University of Kent

School of Economics Discussion Papers

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January 2021

KDPE 2101

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January 17, 2021

Abstract

Recent UN data show that the lifetime fertility of women in developed countries has fallen below 2.1 live births. By contrast, fertility rates in most developing countries have remained quite high despite falling mortality rates. This paper examines the effect of culture on fertility outcomes in developing countries, using the norms of premarital sexual behaviour as a measure of culture. Three types of norms are identified viz., the emphasis on female early marriage, the emphasis on female virginity at marriage, and weakly censuring premarital sexual behaviour. These differences in premarital rules are a source of identifying variation in the age at first birth and the number of children. Using a sample of women aged 15 to 49 from Africa and Turkey, the study shows that premarital sexual norms significantly affect the age at first birth and the number of children per woman. It finds that the cultural emphasis on early marriage significantly lowers a woman's age at first birth while it raises her fertility level relative to the culture which weakly censures female premarital sexual relations. Conversely, the emphasis on female virginity at marriage increases the age at first birth and lowers fertility relative to the comparison group.

Keywords: Fertility Adolescent fertility Premarital norms Cultural preferences

*I am grateful to Dr Zaki Wahhaj and Dr Guy Tchuente for their helpful comments, suggestions, and feedback. I also want to thank the seminar participants and members of the Microeconomics forum of the School of Economics for their useful comments and suggestions.

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1. Introduction

The correlation between fertility rates and economic growth is a well-established economic fact (Galor & Weil, 1996). Empirical evidence suggests that reductions in fertility rates can increase female participation in the labor market by freeing up women's time from childcare. It can also raise physical and human capital per capita by reducing the child dependency ratio (Bloom, Canning, Fink, & Finlay, 2009; Bloom, Kuhn, & Prettner, 2017; Canning, Raja, & Yazbeck, 2015). Many countries have experienced significant reductions in total fertility in the last few decades. But by 2019 while the lifetime fertility in a majority of, mainly developed, countries was below 2.1 live births per woman, most developing countries recorded fertility rates above this level. The region of Sub-Saharan Africa (SSA), for example, had an average of 4.6 live births per woman, Oceania, excluding Australia and New Zealand (3.4), North Africa and Western Asia (2.9), and Central and Southern Asia (2.4) (UN 2019, World Population Prospects).

Adolescent fertility rate has also been significantly high in many countries of sub-Saharan Africa and Latin America. Between 2010 and 2019, adolescent birth rate (i.e., births per 1,000 women aged 15 to 19) was highest in sub-Saharan Africa, at 104 per 1,000, followed by Latin America and the Caribbean at 63 per 1,000 young women. Besides swelling the total fertility rate adolescent childbearing in this region has very dire health and development consequences for the young mothers and their children, and the larger society. Indeed, the projection by the United Nations that Sub-Saharan Africa could become the most populous region around 2062, surpassing both Eastern and South-Eastern Asia and Central and Southern Asia in size, is unsettling. The question then is why, despite the significant progress in development indicators like educational attainment, health care provision and falling child mortality rates, does the fertility decline in much of Sub-Saharan Africa remain sluggish or outrightly stalled in some countries.

Different factors, mostly economic, have been identified as contributing to the sluggish fertility decline in Africa. One of such factors is the late onset of fertility transition in Africa which has been blamed on the slow pace of economic development (Canning et al., 2015; Shapiro, 2015). But consensus is also growing lately that economic factors alone do not adequately explain a

wide range of social and economic decisions made by people in African societies, including fertility decisions. Cultural beliefs and attitudes are growing in importance as determinants of the daily choices that are made by individuals and households in developing countries (Fernández, 2008; 2011). The question addressed in this paper is whether cultural norms can explain the unique fertility outcomes of women in Africa and, by extension, the sluggish decline in fertility rates compared to other developing regions. It specifically tests for the impact of cultural norms relating to female premarital sexual behavior on the age at first birth, representing the commencement of motherhood, and the number of children a woman has (i.e., total fertility at the time of survey). These fertility outcomes have important ramifications for the general wellbeing of women within households and their capacity to contribute to their nation's economy by, say, participating in the labor force or political leadership.

Anthropologists suggest that norms about sexuality developed out of the efforts of societies to adapt to the economic and cultural conditions prevalent in preindustrial dispensations. They were strategies adopted to guarantee the reproductive continuity of a group of people across time by ensuring that their daughters were married at the right time to the right suitors (Goethals, 1971; Murdock, 1964; Whiting, Burbank, & Ratner, 1986). Norms that regulate female premarital sexual behavior grew out of the unique cultural conditions of each society and were dependent on factors like the nature of subsistence (i.e., whether it was a food producing or a food gathering society), production technology, social stratification (such as the presence of a caste system, etc.), political organization, religion, as well as rules of descent (whether patrilineal, matrilineal, or bilateral) and marital residence.

It is also thought that the various premarital sexual norms may have developed out of the need to curb out-of-wedlock pregnancies in many cultures, as Broude's (1996) review expounds. For example, in patrilineal societies, where descent and inheritance are through a person's father, premarital sexual relations were prohibited for females. Premarital pregnancy was problematic in such systems because an out-of-wedlock child not only reduced the marriage potential of its mother but was essentially without identity if the child's paternity was in doubt. However, in societies where descent was traced through the women – the matrilineal system – premarital

sexual norms tended to be permissive or weakly sanctioned. Premarital pregnancy was tolerated in matrilineal systems because women belonged in their natal homes and were guaranteed the support and acceptance of their kin groups for themselves and their offspring. The nature of marriage rites was also found to correlate with norms of female premarital sexual behavior. Dowry paying societies, where property was transferred from the bride's family to the groom's, had permissive premarital sexual norms. The practice of bride price payment (wealth transfer from the groom's family to the bride's), on the contrary, led to the evolution of restrictive premarital sexual norms. It is this backdrop that motivates this empirical analysis of the relationship between norms of female premarital sexual behavior (representing culture) and a set of fertility outcomes.

A combination of data from different sources has been utilized to address the above stated research question. Information on the age at first birth and the number of children, as well as other individual characteristics, come from the Demographic and Health Surveys (DHS) for twenty-three (23) African countries and one country from the Middle East. Murdock's (1967) Ethnographic Atlas (EA) provides information on the cultural practices of the respective ethnic groups identified in the DHS datasets. The focus in this research is on the norms of premarital sexual behavior of women and girls. The matching of ethnicity names from the DHS to identical names in the Ethnographic Atlas helps in identifying each woman's ancestral practice regarding female premarital sexual behavior (the details of this process are given in section 4.2) [1]. A sample of 196,608 women aged between 15 and 49 years from multiple DHS waves. For a robust result, the restrictive sexual norms obtained from the EA are split into: 'the early marriage of girls' cultural norm and the 'insists on virginity of girls' cultural norm. The justification for the split comes from the findings in previous African studies indicating a difference between cultures with emphasis on female virginity and cultures with emphasis on female early marriage (Swaartbooi-Xabadiya & Nduna, 2014). Additional data on measures of formal institutions[2] were

[1] Figure A.1 (see Appendix) maps the distribution of female premarital sexual norms by ethnic groups in Africa using the information from Murdock's (1967) Ethnographic Atlas.

[2] Formal institutions include the state laws, constitutions, and regulations that structure economic, social, and political interactions; informal institutions are the unwritten rules (including taboos and customs) of conduct governing the behavior of members of a local community (North, 1991).

obtained from Afro-barometer and the European Social Surveys (ESS) to create an interaction with culture. This interaction aids the isolation of informal institutions from cultural preferences.

To identify the effect of each type of female premarital sexual norm on fertility outcomes, this research studies women in urban areas, who are most likely to live outside their indigenous villages. It exploits the fact that women from different cultural backgrounds live in the same urban neighborhoods and face similar market and institutional settings. This allows the use of the 'epidemiological approach' to estimate the effect of the respective norms on fertility outcomes. Examples of such application can be found in the literature that examines a variety of outcomes for immigrants in developed countries (see Fernandez and Fogli, (2009) and Marcen, Molina et al. (2018) etc.). The differences in premarital sexual norms serve as a means of identifying variation in the effect of culture on the onset of motherhood and fertility at a given age. Comparison is made between the outcomes of the restrictive culture groups - the culture with emphasis on female early marriage and the culture with emphasis on female virginity – and outcomes of the culture that 'weakly censures' female premarital sexual behavior.

The findings in this paper indicate that, compared to the culture that emphasizes neither female early marriage nor virginity, the culture with an emphasis on early marriage lowers a woman's age at first birth by 0.72 years while it increases her fertility by 0.32 children (0.45 for the 25 to 49 age cohort). By contrast, the culture with an emphasis on female virginity increases the female age at first birth by 1.13 years and reduces fertility by 0.76 children (0.85 for the older cohort) compared to the permissive or 'weakly censured' group. According to these findings, the cultural norms regarding female premarital sexual behavior have a strong and significant impact on the fertility outcomes of women in African countries. This suggests a persistence of cultural influence on fertility behavior and can be regarded as evidence in support of the theory of cultural transmission à la Bisin and Verdier (2011).

This paper contributes specifically to the literature on culture and fertility which, to a considerable extent, is focused on the fertility outcomes of immigrants in developed countries. A key paper in this regard is Fernandez and Fogli (2009), which employs the 'epidemiological approach' to examine the effect of culture on the work and fertility outcomes of second-

generation immigrants in the United States of America. Using past female labor force participation rates (FLFP) and total fertility rates (TFR) from countries of ancestry as proxies for culture, they find that the cultural proxies significantly explain the observed outcomes despite controlling for market and institutional conditions. Marcen et al. (2018), also using American data, show that the mean number of children by country-of-origin correlates positively with the number of children born and the decision to have children by second-generation immigrants.

Studies with a focus on migrant populations in Western Europe include Chabe-Ferret (2013), for example, which uses the TeO Survey to examine the persistence of own-country fertility norms among immigrants in France. The author employs a duration model to document a positive effect of home country fertility norms on the hazard rate of second and third births. The paper does not, however, find any significant effect of own-country fertility norms on the age at first birth. On their part, Stichnoth and Yeter (2016) study first- and second-generation immigrants in Germany. They find a positive and significant effect of country-of-origin fertility rates (their measure of culture) on fertility outcomes, noting that the effect was strongest among the first-generation immigrants than it was for the second and later generations.

In a broader context, this study adds to the research on the outgrowth of gender norms from the socio-economic conditions of pre-industrial societies by matching historical norms of female pre-marital sexual behaviour to current populations and estimating their effect on fertility outcomes. Giuliano's (2017) review highlights several historical precursors of modern-day gendered norms around the world. Some of which include the type of agriculture and agricultural technology a society practiced (Alesina, Giuliano, & Nunn, 2011; 2013; Giuliano, 2015; Hansen, Jensen, & Skovsgaard, 2015), rules of descent and kinship systems (Gneezy, Leonard, & List, 2009; Gottlieb & Robinson, 2016; Lowes, 2016), and ancestral patterns of settlement and social structures (Alesina, Brioschi, & Ferrara, 2016; Michalopoulos, Putterman, & Weil, 2016; Moscona, Nunn, & Robinson, 2018). The contribution of this study to existing research lies in its analysis of the effect of marital norms within ethnic groups on fertility outcomes using data from developing countries. Its novelty is in its choice of cultural proxy (female premarital sexual norms) which, to the best of my knowledge, has not been used in any

previous study to analyse fertility outcomes in Africa or any other developing regions. The distinct rules of female premarital sexual behaviour in different African societies shed light on the level of influence that cultural beliefs exert on fertility decisions in different countries.

The next section explains the context of this research and discusses the relevance of changes in fertility rates to development in Africa. Section 3 explores the origins of premarital sexual norms from sociological and anthropological writings. These inform our empirical analysis by highlighting the relevance of premarital norms in contemporary African contexts. A description of the data is given in Section 4 together with an explanation of the procedure used in linking historical attributes to the ethnic groups in the DHS dataset. The empirical model and identification strategy are discussed in section 5 while section 6 presents the estimation results. Lastly, the research findings are discussed in section 7 and the conclusions of the paper are reported in section 8.

2. Context/Background of Culture and Fertility Decisions

In this section we explore a few theoretical explanations given in the literature as underpinning the relationship between fertility, or in some cases, changes in the structure of the population, and economic development. It is not the intention of this section to provide a comprehensive review of this extensive literature but to give a selective highlight of key studies that form the supporting framework for this research. It also provides a context for the study.

2.1 Fertility transition and development: Is Africa different?

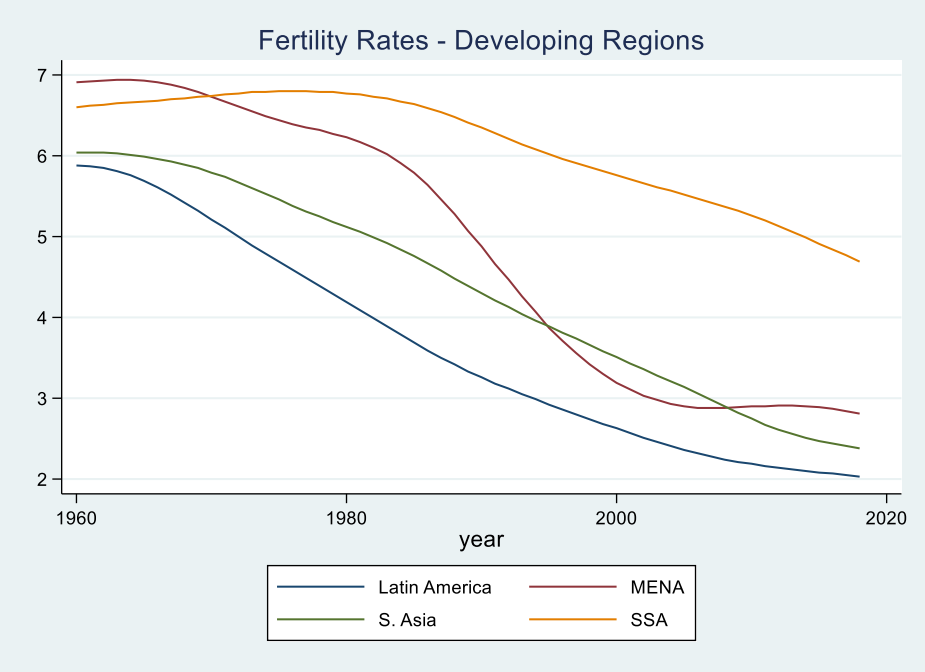
Fertility transition - the decline in fertility from high to low levels - is integral to the development success story of today's economically advanced countries. The steady reduction in total fertility rates in different regions of the world is widely associated with the growth in vital indicators like labor supply, income per capita, and human capital development (Bardhan & Udry, 1999; Bloom et al., 2009; Herzer, Strulik, & Vollmer, 2012). In Galor and weil (1996; 2000), and Galor (2005ba) we find the theoretical foundations, through the vehicle of the Unified Growth Theory, for the

association between declining fertility and the growth in income per capita. Their theory is used to explain why, and how, the Malthusian trap was averted in developing and developed countries (Chatterjee & Vogl, 2018). The key argument of the theory, as analyzed by Galor (2005b) and Weil (2000) and Galor (2011), is that technological progress which resulted from the industrial revolution in Western Europe, and the industrialization process in developing countries led to an increase in the demand for human capital. The higher demand for human capital incentivized parents to invest in their children's education, thus trading off child quantity for quality (Doepke, 2015). This trade off eventually resulted in the reduction in fertility rates across countries (Becker et al. 1990; 1999). In addition, the higher demand for human capital was reinforced by the reduction in child labor, improvements in life expectancy, and a decreasing gender gap in education and job opportunities (Galor, 2005a). These were the precursors to the successful demographic transition in advanced and emerging economies.

Globally, fertility rates have declined since the 1950s, leading to a much slower growth in world population (UN, 2019). However, high fertility rates and, by consequence, rapid population growth is still the norm in Africa, especially Sub-Saharan Africa. This remains a cause of concern among development experts and policy makers and for good reason, given the challenges that rising populations pose to sustainable development. The chief source of worry is Africa's inability to replicate the trend in demographic transition that countries in Europe and North America have experienced through the course of their development. The continent has also been unable to attain a rapid decline in fertility following rising income levels and rapid economic growth as is found among the developing countries of Asia and parts of Latin America (Bongaarts, Frank, & Lesthaeghe, 1984; Bongaarts & Casterline, 2013). Demographers have, however, observed that fertility transition began much later in Africa than it did in other developing regions although this process is not consistent across all African countries despite significant economic progress. They note that this phenomenon is rare in other developing regions, which begs the question why fertility transition in Africa is different (Bongaarts & Casterline, 2013; Bongaarts, Mensch, & Blanc, 2016; Kebede, Goujon, & Lutz, 2019).

A look at recent World Bank data shows that Africa has seen a very slow decline in total fertility rates between 1965 and 2018 (Figure 1). This decline is also mainly driven by North Africa where there has been a steady drop in fertility from 1966 to 2006. The fertility rate in Sub-Saharan Africa, on the other hand, was rising from 1960 and 1972. It stagnated at roughly 6.8 births per woman from 1972 to 1980 before it began a sluggish decline. Therefore, compared to Southern Asia and Latin America, Africa's fertility decline was much slower between 1960 and 2010, and way higher than both regions by 2018 (WDI, 2019). Within Sub-Saharan Africa, there are significant variations across countries such that by 2018 fertility rates ranged widely between 2.4 births per woman in South Africa to 6.9 births per woman in Niger. Overall, the demographic transition in Sub-Saharan Africa is regarded as still in its very early stages (Canning et al., 2015).

Figure 1. Fertility Rates for selected Developing Regions (1960-2019)



Source: World Development Indicators (2019), Online access: https://databank.worldbank.org/source/world-development-indicators

Note: The figure shows trends in fertility rates in Latin America, Middle East, and North Africa (MENA), South Asia, and Sub-Saharan Africa (SSA)

The foregoing discussion gives credence to the description of Africa as the last major frontier of development (Sinding, 2009). Several reasons account for this including the obvious fact that it lags other developing regions the world in the race towards improved living standards for its citizens, a situation compounded by its high population growth rate. The need to regulate the

rapidly rising African population so that the continent can benefit from the 'dividends' of demographic transition (see Bloom, Canning et al. (2003)) that other developing regions have long been enjoying, is considered a matter that should be prioritized by African leaders (Bloom et al., 2017; Eastwood & Lipton, 2011). An unacceptably high fertility rate is certainly not the only explanation for Africa's low productivity and income. Policy and institutional failures are among the key factors responsible for the pervasive poverty and dismal development outcomes in the continent. But, while it may not be a sufficient condition for economic development, fertility decline is seen as a necessary condition which, combined with the right the policy and institutional environment, can lead to the rapid development of any region or country (Sinding 2009; Canning, Raja et al. 2015).

2.2 The Importance of Fertility Transition: A Brief Overview of the Literature

There is a vast theoretical and empirical research on the effect of changes in fertility rate on economic growth which also outlines the potential benefits that poor countries stand to reap by actively seeking to lower their fertility rates (Ashraf, Weil, & Wilde, 2013; Das Gupta, Bongaarts, & Cleland, 2011). The study by Ashraf et. al. (2013) uses a demographic-economic simulation model to analyze the effect of exogenous shocks to fertility on GDP per capita while accounting for general equilibrium effects, the evolution of population age structure, accumulation of human and physical capital, and resource congestion. Matching the model to data from Nigeria they established that a decline in fertility increases income per capita by an economically significant amount. Their research identifies four channels through which changes in fertility affect the economy. These are: the dependency effect, which is important in the early years of the transition; the congestion of fixed resources (or Malthusian) effect; the capital shallowing (or Solow) effect; and the human capital effect. A more concise description of these effects is given by Bloom, Kuhn et al. (2017) who regard them broadly as 'accounting' and 'behavioral' effects. Accounting effects, they claim, stem from a falling youth dependency ratio resulting from a decline in fertility. As the ratio of the working-age to dependent population rises, it expands the labor force, savings, and each worker's capacity to produce. Behavioral effects arise from the

rise in female labor force participation, greater investment in the health and education of children by families due to the fall in fertility.

An extended version of Ashraf et al.'s model is used by Mason, Lee et al. (2016) and Karra, Canning et al. (2017) to confirm the existence of the said effects. Mason et al.'s study incorporates the effects of capital, human capital, and labor to show that changes in the age structure of the population and investments in human capital substantially affect living standards in the long run. Karra et. al.'s extended model includes four new channels/effects: the effect of fertility on savings; the effect of fertility on children's health; a feedback from education to fertility; and the inclusion of a three-sector model with market imperfections to capture the conditions in developing countries. They find that the additional channels doubled the effect of fertility reduction on income per capita and predicted a larger positive effect of the reduction in fertility on economic growth. These theoretical papers generally re-affirm the important role of human and physical capital in productivity and income growth of a country. Investments in human capital is emphasized in the literature as a by-product of the demographic transition. It considered a huge necessity for achieving long run economic growth in developing countries (Becker, Murphy, & Tamura, 1990; Bloom, Canning, Fink, & Finlay, 2012; Chatterjee & Vogl, 2018; Kalemli-Ozcan, Ryder, & Weil, 2000; Mason et al., 2016).

There are several empirical findings in support of the theoretical conclusions highlighted above. Different studies of the long-run effects of an experimental family planning program in Matlab, Bangladesh, by Joshi and Schultz (2007), Schultz (2009) and Joshi and Schultz (2013), show the positive effect of a program intervention on fertility levels. These studies find that the villages where the program was implemented experienced a decline in fertility of between 10 percent to 15 percent. The decline in fertility, the studies argue, led to higher household incomes (through a lower youth dependency ratio), improved the health and earnings status of women, and led to healthier and better educated children. Miller's (2010) study of the expansion of a family planning organization in Columbia (PROFAMILIA) added new evidence that women's access to contraceptives reduced fertility and their socio-economic outcomes. The study finds that PROFAMILIA lowered the cost of postponing first births and enabled young women to gain more

education. This means that girls were able build their capacity to participate in the labor force and had prospects of a better and more independent lives.

Rosenzweig and Zhang (2009) also confirm the negative correlation between fertility and education levels with Chinese data. They use the presence of twins to identify the existence of a trade-off between the quantity of children and their quality, and whether a reduction in fertility raises a family's per child investment in human capital. The study finds that having an extra child had a negative effect on educational performance, children's health, and expectations about college enrolment.

2.3 The Challenge of Adolescent Fertility

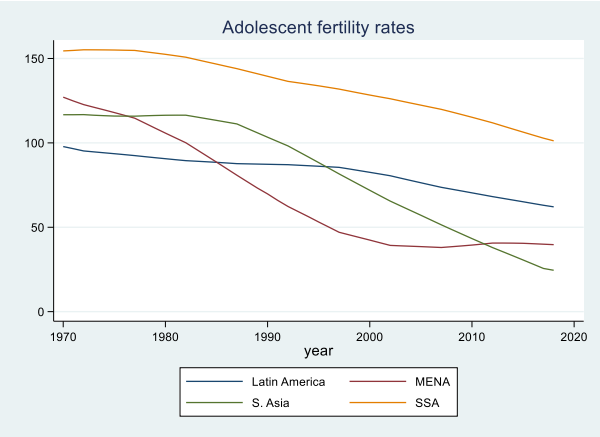
Adolescent fertility, defined by the World Health Organization (2004) as pregnancy and childbearing by girls aged between 10 and 19 years, has been a matter of great concern for many countries in recent times. This is because early childbearing has enormous implications for population growth and economic development (WDR, 2007) besides the personal and societal ramifications. The population of adolescents globally is quite significant, standing at 16 percent of total world population. Although there are more adolescents in South Asia (nearly 350 million according to UNICEF statistics) than in any other region, Sub-Saharan Africa alone has the greatest proportion of its population as adolescents. They constitute 23 percent of total population in SSA with the numbers growing steadily (UNICEF, 2012; 2019). It is projected that by 2030, Sub-Saharan Africa will be home to almost 25 percent of the world's adolescent population given current trends in population growth (UNFPA, 2013).

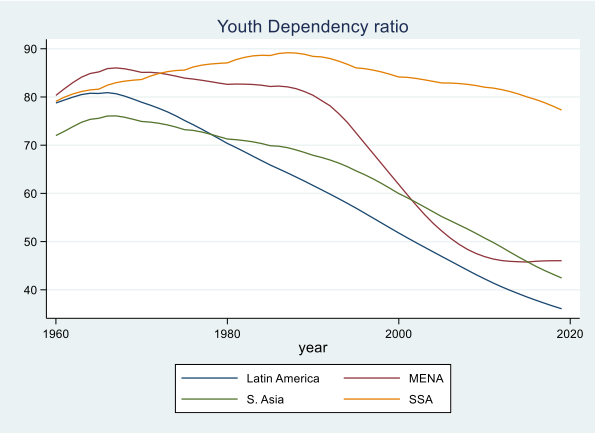
Another notable fact is that the rate of adolescent fertility in some Latin American and Sub-Saharan African countries is very high. Overall, adolescent fertility has remained higher in SSA than other developing regions (see figure 2a), declining from nearly 154 births in 1960 to 101 births per woman aged 10 to 19 years in 2019. It also contributes substantially to the high youth dependency ratio. Figure 2b shows the youth dependency ratio in SSA is above the ratios in other developing regions. Evidently, the contribution of adolescent fertility to total fertility rate in Sub-Saharan Africa is an important explanatory factor of the stagnating fertility transition in the sub-region and in Africa as a whole. In general, it poses some major problems for sustainable

development in Africa. A rising adolescent fertility rate swells the total fertility rate, given falling child mortality rates, and results in a rapid population growth. The outcome is, therefore, a larger youth dependency ratio which lowers the productive capacity of the working-age population and reduces saving and investment. The consequence of an enlarged youth dependency ratio is a diversion of resources from investments in the production of capital goods to the provision of goods for current consumption by the younger population (Coale & Hoover, 1958), see Das Gupta et. al. (2011) for review. The overall effect is a fall in long-run economic development and income growth (Das Gupta et al., 2011; Iyigun, 2000; Momota & Horii, 2013) (World Bank WDR 2007). This, no doubt, is the reality that most African countries are faced with.

In addition to the macroeconomic problems that result from a high adolescent fertility rate, there are personal difficulties that an adolescent girl faces from having an early childbirth. Her capacity for personal development is hugely diminished primarily because of her inability to continue schooling. Adolescent pregnancy is identified as a key factor in the school dropout and lower educational attainment of girls (Clark, Koski, & Smith-Greenaway, 2017; Lloyd & Mensch, 2006; Lloyd & Mensch, 2008; Panday, Makiwane, Ranchod, & Letsoala, 2009; Sedgh, Finer, Bankole, Eilers, & Singh, 2015). Also, the health and wellbeing of young women and that of their children is jeopardized (Bongaarts et al., 2016; Ganchimeg et al., 2014; Sommer, Likindikoki, & Kaaya, 2015) (WDR 2007; UNICEF, 2012; World Bank, 2011). An out-of-wedlock pregnancy of an adolescent woman can expose her to social ostracism in communities where premarital sex is viewed in a negative light. She may also face financial difficulties if her family regards her pregnancy as shameful and thus reject her and her baby (Singh, 1998).

Figure 2: (a) Adolescent Fertility Rate (1970-2019) (b) Youth Dependency Ratio (1960-2019)





Source: World Development Indicators (2019), Online access: https://databank.worldbank.org/source/world-development-indicators

Note: The figure shows trends in (a) Adolescent fertility rates, and (b) Youth Dependency Ratios for Latin America, Middle East, and North Africa (MENA), Southern Asia, and Sub-Saharan Africa (SSA)

2.4 Determinants of Fertility in Africa

The foregoing discussions beg the question of why adult and adolescent fertility remains persistently high in African countries. From the standpoint of economic research, the stall in fertility decline can be pinned on a variety of factors including under-development, low level of education, and the failure of political leaders to prioritize the provision of reproductive health services (Bongaarts, 2011; Bongaarts, 2017; Kebede et al., 2019; Shapiro, 2015). The conventional theory of fertility transition does not, however, completely explain the nature and causes of the sluggish decline in fertility in Sub-Saharan Africa. This gap is being filled by recent studies that are focusing more on the social and cultural dynamics of African societies. Such studies are increasing helping researchers to identify non-economic reasons for the high fertility rates in Sub-Saharan Africa which have defied the growth in income per capita and levels of educational attainment, low child mortality and improvements in other development indicators.

A succinct summary of some of the social and economic explanations for the high fertility rates observed across Africa is given in Caldwell et al. (1992). The importance of ancestry and descent systems with well-established support networks within the extended family system features prominently. The extended family system has a unique relevance in the African society because

it provides social security for the older generation. The practice of polygyny in most parts of Africa and its tendency to absorb men of all economic costs of childrearing, as well as the communal land ownership system, make larger families an attractive choice. Added to that is the pro-natalist nature of African societies which feeds the desire for a large family size and raises the demand for children. Other promoters of high fertility are the land tenure and inheritance system wherein a large family means more land; kinship and family structures; as well as religion and cultural attitudes (Bongaarts & Watkins, 1996; Bongaarts & Casterline, 2013; Bongaarts et al., 2016; Caldwell & Caldwell, 1987; Canning et al., 2015; Casterline & Agyei-Mensah, 2017; Johnson-Hanks, 2015). These factors help to reinforce the strength of cultural preferences on fertility decisions in different countries. The task in this paper is to investigate whether the cultural norms surrounding female premarital sexual behavior influence the fertility decisions of women in contemporary societies. In the next section we briefly explore the anthropological writings to understand the development female pre-marital sexual norms in different societies.

3. Conceptual Framework

This section describes the concepts guiding the empirical analysis in this paper. It discusses the nature and historical origins of the rules governing female premarital sexual behavior that are found in modern societies. The ideas presented here are mainly from the sociology and anthropology literature. They provide insight on the cultural values and practices surrounding fertility and the prescriptions for female sexual and reproductive behavior which were common in preindustrial societies. Culture is conceptualized in this study as the shared beliefs, attitudes, and preferences of a group of people. These shared beliefs and perceptions metamorphose into norms of behavior which shape, and are shaped, by the system in which they are enshrined (Cislaghi & Shakya, 2018; Mackie, Moneti, Shakya, & Denny, 2015; Pulerwitz et al., 2019). Cultural norms tend to persist due to the social pressure and reward (or penalty) systems that drive compliance and/or deter defiance.

There is no gainsaying the fact that women are at the center of the reproductive process and that every lineage depends on the fecundity of its females for continuity. It is, therefore, understandable for different ideologies and norms concerning female sexuality to be found in different societies. Some common ideologies include those that surround the transition from girlhood to womanhood, the emphasis on upholding family honor, submission to husbands and in-laws, as well as the value placed on serving one's family (Bantebya, Muhanguzi, & Watson, 2014; Marcus, Harper, Brodbeck, & Page, 2015). These, and other rules of their kind, are often intended to ensure the continuity of procreation across generations. They dictate how children should be cared for and what practices should govern adolescent sexuality, courtship and marriage, divorce, inheritance, etc. (Whiting et al., 1986). One of such rules concerns female premarital sexual behavior and is our cultural proxy of choice for the analysis in this paper.

Studies in anthropology highlight various cultural norms that governed female premarital sexual behavior in pre-industrial societies that may be found in modern societies today. These range from norms that are very permissive towards, or tolerant of, female pre-marital sexual activities to norms that expressly prohibit pre-marital sexual relations (Broude, 1975; 1996; Heise, 1967). From ethnographic records, Murdock (1964) groups these pre-marital sexual norms into three distinct variants: the restrictive norms, the permissive norms, and the intermediate group (or semi-restrictive) which is a mix of the two extreme cases and is dependent on prevailing circumstances. Generally, restrictive norms were practiced by societies which valued the chastity of women and girls. Unmarried girls were expected to preserve their virginities until marriage and were severely sanctioned if they engaged in pre-marital sex. Societies where virginity testing at marriage is practiced are among those with restrictive premarital sexual norms (Ember, Carol R., Milagro Escobar, and Noah Rossen 2019). It is also known that some of the societies with restrictive premarital sexual norms "arrange that their daughters are married at or before menarche … explicitly for the purpose of ensuring premarital virginity" (Whiting et at. 1986, 296). However, not all societies where the practice of early/arranged marriage of girls is practiced prohibit female premarital sexual behavior. Whiting et al. cite the !Kung San of Botswana as an example of a society where female premarital sexual activities are permitted or ignored but childhood betrothal and early marriage is customary.

A second category of premarital sexual norms was found in societies where there were little to no restrictions on premarital sexual relations and female chastity was not relevant. The Trobiand Islanders of Melanesia and the Lepcha of India are some examples of societies known to actively promote premarital sexual relationships (Whiting et al 1986; Ember et al. 2019). The last category is made up of societies with intermediate, or semi-restrictive, norms. This includes a variety of cases such as the cultures where premarital sex is prohibited in principle but weakly sanctioned; societies where trial marriages were practiced; and societies where female premarital sex was sanctioned only when it resulted in a pregnancy. The strength of each variant was dependent on the socio-cultural complexity of a given society. Some examples of societies in this category are the Kikuyu of Kenya and the Kwoma of New Guinea (Whiting et al. 1986).

Based on this insight, it is possible to classify different ethnic groups in contemporary data according to their characteristic norms of female premarital sexual behavior. This is achieved in this study by matching ethnographic information on premarital norms (from Murdock's Ethnographic Atlas) to ethnicity names in the Demographic and Health Surveys for the sample of countries studied. The distribution of premarital norms across Africa is shown in Figure A.1 in the paper's Appendix. Unfortunately, we find a large proportion of ethnic groups in Africa with missing data on female pre-marital sexual norms. The map however indicates that 25 percent of ethnic groups in Africa have permissive female premarital sex norms while 13 percent have restrictive norms. The restrictive group comprises of the culture with an emphasis on early marriage and the culture with an emphasis on female virginity at marriage.

Evidence from studies with African data suggest that significant associations exist between the norms of premarital sexual behavior and, for example, premarital fertility and the prevalence of abortion in Cameroon (Johnson-Hanks, 2002; 2003); adolescent pregnancy in Zambia (Svanemyr, 2020); and the relaying of contradictory messages regarding sexuality to young people in rural Tanzania (Wight et al., 2006). Johnson-Hanks (2003) specifically employs ethnographic data to compare the outcomes of two ethnic groups in Cameroon. She finds that premarital sexual relations among adolescents are not just tolerated by the Beti ethnic group but are considered a normal way of life. It is not surprising then that late female marriages and a high rate of

premarital fertility is prevalent among the Betis. By contrast, the Biu-Mandara abhor premarital sexual relations and insist on female virginity at marriage. They enforce this rule by closely monitoring young women's movements and interactions with the opposite gender. Strict sanctions are characteristically applied on violators while the practice of early marriage is commonly used to curb female premarital sexual relationships.

Similar restrictive norms are found among several ethnic groups in Southern Africa. The Xhosa (i.e., the Zulus of South Africa), for example, emphasis the virginity of girls at marriage and are known for conducting regular virginity tests on girls over the course of their maidenhood. Girls who pass the tests are openly rewarded while the ones who fail face public humiliation (Bennett, Mills, & Munnick, 2010; Durojaye, 2016; Stander, 2016; Swaartbooi-Xabadiya & Nduna, 2014). The emphasis on the chastity of young women and the preservation of their virginity often transcends the desire to simply prevent premarital pregnancy and the birth of illegitimate children. It borders a lot on protecting the family name, which essentially means protecting the honor and pride of the male members of the girl's family. Thus, the integrity of the men in the immediate household and that of the larger lineage are inextricably tied to the chastity of their daughters and wives. Violations of these norms are often met with harsh sanctions and, in cultures where honor killing is acceptable, the loss of virginity often means the loss of life for the girl and her seducer (Addison, 2010; Birech, 2013; Marcus et al., 2015; Schlegel, 1991; Schneider, 1971). In the African context, Swaartbooi-Xabadiya and Nduna's study, which was based on adolescents between the ages of 16 to 19 years, shows that female virginity is not only highly valued in Southern African societies, but female chastity is strategically rewarded to make violation unattractive. It also underlines the fact that, though the premarital norms are restrictive in these societies, early marriage is not emphasized and, therefore, early childbearing is less common. This raises the potential of finding in this study a higher age at first birth and lower fertility among women from the culture with an emphasis on female virginity at marriage.

4. Data Description

4.1 Data Sources and Sample

The starting point of data collection is the Demographic and Health Surveys (DHS) for Sub-Saharan African (SSA) and Middle East and North African (MENA) countries. Individual level data from the DHS have been combined with data from Afro-barometer, European Social Survey (ESS), and Murdock's (1967) Ethnographic Atlas (EA) to create a rich dataset containing information on fertility, ethnicity, pre-marital sexual norms, and a measure of formal institutions. The DHS waves are from the period 1986 to 2017 while the seventh round of Afro-barometer (2019 edition) and the fourth round of ESS (2008 edition) were used. The information in the respective data sources is, clearly, from different time periods but this time difference poses no significant challenge for the study especially because behavioural changes are often sluggish across time. All available DHS waves with information on a woman's ethnicity or her native language, and age of first birth were used. Some countries were dropped for a lack of information on age at first birth. For countries where native language rather than ethnicity was recorded in the data, the ethnic group was traced and matched to the language with the help of an online version of the 23rd Edition of Ethnologue: Languages of the World (edited by Ebarhard, Gary and Charles 2020), and the Joshua Project (n.d), an independent research initiative that highlights ethnic people groups of the world. This enabled the matching of a lot more observations from the DHS to Murdock's Ethnographic Atlas.

An important limitation with the data was the lack of barometer information for eight countries – Angola, Congo DRC, Congo-Brazzaville, Ethiopia, Mozambique, Niger, Rwanda, and Chad. For the Middle East and North African countries in the DHS, only Turkey and Egypt have ethnographic information on pre-marital sexual norms. This considerably reduced the number of MENA countries included in the analysis. Also, within the countries included there were some ethnic groups with missing ethnographic information on pre-marital sexual norms which were then dropped from the analysis. In total, only twenty-four countries had complete information on fertility behavior, pre-marital sexual norms, and perceptions about formal institutions. Eighteen countries have complete information for at least two waves while six had for only one

wave. Lastly, the research is based on the urban population alone which allows the use of the 'epidemiological approach' to analysis the fertility decisions of women outside their local/village communities. The analysis includes all women aged 15 to 49 living in urban areas, a total of 196,608 observations. The list of countries and survey waves, and the names of ethnic groups with their respective norms of pre-marital sexual behavior are included in the Appendix (table A.1).

4.2 Data Matching Procedure

Information on the pre-marital sexual norms of different ethnic groups come from Murdock's (1967) Ethnographic Atlas. The Ethnographic Atlas is used in several studies including Fenske (2013); Michalopoulos and Papaioannou (2013); Michalopoulos, Putterman et al. (2016) Alesina, Briosch et al. (2016) to link the historical characteristics of different groups of people to their contemporary outcomes. Michalopoulos et al. (2016), for example, combines data from the Ethnographic Atlas with the DHS to study the influence of ancestral lifeways on modern populations. In the present paper, ethnicity names in the DHS were directly matched to their counterparts in the EA where possible. In several cases a direct match was not possible due, for example, to differences in spelling, or because some ethnic groups in the DHS were sub-groups of those in the EA, and vice versa. To resolve this, a concordance of ethnicity names was constructed with information from the 23rd Edition of Ethnologue: Languages of the world (online version) and the Joshua Project website. Constructing the language and ethnicity concordance was done by closely following the procedure in Michalopoulos, Putterman et al. (2016), and Giuliano and Nunn (2018). Thus, out of the 379 ethnic groups in the DHS with complete information included in the study, 36 percent (137) were matched directly while 64 percent (241) were matched through the concordance of names.

A second data matching was done between the DHS, the Afro-barometer, and the European Social Survey (for Turkey only) to include information on measures of formal institutions. The data matching was done at the level of the regions in each country using identical regional names from the respective sets of surveys. In large part, the regional names were the same but, in several cases, the regional names in the DHS were different from those in the Afro-barometer

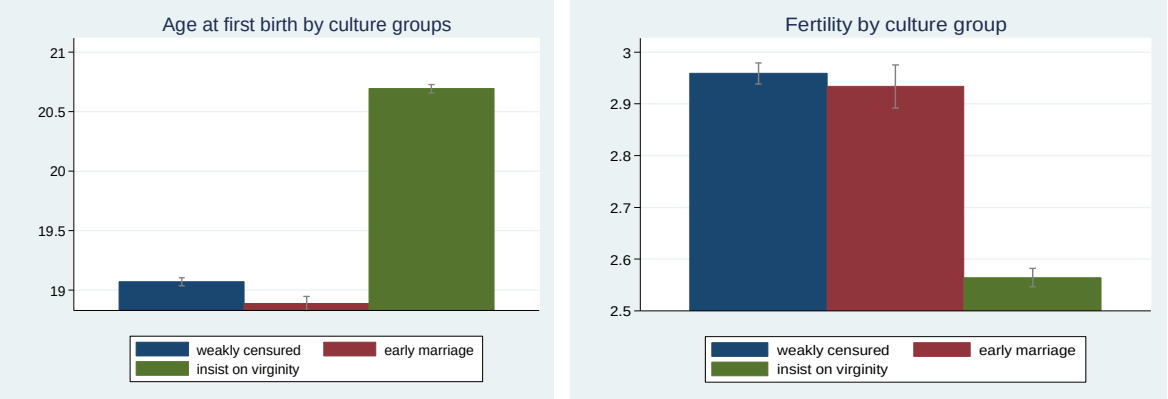
– DHS regions were either smaller units of the regions in Afro-barometer or larger, older regional delineations. To ensure uniformity, and with the aid of country maps accessed online, regions in the DHS or the Afro-barometer and the ESS were either grouped or renamed. For example, in Egypt, current regions are known as governorates, as used in Afro-barometer and Arab barometer. But these are sub-divisions of the old regions used in the DHS. Current and older maps of Egypt were used to group the governorates into the old Egyptian regions. The relevance of this exercise is to obtain values for formal institutions for each region from Afro-barometer and ESS and assign them to the regions in the DHS. This is vital for analyzing the interaction effect of formal institutions on culture.

4.3 Description of Key Variables

The main cultural variable is the 'Norms of Pre-marital sexual behavior of girls', which is categorized in the Ethnographic Atlas as: (i) Early marriage of females, (ii) Insistence on virginity of girls, (iii) Prohibited but weakly censured, (iv) Allowed, censured only if girl is pregnant, and (v) Freely permitted. This variable was recoded into three distinct categories: (i) Early marriage (ii) Insistence on virginity of girls, and (iii) Weakly censured. This categorization enables a comparison between societies with strong, or restrictive, pre-marital sexual norms with societies that have less restrictive, or permissive, pre-marital sexual norms for women. The aim is to examine how specific norms of pre-marital sexual behavior influence the fertility outcomes of the current population of women in the study area. Variation in fertility behavior is expected within localities (using the primary sampling units of the DHS) where people from different cultural backgrounds reside. The summary statistics for the urban sub-sample, table A.2 of the Appendix, shows that 35 percent of women in the study sample have a cultural background that weakly censures or is permissive towards the pre-marital sexual activities of girls. The proportion for the overall sample is 33 percent. Early marriage appears to be the less common form of marital norm in both the overall and urban samples as only 1 percent of women belong in this culture group. Lastly, the practice of guarding the virginity of girls is much more common as the table shows that 64 percent of women in the study sample have this cultural background.

The outcome variables for this research are a woman's age at first birth, and the number of children she has. Age at first birth represents the commencement of motherhood, it is neutral to marital status but can be expected to correlate with early marriage. This is an important outcome because it helps us assess the prevalence of adolescent or teenage fertility across culture groups. The average age at first birth in the data is roughly 20 years for urban dwellers. In Figure A.1 we visualize the distribution of the age at first birth across the three culture groups. Specifically, in cultures where girls must remain virgins until marriage women reach an average age of 21 and a half years before having their first child. In cultures where early marriage is the norm, the average woman's age at first birth is roughly 18 years whereas in cultures where the pre-marital sexual behavior of girls is not strictly controlled the average age at first birth is just above 19 years.

Figure 3: Average Age at First Birth and Number of Children by Cultural Norms



Source: Author's computations from the DHS and EA datasets

The total fertility rate is measured by the number of children ever born by a woman. It will, potentially, be less useful for younger women in this study than for older women since the younger women are less likely to have completed their fertility cycle. Notwithstanding, the respective culture groups show some interesting dynamics as seen in figure 3. The weakly censured group and the early marriage group tend to have more children on average, about 3 children per woman. Women from the culture group with emphasis on female virginity before marriage have, on average, 2.6 children each. The graphs give insight on the relationship between each culture group and our outcomes variables. Specifically, it shows that women from

the culture with emphasis on female virginity before marriage have, on average, a higher age at first birth and a lower fertility rate compared to women from cultures with emphasis on early marriage of girls and the culture in which female pre-marital sexual relations are weakly censured. Other explanatory variables included are age, religion, year of birth, and survey year fixed effects. An average woman in the urban sample is 33 years old and has about 6 years of education. A transformation to the variable 'religion' was done for Turkey which had no data on religion in the DHS. With over 98 per cent recorded in the ESS as Muslims, attesting to the existing state-wide Islamic religion, all observations in the Turkish data were assigned Islam as their religion.

Finally, the effect of formal institutions is measured by an average of two variables - trust for the police department and trust for the courts of law. Response to the question: "How much do you trust each of the following, or haven't you heard enough about them to decide?" were coded for the Police department and the Courts of Law. The categories of response include: 'Not at all'; 'Just a little'; 'Somewhat'; 'A lot'; and 'don't know/haven't heard enough'. To make each into a binary variable, the options were recoded into 'trust' and 'no trust', to capture the strength of each institutional variable. Thus, 'not at all', and 'just a little' responses were coded as 'no trust', while 'somewhat' and 'a lot' were coded as 'trust'. 'Don't know/have not heard enough' responses were coded in the original data as missing values and, as such, were not included when computing the average. The resultant variable, a proxy for formal institutions, ranges between 0 and 1. An average value closer to 1 represents strong formal institutions while a value closer to 0 indicates weak formal institutions. In our sample the average value for formal institution is 0.52, indicating that 52 percent of those surveyed trust existing regulatory and legal institutions. This measure of formal institutions enters the model through its interaction with the cultural variables. It helps to highlight the fact that informal institutions are likely to be less relevant in areas where formal institutions are stronger. The interaction term, therefore, tells us whether the estimates we obtain from the main specification are solely a reflection of cultural preferences or they include the effects of informal institutions.

5. Estimation strategy

5.1 Identification

Identifying the effect of culture is inherently challenging because of how varied it has been defined. Several different measures are used in the literature to conceptualize culture in a way that permits concise estimations of its effect on outcomes. This study utilizes the norms surrounding female pre-marital sexual behavior as a measure of culture. Each ethnic group in the chosen data has been matched to its unique pre-marital sexual norm as given in the Ethnographic Atlas and the women from these ethnic groups are assigned their respective pre-marital sexual norms. The norms are in three categories and each emphasizes a different aspect of female pre-marital sexual behavior. These differences in pre-marital rules of behavior enable the identification of the effect of culture on our fertility outcomes of interest. An important element of this empirical strategy is the application of the 'epidemiological approach' which has been used in several studies to estimate the effect of culture on a variety of outcomes (see for example Fernandez (2007); Fernandez and Fogli, (2009); Stichnoth and Yeter (2016); Marcen, Molina et. al. (2018)).

The 'epidemiological approach' is applied here to identify culture by examining the outcomes of women in urban areas within their own countries. It is, however, impossible to determine from our data whether a woman was born in an urban area or whether she migrated there from a rural area. But given recent trends in urbanization and the high rate of rural-urban migration across Africa, for example (United Nations, 2019), it is plausible to assume that a large proportion of urban dwellers live outside of their indigenous communities. Since we observe women from different ethnic groups in the data living in the same urban localities and sharing the same markets and formal institutions, we can compare their fertility outcomes based on the pre-marital sexual norms of their respective ethnic groups. This approach also helps us to determine whether any observed variations in fertility behavior are driven solely by cultural preferences or they are also influenced by informal institutions. We argue that women living outside their local communities and villages are less constrained by the informal rules and

regulations in such communities and, therefore, their fertility decisions will more likely be based on their internalized cultural preferences.

5.2 Model Specification and Estimation

The goal of this paper is to examine the effect of cultural norms on women's fertility behaviour. Specifically, it investigates how the norms of female pre-marital sexual behaviour affect women's age at first birth, representing their commencement of motherhood, and fertility at a given age. Women from different ethnic groups and cultural backgrounds are studied within a common institutional setting. We estimate the relationship between cultural norms and fertility behaviour using the following model:

$$y_{ig} = \alpha_0 + \alpha_g + Z'_{ig}\boldsymbol{\beta} + X'_{ig}\Upsilon + \eta_g + \epsilon_{ig} \qquad (1)$$

Where y_{ig} is either the age at first birth or the number of children of woman i in location g. We define Z_{ig} as a vector of binary variables indicating whether woman i in location g belongs to a culture with emphasis on the early marriage of girls, the culture that insists on female virginity before marriage, or a culture group that permits/weakly censures female pre-marital sexual behaviour. The vector, X_{ig}, contains individual characteristics such as age (and its square), religion, and year of birth. Given the apparent endogeneity of education and household characteristics, and the lack of parental information in the DHS data, these variables have been excluded. Location-specific effects are captured in α_g (the sampling clusters in the data); η_g has the survey year fixed effects while ϵ is the random disturbance term.

To explore the influence of formal institutions on cultural norms, a second model is also estimated with an additional variable for the interaction of culture with a measure of formal institutions:

$$y_{ig} = \alpha_0 + \alpha_g + Z'_{ig}\boldsymbol{\beta} + \left(Z'_{ig} * H\right)\boldsymbol{\Gamma} + X'_{ig}\Upsilon + \eta_g + \epsilon_{ig} \qquad (2)$$

All parameters are as earlier defined. While H represents the measure of formal institutions (already defined in section 4.3), $\boldsymbol{\Gamma}$ is a vector of interaction terms. Equations (1) and (2) are estimated by Ordinary Least Squares without and with location fixed effects. Since women in the study are from different cultural backgrounds but reside in common urban centres, we expect variations in outcomes at the community level. Therefore, the standard errors reported have been corrected for clustering at this level.

6. Results

Estimates are reported for age at first birth and fertility levels for the main model (equation 1) and the extended version that included the interaction of culture with formal institutions (equation 2). The results are presented in Tables 1 to 3 with columns having similar characteristics. Table 1 shows the main effect of culture on the age at first birth from different specifications in Columns (1) through (4). The effect of the interaction between culture and a representation of formal institutions is shown, also for various specifications, in Columns (5) to (8). In Table 2, the estimates are reported for fertility, i.e., the number of children at a given age, from the full sample of women studied. To understand the likely effect of culture on completed fertility, a separate model has been estimated for a restricted sample of women of ages 25 to 49 years and the results are reported in Table 3.

We begin first by estimating a very simple version of our models, each including only the outcome variable and the cultural proxy, without and with location fixed effects. Results for all the parsimonious models are shown in columns (1), (3), (5) and (7) for each table while columns (2), (4), (6) and (8) each present coefficient estimates for the cultural proxy (and interaction terms as the case may be) as well as controls for other individual characteristics. For ease of readability each table reports estimates for the cultural variables and their interacted versions only. The discussion and interpretation of the results will focus on the outputs in columns (4) and (8) (our preferred specifications) which contain full controls and location fixed effects. Because the cultural proxy has three distinct categories, the results are reported for two groups

i.e., the culture with an emphasis on early marriage and the culture with an emphasis on female virginity before marriage, while the third group is omitted. Thus, the comparison is between the outcomes for women in the reported groups and the outcomes for women from the culture in which female premarital sexual behaviour is weakly censured.

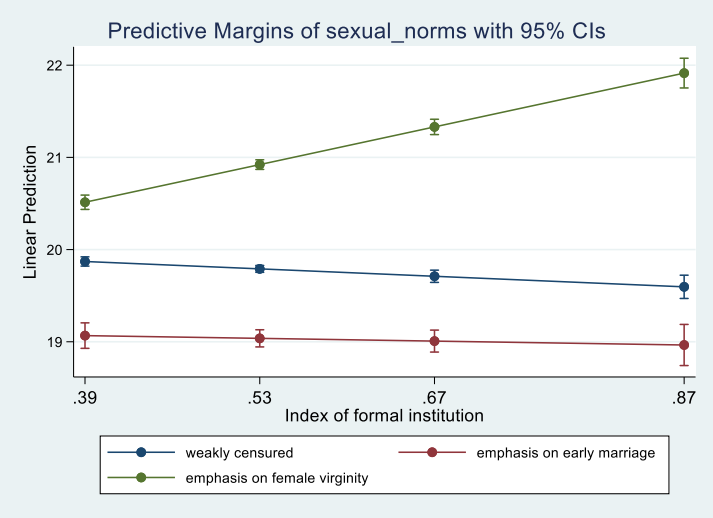
Considering the main model, the estimates in columns (1) to (4) of Table 1 suggest that the culture with emphasis on female early marriage has a negative and statistically significant effect on the age at first birth across all four specifications. The signs support a priori expectations about the relationship between the cultural emphasis on early marriage and the age at first birth (Jensen & Thornton, 2003). This outcome also suggests that women from cultures with an emphasis on early marriage begin childbearing at a significantly younger age than women whose cultural norms are less restrictive and weakly censure female pre-marital sexual behaviour. On the other hand, we can see that the culture with an emphasis on female virginity before marriage has a positive and statistically significant effect on the age at first birth, as shown by our data (Figure 1a). Such an effect indicates that women from this culture are more likely to commence childbearing at an older age than women with a weakly censured cultural background as well as women from cultures that emphasize early female marriage.

There are two separate estimation results for fertility rate, one for the full sample and another for the restricted sample (women of ages 25 to 49). Table 2 shows that the coefficient estimates for the culture with an emphasis on female early marriage are positive for all specifications and only statistically insignificant for the simple model with location fixed effects. The positive outcomes are, however, not surprising since early marriage correlates with high fertility. Again, by contrast, insisting on female virginity at marriage has consistently negative and statistically significant coefficients across the different specifications, suggesting that a cultural emphasis on female virginity before marriage reduces fertility. Restricting the sample to women above 25 years yields an even stronger effect on fertility with larger magnitudes and higher levels of statistical significance, as seen in Table 3. This simply confirms the opposite effects on fertility of the cultural emphasis on early marriage as well as female virginity at marriage on fertility relative to the culture which emphasises none of these.

Next, we set out to ascertain whether the effects observed above come mainly from culture or they are confounded by informal constraints on behaviour. To do this, we expand the model to include an interaction between the three cultural variables and an index of formal institutions. The estimates are also reported in columns (5) to (7) of Tables 1 to 3 for age at first birth and fertility (full sample and sub-sample). Returning to Table 1 and, again, focusing on the estimates in column (8), we see that while there is no statistically significant effect for the interaction between formal institutions and the cultural an emphasis on early marriage, the interaction effect is statistically significant for the culture with emphasis on female virginity. These interaction terms suggest that the effect of each cultural proxy varies with the strength of formal institutions in different locations. Moreover, having a statistically significant interaction coefficient indicates that formal institutions matter in determining the effect of culture. Without the interaction variables, such as we have in the first model, the effects of the cultural variables are likely to also capture certain unobserved influences, most likely the influence of informal institutions.

The last set of results (Tables 2 and 3) provide a clearer picture, showing that the coefficient estimates for the interaction terms are statistically significant for both culture groups in respect to fertility at any given age. In addition, the results from the interactions are shown graphically in Figures 4 and 5. Figure 4 shows that the strength of formal institutions does not affect the age at first birth for the culture with emphasis on early marriage, hence the lack of statistical significance of the estimates. But the culture with an emphasis on female virginity returns a remarkably strong interaction effect on the age at first birth, as the upward trend indicates. With respect to fertility, there is clearly a downward effect (ref. Figure 5) for both cultural groups relative to the culture in which female premarital sexual behaviour is weakly censured. Overall, as formal institutions become stronger, the fall in fertility rate is sharper for the cultural emphasis on female fertility than for the culture with emphasis on early marriage. There is, obviously, no effect on the culture which weakly censures female premarital sexual behaviour.

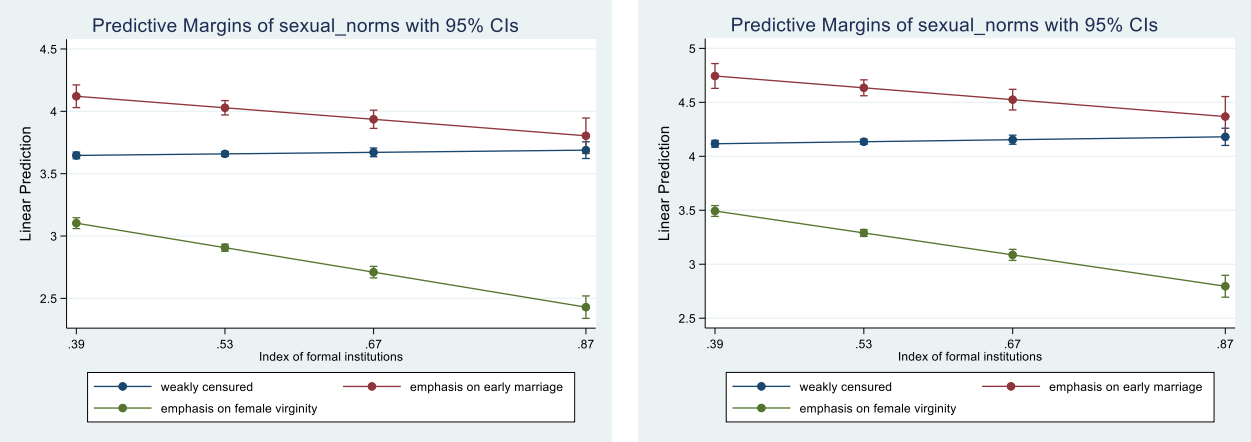
Figure 4: Age at first birth (Full sample)



Source: Computed from Author's regression analysis using DHS, the EA, and Afro-barometer data sets.
Figure 2 shows the changes in age at first birth of women within each culture as the measure of formal institutions increases from a low level to a high level.

Figure 5: Fertility

(a) Full sample **(b) sub-sample: (25 to 49-year-olds)**



Source: Computed from Author's regression analysis using DHS, the EA, and Afro-barometer data sets.
Figure 3 shows the changes in fertility rates within each culture group as the measure of formal institutions increases from a low level to a high level.

7. Discussion of findings

This paper estimates the effect of culture – captured by the norms governing female premarital sexual behaviour - on the age at first birth and fertility. This section discusses the findings based on the estimates reported in section 6.

7.1 Effect of culture on Age at First Birth

According to our estimates, the cultural norm with emphasis on female early marriage significantly decreases the age at first birth significantly by approximately 0.72 years relative to the culture that weakly censures female premarital sexual behaviour. It is reasonable to expect this effect especially in societies where early marriage of girls is valued. Giving out girls early in marriage is valued in some societies partly because of the desire to make full use of a woman's reproductive lifespan. This is common in cultures like the Masai tribe in Kenya, where large families are of prime importance (Whiting et al., 1986). In such cultures, women are valued mainly for their reproductive abilities which makes the adoption of birth control measures at the early stages of marital life highly unlikely. So, girls who marry early have a greater likelihood of giving birth to their first babies at a very young age.

We find a huge contrast in the outcome for women with the culture in which female virginity at marriage is highly valued. The estimates show that this cultural norm has a strongly positive effect on the age at first birth. Thus, compared to the culture with a less restrictive disposition toward female pre-marital sexual behaviour, the age at first birth is higher by 1.13 years for women with a virginity cultural background even after controlling for heterogenous location effects. This may be surprising, from a cursory perspective, because it seems logical to expect a correlation between insisting on girls' virginity and early marriage, and by extension, an early commencement of childbearing. Indeed Birech (2013), and Fayisetan and Pebley (1989) explain that the traditional marital requirement of a virgin bride was largely sustained through the early marriage of girls as practiced in India and across several ethnic groups in West Africa. The assumption is that younger brides are more likely to be virgins and highly fecund at the early stages of marriage. Findings in this paper suggest that the conclusions in the above literature do

not hold in all cases. A plausible explanation may be Whiting et al.'s (1986) 'Duration of Maidenhood across Cultures' which classifies preindustrial cultures according to the strategy of maidenhood each society adopted. Whiting and co-authors investigations show that in cultures where late female marriage and prolonged maidenhood (the period between menarche and marriage) was practiced, the virginity of girls before marriage was valued. Such cultures strictly curbed female pre-marital sexual behaviour to prevent out-of-wedlock pregnancies. Thus, in while societies with a duration of maidenhood five or more years had restrictive rules governing female pre-marital sexual behaviour, societies where maidenhood lasted for about three to four years were more tolerant of female premarital sexual relations. In-between these are those with a short or non-existent maidenhood. These were found to have a mix of restrictive and permissive rules of female premarital sexual relations. While some in this category practiced early/arranged marriages with no real emphasis on female chastity, others placed a high value on female virginity with premarital sex seen as a taboo. Therefore, finding a large positive impact on the age at first birth for the culture with emphasis on female virginity in the study sample finds support in Whiting et al.'s account on the societies with prolonged maidenhood.

7.2 Interaction effect of Formal institutions on Age at First Birth

The 'epidemiological' approach to the study of culture in economics is so called because it enables the isolation of culture's effect from that of local/traditional institutions operating in the home countries immigrants. A question that has dogged this approach in developed country studies is how to determine that the effects observed are solely from culture and are not driven by unobserved informal constraints within clusters of immigrant neighbourhoods. Studying the effect of culture within individuals' home country presents an obvious challenge for distinguishing between the effect of culture and that of informal institutions. This makes accounting for the role of formal institutions like organized labour markets, health care provision, educational institutions, and strong legal and regulatory agencies crucial.

A measure of formal institutions is introduced in our model through its interaction with the cultural variables. This interaction enables us to compare the fertility outcomes of women in areas with strong formal institutions with those in areas where formal institutions are weak, for

example, women in the rural areas. In places where formal institutions are weak, we can expect that informal constraints will hold sway such that a failure to account for this interaction may result in over- or under-estimating the effect of culture. In this setup, the interaction effect for the culture with emphasis on early marriage from the specification with full controls and location fixed effects is not statistically significant. A summary of the main effects and the effects with interactions is presented in Table 4. At a mean value of 0.52 and a standard deviation of 0.18 for our formal institutional index, the net effect (i.e., the sum of the coefficients of the interaction terms and the cultural variable) is a reduction in the age at first birth by 0.76 years for women from the culture with an emphasis on early marriage relative to the culture which weakly censures female premarital sexual relations. This effect does not differ from the main culture effect obtained without interactions. Indeed Figure 4 shows a zero-interaction effect on the culture with emphasis on early marriage across all values of our formal institutional index.

On the other hand, we see a significant increase in the age at first birth from the interaction between formal institutions and the culture with emphasis on female virginity. Figure 4 shows the widening gap between the outcome for the female virginity culture and the culture that weakly censures premarital sexual behaviours at higher levels of formal institutions. At an average of 0.52 for the index of formal institutions, the net interaction effect is 1.1 years higher age at first birth for women from this culture group relative to the 'weakly censured' group. At one standard deviation above the mean of formal institutional index the age at first birth increases by 0.63 points for the female virginity culture. This effect is statistically significant at the 1 percent level and indicates that strong formal institutions play an important role in the relationship between cultural preferences and fertility outcomes.

7.3 Culture's effect on Fertility

Our second outcome of interest is fertility, which is examined for a given age of women in the sample. After controlling for individual-specific and location effects, the estimates in Table 2 show that women whose cultures place emphasis on female early marriage have more children than women whose cultures are tolerant of female premarital sexual activities. Precisely, the effect of a culture with an emphasis on early marriage is to increases fertility by 0.32 children

relative a culture that weakly censures female premarital sexual behaviour. Like the findings for age at first birth, the culture with emphasis on early marriage produces an effect that corresponds to our prior expectations, thus providing evidence that a culture of early marriage contributes significantly to higher fertility rates. This outcome remains consistent for the sample of women of ages 25 to 49 (see Table 3) in the culture of early marriage. For this group, fertility increases by 0.45 children relative to the culture that weakly censures female premarital sexual relations.

By contrast, the culture emphasis on female virginity at marriage exerts a strong negative effect on fertility. It decreases fertility by 0.76 children (0.9 for the older cohort) relative to the culture that weakly censures premarital sexual behaviour. Findings in anthropological research have shown that in cultures where prolonged maidenhood and late female marriage are supported, family sizes tend to be smaller. It is reasonable to conclude that the evidence from this analysis support earlier anthropological findings and suggest that pockets of such outcomes can be seen in African societies despite the more common preference for larger families.

7.4 Interaction effect of Formal Institutions on Fertility

We next examine how the interaction between culture and formal institutions impacts on fertility. Firstly, the interaction between formal institutions and the culture which emphasises early marriage has a statistically significant effect on fertility. It is instructive to note that this was not the case for the age at first birth. At the average value of 0.52 for our chosen index of formal institutions, a cultural emphasis on early marriage increases fertility by 0.38 children relative to the culture in which female premarital sexual behaviour is weakly censured. Figure 5a highlights this effect on predicted fertility. The gradual decline in predicted fertility for the culture with emphasis on early marriage can be seen. Also, at higher values of formal institutions the gap in fertility between the culture of early marriage and the culture that weakly censures premarital sexual behaviour narrows substantially. According to our estimates, raising the index of formal institutions by one standard deviation above its mean results in a much smaller increase in fertility (0.24) for the culture with emphasis on early marriage relative to the comparison culture. A further increase in the index by two standard deviations above the mean

causes a decrease in fertility by 0.67 children relative to women from the culture that weakly censures premarital sexual behaviour. The older age cohort (Figure 5b) sees a similar interaction effect. A two standard deviation increase in the index of formal institutions increases fertility by 0.18 children relative to the culture that weakly censures premarital sexual relations. This is a much smaller increase in fertility than the 0.51 increase we obtain when the institutional index is at its mean. Thus, the effect of a cultural emphasis on early marriage on fertility is smaller in places where formal institutions are stronger.

Figure 5 (a and b) also shows the interaction effect on fertility for the culture with emphasis on female virginity. These figures show that in places where formal institutions are stronger (indicated by higher values of our institutional index) there is a substantial decline in fertility per woman at all age levels. Such that we find substantial differences between the fertility outcomes of women from the culture that emphasises female virginity and the culture that weakly censures female premarital sexual behaviour. Estimates show that, at the mean institutional index, fertility decreases by 0.73 children (0.83 for the 25 to 49 age range) relative to the comparison group. A one standard deviation increase in the index of formal institutions reduces fertility by 1.01 children for the culture with emphasis on female virginity relative to the culture where female premarital sexual behaviour is weakly censured. The decrease in fertility for the older age cohort is 1.12 children relative to women in the comparison group.

8. Conclusion

This paper contributes to the research on the cultural context of fertility behaviour different parts of world. The literature typically uses home-country fertility rates to represent the culture of immigrants in developed countries. This paper employs a unique proxy for culture: the rules governing female premarital sexual behaviour within different societies. Based on a combination of ethnographic information with contemporary data from the Demographic and Health Surveys, the paper distinguishes between three cultural norms of female premarital sexual behaviour that correspond to different ethnicities in the DHS. These include the culture with emphasis on

female early marriage, the culture with emphasis on female virginity before marriage, and the culture that permits or weakly censures female premarital sexual behaviour. Armed with these distinctions, and subject to the availability of data with complete information, the study estimated the effect of each cultural norm on the age at first birth and fertility for a sample of women aged between 15 and 49 years using African and Turkish data.

Identifying the effect of culture was achieved by exploiting the differences in the rules governing female premarital sexual behaviour across ethnic groups. The tendency for some ethnic groups to restrict female premarital sexual relations while others tolerated such activities, as well as the differences in what each culture emphasised: either female early marriage, female virginity at marriage, or to weakly censure premarital sexual relations, provided the source of identifying variation in the effect of culture on fertility outcomes. The use of a mainly urban sample the allowed the use of the 'epidemiological approach' to estimate the effect of culture and isolate this from the effect of informal institutions. By Including the interaction between culture and formal institutions the analysis showed how the effect of culture changed at different levels of strength of formal institutions.

The findings show that in the developing world, the female age at first birth and fertility rate are significantly affected by the rules of female premarital sexual behaviour in each woman's ethnic group. Specifically, the age at first birth for a woman whose culture lays emphasis on female early marriage is significantly lower than that of a woman whose culture weakly censures female premarital sexual behaviour. The culture of early marriage is found to also increase fertility relative to the culture in which premarital sexual behaviour is weakly censured. Conversely, the culture with emphasis on female virginity at marriage tends to increase female age at first birth while it decreases fertility compared to the culture that weakly censures female premarital sexual activities. We also find an important moderating role for formal institutions. Interactions between each cultural norm and an index of formal institutions yielded mixed results. While the interaction effects on age at first birth and fertility were both very strong for the culture with emphasis on female virginity, there was no effect on age at first birth for the culture of early

marriage. Some effect on fertility was, however, recorded at higher values of the formal institutional index.

These findings show that strong formal institutions do mitigate the effect of cultural norms. They highlight the relevance of separating cultural preferences from traditional constraints in estimating the effect of culture. It is especially relevant when seeking evidence to guide the articulation of programmes targeted at women's reproductive choices in developing countries. Effecting a change in indigenous practices would require measures that are informed by evidence-based research which takes the huge diversity in the norms, preferences, and beliefs across different people groups into account. The findings are also significant for developing inclusive fertility control programs for African societies. They underline the importance of understanding the value system in place in such societies and how to incorporate a local content in the development of targeted intervention programs to attain maximum effect. This research opens an important angle for further research which is to examine the relationship between the different cultural norms and the adoption of modern contraceptives.

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Table 1: Age at First Birth

Dep. Variable: Age at first birth	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cultural norms:								
Early marriage	-1.309***	-0.678***	-0.933***	-0.716***	-0.764	-0.461	-1.055***	-0.945***
	(0.180)	(0.182)	(0.052)	(0.051)	(1.016)	(1.092)	(0.216)	(0.200)
Insists on virginity	2.453***	1.626***	1.470***	1.126***	-0.883**	-1.229***	-1.156***	-0.719***
	(0.080)	(0.090)	(0.043)	(0.038)	(0.297)	(0.283)	(0.152)	(0.146)
Early marriage*instn.	-	-	-	-	-1.351	-0.385	0.303	0.361
					(2.583)	(2.750)	(0.381)	(0.357)
Virginity*institution	-	-	-	-	5.925***	5.467***	4.823***	3.492***
					(0.530)	(0.484)	(0.279)	(0.273)
Constant	19.25***	-147.0***	19.72***	-111.3***	19.90***	-142.4***	20.09***	-90.88***
	(0.063)	(8.531)	(0.024)	(5.682)	(0.163)	(8.364)	(0.091)	(6.198)
Observations	113849	113842	113849	113842	113849	113842	113849	113842
Full controls**	No	Yes	No	Yes	No	Yes	No	Yes
Location Fixed effects	No	No	Yes	Yes	No	No	Yes	Yes

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

** Controls include age and age squared, religion, and year of birth. Survey year dummies are excluded because heterogeneity is considered at the cluster/community level. Standard errors are clustered at the primary sampling unit.

Table 2: Fertility Rate (Full sample)

Dep. Variable: Number of children	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cultural norms:								
Early marriage	0.246*	0.445***	0.0265	0.319***	2.184*	2.650***	0.853***	0.766***
	(0.125)	(0.105)	(0.033)	(0.030)	(0.893)	(0.758)	(0.151)	(0.132)
Insists on virginity	-0.455***	-0.689***	-0.546***	-0.758***	-0.0823	0.0622	0.152*	0.0383
	(0.033)	(0.050)	(0.020)	(0.021)	(0.124)	(0.138)	(0.076)	(0.079)
Early marriage*instn.	-	-	-	-	-4.925*	-5.768**	-1.513***	-0.748**
					(2.297)	(1.949)	(0.265)	(0.232)
Virginity*institution	-	-	-	-	-0.969***	-1.651***	-1.284***	-1.491***
					(0.209)	(0.227)	(0.136)	(0.146)
Constant	3.186***	40.68***	3.600***	84.25***	2.805***	45.35***	3.477***	74.57***
	(0.028)	(5.117)	(0.012)	(3.199)	(0.058)	(5.078)	(0.045)	(3.377)
Observations	113849	113842	113849	113842	113849	113842	113849	113842
Full controls**	No	Yes	No	Yes	No	Yes	No	Yes
Location Fixed effects	No	No	Yes	Yes	No	No	Yes	Yes

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

** Controls include age and age squared, religion, and year of birth. Survey year dummies are excluded because heterogeneity is considered at the cluster/community level. Standard errors are clustered at the primary sampling unit.

Table 3: Fertility Rate (25 to 49 age cohort)

Dep. Variable: Number of children	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cultural norms:								
Early marriage	0.709***	0.688***	0.295***	0.449***	4.287***	4.188***	1.174***	0.986***
	(0.178)	(0.155)	(0.045)	(0.041)	(1.195)	(1.091)	(0.189)	(0.167)
Insists on virginity	-0.800***	-0.802***	-0.833***	-0.852***	-0.200	0.0359	0.203*	-0.00429
	(0.041)	(0.059)	(0.028)	(0.027)	(0.150)	(0.159)	(0.093)	(0.092)
Early marriage*instn.	-	-	-	-	-9.060**	-9.073**	-1.633***	-0.917**
					(3.012)	(2.772)	(0.334)	(0.296)
Virginity*institution	-	-	-	-	-1.385***	-1.858***	-1.906***	-1.586***
					(0.256)	(0.262)	(0.167)	(0.168)
Constant	3.684***	45.77***	4.128***	96.59***	3.243***	51.44***	3.931***	85.70***
	(0.036)	(5.963)	(0.012)	(3.927)	(0.072)	(5.939)	(0.055)	(4.022)
Observations	92153	92147	92153	92147	92153	92147	92153	92147
Full controls**	No	Yes	No	Yes	No	Yes	No	Yes
Location Fixed effects	No	No	Yes	Yes	No	No	Yes	Yes

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

** Controls include age and age squared, religion, and year of birth. Survey year dummies are excluded because heterogeneity is considered at the cluster/community level. Standard errors are clustered at the primary sampling unit.

Table 4: Summary of main and Interaction effects

Outcomes	**Age at first birth**		**Fertility rates (full sample)**		**Fertility rates (age 25+)**	
Cultures types	Main effect	Net effect	Main effect	Net effect	Main effect	Net effect
Emphasis on early marriage	-0.716	-0.757	0.319	0.377	0.449	0.509
Emphasis on female virginity	1.126	1.097	-0.758	-0.737	-0.852	-0.825

Average value of formal institution: 0.52; Standard Deviation: 0.18. Net effects are computed from the estimates in column (4) of each table.

Appendix: Additional Tables and Figures

Table A.1: Age at first birth - Main effects

Dep. Variable: Age at first birth	(1)	(2)	(3)	(4)
Cultural norms:				
Early marriage	-1.309***	-0.678***	-0.933***	-0.716***
	(0.180)	(0.182)	(0.052)	(0.051)
Insists on virginity	2.453***	1.626***	1.470***	1.126***
	(0.080)	(0.090)	(0.043)	(0.038)
Constant	19.25***	-147.0***	19.72***	-111.3***
	(0.063)	(8.531)	(0.024)	(5.682)
Observations	113849	113842	113849	113842
Full controls**	No	Yes	No	Yes
Location Fixed effects	No	No	Yes	Yes

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

** Controls include age and age squared, religion, and year of birth. Survey year dummies are excluded because heterogeneity is considered at the cluster/community level. Standard errors are clustered at the primary sampling unit.

Table A.2: Age at first birth – Interaction effects of formal institutions

Dep. Variable: Age at first birth	(1)	(2)	(3)	(4)
Formal institution	-1.672***	-2.955***	-0.747***	-0.573***
	(0.362)	(0.344)	(0.178)	(0.166)
Cultural norms:				
Early marriage	-0.764	-0.461	-1.055***	-0.945***
	(1.016)	(1.092)	(0.216)	(0.200)
Insists on virginity	-0.883**	-1.229***	-1.156***	-0.719***
	(0.297)	(0.283)	(0.152)	(0.146)
Early marriage*instn.	-1.351	-0.385	0.303	0.361
	(2.583)	(2.750)	(0.381)	(0.357)
Virginity*instn.	5.925***	5.467***	4.823***	3.492***
	(0.530)	(0.484)	(0.279)	(0.273)
Constant	19.90***	-142.4***	20.09***	-90.88***
	(0.163)	(8.364)	(0.091)	(6.198)
Observations	113849	113842	113849	113842
Full controls**	No	Yes	No	Yes
Location Fixed effects	No	No	Yes	Yes

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

** Controls include age and age squared, religion, and year of birth. Survey year dummies are excluded because heterogeneity is considered at the cluster/community level. Standard errors are clustered at the primary sampling unit.

Table A.3: Fertility (all women in sample) – Main effects

Dep. Variable: Number of children	(1)	(2)	(3)	(4)
Cultural norms:				
Early marriage	0.246*	0.445***	0.0265	0.319***
	(0.125)	(0.105)	(0.033)	(0.030)
Insists on virginity	-0.455***	-0.689***	-0.546***	-0.758***
	(0.033)	(0.050)	(0.020)	(0.021)
Constant	3.186***	40.68***	3.600***	84.25***
	(0.028)	(5.117)	(0.012)	(3.199)
N	113849	113842	113849	113842
Full controls**	No	Yes	No	Yes
Location fixed effects	No	No	Yes	Yes

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

** Controls include age and age squared, religion, and year of birth. Survey year dummies are excluded because heterogeneity is considered at the cluster/community level. Standard errors are clustered at the primary sampling unit.

Table A.4: Fertility - Interaction effects of formal institutions

Dep. Variable: Number of children	(1)	(2)	(3)	(4)
Formal institution	0.982***	1.779***	0.251**	0.0879
	(0.132)	(0.140)	(0.089)	(0.088)
Cultural norms:				
Early marriage	2.184*	2.650***	0.853***	0.766***
	(0.893)	(0.758)	(0.151)	(0.132)
Insists on virginity	-0.0823	0.0622	0.152*	0.0383
	(0.124)	(0.138)	(0.076)	(0.079)
Early marrg*instn.	-4.925*	-5.768**	-1.513***	-0.748**
	(2.297)	(1.949)	(0.265)	(0.232)
Virginity*instn.	-0.969***	-1.651***	-1.284***	-1.491***
	(0.209)	(0.227)	(0.136)	(0.146)
Constant	2.805***	45.35***	3.477***	74.57***
	(0.058)	(5.078)	(0.045)	(3.377)
Observations	113849	113842	113849	113842
Full controls**	No	Yes	No	Yes
Location Fixed effects	No	No	Yes	Yes

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

** Controls include age and age squared, religion, and year of birth. Survey year dummies are excluded because heterogeneity is considered at the cluster/community level. Standard errors are clustered at the primary sampling unit.

Table A.5: Fertility (25 to 49 age cohort) - main effect

Dep. Variable: Num. of children	(1)	(2)	(3)	(4)
Cultural norms:				
Early marriage	0.709***	0.688***	0.295***	0.449***
	(0.178)	(0.155)	(0.045)	(0.041)
Insists on virginity	-0.800***	-0.802***	-0.833***	-0.852***
	(0.041)	(0.059)	(0.028)	(0.027)
Constant	3.684***	45.77***	4.128***	96.59***
	(0.036)	(5.963)	(0.012)	(3.927)
N	92153	92147	92153	92147
Full controls **	No	Yes	No	Yes
Location fixed effects	No	No	Yes	Yes

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

** Controls include age and age squared, religion, and year of birth. Survey year dummies are excluded because heterogeneity is considered at the cluster/community level. Standard errors are clustered at the primary sampling unit.

Table A.6: Fertility (25 to 49 age cohort) - Interaction effects of formal institutions

Dep. Variable: Number of children	(1)	(2)	(3)	(4)
Formal institution	1.134***	2.068***	0.405***	0.134
	(0.166)	(0.169)	(0.108)	(0.105)
Cultural norm:				
Early marriage	4.287***	4.188***	1.174***	0.986***
	(1.195)	(1.091)	(0.189)	(0.167)
Insists on virginity	-0.200	0.0359	0.203*	-0.00429
	(0.150)	(0.159)	(0.093)	(0.092)
Early marrg*avrg_instn	-9.060**	-9.073**	-1.633***	-0.917**
	(3.012)	(2.772)	(0.334)	(0.296)
Virginity*instn	-1.385***	-1.858***	-1.906***	-1.586***
	(0.256)	(0.262)	(0.167)	(0.168)
Constant	3.243***	51.44***	3.931***	85.70***
	(0.072)	(5.939)	(0.055)	(4.022)
Observations	92153	92147	92153	92147
Full controls	No	Yes	No	Yes
Location fixed effects	No	No	Yes	Yes

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

** Controls include age and age squared, religion, and year of birth. Survey year dummies are excluded because heterogeneity is considered at the cluster/community level. Standard errors are clustered at the primary sampling unit.

Table A.7: List of countries and survey waves in sample

Country	**DHS waves**	**Country**	**DHS waves**
Benin	Waves 3 to 6	Eswatini	Wave 5
Burkina Faso	Waves 2 to 5	Gabon	Waves 4 and 6
Burundi	Wave 7	Gambia	Wave 6
Cameroon	Waves 3, 4 and 6	Ghana	Waves 1, 3, 4, 5, and 7
Cote D'Ivoire	Wave 6	Guinea	Waves 4, 5, and 6
Egypt	Wave 6	Kenya	Waves 1, 3, 4, 5, and 7
Lesotho	Waves 4,5, and 7	Senegal	Waves 1, 2, 3, 4, 6 and 7
Liberia	Waves 5 and 6	Sierra-Leone	Waves 5 and 6
Malawi	Waves 4, 6 and 7	Togo	Wave 6
Mali	Waves 1, 3, 4, 5 and 6	Turkey	Waves 3, 5 and 6
Namibia	Waves 2, 4, 5, and 6	Uganda	Waves 1, 3, 6 and 7
Nigeria	Waves 2, 4, 5, and 6	Zambia	Waves 2 to 6

Table A. 8: Summary statistics – urban sample only

Variables	Mean	Standard Dev.	Min.	Max.
Age	32.78	8.275	15	49
Year of birth	1975		1936	2002
Age at 1st birth	20.21	4.157	7	45
Age at 1st marriage	19.65	4.441	5	49
Husband's age	40.33	9.941	14	95
No. of children	3.00	2.019	1	18
Household size	6.43	4.477	1	76
Kids under 5yrs	1.13	1.234	0	21
Years of educ.	6.25	4.745	0	23
Formal institutions*	0.52	0.177	0.142	0.956
Pre-marital norms:				
Weakly censured	0.35	0.477	0	1
Early marriage	0.01	0.109	0	1
Insists on virginity	0.64	0.480	0	1
Religion:				
No religion	0.02	0.132	0	1
Traditional	0.01	0.084	0	1
Christian	0.41	0.492	0	1
Islam	0.56	0.497	0	1
Other**	0.002	0.048	0	1
Year of sample			1986	2017

**Formal institutions variable is represented by a combination of responses for trust in the police force and the law courts. **No details provided in the original DHS data.*

Source: Author's computation from a combination of DHS, the EA, and the Barometer datasets.

Table A.9: Ethnicities and Premarital norms

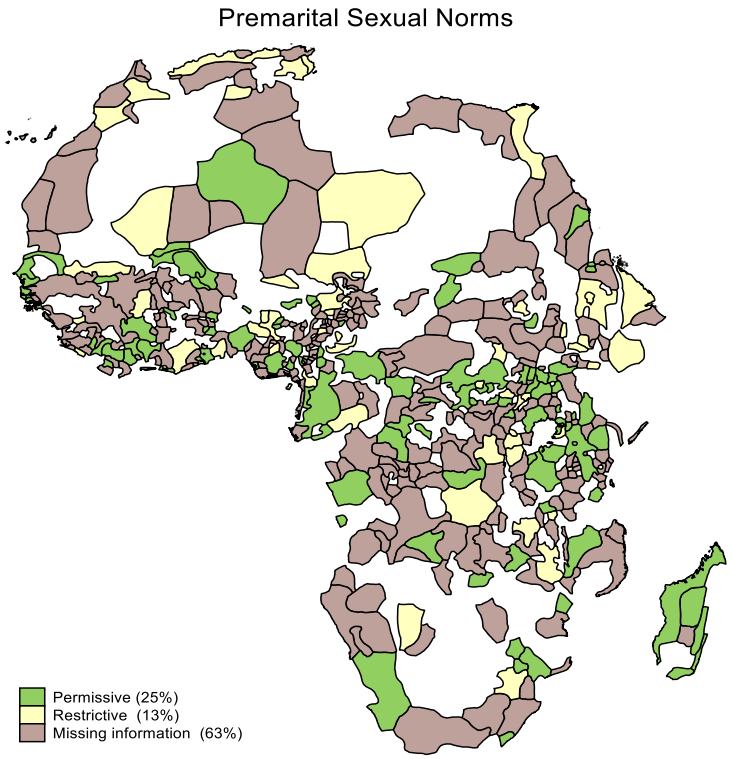
Ethnicities are neatly sorted into each group in data without overlaps.

Permissive: Weakly censures premarital sexual relations	Restrictive: Values Early Marriage of girls	Restrictive: Values Virginity of girls
Acholi	Bamum	Afar
Amba	Bemba	Alur
Babwa	Chewa	Amhara
Bari	Igala	Arusi
Baya	Kanuri	Ashanti
Bete	Kota	Bodi
Dagari	Kung	Burji
Diola	Luba	Chiga
Ekoi	Nyakyusa	Egyptians
Ewe		Fon
Fang		Gusii
Fur		Kafa
Ganda		Konso
Gbande		Kurd
Gisu		Mao
Guro		Mbum
Ibo		Minianka
Ila		Ruanda
Kamba		Rundi
Kipsigis		Sidamo
Kongo		Soninke
Koro		Teda
Kpelle		Turks
Lala		Vai
Luo		
Luvale		
Madi		
Masai		
Mbuti		
Nama		
Ngere		
Ngumba		
Samburu		
Sapo		

Sena		
Senufo		
Serer		
Somali		
Somba		
Songhai		
Tem		
Thonga		
Tiv		
Tukulor		
Wolof		
Yao		
Yoruba		
Zazzagawa		

Source: Murdock's (1967) Ethnographic Atlas

Figure A.1: Premarital Sexual Norms by Ethnic Groups in Africa



The restrictive norms group comprises of the cultural emphasis on early marriage and the emphasis on female virginity at marriage. The permissive group emphasises neither.
Source: Murdock's (1967) Ethnographic Atlas. Online access: http://worldmap.harvard.edu/data/geonode:murdock_ea_2010_3

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