Corruption and Inequality in Contraceptive Use

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Abstract

The paper assesses the role of corruption for unmet need of modern contraception in Sub-Saharan Africa, and by extension, its role in explaining persistently high fertility in the region. We construct a regional-level bribery measure from Afrobarometer survey data, while we use individual-level DHS data to measure contraception. The probability of using modern contraception is considerably lower when corruption is rife. Education plays an important role. Women with high education are always more likely to use modern contraception, but the interaction between corruption and education shows that corruption fosters social inequality, as the education-driven gap in the use of modern contraceptive methods widens when corruption is high.

1 Introduction

Over the last few decades the World has witnessed an unprecedented fertility decline. In this landscape, one region stands out: Sub-Saharan Africa. Here the Total Fertility Rate (TFR) remains about the double as other continents of the World (Bongaarts and Casterline, 2013; Pörtner, 2018). At the same time, Sub-Saharan Africa still faces substantial "unmet need" for contraception (Bongaarts and Casterline, 2013;

Casterline et al., 2017). With a pattern of high fertility and high rates of unmet need for contraception, scholars have brought forward the idea of African exceptionalism, arguing that deep cultural norms, may drive a preference for larger family size (Caldwell and Caldwell, 1987; Caldwell et al., 1992; Bongaarts and Casterline, 2013) However, another exceptional feature of Sub-Saharan Africa that is often overlooked by demographers, is it's very high level of corruption. Africa is widely considered among the world's most corrupt places. In contrast to demography, the issue of corruption features eminently in the public health literature (Vian, 2007). An important insight from this literature is that corruption significantly hampers the provision of health care. Clearly, in Sub-Saharan Africa, the provision of family planning is critical for reducing unmet need for contraception. Corruption is however, likely to have an impact on both the demand and provision for the take up of modern contraception. As such, it is consequently an aspect that ought to be considered carefully before making any firm conclusions about African exceptionalism in terms of fertility.

In order to better understand the role corruption plays for fertility, we consider in this study the potential effects of corruption on the take-up of modern contraception. Whereas there is not necessarily a one-to-one connection between contraceptive decision making and childbearing events (Casterline and El-Zeini, 2014), it is nevertheless the most direct behavioural measure of what couples intend to do in terms of having children. Contraceptive use is obviously a decision taken at the individual or couple level. One of the most important drivers at the individual level is the woman's education. Highly educated women will have stronger demand for contraception, as they prefer to limit fertility or they consider it more important to time fertility events. This is in part driven by their relative bargaining power - in part because of their perceived opportunity costs, which is higher than those with lower education. These decisions are however influenced by the context where the woman lives, and the conditions under which family planning decisions are made. Highly educated women are

both better informed and better resourced to access modern contraceptives. In a landscape where corruption is rife, contraception is potentially more costly, and as such, women with more resources may benefit. Moreover, highly educated women might be better equipped to maneuver corruption-ridden institutions.

The presence of corruption means that resources aimed for certain purposes get channeled away for private gains. In essence, its effect is to render investments inefficient. There is an extensive literature showing that corruption generally hampers economic progress through inefficiency of government institutions. Thus, corruption has malevolent impact on economic prosperity. Since the latter clearly affects fertility trends (Myrskylä et al., 2009), one would also expect corruption to affect fertility. Instead, the link between corruption and take-up of contraception is more complex. First, the availability of contraception is heavily dependent upon counseling services and provision of contraception at family planning centres (i.e. health stations). A relevant concern lies in the fact that corrupt societies tend to favour large and complex investment projects where illegal extraction of funds is easier. In terms of family planning this pattern is important, because investment in large hospitals may crowd out the diffusion of smaller health clinics, the latter arguably more effective in reaching out to those in greater need for family planning. In other words, political corruption at the higher levels may matter for diffusion of family planning in rural areas. Secondly, corruption may render the efficiency of supply chains. In other words, where corruption is high, one may expect poorer provision of family planning in general. Lastly, corruption may have important effects on the demand for family planning. Governments and aid organizations operate with a range of initiatives in order to increase family planning services and encourage take-up of modern contraception. One such effort comes through various information campaigns in order to improve awareness of the benefits of family planning but also awareness of where and how it can be obtained. All else equal, these information efforts will be compromised in so far corruption is high, and

consequently lower the demand for family planning.

Whereas these mechanisms are intuitive, and may have additional effects other than corruption affecting economic prosperity, other channels are more subtle. For instance, hierarchical societies are in general more prone to corruption. Yet, at the same time, the more hierarchical a society is, the stronger are social norms in terms of contraceptive use, and as such, the level of hierarchy in any given society, will affect the use of modern contraceptives. In so far this is the case, the presence of corruption may not have a fully causal effect on contraceptive use - rather, part of the effect may instead be a symptom of how traditional a society is.

In order to assess the role of corruption, we use information from the Afrobarometer surveys to construct a time-varying regional-level measure of corruption. These measures are matched with harmonized sub-national regions in the DHS surveys, which in turn contains individual specific information on contraception use, and in particular, a measure of unmet need of contraception and individuals' education. Whereas the Afrobarometer data offers several indicators of corruption, our analysis use a measure of bribery, which is less subjective than individual perceptions of corruption (Treisman, 2007). Thus, our empirical analysis is based on regressions at the individual level, but includes sub-national regional measures of the extent bribery matter in daily transactions. By including regional fixed effects, we show that bribery is associated with significantly higher unmet needs in contraceptive use. Secondly, as expected, education is strongly associated with unmet needs. When education is interacted with the regional measures of bribery, however, we find a strong educational gradient suggesting that in highly corrupt regions, the gap in unmet needs becomes wider. This means that corruption generates social inequalities between women attaining more education as opposed to those with less education.

We explore possible mechanisms in several ways. By running a set of regressions where the dependent variable captures respondents' awareness of family planning, we

find again that corruption plays an important role. Even when controlling for economic development and education (the sub-national regional Human Development Index), we find that high corruption brings about poorer awareness of family planning. Consequently, corruption plays a role in reducing the demand for modern contraception. In order to explore supply side effects, we make use of information from the Service Provision Assessment (SPA). From this data we find support for the idea that corruption favour investments in large hospitals in place of smaller and more widespread health clinics. We also find that high corruption associates with higher rates of stock outs, suggesting that indeed corruption has an effect on the quality of the supply chain of family planning equipment and medicines.

In the final part of the study we use data from the Global Data Lab (globaldatalab.org) to link sub-national fertility levels with our corruption measure from the Afrobarometer and the prevalence of unmet need as recorded by the DHS. Previous studies have suggested that the relationship between family planning and fertility is not necessarily very strong, and especially so in Sub-Saharan Africa (Casterline and El-Zeini, 2014). However, these studies relied on trends measured at the country level. As we show in this analysis, the prevalence of family planning varies substantially within countries. By regressing age specific fertility rates on unmet need for contraception and corruption, we find here sizeable effects of both. Importantly, our results indicate that the combination of high corruption and low prevalence is particularly important for fertility.

2 Background

This study brings together two extensive fields in the social sciences: family planning and corruption. Family planning, in its modern version, incorporates promotion and provision of contraception, sexual education, counseling and infertility manage-

ment (Organization et al., 2007; Shaw, 2010). Its focus is firmly on the reduction of unmet need for modern contraceptive, which is defined as the provision of modern contraceptive to "women who are fecund and sexually active but are not using any method of modern contraception, and report not wanting any further children or wanting to delay the next child" (WHO, 2019). In this manner, it is assumed that women are not forced to have less children, but rather, they are given the opportunity to choose (**?**).

Family planning is viewed by most as an intervention with broad potential benefits. It is thought to not only stabilize population growth, but also to decrease poverty, improve health and reduce maternal and child mortality, empower women and grant reproductive rights, and enhance environmental sustainability (Cleland et al., 2006; Glasier et al., 2006). There is ample evidence to support all of these claims (For a literature review refer to Cleland et al. (2006, 2012); Prata et al. (2017)). Despite the scope of its potential benefits, the success of family planning interventions depends closely on attitudes embedded in local culture, religiosity, the level of education, the quality and quantity of infrastructure and, more generally, the political and economic environment of the targeted location. These factors play important roles both for the demand side of contraceptive use, but also matter for its supply - not least through the distribution of family planning services(For a literature review refer to Herbert (2015); Woldemicael and Beaujot (2011); Ackerson and Zielinski (2017)). Intuitively, one can easily argue that corruption must play a role for these factors.

Using a broad definition of corruption which includes not only the "misuse of public office for private gain" (Svensson, 2005; J. Farrales, 2005), but also clientelism, rent seeking behaviour and ethnic favoritism (Hodler and Raschky, 2014; Friedman, 2018), it has been shown that corruption is associated with a range of negative societal outcomes. Corruption correlates positively with inequality (Gyimah-Brempong, 2002; Jong-Sung and Khagram, 2005; Rose-Ackerman, 2004), negatively with the size and quality of the public sector (Tiongson et al., 2002; Rose-Ackerman and Palifka,

2016), it stifles economic growth by discouraging capital flows and foreign direct investment (FDI) (Mauro, 1995; Lambsdorff, 2003), lowering productivity (Lambsdorff, 2003), and leading to under-investment in human capital and education (Tanzi and Davoodi, 2002; Mauro, 1997) among others. These effects are especially evident in developing countries, where lower constraint on the rule of law act as a catalyst for corruption (Lawal, 2007). Importantly, corruption is also associated with poor effectiveness of the health sector (Vian, 2008). There are consequently good reasons to expect corruption to affect the supply of modern contraception. Health care scholars have long been concerned with corruption and the way it affects the provision of health services. Health care is particularly exposed to corruption, not only because of its monetary importance, but also because of its diverse and complex functions which includes a large number of actors being involved. Any health system will involve a large number of transaction and interactions at different levels. As described by Savedoff and Hussmann (2006a), a health system must make use of limited financial resources to procure drugs and equipment and develop necessary infrastructure, but becomes vulnerable to state capture, extortions and bribes. Given its complexity, individual agents working within the health system might navigate through various loopholes and mismanagement for private gains by, for instance, illegally charging patients, providing them with unnecessary treatments or thieving the public resources (Savedoff and Hussmann, 2006b,a). Additionally, Vian (2008) argue that health systems which operate with strong monopoly power, has a high degree of discretion where accountability and transparency are low, thereby facilitating corruption further. Still, the actual extent to which corruption occur, will necessarily depend on the extent individual actors are willing to accept corruption as a way of operating (Randall and Gibson, 1991; Kurland, 1995; Raats et al., 1995; Miller et al., 2001).

Vian (2008) provides important insights into how corruption affects the link between expenditure and health care supply - and by extension - family planning ser-

vices. Firstly, corruption leads to higher levels of mismanagement of resources and absenteeism in general. Poor quality planning makes inefficient use of funds more likely. For instance, poor planning may reduce the supply of available contraception through more frequent incidents of stock-outs. Absenteeism in turn, will reduce the number of patients that can be treated (Lewis, 2006). Secondly, as corruption imposes an additional cost in any transaction, more corruption will increase the cost of procuring contraception and reduce resources available for family planning interventions (Vian, 2008). Thirdly, countries where political corruption is rife, will tend to allocate funds to large scale project, where extraction is easier, but at the cost of implementation of smaller scale and geographically dispersed programs, which characterizes family planning in rural areas (Mauro, 1995; Vian and Crable, 2017). If ethnic favoritism and clientelism are also present, resource allocation would create even larger disparities in that those places and individuals that need it most, do not get access (Franck and Rainer, 2012; Hodler and Raschky, 2014; Burgess et al., 2015). Finally, a pervasive environment of corruption is often characterized by weak incentive schemes for public workers, which in turn lead to lower quality of the service provided, through theft of public resources (with the aim of selling it for private gains), discrimination and limits to the health service access. (Smith, 2003; Vian and Crable, 2017; Vian, 2006; Azfar and Gurgur, 2008)

Another side of corruption arises from the fact that funds to support family planning comes from international donors. Similarly to what Brodwin (1997) showed for community leaders in Haiti, who used health funds obtained from donors for their own private use, Smith (2012) documents extensive proliferation of fraudulent NGOs mushrooming in the wake of the HIV epidemic. Low levels of accountability enables individuals to easily set up their own NGOs with the purpose of attracting and direct international funds to themselves. In his study, Smith (2012) also describes how corruption in some societies is widely accepted, both by those who run the NGOs,

but also those who are dependent upon it. A certain level of misuse of resources by directors of NGOs appears indeed acceptable by many, as long as the stolen funds are used in a socially accepted manner. These insights are in line with many other studies arguing that corruption is part of cultural beliefs, and an acceptable means of running a business enterprise (De Sardan, 1999; Vian, 2008; Uslaner, 2010; Seleim and Bontis, 2009).

The relationship between corruption and family planning rests heavily on supply arguments. However, there is also an indirect demand effect. A woman's demand for family planning is determined by her preference for controlling fertility. These preferences are nevertheless shaped by religion and culture, by the relationship with the partner, by the information she has accumulated on family planning, and, importantly, by her level of education (Ackerson and Zielinski, 2017). All of these are in some way affected by corruption. Clearly, corruption by itself may affect the educational infrastructure. With the same arguments made for the health care provision, corruption may equally affect the diffusion of schools, especially in rural areas. Likewise, corruption may hamper the spread of informational campaigns, which would otherwise affect womens's demand for family planning. One important demand argument is that higher levels of corruption may be associated to more hierarchical institutional setting (Husted, 1999; Yeganeh, 2014; H. Akbar and Vujić, 2014). There is ample evidence showing that corruption is more widespread in autocratic regimes and less so in democratic societies, where the institutional structure tend to be more horizontal. At the same time, hierarchical societies tend to be more traditional in terms of social norms and attitudes. These attitudes are often manifested through an gender equity favouring men. This also means that men has stronger decision making power in the household. In other words, the presence of hierarchical institutions, make women value their partner's approval more strongly, but as hierarchical societies are more traditional, women's demand for contraception becomes lower USAID. (Eliason et al., 2013; Ochako et al.,

2015; Wuni et al., 2018).

Importantly, the effect of corruption on take-up of modern contraceptive use is potentially stronger for the poor strata of the population (Azfar and Gurgur, 2008; USAID). In a landscape where corruption is rife, more resourced households will be both better informed and better resourced to access modern contraceptives. Since availability of family planning is generally higher in low corruption areas, the role of household income may play less of a role for the use of modern contraception. By extension, living in higher income household may imply that women both have higher education and better empowered, but since family planning is widely available, the effect of women's education, may be less pervasive compared to high corruption areas.

3 Data

Our measure of corruption is calculated from the Afrobarometer survey rounds 2 (2004) to 6 (2016), and is constructed as the regional-level percentage of respondents that, in the year before the survey, had to pay a bribe in at least one of two cases: to avoid problems with the police or to obtain a document or permit. Most of the corruption indexes currently available are likewise calculated starting from survey questions but are generally based on perceptions of corruption. These perceptions, while moderately correlated with the actual extent of corruption within a territory, seem to depend more on individual characteristics such as education and gender (Olken, 2006). The use of bribery is possibly less subjective. Rather than gauging individuals' perception of corruption, it measure the actual extent in which they had to engage in corrupt behaviour, even more so when we consider that, in most contexts, there's no significant stigma to admitting to have payed bribes (Mocan, 2008; Olken and Pande, 2012). The individual responses for these variables are aggregated up to the regional level, which are - importantly - harmonized with sub-national regions in the DHS surveys.

We keep only the regions with at least 25 respondents per wave and for which is possible to calculate bribery at least two different points in time. Overall, the average number of respondent per region-year is 174, with a median of 116. Figure 3 shows the distribution of bribery in the sample regions. In the sample used to calculate the bribes measure, 27% of the Afrobarometer respondents have a first hand experience of corruption, with Kenya as the most corrupt country and Malawi being the least corrupt one. The Afrobarometer and the DHS surveys are obviously two independent data collection projects. This means that the timing of survey waves do not necessarily coincide. Since the bribery measures act as an explanatory variable, we make sure the Afrobarometer variables are lagged up to three years before the survey date of the DHS waves. As for the DHS, we have 173,897 respondents, all women aged 15 to 49, from 11 African countries, Benin, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, Senegal, Togo, Uganda, and Zambia, divided in 65 sub-country regions.

As we suggested in Section 2, one possible reason corruption may affect contraceptive use comes from the fact that more hierarchical societies are more prone to corrupt behaviour. Yet, at the same time, traditional attitudes (including attitudes towards use of contraception) are stronger. Whereas the Afrobarometer survey does not provide a direct measure of neither the level of traditional attitudes nor the degree of hierarchy (which is in any case difficult to define and measure), we can construct a proxy. Here we do so by building an indicator for the support for free democratic elections in the region, with the idea that weaker democracies correlate positively with the strength of hierarchy, and hence traditional attitudes.

The dependent variable is the use of modern contraceptive methods[1], as opposed to no use of contraception or folkloric/traditional methods. In line with the literature, we measure this through *met* need for modern contraception. Following Bradley et al.

[1]The modern contraceptive methods are: female sterilization, male sterilization, the contraceptive pill, interuterine contraceptive device, injectables, implants, female condom, male condom, diaphragm, contraceptive foam and contraceptive jelly, lactational amenorrhea method, standard days method.

(2012), we define DHS respondents as in need for contraception if they are fecund, married or unmarried and sexually active, and do not desire a birth in the two years following the survey. Among these women, we classify as in need of modern contraception those that do not use any contraception or use traditional/folkloric contraceptive methods. Respondents that use modern contraception are instead classified as having "met need for contraception". We obtain a baseline sample of 173,897 women, with 38% that use modern contraceptive methods and 62% that have an unmet need for contraception. Of those, 65% have an unmet need for spacing, i.e. they want to delay their next pregnancy, while 35% do not want more children.

In addition, we know the respondent's highest level of schooling completed. This is defined as no education, completion of primary school or if they completed secondary school or higher. We construct three different dummies, one for each possible education level. One possible reason why education matters for the take up of modern contraception is that it brings about stronger empowerment and negotiation power. In order to tap into this mechanism, we build two indicators from the DHS to capture women's empowerment. The first one measures *Domestic violence*, and is a dummy variable taking value one if the respondent says it's never justified for the husband to beat their wife/partner and zero otherwise. The second indicator is *Household decision making*, a dummy taking value 1 if the respondent usually makes decisions regarding her own health, large household purchases and visits to family or relatives. Finally, we measure other individual characteristics that may have an effect on contraceptive behaviour. These include respondent's age, age squared, living in rural as opposed to urban residence, employment status and occupation, religion, if being part of the region's ethnic majority, the number of living children, and the intention of having a child in the two years following the survey.

In some specifications we also control for the regional-level Human Development Index (S-HDI), as measured by Smits and Permanyer (2019). This index is an average

of the sub-national values of three dimensions: education, health and standard of living, measured by indicators of mean years of schooling of the adult (25+) population and expected years of schooling of children aged 6, Gross National Income per capita in 2011 US$ PPP, and life expectancy at birth respectively. The indicators are constructed so that the country-level HDI calculated using the sub-national data is equal to that in the UNDP-HDI database. Table 1 displays the summary statistics for the final sample.

4 Methodology

The analysis assesses the role of bribery on the adoption of modern contraceptive methods. To isolate the effect of bribery we adopt the following empirical approach:

$$Contraception = \beta_0 + \beta_1 Bribery_{r,t} + \beta_2 Education_{t,i} + \boldsymbol{\beta}\mathbf{X}_{t,i} + \alpha_r + \gamma_t + \epsilon_{r,t,i} \quad (1)$$

Where i refers to the individual as recorded in the DHS and r denotes the regions where the individual resides. The dependent variable, *Contraception*, is a dummy taking value 1 if the respondent has a met need for contraception and 0 in the case of unmet need, while *Bribery* is the sub-national regional-level bribery score calculated from the Afrobarometer. The main coefficient of interest in the model is β_1, that isolates the effect of regional-level bribery on an individual's choice of contraceptive method. To further examine the role of corruption and education, we specify a second model that includes the interaction between *Bribery* and *Education*:

$$\begin{aligned} Contraception = \beta_0 + \beta_1 Bribery_{r,t} + \beta_2 Education_{t,i} + \boldsymbol{\beta}\mathbf{X}_{t,i} \\ + \beta_3 Bribery_{r,t} * Education_{t,i} + \alpha_r + \gamma_t + \epsilon_{r,t,i} \end{aligned} \quad (2)$$

β_3 are here the coefficients of interest, as it identifies differences in the impact of regional-level corruption depending on the education level of individuals. It is important to notice that, in all specifications, education is represented through three dummy variables, representing the higher educational level attained by the respondent, no education (taken as the reference group), primary school, and secondary or higher. All specifications also include X_i (the vector of individual-level controls) and year of interview FE (γ_t).

Whereas the DHS are in most cases cross-sectional surveys, it is important to point out that we have repeated observations for both countries and sub-national regions. From the Afrobarometer, we have used indicators that were available for five rounds, and hence matched with the respective DHS surveys. This set-up has several implications. First, it is clear that the measures taken from the Afrobarometer, will necessarily contain noise as they are aggregated from individual responses but for each round, they are taken from different samples. On the other hand, given that these measures are repeated over time, we can control for both country and sub-national region effects. This provides a more robust estimation of the key relationships, not least because there is variation over time at both levels. In all specifications, standard errors are clustered at the regional level.

5 Results

The Estimates of equations 1 and 2 are reported in Table 2. In columns (1) and (2) we estimate the model with random effects and with region fixed effects respectively, and without interaction between *Bribery* and *Education*. The results support our initial assumption: the higher the corruption within a country the lower the use of modern contraception. Specifically, a one standard deviation (0.158) increase in regional-level bribery leads to a two percentage points decrease in the probability of

using a modern contraceptive method. Education, on the other hand, positively impacts modern contraception, with both primary and secondary educated respondents that have a higher, and statistically significant in both columns, probability of using modern contraception when compared to people with no education.

Next, in columns (3) and (4) we include in the model the interaction term between *Bribery* and *Education* to detect potential differences in the impact of corruption depending on an individual's education level. While the coefficients of the two variables remain significant and consistent with those of the models without interaction, this specification shows the role played by corruption in fostering social inequality. The coefficients in this logit specification is of course hard to interpret given the non-linear functional form. In Figure 4 we demonstrate the effect by providing a set of predictions. The vertical axis measures here the probability of using modern contraceptive use, whereas the horizontal axis measure the regional bribery score. Predictions are then made for non-educated, those with primary education and those with secondary education or higher. The figure demonstrates the interaction effects very clearly. As bribery become more pervasive, the gap between educational groups widens. In other words, it is especially those with lower education levels that are affected the most by a highly corrupt environment, as evidenced by the sharp decline in modern contraception use by the non-educated when bribery increases.

In Table 3 we present the same specifications as 2 while also including sub-national HDI as one of the control variables. This is an important control, for the simple reason that take up of modern contraception is likely to be higher in more prosperous regions. Our previous results are robust to the addition of $S-HDI$, with corruption that continues to negatively affect the use of contraception, and the highly educated that have a higher probability of using modern contraceptive methods. The coefficient associated with $S-HDI$ is positive and significant at the 1% level in columns (1) and (3), indicating that in more developed regions the adoption of modern contraceptive methods

is indeed stronger. However, when we include region fixed effects in the model the coefficient loses significance. This suggests that the region fixed effect, fully captures the correlation between economic prosperity and take-up of modern contraception. It also suggests that corruption in these regions are not strongly correlated with economic prosperity.

In so far as corruption is correlated with other regional characteristics, our results might not capture solely the role played by corruption in inhibiting the use of modern contraceptive methods. While the inclusion of region fixed effects allows to control for unobserved time constant characteristics, it is of interest to understand if the effect of corruption is driven by other characteristics. As we have stated previously, one possibility is that hierarchical societies are more prone to corruption, yet at the same time, affects contraceptive take-up. In order to assess this possibility, we include in the regression a measure for the regional-level support for free and regular elections. Strong support to democracy is expected to reflect lower degree of hierarchy. The results of this specification are shown in Table 4. Focusing on the coefficient for *Choose leaders through elections*, we find a positive relationship between regional support for democracy and use of modern contraceptive methods, with a lower probability of unmet need for contraception in regions where the preference for free elections is higher. In contrast to the previous specification where we included the regional HDI, we see here that the relationship remains positive even when regional fixed effects are included. In so far attitudes towards democracy reflect the level of hierarchy in these regions, we see that this has an important impact on contraceptive use. Still, the effect of corruption remains unaltered. In other words, stronger democratic attitudes may reflect more modern societies, and hence explain its positive relationship with respect to take-up of modern contraceptives. Yet, corruption appears to have a pervasive impact on contraceptive use.

Next, in Table 5, we study the role played by women's empowerment and its inter-

play with regional corruption. In columns (1), (2) and (3) we focus on *Domestic violence*, i.e. whether a DHS respondent justifies for the husband to hit his wife. As columns (1) and (2) show, women that do not accept domestic violence are more likely to use modern contraception, effect that is driven by highly corrupt regions. However, when we include in the regression the interaction between *Bribery* and *Education*, the coefficient of *Domestic violence* is no longer significant. Conversely, as shown in columns (4), (5) and (6), coefficients associated with *Household decision making* remain significant throughout, with more empowered women that have a higher probability of using contraception, difference that diminishes as corruption increases. All in all, while women's empowerment helps in explaining fertility planning decisions, its effect does not seem to vary with corruption as much as that of education, as shown in Figure 5.

6 Exploring mechanisms

The presence of unmet need of modern contraception from corruption arises through three main channels: demand, supply and distribution. In this section we present additional analysis in order to shed light on how corruption operates in lowering take-up of contraception. Generally speaking, demand is affected through several forces. In terms of corruption, however, the key argument rest on the idea that in more corrupt regions, demand is lower because corruption compromise standard information channels. That is, corruption may lower funds and resources allocated for informational campaigns, which would otherwise increase awareness of availability and the benevolent effects of contraception. Whereas we do not have any direct information on how funds aimed for these purposes get diluted by corruption, the DHS does contain information about women's awareness of modern contraception. We therefore re-run previous regressions based on the DHS, but use instead various measures of awareness as the dependent variable.

Table 7 shows the results of these regressions. The models shown in columns (1), (2) and (3) use as dependent variable a dummy variable taking value 1 if the DHS respondent received any information on family planning from radio (Column 1), television (Column 2), or newspapers (Column 3). The results shown in columns (4) and (5), instead, use as the dependent variable a binary indicator that takes the value 1 if the respondent report to be aware of a source of modern family planning. For the models reported in columns (1) to (4) we include in the sample all the respondents that do not use contraception, while for the model reported in column (5) we include only those that have an unmet need for contraception. *Bribery* is the corruption measure at regional-level. *Education* is, as before, dummy variables indicating the level of education. The control variables at the individual-level are: age, age squared, marital status, type of work, residence area, parity (i.e. the number of children), belonging to the region's ethnic majority, religion, and year of interview FE. In all regressions we include region fixed effects. The results show that there is no strong relation to information passed on by the standard media channels. We do find instead a strong relationship between general awareness and corruption (i.e. columns (4) and (5)). This indicates that indeed, awareness of modern contraception is considerably lower in high corrupt regions. The effect of education is noticeable. The higher the educational level, the higher is awareness of contraception. These estimates are of course consistent with previous results, since we did find a strong educational gradient in terms of actual use of modern contraception. Thus, educations certainly increases the awareness about contraception and its use.

To explore the supply and distribution channels, we use instead information from the Service Provision Assessment (SPA), which is a survey managed by the broader DHS program. Its main purpose is to assess health facilities and provides a comprehensive overview of a country's health service delivery. The SPA surveys use health facilities as the unit of observation and include information about hospitals and health

centers (though it excludes pharmacies and doctors). The surveys collect information on 400 to 700 facilities per country. Importantly, the sample is selected to provide indicators at the national level for the different facility types and the managing authority as well as aggregate indicators at the regional level. The SPA is composed of four questionnaires: inventory, observation protocols, exit interviews and health workers interviews (i.e. interviews of personnel working at the health facility). The former collects information on the availability of different services, the general service readiness and the level of infrastructure and equipment available. The second and third questionnaires assess the quality of the services provided either through the interviewer or through surveys to patients, respectively. Finally, the fourth part provides information concerning the quality and training of the health workers. For this analysis we focus on the inventory questionnaire.

In comparison to the DHS, only a small set of SPA surveys can be matched with the Afrobarometer. We use SPA surveys that are implemented within a 3 year period after the Afrobarometer. Given the limited availability of SPA surveys, we are only able to match 13 SPA waves from 6 countries. The countries are Ghana 2002; Kenya 2004 and 2010; Malawi 2013; Senegal 2013, 2014, 2015, 2016 and 2017; Tanzania 2006 and 2014; Uganda 2007, and Zambia 2005. Unfortunately, the inventory questionnaires for these waves are not all the same nor are they fully harmonized. This means that the selected variables are derived from similar raw variables, but with deviations in the way they are coded. With this caveat in mind, it should be clear that the analysis is exploratory rather providing conclusive proof of the suggested mechanisms.

The distribution channel hypothesizes that in more corrupt regions, one tends to observe investments in larger and more extensive projects, the idea being that it is easier to extract bribe-rent when the investment is large and consequently complex. In our setting, this idea would manifest itself through a disproportionate allocation of funds to large hospitals at the cost of diffusion of smaller family clinics, which pre-

sumably would be more effective in providing modern contraceptive to a public where a large part live in rural areas. We can test this using the SPA surveys by focusing on the type, size and location of the health facility. More precisely, we first explore if in regions with higher levels of corruption we also observe a higher likelihood of the health facility being a hospital. We next consider if there is an association between the number of hospital beds (which is a proxy for the size of the health facility) and our measure of bribery. Finally, we assess if the there is a higher likelihood of the health facility being located in an urban setting (as opposed to rural), if corruption is high. Results are reported in columns (1) to (3) in Table 6. The first and third models are estimated with the logistic regression model, whereas the second model (hospital beds) is estimated with simple linear regression. The estimates suggest that there is a positive association between corruption and the concentration of hospitals. Column (2) use the average number of beds per facility within the region as dependent variable, and again we see a positive association with corruption. In column (3) we use the percentage of health facilities in a rural areas (over the total across rural and urban areas), though here we find no significant association.

The supply channel argues that more corrupt regions have higher levels of unmet need for contraception due to low or unstable supply of contraceptives. Again, the SPA provides relevant information to measure this. We use two measures. The first is a simple indicator if the health facility provides family planning at all. The second measure is an indicator of stock outs. This variable takes the value 1 if the facility experienced a stock out of family planning supplies in the past six months. Both are estimated with logistic regression, again the health facility being the unit of observation. The estimates presented in columns (4) and (5) suggest that indeed higher bribes are related to lower percentages of family planning facilities and that higher corruption brings about a higher frequency of stock outs of family planning medicines.

7 Conclusions

The analysis of corruption's role in shaping demographic behaviours is still relatively underdeveloped. With this paper we offer preliminary results suggesting that corruption does indeed affect fertility. Specifically, we study the relationship between bribery and the take-up of modern contraception by constructing a regional-level bribery score from Afrobarometer survey data and merging it with individual-level DHS data on contraception.

We present evidence of the inhibiting effect of corruption on the use of modern contraception, an effect that is robust to different model specifications. The mechanisms underlying our findings could be many, ranging from the link between bribery and economic and social backwardness within a country, to the role that corruption plays in diverting investments and foreign aid dedicated to supply modern contraception. Furthermore, the impact is mediated by education, with the less educated strata of the population that see a strong decline in contraception use as corruption rises, thus widening social inequalities that we find to be present regardless of corruption.

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Tables and Figures

Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min	Max
Bribery	0.276	0.163	0.0190	0.746
S-HDI	0.477	0.0816	0.237	0.668
Age	30.02	8.821	15	49
Rural household	0.635	0.481	0	1
Choose leaders through election	0.829	0.0868	0.575	1
Met need for modern contraception	0.376	0.484	0	1
No education	0.302	0.459	0	1
Primary education	0.385	0.486	0	1
Secondary education	0.313	0.464	0	1
Household decision making	0.275	0.446	0	1
Domestic violence	0.589	0.492	0	1
Number of living children	3.081	2.348	0	15
Never married	0.174	0.379	0	1
Currently married	0.708	0.455	0	1
Formerly married	0.118	0.322	0	1
Not working	0.312	0.463	0	1
Professional/technical/managerial	0.0444	0.206	0	1
Clerical	0.00819	0.0901	0	1
Sales	0.197	0.398	0	1
Agricultural - self employed	0.235	0.424	0	1
Agricultural - employee	0.0465	0.211	0	1
Household and domestic	0.0214	0.145	0	1
Services	0.0451	0.208	0	1
Skilled manual	0.0473	0.212	0	1
Unskilled manual	0.0422	0.201	0	1
Atheist	0.0145	0.120	0	1
Catholic	0.180	0.384	0	1
Other Christian	0.480	0.500	0	1
Muslim	0.301	0.459	0	1
Other	0.0250	0.156	0	1

Table 2: The effect of Bribery and Education on met need for Contraception

	(1)	(2)	(3)	(4)
Bribery	-0.586***	-0.572***	-1.508***	-1.481***
	(0.0798)	(0.155)	(0.105)	(0.292)
Primary education	0.539***	0.536***	0.307***	0.308***
	(0.0164)	(0.0637)	(0.0284)	(0.0892)
Secondary education	0.823***	0.820***	0.422***	0.422**
	(0.0190)	(0.0809)	(0.0327)	(0.172)
Bribery*Primary education			1.068***	1.052***
			(0.106)	(0.304)
Bribery*Secondary educations			1.672***	1.657***
			(0.111)	(0.563)
Observations	173,897	173,897	173,897	173,897
Countries	11	11	11	11
Regions	65	65	65	65
	ME	Region FE	ME	Region FE

Dependent variable: Met need for contraception. *Bribery* is the bribery measure at regional-level. *Education* is a dummy taking the value 1 for the observations after 1918 and 0 otherwise. The controls, all at individual-level, are: age, age squared, marital status, type of work, residence area, parity, belonging to the region's ethnic majority, religion, and year of interview FE. In columns (1) and (3) we run a multilevel mixed-effect model with country and region-level RE, while columns (2) and (4) include Region FE. *, **, *** indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 3: The effect of Bribery, Education and S-HDI on Modern Contraception

	(1)	(2)	(3)	(4)
Bribery	-0.550***	-0.550***	-1.473***	-1.455***
	(0.0804)	(0.164)	(0.106)	(0.294)
S-HDI	1.724***	0.753	1.721***	0.962
	(0.482)	(1.449)	(0.472)	(1.569)
Primary education	0.538***	0.536***	0.306***	0.307***
	(0.0164)	(0.0639)	(0.0284)	(0.0893)
Secondary education	0.822***	0.820***	0.420***	0.421**
	(0.0190)	(0.0811)	(0.0327)	(0.173)
Bribery*Primary education			1.066***	1.052***
			(0.106)	(0.304)
Bribery*Secondary education			1.673***	1.660***
			(0.111)	(0.562)
Observations	173,897	173,897	173,897	173,897
Countries	11	11	11	11
Regions	65	65	65	65
	ME	Region FE	ME	Region FE

Dependent variable: Met need for contraception. *Bribery* is the bribery measure at regional-level. The controls, all at individual-level, are: age, age squared, marital status, type of work, residence area, parity, belonging to the region's ethnic majority, religion, and year of interview FE. In columns (1) and (3) we run a multilevel mixed-effect model with country and region-level RE, while columns (2) and (4) include Region FE. *, **, *** indicate statistical significance at 10%, 5%, and 1% level, respectively. respectively.

Table 4: The effect of Bribery and Support for Democracy on Modern Contraception

	(1)	(2)	(3)	(4)
Bribery	-0.514***	-0.497***	-1.441***	-1.249***
	(0.0816)	(0.154)	(0.108)	(0.255)
Choose leaders through elections	0.656***	0.664**	0.454***	0.566*
	(0.150)	(0.296)	(0.151)	(0.290)
Primary education	0.538***	0.535***	0.311***	0.307***
	(0.0164)	(0.0638)	(0.0284)	(0.0782)
Secondary education	0.823***	0.819***	0.429***	0.570***
	(0.0190)	(0.0810)	(0.0327)	(0.146)
Bribery*Primary education			1.046***	0.864***
			(0.107)	(0.277)
Bribery*Secondary education			1.641***	1.124**
			(0.112)	(0.481)
Observations	173,897	173,897	173,897	173,897
Countries	11	11	11	11
Regions	65	65	65	65
	ME	Region FE	ME	Region FE

Dependent variable: Met need for contraception. *Bribery* is the bribery measure at regional-level. *Choose leaders through elections* is the regional level % that are in favor of choosing their leaders through elections. The controls, all at individual-level, are: age, age squared, marital status, type of work, residence area, parity, belonging to the region's ethnic majority, religion, and year of interview FE. In columns (1) and (3) we run a multilevel mixed-effect model with country and region-level RE, while columns (2) and (4) include Region FE. *, **, *** indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 5: The effect of Bribery and Women's empowerment on modern contraception: Logit model

	(1)	(2)	(3)	(4)	(5)	(6)
Bribery	-0.562***	-0.641***	-1.468***	-0.586***	-0.470***	-1.396***
	(0.152)	(0.170)	(0.303)	(0.156)	(0.174)	(0.279)
Primary education	0.527***	0.527***	0.299***	0.534***	0.534***	0.300***
	(0.0626)	(0.0627)	(0.0856)	(0.0632)	(0.0629)	(0.0871)
Secondary education	0.805***	0.806***	0.412**	0.814***	0.816***	0.411**
	(0.0798)	(0.0798)	(0.167)	(0.0796)	(0.0790)	(0.169)
Bribery*Primary education			1.053***			1.078***
			(0.297)			(0.301)
Bribery*Secondary education			1.645***			1.684***
			(0.547)			(0.558)
Domestic violence	0.0545***	0.0158	0.0529*			
	(0.0158)	(0.0329)	(0.0309)			
Bribery*Domestic violence		0.147	-0.001			
		(0.128)	(0.115)			
Household decision making				0.0818***	0.193***	0.201***
				(0.0249)	(0.0527)	(0.0513)
Bribes*Household decision making					-0.436**	-0.447**
					(0.217)	(0.211)
Observations	169,372	169,372	169,372	173,787	173,787	173,787
Countries	11	11	11	11	11	11
Regions	65	65	65	65	65	65
	Region FE	Region FE	Region FE	Region FE	Region FE	Region FE

Dependent variable: Met need for contraception. *Bribery* is the bribery measure at regional-level. *Domestic violence* is a dummy taking value 1 if the respondent never agrees that a husband is justified in hitting his wife. *Household decision making* is a dummy taking value 1 if the respondent is involved in the household decision making process. The controls, all at individual-level, are: education level, age, age squared, marital status, type of work, residence area, parity, belonging to the region's ethnic majority, religion, and year of interview FE. In all columns we include Region FE. *, **, *** indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 6: Facility level analysis: Distribution and supply channel

	(1)	(2)	(3)	(4)	(5)
Bribery	3.138***	53.71***	0.546	0.330	2.325**
	(5.52)	(3.83)	(0.41)	(0.61)	(2.19)
HDI	4.922***	107.6***	-10.74***	-4.036***	-4.418**
	(3.15)	(3.20)	(-2.63)	(-3.46)	(-2.02)
Bribery	-4.335***	-38.83**	5.809***	3.541***	1.032
	(-5.26)	(-2.41)	(3.30)	(5.87)	(0.95)
Observations	5885	6240	4770	7061	1845
Countries	7	5	3	6	3

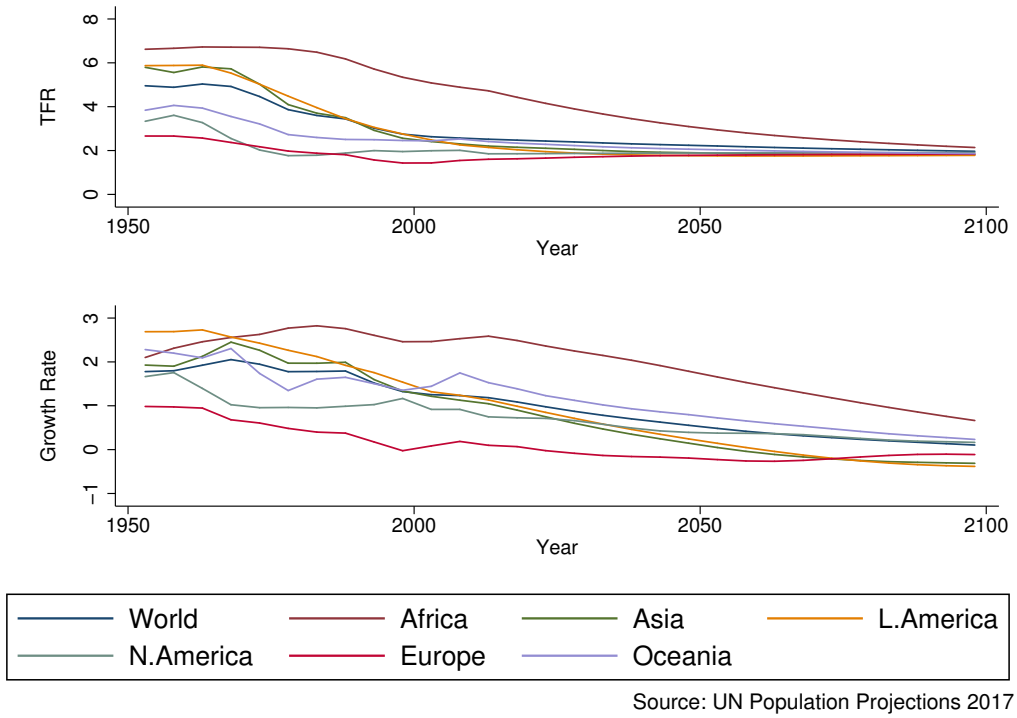
Dependent variables: (1) Facility type, value of 1 when facility is a hospital. (2) Number of beds reported (3) Rural Settings, value of 1 when facility located in rural setting (4) Family Planning provided by facility, value of 1 when it is provided (5) Experienced a FP stock out in the past 6 months, value of 1 when it occurred. Columns 1,3,4 and 5 are estimated using logit model. Column 2 estimated using regression model. *, **, *** indicate statistical significance at 10%, 5%, and 1% level,respectively

Table 7: Bribery and knowledge of family planning

	(1)	(2)	(3)	(4)	(5)
Bribery	-0.123	-0.0643	-0.314	-1.147***	-1.049**
	(0.259)	(0.252)	(0.348)	(0.416)	(0.422)
Primary education	0.489***	0.643***	1.443***	0.795***	0.795***
	(0.0479)	(0.0599)	(0.111)	(0.0393)	(0.0460)
Secondary education	1.115***	1.535***	2.813***	1.596***	1.490***
	(0.0617)	(0.0837)	(0.114)	(0.0557)	(0.0618)
Observations	339,716	339,716	339,716	270,312	99,552
Countries	11	11	11	11	11
Regions	65	65	65	65	65

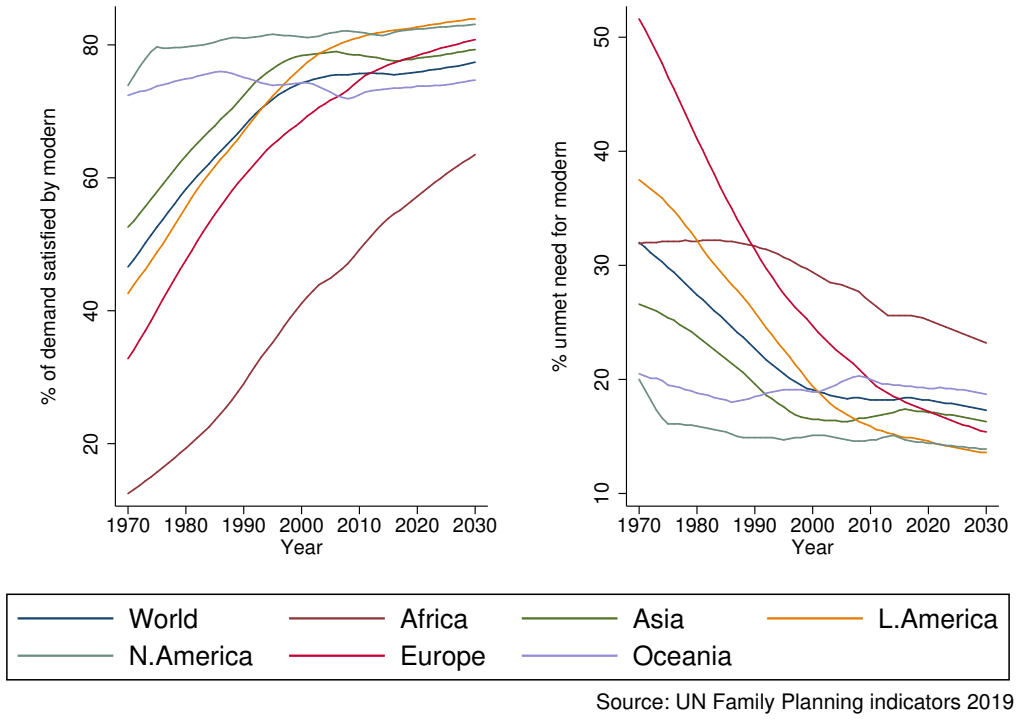
Dependent variables: In columns (1), (2), and (3) - dummy variable taking value 1 if the DHS respondent received information on family planning from radio (Column 1), television (Column 2), or newspapers (Column 3). In columns (4) and (5) the dependent variable is a dummy variable taking value 1 if the respondent is aware of sources of family planning available. In columns (1) to (4) we the sample includes all the respondents that do not use contraception, while in column (5) only those that have an unmet need for contraception. *Bribery* is the bribery measure at regional-level. The *Education* variables are defined as dummies as before. The control variables, all at individual-level, are: age, age squared, marital status, type of work, residence area, parity, belonging to the region's ethnic majority, religion, and year of interview FE. In all columns we include Region FE. *, **, *** indicate statistical significance at 10%, 5%, and 1% level, respectively.

Figure 1: Total fertility rate and Population growth rate by continent



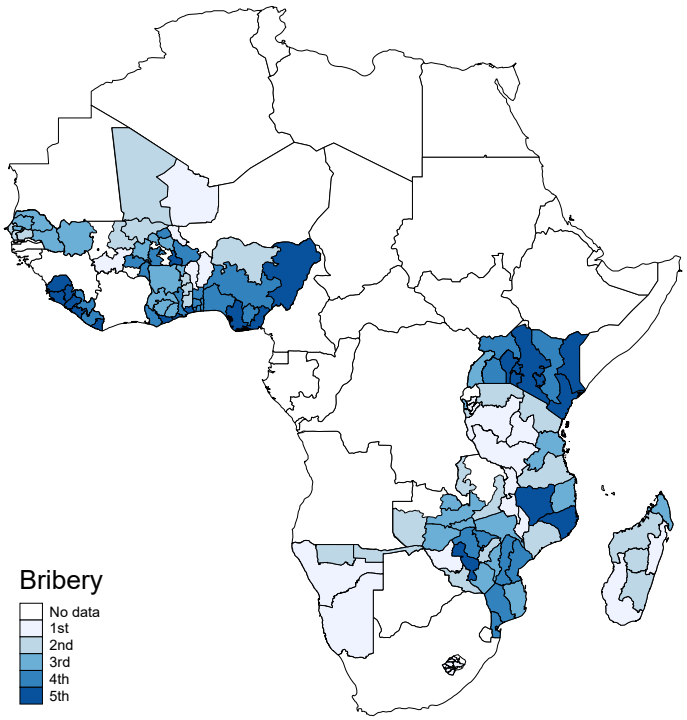
Source: UN Population Projections 2017

Figure 2: Family planning indicators by Continent



Source: UN Family Planning indicators 2019

Figure 3: Geographical distribution of Bribery



Note: the figure shows the distribution of Bribery in the sample regions. A darker color corresponds to a higher level of corruption.

Figure 4: Heterogeneous effects of Education level and Bribery on Contraception

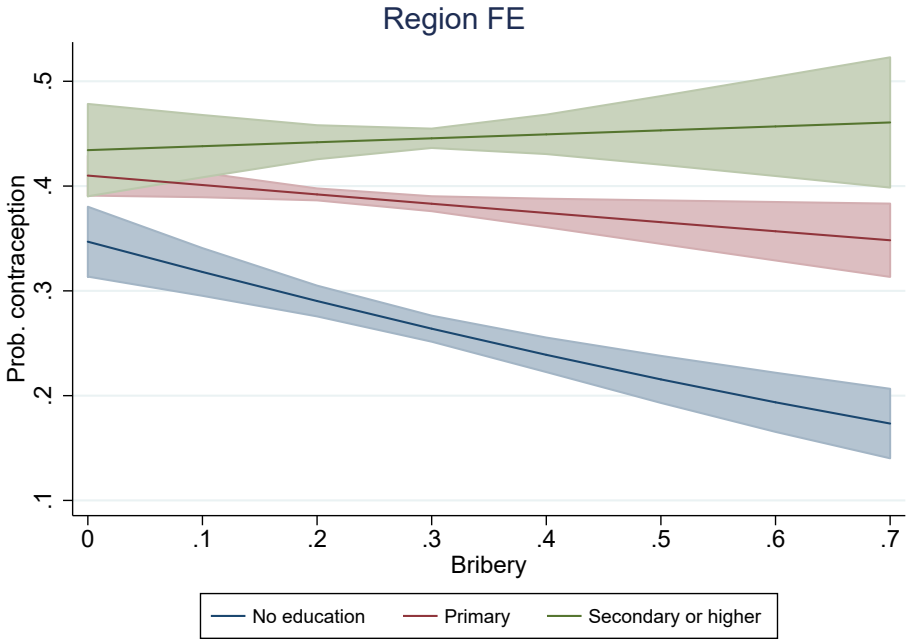


Figure 5: Heterogeneous effects of Women's empowerment and Bribery on Contraception