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Explaining inter-ethnic and inter-religious marriage in Sub-Saharan Africa

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Sanghamitra Bandyopadhyay and Elliott Green

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Inter-cultural marriages have long been of great interest to social scientists who wish to examine how ethnic, religious, racial and other identities form and change over time. However, the vast majority of this research has been concentrated in developed countries. As such we undertake the first major examination into the causes and correlates of inter-ethnic and inter-religious marriage in contemporary Sub-Saharan Africa. We use Demographic and Health Survey (DHS) couples data in a series of multi-level logit models from up to 36 countries to document a number of findings. First, we show that inter-ethnic marriage rates are high, at 22.3% on average, and rising across Africa over the past 30 years, with rates approaching 50% for recent marriages in Gabon and Zambia and rising rates over time for all countries in our dataset. In contrast, however, we show that inter-religious marriage rates are much lower, at only 5%, and stagnant, with no country average higher than 15% and declining over time in a number of countries. Second, as expected from the literature on inter-cultural marriages in other contexts, we show that modernization variables such as urbanization, literacy/education, wealth and declines in polygamy and agricultural employment are significantly correlated with rising levels of inter-ethnic marriage; in contrast, the relationship between modernization and inter-religious marriage is much more ambiguous. Third, we show that inter-ethnic marriage is significantly correlated with higher age at marriage, being previously married and migration before marriage. Finally, we find no evidence that inter-married couples have fewer children, in contrast to findings elsewhere.

Keywords: Ethnicity; Religion; Marriage; Sub-Saharan Africa; DHS data; Modernization

JEL codes: J12, N37, O10

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Abstract

Inter-cultural marriages have long been of great interest to social scientists who wish to examine how ethnic, religious, racial and other identities form and change over time. However, the vast majority of this research has been concentrated in developed countries. As such we undertake the first major examination into the causes and correlates of inter-ethnic and inter-religious marriage in contemporary Sub-Saharan Africa. We use Demographic and Health Survey (DHS) couples data in a series of multi-level logit models from up to 36 countries to document a number of findings. First, we show that inter-ethnic marriage rates are high, at 22.3% on average, and rising across Africa over the past 30 years, with rates approaching 50% for recent marriages in Gabon and Zambia and rising rates over time for all countries in our dataset. In contrast, however, we show that inter-religious marriage rates are much lower, at only 5%, and stagnant, with no country average higher than 15% and declining over time in a number of countries. Second, as expected from the literature on inter-cultural marriages in other contexts, we show that modernization variables such as urbanization, literacy/education, wealth and declines in polygamy and agricultural employment are significantly correlated with rising levels of inter-ethnic marriage; in contrast, the relationship between modernization and inter-religious marriage is much more ambiguous. Third, we show that inter-ethnic marriage is significantly correlated with higher age at marriage, being previously married and migration before marriage. Finally, we find no evidence that inter-married couples have fewer children, in contrast to findings elsewhere.

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1. Introduction

Inter-cultural marriages have long been of great interest to social scientists who wish to examine how ethnic, religious, racial, linguistic, national, caste and tribal identities form and change over time. There has been a great deal of attention on inter-racial marriages in the United States over the past few decades, as well as on inter-religious and inter-national marriages in other contexts. However, there remains a notable absence of quantitative literature on inter-marriage in Sub-Saharan Africa despite high levels of ethnic and religious diversity and a long-standing qualitative focus on the subject from anthropologists.

As such we undertake the first major examination into the causes and correlates of inter-ethnic and inter-religious marriage in contemporary Sub-Saharan Africa. We use Demographic and Health Survey (DHS) couples data from up to 26 countries for inter-ethnic marriage and up to 36 countries for inter-religious marriage, and document several novel and important findings. First, we show that inter-ethnic marriage rates are high and rising across Africa, while inter-religious marriage rates are low and stagnant. More specifically, we show that more than one out of every five marriages (22.3%) in our sample is inter-ethnic, while only one out of every twenty (5.0%) is inter-religious. Moreover, the inter-ethnic marriage rate is rising for every country in our sample and even approaches 50% in Gabon and Zambia in recent years, while the picture is much more mixed for inter-religious marriages. Second, as expected from the literature on inter-cultural marriages in other contexts, we show that modernization variables such as urbanization, literacy/education, wealth and a decline in polygamy are significantly correlated with rising levels of inter-ethnic marriage; in contrast, the relationship between modernization and inter-religious marriage is much more ambiguous. Similarly, we show that agricultural employment is negatively and significantly correlated with inter-ethnic marriage, while employment in services, professional/managerial and clerical positions is positively correlated. Third, we show that

inter-ethnic marriage is significantly correlated with higher age at marriage, being previously married and migration before marriage. Finally, we find no evidence that inter-married couples have fewer numbers of children, in contrast to findings elsewhere.

The rest of the paper is organized as follows. In section 2 we discuss the previous literature on inter-marriage and provide an overview of inter-ethnic and inter-religious marriages in Africa. Section 3 describes the broader context of inter-ethnic and inter-religious marriage in Africa. In Section 4 we present estimates from our multi-level regression analysis. Finally, in Section 5 we conclude.

2. Literature Review

The vast majority of literature on inter-cultural marriages has been on inter-racial marriages in the United States (see (Qian & Lichter, 2011) for a recent overview), with some assorted literature on other countries such as Estonia (Van Ham & Tammaru, 2011), the Netherlands (Kalmijn & Van Tubergen, 2006; Van Tubergen & Maas, 2007), Singapore (Lee, Potvin, & Verdieck, 1974), Latvia (Monden & Smits, 2005), Sweden (Dribe & Lundh, 2008, 2011) and the UK (Jones, 1984; Muttarak & Heath, 2010). In the developing country context there is a small literature on inter-caste and inter-religious marriage in India (Ahuja & Ostermann, 2016; Goli, Singh, & Sekher, 2013), inter-ethnic marriage in China (Mamet, Jacobson, & Heaton, 2005) and mixed marriages by nationality in Qatar (Alharahsheh, Mohieddin, & Almeer, 2015). Cross-national examinations of intermarriage are extremely small in number; one such example is (Peres & Schrift, 1978), which studies Israel, the United States and South Africa; another (Hou, Wu, Schimmele, & Myles, 2015) studies Canada and the United States. In contrast to much of the aforementioned literature, the scholarship on inter-marriage in Africa is almost entirely qualitative in nature (Arens & Arens,

1978; Grillo, 1974; Jacobson, Amoateng, & Heaton, 2004; Peil, 1975; Salamone, 1975; Schildkrout, 1974; D. J. Smith, 2005).

There are several individual and group-level factors which have been shown to be positively correlated with intermarriage across the quantitative and qualitative literature. The first and foremost one is education (Choi & Tienda, 2017; Dribe & Lundh, 2008; Furtado, 2012; Furtado & Theodoropoulos, 2011; Hou et al., 2015; Kalmijn & Van Tubergen, 2006; Muttarak & Heath, 2010; Qian, Lichter, & Tumin, 2018; Van Tubergen & Maas, 2007), inasmuch as education should promote greater tolerance of individuals from different backgrounds, while more educated individuals are more likely to come into contact with members of other groups. Indeed, any factor that might increase inter-cultural contact before marriage could lead to greater intermarriage, with strong evidence for the positive role of urbanization (Choi & Tienda, 2017), age at marriage (Muttarak & Heath, 2010) and service in the armed forces (Arens & Arens, 1978; Chiswick & Houseworth, 2011; Fryer, 2007; Peil, 1975; D. J. Smith, 2005).

Other individual factors correlated with intermarriage include being previously married – which might lead individuals to be downgraded by others in the marriage market and thus lead them to search farther than others for a new spouse, including across cultures (Chiswick & Houseworth, 2011); alternatively individuals in a second or subsequent marriage may have a history of migration and thus have fewer intra-ethnic familial ties that would lead them away from an inter-ethnic marriage (Arens & Arens, 1978, p. 153). As regards religion, (Arens & Arens, 1978, p. 155) find evidence from one town in Tanzania that Muslims are more likely to inter-marry ethnically than Christians. From the qualitative literature we find evidence that polygamy might be positively associated with inter-ethnic marriage, inasmuch as men could take on one wife from their own ethnic group and feel free to take a second wife from another group (Salamone, 1975, p. 414). Finally, at the group level there is a robust finding for a negative role for group size (Chiswick & Houseworth,

2011; Choi & Tienda, 2017; Fryer, 2007; Furtado & Theodoropoulos, 2011; Hou et al., 2015; Kalmijn & Van Tubergen, 2010; Mamet et al., 2005; Van Tubergen & Maas, 2007), due to the fact that members of smaller groups are forced to interact more with non-group members than members of larger groups. As such we add variables capturing all of these characteristics below.

3. Overview of Intermarriages in Africa

Inter-cultural marriages have a long history in Africa. Most obviously, whole ethnic or racial groups have developed around a history of mixed marriage, most prominently the Coloured groups in southern Africa who emerged from centuries of European-African-Asian mixing. In Cape Verde the majority ethnic group is the Creoles of mixed African and European descent, a group which features prominently in other former Portuguese colonies as well, while in Tanzania and Comoros members of the Shirazi ethnic group claim to have mixed African-Persian ancestry. In other parts of pre-colonial Africa it was very common to have inter-ethnic marriages between groups as a means of developing extensive kinship ties and political alliances while still maintaining group identities, such as in Cameroon, the eastern Congo, Ethiopia, Kenya, Malawi and Nigeria (Forrest, 2004, pp. 38-41; Lonsdale, 2012, pp. 93-94). While (Lonsdale, 2012, p. 102) argues that inter-ethnic marriage was discouraged in colonial Africa as colonial officials attempted to define tribes as distinct units – and in apartheid South Africa white/non-white marriage was actually banned – there is nonetheless evidence that inter-ethnic marriage rates were 30% or higher in colonial towns in Sierra Leone, South Africa and Zambia (Banton, 1957; Hellmann, 1948; Wilson, 1942).[1] Moreover, anecdotal evidence exists that inter-ethnic marriage continued to remain high in post-colonial Botswana (Werbner, 2002), Ghana (Schildkrout, 1973) and Tanzania (Arens & Arens, 1978), even as it was actively discouraged in various contexts (Cohen, 1969).

Indeed, there are multiple prominent examples of inter-ethnic and inter-religious marriage in Africa. Thanks to the recent film *A United Kingdom* (2016), perhaps the most famous example of an inter-racial marriage was the marriage of Seretse Khama, then Paramount Chief for the Bangwato tribe and later President of Botswana 1966-1980, to the white British woman Ruth Williams in the UK in 1948, which led to his exile from Botswana for five years in the 1950s. One child from this marriage, Ian Khama, later became a politician himself and was President of Botswana between 2008 and 2018. Other prominent examples of children from inter-racial couples who went on to become heads of state in post-colonial Africa include Nicolas Grunitzky, President of Togo 1963-1967 (with an African mother and German-Polish father) and Jerry Rawlings, President of Ghana 1981-2001 (with an African mother and a Scottish father). Examples of intra-racial, inter-ethnic marriages in contemporary Africa include Alpha Oumar Konaré, President of Mali 1992-2002 and at least three recent heads of state of Liberia (Charles Taylor [1997-2003], Guyde Bryant [2003-2006] and Ellen Johnson-Sirleaf [2006-2018]).

Interestingly, examples of inter-religious marriages are also not too difficult to find but are usually examples of inter-ethnic or inter-racial marriages as well. For instance, the Catholic Félix Houphouët-Boigny, President of Cote d'Ivoire 1960-1993, was married to the Muslim Kady Racine Sow from Senegal from 1930 to 1952; similarly Alassane Ouattara, President of Cote d'Ivoire since 2010, is Muslim yet married to the Catholic French national Dominique Nouvian. Finally, Ali Bongo Ondimba, President of Gabon since 2009, is Muslim and married the Christian French national Sylvia Najma Valentin in 1989 and the Christian American national Inge Lynn Collins in 1994 (whom he later divorced).[2]

4. Results

4.1. Data Description

We use Demographic and Health Survey (DHS) Couples data, where each observation is a married couple living in the same household. The DHS program has surveyed individuals from low- and middle-income countries since the late 1980s with the purpose of collecting data on fertility, family planning, health and nutrition. The DHS usually (but not always) collects data from both men and women in their surveys, whereupon men are interviewed randomly in every second or third household surveyed and the couples data is created by matching data from the information provided in the individual surveys. The women in the couples data are always aged 15-49; the age range of the men is more variable but always includes those between the ages of 20 and 49 (usually aged 20-54). The surveys generate both individual- and household-level data; the former include age, ethnicity, religion, literacy, education and age at marriage, among others, while the latter include urban residence and asset ownership/wealth.

To calculate data on intermarriage we used individual-level data from both spouses on ethnicity and religion from the most recent DHS survey by country. Not all surveys list data on ethnicity; in many cases the data is either missing or it is given by language groups (i.e., Namibia), race (Zimbabwe) or region (Democratic Republic of Congo). In some cases such as Rwanda and Tanzania older surveys asked data about ethnicity but have not included the question for over twenty years; as such we use surveys from the 1990s for three countries (namely the Central African Republic, Rwanda and Tanzania). We are thus left with 26 country surveys from 1992 through 2016 across the continent with data on ethnic identity for both women and men.

As for religion, most surveys include data on the following religious categories: Muslims, Catholics, Protestants, Animists and no religion. In many cases different types of non-Catholic Christians were listed, while in four cases (Guinea, Liberia, Niger and Senegal) Christians were listed as a single group. We only consider three religious groups in the

paper in order to calculate religious intermarriage, namely Animists, Christians and Muslims, which leaves us with data from 36 countries.

4.2. Descriptive Statistics

We first begin our analysis with a series of descriptive statistics. The average proportion of marriages that are inter-ethnic across the entire dataset are 22.3%, compared to only 5.0% that are inter-religious. To put these numbers in perspective, inter-marriage rates in other ethnically mixed countries include inter-caste and inter-religious marriage rates of 6.1% and 2.7% in India (Goli et al., 2013), inter-ethnic marriage rates in Latvia of around 33% (Monden & Smits, 2005) and inter-racial marriage rates in the US of roughly 10% (Livingston & Brown, 2017). In other words, inter-ethnic marriage rates in Africa are among the highest in the world.

The country averages for both measures are given in Figures 1 and 2, with means by country alongside survey size and year given in Table 1. The differences between countries are quite stark for inter-ethnic marriage but less so for inter-religious marriage, which is confirmed in the country-level Inter-Class Correlation (ICC) for the country level of 5.5% for inter-ethnic marriage but 0% for inter-religious marriage. In only one case does the inter-religious marriage rate exceed that of the inter-ethnic marriage rate, namely Togo (which we return to below).

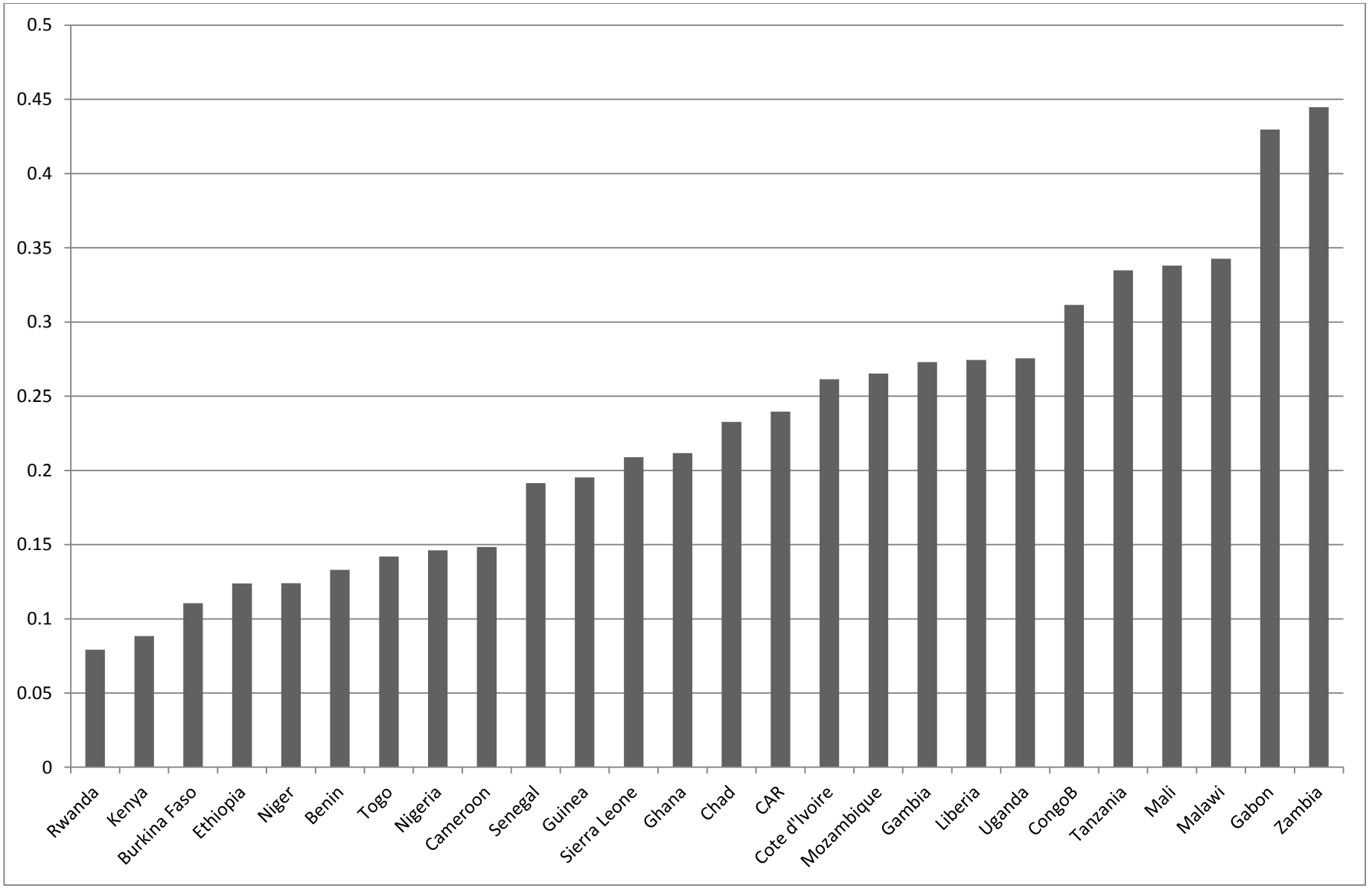

Figure 1: Inter-ethnic Marriage Rate by Country

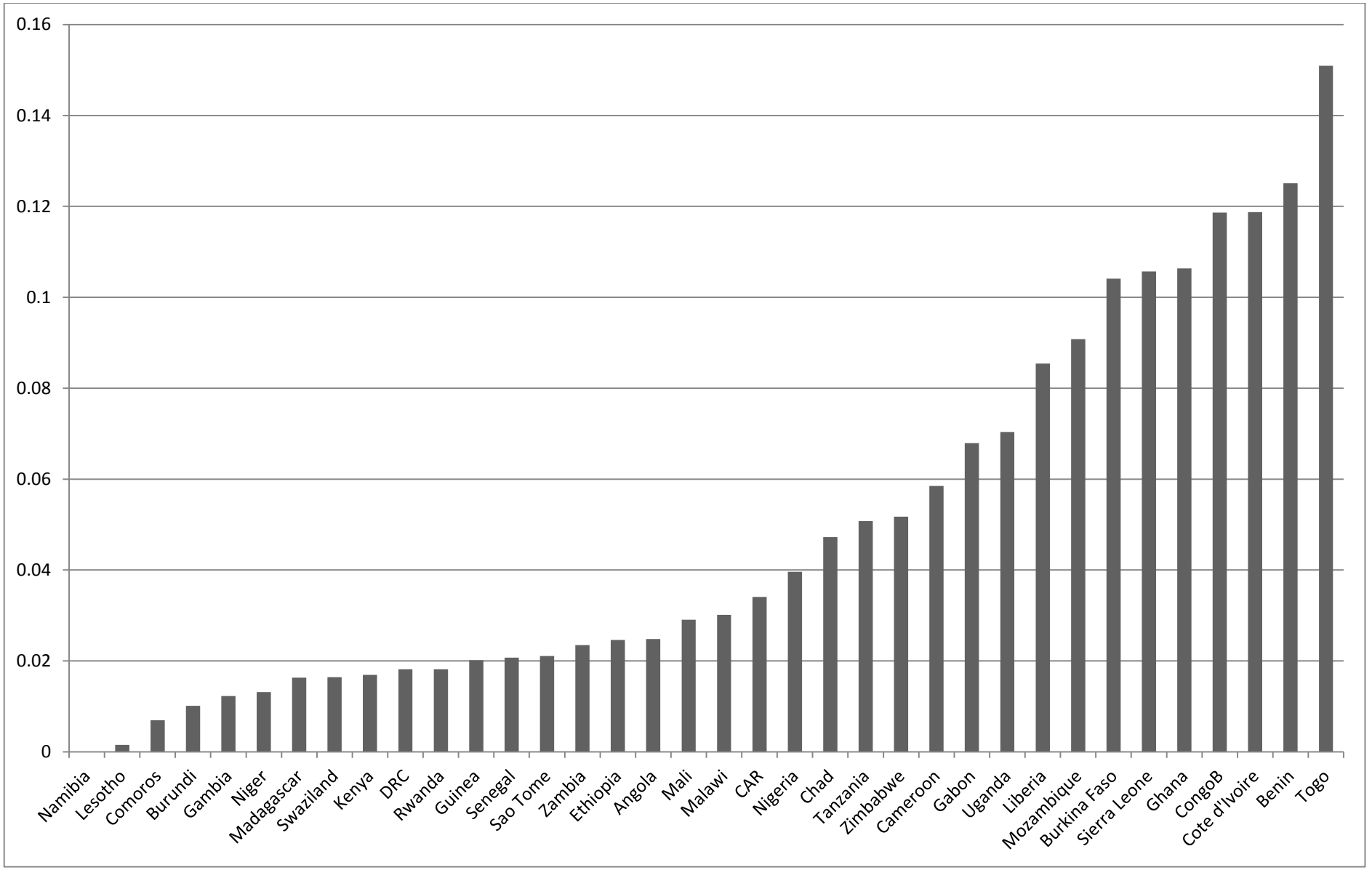

Figure 2: Inter-religious Marriage Rate by Country

Table 1: Descriptive Statistics

Panel A: Data by Country

Country	Year	Survey size	Inter-ethnic Marriage Rate	Inter-religious Marriage Rate
Angola	2015	2,405		0.025
Benin	2011	2,941	0.133	0.125
Burkina Faso	2010	5,088	0.110	0.104
Burundi	2010	2,023		0.010
Central African Republic	1994	939	0.240	0.034
Cameroon	2011	2,973	0.148	0.059
Chad	2004	924	0.233	0.047
Comoros	2012	874		0.007
Congo-Brazzaville	2011	2,372	0.312	0.119
Cote d'Ivoire	2011	6,745	0.261	0.119
DR Congo	2013	4,486		0.018
Ethiopia	2016	6,141	0.124	0.025
Gabon	2012	1,946	0.430	0.068
Gambia	2013	1,388	0.273	0.012
Ghana	2014	1,828	0.212	0.106
Guinea	2012	2,254	0.195	0.020
Kenya	2014	4,211	0.088	0.017
Lesotho	2014	736		0.002
Liberia	2013	1,844	0.274	0.002
Madagascar	2008	4,599		0.016
Malawi	2015	3,806	0.343	0.030
Mali	2012	3.039	0.338	0.029
Mozambique	2011	2,141	0.265	0.091
Namibia	2013	1,249		0
Niger	2006	2,226	0.124	0.013
Nigeria	2013	8,658	0.146	0.039
Rwanda	1992	588	0.079	0.016
Sao Tome and Principe	2008	932		0.021
Senegal	2016	1,400	0.191	0.021
Sierra Leone	2013	3,725	0.209	0.106
Swaziland	2006	802		0.016
Tanzania	1996	1,088	0.335	0.051
Togo	2013	2.270	0.142	0.151
Uganda	2016	2479	0.276	0.070
Zambia	2013	7,198	0.445	0.024
Zimbabwe	2015	3,499		0.052
All-country Average	**2011**	**3958**	**0.223**	**0.050**

Panel B: Pooled Data

Variable	Obs.	Mean	St. Dev.	Min.	Max.
Interethnic Marriage Rate	75,070	0.223	0.416	0	1
Age (Women)	97,019	30.530	8.108	15	49
Age (Men)	97,202	37.695	9.215	15	82
Literate (Women)	97,130	0.471	0.499	0	1
Literate (Men)	96,545	0.653	0.476	0	1
Urban residence	97,202	0.317	0.465	0	1
Wealth Index	94,587	2.893	1.423	1	5
Electricity access	97,202	0.283	0.450	0	1
Polygamy	97,202	0.211	0.408	0	1
Muslim (Women)	96,947	0.317	0.467	0	1
Muslim (Men)	96,976	0.321	0.467	0	1
Ethnic group size (Women)	75,597	0.175	0.150	0	0.908
Ethnic group size (Men)	75,597	0.174	0.151	0	0.921
Religious group size (Women)	97,202	0.696	0.287	0	0.999
Religious group size (Men)	97,202	0.659	0.288	0	0.994
Country Population (logged)	97,202	16.729	1.292	12.005	18.962

In the case of inter-ethnic marriage some obvious reasons help to explain much of the cross-country variation. For instance, countries with many small groups such as Tanzania (85 ethnic groups with one or more members, with the largest only 12% of the population) will naturally see higher inter-ethnic marriage due to the composition of the marriage market than countries with small numbers of ethnic groups and/or one group that is a majority of the population such as Rwanda (3 ethnic groups with the Hutu accounting for ~90% of the population). Another difference between countries on either end of the spectrum is the level of urbanization, which creates more possibilities for people from different ethnic groups to interact with each other: UN data at the time of the DHS survey records levels of urbanization at 6.3% in Rwanda and 16.9% in Niger versus 40% in Zambia and 86.4% in Gabon. Finally, there is also an obvious correlation between country population size and inter-ethnic marriages, with low levels of inter-ethnic marriage in large countries such as Nigeria (151 million people at the time of its survey in 2008) and Kenya (44.9 million) and higher levels of inter-ethnic marriage in smaller countries such as Gabon (1.6 million) and Congo-Brazzaville (4.2 million).

As regards inter-religious marriage, the differences across countries are much lower than with inter-ethnic marriage but there are still obvious reasons which explain country-level variation. First, the two highest levels of inter-religious marriage occur in Togo and Benin, which also have the two highest levels of Animists of any country in the sample (at 23.7% and 17.6%, respectively), while none of the nine countries with the lowest level of inter-religious marriage are more than 0.1% Animist. Inasmuch as many practising Animists may consider themselves Christian or Muslim as well (Falen, 2016), many of these marriages may actually not be considered inter-marriages by the individuals involved. Secondly, as with ethnicity religious group size is a clear determinant of inter-religious marriage: the largest religious group is no higher than 65% of the population for five of the six highest-ranking countries, while the largest religious group is more than 90% of the population for six of the seven lowest-ranking countries.

We next examine the times series trend for both types of intermarriage using date of marriage in Figure 3. (To make the data comparable we only include countries where ethnic/religious minorities comprise 10% or more of the sample, leaving us with 25 and 18 countries for inter-ethnic and inter-religious marriage, respectively).[3] Here we are limited to couples where the wife is in her first marriage inasmuch as the DHS only collects data on date of first marriage.[4] We use two-year moving averages and use 1984 and 2014 as end dates as those are the first and last dates where there is a minimum average of more than 500 observations per year. What is obvious is that inter-ethnic marriage has been steadily increasing from an average of 17% in 1984 to 26% in 2014; in contrast, however, inter-religious marriage rate has averaged around 7% across the entire period of study.[5] The rise in the inter-ethnic marriage rate corresponds to rising rates of intermarriage in other contexts such as India, Qatar and the United States (Alharahsheh et al., 2015; Goli et al., 2013; Qian & Lichter, 2011); the stagnation in inter-religious marriage, however, does not.[6]

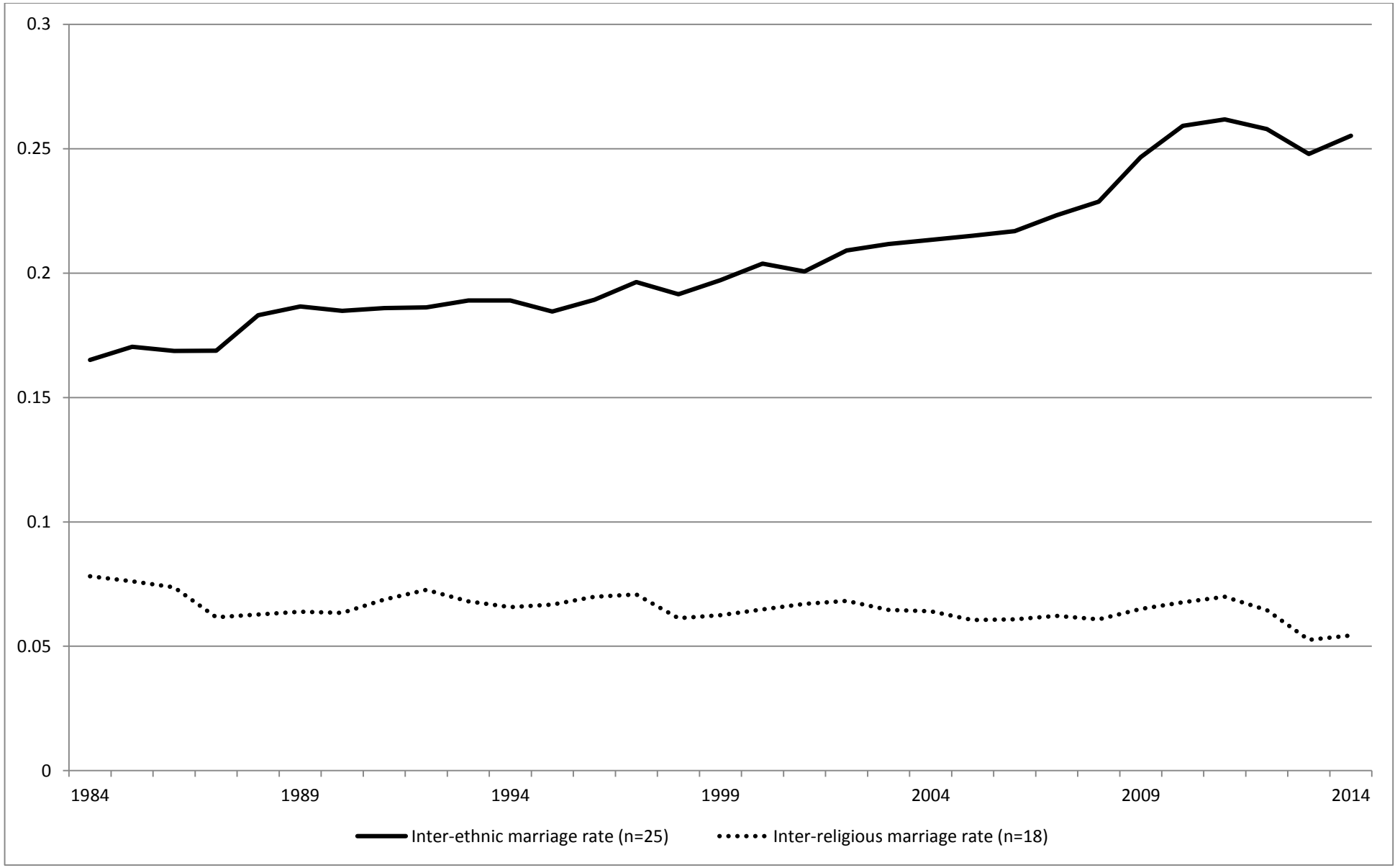

Figure 3: Intermarriage Rates by Year of Marriage (two-year moving averages)

Indeed, as seen in Figures A1-A35 in the Appendix, we plotted the inter-ethnic and inter-religious marriage rates by year of (first) marriage for each country where we had an average of 50 or more observations per year, first for the (most recent) survey that we used in the cross-national analysis, and then including all older surveys as well.[7] With inter-ethnic marriages the trend is always upwards over time, with some countries slower than others. In two countries the rates have been increasing rapidly at over 1% per year: Liberia saw a rise from around 19% in 2000 to 35% in 2012, while in Gabon the rate rose from 28% in 1993 to 49% in 2011. However, in the case of inter-religious marriages the trend is very mixed, with substantial increases in Cote d'Ivoire (5% to 17% over 27 years) and Uganda (3% to 10% over 36 years), declines in Ghana (21% to 8% over 35 years) and Togo (22% down to 14% over 30 years) and very marginal change elsewhere.

This striking difference in the trends among inter-ethnic and inter-religious marriage can be explained when we break down the intermarriage rate by individual and couple characteristics in Table 2, with binary variables listed with their difference-of-mean test results. First, it confirms that Animists have much higher inter-religious rates (but much lower inter-ethnic marriage rates) than non-Animists, while Muslims have lower rates of inter-ethnic and inter-religious marriage. It then shows that along six different measures of modernization – urbanization, polygamy, literacy, access to electricity, education and wealth – inter-ethnic marriage increases with modernization while inter-religious marriage actually decreases (but not significantly in the case of urban residence), but always by a much smaller amount than the increases for inter-ethnic marriage. In other words, modernization is generally correlated with increasing rates of inter-ethnic marriage but its relationship with inter-religious marriage is more complex, producing the flat relationship across time seen in Figure 3.

Table 2: Intermarriage Rates by Female/Couple Characteristics

	Inter-Ethnic Marriage	Difference	**Inter-religious Marriage**	Difference
All	0.223		0.050	
Religion				
Non-Animist	0.226		0.045	
Animist	0.074	-0.152***	0.257	0.211***
Non-Muslim	0.249		0.063	
Muslim	0.192	-0.057***	0.030	-0.032***
Urban Residence				
Rural	0.177		0.050	
Urban	0.323	0.146***	0.048	-0.002
Polygamous Marriage				
Yes	0.178		0.061	
No	0.236	0.058***	0.047	-0.014***
Literacy				
Illiterate	0.180		0.057	
Literate	0.283	0.103***	0.041	-0.016***
Access to Electricity				
No	0.192		0.052	
Yes	0.302	0.110***	0.044	-0.008***
Level of Education				
No education	0.159		0.057	
Some Primary	0.246		0.045	
Some Secondary	0.316		0.045	
Some Higher	0.346		0.037	
Wealth Quintile				
Poorest	0.163		0.066	
Poorer	0.180		0.052	
Middle	0.198		0.046	
Richer	0.247		0.041	
Richest	0.348		0.043	

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$. The level of statistical significance is given for a mean-comparison test between two variables and is listed after the second observation. The results are nearly identical for men (with the sole exception that there is no statistically significant difference in inter-religious marriage rates for Muslim and non-Muslim men).

4.3. Regression Results

We now turn to our regression results. Due to the nature of the datasets available, much of the literature in the field has employed a wide range of methods which suit the data structure, for example, linear probability models (Furtado & Theodoropoulos, 2011), log-linear models (Qian & Lichter, 2011) and binomial logistic regression (Van Tubergen & Maas, 2007). As with other recent papers in the field (Choi & Tienda, 2017; Hou et al., 2015; Kalmijn & Van Tubergen, 2010) we used a multi-level logistic regression approach since the individual DHS data is nested within ethnic/religious groups and countries. OLS or other approaches typically used in the literature are likely to result in biased standard errors, thus making the coefficients more likely to be rendered significant. In addition to being better suited for nested data, the multilevel regression model also generates standard errors and *p* values for the regressors that are less biased. Moreover, the multi-level approach allows us to estimate the extent to which group differences can be explained.

Thus, based on the ICC results reported in section 4.2 above, we ran a three-tiered multi-level logit model to explain inter-ethnic marriage but a two-tiered model for inter-religious marriage, with levels 1-3 accounted by the individual, ethnic/religious group and country. Doing so allowed us to control for variables that vary across the different levels of the model, each of which has a notable contribution to the variance in the data. We included age, age squared, literacy, religion and relationship to head of the household (daughter/son and daughter-in-law/son-in-law) as individual-level variables, with wealth, polygamy and urban residence measured at the couple level. In each case we ran regressions with female and then male individual characteristics. From 2000 the DHS has constructed a wealth index divided along quintiles based on asset ownership; in order to include data from the three countries with surveys before 2000 we used access to electricity as a measure of wealth as it was the variable with the highest correlation with the wealth index across the

dataset (r=0.59). At the group level we included group size and size squared to account for size of the marriage market. Finally, for the inter-ethnic marriage regressions we included the country (logged) population, which was the only variable at the country level that was consistently statistically significant.[8]

We begin with data on inter-ethnic marriage, with our first set of results listed in Table 3; we first list the results for women and then men, and in each case list results using electricity access as a measure for wealth before listing results with the Wealth Index. At the individual level, literacy is always positive and statistically significant, as expected from prior literature, while Animist identification is always negative and statistically significant. Other variables that are only statistically significant for one gender include age (quadratic, for women), Muslim identification (positive, for men), and son of the head of household (negative, for men). This last result suggests either that the parents of the husband are much less likely to allow their son to live with them if he is in an inter-ethnic marriage, or that the daughter-in-law may assimilate or "pass" as a member of her husband's ethnic group when living with her husband's parents.

Table 3: Inter-ethnic Marriage, Main Results
(Dependent Variable: Interethnic Marriage)

Individual Characteristics	Women	Women	Men	Men
	1	2	3	4
Age	0.031***	0.029***	0.016*	0.010
	(0.009)	(0.009)	0.009	0.009
Age (squared)	-0.001***	-0.001***	-0.0003***	-0.0002*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Literate	0.341***	0.268***	0.274***	0.207***
	(0.024)	(0.025)	(0.025)	(0.026)
Urban	0.619***	0.476***	0.659***	0.513***
	(0.025)	(0.028)	(0.025)	(0.028)
Electricity	0.426***		0.474***	
	(0.028)		(0.028)	
Polygamy	-0.073***	-0.095***	-0.110***	-0.125***
	(0.026)	(0.027)	(0.027)	(0.027)
Animist	-0.677***	-0.642***	-0.424***	-0.389***
	(0.103)	(0.104)	(0.081)	(0.081)
Muslim	0.055	0.032	0.089***	0.079***
	(0.034)	(0.035)	(0.039)	(0.040)
Daughter/Son	0.209	0.168	-0.164***	-0.211***
	(0.132)	(0.136)	(0.057)	(0.058)
Daughter-in-law/Son-in-law	-0.083	-0.118**	0.256**	0.211*
	(0.054)	(0.055)	(0.119)	(0.122)
Ethnic group size	-10.731***	-16.816***	-15.592***	-15.006***
	(1.150)	(1.848)	(1.646)	(1.742)
Ethnic group size (squared)	10.363***	30.346***	27.750***	26.325***
	(2.177)	(5.056)	(4.471)	(4.697)
Country Population (logged)	-0.344***	-0.419***	-0.355***	-0.384***
	(0.077)	(0.084)	(0.085)	(0.096)
Wealth Index		0.205***		0.219***
		(0.010)		(0.010)
Constant	4.706***	5.783***	5.108***	5.322***
	(1.298)	(1.422)	(1.427)	(1.623)
Wald Chi squared	2593.41***	2664.4***	2700.27***	2748.75***
Countries	26	23	25	23
Ethnic Groups	731	631	682	592
Observations	74,967	72,372	74,401	72,386

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$. The results above are multi-level logit model estimates with random intercepts at the ethnic group and country levels.

The couple-level results are all as expected, with urbanization positively associated with intermarriage while polygamy is negatively associated; both electricity access and the wealth variable are positively associated with inter-ethnic marriage. The group-level results show a very strong U-shaped quadratic relationship with inter-ethnic marriage, which again concords with previous literature. Finally, at the country level there is a consistently negative and significant relationship with population, such that larger countries have lower rates of inter-marriage; we plot this relationship in Figure 4. We suggest that this relationship could be driven by the same logic as the group size variable, inasmuch as it could be not only the percentage of co-ethnics which affects the propensity to intermarry but also the absolute number of co-ethnics; however, this relationship remains a topic for further research.

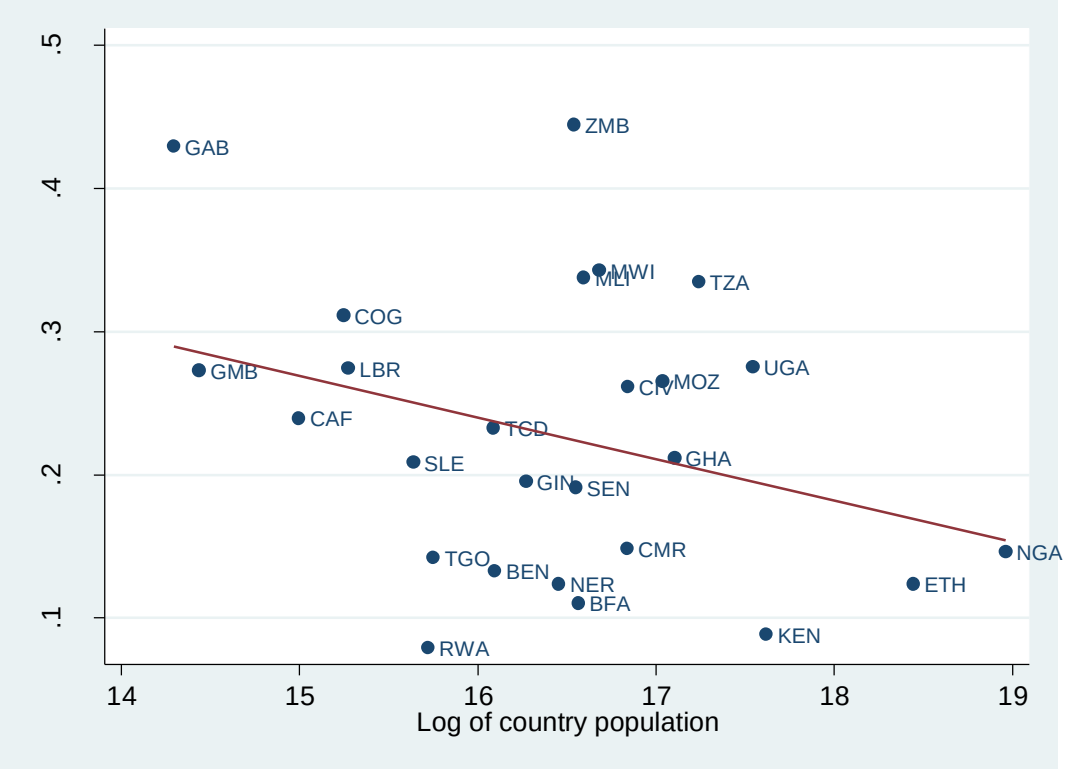

Figure 4: Interethnic Marriage and Country Population

We next examine the results according to occupation, using the raw occupational identities given in the DHS surveys (and unemployed status as the null category). As expected from the literature, male service in the armed forces is positively associated with inter-ethnic marriage.[9] More modernized professions such as clerical work, professional/technical/managerial positions and employment in the services industry are associated positively with inter-ethnic marriage, while agricultural work is negatively correlated.

Table 4: Inter-ethnic Marriage and Occupation
(Dependent Variable: Interethnic Marriage)

Individual Characteristics	Women	Men
	1	2
Controls from Table 3	yes	yes
Job: Agriculture	-0.287***	-0.246***
	(0.028)	0.050
Job: Army		0.352*
		(0.185)
Job: Clerical	0.705***	0.275***
	(0.124)	(0.093)
Job: Household/Domestic	0.132	0.099
	(0.100)	(0.116)
Job: Professional/Technical/Managerial	0.352***	0.164***
	(0.056)	(0.057)
Job: Sales	0.126***	-0.016
	(0.029)	(0.057)
Job: Services	0.169***	0.317**
	(0.060)	(0.063)
Job: Skilled Manual	-0.051	0.142***
	(0.054)	(0.053)
Job: Unskilled Manual	0.106*	0.163***
	(0.058)	(0.060)
Constant	5.091***	5.125***
	(1.332)	(1.454)
Wald Chi squared	2825.14***	2935.49***
Countries	26	25
Ethnic Groups	730	682
Observations	74,912	74,334

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$. The results above are multi-level logit model estimates with random intercepts at the ethnic group and country levels.

In Table 5 we examine additional evidence that relies upon date of marriage data. As noted above, the DHS collected data on age at first marriage only, which means that age at marriage for the current marriage can only be constructed by considering individuals in their first marriage. All women in the sample were asked about their history of previous marriages but the question was asked of men only from 2000 onwards, which leads to

dropping CAR, Rwanda and Tanzania from the male sample. (The question was also sometimes dropped in other contexts, including 38% of the sample in Niger.) Within this sub-sample we can test for any correlation between inter-marriage and being previously married as well as age at marriage (for first marriages only). We can also test whether migration has any effect on intermarriage by using data from (up to eight) countries where surveys tabulated whether or not individuals had migrated to their previous location. (In our analysis we only considered individuals as migrants if they had only been married once and had migrated prior to marriage). In all three cases our results for both genders concord with each other and the previous literature, suggesting that both women and men in an inter-ethnic marriage are more likely to have been previously married, are more likely to be older when they marry into an inter-ethnic marriage and are more likely to be a migrant.[10]

Table 5: Inter-ethnic Marriage; Additional Results
(Dependent Variable: Interethnic Marriage)

Gender	Women	Women	Women	Men	Men	Men
	1	2	3	4	5	6
Controls from Table 3	Yes	Yes	Yes	Yes	Yes	Yes
Previously Married	0.453***			0.136***		
	(0.027)			(0.026)		
Age at (first) Marriage		0.006***			0.005***	
Migrant before (first) Marriage			0.269***			0.358***
			(0.040)			(0.034)
Wald Chi sq	2834.48***	2867.57***	1108.18***	2085.01***	1767.82***	1194.52***
Countries	26	26	8	23	23	7
Ethnic Groups	731	713	265	590	568	251
Observations	74,893	63,304	24,319	71,015	43,634	23,758

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$. The results above are multi-level logit model estimates with random intercepts at the ethnic group and country levels.

We next turn to evidence from inter-religious marriage in Table 6. We use the same four specifications as from Table 3, except in a two-level model, using religious group size instead of ethnic group size and dropping country population as a covariate. Our results are in some cases in line with those of Table 2, inasmuch as wealth and Muslim identification (for women) are negatively correlated with inter-religious marriage. However, in contrast to Table 2, polygamy is actually positively associated for women. The more mixed results for inter-religious marriage than for inter-ethnic marriage are almost certainly a consequence of the rarer nature of inter-religious marriage, especially in countries with large religious majorities.

Table 6: Inter-religious Marriage, Main Results
(Dependent Variable: Inter-religious Marriage)

Individual Characteristics	Women	Women	Men	Men
	1	2	3	4
Age	-0.017	-0.014	-0.017	-0.015
	(0.016)	(0.016)	0.015	0.015
Age (squared)	0.0002	0.0002	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Literate	-0.115***	-0.062***	0.082*	0.092
	(0.042)	(0.044)	(0.043)	(0.045)
Urban	0.130***	0.224***	0.178***	0.195***
	(0.044)	(0.048)	(0.047)	(0.051)
Electricity	-0.220***		-0.080	
	(0.050)		(0.053)	
Polygamy	0.203***	0.213***	-0.045	-0.040
	(0.041)	(0.041)	(0.044)	(0.045)
Animist	0.004	-0.266	0.669*	0.589
	(0.385)	(0.391)	(0.360)	(0.369)
Muslim	-0.336***	-0.318***	-0.736***	-0.672***
	(0.109)	(0.108)	(0.284)	(0.295)
Daughter/Son	0.030	0.051	0.055	0.075
	(0.253)	(0.254)	(0.096)	(0.096)
Daughter-in-law/Son-in-law	0.145	0.160*	0.132	0.172
	(0.089)	(0.089)	(0.279)	(0.281)
Religious group size	-11.110***	-11.389***	-12.780***	-12.898***
	(1.697)	(1.761)	(1.494)	(1.561)
Religious group size (squared)	6.396***	6.538***	7.165***	7.227***
	(1.763)	(1.832)	(1.592)	(1.664)
Wealth Index		-0.123***		-0.038
		(0.016)		(0.017)
Constant	1.042***	1.313***	1.618***	1.655***
	(0.351)	(0.359)	(0.386)	(0.394)
Wald Chi squared	2593.41***	2664.4***	2700.27***	2748.75***
Countries	36	36	35	35
Country-Religious Groups	124	114	119	112
Observations	89,082	86,648	88,666	86,781

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$. The results above are multi-level logit model estimates with random intercepts at the ethnic group and country levels.

We also replicated the occupational analysis and date of marriage/previous marriage analysis from Tables 4 and 5, respectively, for inter-religious marriage; for the sake of brevity we simply summarize the results here. In the former case there are no occupations that are

consistently associated with inter-religious marriage for both men and women. In the latter case we find that being previously married and being a migrant is positively correlated with inter-religious marriage, while age at marriage is not.

Our final set of results involves the consequences of intermarriage, again not listed here for brevity. While there is evidence that, in other contexts, intermarriage is more likely to end in divorce (Kalmijn, De Graaf, & Janssen, 2005; Milewski & Kulu, 2014; S. Smith, Maas, & Van Tubergen, 2012), we cannot measure this relationship as the DHS does not ask for individual characteristics of previous spouses for individuals who have been married more than once. However, we can test the theory from previous research that intermarriages are more likely to yield fewer children, even after we control for age at marriage (Chang, 2005; Fu, 2008). Inasmuch as the DHS data lists total children ever born rather than children from the current marriage, we again must eliminate spouses who were previously married or for whom we have no data on previous marriages. Using a poisson model with the number of children as the dependent variable, we find that neither inter-ethnic nor inter-religious marriage is correlated with lower numbers of children.

Before concluding we list additional robustness tests which are available from the authors upon request. First, we substituted level of education for literacy for both men and women. Second, we excluded couples who live with other adults (i.e., parents of the wife or husband), to eliminate the possiblity that one or both of the spouses has changed their ethnic or religious identity to conform to the identity of the household. Finally, we only included men aged 20-49 as surveys from Liberia and Swaziland exclude men aged 50 or older (with another seven countries excluding men aged 55 or more). In none of these cases do our basic results change.

5. Discussion and Conclusions

In this paper we analyzed the determinants of inter-ethnic and inter-religious marriage in contemporary Africa, using DHS couples data from up to 36 countries. We found that the prevalence of inter-ethnic marriage is much more prelavent than inter-religious marriage, with an average of 22% compared to 5%, respectively. We also found strong evidence that measures of modernization such as literacy/education, urbanization, wealth, non-polygamous marriages, later age at marriage and non-agricultural employment are correlated with inter-ethnic marriage, which helps to explain why inter-ethnic marriage rates have been steadily increasing in Africa since the 1980s. However, the relationship between measures of modernization and inter-religious marriage are much more ambiguous, which can explain why, in contrast, the rate of inter-ethnic marriage has stagnated over the past 30 years.

There are multiple potential avenues of future research on this topic. With better data on previous marriages it could be possible to see if inter-marriage is correlated with higher levels of divorce in Africa, as it is elsewhere. With more detailed personal histories it would be possible to test the theory that exposure to inter-ethnic or inter-religious violence could be correlated with lower levels of inter-marriage (Horowitz, 2000, pp. 61-62). It could also be possible to use DHS data in other developing country contexts outside Africa. For instance, preliminary analysis of inter-ethnic marriage in the Philippines shows an inter-ethnic marriage rate of 26% and a positive correlation with urbanization but surprisingly no correlation with literacy, education, wealth or group size. Finally, tracking data on the children of inter-marriages could allow for better understanding of how such children identify ethnically or religiously once they become adults, which would greatly add to our understanding of how inter-marriages can affect ethnic and religious demography across time.

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Figures A1-A20: Country-by-Country Analysis of Inter-ethnic Marriage, Using Two-Year Averages with Most Recent Survey and All Surveys
(Only countries with an average of n=50 observations per year of marriage)

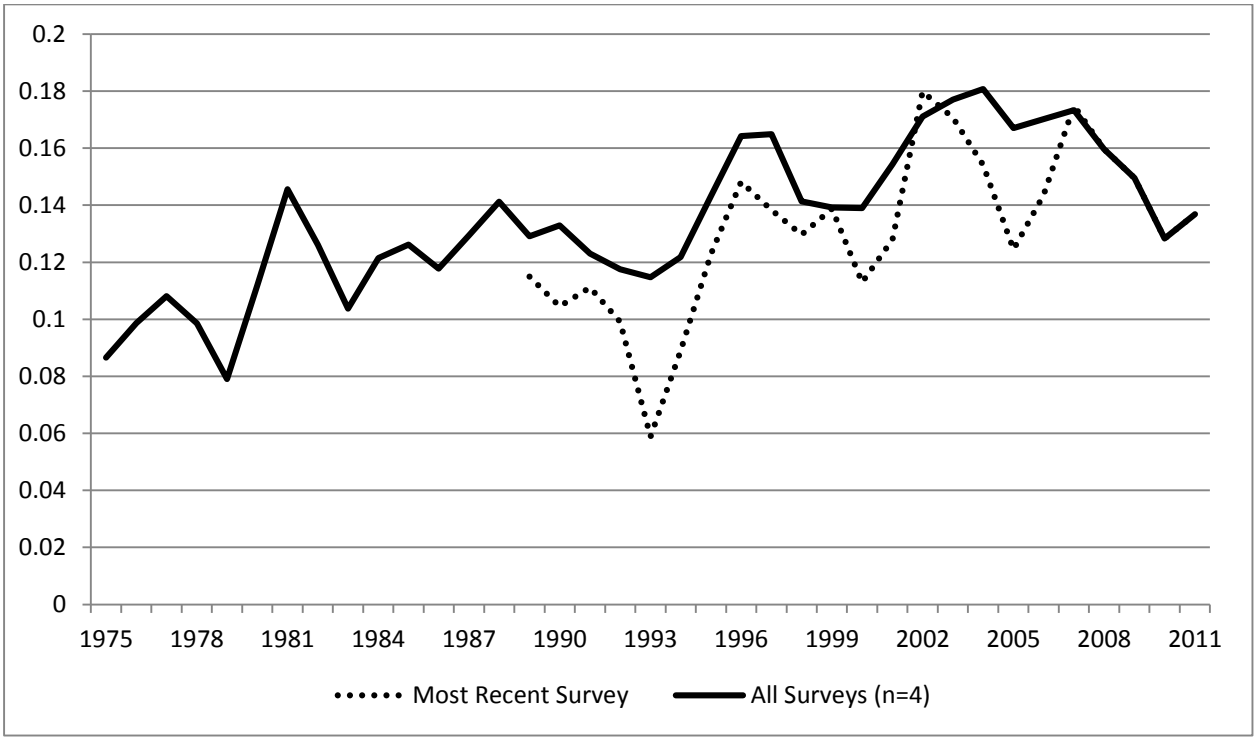

Figure A1: Benin

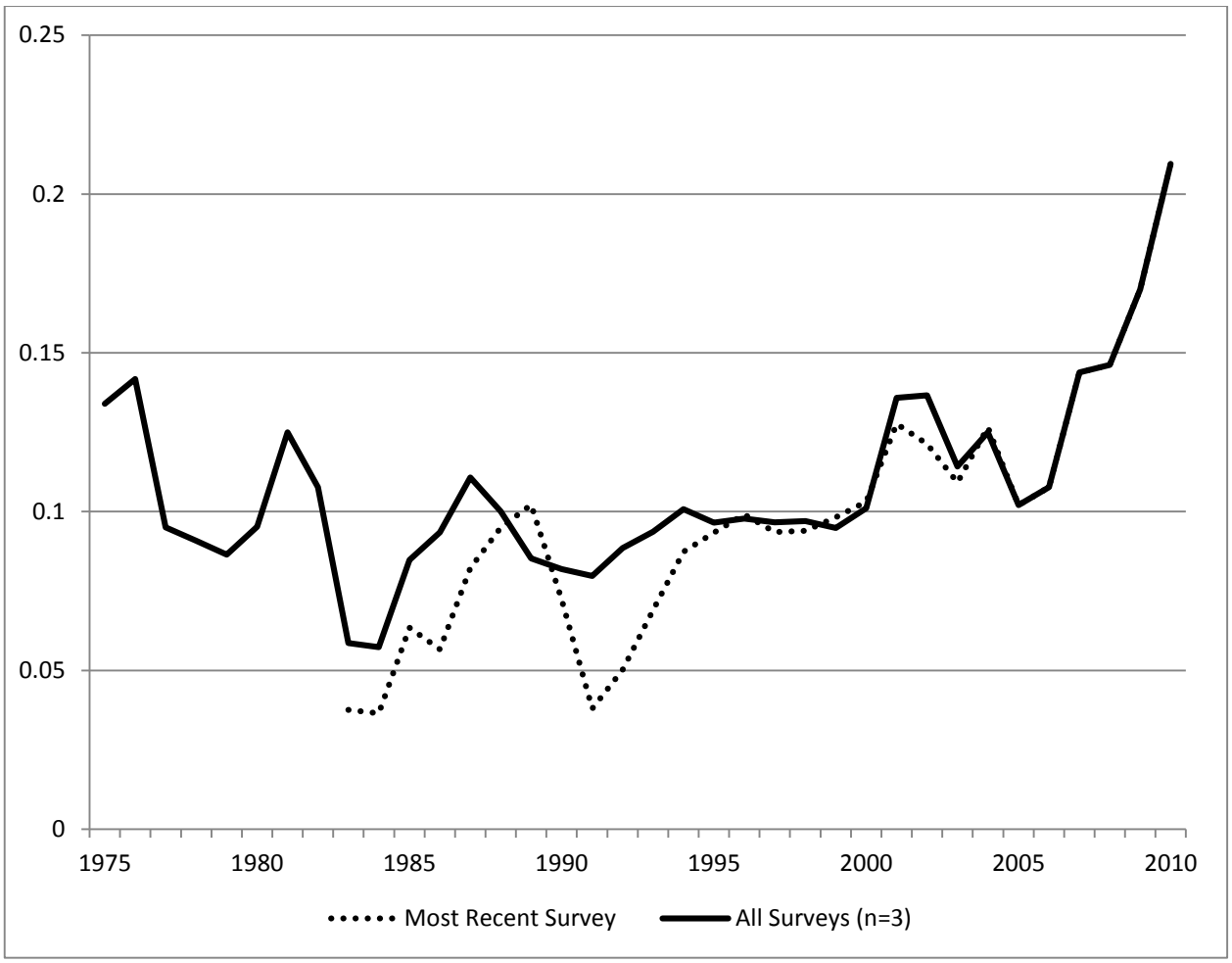

Figure A2: Burkina Faso

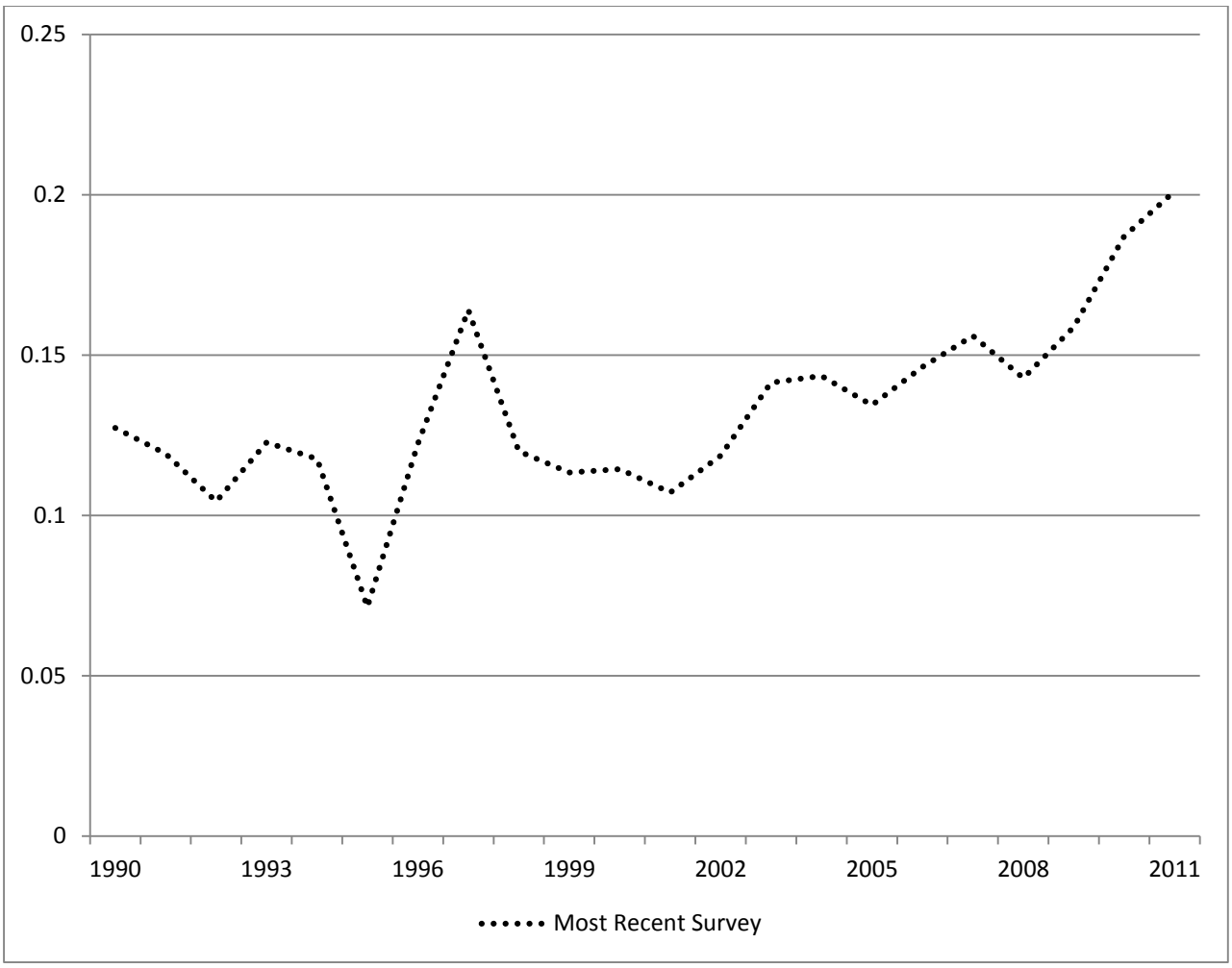

Figure A3: Cameroon

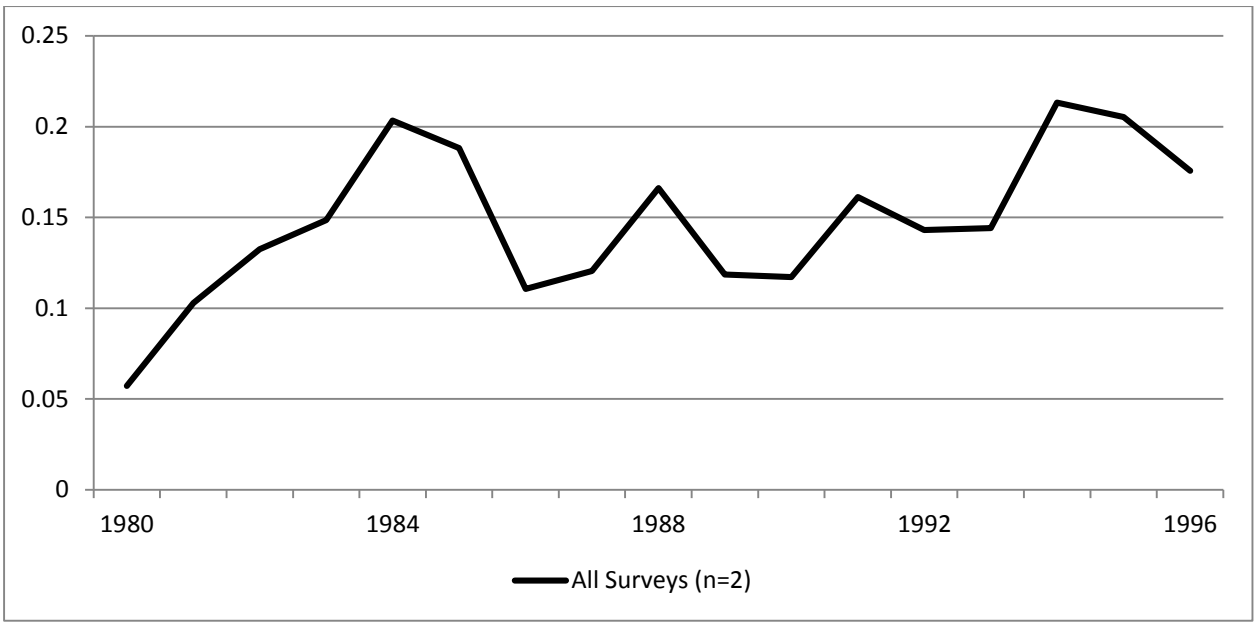

Figure A4: Chad

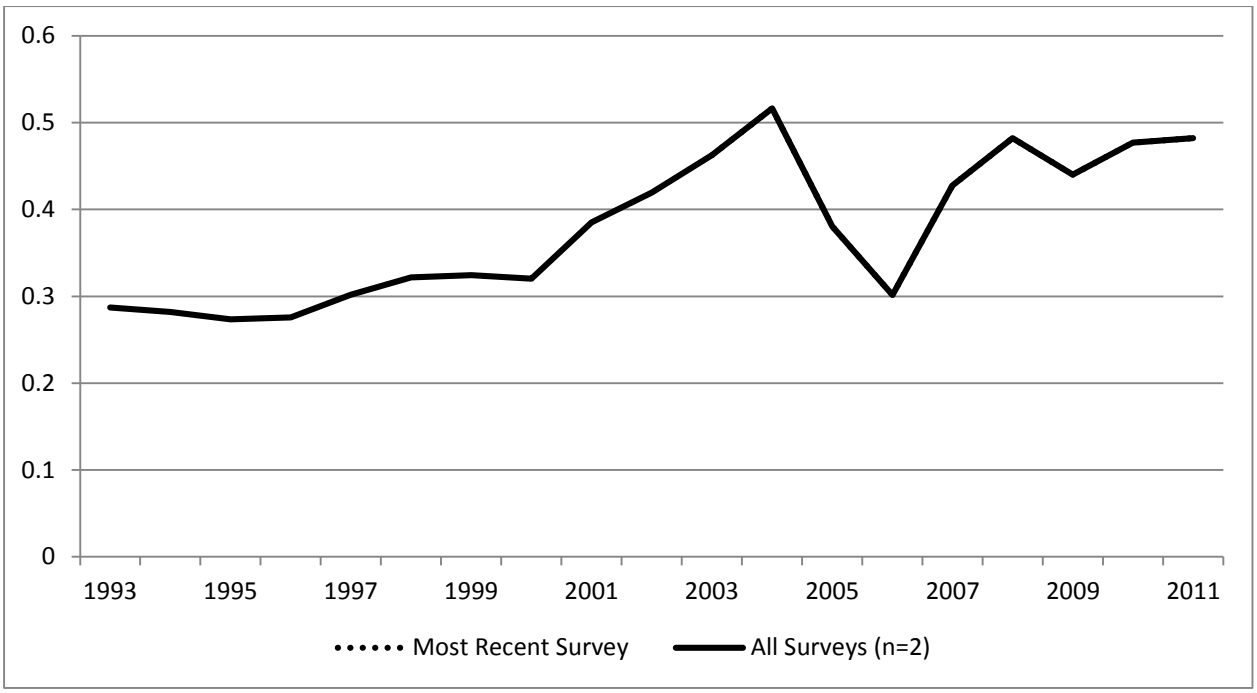

Figure A5: Gabon

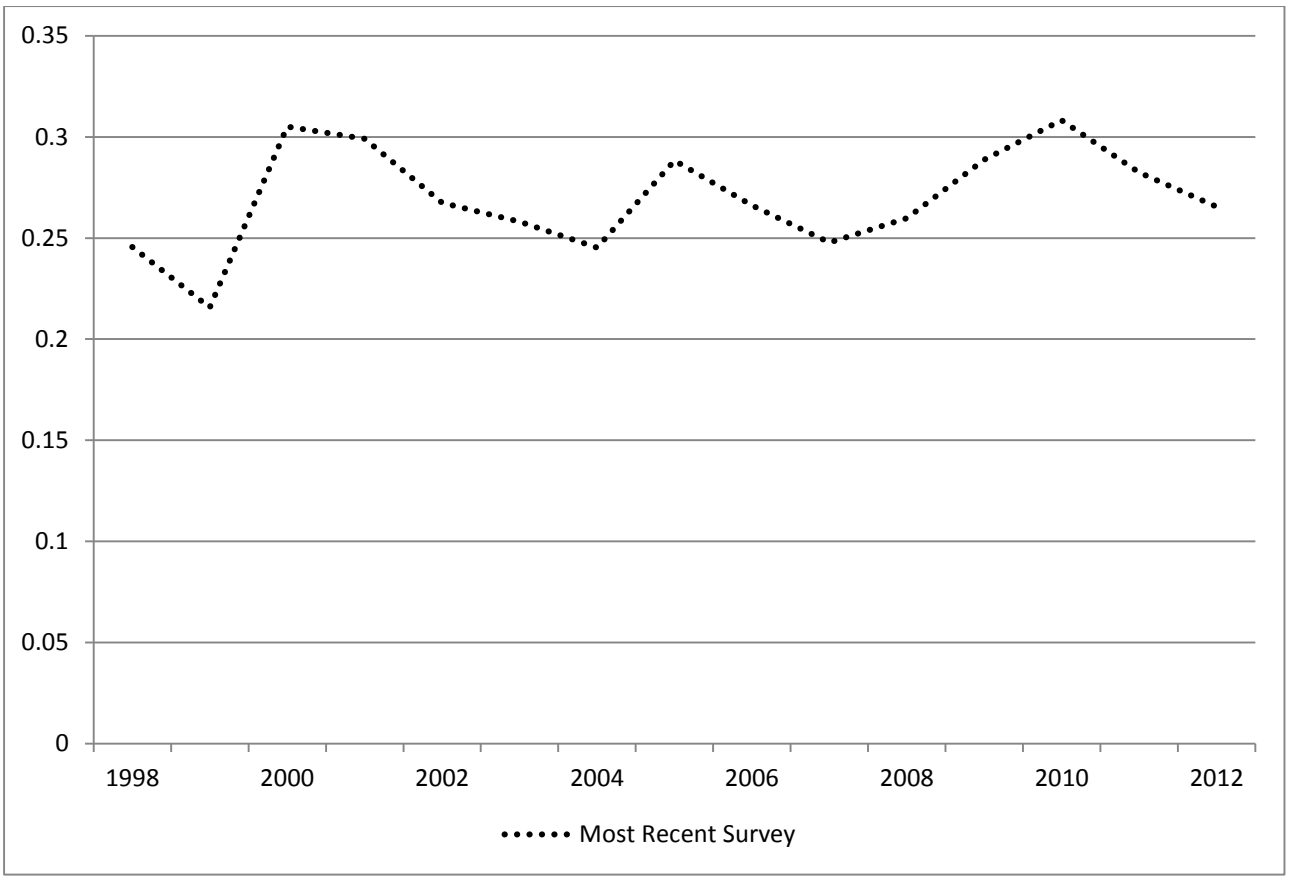

Figure A6: Gambia

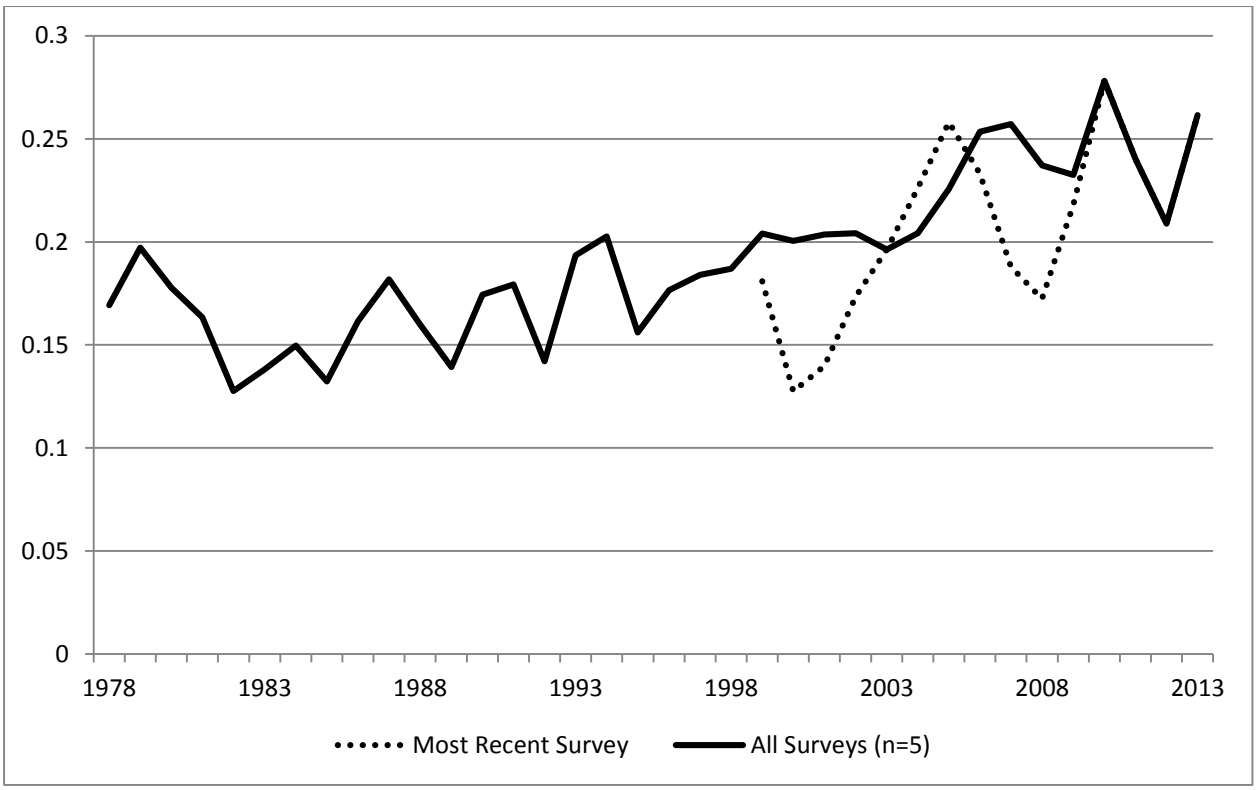

Figure A7: Ghana

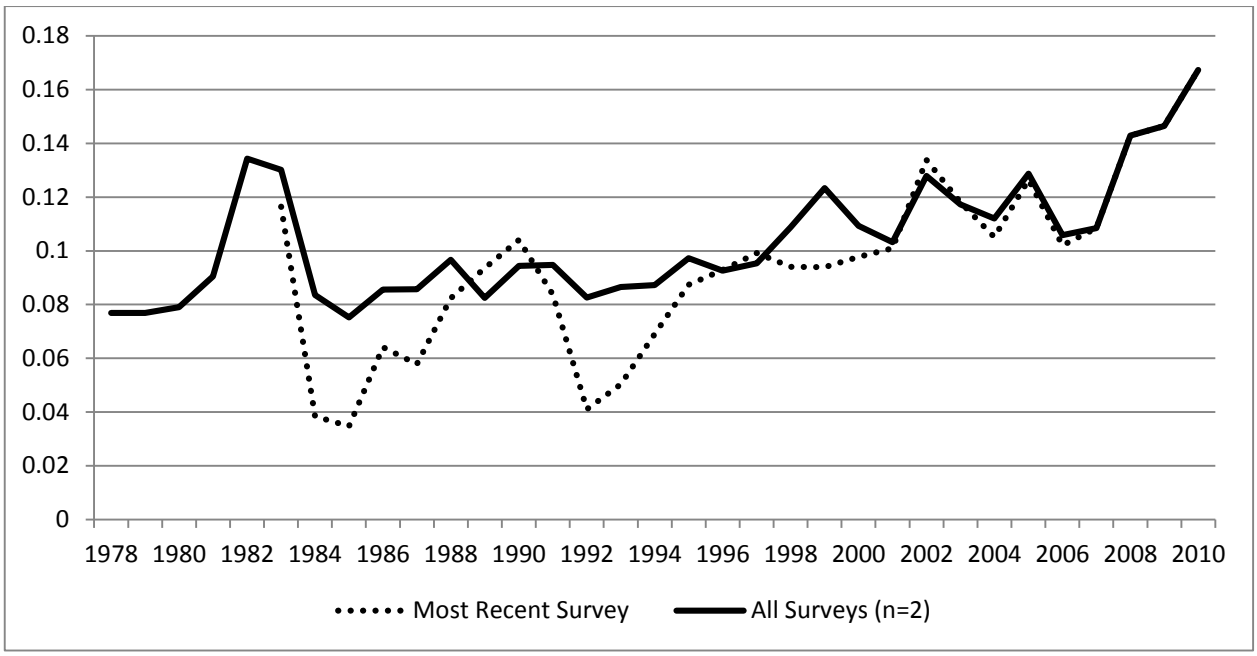

Figure A8: Guinea

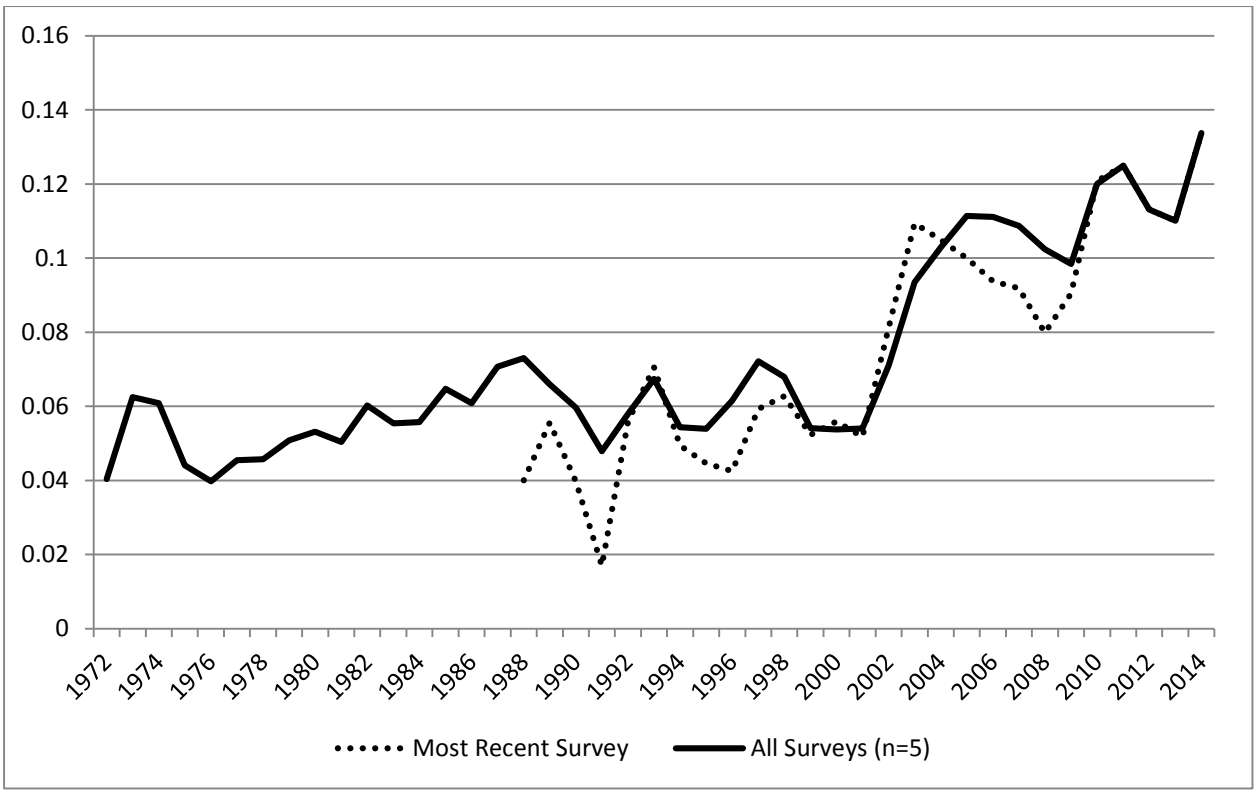

Figure A9: Kenya

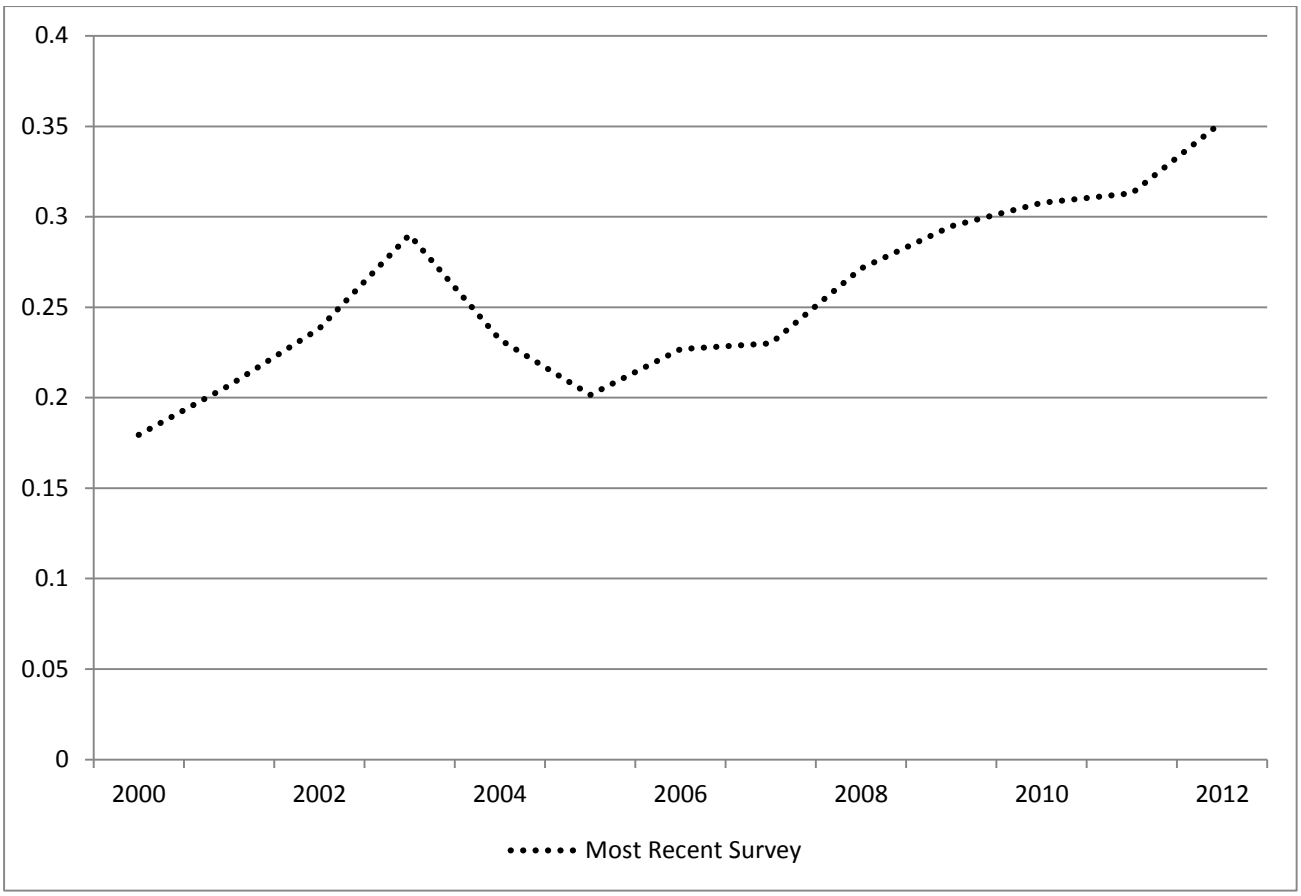

Figure A10: Liberia

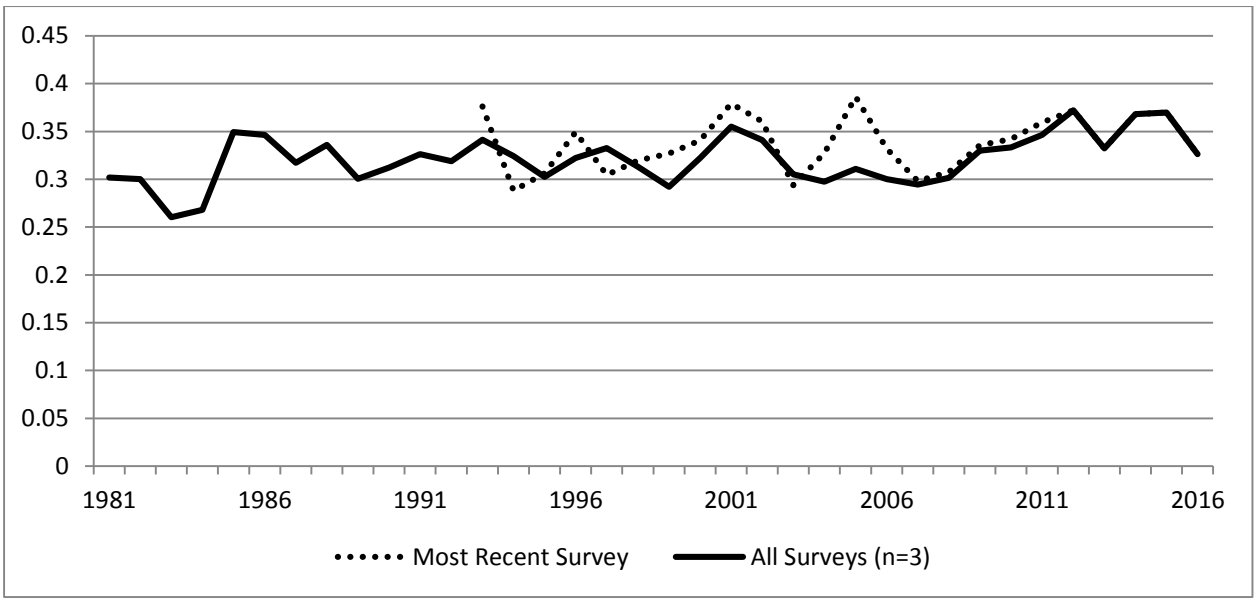

Figure A11: Malawi

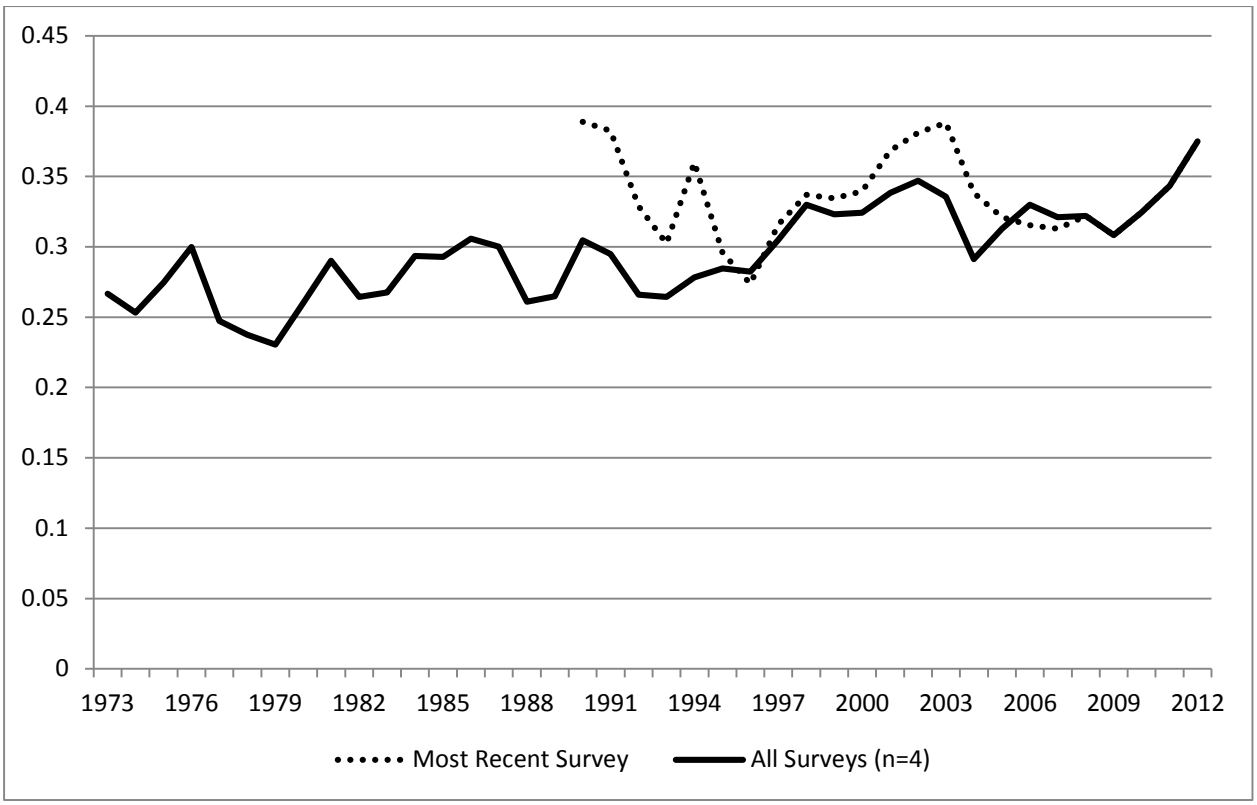

Figure A12: Mali

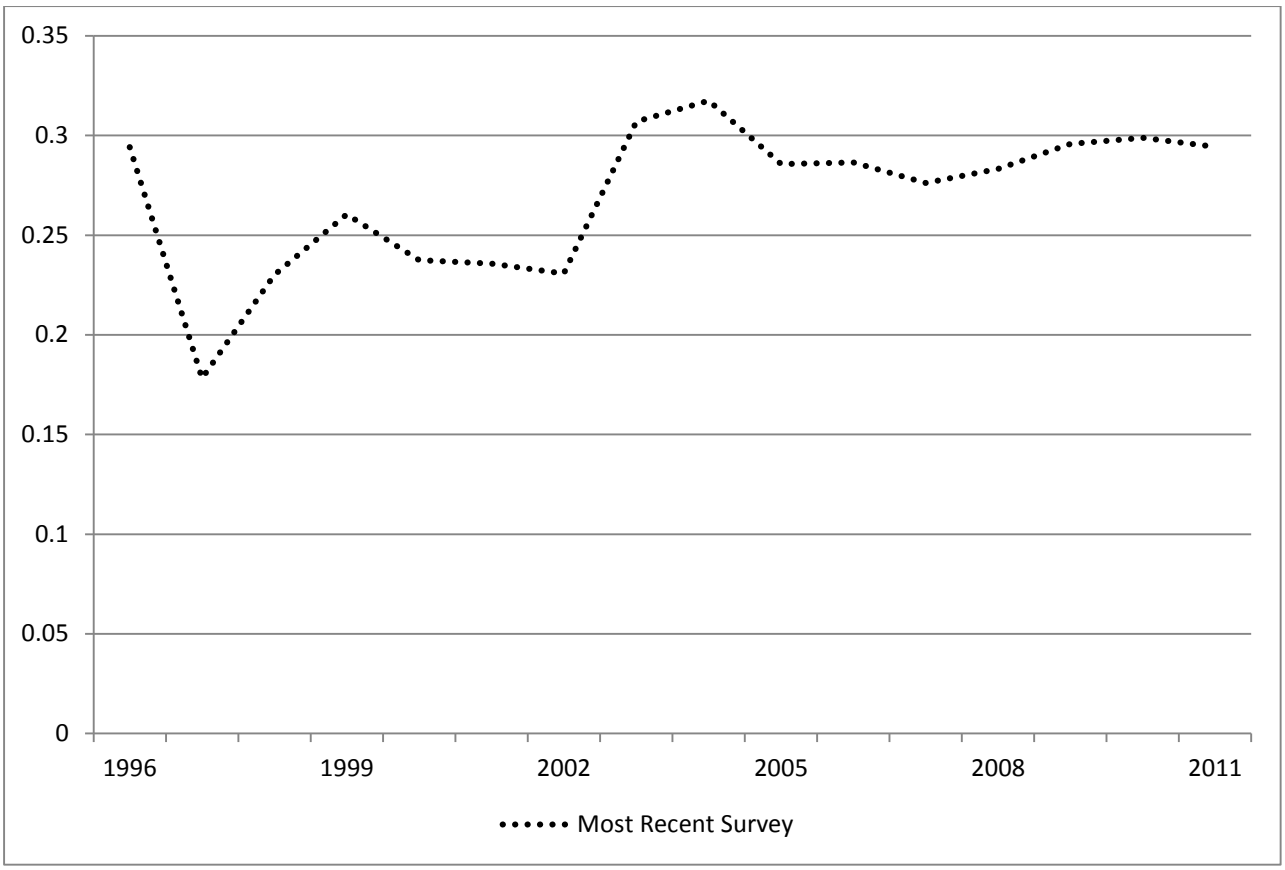

Figure A13: Mozambique

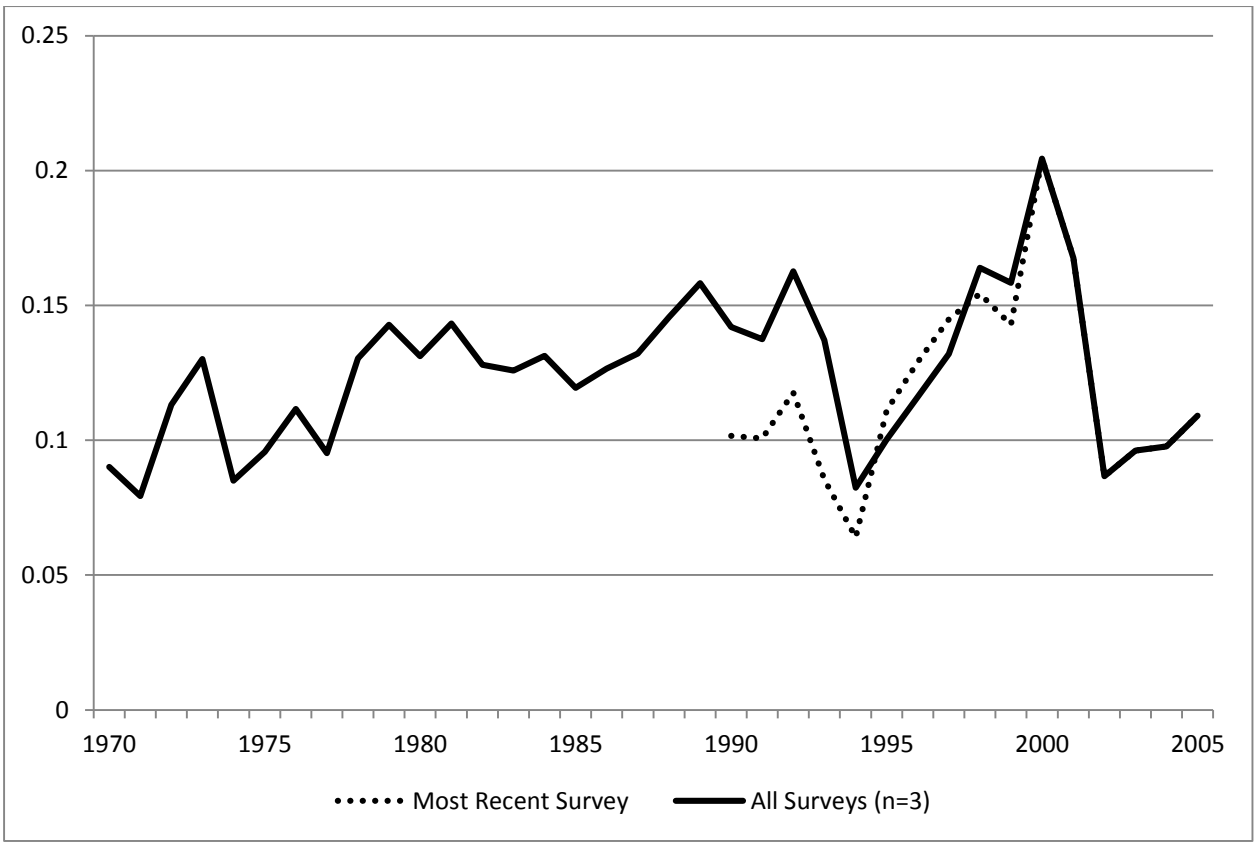

Figure A14: Niger

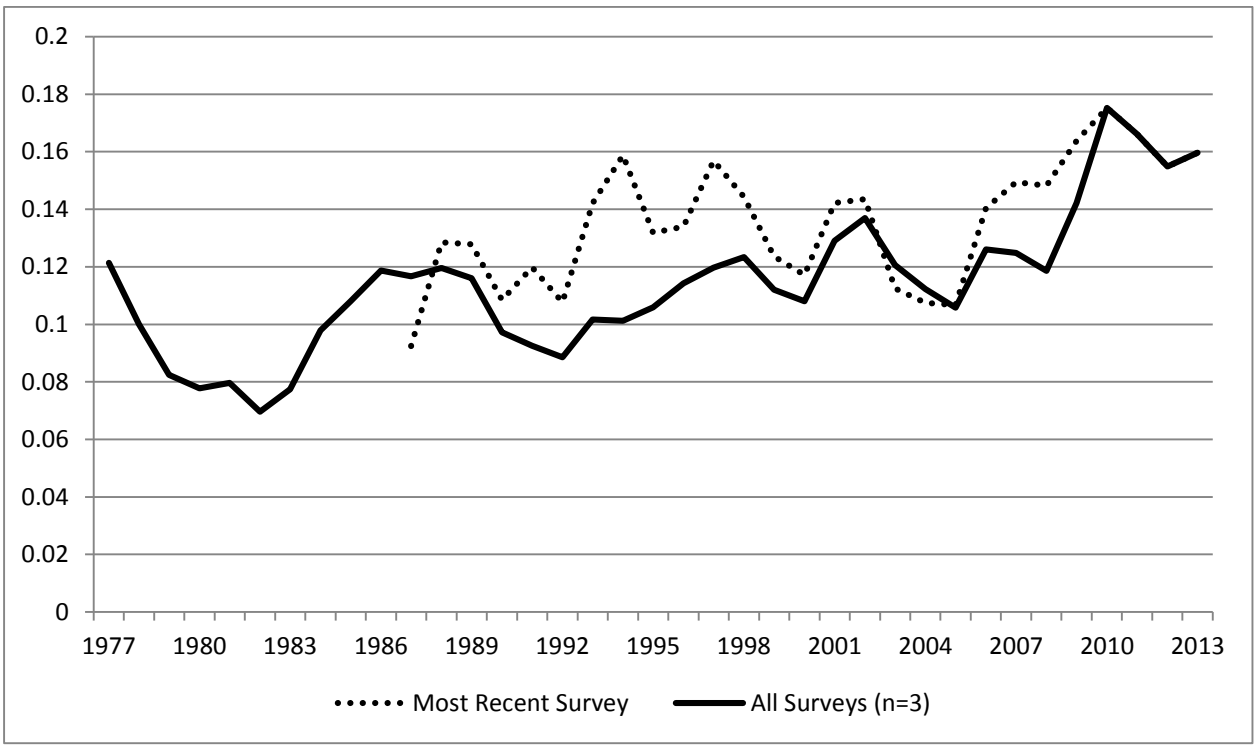

Figure A15: Nigeria

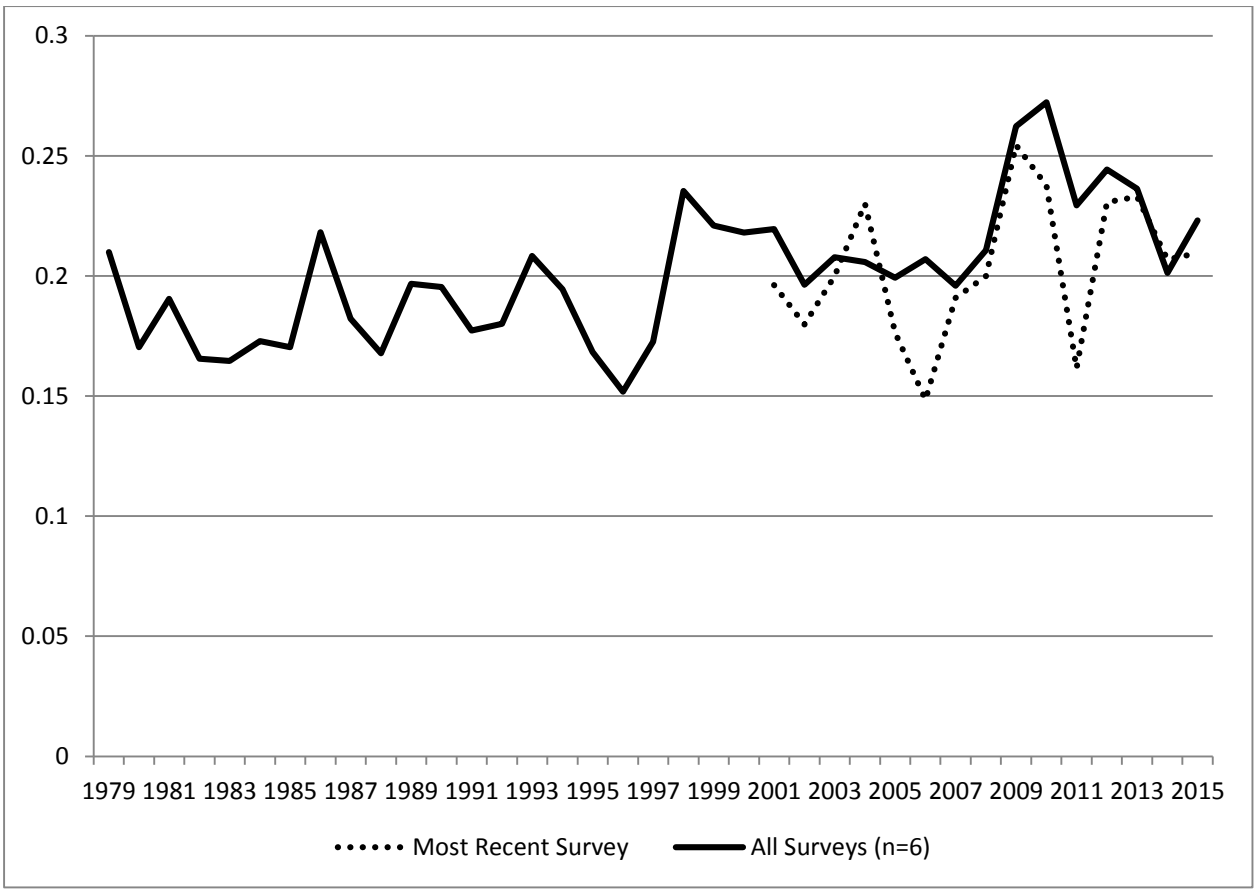

Figure A16: Senegal

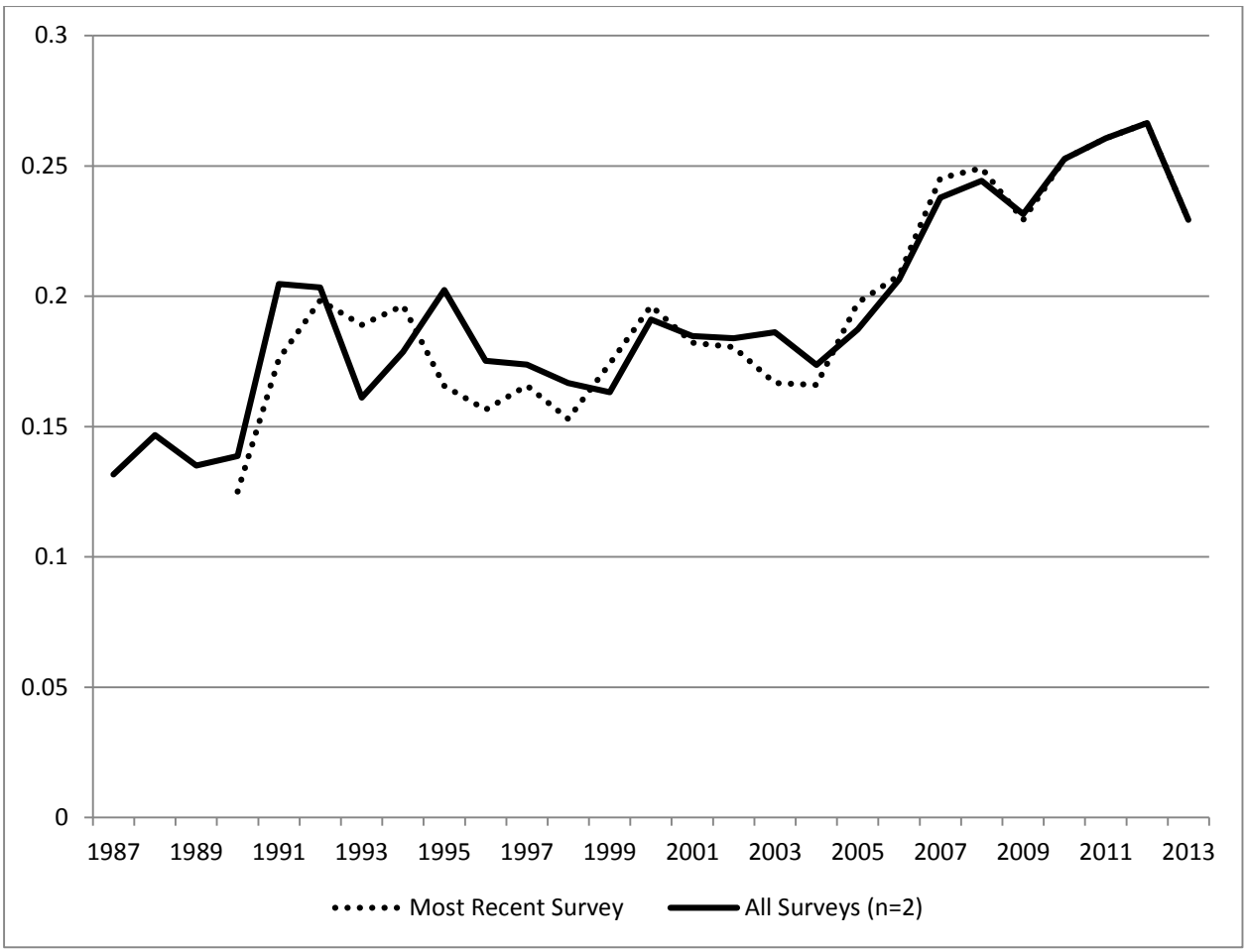

Figure A17: Sierra Leone

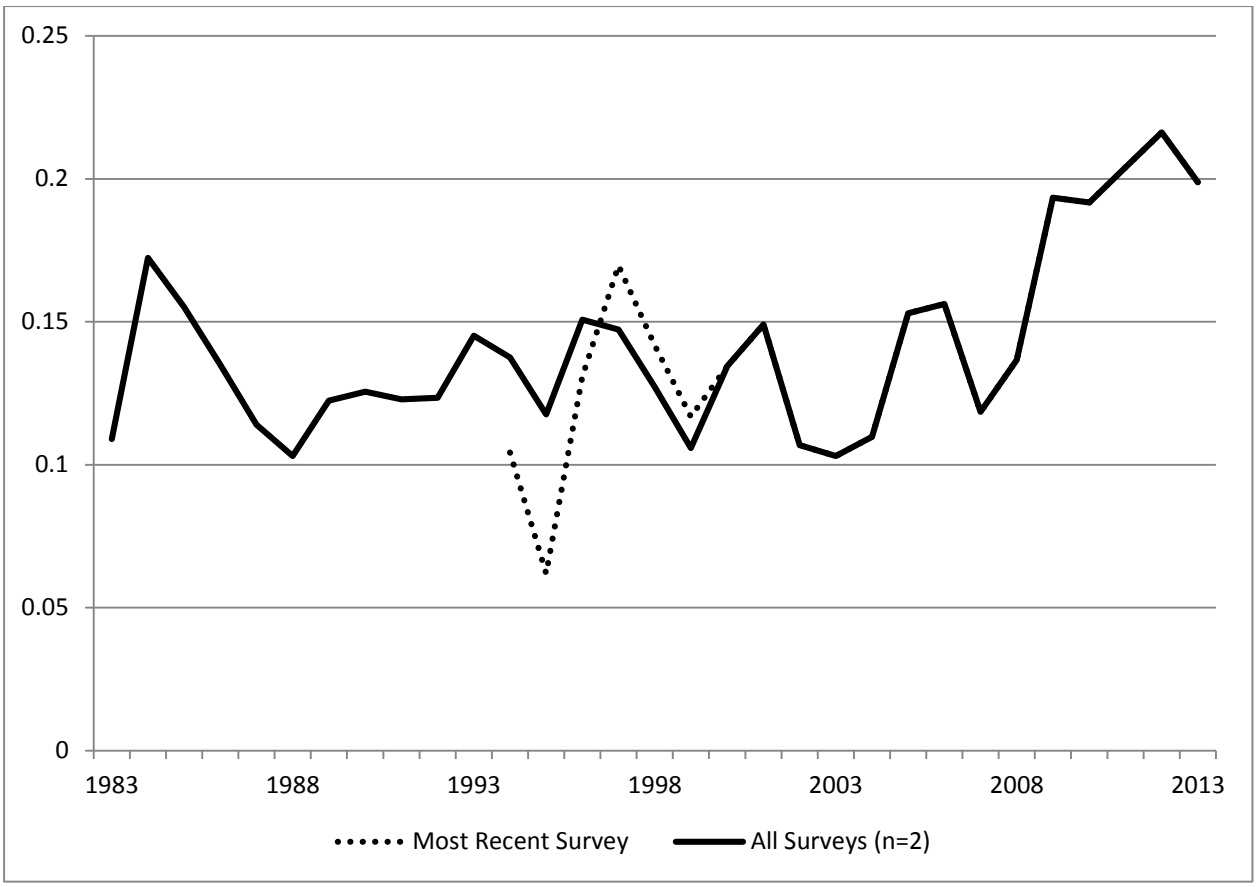

Figure A18: Togo

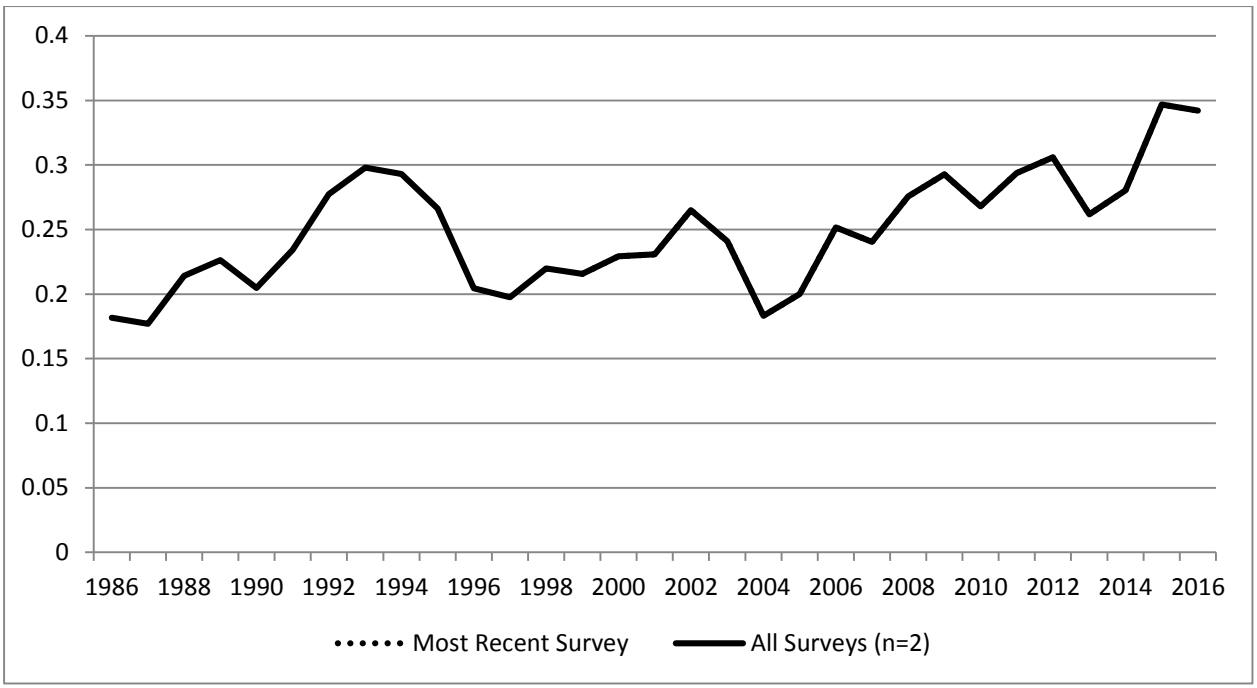

Figure A19: Uganda

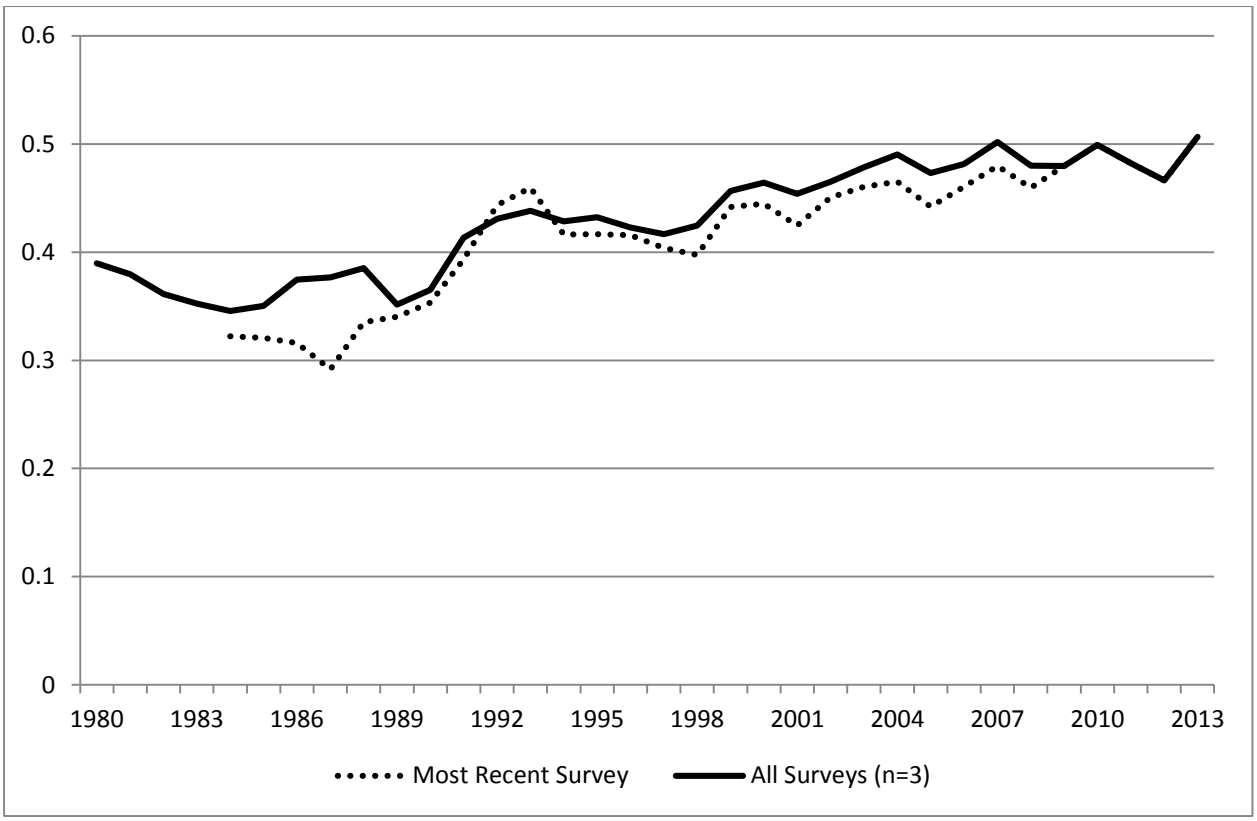

Figure A20: Zambia

Figures A20-: Country-by-Country Analysis of Inter-religious Marriage, Using Two-Year Averages with Most Recent Survey and All Surveys
(Only countries with an average of n=50 observations per year of marriage)

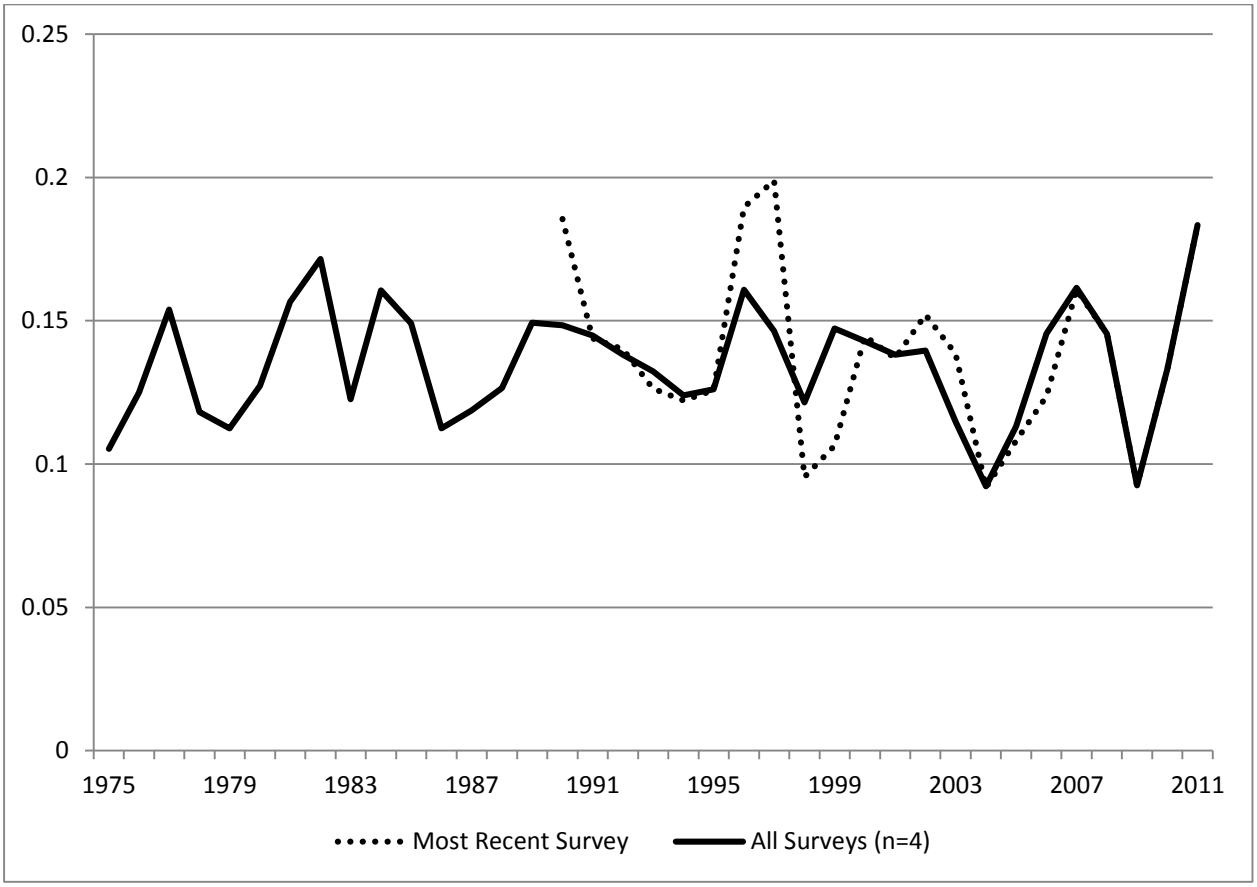

Figure A21: Benin

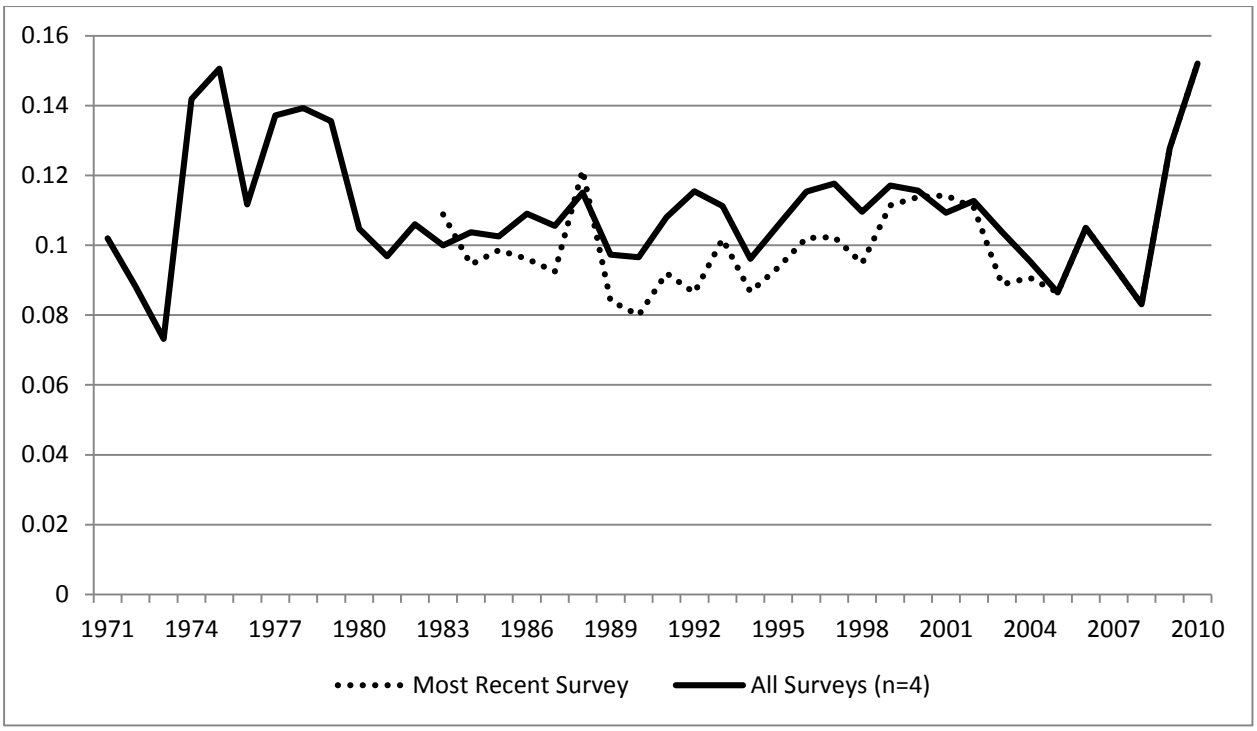

Figure A22: Burkina Faso

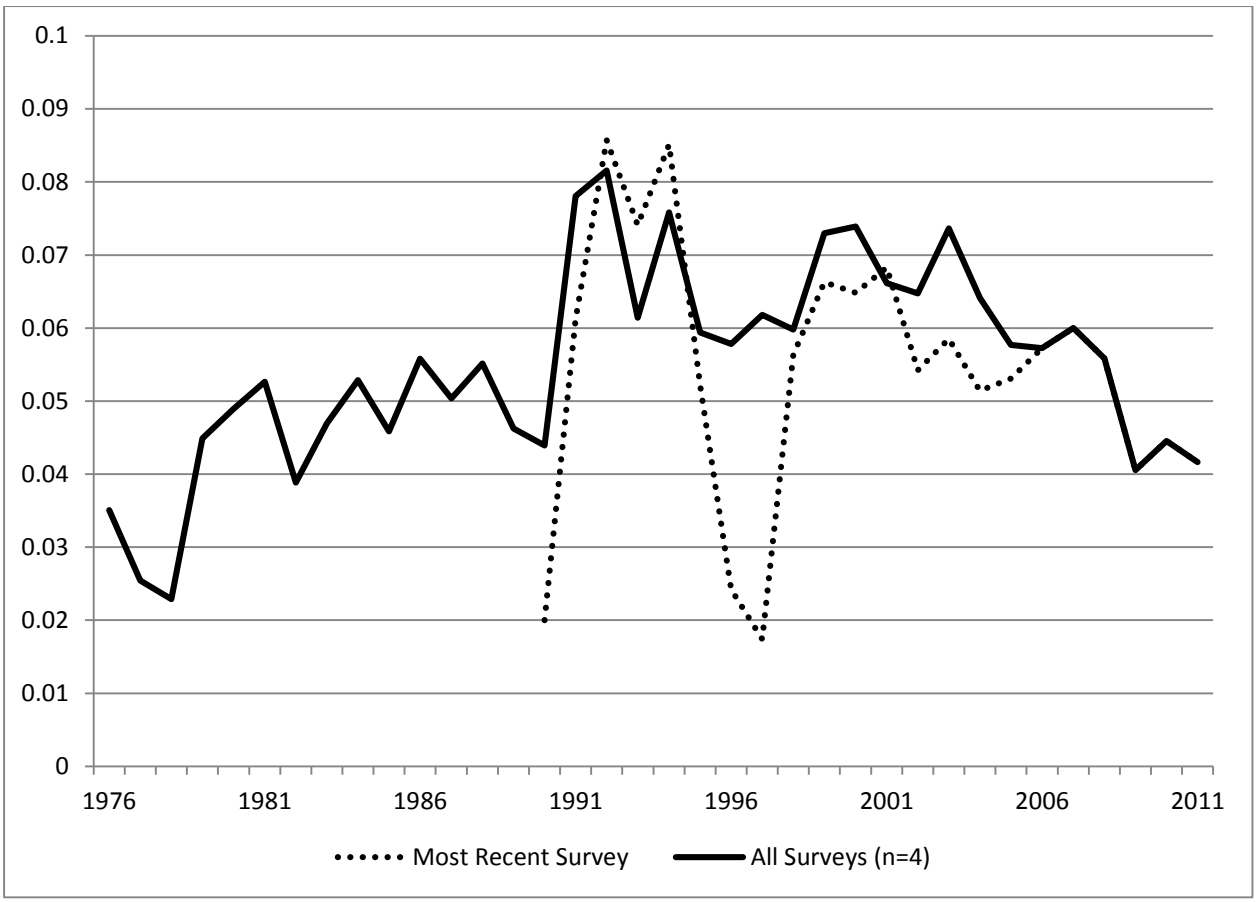

Figure A23: Cameroon

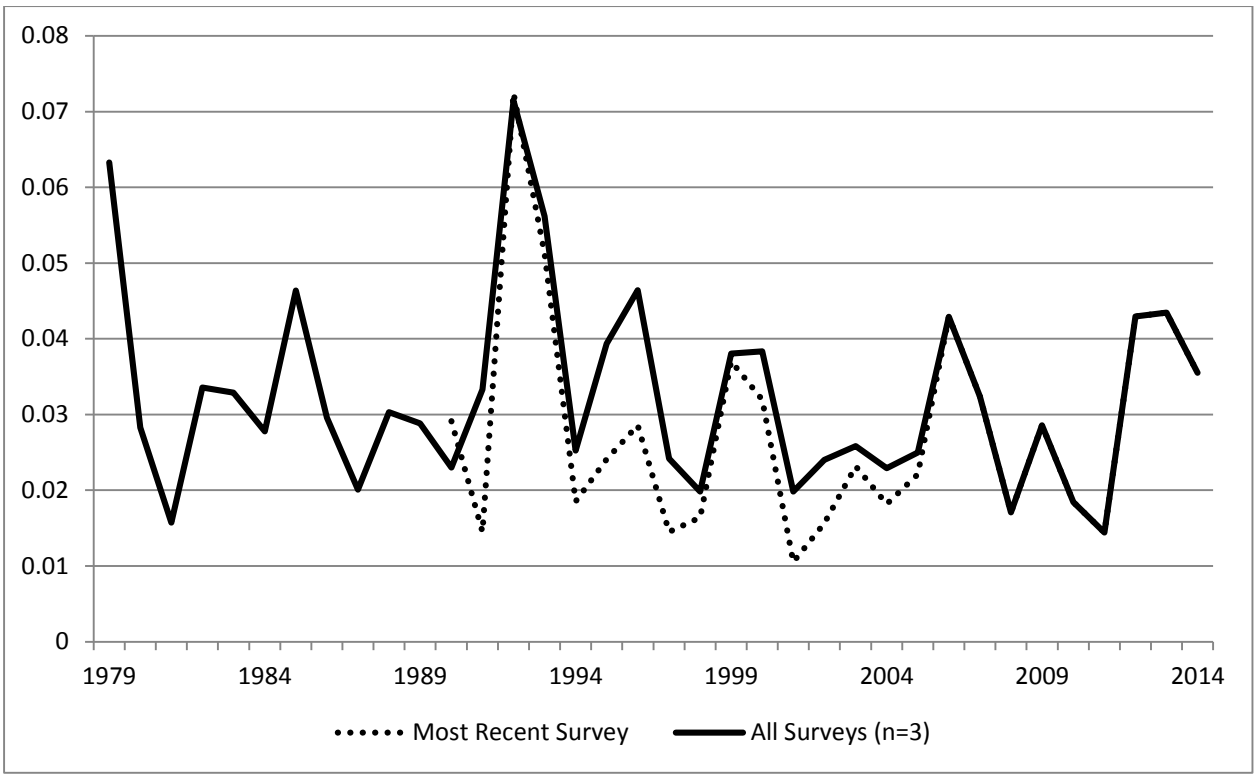

Figure A24: Chad

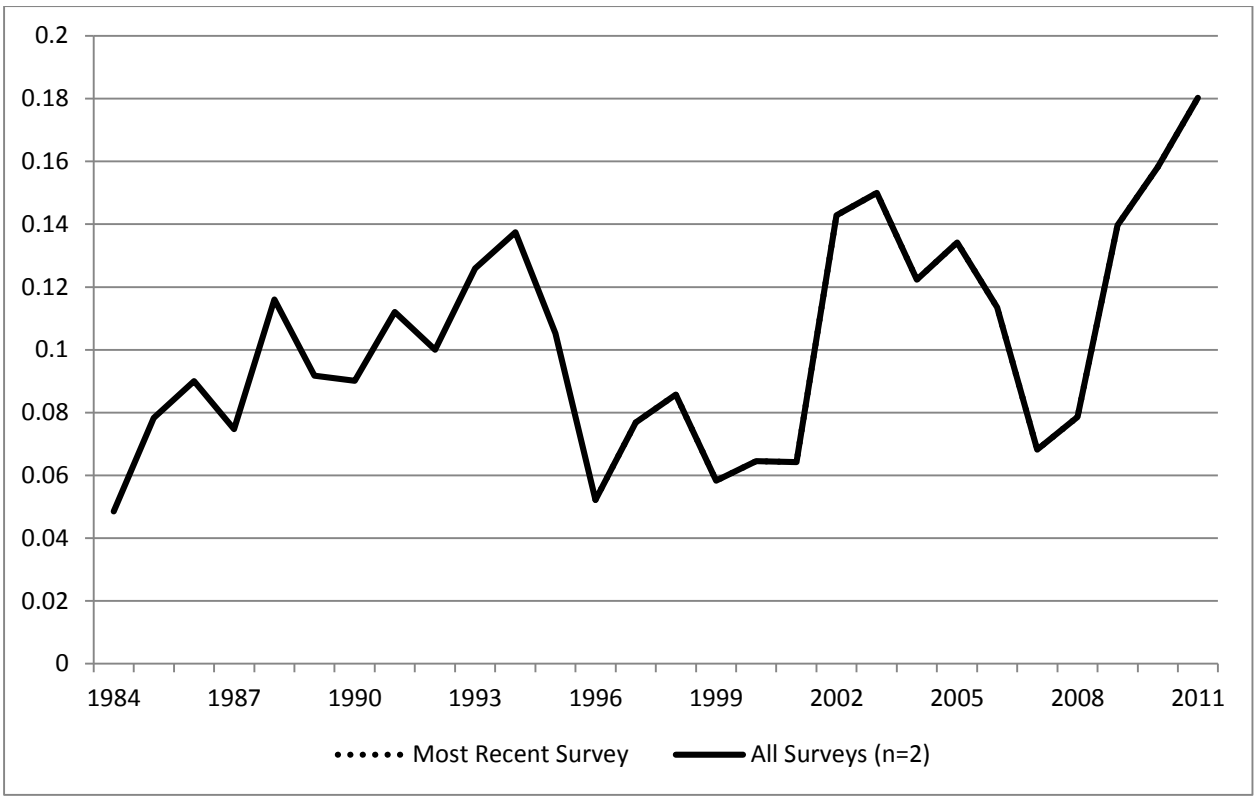

Figure A25: Cote d'Ivoire

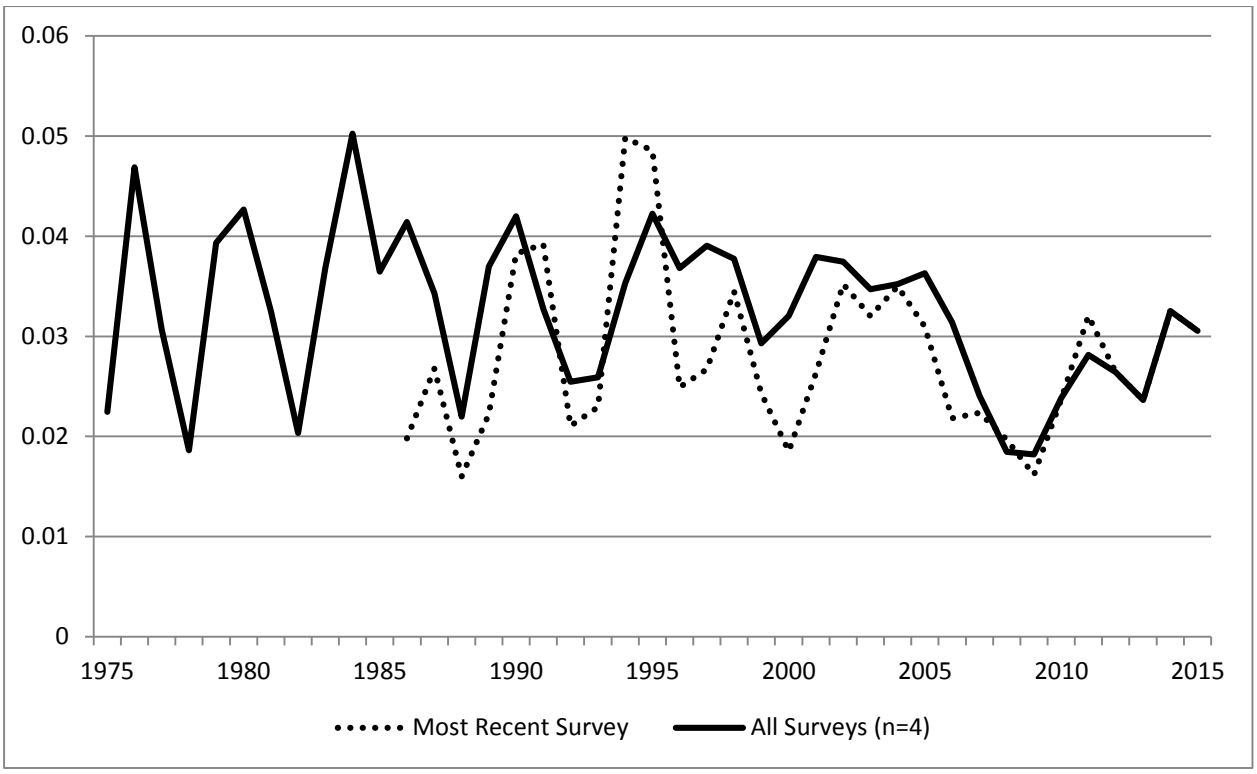

Figure A26: Ethiopia

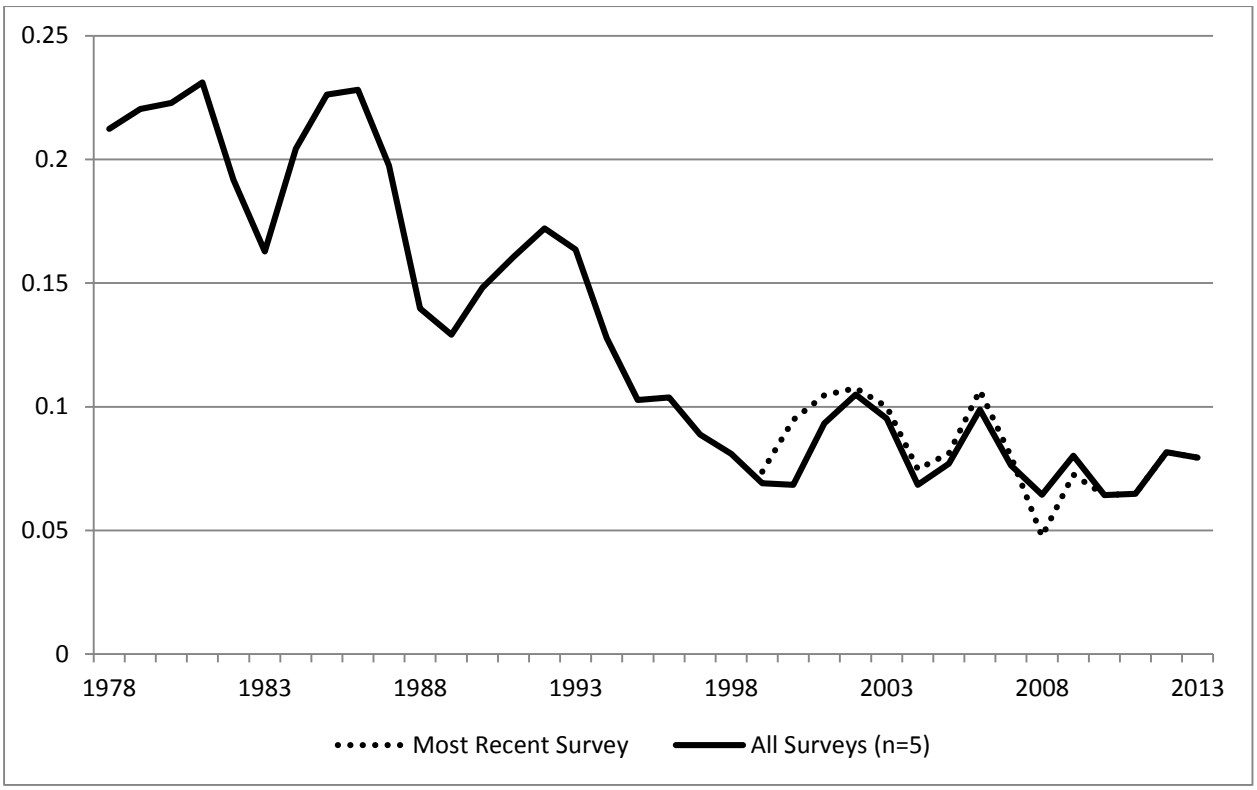

Figure A27: Ghana

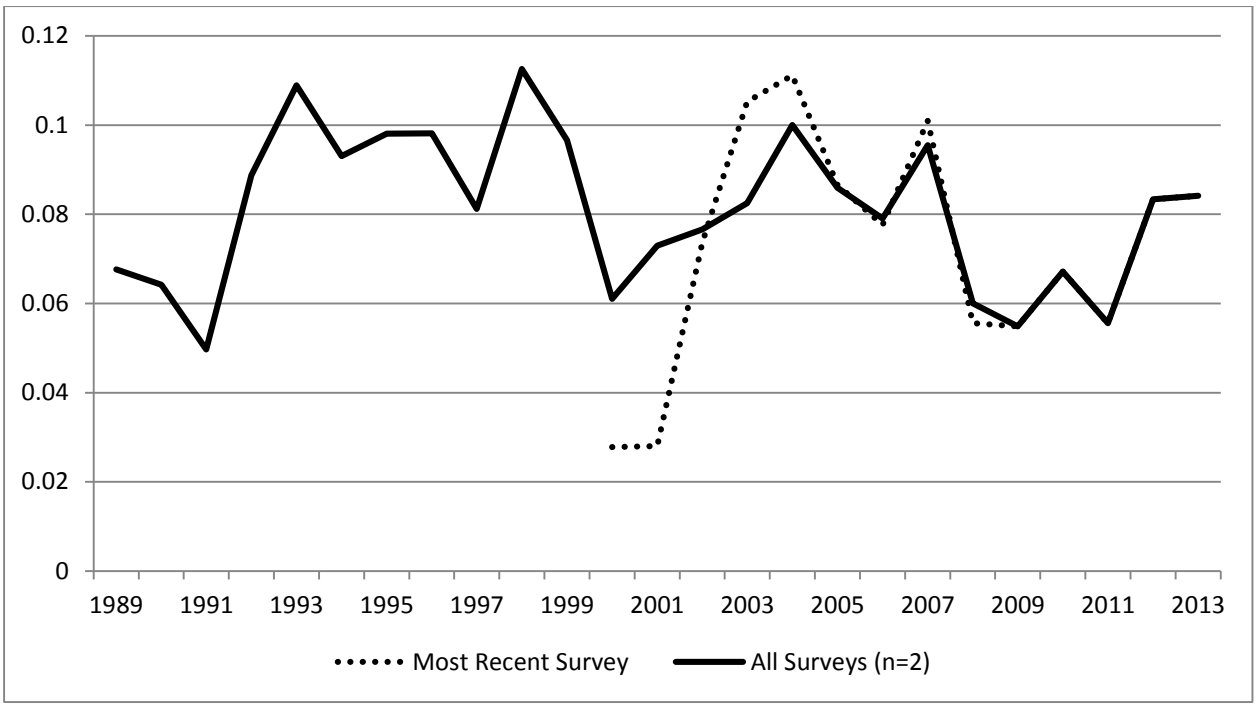

Figure A28: Liberia

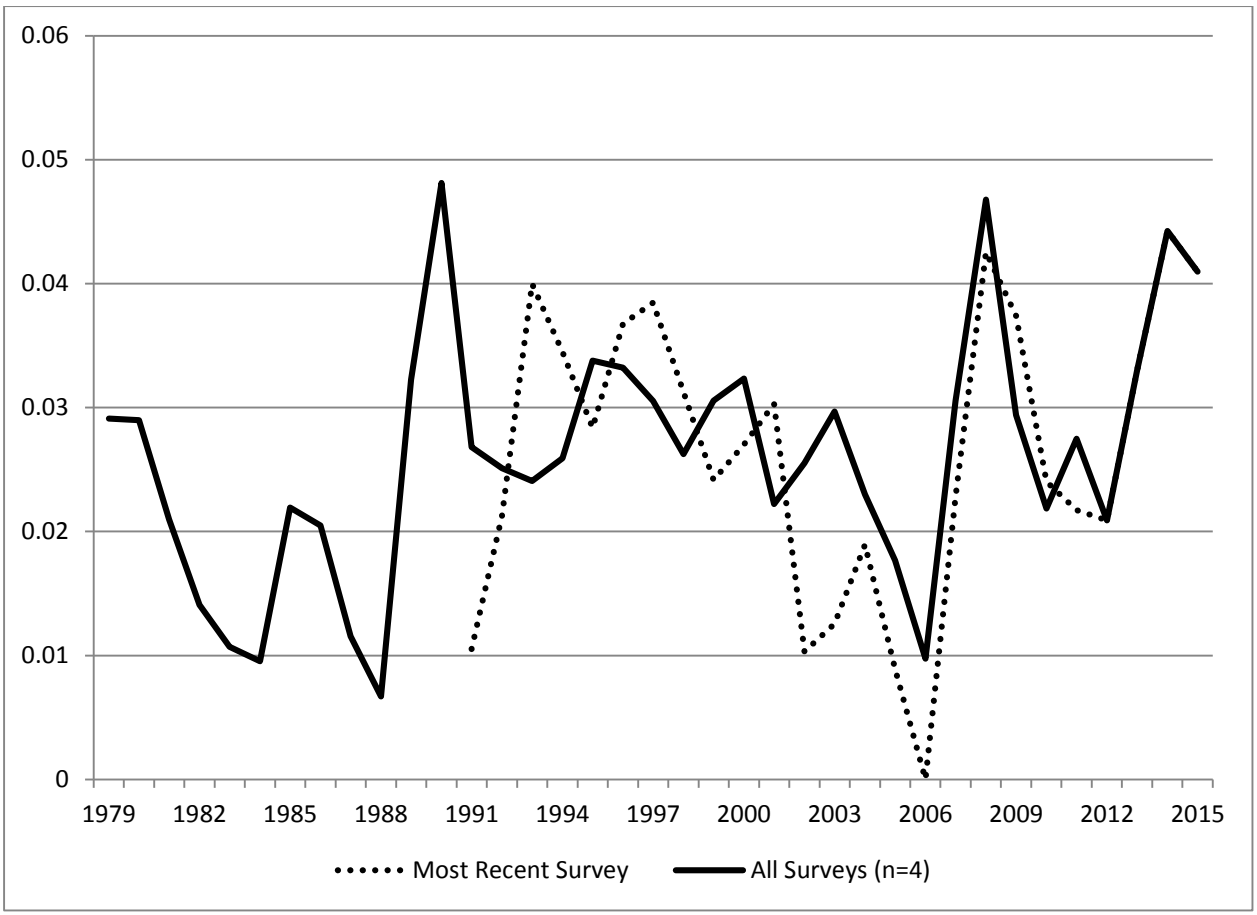

Figure A29: Malawi

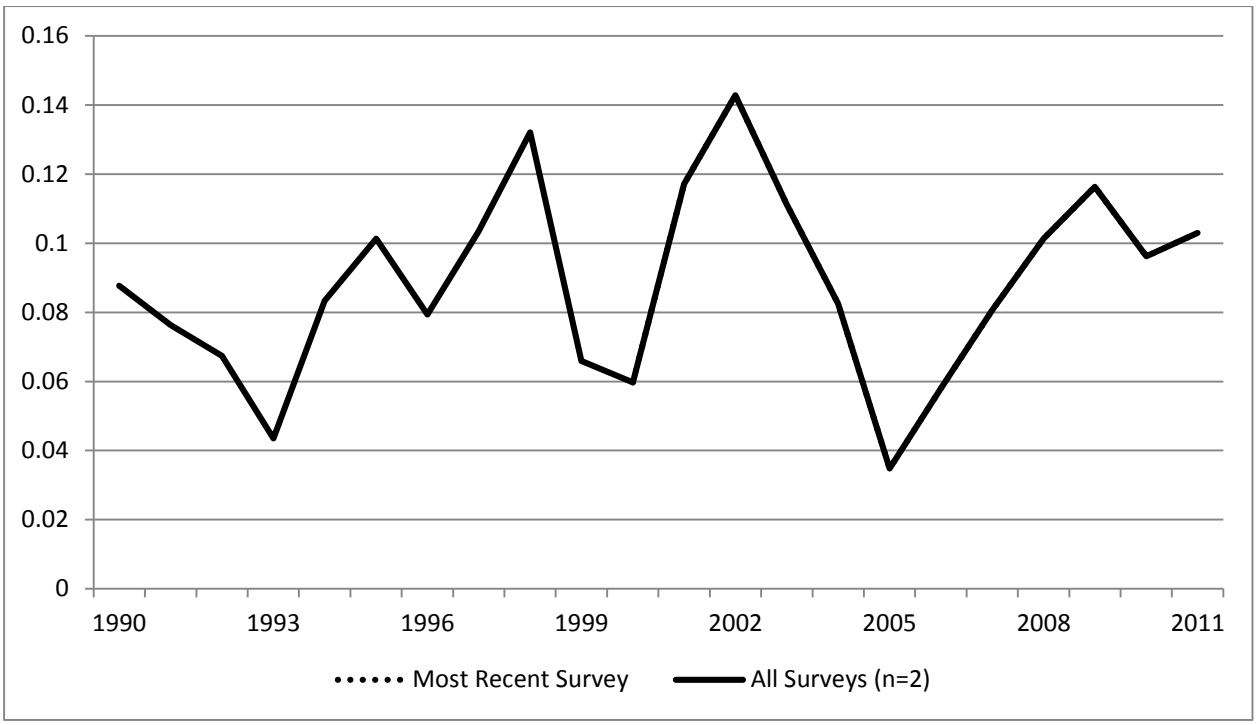

Figure A30: Mozambique

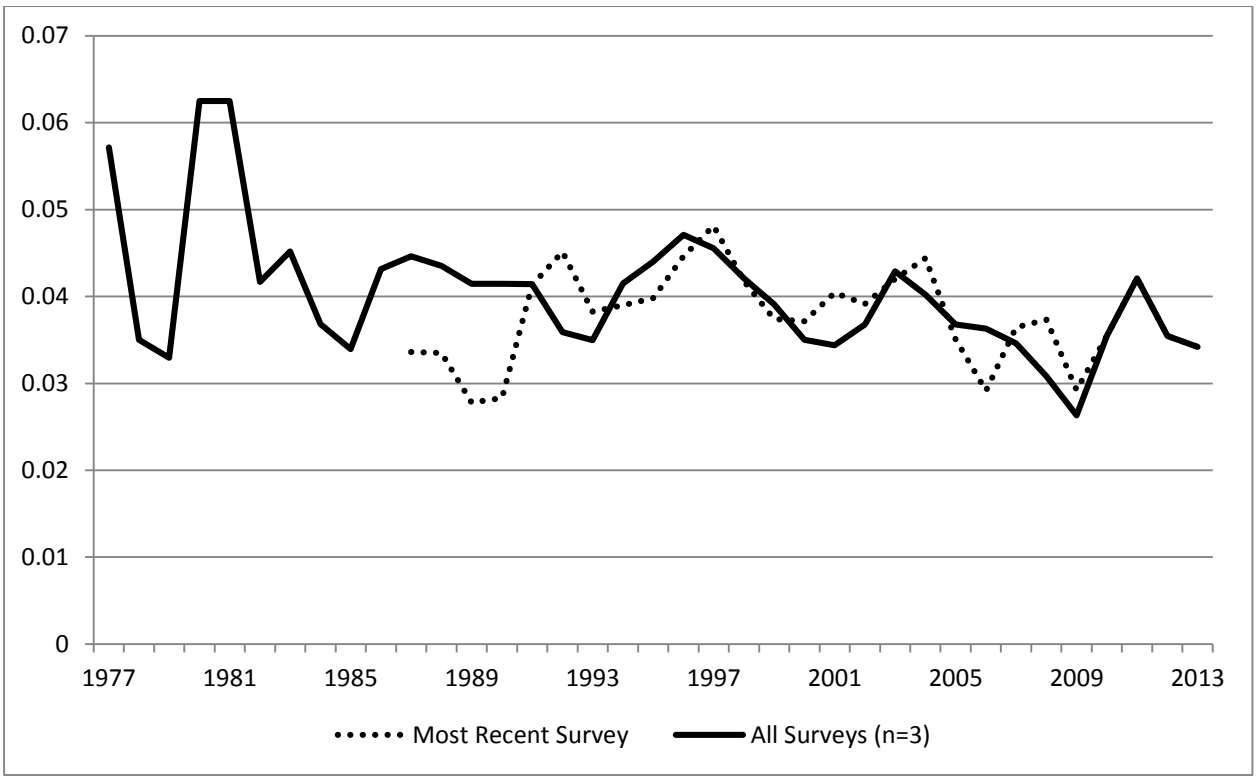

Figure A31: Nigeria

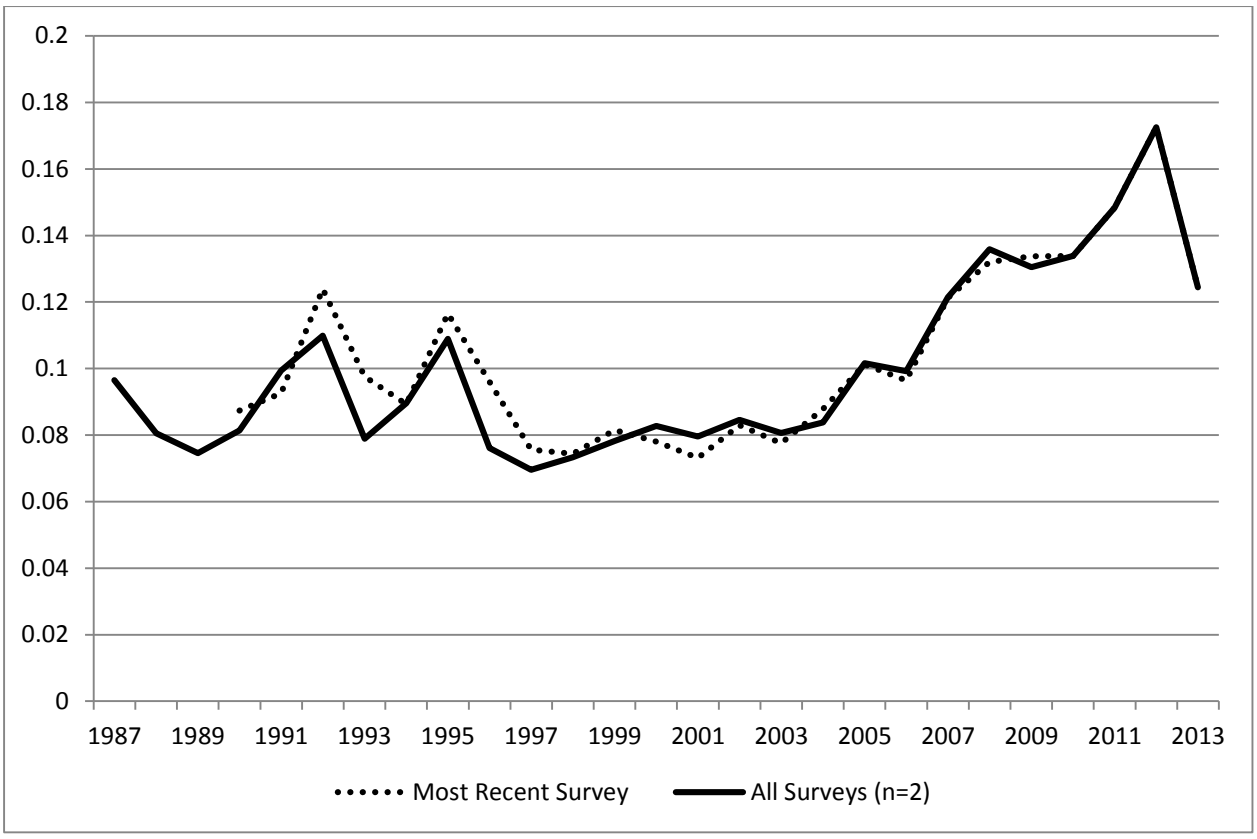

Figure A32: Sierra Leone

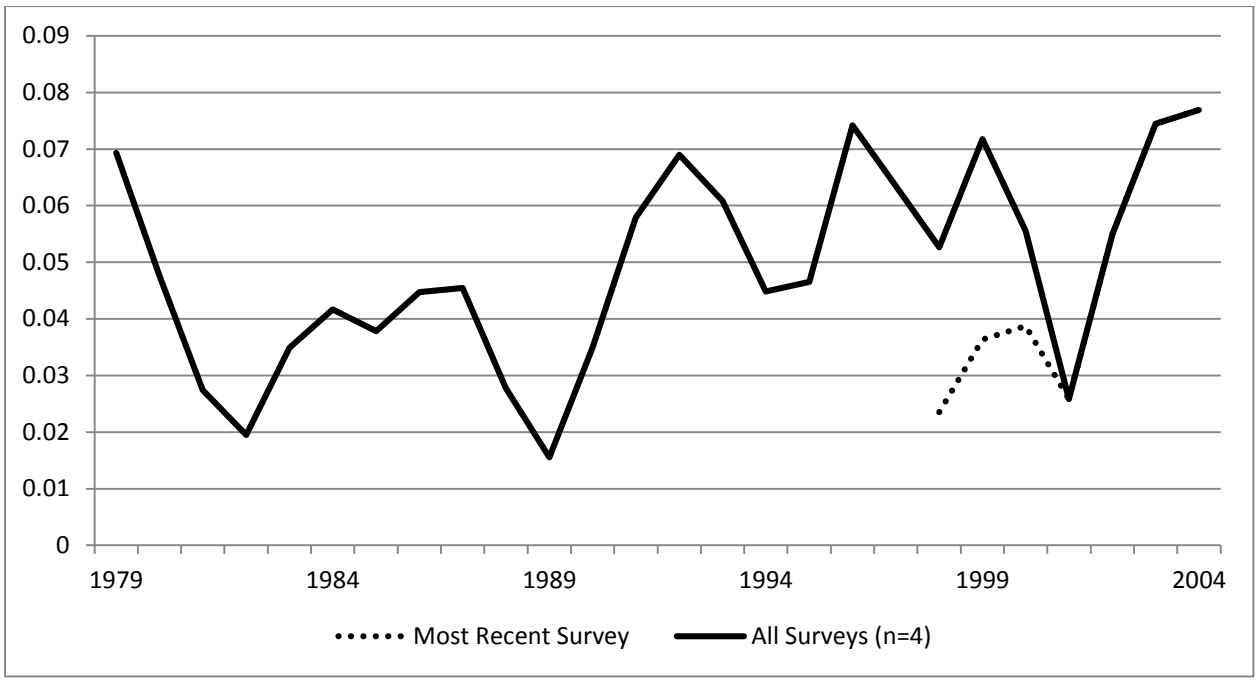

Figure A33: Tanzania

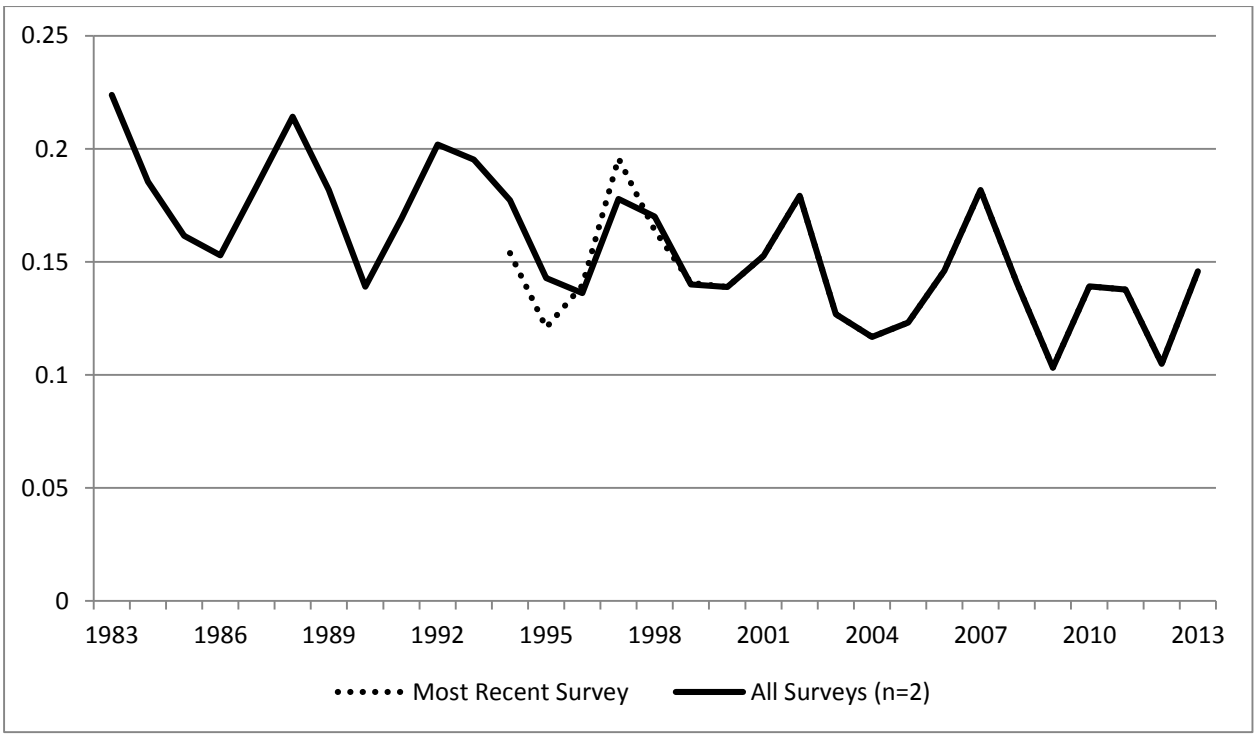

Figure A34: Togo

Figure A35: Uganda

[1] Also see (Brennan, 2006) on fierce debates which took place among Africans in colonial Tanzania around inter-racial marriages.

[2] These examples of relationships between nationals and foreigners suggest some degree of native/foreign marriages in Africa as well. The DHS data, however, does not allow for a great deal of insight into this type of intermarriage inasmuch as we only have data on national origin for ten countries in the dataset (of which the highest rate of native/foreign marriage was in Gambia, at 8.1%). Regression analysis suggested that modernization variables such as access to electricity, urbanization and literacy are correlated with native/foreign marriage (results available from authors).

[3] The general trend is the same for both type of intermarriage if we include all countries in the dataset.

[4] Doing so gives us more observations than if we were to use date of marriage by men, who are more than twice as likely to have been previously married as women: only 16% of women have been married more than once, compared to 37% for men.

[5] The slight dip in intermarriage rates in 2013-2014 could be a consequence of a decline in the number of countries covered in the dataset, which drops from 23 in 2012 to 17 in 2013 and 12 in 2014.

[6] Hypothetically less recent marriages might be more likely to have been reported as intra-ethnic than more recent marriages due to the possibility that one spouse has assimilated into the other spouse's ethnicity over time. We tested this theory by regressing inter-ethnic marriage on a variable measuring years since (first) marriage. The coefficient on this variable is negative and statistically significant for both men and women when excluding individual-level variables, but it loses statistical significance if individual characteristics are included (with results available from the authors upon request). This result is consistent with a correlation between a rising rate of inter-ethnic marriage and a change in individual-level correlates of modernization.

[7] In one case, Chad, there was only an average of 50+ observations per year when we combined two surveys. The three countries where the average number of observations per year never crossed 50 were the Central African Republic, Rwanda and Tanzania (for all three countries the trend was upwards for inter-ethnic marriage).

[8] We tried adding a wide variety of country-level variables that might be correlated with ethnicity and inter-ethnic relations (Green, 2013), such as size (log of kilometres squared), ethno-linguistic fractionalization, historical slave exports, tropical geography (log of mean latitude), level of democracy (Polity2 score), national (as opposed to ethnic) affiliation (as measure by Afrobarometer round 6 surveys), average fluency in the official language (Albaugh, 2014), the intensity of local language use in education (Albaugh, 2014), the presence of the 'cousinage' system in West Africa and log of GDP per capita, none of which were statistically significant at the 5% level or greater. We also tested for spatial ethnic segregation at the country level (as measured by the generalized dissimilarity index; cf. (Robinson, 2018)), which was not statistically significant.

[9] We do not include a variable for armed service for women in column 1, as only 4 out of 72,717 women in the sample listed the army as their occupation, versus 160 for men.

[10] We checked as well to see if years since migration might be correlated with inter-marriage, as has been found elsewhere (Choi & Tienda, 2018), but found no correlation; we also found no correlation between inter-marriage and migration after marriage (results available from authors).