The Effects of Fertility on Intrahousehold Resource Allocation and Women's Bargaining Power - Evidence from Nigeria

Department of Economics and Management
Lund University

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Author:
Isabella Rego Monteiro

Supervisor:
Ana Rodríguez-González
Postdoctoral fellow
Department of Economics

Abstract

This paper analyzes the impact of reproductive outcomes on women's participation in their family's decision-making and on the share of the household's resources allocated to them. It also examines the effects on labor, time use, and health-related outcomes. Two main sources of variation in reproductive outcomes are used: an increase in the number of children, instrumented by the event of multiple births, and a change in gender composition of a woman's children, instrumented by having a firstborn son. It builds upon literature on bargaining power, on the effects of fertility on mothers' welfare and labor supply and on the impacts of gender distribution of the progeny on women's position within their household. The findings indicate that an increase in the number of children is associated with a lower probability of participating in the household's decision-making regarding the usage of family income, a lower likelihood of using preventative health services, lower monthly incomes and lower household's expenditures on women's clothing. Similarly, having a male son increases the probability that a woman is the owner or manager of a family-owned income generating activity.

Keywords: fertility, reproductive behavior, female empowerment, bargaining power, development, Nigeria

Contents

1 Introduction

In Nigeria, women are particularly vulnerable to poverty. On average, they are employed in lower paying jobs, more likely to be underemployed and less likely to have access to productive assets and land (World Bank, 2022). Intrahousehold power dynamics also favor the male spouse, as only 70 percent of women have main control over their own incomes, and even fewer have a say in their own health care and usage of contraception (DHS, 2013).

In this scenario, closing the gender poverty gap is essential for the country to sustainably achieve its poverty reduction goals (World Bank, 2022). Nevertheless, such a change would necessarily require women to gain a more equitable control over productive assets. As a response, successful cash transfers initiatives were created, one example is the discontinued Child Development Grant Program (CDGP), which combined the provision of the necessary liquidity to allow women to invest in productive assets with health communication interventions relating to child feeding. Similarly, the newly created National Social Safety Nets Project also prioritizes women in their targeting.

In addition to providing cash transfers to vulnerable households, these programs have the underlying objective of influencing the intrahousehold power dynamics by giving the monetary transfer directly to women. Indeed, looking at these dynamics provides a powerful tool for government policy to alter how households make choices, allowing policy-makers to affect people's outcomes through channels other than prices and incomes, by modifying allocation rules (Quisumbing and Maluccio, 2000).

Most research that looks at the potential mechanisms through which governments can influence the intrahousehold allocation of resources has focused on government transfers and subsidies. However, generating more evidence on how women's bargaining power [1] and agency[2] are affected by their reproductive outcomes could facilitate the usage of these channels to increase women's control over productive assets and decrease the gender poverty gap in Nigeria.

I attempt to understand the impact of two selected variables that relate to reproductive behavior on women's measures of decision-making within the family, share of the household's resources, participation in unpaid activities, access to information technology, as well as labor and health outcomes. I do so by using two different instrumental variables common in the literature.

The first analysis consists in using the event of twins at first birth as an instrument for fertility and in comparing the outcomes observed for women to those for men. I anticipate that an unexpected increase in the number of children would hamper women's bargaining power by having them allocate more time to domestic tasks and interfering with their ability to work and manage any income

[1]The ability to obtain a large share of the possible joint benefits to be derived from any agreement. (Oxford Reference)

[2]The ability to take action or choose what action to take. (Cambridge Dictionary)

generating activities they may be involved with.

A second analysis will be carried out by instrumenting whether or not a woman has a son with the gender of the firstborn. As is the case in many other countries, it would be expected that, because of the existence of a preference for sons in Nigeria, having a son would lead to a significant increase in bargaining power.

2 Literature Review

Extensive research has been conducted, in recent years, on the topic of intrahousehold allocation of resources and bargaining power. This follows a shift in the analysis of household behavior from unitary household models in favor of collective models, which allow individuals within a household to have distinct preferences and differing degrees of capacity to impose their will in the family's decision-making process. In the context of developing countries, differences in allocation of factors within households have been found to be consistent with cooperative bargain models (Udry, 1996). Nevertheless, the hypothesis of Pareto Efficient allocation of resources has been shown to be violated in Burkina Faso, with plots managed by women being farmed less intensively, and with significant welfare gains to be attained by reallocating the productive resources (Udry, 1996).

When analyzing the determinants of these differentials in allocations, however, a majority of studies have focused on examining the impact of initial endowments, such as individual assets at the time of marriage or human capital levels (Quisumbing and Maluccio, 2003; Beegle et al, 2001), and government transfers (Lundberg et al, 1997) on individuals' power dynamics within a household. For this reason, while appropriately focused on within-family gender inequalities, most research conducted in the field has not directly addressed the impacts that fertility-related events may have on women's position within the household, in spite of the arguably important nature of births in the family dynamics and of indications that as the number of progeny increases, women and children's share of resources decreases, while men's stay constant. Indeed, evidence from Malawi shows that while children are relatively more affected when the birth count is higher, women also become poorer as the number of children increases (Dunbar et al, 2013).

Notwithstanding this suggestive result, fertility in relationship to intrahousehold allocation of resources has been mostly studied with regard to children, through the Quantity-Quality trade-off literature. Findings in this regard indicate that fertility decisions carry important consequences for human capital accumulation (Booth, 2005), albeit likely induced more by the order of birth than by the number of siblings itself (Devereux et al, 2005), carrying potential consequences for future earnings and intergenerational transmission of poverty.

Concerning women's own outcomes in relationship to their fertility levels, impacts on labor decisions have been widely analyzed, providing some evidence that total labor supply and type of

employment is relevantly affected by an increase in fertility. This is especially the case for unmarried women (Bronars and Grogger, 1994), who see their likelihood of employment reduced, and in developing countries, where they tend to shift to informal or unpaid jobs (Cáceres-Delpiano, 2012; Agüero and Marks, 2011). While there are indications that these trends fade with time (Angrist and Evans, 1996), overall the results still point to fertility having significant impacts on important determinants of women's earnings potentials and financial independence. Nevertheless, not much has been said about the direct impacts of the number and timing of births on measures of women's agency and bargaining power.

Few papers attempt to investigate impacts that may stem beyond children's human capital accumulation and women's labor supply. Cáceres-Delpiano (2011), for instance, finds that women who experience increased fertility are more likely than others to use contraceptive methods, to not live in the same household as their children, and to be unmarried or the head of the family. Similarly, Cáceres-Delpiano and Simonsen (2010) indicate that higher fertility is associated with higher rates of marital breakdown, a smaller likelihood of taking up health insurance and higher chances of having high blood pressure.

Other studies that link fertility outcomes to women's bargaining power do so by analyzing how the gender-ratio in women's children may affect their control over household resources, as mothers of male progeny may be favored within the family. By using the birth of a son in a woman's first pregnancy as an instrument for having had a son at all, such studies point to a shift in bargaining power occurring if women are not able to provide a male heir for the family.

Li and Wu (2009) show that, in China, mothers of firstborn sons are more likely to have a bigger say in the family's decision-making and be more nutritionally secure. Fan et al (2018) find similar results, pointing to the time Chinese women spend on unpaid household chores to be decreased for women with firstborn sons. Conversely, estimates for India do not find many significant benefits of having sons to mothers' household status (Zimmermann, 2018), in spite of the clear son preferences exhibited in the country. These studies, however, have the important caveat of not being able to rule out that the results observed reflect a direct consequence of the male heir rather than changes to the mother's position in the house due to having a son, as women's outcomes may be directly influenced by the firstborn.

Overall, information is scarce on how fertility outcomes impact women's bargaining power, share of intrahousehold resource allocation, and agency. One of the main reasons for such an evidence gap is the difficulty in locating exogenous sources of variation in fertility, as decisions on reproductive behavior are inherently determined by family members and women themselves.

Although instrumental variables such as the multiple birth instrument for fertility, used in many of the aforementioned papers, can seemingly approximate an exogenous event, these methods are not without problems. Such strategies rely on the near randomness of multiple births to estimate the

impacts of an increase in family size, thereby expecting to eliminate the bias associated with women in possession of certain preferences and characteristics purposefully choosing different amounts of children.

Nevertheless, twin births have been linked to mothers' health characteristics and health behavior before the pregnancy, as healthier mothers are more likely to experience such an event (Bhalotra and Clarke, 2019). This suggests estimates derived from the twin instrument to be biased downward, creating difficulties for the correct estimation of the effects of fertility on women's outcomes.

Similarly, the event of giving birth to dizygotic twins has also been shown to correlate with mother's characteristics (Farbmacher et al, 2018), thus indicating that using twins as an instrument without accounting for whether or not they are identical may lead to biased results. To reduce such concerns, Farbmacher et al (2018) suggest using same-gender twins as a proxy for monozygotic multiple births. Another possible drawback of using twins as an instrument for fertility is the plausible violation of the exclusion restriction, as twins are more likely to be born with lower endowments (Rosenzweig and Zhang, 2009), creating incentives for parents to base their time and resource allocation decisions on the twins' necessities.

In order to contribute to the literature on how fertility events may impact women's bargaining power and intrahousehold resource allocation, I will look at the impacts of increased fertility on women's labor outcomes, health choices conditional on health status, decision-making power over household assets, and time allocation into non-paid household activities in Nigeria. I will also analyze whether the firstborn child's gender has any impact on women's bargaining power indicators in this country.

3 Context

With a population of 206.1 million in 2020, Nigeria is the most populated country in the African continent. In 2018, around 40 percent of its population lived below the country's poverty line (The World Bank Group, 2022), and according to the World Bank's estimates, approximately 1/5 of individuals below the poverty line in Sub-Saharan Africa are located in Nigeria.

The country is divided into 36 States and 774 Local Government Areas. Economic disparities are large across states, with the Northern States being significantly poorer than the rest of the country. Indeed, in 2018, average poverty rates in the Northern Region had reached 57.9 percent, while those in Southern states were much lower, at an average of 20.3 percent (World Bank, 2022). Similarly, differences in poverty rates between rural and urban areas are also dramatic, with 56.7 percent of households primarily engaged in agriculture being poor, against 32.2 percent of Nigerian families who do not participate in agricultural activities (World Bank, 2022).

Inequalities in resource allocation are also clear between age groups and genders: Nigerian chil-

dren are among the individuals most vulnerable to poverty, with 48.3 percent of the population under 14 years old being poor (World Bank, 2022). Similarly, women are also a particularly vulnerable share of the population.

3.1 Women's status in Nigeria

In Nigeria, disparities between genders are large and spatially concentrated. According to data from Nigeria's Demographic and Health Survey (NDHS), in 2013, prime-aged women were on average 17 percentage points more likely to not have received formal education than men, and women's literacy rates were 22 percentage points lower than those of men.

While labor participation for women is high relative to other countries, with nearly 62.5 percent of married women being employed, it still falls short of the participation rates of married men, which neared 75.9 percent (World Bank, 2022). Working age women are also 7 percentage points more likely than men to be underemployed, with 17.3 percent of them working less than 20 hours each week (World Bank, 2022). Despite significant differences in the sector of employment between men and women, women earn less than men even within the same job type, with wage workers earning 22 percent less if they are female (World Bank, 2022).

Once accounting for differences in sector, wage differentials in Nigeria seem to be driven in part by women's low levels of access to productive inputs. Indeed, women face difficulties in accessing land and inputs, having a 25 percentage points lower fertilizer use than men (Sheahan, M., Barrett, C. B., 2014). For this reason, female-owned plots have lower farm productivity-levels (Trends and Drivers of Agricultural Productivity in Nigeria, IFPRI), with yields being 30 percent lower in female-managed plots (World Bank, 2022). Women's ownership of assets, when compared to men, is also remarkably lower: females are 19 percentage points less likely to own land than their counterparts and 22 less likely to own a house (DHS 2013).

Likewise, differences in agency over their own earnings are quite significant, with only 70 percent of women being the main deciders over their own income (DHS 2013). Women's participation in the household's decision making process is also much lower than that of men: only 39 percent of married women participate in decisions regarding their own health care, against 87 percent of men. With regards to big purchases for the household, only 38 percent of women have a say, compared to 76 percent of married men (DHS 2013).

Concerning Nigerian women's agency over their own reproductive choices, only 15 percent of married women use contraception and approximately 16 percent of married women have an unmet need for contraception, as they claim to not desire another child in the next two years but do not currently use any form of family planning (DHS 2013). Women living in polygamous marriages, which constitute 33.2 percent of all married women (DHS 2013), are also significantly poorer than

those that are in a monogamous relationship, widowed or unmarried (World Bank, 2022).

In addition, Intimate Partner Violence is also a deep-rooted problem in the country, with on average 27.8 percent of women having experienced physical violence since the age of 15 and with 11.2 percent experiencing it with more or less frequency ("Often or Sometimes"). Perceptions that wife beating is justified is also generally high, as 34.7 percent of women in reproductive age agree that there are situations which may warrant physical abuse from their partners (DHS, 2013).

3.1.1 Son preference in Nigeria

Son preference in Nigeria is well documented. In spite of the great variety of ethnicities present in the country, most of these societies are patrilineal, implying that the continuity of a family's bloodline is conditional on the existence of male progeny. As a consequence, women commonly face pressures by their husband's relatives to deliver a boy and being unable to do so is associated with a bigger probability of divorce and of being in a polygamous relationship (Milazzo, 2014). Furthermore, land inheritance is frequently determined through the male lineage of a family, and widowed women without male children are not entitled to their late husband's estate (Milazzo, 2014). Using data from the 2008 Nigeria Demographic and Health Survey (NDHS), Milazzo (2014) concludes that Nigerian women whose firstborn child is female are less likely to use contraceptives, more likely to have and desire more children and to wait shorter intervals between a pregnancy and the next one.

Milazzo (2014), argues that this behavior may be the underlying cause for missing women in Nigeria, as the database indicates that the share of women who have had a firstborn daughter decreases starkly with age, suggesting increased mortality on their part. Indeed, according to the author, data from the 2008 NDHS indicates that son preferences did not seem to translate into significant differences in the sex-ratio at birth at the time, due to difficulties in early detection of a child's gender. Nevertheless, the ratio of women who have had a firstborn daughter is significantly smaller overall and decreases importantly as women become older, suggesting that harmful practices, such as shortening the time period between pregnancies when trying to conceive a son, are the likely cause for excess mortality among adult women.

Another major factor has gained attention in recent years as being a main contributor to the differences in the numbers of men and women: Nigeria's sex ratio at birth has been rising rapidly, pointing to an increasingly frequent occurrence of pre-natal sex selection. Kaba (2015) estimates that Nigeria's sex ratio at birth has increased from 1.03 in 2008, to 1.06 in the last decade, leading the country to have the second highest rate in the African continent. As apparent from the country's rising sex ratio, gathering more evidence about the how family dynamics change in response to fertility outcomes may be of extreme importance in understanding the underlying causes to the

number of missing women and girls in Nigeria.

4 Data

4.1 The General Household Survey (GHS)

The General Household Survey, from now on referred to as the GHS, is a nationally representative cross-sectional survey conducted by Nigeria's National Bureau of Statistics, as a part of the "Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA)" initiative. It is composed of four different waves (2010-2011, 2012-2013, 2014-2015, 2018-2019), and it contains information on agricultural production, household-level and individual-level socio-economic characteristics, as well as data on decision-making process, allocation of resources and control over income sources. Each survey wave is conducted in two different data-collection stages: one during the post-planting period and another one in the post-harvest phase. Each wave consists of micro-data for approximately 5,000 households, selected by randomly sampling 500 enumeration areas and then interviewing 10 households in each one. For this reason, I clustered standard errors at the enumeration area level.

I constructed the pooled cross-sectional database using all four waves. The data allows for linking children to their biological mothers and fathers, as well as distinguishing between their genders and between monogamous and polygamous marriages. I limited the sample to married couples under the age of 65 and to families that followed traditional gender roles, with a male individual being the household head and with female spouses having at least one biological child. Polygamous households were treated as a different family nucleus for each spouse and her biological children, however, all were linked to a same head. Because the total number of pregnancies and the order of births were not explicitly informed, I only used married women who had no other children living outside of the household for the analysis, thus ensuring that the total number of pregnancies can be adequately inferred.

Twins were identified by selecting the household head's children that were born to the same mother during a same year and month. In total, the initial pooled samples contain 236 non-duplicated mothers of twins, as some appear in more than one year of the original GHS datasets. The "General Women" sample, a subset of the original pooled cross-sectional data, was further limited to only women who have had at least one pregnancy, with the twin binary variable only signalling mothers who have experienced multiple births in their first pregnancy. The database was left with 69 mothers of twins out of the entire sample of 6890 women. Similarly, the "Men" sample was constructed by using only the subset of married male heads, with a binary variable signalling whether they are husbands to one of the women who have experienced multiple births in their first pregnancy. Due

to lack of information on some of the key variables analyzed for women, only 48 fathers of firstborn twins are included in a dataset of 4617 men.

A third subset from the original pooled cross-sectional data was created for the second part of my analysis. In this dataset, mothers with male firstborns were identified and signalled through a binary variable, used as an instrument for having any male children. However, because the sex ratio of firstborns was heavily skewed toward males in most waves, I only used the 2010 data, which more closely resembled Nigeria's national average and which was balanced in most covariates and individual characteristics. For the analysis, a subset with all mothers younger than 65 years old was used, which will be referred to as "Women Subsample - 2010".

Additionally, two other subsets were created with the objective of conducting robustness checks on the results by using subsamples of data excluding ages in which the sex ratio of firstborns deviates too strongly from the initial one. These will be referred to as "Women Subsample - 2010 + under 43", with only mothers who were 42 years old or less at the time of the survey, and "Women Subsample - 2010 + under 28", only containing women who are 27 or younger. The subsets for this second part of the analysis contain 2,477, 2112 and 808 women, respectively.

4.2 Descriptive Evidence

Summary statistics for the four different datasets ("General Women", "Men", "Women Subsample - 2010", "Women Subsample - 2010 + under 43", "Women Subsample - 2010 + under 28") are reported in section 9 (Appendix).

Women's Characteristics in the General Sample

Women in the "General Women" sample, the less restricted database in my analysis, are all married and have children. They are mostly young, at an average of 35.5 years old, and rural women, with sixty eight percent of them living in rural areas. While religious beliefs are not uniform in Nigeria, traditional faith does not account for a significant share of believers: 56 percent of the sample is Muslim and almost all the remainder is Christian. When compared to the national average, the women in the sample are slightly less educated: although literacy rates are at the national average, at 62.2 percent, the average years of schooling is almost one year below the Nigerian women's mean of 5.7 years, at only 4.9 years of education (UNDP Human Development Reports). [3]

In what concerns their reproductive behavior and familial structure, women in the "General Sample" sample have 3.2 biological children and deliver their first child at the age of 23. Polygamous relationships are fairly common, but not the norm: only 33.5 percent of married women in the

[3]UNDP Human Development Reports: https://hdr.undp.org/en/towards-hdr-2022

sample have co-wives. The likelihood of birthing twins is also comparable to the average in most countries, with only 3.3 percent of pregnancies resulting in multiple births, and merely 1.2 percent of them in twins of the same gender.

Moreover, 82.9 percent of women in the general dataset have a male child, and 58.1 percent of them have a son in their first pregnancy. The difference between the sex ratio at birth suggested by these numbers and the average sex ratio for humans is stark. For this reason, the database used in section 5.2 ("Women Subsample - 2010") is limited to only one year, in which the sex ratio of firstborns proved to be slightly less skewed towards sons.

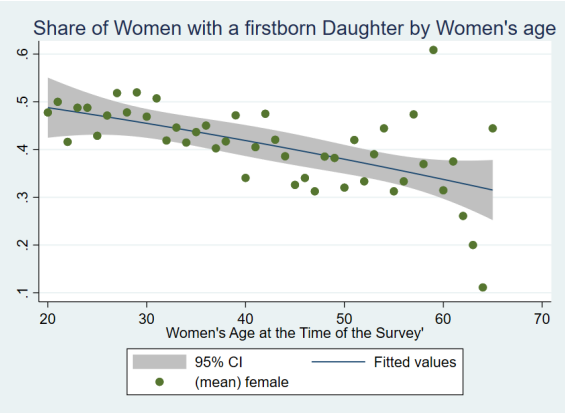
Women's Characteristics in the Subsamples

Female spouses in the "Women 2010 Subsample" are slightly younger than in the dataset composed of all four survey years, with an average age of 33. They have very similar levels of schooling to the original sample, completing on average 5 years of education in their lifetime. The number of biological children and age at which they deliver their first child is also comparable to the ones in the complete dataset. Although moderately more balanced, the sex ratio of firstborns is still biased toward boys, as 56 percent of the women in the sample have a firstborn son. This can be partially explained by how the database was constructed, since restricting its observations to married women implies that mothers of firstborn daughters, who are more likely to get a divorce (Milazzo, 2014), would probably be less represented.

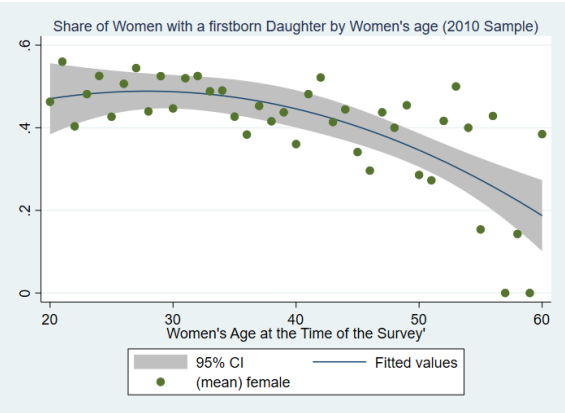
An additional explanation for the imbalance in the observed sex ratio, as suggested by Milazzo (2014), is that women who fail to produce a male heir in their first pregnancies will adopt riskier health behaviors to increase their chances of having a son, as discussed in section 3.1.2. If this were the case, while sex rates at birth would still be balanced, women who have firstborn daughters would suffer from worse health outcomes and higher mortality rates, leading us to observe a smaller share of them in our sample. Indeed, when plotting the data used for this paper, such a trend seems to be present.

As indicated by figure 1, the share of women whose first pregnancy resulted in a daughter decreases starkly with age in the 2010 GHS dataset, suggesting that women who do not manage to have a firstborn son are disappearing from the sample either due to increased divorce rates or mortality. The same seems to also be true for the entire sample of women, but less strongly so. This means that any conclusion drawn about the effects of having a son on married women's agency will likely be biased, as women who manage to maintain their health and stay married to their partners after having a firstborn daughter are probably different from those who do not.

A closer analysis of the restricted sample graph allows us to observe, however, that until the



(a) Pooled cross-sectional data from all waves



(b) Wave 1 (2010)

Figure 1: Missing Women: share of women with firstborn daughters by age - data from the National Bureau of Statistics, Federal Republic of Nigeria. Nigeria General Household Survey (GHS).

age of 42.5 the share of female firstborns stays within the confidence interval of being constant, suggesting that it is possible to decrease the selection bias, at least partially, by limiting the analysis to women before the age of 42. Nevertheless, this strategy alone is not able to account for the different likelihood of a woman getting married to the father of the child if that pregnancy yields a boy, which would influence whether or not the individual appears in my sample.

4.2.1 Balance of Characteristics by Twin Status

Overall, table 1 indicates that women who gave birth to twins in their first pregnancy and those who birthed singletons appear to be quite balanced in the selected individual characteristics, with the exception of mothers of twins being less likely to be in a polygamous marriage and having a smaller gap in years of schooling years when compared to their partners.

When limiting the ”Twin Firstborn” group to solely mothers of same-gender twins, the number of characteristics that are statistically different between groups decreases, supporting the claims that this would be a more appropriate instrument, since the event of monozygotic twins being more exogenous. Notwithstanding, a slight increase is seen in the differences in the likelihood of being in a polygamous relationship, most likely due to the imprecision of same-sex twins as a proxy for monozygotic multiple births and due to the very small number of women that fit this criteria in the data. Unsurprisingly, table 1 also reveals that men’s characteristics do not seem to be different depending on whether or not their wives experienced a multiple birth.

Women - All twins					
	Singleton Firstborn	Twin Firstborn	Difference	Dif. Standard Error	N
Age	35.53	34.003	-1.527	(1.295)	6885
Age at first birth	23.13	24.041	0.911	(0.782)	6885
Literacy	0.627	0.7117	0.0847	(0.0595)	6632
Years of schooling	4.971	5.712	0.741	(0.663)	6885
Polygamous	0.337	0.195**	-0.142**	(0.0577)	6784
Health Issues	0.00300	0	-0.00300	(0.00666)	6885
Dif. School Years	1.235	-0.178***	-1.413***	(0.616)	3245
Urban	0.320	0.3638	0.0438	(0.0571)	6885

Women - Same gender twins					
	Singleton Firstborn	Twin Firstborn	Difference	Dif. Standard Error	N
Age	35.53	33.026	-2.504	(1.892)	6885
Age at first birth	23.13	23.209	0.0790	(1.143)	6885
Literacy	0.627	0.77	0.143	(0.0878)	6632
Years of schooling	4.973	6.123	1.150	(0.969)	6885
Polygamous	0.337	0.165**	-0.172**	(0.0843)	6784
Health Issues	0.00299	0	-0.00299	(0.00973)	6885
Dif. School Years	1.226	0.089	-1.137	(0.877)	3245
Urban	0.320	0.42	0.1000	(0.0834)	6885

Men - All twins					
	Singleton Firstborn	Twin Firstborn	Difference	Dif. Standard Error	N
Age Husband	46.03	43.658	-2.372	(2.588)	4615
Age Wife	36.51	35.119	-1.391	(1.880)	2369
Age at first birth	23.38	24.595	1.215	(1.068)	2323
Urban	0.384	0.4411	0.0571	(0.0716)	4616
Polygamous	0.1	0.0597	-0.0403	(0.0441)	4592
Years of schooling	3.576201	7.080982	3.504781	(0.80502)	4616

Table 1: Characteristics by twin status of first born

4.2.2 Balance of Characteristics by Gender of Firstborn

Women ages 13-65					
	Firstborn girl	Firstborn boy	Difference	Dif. Standard Error	N
Age	32.19	33.744***	1.554***	(0.381)	2477
Age at first birth	22.25	21.97	-0.281	(0.231)	2477
Literacy	0.621	0.5651***	-0.0559***	(0.0199)	2474
Years of schooling	5.926	5.174***	-0.752***	(0.216)	2477
Polygamous	0.268	0.3108***	0.0428**	(0.0185)	2461
Dif. School Years	0.977	1.19	0.212	(0.201)	1256
Urban	0.361	0.34	-0.0204	(0.0193)	2477

Women ages 13-42					
	Firstborn girl	Firstborn boy	Difference	Dif Standard Error	N
Age	29.86	30.20	0.341	(0.289)	2112
Age at first birth	21.57	20.811***	-0.759***	(0.217)	2112
Literacy	0.603	0.57	-0.0283	(0.0216)	2109
Years of schooling	5.69	5.213**	-0.477**	(0.230)	2112
Polygamous	0.275	0.3089*	0.0339*	(0.0200)	2102
Dif. School Years	1.027	1.29	0.263	(0.214)	1097
Urban	0.338	0.31	-0.0292	(0.0204)	2112

Women ages 13-27					
	Firstborn girl	Firstborn boy	Difference	Dif. Standard Error	N
Age	23.41	23.09	-0.320	(0.209)	808
Age at first birth	19.22	18.91	-0.308	(0.247)	808
Literacy	0.596	0.55	-0.0488	(0.0350)	805
Years of schooling	4.763	4.54	-0.219	(0.350)	808
Polygamous	0.316	0.31	-0.00363	(0.0329)	802
Dif. School Years	1.093	1.22	0.129	(0.361)	373
Urban	0.301	0.26	-0.0417	(0.0316)	808

Table 2: Women's characteristics by sex of first born and age subsample

As expected, the results in table 2 indicate that the sample of women containing the older cohort is likely to be biased. Women with a firstborn boy are on average older, less educated, and more likely to be illiterate or in a polygamous marriage, likely stemming from the fact that in order to maintain their health and marital status, women with female firstborns have to have a higher degree of initial agency. This suggests that any results found by comparing women with and without male firstborns

will be attenuated.

Similarly, eliminating the older cohort of women decreases the magnitude and the significance of inter-group differences, reflecting the fact that up to 42 years old the share of women having had a son in their first pregnancy isn't significantly different from those in their early twenties. Indeed, women that have male firstborns appear to have levels of education and probabilities of being in a polygamous marriage that are more similar to their counterparts than in the unrestricted sample. However, while the subsample of women younger than 42 does decrease imbalances, it still indicates that the compared groups could have slightly different potential outcomes.

On the other hand, in the group consisting of younger women, no significant differences exist in the selected variables, reflecting the fact that any changes that occur as a consequence of not being able to produce a male heir, such as in a woman's marital or health status, are less widespread in shorter time frames. The short-term effects of having a son are thus easier to estimate.

5 Empirical Strategy

Reproductive behavior is inherently endogenous, as women and their families are able to self-select into certain quantities and gender composition of the progeny. Quasi-experimental methods are thus necessary to ensure that women with different fertility outcomes are comparable in terms of initial potential outcomes.

5.1 Effects of Fertility on Women's Agency and Bargaining Power

I estimate the effects of fertility on women's agency using the event of twin births as an instrument for fertility. Because of the near randomness associated with the birth of twins, instrumenting fertility through it should allow mother's characteristics to be balanced before birth and avoid self-selection into larger families by women with certain types of preferences and common characteristics.

Because twin pregnancies are more common if a woman has already had previous pregnancies, controlling for parity in the number of gestations is necessary for the estimation. For this reason, I limit my sample to women who have had at least one child and compare women whose first pregnancy resulted in twins with those whose first pregnancy led to the birth of singletons.

5.1.1 Endogeneity Concerns

While experiencing a multiple birth is a seemingly random event, evidence now shows that it is linked to a number of observed and unobserved mother's characteristics. A first possible concern about the instrument's randomness lies in the increased likelihood of having twins if the woman has been pregnant before, requiring the analysis to focus on subjects at a parity of pregnancies, as previously mentioned in this section.

Additionally, as indicated by Bhalotra and Clarke (2019), the event of a multiple birth is associated with a woman's health status and health-related behaviors, with healthier women having higher odds of delivering twins. In order to partially control for the bias that this generates, I incorporate controls for mother's health before pregnancy, which are available for the first two waves of GHS. Nevertheless, a plethora of factors is indicated by the authors as being robustly correlated with the birth of twins, and effectively controlling for all of them seems unlikely.

A third problem that may arise for the instrumental variable's exogeneity is the fact that only monozygotic twin pregnancies are believed to be truly random. This is addressed in a robustness check by limiting the instrumental variable of multiple births to only consider same-sex twins.

Lastly, women undergoing fertility treatments are more likely to have twins and are also systemically different from women that are not going through these treatments, with differences in the potential outcomes from both groups generating selection bias. Nevertheless, as argued by Cáceres-

Delpiano (2012), the costly nature of IVF treatments suggests that their likelihood is greatly reduced in the context of developing countries. While this does not completely eliminate the issue of self-selection into multiple births, this type of bias is certainly less pronounced in the sample than in data from high-income countries.

5.1.2 Sample Size Concerns

Upon restricting the sample of twin mothers to only those having had a multiple birth in their first pregnancy, the amount of twin mothers drops considerably. Indeed, my analysis is limited to only 69 mothers of twins. While most of today's studies featuring the multiple birth instrumental variable use census data to address the fact that only approximately 2.5% of pregnancies result in multiple births, seminal papers in the field have used very small numbers of twin pairs. Namely, Rosenzweig and Wolpin (1980) use a sample with only 25 twin mothers to conduct their estimates. Given the absence of census data on Nigeria's population, and the particular opportunity that the GHS database offered in estimating women's time allocation into unpaid activities and participation into the household's decision making process, I argue that an analysis was still warranted, in spite of a possible lack of precision of the coefficients.

5.1.3 Validity of the Exclusion Restriction

The validity of an instrumental variable is limited to the extent to which it only affects the dependent variables through the endogenous one. As such, multiple births should only affect the bargaining power measures through their effect on the number of biological children a woman will have. However, concerns arise with regard to this requirement.

As pointed out by Rosenzweig and Zhang (2009), twins are usually born at lower weights and have higher mortality rates than their counterparts. For this reason, parents are likely to have different labor supply and resource allocation choices than if they had birthed singletons. Indeed, the birth of twins may increase parents' labor supply, as a way to counterbalance their childrens' elevated health expenses. Alternatively, they may feel the need to allocate more time to the twins, thus lowering the amount of hours worked or the number of their own health check-ups Cáceres-Delpiano (2012).

Regardless of not being able to effectively test the exclusion restriction, precautions can be taken to ensure that the results are not discredited by the possibility of endowment effects. As we are interested in changes in women's position relative to other household members, a first way to address this problem is by using measures of bargaining power that are relative to other adults in the house. For instance, whether or not the woman has some level of exclusive control over her own income, or over the profits generated by selling the household's produce. A second possible way to better

understand the extent to which endowment effects might be influencing the findings consists in comparing the results for men and women. This will be further discussed in the Robustness Tests section.

5.1.4 First-stage

The effects of a multiple birth in the first pregnancy on the number of a woman's biological children were estimated as such:

$$NumberChildren_i = \alpha_i + \mu_1 Twin_i + \mu_2 Age_i + \mu_3 AFP_i + \mu_4 InitialHealth_i + X_i + \epsilon_i \quad (1)$$

Here, "Twin" is a binary variable for whether a woman has given birth to twins in her first pregnancy, "Age" refers to a woman's current age in the survey. "AFP" stands for age at first pregnancy, which allows to control for the fact that, in general, older women are more likely to have twins. "Initial Health" is an indicator of the presence of health problems, conditional on that problem having started before getting pregnant with their first child. "X" is a vector of individual characteristics ("Whether in a Polygamous Marriage", "Literacy", "Years of Schooling", "Differences in years of schooling (husband's- wife's)", "Household Religion", "Whether house is owned by family", "Whether lives in Urban setting" and "Percentage of economically active adults whose main occupation is in a field other than agriculture"). Year and Zone fixed effects are also included. In the First-stage estimation, μ_1 represents how much having had a twin birth increases the number of a woman's biological children.

The first stage is estimated for both mothers and fathers, as husbands may have children from multiple wives. The "X" vector in the men's regression is slightly different from that of women. Due to collinearity, the variables "religion" and "educational differences between husband and wife" were omitted. Additionally, to control for the possibility that men's household status changes depending on the stage of their life, their own age is also added to the set of controls.

5.1.5 Second Stage

The instrumental variable regressions were estimated as such:

$$P(WBP_i = 1) = \alpha_i + \beta_1 Fertility_i + \beta_2 Age_i + \beta_3 AFP_i + \beta_4 InitialHealth_i + \epsilon_i \quad (2)$$

$$P(WBP_i = 1) = \alpha_i + \beta_1 Fertility_i + \beta_2 Age_i + \beta_3 AFP_i + \beta_4 InitialHealth_i + X_i + +\epsilon_i \quad (3)$$

Where β_1 gives the effect that increasing fertility will have on the probability of any of the bargaining power outcomes. Most dependent variables are binary, with the exception of individual

earnings and time spent doing unpaid domestic activities and expenditures with clothing, for this reason, the equations are written as a linear probability model. Equation 2 describes a first regression that uses a minimal set of controls (”Age”, ”Age at First Pregnancy” and ”Initial Health”), while equation 3 represents a regression with an additional set of individual characteristics as controls. Vector ”X” is the same as described in the previous subsection. I also include Zone and Year fixed effects.

Regressions are first estimated for a sample of mothers and the results for the sample of fathers is estimated separately as a robustness check. The specification for men's second stage is the same as in equation 3, but the vector of characteristics is mildly different, as described in the previous section.

5.2 Effects of Gender composition on Women's Agency and Bargaining Power

Following Li and Wu (2009), I estimate the effects of the gender composition of the progeny on Women's Agency using the gender of the firstborn child as an instrument for having a male son. As argued by Li and Wu (2009), due to most families desiring more than one child, they are less likely to interfere with the birth and survival of girls if they are born in a woman's first pregnancy, therefore allowing the firstborn's gender to more closely resemble a random event.

5.2.1 First-stage

$$P(MaleChild_i = 1) = \alpha_i + \mu_1 MaleFirstborn_i + X_i + \epsilon_i \quad (4)$$

In the equation above, ”MaleFirstborn” is a binary variable indicating whether a woman's firstborn child was a male. ”Age” refers to a woman's current age in the survey. ”X” is a vector of individual characteristics, closely resembling the controls included by Li and Wu (2009): (”Whether in a Polygamous Marriage”, ”Literacy”, ”Years of Schooling”, ”Difference in Years of Schooling (husband's-wife's)”, ”Difference in Age (husband's-wife's)”, ”Age”, ”Family's per capita income”, ”Share of economically active household members whose main activity is not in agriculture”, ”Age of firstborn”). Zone fixed effects are also included, however, none of the regressions in section 5.2 include year fixed effects, as the sample used for this analysis is limited to observations in 2010. μ_1 indicates by how much having had a firstborn male baby increases the probability that a woman has any male children.

5.2.2 Second Stage

$$P(WBP_i = 1) = \alpha_i + \beta_1 MaleChild_i + X_i + \epsilon_i \quad (5)$$

Equation 5 illustrates the IV estimation of the effect of having male children on women's bargaining power measures. The magnitude of this effect is captured by β_1. The regression specification also includes a Zone fixed effects and a vector "X" of individual characteristics, which is the same that was indicated in the First-Stage section. This basic model is estimated for three subsamples of women, with the intent of achieving a better understanding of how effects on their bargaining power may vary depending on the age and development stage of the male firstborn. The first subsample includes all mothers younger than 65 years old. The second subsample is limited to mothers younger than 43 years old. Lastly, the third estimation is limited to only women who are younger than 28 years old.

6 Results

6.1 Effects of Fertility on Women's Agency and Bargaining Power

6.1.1 Exogeneity test

Table 3 tests the extent to which the event of multiple births can be considered exogenous in relation to the control variables that will be used in the regressions.

Regression of instrument on Control Variables			
	Dependent Variable		
	Women		**Men**
	Twins	Same gender twins	Twins
Age Woman	-0.000490**	-0.000325*	-0.000373
	(0.000224)	(0.000185)	(0.000528)
Age at First Pregnancy	0.000618*	0.0000539	0.00103**
	(0.000323)	(0.000261)	(0.000496)
Age Man	-	-	-0.000238
	-	-	(0.000437)
Polygamous Marriage	-0.00389	0.000169	-0.0110
	(0.00408)	(0.00388)	(0.00830)
Prior Health Issues	-0.00548	0.000671	-
	(0.00408)	(0.00251)	-
Years of education difference (husband's-wife's)	-0.000768	-0.000228	-
	(0.000658)	(0.000332)	-
Lives in Urban areas	-0.00451	-0.00154	-0.00190
	(0.00462)	(0.00273)	(0.00757)
Religion	-0.00575	-0.00293	-
	(0.00421)	(0.00342)	-
Year Dummies	Yes	Yes	Yes
Zone Dummies	Yes	Yes	Yes
Observations	3164	3164	2322
R-squared	0.008	0.007	0.184

Table 3: Exogeneity of the instrument with regard to control variables used in the regression.
Uses survey weights and clustered standard errors at the enumeration area level.

As indicated by Angrist (2010), the occurrence of twins is associated with both the mother's current age and their age when giving birth to the first child. The results in table 3 confirm that the birth of twins can partially be explained by these characteristics. However, the findings in table 3 suggest that somewhat less biased results can be obtained by using same-gender twins as the instrument, confirming the indications from table 1 that using the same-gender IV yielded groups that were more balanced in observed characteristics.

A second important conclusion that can be taken from table 3 is that, apart from age and age at first pregnancy, all of the other variables seem to be statistically insignificant in explaining the birth of twins, easing concerns that the instrument could have additional sources of endogeneity other than those already expected.

6.1.2 First-Stage

First-stage Regression			
	Dependent variable: Number of children		
	All Firstborn Twins		Same gender Firstborn twins
Twin at first pregnancy	0.820***	0.825***	0.780***
	(0.240)	(0.240)	(0.283)
Mother's age	0.109***	0.116***	0.115***
	(0.00500)	(0.00555)	(0.00556)
Age at first pregnancy	-0.170***	-0.170***	-0.169***
	(0.00751)	(0.00806)	(0.00806)
Vector of Controls "X"	No	Yes	Yes
N	3164	3106	3106
R-squared	0.378	0.392	0.391
F statistic	61.13	48.27	48.06

Table 4: First-stage regression for three different specifications of the model
Uses survey weights and clustered standard errors at the enumeration area level.

The results of the first stage regression indicate that having twins in the first pregnancy is strongly associated with an increased number of progeny: a woman who has had a multiple pregnancy during their first gestation has on average 0.820-0.825 more children than those who have not. The effect is smaller but equally significant in the case of same-gender twins: the event increases the number of children by 0.780. The other two regressors are also unsurprisingly important in determining the total number of children. Increasing a woman's age by one year is associated with her having, in general, 0.109-0.116 more children, as older women have had more time to expand their families. Conversely, women who have started to have kids later in life would have a smaller time span to

reproduce, leading each year of delayed fertility to decrease their current number of offspring by 0.169-0.170.

In addition to maintaining a high level of significance and similar magnitudes with three different specifications, the F statistic indicates that having a twin is not a weak instrument. Overall, the birth of twins seems to be a reasonable instrument to estimate the effect of fertility in this sample and comparing the results obtained by instrumenting fertility with twins of any gender to the findings with the same-gender twin IV may provide a good robustness check for the instrument's bias.

6.1.3 Model Results

Table 5 presents the results of the Twin Instrumental Variable Regressions, with each column containing a different specification of the model and each row a different measure of women's decision-making abilities and empowerment.

Although many coefficients are not significant, the directions of results reported for regression with a basic set of controls generally point to increases in the number of children having negative repercussions in a women's measures of bargaining power. Indeed, in this specification a woman's ability to decide over household income is negatively affected by children: having an additional child decreases the probability that she has any say in the family's usage of income by 0.186 percentage points. This effect increases in magnitude if controlling for the additional set of individual characteristics, with the probability of having agency over incomes decreasing by 0.270 percentage points.

Similarly, the probability of having a routine medical check-up [4] decreases with the number of kids: increasing the number of biological children by 1 decreases the likelihood of a woman seeking preventative health care by 0.0190 percentage points. This also holds true for the regression with additional controls but, again, the magnitude is slightly larger: diminishing the likelihood of preventative care by 0.0257 percentage points. Having one more child is also negatively linked with lower total household expenditures with clothes, as it decreases it by 4158 Nairas. This effect persists in the regression with added controls, but the magnitude of the fluctuation is larger.

Although not significant in the basic regression, two other variables appear to have a statistically significant reaction to an increase in the number of children upon adding a vector of individual characteristics to the estimation. Indeed, having an additional child is associated with a decrease in monthly income of 18243 Nairas. The amount of money spent on women's clothes is also significantly affected by the number of offspring, with a one unit increase leading to 2211 Nairas less being spent on women's clothing.

[4] Medical Visit that is unrelated to pregnancy, conditionally on not being sick or wounded

	Twins - less controls		Twins more controls		Same-sex twins	
	Number of Children	N	Number of Children	N	Number of Children	N
Labor Outcomes						
Monthly Income	-9726.2	1792	-18243.9*	1152	-14831.6***	1152
	(6860.8)		(9596.9)		(5544.7)	
Any Work	-0.0714	6750	-0.00781	3106	-0.0746	3106
	(0.0713)		(0.0927)		(0.171)	
Participation in Household Decisions						
Participates in Income Decisions	-0.186**	5904.	-0.270**	2700	-0.279**	2700
	(0.0781)		(0.114)		(0.135)	
Owns or Manages any Household Activity	0.0114	2616	-0.264	1255	-0.769	1255
	(0.175)		(0.288)		(0.493)	
Health Behavior						
Went to the doctor if sick	0.159	1021	0.0994	547	0.0768	547
	(0.212)		(0.152)		(0.197)	
Medical check-up if not sick (non-pregnancy related)	-0.0190***	5954	-0.0257***	2687	-0.0252**	2687
	(0.00624)		(0.00966)		(0.0122)	
Time Use: Unpaid work						
Any Unpaid Activity (Other)	0.0666	6783	0.0259	3106	0.116	3106
	(0.0627)		(0.0868)		(0.141)	
Unpaid Childcare	0.0401	3397	-0.0200	1709	-0.146	1709
	(0.101)		(0.154)		(0.212)	
Hours Unpaid Work (other)	0.282	3292	5.048	1658	-1.064	1658
	(3.571)		(5.113)		(1.575)	
Hours childcare	-3.983	1833	-0.786	940	-5.952*	940
	(4.207)		(5.165)		(3.294)	
Access to ICT						
Owns mobile phone that uses	-0.0269	5936	-0.0977	2965	-0.298	2965
	(0.0843)		(0.126)		(0.257)	
Expenditure on goods						
Total clothing expenditures	-4158.6**	6745	-7695.8**	3094	-9516.9	3094
	(2025.7)		(3742.7)		(5883.5)	
Women clothing expenditures	-768.1	6745	-2211.1**	3094	-2761.0*	3094
	(519.2)		(956.4)		(1595.9)	
% clothing expenditures women and children	-0.0131	6373	-0.0299	2966	-0.0682	2966
	(0.0342)		(0.0696)		(0.101)	

Table 5: Second Stage Results

6.1.4 Robustness Tests

The results of a first robustness check can be found the fourth column of table 5. In order to account for possible endogeneity in the inclusion of heterozygotic twins in my estimates, I also estimate the effects of fertility by using same-sex twins as an instrument, as suggested by Farbmacher et al (2018). The specification is exactly the same as my main model with added control, and uses the exact same vector of control variables. However, this estimation is based on a sample of merely 31 ”monozygotic” twin mothers who have had a multiple birth in their first pregnancy. As the

sample of mothers that meet these requirements is small, results are to be examined in awareness of their limitations. Another caveat to be noted is that same-sex twins are not a perfect measure for monozygotic multiple pregnancies.

However, in spite of the very small sample, results for the same-sex twin specification seem to be less imprecise than expected, as the magnitudes and significance levels are similar to the results in column 3. Particularly, the effects on monthly income, likelihood of participating in the household's economic decision-making, probability of having preventative medical check-ups, and on total expenditures with women's clothing confirm the results found in the previous specifications of the model.

On the other hand, with this instrument, the effects of the number of children on total household's clothing expenditures disappear, seemingly indicating that clothing expenditures drop more consistently for women than for the rest of the household. Nevertheless, because of the stark jump in significance and small number of same-sex twin mothers, not much can be interpreted from these results.

Along the same lines, there is a big jump in significance and magnitude of the effect of the number of children in hours allocated to childcare, which decrease with the number of progeny. The direction of these results is the same in other specifications, indicating that the effects on women's agency of increases in fertility are not coming exclusively from a shift in time allocation towards childcare, but more plausibly from a change in the intrahousehold allocation of resources and bargaining power. However, because of the big jump, this particular coefficient seems to be imprecise.

A second robustness check, consisting of running the same regressions for men's outcomes [5], is justified to better understand whether the findings for women are a mere result of the household getting relatively poorer with an increase in the number of children. Additionally, this analysis can help address the possibility of the twins' presence shifting time allocation and consumption preferences in the entire household, as twins are usually more fragile and less endowed at birth. If any of these scenarios were true (both becoming relatively poorer and twin endowment effects), we would expect that changes in women's outcomes be closely mimicked by men's.

The results in table 6 are mostly not statistically significant. However, the directions of the coefficients seem to exclude that men are decreasing their bargaining power. Indeed, while we cannot rule out the possibility that there is no effect in these variables, higher incomes and a higher share of participation and management of household activities and of clothing expenditures seem to be tied to having more children. Perhaps more importantly, the share of men that are involved in childcare decreases significantly with an increase in the number of children.

Such results do not seem to be consistent with household shocks in fertility affecting both men and women in the same way, but rather they could indicate that men's command of house-

[5] First-stage in the appendix

hold resources remains unchanged while women's decrease, similarly to findings in Dunbar et al (2013). Nevertheless, the robustness check is unable to provide any insight on the mechanism behind women's decreased bargaining power indicators. For this reason, if allowing endowment effects to affect women's decision-making at a higher degree than men or to further drive the household into specialization of activities, the violation of the exclusion restriction cannot be discarded.

However, because we are specifically interested in the effects of fertility outcomes on women's bargaining power, changes in these measures generated by the birth of less endowed children are still within the wider scope of interest.

	Twins - Men	
	Number of Children	N
Labor Outcomes		
Monthly Income	250026.2	1596
	(2877664.5)	
Any Work	-0.230	2321
	(0.646)	
Participation in Household Decisions		
Participates in Income Decisions	0.288	2259
	(0.661)	
Owns or Manages any Household Activity	0.0566	2137
	(0.152)	
Health Behavior		
Went to the doctor if sick	-3.119	732
	(14.32)	
Time Use: Unpaid work		
Any Unpaid Activity (Other)	-0.412	2322
	(1.172)	
Unpaid Childcare	-0.412**	604
	(0.204)	
Hours Unpaid Work (other)	0.935	257
	(1.236)	
Hours childcare	-23.64	88
	(156.4)	
Access to ICT		
Owns mobile phone that uses	-0.303	2235
	(0.909)	
Expenditure on goods		
Total clothing expenditures	43702.9	2311
	(94489.3)	
Men clothing expenditures	7847.3	2311
	(17500.2)	
% clothing expenditures men	0.184	2262
	(0.511)	

Table 6: Second Stage Results for Men

6.2 Effects of Gender composition on Women's Agency and Bargaining Power

6.2.1 Exogeneity test

Regression of instrument on Control Variables			
	Dependent Variable		
	Firstborn Son		
	<66	<43	<28
Age	0.00305	0.00295	-0.00853
	(0.00211)	(0.00316)	(0.0120)
Age at First Pregnancy	-0.00442	-0.00704	-0.00900
	(0.00392)	(0.00463)	(0.0105)
Polygamous Marriage	0.0280	0.0232	-0.102
	(0.0435)	(0.0451)	(0.0716)
Years of education difference (husband's-wife's)	0.00297	0.00392	-0.00376
	(0.00531)	(0.00581)	(0.0103)
Religion	0.0501	0.0692	0.190**
	(0.0565)	(0.0541)	(0.0890)
Lives in Urban areas	0.0270	0.0241	-0.0399
	(0.0393)	(0.0414)	(0.0644)
Zone Dummies	Yes	Yes	Yes
Observations	1240	1082	365
R-squared	0.010	0.013	0.048

Table 7: Exogeneity of the instrument with regard to control variables used in the regression.
Uses survey weights and clustered standard errors at the enumeration area level.

With the exception of religion, none of the controls used in the main model seem to have a significant effect in the probability that the firstborn child is male. This is consistent with Angrist's (2010) claims that gender-composition instruments, unlike multiple birth instrumental variables, do not depend on basic maternal characteristics.

6.2.2 First-Stage

First-stage Regression			
	Dependent variable: Any sons		
	<65	<42	<28
Son at first pregnancy	0.335***	0.372***	0.615***
	(0.0223)	(0.0245)	(0.0451)
Mother's age	0.00318	0.00444	-0.00262
	(0.0165)	(0.0164)	(0.0220)
Age at first pregnancy	-0.00202	0.00203	0.00496
	(0.0164)	(0.0162)	(0.0205)
Vector of Controls "X"	Yes	Yes	Yes
N	1240	1083	367
R-squared	0.293	0.325	0.532
F statistic	20.91	26.53	27.48

Table 8: First-stage Regression
Uses survey weights and clustered standard errors at the enumeration area level.

The first stage results indicated above demonstrate that the gender of the firstborn child adequately predicts the likelihood of having at least one son. These results are seemingly stronger for the sample of younger women, possibly as less mature individuals are likely to have had a smaller number of pregnancies, making the gender of the firstborn more decisive. The F statistics are above 10, indicating that the instrument is not likely to be weak.

6.2.3 Model Results

In spite of results from the sample of women between 13 and 65 years old not being very significant, as visible from table 9, the directions of the effects seem consistent with having a son increasing women's bargaining power inside the household. Indeed, while not statistically different from zero, the birth of a male seems to be positively associated with wages, with the share of control over the household's resources, and negatively correlated with conducting unpaid household activities.

Particularly, having given birth to a boy increases the likelihood of owning or managing an income generating activity in the household by 0.156 percentage points. Conversely, and quite surprisingly, having had a male baby decreases the percentage of clothing expenditures destined for women and children, which may reflect the fact that, on average, the firstborn children of women in the unrestricted sample (13-65) are 12.4 years old and thus not likely to be dressed in children's clothes. Considering the rapidly decreasing share of women with female firstborns in groups of older females, however, these results should be interpreted cautiously.

	<66		<43		<28	
	Has a son	N	Has a son	N	Has a son	N
Labor Outcomes						
Monthly Income	7741.2	749	3999.8	629	-15710.4*	181
	(13707.8)		(14235.7)		(8768.1)	
Any Work	-0.00702	1240	-0.00865	1083	-0.0828	367
	(0.0874)		(0.0878)		(0.0996)	
Participation in Household Decisions						
Participates in Income Decisions	0.0905	1089	0.0711	946	0.101	303
	(0.104)		(0.105)		(0.0853)	
Owns or Manages any Household Activity	0.156*	968	0.154*	857	0.126	293
	(0.0893)		(0.0890)		(0.108)	
Health Behavior						
Went to the doctor if sick	-0.160	357	-0.146	301	-0.0999	91
	(0.188)		(0.173)		(0.136)	
Medical check-up if not sick (non-pregnancy related)	-0.0272	1211	-0.0146	1066	-0.0113	364
	(0.0307)		(0.0256)		(0.0356)	
Time Use: Unpaid work						
Any Unpaid Activity (Other)	-0.0187	1240	-0.000381	1083	0.00810	367
	(0.0921)		(0.0920)		(0.0922)	
Unpaid Childcare	0.110	303	0.0365	272	-0.159	96
	(0.207)		(0.195)		(0.168)	
Hours Unpaid Work (other)	-1.556	293	-2.829	264	3.966	94
	(4.424)		(4.501)		(3.681)	
Hours childcare	-5.106	161	-4.628	151	8.345*	61
	(8.696)		(8.791)		(4.313)	
Access to ICT						
Owns mobile phone that uses	-0.0704	1216	-0.0582	1065	-0.174**	361
	(0.0669)		(0.0677)		(0.0763)	
Expenditure on goods						
Total clothing expenditures	1112.7	1229	2591.3	1075	540.7	365
	(4078.1)		(3378.6)		(1809.6)	
Women clothing expenditures	-797.8	1229	37.88	1075	-555.6	365
	(1078.1)		(717.9)		(635.5)	
% clothing expenditures women and children	-0.0946**	1210	-0.0691*	1061	-0.0417	362
	(0.0434)		(0.0409)		(0.0374)	

Table 9: Second stage Regression

Uses survey weights and clustered standard errors at the enumeration area level.

6.2.4 Robustness Test

Limiting our sample to age groups in which the share of male firstborns is not statistically different from the sex-ratio of younger women's first child could allow us to have more balanced potential outcomes between those who have a male eldest child and those who do not. The upper limit in age for not having a statistically different sex-ratio is roughly at 42.5 years old, as one can observe from the graph in section 4.2.

The results in table 9 indicate that the direction of the effect of a son on the dependent variables does not change much when restricting the database to women younger than 43 years old. Their income and likelihood of having a say in the household's earnings seem to be positively related to having a son, although not statistically different from zero. Similarly, the time doing unpaid household activities has a negative and non-significant coefficient. The effect of a son on a woman's probability of being the owner or manager of an income generating activity continues to be significant and maintains the same magnitude: women with sons are 0.154 percentage points more likely to manage such activities. Likewise, the negative effect of sons on the share of women and children's clothes persists, albeit with a lower intensity. The similarity of these results to what had been found in the entire sample suggests that, in spite of the existence of selection bias among older women, the share of participation in household decision-making is still likely to be positively affected by having given birth to a male heir.

On the other hand, these relationships shift considerably when observing the results in a subsample of very young mothers (under the age of 27). In spite of not being statistically significant, coefficients indicating the effects of sons on the participation in household decision-making continue to be positive. However, women's labor outcomes now seem to be negatively affected by the birth of sons, with young mothers who have a son having, on average, monthly incomes that are 15710 Nigerian Nairas smaller than their counterparts. Hours doing unpaid work also seem to be increasing, with mothers of sons spending on average 8 hours more per week caring for children. Along the same line, young mothers of boys are also less likely to own a mobile phone, conditionally on having access to one.

Overall, it seems that women in the younger cohort do not experience the same modest increase in agency and bargaining power that was detected in older ones. One possible explanation is that women are expected to allocate more time and resources to look after male sons, delaying their process of acquiring control over a larger share of the household's resources.

7 Conclusion

In Nigeria, reproductive outcomes play a clear part in women's vulnerability to poverty. Indeed, not being able to deliver a son increases the likelihood that the male spouse will take on another wife, with women in polygamous arrangements being among the poorest in the country. In case of being widowed, women who have not managed to produce a son have no claim to their late husband's inheritance (Milazzo, 2014). Additionally, according to Milazzo's (2014) findings, a possible cause for the missing women among those that have had female firstborns is their adoption of risky health behaviors in order to have a male child. Empirical evidence also shows that, in other Sub-Saharan countries, having a larger amount of children leads women to become relatively poorer, while resources devoted to male household heads stay constant (Dunbar et al, 2013).

For this reason, choices concerning women's reproductive behavior can have important consequences for their lives, by being intimately tied to women's levels of human capital, agency over their own earnings, and intrahousehold allocation of resources. This is especially true in the case of unplanned events, as women's optimal choices and accumulation of bargaining power may be hampered by these shocks. Notwithstanding, there is a considerable gap in evidence in the literature linking women's reproductive outcomes to their measures of empowerment, control over assets and resilience to poverty.

This paper analyzes how women's bargaining power and share of control over household resources are impacted by changes in family composition and fertility in Nigeria. Two different fertility-related events were studied. First, I examined how an unexpected increase in the number of their biological children affected women's participation in household decision-making, control over resources, time allocation and usage of health services.

I find that increasing the number of children decreases the probability that a woman will get routine health check-ups conditionally on not being injured or ill. The demand for health services subject to being sick, however, appears to be unrelated to the number of children.

Moreover, an increase in the number of offspring is associated with smaller monthly wages and a lower probability of women having some level of control over the family's income and their own. Men's participation in the decision making process, on the other hand, does not change with increases in the number of children. Similarly, an additional child is linked to smaller expenditures on women's clothing, while the amount spent on male clothing remains unaltered.

Overall, men who have an additional child do not appear to have any significant decrease in their measurements of agency and participation in the household decision-making process. This suggests that unplanned increases in the number of children disproportionately affect women, their measures of intrahousehold bargaining power and the resources allocated to them.

The second analysis conducted focuses on estimating the impacts of having a male son on

women's measures of bargaining power. I find that women who have provided a male heir to the family are more likely to be the owner or manager of an income generating activity within it. This finding holds true for two different samples of women, adding to the evidence that, similarly to other countries, the relative position of Nigerian women within the household may increase if they successfully provide their families with male descendants.

The effects of having a male child for young women who have given birth to the firstborn son on average 4 years prior to the survey, however, are in the opposite direction. These findings could possibly be confounded by a disproportionate allocation of time and resources to firstborn sons during the early childhood development phase, due to the relative importance of their well-being. Future studies could therefore be warranted to generate more evidence on how a woman's increase or loss of bargaining power due to a reproductive shock may fluctuate around the timing of said shock.

Overall, regardless of the exact mechanism that is driving these changes, women seem to be unequally affected by fertility shocks and reproductive outcomes, leading to changes in their share of controlled resources and participation in decision-making. For this reason, being able to control their reproductive behavior in terms of both timing and quantity of children desired is of utmost importance. This line of research carries important policy implications, as the provision of birth control and family planning tools could possibly benefit from more appropriate targeting.

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9 Appendix:

First-stage Regression	
	Dependent variable: Firstborn is twin
	Men Sample
Son at first pregnancy	1.369***
	(0.363)
Mother's age	0.0113
	(0.0296)
Age at first pregnancy	-0.215***
	(0.0455)
Vector of Controls "X"	Yes
N	76
R-squared	0.515
F statistic	.

Table 10: First-stage regression for the Men database.
Uses survey weights and clustered standard errors at the enumeration area level.

Year	Entire Sample					2010														
Women's Age subsample						13-65 years old					13-42 years old					13-27 years old				
	Obs	Mean	Std. dev.	Min	Max	Obs	Mean	Std. dev.	Min	Max	Obs	Mean	Std. dev.	Min	Max	Obs	Mean	Std. dev.	Min	Max
Household Characteristics																				
Family owns the house	6,880	0.715197	0.451353	0	1	2,477	0.706042	0.455665	0	1	2,112	0.696511	0.459874	0	1	808	0.708226	0.45486	0	1
Urban	6,885	0.320152	0.466569	0	1	2,477	0.349529	0.476917	0	1	2,112	0.322083	0.467385	0	1	808	0.2785	0.448539	0	1
Muslim	6,730	0.562581	0.496105	0	1	2,448	0.563616	0.496038	0	1	2,087	0.596195	0.490777	0	1	799	0.727319	0.445617	0	1
% household members whose main activity not in agriculture	6,868	0.872628	0.245289	0	1	2,477	0.748671	0.302761	0	1	2,112	0.744003	0.301636	0	1	808	0.703505	0.300007	0	1
Women's Characteristics																				
Woman Age	6,885	35.51535	10.58429	15	65	2,477	33.07441	9.428649	15	65	2,112	30.04917	6.598423	15	42	808	23.23353	2.957915	15	27
Polygamous	6,784	0.335813	0.472309	0	1	2,461	0.292481	0.454995	0	1	2,102	0.293654	0.455544	0	1	802	0.31383	0.464338	0	1
Literacy	6,632	0.628078	0.483354	0	1	2,474	0.589014	0.492112	0	1	2,109	0.587727	0.492361	0	1	805	0.569821	0.495409	0	1
Years of schooling	6,885	4.978267	5.420198	0	22	2,477	5.498438	5.333729	0	18	2,112	5.427173	5.252302	0	18	808	4.64477	4.962754	0	16
Difference Education (husband's - wife's)	3,245	1.219857	3.558663	-10	12	1,256	1.090289	3.561288	-10	10	1,097	1.166779	3.538101	-10	10	373	1.161121	3.47532	-9	10
Previous health issues	6,885	0.002974	0.054455	0	1	2,477	0.00738	0.085604	0	1	2,112	0.005103	0.071271	0	1	808	0.007858	0.08835	0	1
Fertility																				
Age at first Pregnancy	6,885	23.13484	6.393971	13	57	2,477	22.0949	5.704301	13	53	2,112	21.14822	4.966207	13	47	808	19.05489	3.498468	13	36
Number of children	6,885	3.226849	1.862946	1	16	2,477	3.345055	1.837993	1	16	2,112	3.216559	1.777367	1	15	808	2.305002	1.250428	1	7
Twins	6,885	0.03308	0.178858	0	1	2,477	0.030752	0.172679	0	1	2,112	0.030388	0.171692	0	1	808	0.028195	0.165633	0	1
Twins at first pregnancy	6,885	0.009799	0.098509	0	1	2,477	0.007258	0.084902	0	1	2,112	0.007079	0.083857	0	1	808	0.006965	0.083214	0	1
Same gender twins	6,885	0.012597	0.111537	0	1	2,477	0.000617	0.024834	0	1	2,112	0.000735	0.027098	0	1	808	0	0	0	0
Same gender twins at first pregnancy	6,885	0.004566	0.067425	0	1	2,477	0	0	0	0	2,112	0	0	0	0	808	0	0	0	0
Son at first pregnancy	6,885	0.581732	0.49331	0	1	2,477	0.567667	0.4955	0	1	2,112	0.550851	0.497525	0	1	808	0.538545	0.498821	0	1
Any sons	4,334	0.829327	0.376267	0	1	2,460	0.84396	0.362967	0	1	2,097	0.827487	0.377916	0	1	804	0.746188	0.435462	0	1
Employment																				
Monthly Income	1,822	22356.17	39229.51	0	650000	1,195	18034.83	38618.92	0	650000	985	17888.49	40454.92	0	650000	321	12618.6	22062.98	0	160000
Employed	6,824	0.739278	0.439061	0	1	2,475	0.754264	0.43061	0	1	2,110	0.738774	0.439407	0	1	808	0.631739	0.482631	0	1
Decides over any household income	5,992	0.307022	0.461297	0	1	2,185	0.33533	0.472214	0	1	1,856	0.314011	0.464246	0	1	689	0.231813	0.422297	0	1
Owner or manager of activity	2,679	0.655124	0.475417	0	1	1,856	0.6558	0.475235	0	1	1,605	0.653017	0.476159	0	1	630	0.56952	0.495537	0	1
Health																				
Doctor if sick	1,036	0.395927	0.489285	0	1	618	0.427948	0.495182	0	1	513	0.419209	0.493911	0	1	178	0.490228	0.501315	0	1
Check-up if healthy	6,036	0.009315	0.096072	0	1	2,414	0.009362	0.096322	0	1	2,068	0.008408	0.09133	0	1	794	0.012476	0.111068	0	1
Time use																				
Any unpaid activity (other)	6,885	0.470507	0.499166	0	1	2,477	0.216182	0.411723	0	1	2,112	0.221469	0.415334	0	1	808	0.231473	0.422035	0	1
Unpaid childcare	3,411	0.570963	0.495011	0	1	540	0.550288	0.497926	0	1	465	0.579836	0.494117	0	1	181	0.705141	0.457244	0	1
Hours unpaid activity (weekly)	3,305	12.733	10.95849	0.25	76	520	12.62937	10.18161	0.5	59	451	12.94653	10.31402	0.5	59	179	14.15004	10.54893	0.5	59
Hours unpaid childcare (weekly)	1,840	11.25822	12.05459	0.25	85	280	11.89736	13.0153	0.25	70	253	12.55173	13.43309	0.25	70	116	12.9504	13.43508	0.25	65
ICT																				
Owns mobile phone that uses	5,993	0.541374	0.498327	0	1	2,286	0.456663	0.498227	0	1	1,960	0.442164	0.496771	0	1	750	0.348941	0.476953	0	1
Expenditures																				
Total clothing expenditure	6,846	13771.34	17722.75	0	454000	2,438	10019.26	14390.14	0	321000	2,083	9910.627	13733.05	0	321000	799	8841.435	9209.715	0	129000
Total clothing expenditure on women	6,846	2669.629	4567.013	0	125000	2,438	1869.702	4060.587	0	55000	2,083	1813.955	3487.957	0	55000	799	1870.928	3365.444	0	52000
Percentage spent on women's or children's clothing	6,454	0.831441	0.205629	0	1	2,401	0.829985	0.221884	0	1	2,060	0.832586	0.214195	0	1	794	0.834515	0.203941	0	1

Table 11: Descriptive statistics for women

Uses survey weights

Sample	**Men**				
Variable					
Family owns the house	2,357	0.63981	0.480157	0	1
Urban	4,605	0.384901	0.486625	0	1
Muslim	453	0.070196	0.25576	0	1
% household members whose main activity not in agriculture	4,604	0.858172	0.266969	0	1
Man Age	4,599	45.81804	13.03245	16	97
Woman Age	2,358	36.53033	11.07873	15	75
Polygamous	4,581	0.098346	0.297815	0	1
Literacy	2,598	0.732354	0.442818	0	1
Years of schooling	2,148	7.698092	5.700288	0	22
Difference Education (husband's - wife's)	1,427	-0.02842	1.168807	-8	10
Previous health issues					
Age at first Pregnancy	2,313	23.43779	6.228616	13	51.5
Number of children	2,313	3.472503	1.852392	1	12
Twins	2,763	0.056605	0.231129	0	1
Twins at first pregnancy	4,605	0.010129	0.100145	0	1
Monthly Income	2,399	47984.7	86190.62	0	1245600
Employed	4,604	0.945135	0.227741	0	1
Decides over any household income	4,466	0.571667	0.494893	0	1
Owner or manager of activity	2,568	0.506378	0.499921	0	1
Doctor if sick	928	0.373309	0.483944	0	1
Check-up if healthy	3,945	0.01375	0.116467	0	1
Any unpaid activity (other)	4,605	0.157309	0.364132	0	1
Unpaid childcare	2,479	1.831975	0.373964	1	2
Hours unpaid activity (weekly)	1,094	3.533314	3.77145	0.25	60
Hours unpaid childcare (weekly)	362	6.505232	7.204062	0.25	70
Owns mobile phone that uses	4,364	0.814132	0.389045	0	1
Total clothing expenditure	4,576	12985.17	16799.94	0	321000
Total clothing expenditure on men	4,576	2406.437	5564.337	0	250000
Percentage spent on men's clothing	4,373	0.171586	0.216356	0	1

Table 12: Descriptive statistics for men

Uses survey weights