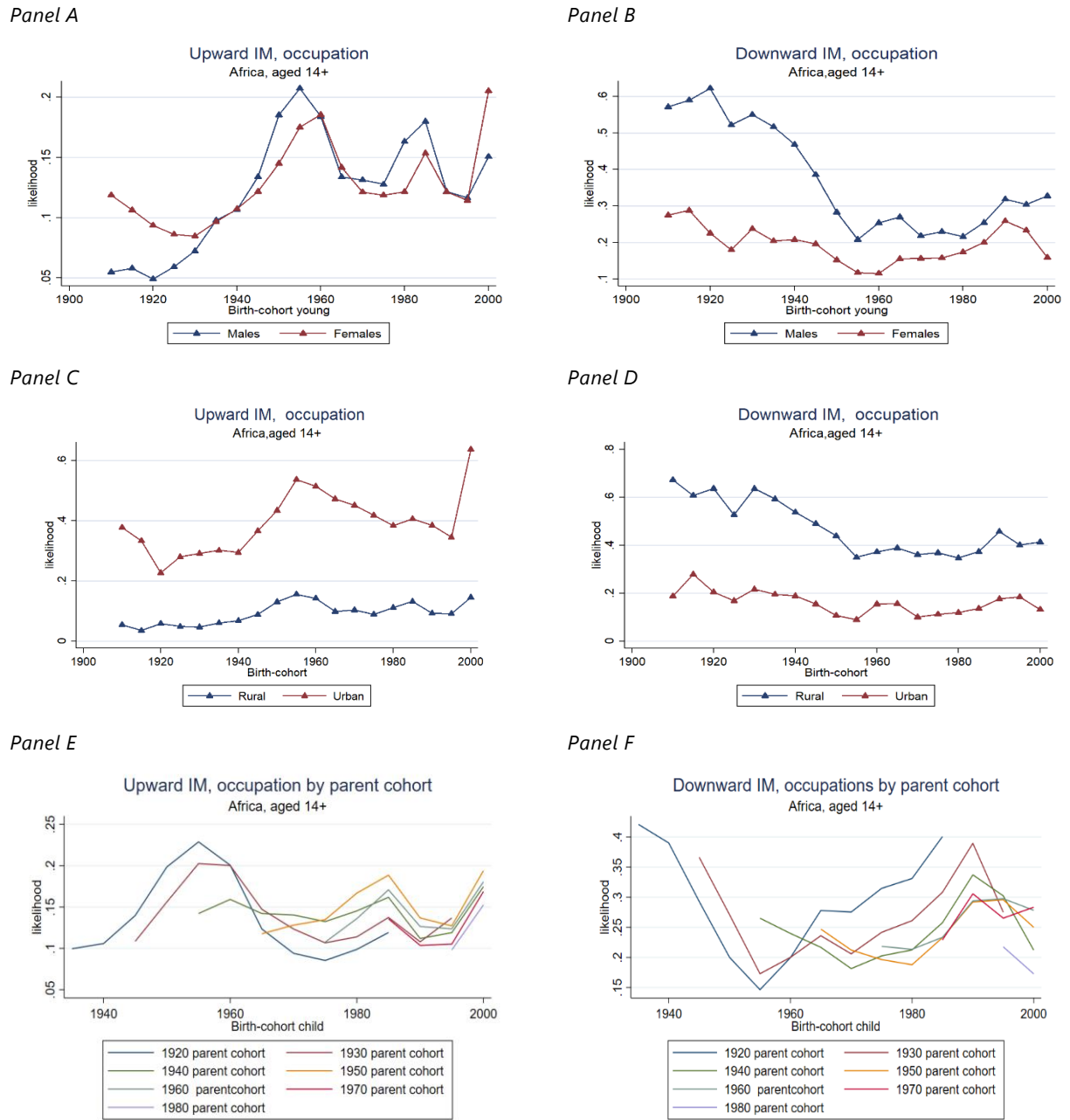
We compute IM as the mean among the individuals whose parental occupational status are available. We maximize coverage by mapping young individuals to the mean occupational level (rounded up to the nearest integer) of the generation immediately above within the household rather than of the occupation of the head of the family only.

B.1. Intergenerational mobility in occupation status

We start by presenting average results for the entire African region (see Figure 4). The first emerging finding is that upward occupational IM figures are much lower than what emerged for educational mobility. Over time, upward IM follows an inverted U-shape pattern, modestly increasing for children born until independence, around the 1960s, and falling after to rise again in the very last cohort. The decline in the 1960s could be due to the political instability and civil wars in many African countries in the immediate aftermath of independence. At the beginning of the new millennium the unconditional probability of an upward mobility was less than 20% for both boys and girls. On the other hand, the downward IM results are striking with a significantly higher value for boys than girls. Historically, the likelihood for downward mobility hovers around 20% for girls. On the other hand, for boys the IM dropped from more than 50% in the mid 1920s to around 35% in 2000s. As expected, upward mobility is higher in urban regions, and downward mobility is higher in rural regions, but has significantly declined in recent decades as increasing urbanization is driving people out of the agriculture sector, particularly boys.

¹⁰ We drop Liberia from our sample as it clearly stands out as outlier. In the remaining 10 omitted censuses the occupational status is missing.

Figure 4. Intergenerational Mobility (IM) Evolution in Africa, Occupation



Note: the left panel shows the *upward* intergenerational mobility (IM up) and the right panel the *downward* intergenerational mobility (IM down) in occupation. The IM up (down) is the average probability of children, aged 14+ born from parents occupied in agriculture (non-agriculture) sectors to be occupied (not occupied) in a non-agricultural job. The x-axis corresponds to the birth- year of the children in intervals of 5 years. The top panel distinguishes between boys and girls, the middle panel between urban vs rural residence. Finally, the bottom panel shows the intergenerational mobility for different parents age birth cohorts.

B.2. The geography of intergenerational mobility in occupation

Table 9 shows simple (unconditional) measures occupational IM across countries. As in educational attainment, we observe that the occupational IM index disguise sizeable variation across countries. On average, less than 20% of children managed to climb up the occupational ladder. On the other side, around 30% of the children born from parents occupied in non-agricultural sectors end up in agricultural professions. In terms of the distribution, the top three countries in terms of upward mobility are Botswana, South Africa and Egypt while the bottom three are Ethiopia, Mali and Burkina Faso. In these three countries, it is highly probable (almost 95%) that the children born from parents employed in agricultural will also be occupied in the same sectors. There is a negative correlation of 46% between the average measures of upward mobility and downward mobility across countries.

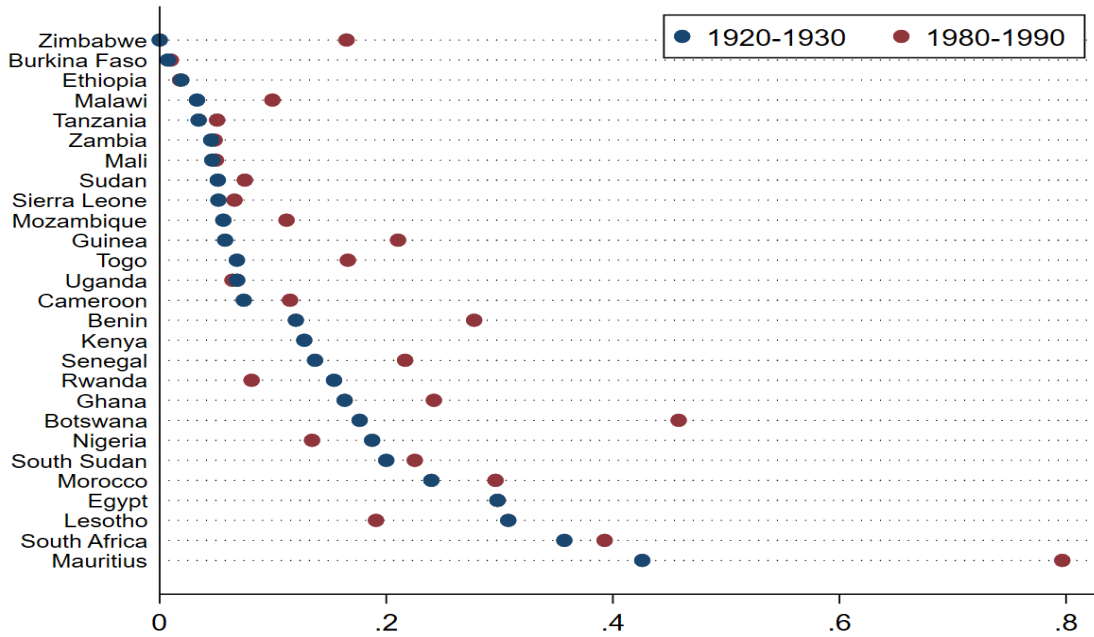
Table 8. Intergenerational Occupational Mobility for Each Country

Country	Census years	Upward IM					Downward IM				
		All	Males	Females	Urban	Rural	All	Males	Females	Urban	Rural
Benin	1979,1992,2002,2010	0.24	0.16	0.40	0.37	0.21	0.19	0.31	0.06	0.08	0.31
Botswana	1981,1991,2001,2010	0.46	0.43	0.50	0.59	0.21	0.23	0.25	0.20	0.23	0.47
Burkina Faso	1996,2006	0.02	0.01	0.02			0.46	0.50	0.39		
Cameroon	1976,1987,2005	0.12	0.13	0.09	0.38	0.07	0.18	0.19	0.17	0.12	0.44
Egypt	1986,1996,2006	0.31	0.29	0.51	0.52	0.26	0.18	0.21	0.06	0.10	0.33
Ethiopia	1984,1994,2007	0.03	0.01	0.05	0.33	0.02	0.28	0.36	0.17	0.14	0.57
Ghana	1984,2000,2010	0.24	0.18	0.30	0.53	0.18	0.23	0.34	0.14	0.12	0.37
Guinea	1983,1996,2014	0.16	0.16	0.15	0.68	0.13	0.12	0.14	0.09	0.04	0.31
Kenya	1989,1999,2009	0.21	0.22	0.18	0.42	0.20	0.36	0.38	0.32	0.11	0.43
Lesotho	1996,2006	0.29	0.22	0.43	0.54	0.27	0.37	0.48	0.19	0.18	0.43
Malawi	1987,1998,2008	0.08	0.11	0.05	0.33	0.07	0.44	0.41	0.49	0.25	0.59
Mali	1987,1998,2009	0.05	0.04	0.07	0.26	0.04	0.29	0.33	0.17	0.10	0.48
Mauritius	1990,2000,2011	0.75	0.73	0.80	0.80	0.73	0.10	0.11	0.07	0.08	0.12
Morocco	1982,1994,2004,2014	0.27	0.27	0.28	0.61	0.25	0.25	0.27	0.20	0.18	0.42
Mozambique	1997,2007	0.12	0.19	0.05	0.35	0.08	0.32	0.23	0.44	0.22	0.62
Nigeria	2006,2007,2008,2009,2010	0.16	0.15	0.19	0.31	0.14	0.22	0.25	0.14	0.11	0.29
Rwanda	2002,2012	0.08	0.11	0.05	0.19	0.08	0.37	0.32	0.41	0.16	0.55
Senegal	1988,2002,2013	0.23	0.27	0.14	0.56	0.17	0.21	0.16	0.33	0.17	0.37
Sierra Leone	2004	0.08	0.07	0.08	0.25	0.05	0.16	0.21	0.12	0.11	0.31
South Africa	1996,2001,2007,2011,2016	0.48	0.51	0.44	0.60	0.29	0.14	0.15	0.14	0.12	0.28
South Sudan	2008	0.22	0.18	0.27	0.31	0.21	0.46	0.53	0.38	0.36	0.50
Sudan	2008	0.09	0.09	0.10	0.58	0.06	0.37	0.38	0.30	0.15	0.60
Tanzania	1988,2002,2012	0.05	0.06	0.05	0.15	0.03	0.32	0.33	0.32	0.29	0.32
Togo	1970,2010	0.11	0.10	0.15	0.64	0.13	0.38	0.48	0.19	0.09	0.57
Uganda	1991,2002,2014	0.08	0.09	0.07	0.38	0.08	0.45	0.47	0.43	0.22	0.57
Zambia	1990,2000,2010	0.07	0.07	0.06	0.38	0.04	0.25	0.25	0.27	0.23	0.62
Zimbabwe	2012	0.17	0.18	0.16	0.61	0.14	0.30	0.29	0.30	0.19	0.47
Average		0.19	0.19	0.21	0.45	0.16	0.28	0.31	0.24	0.16	0.44

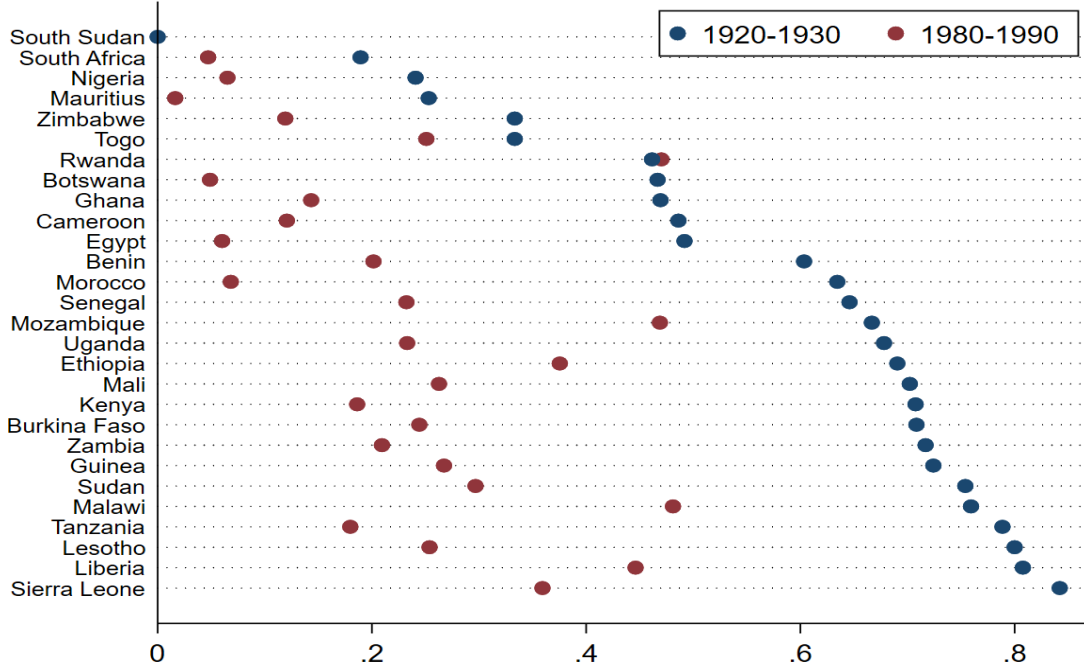
Note: the table demonstrates the simple country level estimates of IM up and IM down in occupation. The sample consists of 27 countries and 65 censuses. Columns (1) to (5) measure the IM up, the likelihood a child aged 14+ born from agricultural parents is occupied in a non-agricultural job. Column (2) and (3) shows the IM up for boys and girls respectively, whereas (4) and (5) the IM up separated for urban and rural regions. Columns (6) to (10) measure the IM down, the likelihood a child aged 14+ born from parents occupied in the non-agricultural sector to work in the agricultural sector. Column (7) and (8) shows the IM up for boys and girls respectively, whereas (9) and (10) the IM down separated for urban and rural regions. The last rows report simple unweighted averages across the 27 countries.

Figure 5: Occupational Mobility for Birth-cohorts 1920-30 and 1980-90

Panel A. Upward occupational mobility



Panel B. Downward occupational mobility

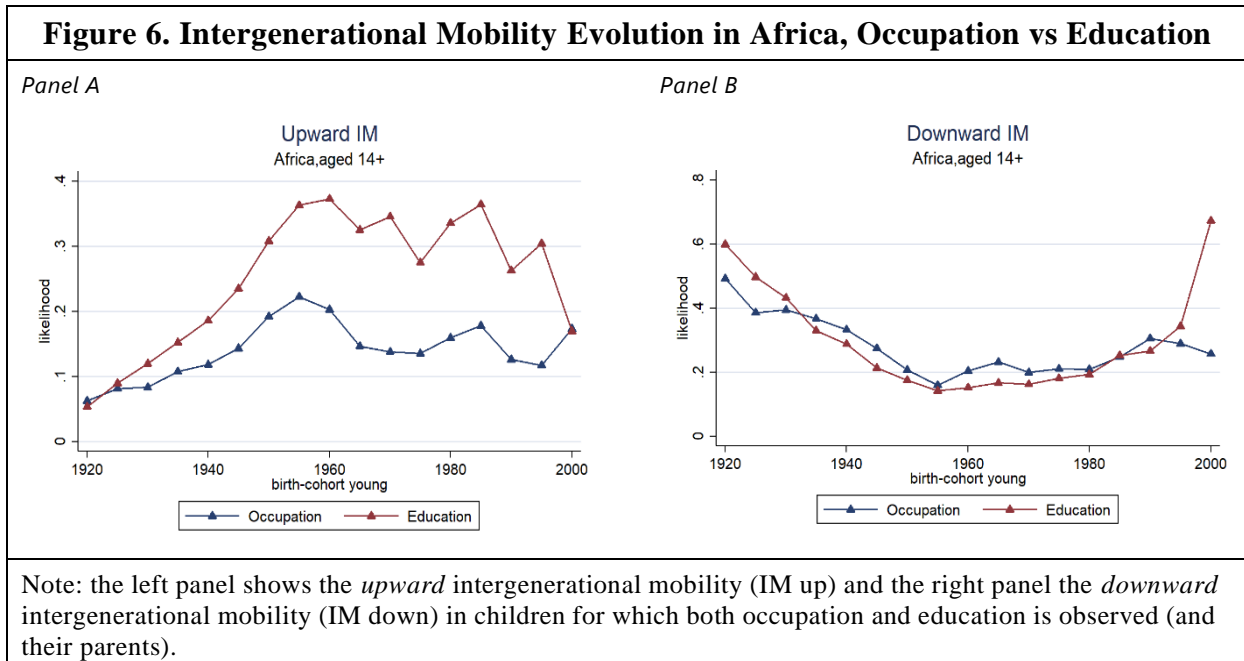


Note: this figure shows the IM up (top panel) and IM down (bottom panel) for two selected birth age cohorts, 1920-30(blue) and 1980-90(red). The countries are sorted in ascending order based on the 1920s estimates.

In Figure 5, we compare the upward and downward mobility indices for the birth-cohorts 1920-30 and 1980-90 for each country. Contrary to Figure 3 where upward educational mobility has significantly increased for many countries between the two birth-cohorts, Figure 4 shows that upward occupational mobility has marginally increased in several countries, including Sierra Leone, Sudan and Tanzania, or remained broadly the same (Burkina Faso, Mali and Zambia). Yet, in Botswana and Mauritius, the likelihood of upward occupational mobility has doubled between 1920-30 and 1980-90. In addition, Figure 5 reveals that downward occupational mobility has significantly declined in Africa, particularly in countries where it was high in the 1920-30s.

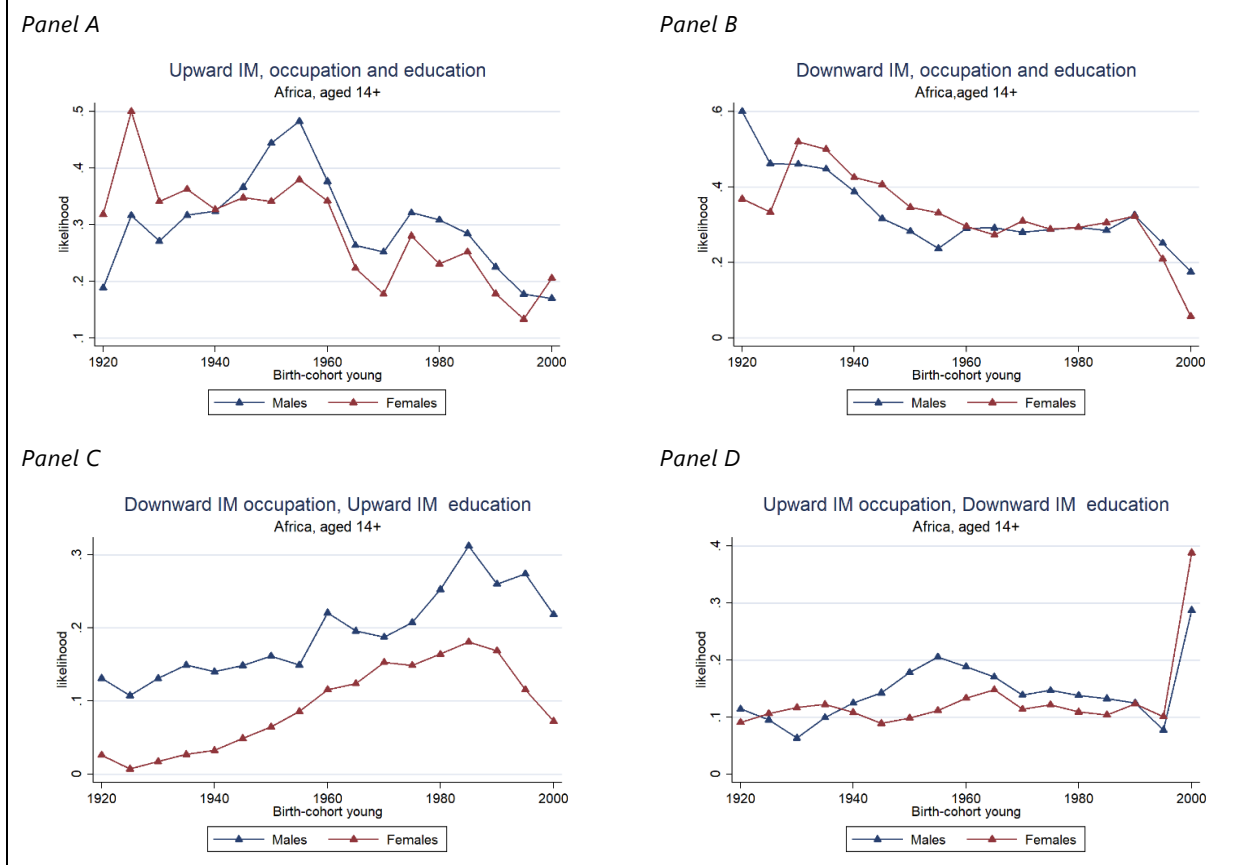
C. The interplay of education and occupation intergenerational mobility

Figure 6 contrasts the educational and occupational mobility intergenerational indicators in Africa. The outstanding fact is the divergent trends of occupational and educational IM. This pattern indicates that more and more children of non-educated parents are completing primary school. At the same time fewer children born from parents with agricultural occupations are employed in higher level occupations. The right-hand chart documents downward occupational mobility. We observe that the two social mobility indicators move hand in hand, although downward educational mobility went up in the 2000s contrary to downward occupational mobility. Appendix D contains the figures comparing subpopulation.



We further examine the conditional probability of a child born from non-educated parents working in the agricultural sector finishes primary school to get employed in a higher occupational job. In other words, we examine the likelihood of moving up in occupation conditional to the fact that the child had managed to move up in education. Also, we examine the likelihood to move downward in occupation conditional to moving downward in education, relative to your parents. Figure 7 shows that the joint upward mobility in education and occupation decline over younger cohorts, suggesting that the occupational reward or premium from better education is declining over time. This disconnect between educational and occupational mobility indices in recent decades could be linked to two factors including the increasing high number of graduates while the creation of jobs remains weak, and the mismatch between labor market needs and the skills of graduates. The joint downward mobility is also declining over time, implying children who fail in education are less and less likely to work in the agriculture sector and are probably unemployed. However, one surprising finding is that the probability for a child who upgraded in education attainment to experience a downward mobility in occupation is higher in the 1980s-90s than in the 1920s-30s. This finding could be explained by the lack of employment opportunities or not enough jobs creation in Africa. Figure 7 highlights that there no gender differences seem to emerge.

Figure 7: Intergenerational Mobility Evolution in Africa, Occupation and Education



IV. INTERGENERATIONAL MOBILITY AT THE DISTRICT LEVEL

In this section, we calculate the intergenerational mobility indices at the district level to explore within country heterogeneities. The administrative divisions differ between countries (regions, states, provinces, counties, districts, etc.), and for simplicity, we will call them districts. Also, some districts have not been identified, therefore the average values in Table 10 and 11 could differ from those in Tables 7-8. Table 10 summarizes the key indicators/statistics for upward and downward mobility in educational attainment for each country, while Table 11 presents the indices for occupational mobility. Both tables shed light that there are substantial within country heterogeneities. For example, there are some districts in Nigeria where almost all children experienced upward mobility in education. In other regions, less than 1% of children upgraded in terms of education attainment (see Figure 8). In Mali, there are some regions where children's probability of being less educated than their parents is more than 70%, while in other regions the probability falls to about 18%. In Ghana, the northern districts have the lowest upward occupational mobility and the highest downward occupational mobility (Figure 9).

Table 9. Educational Mobility at the District Level

Country name	Regions	Upward				Downward			
		Mean	Median	Max	Min	Mean	Median	Max	Min
Benin	77	0.28	0.29	0.60	0.09	0.32	0.31	0.57	0.15
Botswana	21	0.65	0.62	0.78	0.50	0.09	0.09	0.19	0.04
Burkina Faso	45	0.11	0.10	0.47	0.02	0.43	0.43	0.77	0.21
Cameroon	39	0.54	0.58	0.83	0.16	0.20	0.17	0.58	0.05
Egypt	235	0.58	0.59	0.86	0.32	0.12	0.11	0.25	0.02
Ethiopia	62	0.13	0.10	0.80	0.00	0.47	0.45	1.00	0.08
Ghana	102	0.53	0.57	0.74	0.16	0.23	0.21	0.50	0.09
Guinea	166	0.13	0.10	0.61	0.01	0.57	0.55	1.00	0.00
Kenya	35	0.50	0.57	0.75	0.09	0.24	0.24	0.38	0.07
Lesotho	61	0.58	0.58	0.86	0.33	0.23	0.23	0.49	0.07
Malawi	183	0.24	0.22	0.55	0.08	0.53	0.55	0.81	0.24
Mali	47	0.13	0.11	0.53	0.02	0.44	0.44	0.71	0.18
Morocco	53	0.33	0.32	0.62	0.11	0.16	0.15	0.35	0.04
Mozambique	143	0.12	0.08	0.51	0.03	0.64	0.66	0.94	0.18
Nigeria	729	0.70	0.78	1.00	0.00	0.11	0.05	1.00	0.00
Rwanda	30	0.35	0.34	0.61	0.24	0.45	0.48	0.56	0.15
Senegal	28	0.24	0.17	0.60	0.07	0.30	0.29	0.49	0.13
Sierra Leone	107	0.22	0.17	0.66	0.03	0.55	0.58	0.88	0.11
South Africa	26	0.77	0.78	0.84	0.67	0.06	0.05	0.11	0.03
South Sudan	72	0.08	0.05	0.46	0.00	0.76	0.76	1.00	0.43
Sudan	129	0.21	0.14	0.76	0.00	0.49	0.50	1.00	0.12
Tanzania	113	0.63	0.62	0.85	0.36	0.20	0.19	0.37	0.06
Togo	37	0.42	0.45	0.72	0.17	0.38	0.40	0.58	0.13
Uganda	148	0.40	0.39	0.71	0.02	0.38	0.39	0.70	0.11
Zambia	55	0.48	0.46	0.75	0.30	0.30	0.32	0.49	0.09
Zimbabwe	88	0.80	0.80	1.00	0.51	0.13	0.13	0.39	0.00
Africa	2831	0.39	0.38	0.71	0.17	0.34	0.34	0.62	0.11

Note: The table demonstrates the summary statistics of district level estimates of IM up and IM down in education. The sample consists of 26 African countries. The last row reports simple unweighted averages of the summary statistics.

Table 10: Occupational Mobility at the District Level

Country name	Regions	Upward				Downward			
		Mean	Median	Max	Min	Mean	Median	Max	Min
Benin	77	0.31	0.26	0.90	0.02	0.32	0.31	0.72	0.02
Botswana	21	0.44	0.41	0.70	0.22	0.29	0.28	0.48	0.15
Burkina Faso	45	0.01	0.01	0.10	0.00	0.66	0.70	1.00	0.17
Cameroon	39	0.16	0.12	0.73	0.01	0.31	0.29	0.83	0.08
Egypt	235	0.44	0.40	0.89	0.10	0.23	0.21	0.76	0.01
Ethiopia	60	0.04	0.02	0.57	0.00	0.42	0.37	1.00	0.12
Ghana	102	0.28	0.27	0.78	0.05	0.30	0.29	0.59	0.08
Guinea	166	0.15	0.08	0.92	0.00	0.39	0.36	1.00	0.00
Kenya	35	0.21	0.17	0.75	0.02	0.42	0.45	0.72	0.04
Lesotho	61	0.27	0.24	0.71	0.04	0.53	0.53	1.00	0.08
Malawi	183	0.12	0.09	0.80	0.02	0.58	0.60	1.00	0.07
Mali	47	0.06	0.04	0.64	0.01	0.45	0.48	0.70	0.07
Morocco	53	0.26	0.23	0.68	0.06	0.31	0.30	0.54	0.13
Mozambique	143	0.13	0.08	0.68	0.02	0.56	0.59	1.00	0.00
Rwanda	30	0.14	0.13	0.34	0.09	0.46	0.47	0.68	0.07
Senegal	28	0.26	0.18	0.75	0.06	0.27	0.27	0.51	0.08
Sierra Leone	107	0.12	0.06	0.75	0.01	0.34	0.31	1.00	0.00
South Africa	26	0.43	0.41	0.72	0.24	0.17	0.17	0.34	0.00
South Sudan	72	0.24	0.23	0.68	0.02	0.51	0.50	1.00	0.17
Sudan	129	0.18	0.09	0.68	0.00	0.48	0.45	1.00	0.08
Tanzania	113	0.08	0.05	0.57	0.02	0.35	0.35	0.63	0.19
Togo	36	0.21	0.14	1.00	0.00	0.53	0.51	1.00	0.00
Uganda	148	0.11	0.07	0.65	0.00	0.58	0.58	1.00	0.14
Zambia	55	0.10	0.04	0.60	0.01	0.44	0.42	0.82	0.15
Zimbabwe	86	0.28	0.20	0.78	0.00	0.41	0.40	1.00	0.00
Africa	2097	0.20	0.16	0.69	0.04	0.41	0.41	0.81	0.07

Note: The table demonstrates the summary statistics of district level estimates of IM up and IM down in occupation. The sample consists of 26 African countries. The last row reports simple unweighted averages of the summary statistics.

Figure 8. Intergenerational Mobility in Education in Nigeria and Mali

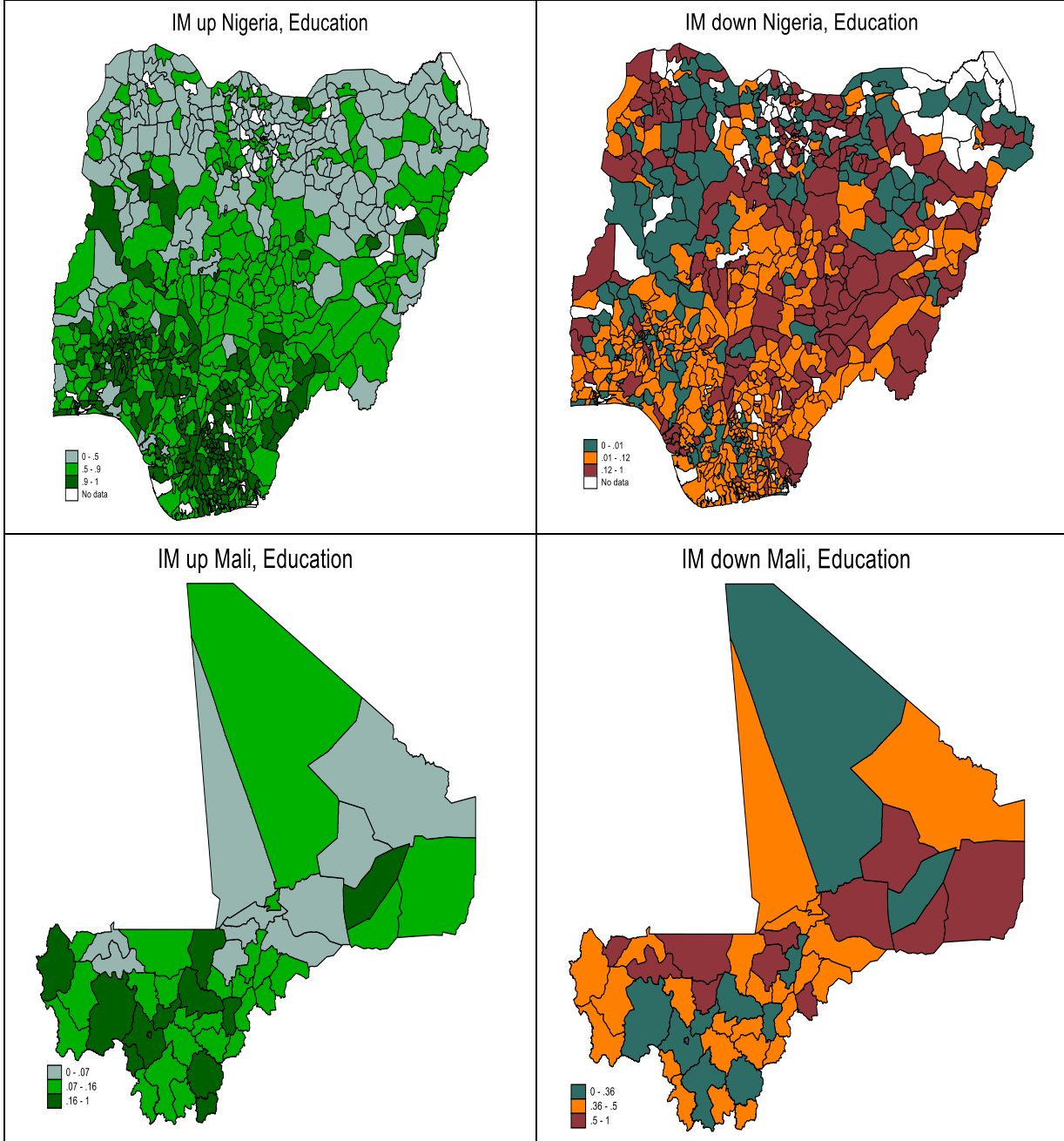
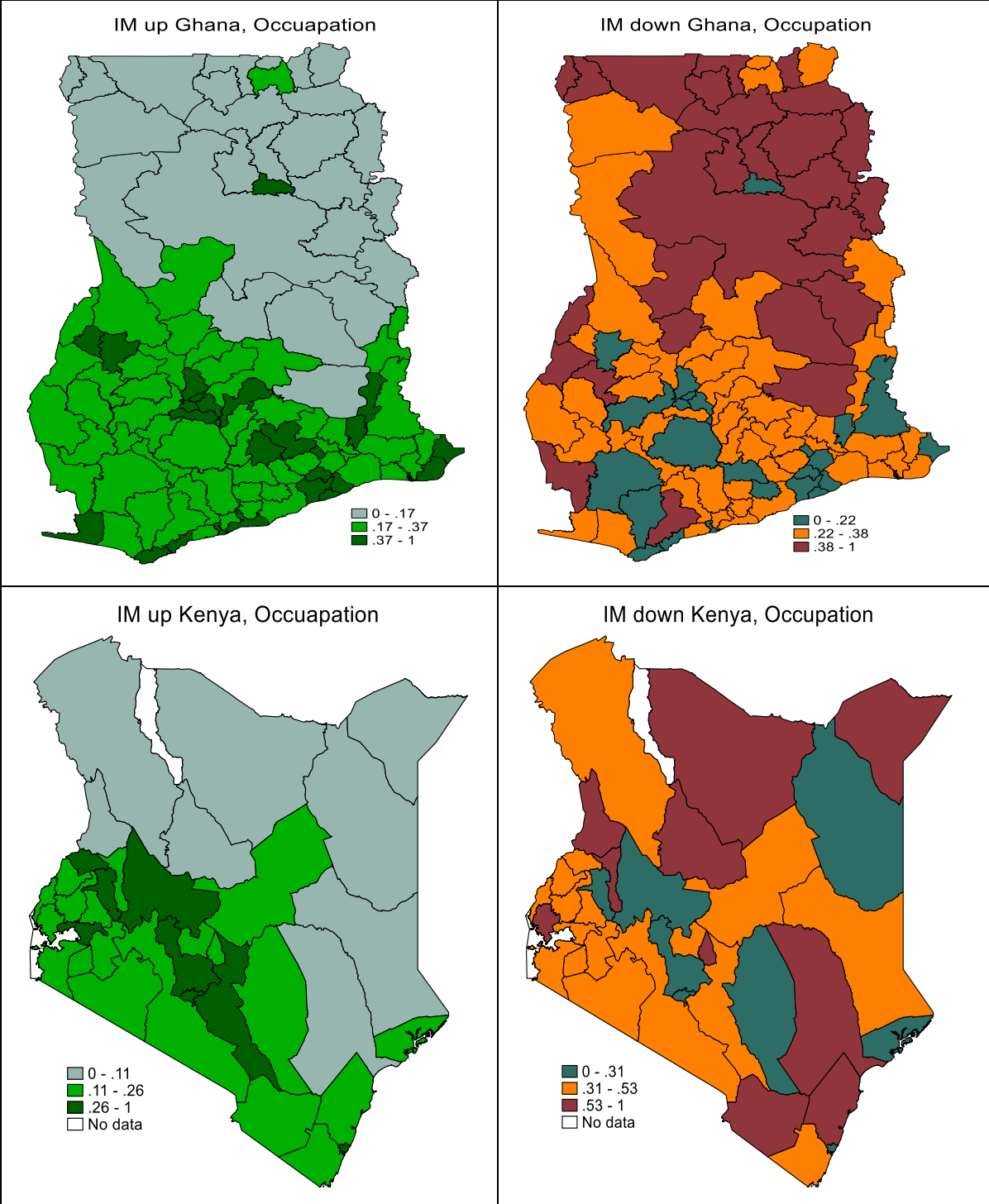


Figure 9. Intergenerational Mobility in Occupation in Ghana and Kenya



V. DETERMINANTS OF EDUCATIONAL AND OCCUPATIONAL MOBILITY

The stylized facts we presented so far highlight the strong correlations between parents' and children's educational and occupational choices. We now turn to empirical analysis to understand how observable individual and family characteristics influence the IM rates. In the absence of external instruments, our analysis is about correlations and not causation.

A. Empirical strategy

The dependent variable is a binary variable taking the value of 1 if the child experienced upward/downward mobility and 0 otherwise. We estimate the determinants of upward and downward educational and occupational mobility using the following equation:

$$Mobility_{ijt} = \alpha + \gamma X'_{ijt} + \pi_j + \vartheta_t + \mu_{ijt} \quad (1)$$

Where, for survey conducted at year t , individual i from country j , $Mobility_{ijt}$ is a binary variable taking the value of 1 if the individual has experienced an upward or downward educational and occupational mobility, and 0 otherwise. We estimate separately the determinants for upward/downward educational mobility and those of upward/downward occupational mobility. π_j are the country fixed effects. The inclusion of country fixed effects will account for observable and unobservable country-specific characteristics that may explain intergenerational educational and occupational mobility. The country level fixed effects remove bias due to omitted variables at the country-level. ϑ_t represents the time fixed effects of the years of the surveys. μ_{ijt} is the error term. Vector X'_{ijt} includes a set of control variables on the socio economic and demographic of individuals, and macroeconomic conditions. These variables include:

- Gender status: we define a binary variable taking the value of 1 if the individual is a female and 0 otherwise. As gender inequality is high in sub-Saharan Africa (Gonzales et al., 2015), we expect female gender to be negatively (positively) correlated with upward (downward) mobility.
- Family size: it represents the number of individuals in the household. High number of children in a household could result in low level of education as parents may not have the financial capabilities to send all children to school. The uneducated children are expected to not be able to upgrade in terms of occupations. We thus expect the sign of the coefficient associated with family size to be negative (positive) in the estimate of upward (downward) educational and occupational mobility.
- Rural area: we create a binary variable taking the value of 1 if the individual lives in rural area and 0 otherwise. The place of living is found to affect the likelihood of intergenerational mobility (Alesina et al. 2021), with individuals living in rural areas having the lowest probability to upgrade in terms of education and occupations because of poverty and the lack of infrasture. Therefore, we expect that the coefficient associated with this variable in the estimate of upward (downward) mobility will be negative (positive).

- Age: it represents the age of the individual at the time of the survey. We also added age square to capture any potential generational effects. On the one hand, individuals born in recent decades could benefit from better schooling as infrastructure availability has improved. On the other hand, the poverty rate has remained persistent in many sub-Saharan African countries, and this persistence in lack of income could prevent some children to go to school. Therefore, the coefficients associated with both age and age square is unknown.
- Access to infrastructure: we include access to electricity and clean water, which are all binary variables taking the value of 1 if the individual has access to electricity or clean water, and 0 otherwise. Access to electricity and water could be considered as a proxy of the household's level of income, but also as a measure of the state capacity to provide public infrastructure given that states remain the main providers of electricity and water in many sub-Saharan African countries. The expected sign in the estimate of upward (downward) mobility is positive (negative).
- GDP per capita: it captures the level of development of countries. While richer countries could have more financial capacities to afford more school infrastructure and create jobs, mismanagement or misallocation of resources can undermine the performance of the education system and the labor markets. Therefore, the expected sign associated with GDP per capita is not known. GDP per capita data are from the IMF's World Economic Outlook (WEO).
- Oil rents: expressed in percentage of GDP, it is a proxy of natural resource endowment. While natural resources can allow a government to invest in education and job creation, some studies have found that rent-seeking activities and corruption could divert resources away from social sectors (Tornell and Lane, 1999). The sign of the coefficient associated with oil rents is thus unknown. The data are extracted from the World Bank's World Development Indicators (WDI) dataset.
- Education spending: this variable measures public spending in the education sector and is expressed as a percentage of GDP. Higher education spending can translate into better schooling infrastructure and improved education conditions, which could increase (decrease) the likelihood of upward (downward) educational mobility. The data are extracted from the World Bank's WDI dataset.
- Pupils/teacher ratio: it captures education conditions, with high pupils/teacher ratio suggesting poor education conditions. We expect the sign of the coefficient associated with this variable to be negative (positive) in the estimate of upward (downward) mobility given that poor education conditions reduce learning abilities and could increase children drop-out. Pupils/teacher ratio data are from the World Bank's WDI dataset.
- Quality of institutions: it is a simple average composite index using three governance indicators from the World Bank's Worldwide Governance Indicators, including regulatory quality, the rule of law and corruption control. As studies have shown (North, 1990; Mauro, 1995), good quality of institutions is correlated with better

economic performances and resource allocation in social sectors, which could lead to higher (lower) probability of upward (downward) intergenerational mobility.

- **Conflict:** we define a binary variable taking the value of 1 if the country is affected by a conflict, and 0 otherwise. Conflict can lead to an economic and humanitarian crisis, create huge unemployment, destroy infrastructure (school, hospitals, etc.), and prevent children to attend school (IMF, 2019). In this regard, the expected sign of the coefficient associated with this variable is negative (positive) in the estimate of upward (downward) intergenerational mobility. The data are from the Uppsala Conflict Data Program (UCDP) provided by the Department of Peace and Conflict Research, Uppsala University.
- **Marital status:** we include the marital status in the estimate of occupation mobility to account for the reduction in freedom of movement as family reasons could add more constraints for married couples to move for better job opportunities. Furthermore, the inclusion of the marital status also helps account for the potential effect of child marriage, which is a concern in many sub-Saharan African countries. Therefore, being married could reduce (increase) the likelihood of upward occupational mobility.
- **Social protection:** Through the provision of essential health care and income security along the life course, social protection plays a critical role in boosting human capital and preventing poverty. Social protection programs empower people to be healthy, pursue their education and seek better job opportunities (World Bank, 2012), which in return could increase (reduce) upward (downward) educational and occupational mobility. The data are from the World Bank's WDI dataset.
- **Labor market flexibility:** by enabling firms to adjust their workforce in response to market fluctuations and economic conditions, less stringent labor market regulations reduce hiring costs, provide better employment prospects and more productive matches between workers and firms. Therefore, we expect labor market flexibility to positively (negatively) affect upward (downward) occupational mobility. The data are from the IMF's structural reforms database.

We use a conditional fixed effect model to explore the determinants of intergenerational mobility. The conditional fixed effect model allows for the inclusion of fixed effects, contrary to traditional simple probit/logit model as "incidental parameter problem" arises with these models (Neyman and Scott, 1948). Andersen (1970) and Chamberlain (1980) noted that the conditional fixed effect estimator is obtained by conditioning the likelihood function on minimal sufficient statistics for the incidental parameters and then maximizing the conditional likelihood function, allowing the estimator to be consistent.

B. Determinants of educational mobility

We report in columns (1) and (6) of table 12 the (observable) determinants of upward and downward mobility in education attainment, respectively. We included covariates individual characteristics such as a female gender dummy, age and age squared, and rural residence.

Moreover, we added covariates that are characterizing household composition such as family size and some proxies of household's financial constraints such as access to electricity and water. Columns (2-5) and (7-10) of table 12 show the same probit regressions augmented with time-varying country-level variables. We included GDP per capita to capture the level of development of countries, oil rents in the percentage of GDP as a proxy of natural resources endowment, public spending in education (expressed in percentage of GDP), the ratio of pupils over teachers to capture education conditions, the quality of institutions and a binary variable taking the value of 1 if the country is in conflict and 0 otherwise. The quality of institutions variables is a simple average composite index using three governance indicators from the World Bank's Worldwide Governance Indicators, including regulatory quality, the rule of law and corruption control. GDP per capita is from the IMF's World Economic Outlook, while the other variables are from the World Bank's World Development Indicators. In all specifications, we include the birth-cohort of the old and year fixed effects. Note that the marginal effects are presented in all Tables.

We find that individual and household characteristics matter, and most variables have a reverse sign in upward and downward mobility estimates. Table 12 shows that all the variables of interest are statistically significant at the 1% level. The marginal effects of rural residence and family size are negative and highly significant in columns 1-5 and positive in columns 6-10, suggesting that children from rural areas and larger families in size are less (more) likely to experience upward (downward) educational mobility. On average, the likelihood of experiencing upward mobility is lower by 11.4 % if you live in the rural area (average of columns 1-5). The downward mobility is higher by 6.6% (average of columns 6-10). This result could be explained by the lack of infrastructure and poverty in rural areas and the financial difficulties to send kids to school for big families. The marginal effects of access to electricity and water are positive and significant in columns 1-5, suggesting that financial constraints or lack of necessary infrastructure are associated with lower (higher) upward (downward) mobility rates in parents' the education status to kids. On average, the probability of children from families who have access to electricity to experience an upward educational mobility is 15.8% higher than those from families without electricity access. The marginal effect associated with female gender is positive in columns 1-5 and positive and significant in columns 6-10, implying that girls tend to be more (less) likely to upgrade (downgrade) in educational attainment. We believe this is because of the fact that they start from a low base and there has been a recent push in several countries to promote gender equality in education. For instance, the Government of Rwanda National Gender Policy, adopted in 2008, introduced special measures to improve girls' enrollement and to increase their performance.

Regarding the macro variables, the results are in line with expectations, and the sign of the marginal effects are reverse for upward and downward mobility. Table 12 shows that the marginal effects associated with GDP per capita, education spending and quality of institutions are positive and significant in columns 1-5. In contrast, those associated with oil rents, the pupils/teacher ratio and conflict are negative and significant. This finding

indicates that children from countries with good quality of institutions, high education spending and income are more likely to experience upward educational mobility, contrary to children from countries with low education conditions, conflict affected countries and resource rich countries.

Table 11. Determinants of Educational Mobility

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Upward mobility					Downward mobility				
Female	0.0093*** (0.001)	0.0205*** (0.001)	0.0378*** (0.001)	0.0233*** (0.001)	-0.0002 (0.001)	-0.0189*** (0.001)	-0.0200*** (0.001)	-0.0149*** (0.001)	-0.0201*** (0.001)	-0.0168*** (0.001)
Rural	-0.1189*** (0.001)	-0.1196*** (0.001)	-0.1226*** (0.001)	-0.1204*** (0.001)	-0.0874*** (0.001)	0.0715*** (0.001)	0.0703*** (0.001)	0.0595*** (0.001)	0.0690*** (0.001)	0.0600*** (0.001)
Age	0.0363*** (0.000)	0.0374*** (0.000)	0.0230*** (0.000)	0.0379*** (0.000)	0.0455*** (0.000)	-0.0302*** (0.000)	-0.0306*** (0.000)	-0.0287*** (0.000)	-0.0311*** (0.000)	-0.0407*** (0.000)
Age square	-0.0006*** (0.000)	-0.0006*** (0.000)	-0.0004*** (0.000)	-0.0006*** (0.000)	-0.0008*** (0.000)	0.0005*** (0.000)	0.0005*** (0.000)	0.0004*** (0.000)	0.0005*** (0.000)	0.0007*** (0.000)
Family size	-0.0055*** (0.000)	-0.0092*** (0.000)	-0.0064*** (0.000)	-0.0092*** (0.000)	-0.0077*** (0.000)	0.0027*** (0.000)	0.0041*** (0.000)	0.0041*** (0.000)	0.0043*** (0.000)	0.0039*** (0.000)
Access to electricity	0.1828*** (0.001)	0.1586*** (0.001)	0.1358*** (0.001)	0.1530*** (0.001)	0.1605*** (0.001)	-0.1051*** (0.001)	-0.0838*** (0.001)	-0.0939*** (0.001)	-0.0958*** (0.001)	-0.1225*** (0.001)
Access to water	0.1062*** (0.001)	0.1026*** (0.001)	0.0639*** (0.001)	0.1052*** (0.001)	0.0784*** (0.001)	-0.0521*** (0.001)	-0.0467*** (0.001)	-0.0333*** (0.001)	-0.0490*** (0.001)	-0.0509*** (0.001)
GDP per capita, Log		0.0681*** (0.001)					-0.1250*** (0.001)			
Oil rents (% of GDP)		-0.0076*** (0.000)					0.0050*** (0.000)			
Education spending			0.0166*** (0.000)					-0.0141*** (0.000)		
Pupils/teacher ratio			-0.0012*** (0.000)					0.0032*** (0.000)		
Quality of institutions				0.0929*** (0.001)					-0.1231*** (0.001)	
Conflict					-0.1151*** (0.001)					0.1341*** (0.001)
Observations	4,116,227	4,116,227	1,995,407	4,071,037	1,952,641	1,150,096	1,150,096	568,908	1,146,268	794,200
R2	0.19	0.21	0.19	0.17	0.20	0.18	0.16	0.24	0.15	0.14
Birth-cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes: The table reports estimates of the intergenerational mobility of children aged 14+ on individual and household characteristics augmented by a macroeconomic variable at a time. The standard errors are shown in parentheses.

However, these estimates for the whole African sample may obscure some country heterogeneities. To address this, we run the estimates for each country. The results are reported in appendix F Table F2. As can be observed, there are substantial country heterogeneities in the determinants of upward and downward mobility in education. For instance, although the estimate for the whole sample in Table 12 shows that girls have a higher (lower) probability than boys to upgrade (downgrade), the results in Table F1 and F2 highlight that the marginal effects of female gender differ between countries. In Botswana, Lesotho and Nigeria, girls have a higher probability than boys to experience upward educational mobility, while that probability is lower in Guinea, South Sudan and Togo (F1). In Mozambique and Ghana, girls are more likely than boys to experience downward educational mobility, contrary to girls from Zimbabwe and Lesotho who are

less likely than boys to downgrade in educational attainment. A striking result is that regardless of the country, children from rural areas are less (more) likely than those from urban areas to experience upward (downward) educational mobility, thus emphasizing the rural/urban divide as shown in Figure 2. Similarly, access to electricity and water appears to have the same effect in almost all countries, underscoring the importance of infrastructure access.

C. Determinants of occupational mobility

We report the results of the estimates of the determinants of intergenerational mobility in occupations in Table 13. In addition to the individual characteristics included for educational mobility estimates in Table 13, we control individuals' marital status. We include GDP per capita, oil rents, the quality of institutions, conflict and social protection coverage (% of working population) for the country-level variables. We also include the time and birth-cohort fixed effects.

Table 13 shows that, as for educational mobility, the variables have a reserved sign for upward and downward occupational mobility. The results show that individuals living in rural areas and those married have the lower (higher) probability of upward (downward) occupational mobility. Furthermore, individuals with access to electricity and water are more (less) likely to upgrade (downgrade) in terms of occupations. Likewise educational mobility, Table 13 shows that girls are more (less) likely than boys to upgrade (downgrade) in terms of occupations. Turning our attention to the macro-variables, the results highlight that individuals from countries with high coverage of social protection coverage, labor market flexibility and good quality of institutions have a high (low) probability of experiencing upward (downward) occupational mobility. Oil rents are positively associated with upward occupational mobility and negatively with downward occupational mobility. That said, oil production can create new jobs and allow some children to work in the non-agriculture sector. As expected, children from countries with higher unemployment rate are less (more) likely to experience upward (more) occupational mobility, while those from countries where the industry sector is developed are more (less) likely to upgrade (downgrade) in terms of occupations. High unemployment rate can make it harder for children from disadvantaged households to find jobs outside agriculture, thus reducing their probabilities to upgrade in terms of occupations. On the other hand, the industry sector offer a window of opportunities for better jobs, which could allow children born from parents working in the agriculture sector to work outside agriculture. We also observe that the marginal effect associated with GDP per capita is positive and significant in column (2) and in column (6).

Table 12. Determinants of Occupational Mobility

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Upward mobility						Downward mobility					
Female	0.0010* (0.001)	-0.0007 (0.001)	0.0130*** (0.001)	0.0045*** (0.001)	0.0048*** (0.001)	-0.0007 (0.001)	-0.0506*** (0.001)	-0.0505*** (0.001)	-0.0366*** (0.001)	-0.0492*** (0.001)	-0.0393*** (0.001)	-0.0502*** (0.001)
Rural	-0.1255*** (0.001)	-0.1259*** (0.001)	-0.1269*** (0.001)	-0.1225*** (0.001)	-0.1227*** (0.001)	-0.1253*** (0.001)	0.1594*** (0.001)	0.1596*** (0.001)	0.1588*** (0.001)	0.1596*** (0.001)	0.1650*** (0.001)	0.1573*** (0.001)
Age	0.0176*** (0.000)	0.0178*** (0.000)	0.0200*** (0.000)	0.0180*** (0.000)	0.0183*** (0.000)	0.0180*** (0.000)	-0.0126*** (0.000)	-0.0128*** (0.000)	-0.0113*** (0.000)	-0.0126*** (0.000)	-0.0146*** (0.000)	-0.0130*** (0.000)
Age square	-0.0002*** (0.000)	-0.0002*** (0.000)	-0.0003*** (0.000)	-0.0003*** (0.000)	-0.0003*** (0.000)	-0.0003*** (0.000)	0.0002*** (0.000)	0.0002*** (0.000)	0.0002*** (0.000)	0.0002*** (0.000)	0.0002*** (0.000)	0.0002*** (0.000)
Family size	-0.0006*** (0.000)	-0.0005*** (0.000)	-0.0007*** (0.000)	-0.0006*** (0.000)	-0.0014*** (0.000)	-0.0007*** (0.000)	0.0022*** (0.000)	0.0022*** (0.000)	0.0024*** (0.000)	0.0022*** (0.000)	0.0022*** (0.000)	0.0024*** (0.000)
Access to electricity	0.0823*** (0.001)	0.0796*** (0.001)	0.0905*** (0.001)	0.0812*** (0.001)	0.0800*** (0.001)	0.0850*** (0.001)	-0.0560*** (0.001)	-0.0571*** (0.001)	-0.0447*** (0.001)	-0.0561*** (0.001)	-0.0569*** (0.001)	-0.0613*** (0.001)
Access to water	0.0504*** (0.001)	0.0526*** (0.001)	0.0565*** (0.001)	0.0494*** (0.001)	0.0474*** (0.001)	0.0532*** (0.001)	-0.0314*** (0.001)	-0.0332*** (0.001)	-0.0366*** (0.001)	-0.0314*** (0.001)	-0.0303*** (0.001)	-0.0354*** (0.001)
Married	-0.0162*** (0.001)	-0.0171*** (0.001)	-0.0175*** (0.001)	-0.0186*** (0.001)	-0.0135*** (0.001)	-0.0189*** (0.001)	0.0112*** (0.001)	0.0122*** (0.001)	0.0131*** (0.001)	0.0118*** (0.001)	0.0166*** (0.001)	0.0131*** (0.001)
Education	0.0843*** (0.000)	0.0848*** (0.000)	0.0908*** (0.000)	0.0829*** (0.000)	0.0680*** (0.000)	0.0849*** (0.000)	-0.0650*** (0.000)	-0.0655*** (0.000)	-0.0657*** (0.000)	-0.0647*** (0.000)	-0.0661*** (0.001)	-0.0666*** (0.000)
GDP per capita, Log		0.0112*** (0.001)						0.0187*** (0.001)				
Oil rents (% of GDP)		0.0037*** (0.000)						-0.0019*** (0.000)				
Social protection			0.0006*** (0.000)						-0.0044*** (0.000)			
Labor market flexibility			0.1096*** (0.005)						-0.1783*** (0.007)			
Quality of institutions				0.0450*** (0.001)						0.0026 (0.002)		
Conflict					-0.0113*** (0.001)						0.0336*** (0.002)	
Industry						0.0005*** (0.000)						-0.0026*** (0.000)
Unemployment						-0.0019*** (0.000)						0.0036*** (0.000)
Observations	2,528,074	2,528,074	1,753,406	2,493,623	1,655,936	2,528,074	1,119,588	1,119,588	892,426	1,112,186	685,467	1,119,588
R2	0.22	0.23	0.24	0.23	0.21	0.23	0.15	0.15	0.15	0.15	0.14	0.15
Birth-cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

To explore whether educational mobility is a predictor of occupational mobility, we run the estimates, including upward (downward) educational mobility in Table 14. The results indicate that upward mobility in education is a strong determinant of upward mobility in occupation and the opposite holds for downward mobility. The probability for children who experienced educational mobility upward to upgrade in terms of occupations is 20% higher than children who experienced downward educational mobility. Also, children who are less educated than their parents (downward educational mobility) are more likely to experience downward occupation mobility. These findings emphasize the strong link between education and occupations.

Table 13. Impact of Educational Mobility on Occupational Mobility

Variables	(1)	(2)	(3)	(4)
	Upward mobility		Downward mobility	
Upward mobility in education	0.1112*** (0.001)			-0.0825*** (0.001)
Downward mobility in education		-0.0739*** (0.001)	0.0753*** (0.001)	
Female	0.0027*** (0.001)	-0.0038*** (0.001)	-0.0339*** (0.001)	-0.0803*** (0.001)
Rural	-0.1247*** (0.001)	-0.1284*** (0.001)	0.1236*** (0.001)	0.1877*** (0.001)
Age	0.0203*** (0.000)	0.0256*** (0.000)	-0.0174*** (0.000)	-0.0169*** (0.000)
Age square	-0.0003*** (0.000)	-0.0004*** (0.000)	0.0003*** (0.000)	0.0002*** (0.000)
Family size	-0.0007*** (0.000)	-0.0013*** (0.000)	0.0032*** (0.000)	0.0031*** (0.000)
Access to electricity	0.0852*** (0.001)	0.1033*** (0.001)	-0.0612*** (0.002)	-0.0642*** (0.002)
Access to water	0.0567*** (0.001)	0.0426*** (0.001)	-0.0180*** (0.001)	-0.0471*** (0.001)
Married	-0.0251*** (0.001)	-0.0122*** (0.001)	0.0178*** (0.001)	0.0199*** (0.001)
Observations	2,040,178	487,896	457,642	661,946
R2	0.2225	0.2821	0.1587	0.1331
Birth-cohort FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Finally, we run the estimates for each country to gauge country heterogeneities. The results reported in Appendix Table F3 for upward occupational mobility and Appendix Table F4 for downward occupational mobility shed light that the effect of each variable differs between countries. For instance, girls have higher probability than boys to experience upward occupational mobility in Benin, Ethiopia and Togo, contrary to girls

from Guinea, Malawi and Mozambique where their chances to upgrade in terms of occupations are lower than boys. However, the sign of the marginal effect associated with upward/downward educational mobility is the same for most countries, meaning that education is a strong predictor of occupations in most African countries. In few exceptions such as Malawi, Sierra Leone and Togo, the upward educational mobility is not a significant determinant of upward occupational mobility, which may be due to market failures or mismatch between trainings and labor market needs.

VI. CONCLUDING REMARKS

Using a rich dataset covering 28 African countries and more than 120 million individuals, this paper provides strong economic mobility evidence across generations in Africa. In the absence of longitudinal consumption and income data, we focus on educational and occupational attainment two salient economic status measures. Our findings are threefold.

First, we demonstrate that intergenerational educational mobility has increased dramatically in Africa. Nowadays, almost 50% of pupils born in the 90s from non-educated parents have completed complete at least primary school, against less than 10% in the 1920s. Moreover, the gender gap has declined substantially. nonetheless, children born in rural regions have a significantly lower (higher) likelihood of upward (downward) mobility in educational status than their urban peers. We document substantial across and within-country variation in upward and downward mobility.

Second, we show that the African region exhibits intergenerational persistence in occupational status. The offspring of parents employed in the agricultural sector has less than a 20% likelihood of upward job mobility. Upward mobility is the same for both genders while downward occupational mobility is smaller for girls than boys. The urban-rural divide is conspicuous and mobility rates are higher for more economically developed countries and districts. We also find that upward occupational mobility is declining for the most recent birth cohorts, while downward mobility increases.

Third, we take advantage of the richness of the data to shed some light on the drivers of educational and occupational mobility in Africa. We present evidence that observable individual and household characteristics can partly explain the variation in mobility rates across individuals for educational and occupational mobility. We find that all individual characteristics (age, gender, marital status, place of birth), and all family characteristics (family size, financial constraints proxied by access to electricity and water) impact upward and downward mobility rates. We also investigate how the macro-economic environment and policies are correlated with occupational and educational mobility indices. Our findings indicate that the quality of institutions, public spending and social protection coverage have a positive (negative) impact on upward (downward) educational and occupational mobility. Good quality of institutions and sound social policies are instrumental for better education outcomes and job creation. On the other hand, conflict

and poor education conditions have a reverse impact as they tend to reduce the likelihood of upward educational and occupational mobility. Thus, children from countries with better macro and socio-political environment have more chances to climb up the social ladder.

This pandemic crisis led to school closures and jobs loss for many people, and this paper is topical. The policy implications of the findings could be useful to revive the African economies. As some studies have shown, the COVID-19 pandemic could exacerbate the pre-existing social inequalities, which are well highlighted in this paper regarding educational and occupational mobility. The paper provides strong evidence of inequalities in social mobility in Africa that policymakers should consider as they put in place policies to address the effects of the pandemic. Policymakers should implement targeted policies to address the gender gap and the rural/urban divide and the social inequalities between districts within countries. Improving access to necessary infrastructure such as electricity and water and social protection are essential to boost educational and occupational mobility. Policies aiming to enhance education conditions, significantly reducing pupils' ratio to teachers, and the quality of institutions should be pursued.

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Supplementary Online Appendix

The Supplementary appendix contains additional results omitted from the main text. Section A breaks down the number of parents-children matched pairs used in the analysis by country and sample. Section B shows the transition matrices for the full sample of countries, first for educational attainment and then for the occupational attainment. Section C shows country level estimates of IM up and IM down across birth cohorts. Section D displays additional evidence of our analysis that is not shown in the main text. Section E shows country level estimates of intergenerational mobility for education and occupation when we restrict the minimum age to be 18 and 25, respectively.

Appendix A. Data by Country and Sample Education

Table A1. Educational Mobility Sample by Country		
Nr	Country	Observations
1	Botswana	110,337
2	Cameroon	458,587
3	Benin	372,130
4	Ethiopia	1,372,629
5	Ghana	1,052,808
6	Guinea	337,771
7	Kenya	1,027,329
8	Lesotho	93,114
9	Liberia	59,122
10	Malawi	329,560
11	Mali	509,439
12	Mauritius	96,427
13	Morocco	2,229,031
14	Mozambique	451,955
15	Nigeria	74,474
16	Rwanda	329,988
17	Senegal	608,154
18	Sierra Leone	86,567
19	South Africa	3,506,219
20	Zimbabwe	83,844
21	South Sudan	88,568
22	Sudan	972,688
23	Togo	43,100
24	Uganda	1,072,014
25	Egypt	5,635,419
26	Tanzania	1,534,897
27	Burkina Faso	366,416
28	Zambia	584,921
Total:		23,487,508

Appendix Table A2. Educational Mobility by Sample

Nr Census	Observations	Nr Census	Observations
1 Botswana 1981	13,609	39 Morocco 2014	1,086,749
2 Botswana 1991	22,194	40 Mozambique 1997	195,098
3 Botswana 2001	35,156	41 Mozambique 2007	256,857
4 Botswana 2011	39,378	42 Nigeria 2006	13,923
5 Cameroon 1976	73,983	43 Nigeria 2007	14,192
6 Cameroon 1987	88,993	44 Nigeria 2008	19,683
7 Cameroon 2005	295,611	45 Nigeria 2009	12,650
8 Benin 1979	33,555	46 Nigeria 2010	14,026
9 Benin 1992	60,327	47 Rwanda 2002	141,669
10 Benin 2002	100,418	48 Rwanda 2012	188,319
11 Benin 2013	177,830	49 Senegal 1988	94,407
12 Ethiopia 1984	368,449	50 Senegal 2002	200,390
13 Ethiopia 1994	793,522	51 Senegal 2013	313,357
14 Ethiopia 2007	210,658	52 Sierra Leone 2004	86,567
15 Ghana 1984	267,498	53 South Africa 1996	730,804
16 Ghana 2000	301,504	54 South Africa 2001	870,921
17 Ghana 2010	483,806	55 South Africa 2007	232,413
18 Guinea 1983	40,647	56 South Africa 2011	914,863
19 Guinea 1996	103,251	57 South Africa 2016	757,218
20 Guinea 2014	193,873	58 Zimbabwe 2012	83,844
21 Kenya 1989	160,194	59 South Sudan 2008	88,568
22 Kenya 1999	214,603	60 Sudan 2008	972,688
23 Kenya 2009	652,532	61 Togo 1970	2,192
24 Lesotho 1996	48,449	62 Togo 2010	40,908
25 Lesotho 2006	44,665	63 Uganda 1991	181,306
26 Liberia 2008	59,122	64 Uganda 2002	309,798
27 Malawi 1987	72,032	65 Uganda 2014	580,910
28 Malawi 1998	107,897	66 Egypt 1986	1,895,172
29 Malawi 2008	149,631	67 Egypt 1996	1,660,644
30 Mali 1987	107,586	68 Egypt 2006	2,079,603
31 Mali 1998	147,125	69 Tanzania 1988	260,793
32 Mali 2009	254,728	70 Tanzania 2002	555,283
33 Mauritius 1990	29,944	71 Tanzania 2012	718,821
34 Mauritius 2000	32,598	72 Burkina Faso 1996	195,229
35 Mauritius 2011	33,885	73 Burkina Faso 2006	171,187
36 Morocco 1982	232,533	74 Zambia 1990	139,532
37 Morocco 1994	401,157	75 Zambia 2000	198,491
38 Morocco 2004	508,592	76 Zambia 2010	246,898
Total: 23,487,508			

Table A3. Occupational Mobility Sample by Country

Nr Country	Observations
1 Botswana	13,535
2 Cameroon	92,846
3 Benin	152,114
4 Ethiopia	652,852
5 Ghana	480,737
6 Guinea	147,508
7 Kenya	50,596
8 Lesotho	12,622
9 Malawi	98,933
10 Mali	210,014
11 Mauritius	41,470
12 Morocco	487,381
13 Mozambique	183,908
14 Nigeria	11,583
15 Rwanda	121,493
16 Senegal	193,428
17 Sierra Leone	37,032
18 South Africa	119,706
19 Zimbabwe	19,895
20 South Sudan	42,368
21 Sudan	198,964
22 Togo	2,782
23 Uganda	153,362
24 Egypt	764,120
25 Tanzania	627,889
26 Burkina Faso	116,429
27 Zambia	131,273
Total:	5,164,840

Table A4. Occupational Mobility by Sample

Nr Census	Observations	Nr Census	Observations
1 Botswana 1981	667	34 Morocco 2014	192,905
2 Botswana 1991	3,585	35 Mozambique 1997	87,290
3 Botswana 2001	3,749	36 Mozambique 2007	96,618
4 Botswana 2011	5,534	37 Nigeria 2008	4,873
5 Cameroon 1976	26,563	38 Nigeria 2009	1,934
6 Cameroon 2005	66,283	39 Nigeria 2010	4,776
7 Benin 1979	14,079	40 Rwanda 2002	58,662
8 Benin 1992	35,183	41 Rwanda 2012	62,831
9 Benin 2002	51,429	42 Senegal 1988	34,956
10 Benin 2013	51,423	43 Senegal 2002	59,805
11 Ethiopia 1984	182,358	44 Senegal 2013	98,667
12 Ethiopia 1994	470,494	45 Sierra Leone 2004	37,032
13 Ghana 1984	155,518	46 South Africa 1996	52,766
14 Ghana 2000	142,768	47 South Africa 2001	49,442
15 Ghana 2010	182,451	48 South Africa 2007	17,498
16 Guinea 1983	19,359	49 Zimbabwe 2012	19,895
17 Guinea 1996	51,392	50 South Sudan 2008	42,368
18 Guinea 2014	76,757	51 Sudan 2008	198,964
19 Kenya 1989	50,596	52 Togo 1970	1,020
20 Lesotho 1996	5,861	53 Togo 2010	1,762
21 Lesotho 2006	6,761	54 Uganda 1991	75,990
22 Malawi 1987	26,936	55 Uganda 2002	77,372
23 Malawi 1998	40,550	56 Egypt 1986	238,042
24 Malawi 2008	31,447	57 Egypt 1996	238,120
25 Mali 1987	54,302	58 Egypt 2006	287,958
26 Mali 1998	71,508	59 Tanzania 1988	143,915
27 Mali 2009	84,204	60 Tanzania 2002	223,525
28 Mauritius 1990	13,260	61 Tanzania 2012	260,449
29 Mauritius 2000	13,430	62 Burkina Faso 1996	116,429
30 Mauritius 2011	14,780	63 Zambia 1990	17,620
31 Morocco 1982	80,673	64 Zambia 2000	54,925
32 Morocco 1994	88,322	65 Zambia 2010	58,728
33 Morocco 2004	125,481		
Total: 5,164,840			

Appendix B. Transition Matrices

Figure B10. Intergenerational Mobility Transition Matrices in Education

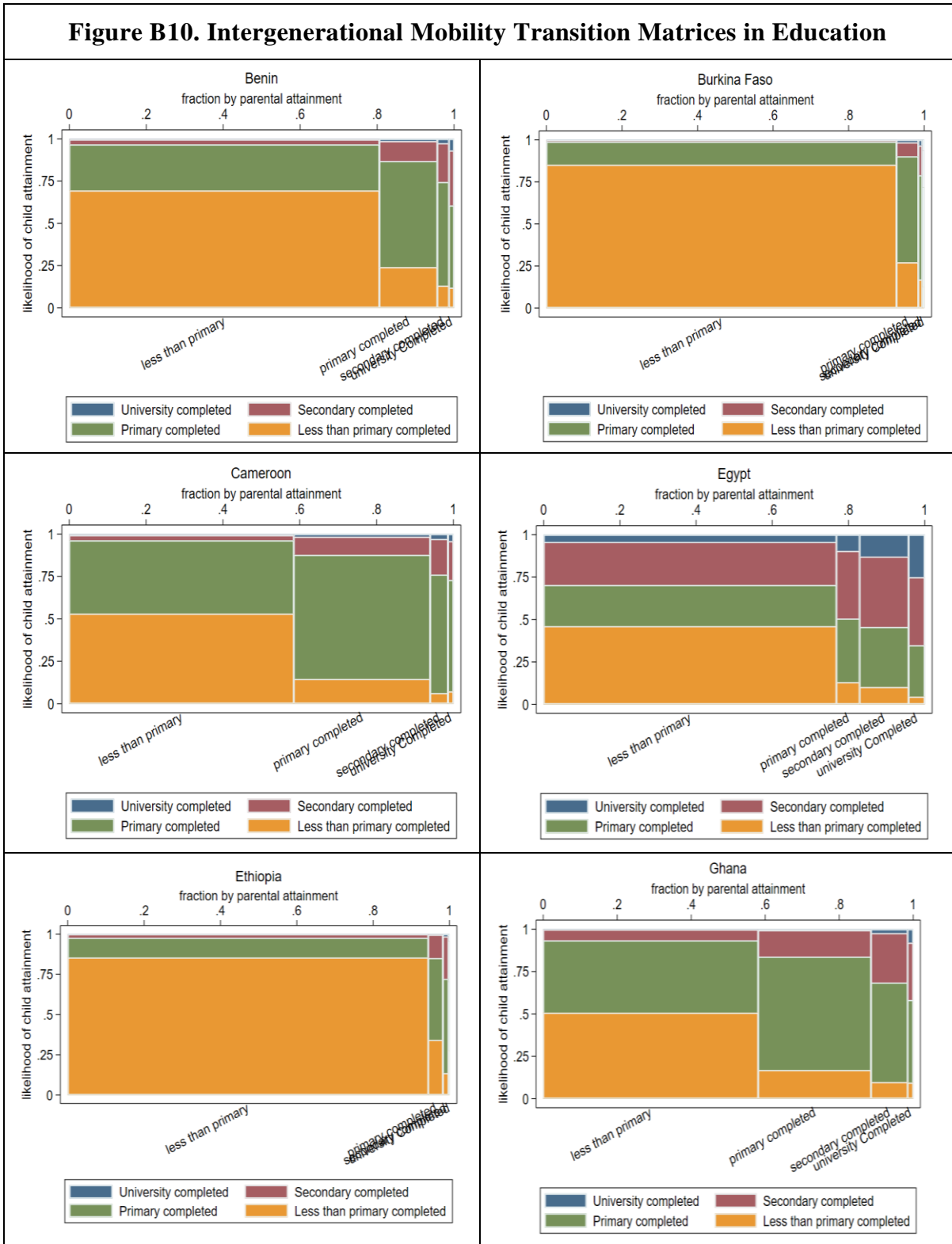


Figure B11. Intergenerational Mobility Transition Matrices in Education
(Continued)

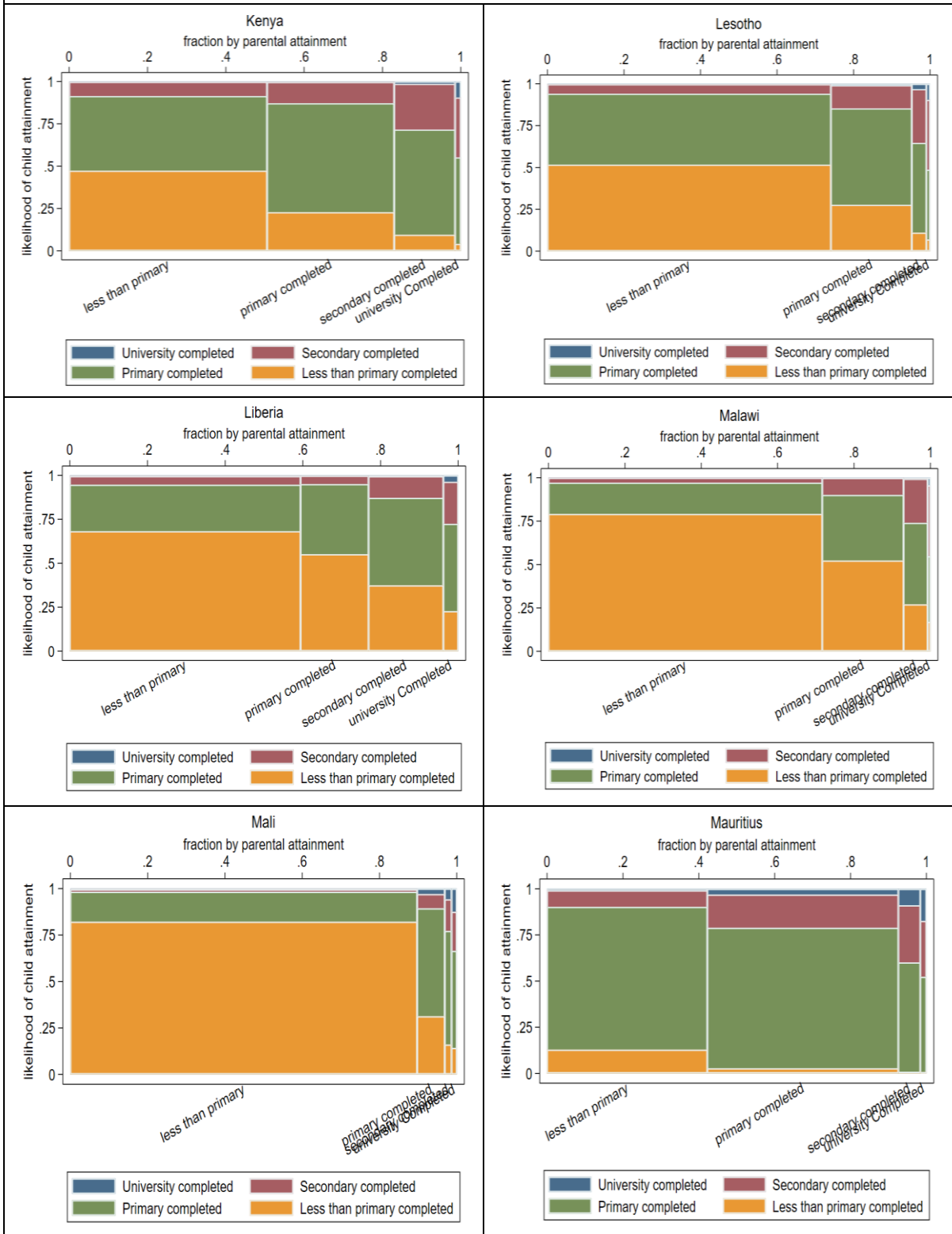


Figure B12. Intergenerational Mobility Transition Matrices in Education
(Continued)

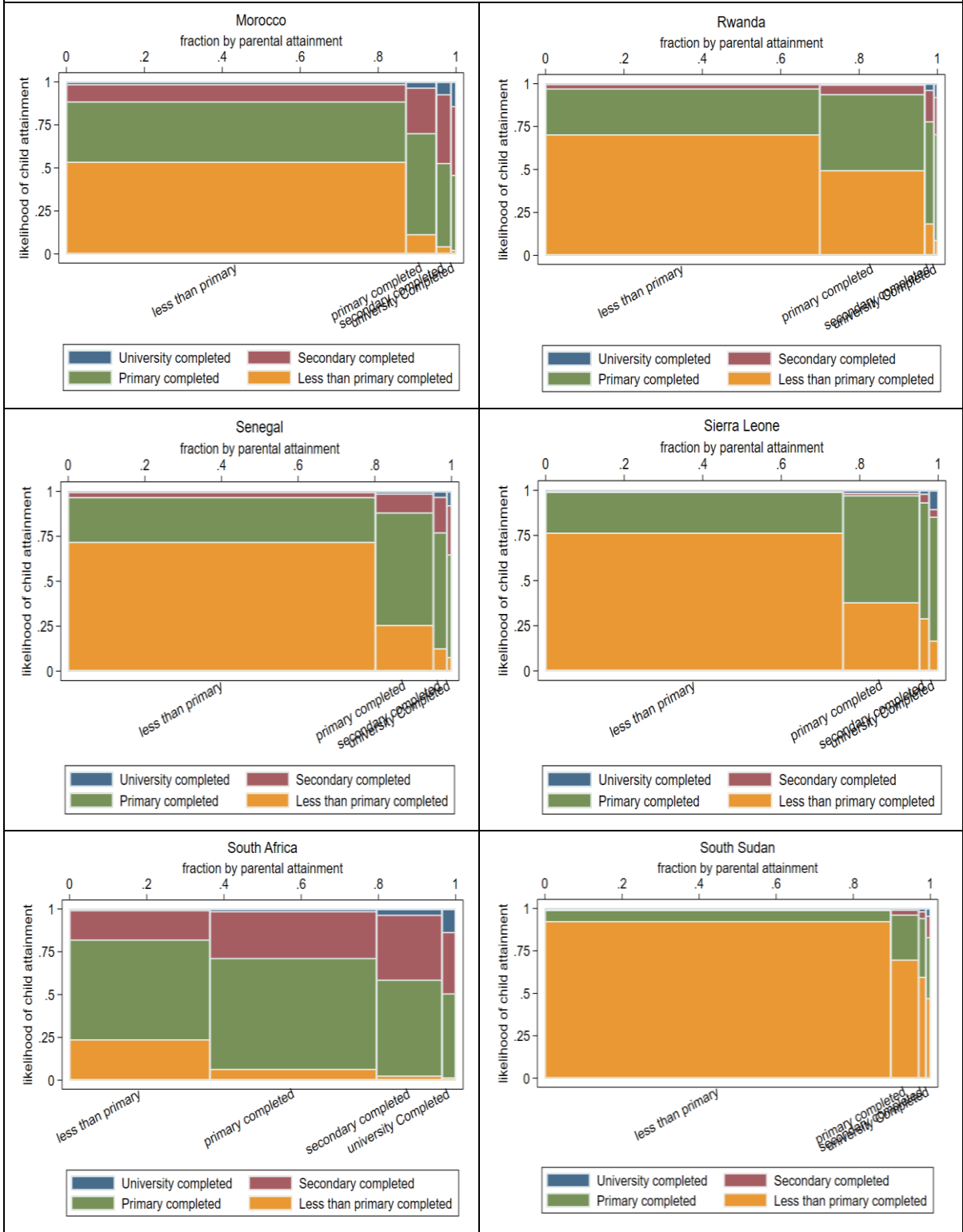


Figure B13. Intergenerational Mobility Transition Matrices in Education (Concluded)

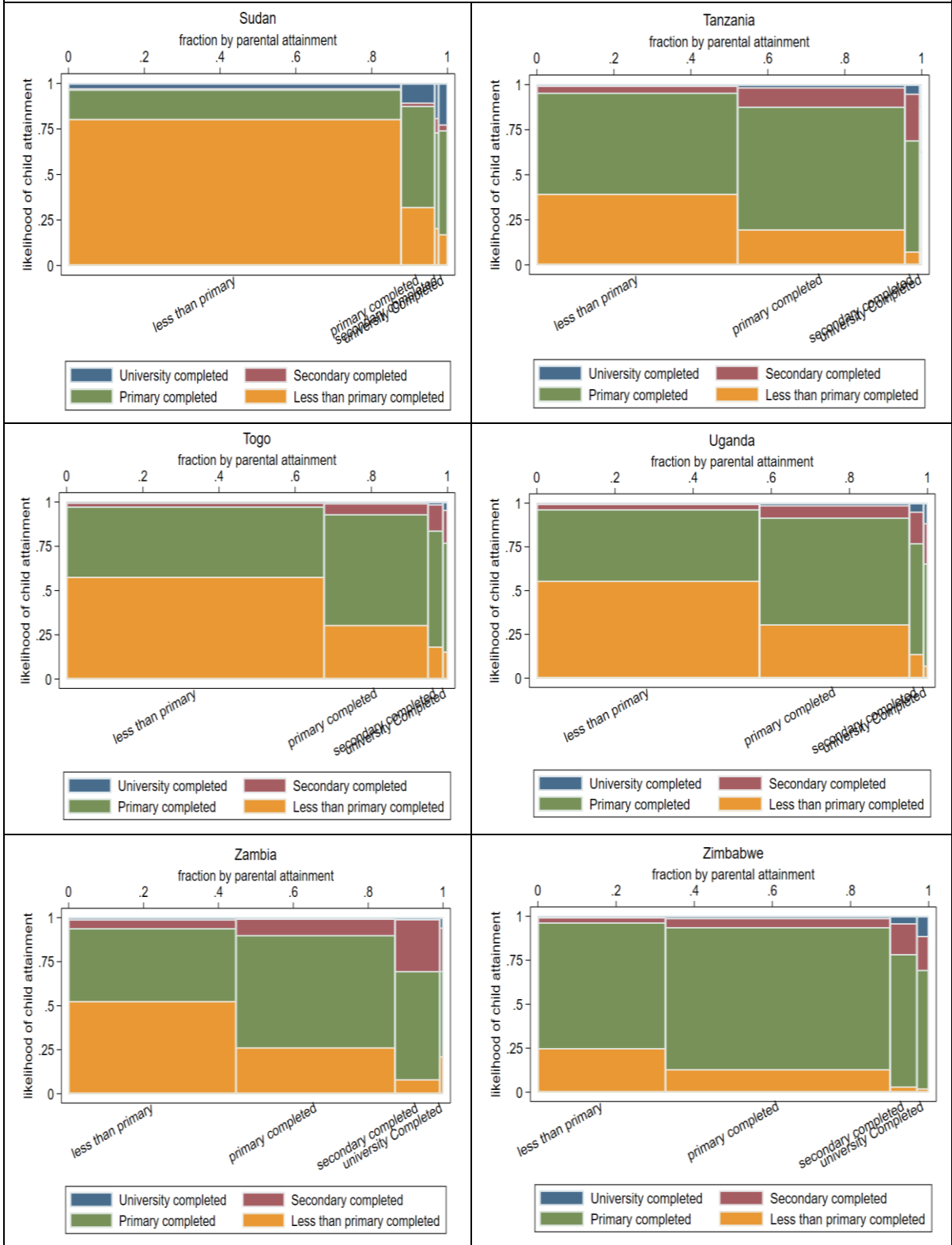


Figure B2. Intergenerational Mobility Transition Matrices in Occupation

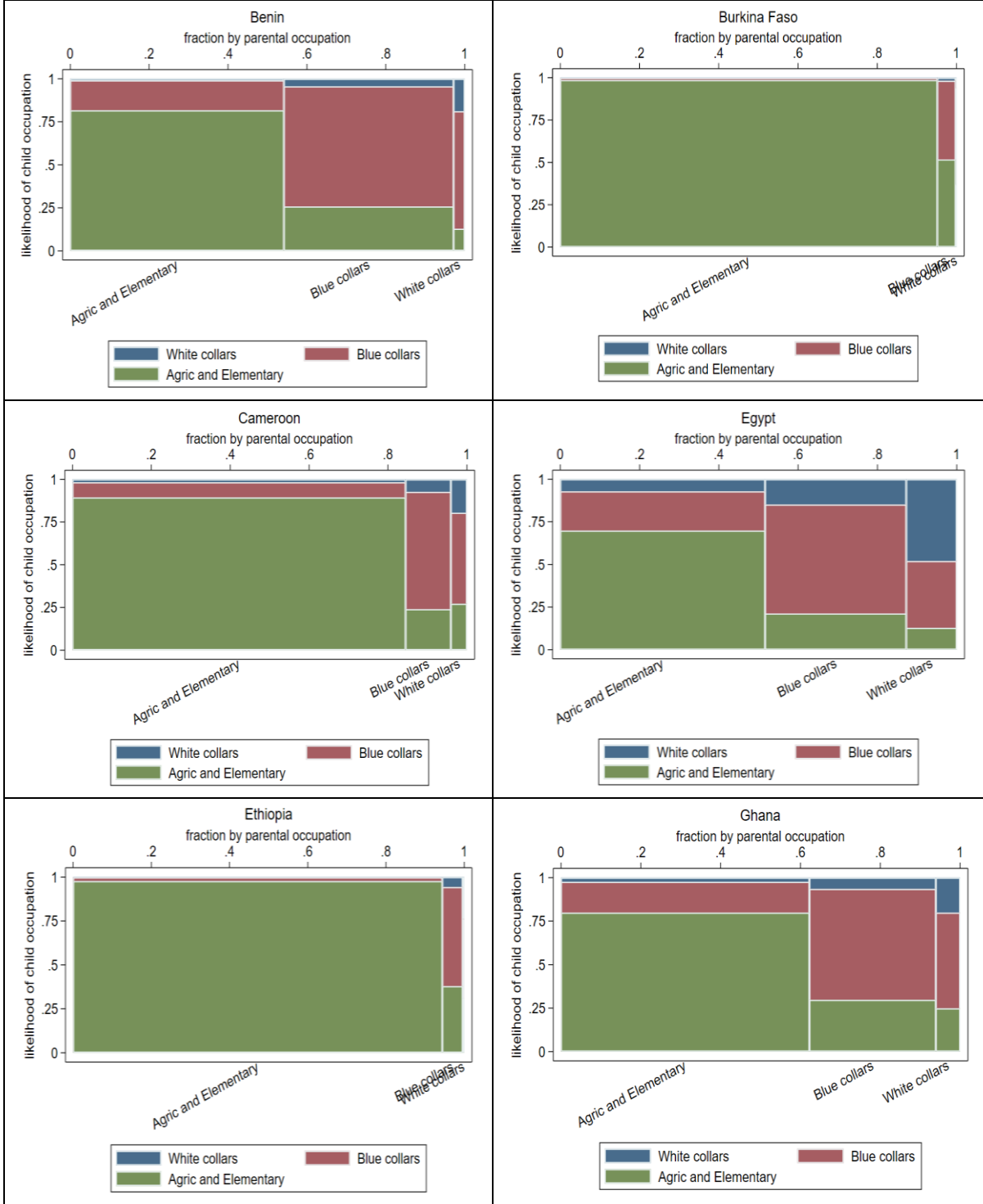


Figure B2. Intergenerational Mobility Transition Matrices in Occupation
(Continued)

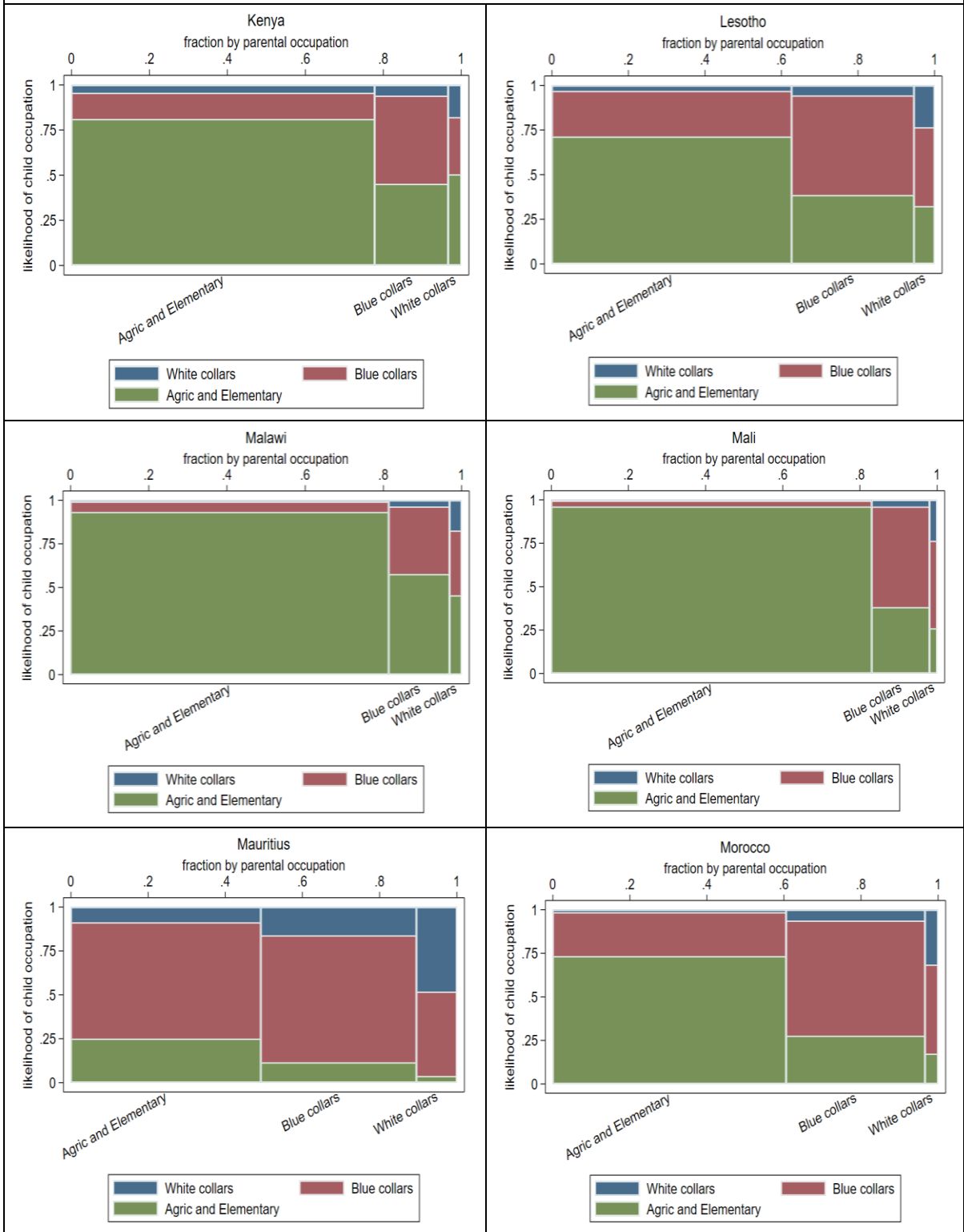


Figure B2. Intergenerational Mobility Transition Matrices in Occupation
(Continued)

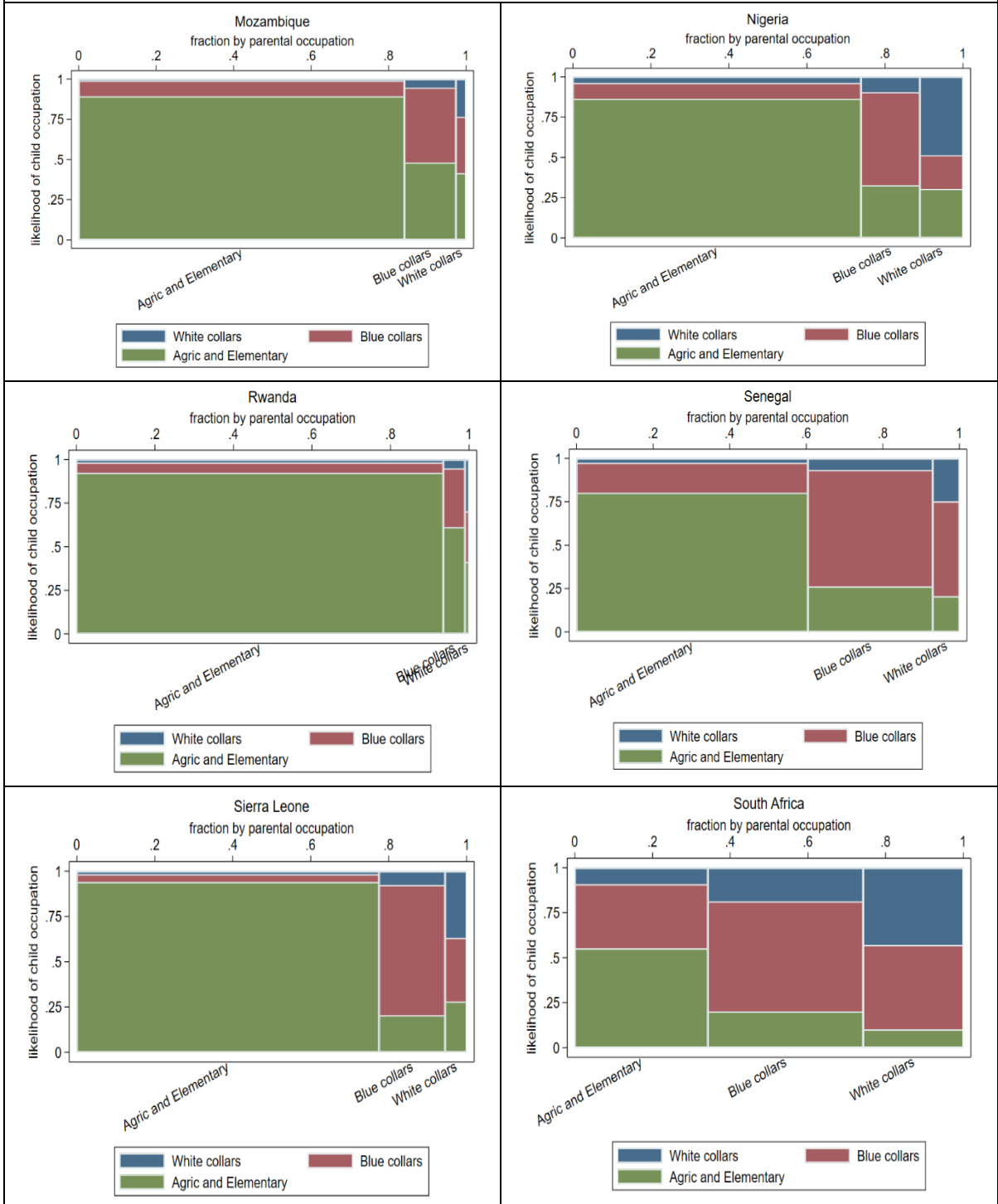
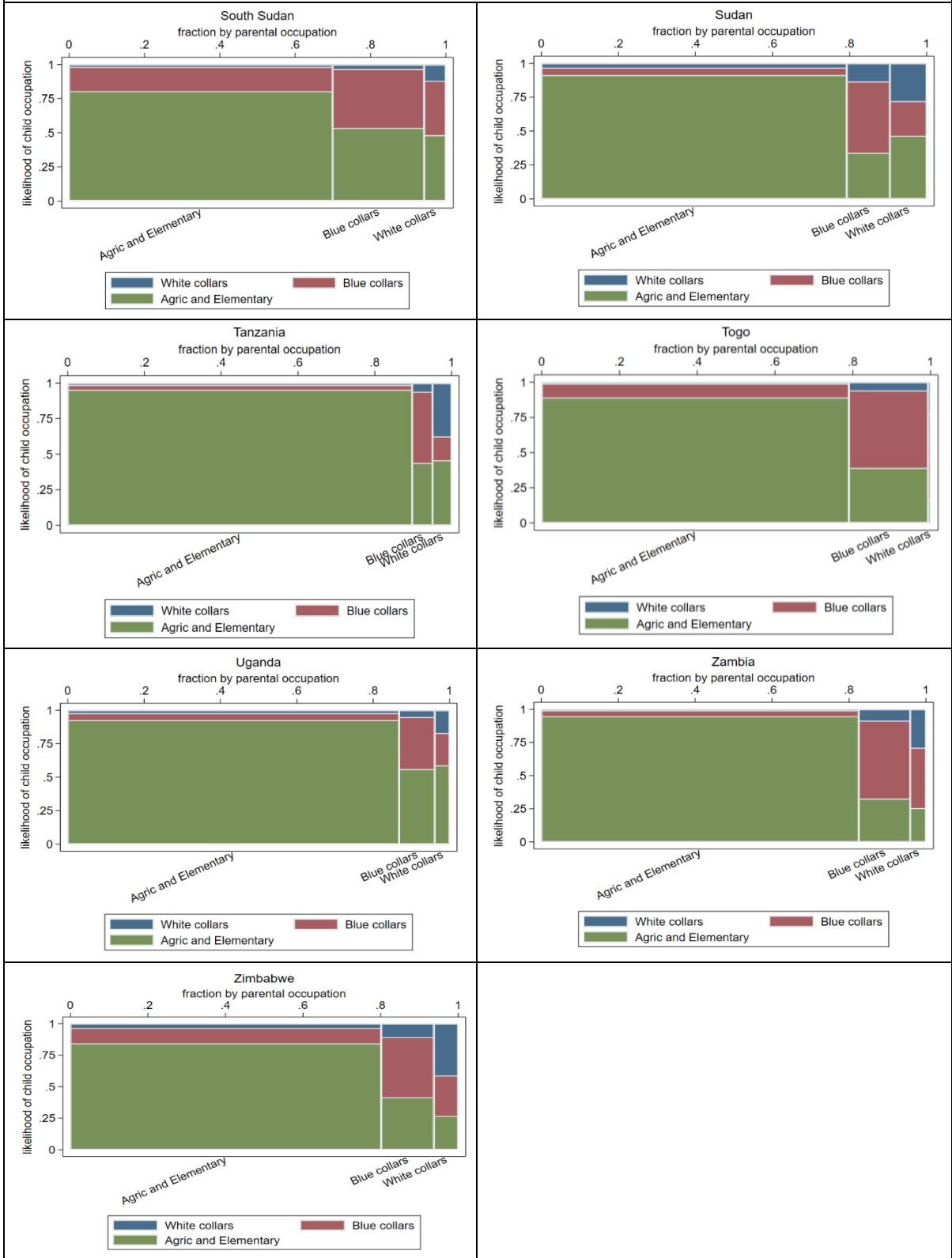


Figure B2. Intergenerational Mobility Transition Matrices in Occupation (Concluded)



Appendix C. Intergenerational Mobility Across Birth-cohorts

Figure C14. Intergenerational Mobility in Education

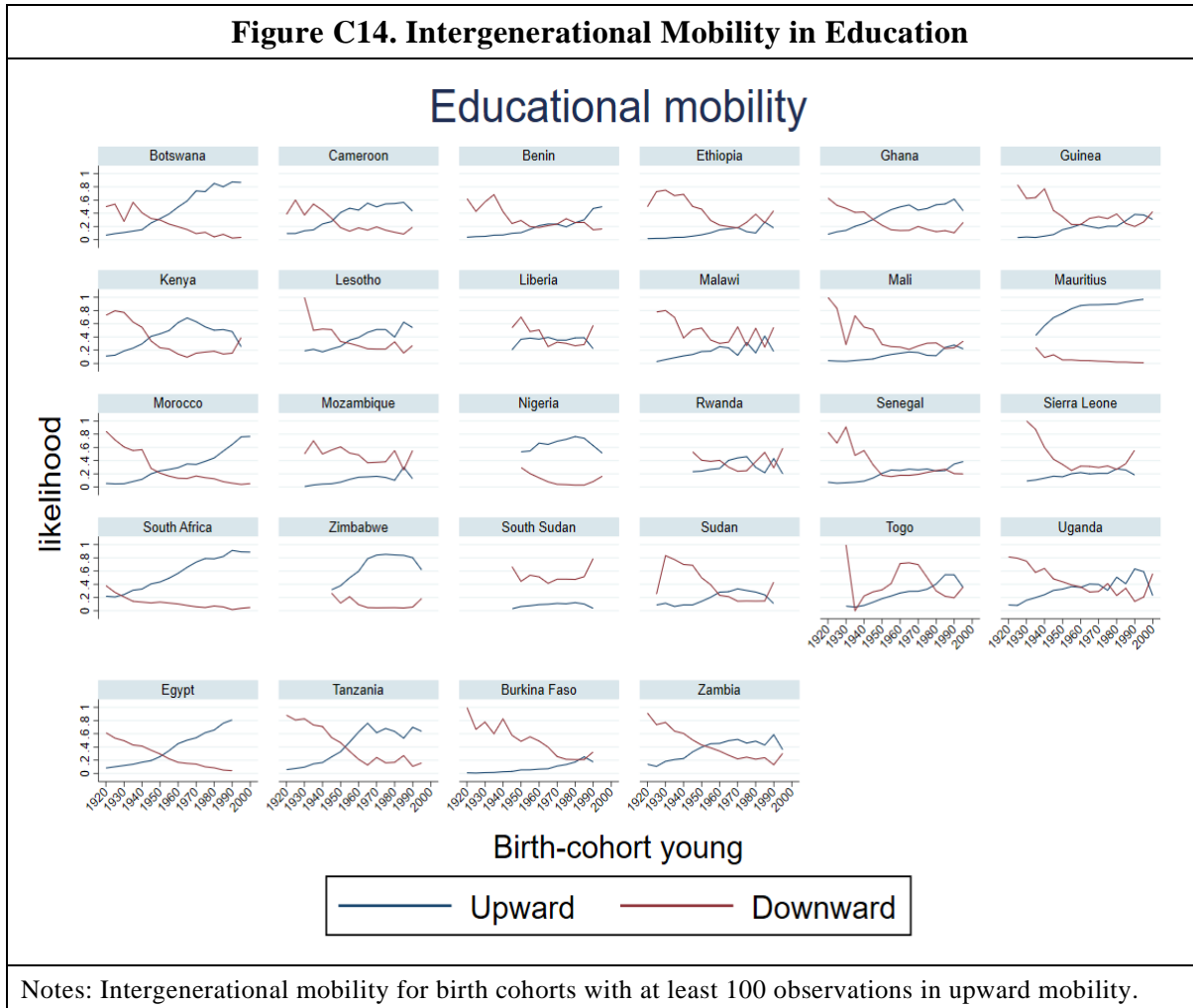
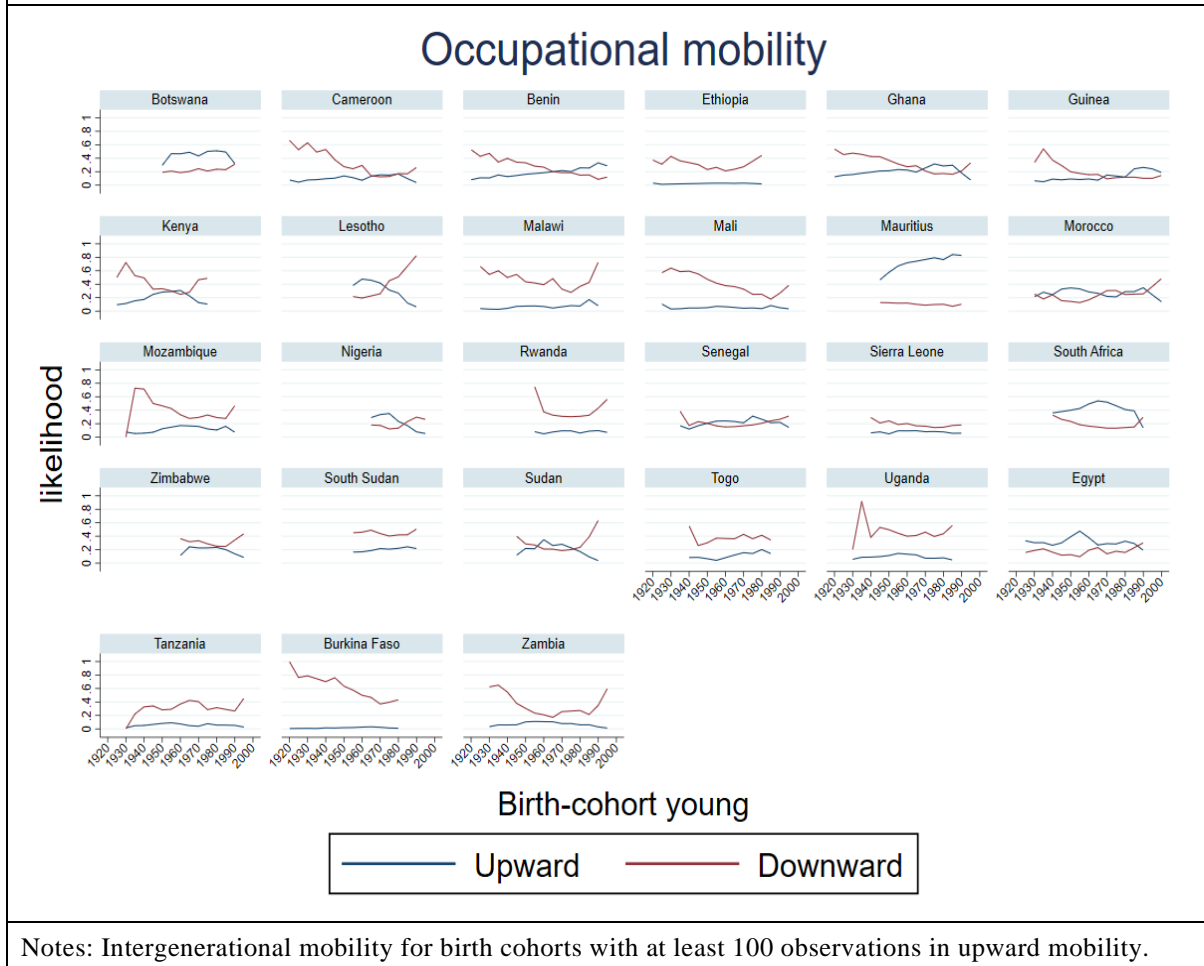


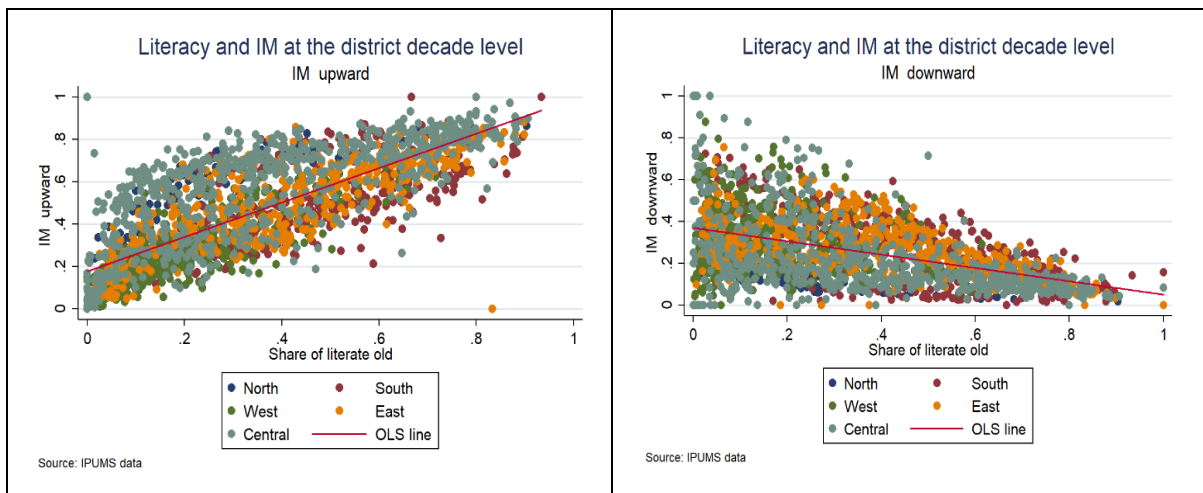
Figure C15. Intergenerational Mobility in Occupation



Appendix D. Further Analysis

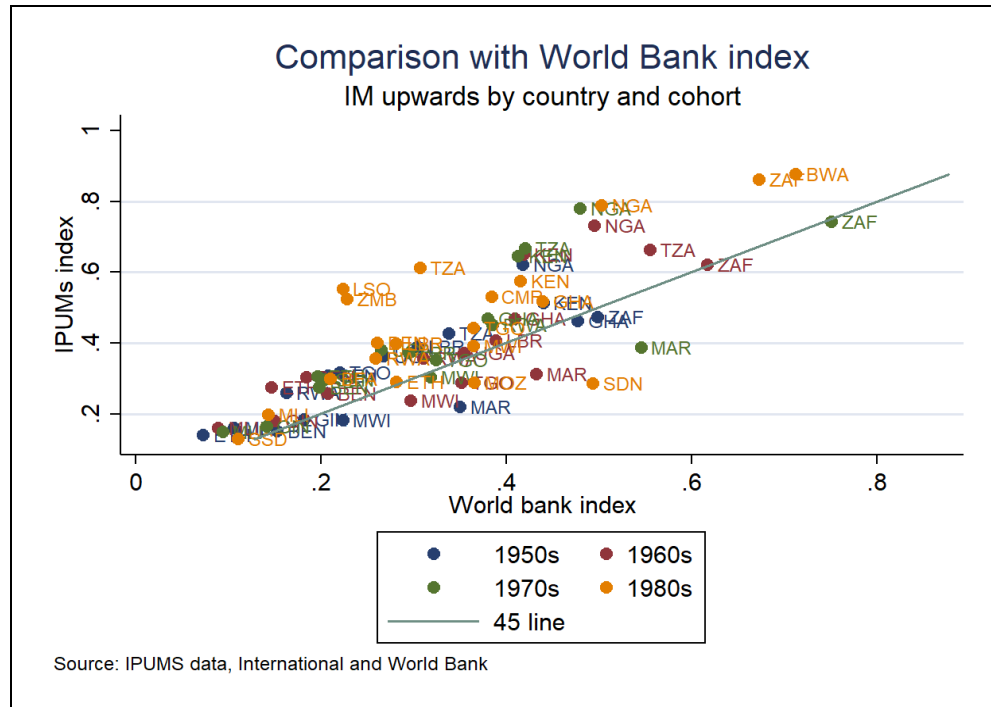
Literacy of the Old and IM

We examine the association between IM and literacy rates of the old generation. We demonstrate the results at the district level. The left graph shows the positive correlation between the share of parents' literacy and upward educational mobility and the right figure the negative link between parents' literacy and downward educational mobility. Note that each dot corresponds to a district color-coded.



Cross check with World Bank's GDIM Index

The World Bank has recently published estimates of intergenerational mobility across 148 economies (see World bank 2018). This database (GDIM) contains estimates of absolute and relative intergenerational mobility (IGM) by 10-year cohorts, where individuals born in the 10-year range of cohorts between 1940 and 1989 are estimated. These IGM measures are also available by type (subpopulation) of parental educational attainment (Mothers /Fathers/ Average/Max) and type (subpopulation) of child's educational attainment (Sons/Daughters/ All, individuals of the surveys). In the figure below, we contrast our upward IM index with the figures reported by the World Bank. We construct the IM upwards index across countries and cohorts and compare it with the World Bank estimates. As can be noted from the 45-degree line the results are comparable, suggesting a strong correlation between our index and that of the World Bank despite the differences in the methodology and data sources.

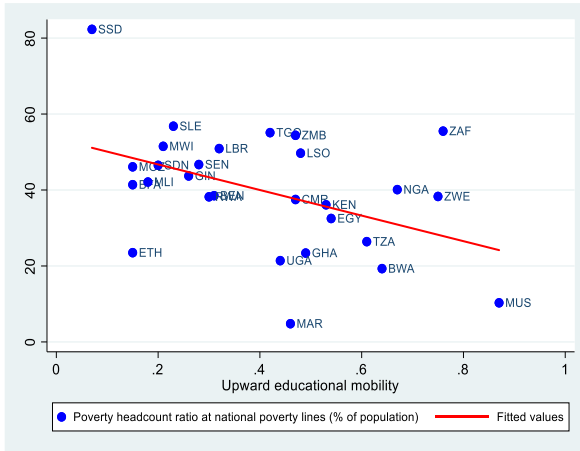


Correlations of educational mobility with key economic indicators

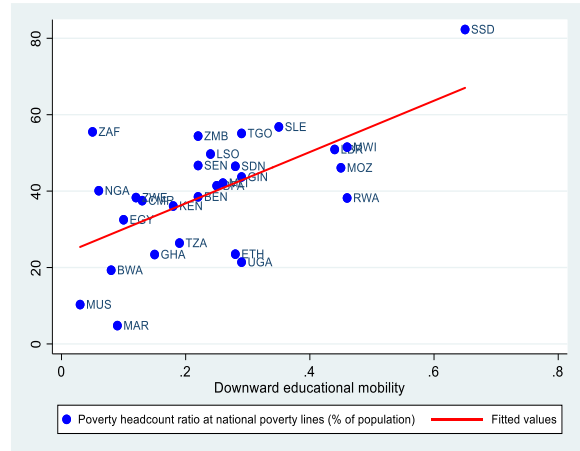
We present sensitivity analysis between IM indices and poverty rates. We look at the correlation between the different intergenerational education and occupation mobility indices and the poverty rates in African countries. The chart below shows that there is a negative (positive) relationship between upward(downward) educational and occupational mobility and poverty. Further analysis could be done to explore empirically this relationship, but at this point income data are not available for several African countries.

Relationship Between Social Mobility and Poverty

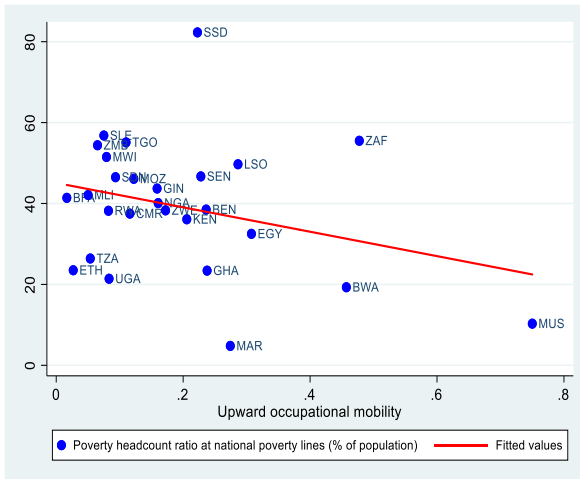
Upward educational mobility and poverty rate



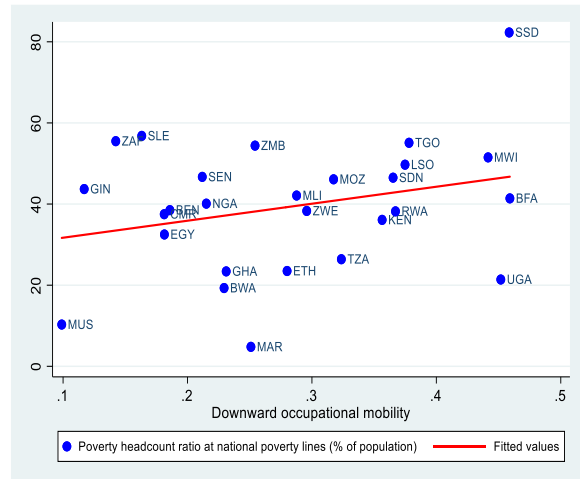
Downward educational mobility and poverty rate



Upward occupational mobility and poverty rate



Downward occupational mobility and poverty rate



Appendix E. Educational and Occupational Mobility with Different Age Limit

Table E1. Educational Mobility with Minimum Age of 18 and 25

country	Minimum age: 18		Minimum age: 25	
	Upward IM	Downward IM	Upward IM	Downward IM
Botswana	0.69	0.08	0.70	0.07
Cameroon	0.48	0.14	0.50	0.13
Benin	0.36	0.22	0.35	0.21
Ethiopia	0.12	0.35	0.15	0.29
Ghana	0.54	0.17	0.54	0.15
Guinea	0.22	0.37	0.22	0.34
Kenya	0.43	0.25	0.50	0.19
Lesotho	0.44	0.31	0.50	0.25
Liberia	0.22	0.58	0.30	0.46
Malawi	0.13	0.58	0.20	0.47
Mali	0.20	0.27	0.20	0.25
Morocco	0.40	0.11	0.38	0.12
Mozambique	0.10	0.58	0.15	0.47
Nigeria	0.62	0.09	0.67	0.07
Rwanda	0.20	0.57	0.28	0.47
Senegal	0.25	0.25	0.26	0.23
Sierra Leone	0.24	0.41	0.25	0.36
South Africa	0.78	0.08	0.80	0.06
Zimbabwe	0.65	0.17	0.72	0.13
South Sudan	0.04	0.79	0.07	0.69
Sudan	0.11	0.44	0.16	0.31
Togo	0.41	0.28	0.45	0.25
Uganda	0.33	0.38	0.37	0.33
Egypt	0.63	0.08	0.62	0.08
Tanzania	0.58	0.21	0.62	0.18
Burkina Faso	0.17	0.26	0.17	0.24
Zambia	0.45	0.24	0.48	0.22

Appendix F. Determinants of Social Mobility at the Country Level

Table F1. Determinants of Upward Educational Mobility by Country

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Benin	Botswana	Egypt	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Malawi	Mali	Mozambique
Female	-0.068***	0.189***	0.218***	-0.094***	-0.084***	-0.038***	-0.045***	0.280***	-0.128***	-0.049***	-0.025***	-0.059***
Rural	-0.084***	-0.125***	-0.099***	0.383*	-0.079***	-0.088***	-0.026**	-0.204***	-0.165***	-0.110***	-0.087***	-0.088***
Age	0.017***	0.014***	0.055***	0.053***	0.005***	0.016***	0.061***	0.050***	0.018***	0.047***	0.007***	0.019***
Age square	-0.0003***	-0.0004***	-0.001***	-0.001***	-0.0001***	-0.0002***	-0.001***	-0.001***	-0.0002***	-0.001***	-0.0001***	-0.0003***
Family size	-0.004***	-0.004**	-0.016***	0.013***	-0.015***	0.001***	0.008***	-0.0002	0.007***	0.006***	0.002***	0.002***
Electricity	0.130***	0.262***	0.158***	0.263***	0.185***	0.047***	0.297***	0.230***	0.114***	0.199***	0.079***	0.085***
Water	0.085***	0.180***	0.152***	0.109***	0.056***	0.016***	0.109***	0.078***	0.038***	0.060***	0.023***	0.043***
Observations	148,252	4,704	1,445,930	37,755	247,583	79,668	47,294	19,521	12,761	58,592	101,058	189,073

Variables	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
	Nigeria	Rwanda	Senegal	Sierra Leone	South Sudan	Sudan	Tanzania	Togo	Uganda	Zambia	Zimbabwe
Female	0.039***	-0.009***	-0.015***	-0.063***	-0.041***	0.028***	-0.055***	-0.182***	-0.120***	-0.095***	-0.019**
Rural	-0.039**	-0.060***	-0.147***	-0.149***	-0.057***	-0.067***	-0.089***	-0.152***	-0.153***	-0.172***	-0.185***
Age	0.048***	0.044***	0.015***	0.019***	0.018***	0.024***	0.037***	0.004	0.029***	0.058***	0.046***
Age square	-0.001***	-0.001***	-0.0002***	-0.0002***	-0.0002***	-0.0003***	-0.0006***	-0.0001	-0.0005***	-0.001***	-0.001***
Family size	-0.009***	0.008***	-0.003***	0.001**	0.0005	0.0001	0.0005**	-0.012***	0.010***	0.004***	0.001
Electricity	0.199***	0.162***	0.126***	0.063***	0.064***	0.131***	0.240***	0.224***	0.280***	0.205***	0.054***
Water	-0.051**	0.016***	-0.008***	0.041***	0.038***	0.076***	0.091***	0.073***	0.109***	0.134***	0.058***
Observations	7,668	105,219	201,683	35,990	45,079	280,109	376,673	3,462	138,963	55,202	10,438

*** p<0.01, ** p<0.05, * p<0.1. Birth-cohort and year fixed effects are included.

Table F2. Determinants of Downward Educational Mobility by Country

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Benin	Botswana	Egypt	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Malawi	Mali	Mozambique
Female	0.074***	-0.159***	-0.152***	0.033***	0.052***	-0.004	-0.009	-0.221***	0.096***	0.0001	-0.006	0.080***
Rural	0.089***	0.043*	0.039***		0.062***	0.139***	0.061***	0.133***	0.199***	0.168***	0.071***	0.091***
Age	-0.061***	-0.019***	-0.039***	-0.054***	-0.016***	-0.064***	-0.068***	-0.046***	-0.060***	-0.094***	-0.037***	-0.063***
Age square	0.001***	0.0003***	0.001***	0.001***	0.0003***	0.001***	0.001***	0.001***	0.001***	0.002***	0.0005***	0.001***
Family size	-0.001	0.004	0.009***	-0.003***	0.008***	0.002	-0.001	0.004*	-0.003	-0.002	-0.001	0.002*
Electricity	-0.143***	-0.207***	-0.081***	-0.116***	-0.098***	-0.057***	-0.209***	-0.221***	-0.180***	-0.224***	-0.170***	-0.186***
Water	-0.053***	-0.123***	-0.096***	-0.047***	-0.029***	-0.061***	-0.050***	-0.044***	-0.072***	-0.079***	-0.051***	-0.077***
Observations	19,422	1,377	270,448	6,230	137,427	3,240	9,604	4,863	4,008	16,450	7,594	12,037

Variables	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
	Nigeria	Rwanda	Senegal	Sierra Leone	South Sudan	Sudan	Tanzania	Togo	Uganda	Zambia	Zimbabwe
Female	0.004	-0.022***	-0.023***	0.074***	0.051***	-0.088***	-0.017***	0.132**	0.053***	0.026***	-0.028***
Rural	0.013	0.110***	0.101***	0.213***	0.089***	0.059***	0.055***	0.091	0.128***	0.152***	0.059***
Age	-0.018***	-0.065***	-0.045***	-0.044***	-0.075***	-0.045***	-0.028***	-0.017	-0.034***	-0.068***	-0.027***
Age square	0.0003***	0.001***	0.001***	0.001***	0.001***	0.001***	0.0005***	0.0002	0.001***	0.001***	0.0004***
Family size	0.001	-0.009***	0.009***	0.002	-0.001	0.005***	-0.001***	0.011	-0.014***	-0.006***	0.004***
Electricity	-0.053***	-0.210***	-0.152***	-0.115***	-0.122***	-0.129***	-0.152***	-0.222***	-0.273***	-0.173***	-0.046***
Water	0.014	-0.021***	0.003	-0.118***	-0.105***	-0.069***	-0.059***	-0.092	-0.133***	-0.068***	-0.029***
Observations	5,069	25,403	32,199	5,177	3,826	18,084	276,810	270	41,634	28,047	10,758

*** p<0.01, ** p<0.05, * p<0.1. Birth-cohort and year fixed effects are included.

Table F3. Determinants of Upward Occupational Mobility by Country

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Benin	Botswana	Egypt	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Malawi	Mali	Mozambique
Upward mobility in education	0.122***	0.555***	0.064***	0.126***	0.018***	0.066***	0.095***	0.041*	0.063***	-0.01	0.032***	0.037***
Female	0.228***	-0.054***	0.131***	0.188***	0.087***	-0.056***	-0.027***	0.121***	0.028***	-0.047***	0.016***	-0.124***
Rural	-0.098***	-0.168***	-0.190***		-0.121***	-0.175***	-0.127***	-0.117***	-0.059***	-0.095***	-0.112***	-0.096***
Age	0.014***	0.034***	0.026***	0.019***	0.017***	0.013***	0.022***	0.044***	-0.004*	0.012***	0.009***	0.017***
Age square	-0.0002***	-0.0005***	-0.0003***	-0.0003***	-0.0003***	-0.0002***	-0.0003***	-0.0006***	0.0001*	-0.0002***	-0.0001***	-0.0002***
Family size	-0.006***	0.002	-0.008***	0.003	-0.004***	0.0006**	0.003***	0.002	0.0005	-0.001*	-0.0003	0.004***
Electricity	0.092***	0.111	0.111***	0.103***	0.088***	0.067***	0.115***	0.014	0.092***	0.056***	0.043***	0.047***
Water	0.141***	0.149***	0.087***	0.045***	0.059***	0.006	0.026***	0.008	-0.017**	0.029***	0.031***	0.066***
Married	-0.071***	-0.03	-0.018***	-0.002	-0.009***	-0.041***	-0.014***	0.007	0.003	0.002	-0.023***	-0.002
Observations	81,025	1,814	480,729	6,429	157,187	54,330	35,499	6,545	8,065	49,679	58,524	152,860

Variables	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
	Nigeria	Rwanda	Senegal	Sierra Leone	South Sudan	Sudan	Tanzania	Togo	Uganda	Zambia	Zimbabwe
Upward mobility in education	0.044**	0.114***	-0.014	-0.024	-0.005	0.031***	0.018***	-0.04	0.067***	0.022***	0.171***
Female	0.031***	-0.052***	-0.207***	0.010***	0.076***	0.012***	-0.019***	0.093***	-0.017***	-0.009***	-0.023***
Rural	-0.053***	-0.059***	-0.162***	-0.078***	-0.072***	-0.099***	-0.051***	-0.168***	-0.121***	-0.061***	-0.135***
Age	0.017***	0.013***	0.023***	0.002**	-0.005***	0.009***	0.005***	0.004	0.016***	0.005***	0.013***
Age square	-0.0002***	-0.0002***	-0.0003***	-0.0002*	0.0001	-0.0001***	-0.0005***	-0.0001	-0.0002***	-0.0006***	-0.0002***
Family size	-0.006***	0.002***	-0.0003	0.002***	0.001	0.001***	-0.001***	-0.009***	0.001***	-0.0003	-0.001
Electricity	0.081***	0.035***	0.101***	0.042***	0.133***	0.053***	0.051***	0.193***	0.092***	0.032***	0.012
Water	0.016	0.009***	0.082***	0.005	0.078***	0.023***	0.024***	0.053	0.024***	0.0386***	0.047***
Married	0.033**	-0.017***	-0.059***	-0.013***	0.084***	-0.001	-0.001	0.021	-0.006***	0.004*	0.003
Observations	5,555	89,171	94,604	25,689	32,422	144,533	267,009	1,166	113,110	41,617	6,551

*** p<0.01, ** p<0.05, * p<0.1. Birth-cohort and year fixed effects are included.

Table F4. Determinants of Downward Occupational Mobility by Country

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Benin	Botswana	Egypt	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Malawi	Mali
Downward mobility in education	0.038***	0.068	0.070***	0.060***	0.002	0.037	0.088**	0.024	0.004	0.024	0.039**
Female	-0.014***	-0.023	-0.097***	-0.007	-0.036***	-0.003	-0.027	-0.117***	-0.031	0.038***	-0.003
Rural	0.043***	-0.016	0.134***		0.096***	0.083***	0.223***	0.114***	0.162***	0.119***	0.087***
Age	-0.003**	-0.049***	-0.008***	-0.006	-0.014***	-0.004	-0.025***	-0.034***	-0.029***	-0.077***	-0.014***
Age square	0.0008***	0.001***	0.0001***	0.0006	0.0002***	0.001**	0.0003**	0.0005***	0.0004***	0.001***	0.0002***
Family size	-0.004***	0.007*	0.004***	-0.001	0.002***	-0.0001	0.008***	0.011***	-0.004	-0.004**	-0.004***
Electricity	-0.005	-0.052	-0.013**	0.008	-0.059***	-0.011	-0.195***	-0.039	-0.076**	-0.018	-0.014
Water	-0.0004	-0.244***	-0.032***	-0.016	-0.028***	0.004	0.028	-0.02	0.028	-0.053***	-0.005
Married	0.002	-0.066	-0.002	-0.016	0.028***	0.025*	0.029	-0.099***	0.013	0.033**	0.052***
Observations	11,942	657	202,972	3,697	59,529	1,897	2,536	1,506	1,566	5,379	3,678

Variables	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	Mozambique	Nigeria	Rwanda	Senegal	Sierra Leone	South Sudan	Sudan	Tanzania	Uganda	Zambia	Zimbabwe
Downward mobility in education	0.091***	0.104*	0.156***	0.061***	0.012	0.018	0.008	0.037***	0.014	0.079***	0.211***
Female	0.093***	-0.034	0.086***	0.152***	-0.062***	0.004	-0.025**	0.017***	0.016	0.040***	0.023
Rural	0.115***	0.139***	0.170***	0.086***	0.093***	0.073***	0.109***	0.036***	0.238***	0.179***	0.117***
Age	-0.029***	-0.033***	-0.017**	0.002	-0.007*	-0.016*	-0.011***	-0.025***	-0.046***	-0.030***	0.006
Age square	0.0006***	0.0005***	0.0003**	-0.0006*	0.0001*	0.0002	0.0002***	0.0004***	0.0007***	0.0005***	-0.0001
Family size	-0.001	0.012***	-0.001	0.001	0.001	0.008**	-0.001	0.0004	-0.0002	0.002	0.004
Electricity	-0.081***	-0.008	-0.072***	-0.077***	-0.006	-0.120***	-0.031***	-0.075***	-0.086***	-0.021*	-0.038
Water	-0.057***	-0.111***	-0.067***	-0.009	-0.057***	-0.021	-0.040***	-0.018***	-0.083***	-0.071***	-0.02
Married	0.011	-0.049	0.002	0.035***	-0.005	-0.101***	-0.013	0.007	0.036**	-0.0005	0.017
Observations	4,628	1,075	1,949	16,220	2,323	1,602	8,431	33,413	7,050	6,756	2,027

*** p<0.01, ** p<0.05, * p<0.1. Birth-cohort and year fixed effects are included.