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Gender norms and adolescents' educational and career aspirations and expectations: Evidence from a survey experiment in Ghana

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Abstract

This study evaluates the influence of priming gender norms on adolescents' self-reported educational and career aspirations and expectations in Ghana. We do so through a survey experiment with a sample of about 2400 adolescents. In the experiment, we assess whether making gender norms more salient will lead female adolescents to report having lower aspirations and expectations in educational attainment, less interest in Science, Technology, Engineering, and Math (STEM) careers, higher interest in female dominated careers, and lower career expectations, consistent with the predictions of the stereotype threat theory. For male adolescents, we test whether the converse is true, consistent with the predictions of the stereotype lift theory. Further, we assess whether such treatment effects are different by adolescent age, parental characteristics (socio-economic status: educational attainment and wealth levels, and gender bias), and enumerator gender. We find mainly null main and heterogeneous treatment effects, with few significant heterogeneous treatment effects that show the nuanced effects of gender norms in our sample. Our findings also speak to survey design, specifically questions order effects and experimenter demand effects, by showing that modules on aspirations and expectations appear relatively immune to survey response effects from priming gender norms and hence unproblematic for survey design.

Keywords: Social norms, Gender norms, Stereotype threat, Stereotype lift, Human capital aspirations, Human capital expectations, Survey design, Adolescents, Ghana, Africa

JEL Codes: C83, C93, D91, J13, J24, O12, O55, Z10

1. INTRODUCTION

Do culture and social norms matter for human attitudes and behavior in all contexts and to what extent? A growing literature shows that culture and one of its dimensions, social norms, determine human attitudes and behaviors, consequently affecting different political, social, and economic outcomes (Alesina and Giuliano, 2015; Collier, 2017; Gelfand et al., 2024; Guiso et al., 2006). A different strand of literature argues that human capital is a key determinant of economic development (Angrist et al., 2021; Attanasio et al., 2022; Barro et al., 2013; Deming, 2022; Diebolt and Hippe, 2019; Gust et al., 2024; Hanushek and Woessmann, 2020, 2015) and recent research shows how aspirations can affect investments in human capital development (Favara, 2017; Genicot and Ray, 2020; Graham and Pozuelo, 2023; Lim and Lee, 2022; Ross, 2019). Given the growing recognition of the importance of social norms in explaining human attitudes and behavior, in this study we focus on gender norms, a subset of social norms (Cislaghi and Heise, 2020), and ask the following research question: to what extent do gender norms affect the educational and career aspirations and expectations of adolescents in Ghana? We use a survey experiment to investigate the effects of gender norms on the human capital (that is, educational and career) aspirations and expectations of adolescents in a novel sample of about 2400 young adolescents from Ghana. In our experiment, we make gender norms more salient for about half the sample by randomly priming gender norms before a survey module on educational and career aspirations and expectations. Consequently, we examine whether priming gender norms before asking about their educational and career aspirations and expectations influence adolescents' reports on the latter.

We are interested in gender norms because they may exacerbate gender inequality, especially in developing countries (Jayachandran, 2021, 2015). Globally gender norms and gender inequality are still impacting females, young and old. The United Nations Development Program (UNDP) gender norms index report states that "the global Gender Inequality Index (GII) value, UNDP's composite measure of gender inequality in empowerment, has remained stagnant since 2019. The outlook is further diminished by a global backlash against women's rights and the lasting devastation of the multidimensional human development crises that followed the Covid-19 pandemic. In many parts of the world, movements against gender equality have gained traction, and women's rights have been rolled back" (United Nations Development Programme (UNDP), 2023, p. 4). Pal et al., (2024, pp.7 - 8) report that "in 2024, LinkedIn data shows that women's workforce representation remains below men's across nearly every industry and economy, with women accounting for 42% of the global workforce and 31.7% of senior leaders … workforces has increased since 2016, yet women remain underrepresented in STEM roles, comprising only 28.2% of the STEM workforce compared to 47.3% in non-STEM sectors". In Ghana, for example, "women

are more vulnerable in the labor market as their employment is precarious: 77% of women are in vulnerable jobs compared to 58% of men ... Women often choose self-employment to balance income generation with childcare and other domestic tasks, and this prohibits them from working in the formal sector and getting high-pay jobs to improve their livelihoods ... Social norms drive these gender gaps. Social norms are sets of informal rules that shape the attitudes, behaviors, and roles of women and men in society. These norms continue to limit Ghanaian women's access to and use of opportunities at the same rate as men and boys and further exclude them from social and economic empowerment" (Caulker et al., 2023). Moreover, "adolescent girls in Sub-Saharan Africa (SSA) are at a higher risk of dropping out of upper secondary school. According to UNESCO, over 19.3 million adolescent girls of upper secondary school age are out of school in SSA and for those who make it to upper secondary school, studying Science, Technology Engineering and Mathematics (STEM) particularly in technical education is improbable" (Amegah et al., 2024).

One of the mechanisms through which gender norms may affect attitudes and behavior of adolescents is through stereotype threats/lifts. In a recent review, Spencer et al., (2016, p. 416) explain that "stereotype threat describes the situation in which there is a negative stereotype about a persons' group, and he or she is concerned about being judged or treated negatively on the basis of this stereotype". Stereotype threat can undermine performance by working memory depletion, motivation and efforts to disconfirm negative stereotypes, conscious attention to automated processes, and taking actions to protect self-worth (Spencer et al., 2016). Previous literature on stereotype threat has mostly examined the effects of making gender norms salient on students' performance in test scores (Pansu et al., 2016; Picho et al., 2013; Picho and Stephens, 2012; Salikutluk and Heyne, 2017; Spencer et al., 2016, 1999; Steele et al., 2002; Steele and Aronson, 1995; Tinghög et al., 2021; Walton and Spencer, 2009) or on entrepreneurial aspirations (Adom and Anambane, 2020; BarNir, 2021; Martiarena, 2022).

While stereotype threats affect negatively the performance of the stereotyped group, they can boost the performance of the non-stereotyped group through a mechanism called stereotype lift (Appel et al., 2015; Appel and Weber, 2021; Chatard et al., 2008; Johnson et al., 2012; Walton and Cohen, 2003). Notwithstanding the growing evidence in support of stereotype threat/lift theory, a recent meta-analysis of stereotype threat studies (Uganda is the only LMIC in the sample while others are from Western Countries) focused on adolescents points out that the existing effect sizes seem inflated due to publication bias arising from the lack of publication of papers with null findings (Flore and Wicherts 2015). Moreover, there are few studies examining samples from the African continent (Picho and Grimm, 2023) and on the educational and career aspirations of adolescents in Africa. The few studies on African samples also work with relatively small sample sizes. Our study attempts to close these gaps in the literature.

We build on the gender norms and stereotype threat/lift literature to evaluate whether priming gender norms affect educational and career aspirations and expectations of adolescents in Ghana. To examine the effects of stereotype threat/lift, we randomly change the order of two survey modules related to adolescents' agreement with gender norms and adolescents' educational and career aspirations and expectations. We randomly expose half of the adolescents in our sample first to a survey module that primes gender norms, and we then evaluate whether priming their gender attitudes lead to differential reporting on their educational and career aspirations and expectations later. In doing so, we assess whether making gender norms more salient before reports of aspirations and expectations will lead female adolescents to report lower aspirations and expectations in educational attainment, less interest in Science, Technology, Engineering, and Math (STEM) careers, higher interest in female dominated careers, and lower career expectations, consistent with the predictions of the stereotype threat theory (Spencer et al., 2016). Conversely, we test whether the reverse is true for male adolescents, consistent with the predictions of the stereotype lift theory (Walton and Cohen, 2003). Further, we assess whether such treatment effects on the adolescents are different by covariates previous literature has identified as potential drivers of gender attitudes and aspirations, such as adolescent age, parental characteristics (socio-economic status (SES) such as educational attainment and wealth levels, and male education preference gender bias), and enumerator gender. We provide justifications for these axes of potential heterogeneity later in the paper.

Adolescence is a period of great physiological and social changes (Steinberg and Morris, 2003), and choices that adolescents do, such as dropping out of school or working hard while in school, will have lifelong repercussions on their well-being. There is evidence that adolescents become increasingly aware of prevailing gender norms as compared with younger ages (John et al., 2017; Kollmayer et al., 2018). Consequently, it is expected that adolescents may already start weighing their own potentials and making choices that affect their life course welfare considering existing gender norms. Some of these potentials entail evaluating their future educational and career plans, which would also drive how much they would invest in their human capital development (Favara, 2017). Recent literature shows how aspirations can affect investments in human capital development. Genicot and Ray (2020), in reviewing the literature on the effect of aspirations on economic behavior, conclude that the social environment of humans seems to be an important determinant of human aspirations and preferences. Genicot and Ray (2020, p. 720) state that "aspirations embody social influences on the individual. Individuals look at others around them, and their experiences and achievements shape their desires and goals". Hence understanding to what extent prevailing gender norms affect adolescents' educational and career aspirations and expectations may have far reaching consequences for human capital development of adolescents.

Data from four (Ethiopia, India, Peru, and Vietnam) low-and middle-income countries (LMICs) surveyed in the Young Lives 2016 Round 5 survey (Favara et al., 2022) on some questions related to some

gender norms (such as it is more important for boys to do well in school than girls; and boys are better leaders than girls) show that 76% of adolescents in the sample agree with male gender stereotypes while 24% disagree. Amongst the female adolescents, 68% agree and 32% disagree, while amongst the male adolescents, 83% agree and 17% disagree. The foregoing data reveals that although majority of adolescents in these LMICs appear to accept these prevailing male gender stereotypes, there are still differences with Indian adolescents agreeing more with these norms than Peruvian adolescents¹.

Testing the effects of priming gender norms on Ghanaian adolescents, we find mainly null main and heterogeneous treatment effects, with a few significant heterogeneous treatment effects that show the nuanced effects of gender norms in our sample. With regards to heterogeneous treatment effects, we find statistically significant effects on only one outcome variable: females' educational expectation. We find that the treatment effect for females' educational expectation is lower when their caregivers have lower educational attainment, which is what we hypothesized. However, our results show a positive treatment effect for females' educational expectations when caregivers have male education preference gender bias, which goes against our hypothesis. Our study adds to the few studies examining the effects of stereotype threat within the African context (Picho and Grimm, 2023), and to our knowledge none of these studies focuses on the educational and career aspirations and expectations of adolescents in Africa. In addition, existing studies on Africa are not based on large observations (usually less than 500 observations). Our study contributes by implementing a large scale (about 2400 observations) study of adolescents and their educational and career attitudes from an LMIC context.

Our findings also speak to the literature on survey questions order effects (Brañas-Garza et al., 2022; Mcfarland, 1981; Stantcheva, 2023). The use of survey experiments has been growing in recent years and they allow researchers to use priming and information provision treatments to measure the causal impact of different stimuli (Haaland et al., 2023; Stantcheva, 2023). Survey experiments also permit researchers to use survey questions ordering to prime their respondents, leading to potentially different responses depending on the information set elicited in the respondent by priming (Alesina et al., 2023; Benjamin et al., 2010; Cohn and Maréchal, 2016; Duquennois, 2022; Fryer et al., 2008; Stantcheva, 2023). For example, Brañas-Garza et al. (2022) use a survey experiment to show how survey questions ordering can affect responses of mothers about the educational expectations for their children. In the treatment groups, they ask the mother about her highest educational achievement and the highest level of educational achievement she expects for her oldest child before asking about her educational expectations for her other younger children. They find that mothers exposed to the priming treatment provide lower educational

¹ Breakdown by country: among female adolescents from Ethiopia, 74% agree and 26% disagree, while for male adolescents, 82% agree and 18% disagree; for female adolescents from India, 80% agree and 20% disagree, while for male adolescents, 96% agree and 4% disagree; among female adolescents in Peru, 53% agree and 47% disagree, while for male adolescents, 71% agree and 29% disagree; and for female adolescents in Vietnam, 65% agree and 35% disagree, while for male adolescents, 83% agree and 17% disagree.

expectations than mothers in the control group. Given that the mothers attained low educational levels, the results show that the priming treatment may remind them of the difficulties of achieving high educational levels and this affects their expectations for their children. Želinský (2022) uses a pre-experiment background questionnaire that makes ethnicity salient by asking three questions on ethnicity to prime the respondents in the treatment group and finds that the treatment group performs worse in a numeric task by 11% compared to a control group.

Moreover, our findings also add to the experimenter demand effects (EDE) literature (Benstead, 2014; Di Maio and Fiala, 2020; Reitmann et al., 2020). EDE suggests that enumerators' characteristics such as gender may affect responses around sensitive topics, even though it may not have effect on many other survey questions (Di Maio and Fiala, 2020; Reitmann et al., 2020). Our findings do not provide strong support for survey questions order effects and EDE with regards to gender norms and adolescents educational and career aspirations and expectations and hence suggest that our treatment questions may not necessarily lead to differential reporting on the outcomes in our study. In essence, questionnaire modules on aspirations and expectations appear relatively immune to survey response effects from priming gender norms and hence unproblematic for survey design

The rest of this study is organized as follows. Section 2 provides a brief literature review. Section 3 details the research design and describes the survey experiment. Section 4 reports the results. In section 5, we discuss the results and conclude.

2. LITERATURE REVIEW

A recent interdisciplinary review of the nature of social norms states that "social norms create a shared understanding of what is and is not acceptable across all types of human collectives - from groups of friends to organizations to nations. Indeed, adherence to such norms is a foundation of well-functioning communities and the glue that holds society together ... While definitions of social norms differ across disciplines, they share a focus on two related phenomena: beliefs about what most people actually do and beliefs about what people should do" (Gelfand et al., 2024, pp. 342 – 343). Social norms can generate social norms in a society. Gelfand et al., (2024, p. 366) argue that "norms are a key factor in determining views on policies related to economic inequality, human rights, personal freedoms, gender equality, and environmental management. Our ability to understand norm dynamics and harness these insights will have important implications for the success of the human species".

Hence understanding the impact of social norms on attitudes and behaviors can provide several theoretical and policy benefits, especially for LMICs where the formal institutional environment appears

relatively weaker (World Bank, 2017). Because formal institutions seem relatively underdeveloped and weaker in LMICs, social norms may play more prominent roles than legal rules and regulations in affecting attitudes and behavior in these contexts. In essence, once the prevailing social norms and their impact are better understood, appropriate social norms interventions may be used to promote desirable behavioral changes if properly implemented (Cislaghi et al., 2020; Cislaghi and Heise, 2018; Cyr et al., 2024; Dhar et al., 2022; Jayachandran, 2021).

As noted in the introduction, the focus of our study is gender norms, a subset of social norms, and we leverage the stereotype threat/lift literature to understand how gender norms can affect the educational and career aspirations and expectations of adolescents in Ghana. We discuss briefly about stereotype threat literature given the existence of recent review papers and meta-analyses that summarize the state of knowledge in this literature. We present some recent and relevant studies on stereotype threat literature in Table 1. The stereotype threat literature emerged in the 1990s with the seminal papers of social psychologists Claude M. Steele, Steven J. Spencer, and their colleagues (Spencer et al., 2016, 1999; Steele and Aronson, 1995; Walton and Spencer, 2009). A related literature in economics points to the importance of social identity for different economic outcomes (Akerlof and Kranton, 2000; Benjamin et al., 2016, 2010; Hoff et al., 2006; Hoff and Pandey, 2014). Closer to our interest on adolescents, a recent meta-analysis examines the effect of stereotype threat on the performance in maths, science, and spatial skills tests of adolescent girls and finds a statistically significant average negative treatment effect size (Cohen's d = -0.22) (Flore and Wicherts, 2015).

While stereotype threat affects the negatively stereotyped group, stereotype lift improves the performance of the non-stereotyped group. Walton and Cohen (2003, pp. 456 - 457) opine that "stereotype lift is the performance boost caused by the awareness that an outgroup is negatively stereotyped. People may benefit from stereotype lift when the ability or worth of an outgroup is explicitly called into question. But they may also benefit even when there is no specific reference to a stereotyped outgroup, if the performance task is linked to a widely known negative stereotype ... How do negative outgroup stereotypes improve performance? They do so, we suggest, by encouraging downward social comparisons with a denigrated outgroup ... In sum, stereotype-inspired social comparison may alleviate the self-doubt, anxiety, and fear of rejection that could otherwise hamper performance on important intellectual tests". They find a statistically significant average positive treatment effect size (Cohen's d = 0.24) in their meta-analysis. Another meta-analysis, in the context of media generated stereotype threats, finds a negative statistically significant average effect size (Cohen's d = 0.17) for stereotype lift effects (Appel and Weber, 2021).

	Table 1: Interature	review of selected studies	-	
Pap	er	Context, sample size, and outcome	Priming method	Main results
		variable		
1.	Fryer et al., (2008)	US. University of Chicago students; 140 participants. Outcome variable was performance in a math test	Explicit priming using the following statement provided to the treatment group before the performance test: "This is a diagnostic test of your mathematical ability. As you may know, there have been some academic findings about gender differences in math ability. The test you are going to take today is one where men have typically outperformed women"(p. 371). This statement is similar to the one used in the seminal paper by Spencer et al., (1999)	Without financial incentives, females do not perform worse than males. In essence, they find a null effect for stereotype threat when there are no financial incentives. They also find that financial incentives widen gender differences, with or without stereotype threat treatment.
2.	Picho and Stephens, (2012)	Uganda. 89 female students in the tenth grade. Outcome was performance in a math achievement test	Explicit priming using the following statement provided to the treatment group as part of the instructions before the performance test: "You are about to take the Math Achievement Test (MAT). The MAT is a very reliable indicator of one's math ability, and is typically used to test mathematical skills, and predict students' ability to excel in future advanced levels of mathematics courses. In the 15 years that it has been used, the Math Achievement Test has successfully distinguished students with a natural ability to excel in mathematics from those lacking the skills to be successful in math" (p. 56)	They find a negative treatment effect of stereotype threat for students in the coeducational school, while a null treatment effect for students in the single-sex school.
3.	Flore and Wicherts, (2015)	A meta-analysis and review of stereotype threat research on female adolescents based on their performance in maths, science, and spatial skills (MSSS)		They find a statistically significant average negative stereotype threat treatment effect size (Cohen's d = -0.22)
4.	Picho and Schmader, (2018)	Uganda. 190 ninth grade students. Outcome was performance in a math test	Explicit priming using the following statement provided to the treatment group as part of the instructions before the performance test: "You are about to take the Math Achievement Test (MAT). The MAT is a test of one's mathematical skills and has been reliable in predicting students' ability to excel in future advanced levels of mathematics courses. In the past, the MAT has successfully distinguished students with a natural ability to excel in mathematics from those lacking the skills to be successful in math. The test has also consistently shown there to be differences in performance between boys and girls. In today's session we want to get a measure of your math ability using MAT" (p. 298)	They find a null treatment effect for stereotype threat
5.	Želinský (2022)	Slovakia. 203 Roma adults as participants. Outcome was performance in a numeric math task	Implicit priming based on a pre-experiment background questionnaire that makes ethnicity salient in the treatment group by including 3 questions on ethnicity	The author finds that making ethnicity salient to Roma adults in the treatment group reduces their performance in a numeric task by 11% compared to a control group
6.	Inglis and O'Hagan (2022)	United Kingdom. 1169 participants, 11- to 13-year-olds. Outcome was performance in a math test	Implicit priming based on completing a demographic section that asked for gender before the multiple-choice exam section for the treatment group and after the exam for the control group	They find null treatment effect for stereotype threat

Table 1: literature review of selected studies

Although stereotype threat and lift theories have been mostly applied to performance tests, their application to other outcomes has been on the rise and represent emerging future research avenues. As noted by Spencer et al., (2016, p. 417), "in the past, the majority of research has examined stereotype threat effects on academic performance. The theory, however, has now been extended to examine how stereotype threat is related to identity and well-being and how it is associated with feelings of belonging in various environments". Examining the literature on stereotype threat in Africa, we find few studies. As noted by Picho and Grimm (2023), there are only three studies on Africa: two in Uganda² and one in Nigeria, and the studies are based on small sample sizes (between 40 and 300 participants), adolescents and undergraduates as experimental subjects, and performance tests as outcomes. We extend the literature by examining understudied outcomes such as educational and career aspirations of adolescents in an African context and with a large sample of adolescents.

Previous literature has also shown that different dimensions can increase or decrease the effects of stereotype threat/lift on various outcomes, such as age of adolescents, parental SES, parental male education preference gender bias, and enumerator gender. For instance, gender norms awareness appears to increase with age of the adolescent (Kurtz-Costes et al., 2014; Master, 2021); Parental SES such as educational attainment and wealth levels and parental male education preference gender bias may affect the human capital investments in their children (Glick et al., 2011; Glick and Sahn, 2009, 2000; Lancaster et al., 2008). Enumerator gender may also affect survey responses (Di Maio and Fiala, 2020; Reitmann et al., 2020).

We thus check for heterogeneity along these dimensions. For the age of the adolescent, we expect older adolescents to have stronger treatment effects than younger adolescents due to the greater awareness of gender norms by older adolescents. Although the general argument in the literature is that younger adolescents should be less affected by stereotype threat, Flore and Wicherts (2015, p. 39) caution by saying that "surprisingly, the subset analyses indicated that the estimated effect size for samples with children younger than 13 was slightly larger than the effect size for samples with older children ... This outcome is rather counterintuitive, because three theories on stereotype threat predict that very young children would not yet be sensitive to detrimental effects of stereotypes". We go with the usual expectation that treatment effects should be higher for older adolescents than for younger adolescents, while recognizing that the converse may also be true in the data.

We expect stronger treatment effects among adolescents from lower wealth households and caregivers with lower educational attainment (Glick et al., 2011; Glick and Sahn, 2009). Moreover, we posit that adolescents living with caregivers that have male education preference gender bias will have stronger treatment effects, assuming that these caregivers would invest more in the education of the male

² These two studies are summarized in Table 1

adolescents than the female adolescents. Furthermore, we also expect that having an enumerator with the same gender will reduce the treatment effects, assuming that the same gender interviewer would lower the social pressure concerns required to conform to the prevailing gender norms. Based on the brief literature review, we test the following hypotheses in our experiment:

Hypothesis H1: On average, girls in the treatment group (that is, being randomly exposed first to a survey module on gender norms and later to a survey module on aspirations/expectations), will have lower levels of educational aspirations and expectations compared to girls in the control group, in line with the stereotype threat theory. For boys, those in the treatment group will have higher levels of educational aspirations and expectations and expectations.

Hypothesis H2: On average, girls in the treatment group will have lower proportion of STEM jobs, higher proportion of female dominated jobs, and lower career expectations compared to girls in the control group. For boys we expect higher proportion of STEM jobs, lower proportion of female dominated jobs, and higher career expectations compared to boys in the control group.

Hypothesis H3: On average, treatment effects will be more intense for older girls and boys, given that the awareness of gender stereotypes and gender norms appear to increase with age.

Hypothesis H4: On average, treatment effects will be more intense for girls and boys with caregivers with lower SES (lower educational attainment and wealth levels) than those with higher SES (higher educational attainment and wealth levels).

Hypothesis H5: On average, treatment effects will be more intense for girls and boys with gender biased parents.

Hypothesis H6: On average, treatment effects will be less intense for girls and boys if the enumerator has the same gender.

3. RESEARCH DESIGN: SAMPLE AND STUDY DESIGN, IDENTIFICATION STRATEGY, AND ESTIMATION STRATEGY

Sample and study design

For this study, we use a survey experiment research design (Cohn and Maréchal, 2016; Haaland et al., 2023; Stantcheva, 2023) in which the survey respondents were randomly assigned into treatment and control groups before receiving treatment. The survey experiment research design enables us to make gender norms salient through priming the respondents with survey questions ordering. We then evaluate

whether gender norms affect the attitudes of respondents by checking differential reporting between the treatment and control groups.

The survey experiment³ was included in the baseline survey of the Leveraging Early Adolescence for Development (LEAD)⁴ study carried out in Ghana. Although majority of the respondents in the study are in the Greater Accra region in the south of Ghana, some are spread across other regions. The LEAD adolescents' baseline questionnaire asked questions regarding their background, schooling, relationship with caregivers, and so on. Two questionnaire modules were used to implement the survey experiment: one module, the gender norms module, primes the respondents about prevailing gender norms and the second module asks them about their educational and career aspirations and expectations. These two modules were placed around the final part of their survey. The order in which the adolescents receive these two modules were randomized. The treatment group (about 50% of the sample) first completed the gender norms module and then the educational and career aspirations module. The control group (the remainder of the sample) did the converse: first they were elicited about their educational and career aspirations and expectations module and then the gender norms module.

Priming is gaining ground in economics research as a low-cost method to study the effects of social norms on human attitudes and behavior (Cohn and Maréchal, 2016). As noted in a recent review on using priming in economics research: "To measure the causal effects of the environment on preferences and behavior, economists have recently turned to priming techniques from experimental psychology ... The key identifying assumption is that priming changes the relative weight individuals attach to a specific identity (and its associated norms) at a given moment. Random assignment ensures that there are no observable and unobservable differences between the priming conditions. Consequently, any behavioral difference between conditions reveals the primed identity's marginal behavioral effect" (Cohn and Maréchal, 2016, pp. 17 – 18).

The gender norms module questions were drawn from the Young Lives Survey (Favara et al., 2022) and asked adolescents whether they agreed with the following statements:

1. It is more important for boys to do well in school than girls.

³ A pre-analysis plan (PAP) for the survey experiment was preregistered (RCT ID: AEARCTR-0012461 and DOI: <u>https://doi.org/10.1257/rct.12461-1.0</u>). The survey was conducted by Innovation for Poverty Action (IPA) office located in Ghana. The LEAD study is financed by Elisabetta Aurino's European Research Council's starting grant. Ethical review for the LEAD study was granted by the University of Barcelona, Ghana Health Services, and IPA

⁴ The sample for the LEAD study was derived from another older study, Quality Preschool for Ghana (QP4G), which sampled caregivers and their children in 2015 in the six most disadvantaged districts of the Greater Accra region, Ghana, for a preschool-based intervention (Wolf et al., 2019). Schools were then randomly sampled, stratified by district, and within district by public and private schools. In these schools, 15 children were randomly selected from each classroom to participate in direct assessments and their caregivers interviewed. Both children and their caregivers were followed up since then and about 2400 parent-child dyads have been tracked for the baseline survey and survey experiment. This original randomization into the QP4G groups is controlled for in this study

- 2. Boys are better leaders than girls.
- 3. Girls should be more concerned with becoming good wives and mothers than desiring a professional or business career.

For the first question, 13% of female adolescents and 49% of male adolescents agreed. For the second question, 15% of female adolescents and 51% of male adolescents agreed. For the third question, 39% of female adolescents and 54% of male adolescents agreed. We create a dummy variable called Adolescent gender bias that is equal to 1 if the respondent agrees to any of the three questions above and zero otherwise. In the full sample, 63% of the respondents are gender biased while 37% are unbiased. In the female subsample, 49% of the respondents are gender biased while 51% are unbiased while in the male subsample, 78% of the respondents are gender biased while 22% are unbiased while in the male subsample, reported earlier in the introduction for other LMICs. As can be expected from the socialization of gender norms for the adolescents, the male adolescents appear more gender biased than their female counterparts.

Outcome variables

Table 2 presents the variables and their definition. For the respondents, we measure the following outcomes: educational aspirations, educational expectations, career aspirations, and career expectations. These educational and career questions, again, come from Young Lives (Favara et al., 2022). For educational aspirations we ask the respondents which level of formal education they would like to attain if they did not have any constraints. We define a dummy variable called University aspirations that is equal to 1 if the highest level of formal education aspired to is university education and above and 0 otherwise. For educational expectations we ask whether the respondents think they would attain their educational aspirations, given their current situation. We create a dummy variable called Education expectations that is equal to 1 if they expect to attain their desired level of education and 0 otherwise. We measure career aspirations by asking the respondents which career they would like to have at the age of 25 if they did not have any constraints. We manually categorize the chosen career aspirations into STEM versus non-STEM careers using the U.S. Bureau of Labor Statistics categorization⁵ and O*NET categorization⁶. We also classify the chosen career aspirations into female vs. male dominated careers using ILOSTAT listing (Limani and Sodergren, 2023) and a 50% female share of employment threshold. We define a dummy variable called STEM that is equal to 1 for STEM career aspirations and 0 otherwise. For example, we categorized the following jobs as STEM: doctor, nurse, pilot, scientist, and engineer.

⁵ See <u>https://www.bls.gov/oes/stem_list.xlsx</u>

⁶ See <u>https://www.onetonline.org/find/stem?t=0</u>

Table 2: Variables and their definition

Variable	Definition									
	Outcome variables									
1. University aspirations	A dummy variable that is equal to 1 if the highest level of formal education aspired to by the respondent is university education and above and 0 otherwise									
2. Education expectations	A dummy variable that is equal to 1 if respondent expects to attain his/her desired level of education and 0 otherwise									
3. STEM	A dummy variable that is equal to 1 if the chosen career of the respondent is a STEM career based on the U.S. Bureau of Labor Statistics categorization and O*NET categorization and 0 otherwise									
4. Female-dominated jobs	A dummy variable that is equal to 1 if the chosen career of the respondent is a career with 50% and above female share of employment based on the ILOSTAT listing and 0 otherwise									
5. Job expectations	A dummy variable that is equal to 1 if respondent expects to attain his/her desired job and 0 otherwise									
	Covariates									
6. Older adolescent	A dummy variable that is equal to 1 if the age of the adolescent is higher than 13 years and 0 otherwise									
7. Low caregiver education	A dummy variable that is equal to 1 if the caregiver has no education or primary education as highest educational attainment and 0 otherwise									
8. Male adolescent gender	A dummy variable that is equal to 1 if the gender of the respondent is male and 0 otherwise									
9. Caregiver gender biased	A dummy variable that is equal to 1 if the caregiver agrees with the following statement: It is important that sons have more education than daughters, and 0 otherwise									
10. Matched enumerator gender	A dummy variable that is equal to 1 when the gender of the respondent and enumerator are the same and 0 otherwise									
11. Bottom wealth tercile	A dummy variable that is equal to 1 if the wealth score is in the bottom tercile and 0 otherwise. Wealth score is calculated using the Ghana Poverty Probability Index (PPI) (Salas et al., 2019) and recoded so that higher values signify higher wealth levels									

We also create a dummy variable called Female-dominated jobs that is equal to 1 for careers with 50% and above female share of employment and 0 otherwise. For example, we labeled the following jobs as female-dominated: fashion designer, caterer, hair stylist/beautician, and nurse. Looking at some of the examples for STEM and female-dominated jobs presented shows that they may not always overlap, given that we may have nursing in both categories while fashion designer and catering are not part of STEM. For career expectations we ask the respondents whether they think they would attain their career aspirations, given their current situation. We define a dummy variable called Job expectations that is equal to 1 if they expect to attain their desired job and 0 otherwise.

Covariates

We use the following covariates in our study: Older adolescent, Male adolescent gender, Low caregiver education, Bottom wealth tercile, Caregiver gender bias, and Matched enumerator gender. Older adolescent is a dummy variable that is equal to 1 if the age of the adolescent is higher than 13 years and 0 otherwise because older adolescents are typically considered as those older than 13 years. Male adolescent gender is a dummy variable that is equal to 1 if the respondent is male and 0 otherwise. Both adolescent age and gender were drawn from the adolescent baseline questionnaire. We also use some questions related to the caregiver from the caregiver baseline questionnaire. Low caregiver education is a dummy variable that is equal to 1 if the respondent is primary education and below and 0 otherwise, as these caregivers do not attain the minimum basic education required by law in Ghana (that is, junior secondary education).

Bottom wealth tercile is a dummy variable that is equal to 1 for wealth scores in the bottom tercile and zero otherwise to capture the poorest households in the sample. Wealth score is calculated using the Ghana Poverty Probability Index (PPI) (Salas et al., 2019) and recoded so that higher values signify higher wealth levels. Caregiver gender biased is a dummy variable that is equal to 1 if the caregiver agrees with the following statement: It is important that sons have more education than daughters, and zero otherwise. Matched enumerator gender is a dummy variable that is equal to 1 when the gender of the respondent and enumerator are the same and 0 otherwise.

Descriptive statistics

We present the descriptive statistics in Table 3, the test of balance of covariates in Table 4, heterogeneity of outcome variables across some covariates in Table 5, and pairwise correlation matrix in Appendix Table A1. From Panel A of Table 3, we see that the proportions for University aspirations (80%),

Education expectations (94%) and Job expectations (97%) are very high. This suggests that many adolescents in Ghana appear to desire university education and are very optimistic about achieving their aspired educational level and jobs. This finding is consistent with very high educational aspirations among adolescents in other LMICs (Favara, 2017).

	Panel A: Full sample										
Va	riable	Ν	Mean	Std. Dev.	Min	Max					
1.	University aspirations	2360	.80	.40	0	1					
2.	Education expectations	2285	.94	.23	0	1					
3.	STEM	2320	.43	.49	0	1					
4.	Female-dominated jobs	2320	.26	.44	0	1					
5.	Job expectations	2296	.97	.18	0	1					
6.	Older adolescent	2476	.37	.48	0	1					
7.	Low caregiver education	2394	.37	.48	0	1					
8.	Male adolescent gender	2476	.50	.50	0	1					
9.	Caregiver gender biased	2393	.75	.43	0	1					
10.	Matched enumerator gender	2476	.51	.50	0	1					
11.	Bottom wealth tercile	2452	.30	.46	0	1					

Table 3: Descriptive statistics

Panel B: Subsamples by adolescent gender

			Mean of		Mean of	Difference in means (Female	
	Variable	Female (N)	Female	Male (N)	Male	minus Male)	p-value
1.	University aspirations	1184	0.828	1176	0.767	0.061	0.000***
2.	Education expectations	1137	0.945	1148	0.943	0.002	0.827
3.	STEM	1181	0.489	1139	0.365	0.124	0.000***
4.	Female-dominated jobs	1181	0.445	1139	0.068	0.377	0.000***
5.	Job expectations	1164	0.958	1132	0.975	-0.017	0.021**
6.	Older adolescent	1239	0.334	1237	0.411	-0.077	0.000***
7.	Low caregiver education	1194	0.374	1181	0.366	0.009	0.665
8.	Caregiver gender biased	1193	0.804	1181	0.701	0.103	0.000***
9.	Matched enumerator gender	1239	0.346	1237	0.674	-0.328	0.000***
10.	Bottom wealth tercile	1216	0.287	1216	0.316	-0.029	0.122

Table 4: Test of balance of covariates

Variable		Control	Mean of control	Treatment	Mean of treatment	Difference in means	p-value
1.	Older adolescent	1226	0.364	1250	0.381	-0.017	0.381
2.	Low caregiver education	1172	0.377	1203	0.363	0.014	0.484
3.	Male adolescent gender	1226	0.498	1250	0.502	-0.004	0.840
4.	Caregiver gender biased	1171	0.744	1203	0.761	-0.018	0.320
5.	Matched enumerator gender	1226	0.526	1250	0.494	0.032	0.115
6.	Bottom wealth tercile	1203	0.315	1229	0.288	0.027	0.147

Table 5: Heterogeneity of outcome variables along some covariates

Panel A	: By	Older	adolescent
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Outcome verichle	Younger adolescent	Mean	Older adolescent	Mean	Difference in means	p-value
1 University aspirations	1497	0.838	863	0 728	0.11	0 000***
2. Education expectations	1463	0.96	822	0.917	0.042	0.000***
3. STEM	1469	0.475	851	0.348	0.127	0.000***
4. Female-dominated jobs	1469	0.248	851	0.278	-0.03	0.112
5. Job expectations	1456	0.973	840	0.956	0.017	0.034**
1						
Panel B: By Low caregiver education			_			
	Higher	M	Lower	M	Difference	1 .
Outcome verichle	caregiver	Mean	caregiver	Mean	in means	p-value
1 University aspirations	1467	0.832	848	0 730	0.002	0 000***
2. Education expectations	1407	0.032	040 921	0.739	0.092	0.000***
2. Education expectations	1422	0.944	821 822	0.945	-0.001	0.880
5. SIEM	1440	0.441	833 822	0.407	0.034	0.114
4. Female-dominated jobs	1440	0.237	833	0.303	-0.066	0.001***
5. Job expectations	1418	0.969	832	0.962	0.007	0.346
Panel C: By Male adolescent gender						
	Female		Male		Difference	
Outcome variable	adolescent	Mean	adolescent	Mean	in means	p-value
1. University aspirations	1184	0.828	1176	0.767	0.061	0.000***
2. Education expectations	1137	0.945	1148	0.943	0.002	0.827
3. STEM	1181	0.489	1139	0.365	0.124	0.000***
4. Female-dominated jobs	1181	0.445	1139	0.068	0.377	0.000***
5. Job expectations	1164	0.958	1132	0.975	-0.017	0.021**
Panel D: By Caregiver gender biased						
	Unbiased	Mean	Biased	Mean	Difference	p-value
Outcome variable	caregiver	0.721	caregiver	0.02	in means	1
1. University aspirations	573	0./31	1/41	0.82	-0.089	0.000***
2. Education expectations	559	0.946	1683	0.944	0.003	0.804
3. STEM	566	0.41	1706	0.434	-0.024	0.308
4. Female-dominated jobs	566	0.24	1706	0.268	-0.028	0.195
5. Job expectations	565	0.958	1684	0.969	-0.012	0.187
Panel E: By Bottom wealth tercile						
	Ton wealth	Mean	Bottom	Mean	Difference	n-value
Outcome variable	TOP wearin	wicall	wealth	wicali	in means	p-value
1. University aspirations	1642	0.837	676	0.703	0.134	0.000***
2. Education expectations	1591	0.947	655	0.937	0.01	0.357
3. STEM	1626	0.442	651	0.392	0.05	0.028**
4. Female-dominated jobs	1626	0.255	651	0.275	-0.02	0.333
5. Job expectations	1601	0.966	653	0.966	0	0.996

Breaking down the data by adolescent gender, as seen in Panel B of Table 3, we see that female adolescents have higher University aspirations than male adolescents, but not higher education expectations. Male adolescents have higher Job expectations. Another interesting pattern in Panel B of Table 3 is that female adolescents have higher STEM job aspirations than male adolescents (12.4 percentage points difference). We also see a statistically significant 37.7 percentage points difference between female and male adolescents in relation to female-dominated jobs. We test the balance of treatment and control groups along observable characteristics measured by the covariates to ascertain whether the randomization led to balanced groups in our sample. From Table 4, we see that the covariates are balanced across the treatment and control groups, with no statistically significant differences between the treatment and control groups. Hence, we conclude that the randomization process created comparable treatment and control groups.

In Table 5 we check for difference in means of the outcome variables across some of the covariates used in this study. Panel A of Table 5 shows that, except for female-dominated jobs, younger adolescents have higher aspirations and expectations. Panel B of Table 5 delineates that, as expected, the proportion for University aspirations for adolescents with more educated caregivers is higher on average than those of adolescents with less educated caregivers, meaning that to some extent, adolescents adjust their aspirations and expectations to their current circumstances. We also see that the proportion of adolescents aspiring to female-dominated jobs is higher on average for less educated caregivers than more educated caregivers, which is also expected as these are jobs that in many cases require less training/educational attainment. Panel D of Table 5 shows that University aspirations for adolescents with gender biased caregivers is more on average than in adolescents with unbiased caregivers and this difference is highly statistically significant. We find this statistic puzzling because we expect less University aspirations for adolescents with gender biased caregivers consistent with some intergenerational transmission of traditional gender norms (Dhar et al., 2019; Perales et al., 2021), but this was not the case.

In Appendix Table A1, we see some interesting pairwise correlations. We can see from Column 1 that the outcome variable University aspirations is statistically significantly associated with the other variables. For example, having parents with lower educational attainment (Low caregiver education) and being in the bottom wealth tercile are negatively and statistically significantly correlated with University aspirations; while having gender biased caregivers is positively and statistically significantly correlated with University aspirations. Figures A1 to A5 in the Appendix present bar graphs of the outcome variables across some of the covariates to give a pictorial view of the heterogeneity seen in Table 5 and correlations observed in Appendix Table A1.

Identification strategy and estimation strategy

Given that we are using a survey experiment research design, our identification strategy is based on randomly assigning the respondents into treatment and control groups and comparing the mean outcomes of the groups to isolate the treatment effect (Angrist and Pischke, 2015; Gertler et al., 2016). Because our outcome variables are dummy variables, we specify the following linear probability model (LPM) and estimate its parameters using the ordinary least squares (OLS) estimation technique:

$$Y_i = \alpha + \beta_1 Treated_i + \delta_i + \varepsilon_i \tag{1}$$

Where Y_i is the outcome of individual i, *Treated_i* is a dummy variable indicating the treatment status of individual i (that is, whether the respondent was exposed to the gender norms module before the aspirations and expectations module), δ_i is the randomization strata (there are three strata in the original Quality Preschool for Ghana study), and ε_i is an individual error term. β_1 captures our treatment effect. We carry out every estimation using heteroskedasticity-robust standard errors or Eicker-Huber-White standard errors (White, 1980; Wooldridge, 2020). For the heterogeneous treatment effects, we add to Equation (1) interaction terms based on chosen covariates.

$$Y_i = \alpha + \beta_1 Treated_i + \beta_2 X_i + \beta_3 Treated_i X_i + \delta_i + \varepsilon_i$$
(2)

Where X_i is one of the chosen covariates for heterogeneity analyses and β_3 is the coefficient of the interaction term that we are interested in for the heterogeneity analyses. We present the regression results in the next section.

4. **RESULTS**

Table 6 presents the regression results for the main treatment effects, while Table 7 shows the regression results for the heterogeneous treatment effects in Panels A to E. Table 8 displays a summary of the results in Tables 6 and 7. Examining Table 8 reveals that the main average treatment effects are statistically insignificant. Therefore, hypotheses H1 and H2 are not supported by our data. We, however, have heterogeneous treatment effects for mainly one outcome variable, Education expectations for females, and a marginal effect on female-dominated jobs for males. Hypotheses H3 and H6 are not supported because there are no heterogeneous treatment effects along the Adolescent age and Enumerator gender dimensions, as seen in Table 8.

Table 6: Main average treatment	effects									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Females	Males	Females	Males	Females	Males	Females Female-	Males Female-	Females	Males
	University	University	Education	Education			dominated	dominated	Job	Job
	aspirations	aspirations	expectations	expectations	STEM	STEM	jobs	jobs	expectations	expectations
Treated	-0.0083	0.0180	0.0174	-0.0031	0.0150	-0.0079	0.0249	0.0060	0.0023	0.0083
	(0.0219)	(0.0247)	(0.0134)	(0.0137)	(0.0291)	(0.0285)	(0.0289)	(0.0148)	(0.0118)	(0.0093)
Observations	1,184	1,176	1,137	1,148	1,181	1,139	1,181	1,139	1,164	1,132
R-squared	0.0054	0.0009	0.0026	0.0008	0.0053	0.0064	0.0039	0.0037	0.0017	0.0010
Control for Original treatment strata FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of outcome variable for control										
group	0.832	0.758	0.937	0.945	0.481	0.370	0.432	0.0646	0.957	0.957

Note: For the description of the variables see Table 1. The regression is estimated using the OLS estimation method. Robust standard errors are given in brackets. All regressions include the constant term. ***, **, * imply significance at the 1%, 5% and 10% levels

Table 7: Heterogeneous tr	eatment effects									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Females	Males	Females	Males	Females	Males	Females Female-	Males Female-	Females	Males
	University aspirations	University aspirations	Education expectations	Education expectations	STEM	STEM	dominated jobs	dominated jobs	Job expectations	Job expectations
Panel A: Interaction with Older adolescent										
Treated	0.0046	0.0360	0.0286*	-0.0124	0.0065	0.0253	0.0401	-0.0122	0.0130	0.0201**
	(0.0245)	(0.0295)	(0.0146)	(0.0144)	(0.0353)	(0.0375)	(0.0350)	(0.0188)	(0.0135)	(0.0097)
Older adolescent	-0.0793**	-0.0923**	-0.0192	-0.0632***	-0.1609***	-0.0498	0.1330***	-0.0116	0.0009	-0.0076
	(0.0346)	(0.0377)	(0.0228)	(0.0223)	(0.0428)	(0.0422)	(0.0433)	(0.0211)	(0.0180)	(0.0152)
Treated x Older adolescent	-0.0424	-0.0332	-0.0349	0.0291	0.0225	-0.0709	-0.0439	0.0437	-0.0329	-0.0263
	(0.0498)	(0.0516)	(0.0318)	(0.0301)	(0.0611)	(0.0578)	(0.0615)	(0.0304)	(0.0266)	(0.0202)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Females	Males	Females	Males	Females	Males	Females Female-	Males Female-	Females	Males
	University aspiration	University aspiration	Education expectation	Education expectation	STEM	STEM	dominated jobs	dominated jobs	Job expectation	Job expectation
Panel B: Interaction with Low caregiver education										
Treated	-0.0170	-0.0119	0.0376**	-0.0090	0.0322	-0.0416	0.0501	-0.0114	0.0154	0.0089
	(0.0255)	(0.0295)	(0.0169)	(0.0174)	(0.0371)	(0.0364)	(0.0367)	(0.0179)	(0.0146)	(0.0114)
Low caregiver education	-0.1071***	-0.1275***	0.0270	-0.0065	0.0138	-0.0979**	0.1286***	-0.0094	0.0073	-0.0058
-	(0.0346)	(0.0380)	(0.0202)	(0.0204)	(0.0434)	(0.0418)	(0.0430)	(0.0211)	(0.0173)	(0.0153)
Treated x Low caregiver education	0.0382	0.0711	-0.0586**	0.0219	-0.0510	0.0818	-0.0749	0.0616*	-0.0341	0.0034
	(0.0480)	(0.0533)	(0.0282)	(0.0283)	(0.0609)	(0.0596)	(0.0604)	(0.0330)	(0.0252)	(0.0198)
Panel C: Interaction with Bottom wealth tercile										
Treated	-0.0084	0.0046	0.0264*	-0.0053	0.0100	-0.0291	0.0187	0.0086	0.0042	0.0146
	(0.0241)	(0.0275)	(0.0158)	(0.0160)	(0.0347)	(0.0346)	(0.0343)	(0.0186)	(0.0148)	(0.0100)
Bottom wealth tercile	-0.1134***	-0.1677***	0.0107	-0.0173	-0.0187	-0.1100**	0.0603	-0.0229	0.0196	-0.0082
	(0.0375)	(0.0410)	(0.0218)	(0.0220)	(0.0459)	(0.0434)	(0.0460)	(0.0210)	(0.0174)	(0.0166)
Treated x Bottom wealth tercile	0.0031	0.0276	-0.0384	0.0116	0.0067	0.0621	0.0262	0.0005	-0.0058	-0.0160
	(0.0538)	(0.0576)	(0.0314)	(0.0311)	(0.0654)	(0.0620)	(0.0652)	(0.0310)	(0.0246)	(0.0226)
Panel D: Interaction with Caregiver gender biased										
Treated	-0.0341	-0.0083	-0.0714**	0.0081	-0.0655	-0.0185	0.0411	0.0083	-0.0356	0.0326*
	(0.0553)	(0.0494)	(0.0302)	(0.0247)	(0.0661)	(0.0517)	(0.0657)	(0.0284)	(0.0318)	(0.0183)
Caregiver gender biased	0.0505	0.0773*	-0.0541***	0.0015	-0.0818	0.0342	-0.0349	-0.0084	-0.0017	0.0232
-	(0.0420)	(0.0401)	(0.0176)	(0.0212)	(0.0519)	(0.0440)	(0.0518)	(0.0228)	(0.0216)	(0.0176)
Treated x Caregiver gender biased	0.0358	0.0289	0.1088***	-0.0130	0.0970	0.0095	-0.0198	0.0016	0.0472	-0.0322
	(0.0604)	(0.0570)	(0.0337)	(0.0299)	(0.0738)	(0.0622)	(0.0734)	(0.0333)	(0.0343)	(0.0213)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Females	Males	Females	Males	Females	Males	Females Female-	Males Female-	Females	Males
	University aspiration	University aspiration	Education expectation	Education expectation	STEM	STEM	dominated jobs	dominated jobs	Job expectation	Job expectation
Panel E: Interaction with Matched enumerator gender										
Treated	0.0021	-0.0089	0.0092	-0.0093	-0.0141	0.0210	0.0124	0.0052	0.0010	0.0042
	(0.0267)	(0.0470)	(0.0145)	(0.0266)	(0.0361)	(0.0490)	(0.0357)	(0.0276)	(0.0138)	(0.0179)
Matched enumerator gender	0.0025	0.0471	-0.0504**	0.0087	-0.0211	0.0798*	0.0089	-0.0149	-0.0143	0.0025
	(0.0321)	(0.0401)	(0.0233)	(0.0224)	(0.0425)	(0.0435)	(0.0424)	(0.0239)	(0.0184)	(0.0160)
Treated x Matched enumerator										
gender	-0.0322	0.0415	0.0160	0.0094	0.0876	-0.0404	0.0405	0.0008	0.0016	0.0061
	(0.0470)	(0.0551)	(0.0312)	(0.0312)	(0.0610)	(0.0603)	(0.0611)	(0.0329)	(0.0262)	(0.0211)

Note: For the description of the variables see Table 1. The regressions are estimated using the OLS estimation method. Robust standard errors are given in brackets. All regressions include the constant term and original treatment strata FE. Older adolescents are those older than 13 years old. Low caregiver education are caregivers whose highest educational attainment is primary education. Bottom wealth tercile refers to respondents whose household wealth score belong to the bottom tercile. Caregiver gender biased refers to caregivers who agree with the statement: It is important that sons have more education than daughters. Matched enumerator gender refers to the situation where the gender of the enumerator matches that of the respondent. ***, **, * imply significance at the 1%, 5% and 10% levels

Table 8: Summary of the results in Tables 6 and 7

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males
	University	University	Education	Education			Female- dominated	Female- dominated	Job	Job
	aspirations	aspirations	expectations	expectations	STEM	STEM	jobs	jobs	expectations	expectations
Main average treatment effect without interaction terms	-0.0083	0.0180	0.0174	-0.0031	0.0150	-0.0079	0.0249	0.0060	0.0023	0.0083
Coefficient of interaction terms in the heterogeneity analyses										
Older adolescents' interaction term Low caregiver education interaction	-0.0424	-0.0332	-0.0349	0.0291	0.0225	-0.0709	-0.0439	0.0437	-0.0329	-0.0263
term	0.0382	0.0711	-0.0586**	0.0219	-0.0510	0.0818	-0.0749	0.0616*	-0.0341	0.0034
Bottom wealth tercile interaction term Caregiver gender biased interaction	0.0031	0.0276	-0.0384	0.0116	0.0067	0.0621	0.0262	0.0005	-0.0058	-0.0160
term	0.0358	0.0289	0.1088***	-0.0130	0.0970	0.0095	-0.0198	0.0016	0.0472	-0.0322
Matched enumerator gender interaction term	-0.0322	0.0415	0.0160	0.0094	0.0876	-0.0404	0.0405	0.0008	0.0016	0.0061

Notes: For the description of the variables see Table 1. This table reports the coefficient of the treatment variable in the regression results reported in Table 6 and the coefficients of the interaction terms from the regression results reported in Table 7. Older adolescents are those older than 13 years old. Low caregiver education are caregivers whose highest educational attainment is primary education. Bottom wealth tercile refers to respondents whose household wealth score belong to the bottom tercile. Caregiver gender biased refers to caregivers who agree with the statement: It is important that sons have more education than daughters. Matched enumerator gender refers to the situation where the gender of the enumerator matches that of the respondent. ***, **, * imply significance at the 1%, 5% and 10% levels respectively.

Hypothesis H4 is related to caregiver educational attainment and wealth score. We expect the negative treatment effect for Education expectations of female adolescents to be more negative when parents have lower educational attainment levels. In other words, we expect a negative and significant interaction term. From Column 3 of Table 8, we see that the interaction term between treated and Low caregiver education is negative and statistically significant at the 5% level, lending support to Hypothesis H4. We hypothesize that the negative treatment effect of male adolescents for Female-dominated jobs should be more negative and instead we get a marginally significant positive effect. Given that this result is marginally significant at the 10% significance level, we would not put too much weight on it and consider it not too different from a null result.

We find results opposite to that of hypothesis H5: we hypothesize that there should be a negative coefficient for the interaction term between Treated and caregiver gender biased for Education expectations of female adolescents, but instead we get a positive coefficient that is significant at the 1% level, as seen in Column 3 of Table 8. Examining Column 3 of Panel D of Table 7 that reports the regression results, we see that in the group of unbiased caregivers, the treatment effect has a negative coefficient (-0.0714 or 7.14 percentage points) that is statistically significant at the 5% level; for the control group we see that females with gender biased caregivers have lower educational expectations and the negative coefficient (-0.0541 or 5.41 percentage points) is statistically significant at the 1% level. Hence without treatment, the gender bias of caregivers seems to influence the educational expectation of their female adolescents. We try to explain the puzzling positive sign of the interaction effect in the discussion section.

5. DISCUSSION AND CONCLUSIONS

Culture and social norms seem to matter for human attitudes and behaviors, but to what extent and in which contexts? In this study we estimate to what extent culture, in the form of gender norms, matters for the educational and career aspirations and expectations amongst a large sample of adolescents in Ghana. In our survey experiment, we randomly prime adolescents about gender norms and then elicit their educational and career aspirations and expectations. We find mainly null main and heterogeneous treatment effects. In essence, we do not find that priming gender norms change female and male adolescents' aspirations and expectation and jobs. Our null findings that making gender norms more salient does not seem to provoke either a stereotype threat or lift is not uncommon in the literature (see Inglis and O'Hagan, 2022; Stricker and Ward, 2004; Benjamin et al., 2010).

What explains our null findings? We have some thoughts. First, it is possible that stereotype threat effects are not strong amongst adolescents in our setting, given the efforts over the years to promote gender equality norms across several societies, including Ghana. From our data, however, we see that adolescents

and caregivers appear to adhere to traditional gender norms, with 49% of the female adolescent respondents and 78% of the male adolescent respondents being gender biased; while from Table 3 we see that 75% of the caregivers are gender biased. Second, we see from Table 3 that adolescents in our sample are quite optimistic about their educational and job outlooks (perhaps because of the changing gender attitudes in the society noted earlier), and we find average higher levels of university aspirations and STEM jobs aspirations among female adolescents than male adolescents. These average high levels in the outcome variables (University aspirations (80%), Education expectations (94%) and Job expectations (97%)) may make it more difficult to detect treatment effects between the treatment and control groups as most in the sample seem to have high levels across board.

Third, another possibility is that stereotype threat effects can only be detected in studies using specific types of priming and information provision treatments, and with particular performance tests as outcomes. Flore and Wicherts (2015, p. 27) mention two types of priming/manipulation: "The explicit stereotype threat manipulation usually involved a written or verbal statement that informed participants that the MSSS [mathematics, science, and spatial skills] test they were about to complete produced gender differences, whereas the implicit stereotype threat manipulations triggered the gender stereotype without explicitly mentioning the gender gap". Some studies examining stereotype threats use explicit priming⁷ that entail highlighting that the performance test is a test of ability, emphasizing the observed performance differences between the stereotyped and nonstereotyped groups, and showing the underrepresentation of the stereotyped group in a particular domain/activity affected by the stereotype. Our priming in this study may be considered as implicit and subtle because we do not emphasize to the respondents any observed performance/behavioral differences between the stereotyped and nonstereotyped group; we do not point out to the respondents that the outcome questions are diagnostic of ability or not diagnostic of ability; and this implicitness/subtlety may explain our null findings. Consequently, future empirical studies may need to try out different types of priming treatment interventions and outcomes to identify more robustly the existence of stereotype threat effect amongst adolescents.

Fourth, our experiment may have been underpowered to detect any treatment effect. Flore and Wicherts (2015, p. 41) note in their meta-analysis that "in our opinion, only studies with large sample sizes will contribute to acquiring an accurate picture of the actual effect of stereotype threat among schoolgirls. A power calculation for a one-tailed t-test indicated that, with an effect size of 0.223, roughly 250 participants are needed per condition to achieve a power of .80". We think that low power may not be our case because we have a large sample of about 2400 participants (with two experimental arms) and consequently, we think that our sample size should have enough power to detect treatment effects if they

⁷ See some examples in our literature review in Table 1

exist. Fifth, although our sample is spread out across Ghana, most of the adolescents reside in urban and peri-urban areas in Greater Accra in the south of Ghana, where gender inequalities may be relatively less. Future research can test findings with more rural and traditional communities in the northern areas of Ghana, which may have strong adherence to traditional gender norms and higher levels of gender inequalities. Finally, 63% of our sample are 13 years old and below and on all our outcome variables the younger cohort (13 years old and below) have higher average values than the older cohort, with statistically significant differences. If gender norms start acting prominently in late adolescence (maybe 15 years old and above) then we may not find treatment effects with younger adolescents and the smaller sample size in the older cohort may not allow us to detect treatment effects.

With regards to heterogeneous treatment effects, we find significant and nuanced effects on only one outcome variable: the educational expectation of females. On the one hand, we find that the treatment effect for educational expectation of females is lower when their caregivers have lower educational attainment, and this is what we hypothesized. On the other hand, our results show a treatment effect for educational expectation of females that is higher when caregivers have a male education preference gender bias, and this finding goes against our hypothesis. In essence, we find a puzzling heterogeneous treatment effect for the educational expectation of females with gender biased caregivers. We note in the results section that without treatment and examining only the control group, the gender bias of caregivers seems to affect the educational expectation of female adolescents. The positive and statistically significant coefficient of the interaction term suggests that treated females with gender biased caregivers.

One possible explanation for this puzzling result is that the treatment gender norms questions provoke some rebellion in the treated females given the gender bias of their caregivers and this makes then go against the expectations of their caregivers in believing they can achieve their educational aspirations. Another potential explanation is that it is possible that our measure of caregiver gender bias (that is, agreement to the statement: it is important that sons have more education than daughters) may not actually capture attitudes of caregivers to their own children. Caregivers may agree with this traditional gender norm in general but may not practice it themselves in their own homes, given the high levels of aspirations and expectations we see in our data for their female children. As this puzzling effect only occurred for one of the outcome variables, we do not give it too much importance, but just to note that these are potential explanations for the puzzling result. Future studies would be needed to confirm or invalidate this puzzling finding.

It is worthwhile to note that in this study we are linking a cultural phenomenon (gender norms) to human capital outcomes (educational and career aspirations and expectations) using a social psychological theory (stereotype threat/lift theories) and working methodologically with survey experimental methods. We think that our study is an interdisciplinary contribution with potential to show the value of interdisciplinary research. Our findings thus contribute to different strands of literature. First, we believe that our null findings are contributing to the literature on stereotype threat/lift theory by enlarging the number of studies from LMICs (particularly from Africa), using a large sample of adolescents, examining less studied outcomes, and helping to reduce the publication bias. To the best of our knowledge, this is the first study to evaluate the effects of stereotype threat/lift on the the educational and career aspirations of adolescents in Africa. Fryer et al. (2008) present null effects of the stereotype threat treatment in their sample when studying stereotype threat in the presence of financial incentives. On the contrary, they find a positive, but insignificant, treatment effect for females in the stereotype threat treatment group, even though the stereotype threat theory predicts a negative treatment effect for females. They call for further studies to verify their null results. In one of the few studies on stereotype threat in Africa, Picho and Schmader (2018) find many null results and do not find any main effects of stereotype threat in their experimental study of Ugandan adolescents. In addition, Flore and Wicherts (2015) emphasize that the existing effect sizes seem inflated due to publication bias arising from the lack of publication of papers with null findings. They recommend that "as directions for future research we propose simple, large replication studies, preferably administered cross-culturally. In our opinion, only studies with large sample sizes will contribute to acquiring an accurate picture of the actual effect of stereotype threat among schoolgirls ... In addition, these studies should be appropriately registered" (p. 41). Our study was preregistered and carried out in an LMIC setting, with about 2400 participants. Hence, we think that our null findings are not out of the ordinary after satisfying the authors' recommendations.

Second, our findings contribute to the survey design and methods literature, specifically to the literature on survey questions order effects (Brañas-Garza et al., 2022; Mcfarland, 1981; Stantcheva, 2023) and experimenter demand effects (EDE) (Benstead, 2014; Di Maio and Fiala, 2020; Reitmann et al., 2020). Our null findings suggest that survey questions order effects and EDE may not apply to survey questions about gender norms and adolescents' educational and career aspirations and expectations in our context. In essence, our gender bias treatment questions may not necessarily lead to differential reporting on adolescents' educational and career aspirations in a setting such as Ghana. Hence researchers may not be too bothered about where to place these questions in their survey design. Moreover, our null findings for EDE are also not surprising, given that these effects may not be found for every type of survey questions. As noted earlier, Di Maio and Fiala (2020) find that EDE only affected the political preference questions in their study and also note that there are very few studies examining EDE in the developing country context. Given that we do not find EDE effects for responses to adolescent educational and career aspirations, it is possible that these types of survey questions do not

suffer much from EDE and thus researchers may not worry too much about their response effects due to questions order in their questionnaire design. We need more large-scale experimental studies in LMICs to confirm our foregoing conclusions.

The findings from our study have important policy implications. Gender norms seem to have a long history due to historical economic factors (Alesina et al., 2013) and many recent papers point to the importance of early childhood education and socialization in forming gender norms (Kurtz-Costes et al., 2014; Master, 2021). Sometimes gender norms persist not due to historical economic factors but for religious reasons. Jayachandran (2021, p. 580) notes that "in other cases, the historical roots of norms are religious rather than economic. Today, some of the lowest female employment rates are observed in the Middle East, North Africa, and India. These societies place a high value on a woman's "purity," or limited interaction with men outside her family. Under the Hindu caste system, men outside the family are a source of "pollution" for women ... Much Islamic doctrine similarly endorses the practice of *purdah*, or female seclusion, which contributes to the low female employment rate in the Middle East and North Africa". Hence any policy reforms to encourage the desired gender norms should consider the root causes of these cultural norms and design appropriate social norms interventions (Cislaghi et al., 2020; Cislaghi and Heise, 2018; Cyr et al., 2024; Dhar et al., 2022; Jayachandran, 2021; United Nations Development Programme (UNDP), 2023) in order to have some hope of creating the desired attitudinal and behavioral changes. Our null findings for stereotype threats for female adolescents suggests that priming the prevailing gender norms in Ghana may not appear discouraging to female adolescents aspiring to the highest levels of education and STEM careers. We note that adolescent girls in our sample have high educational and job aspirations, probably related to efforts to promote a more gender inclusive society. These efforts should continue as they seem to be bearing fruits, leading to female adolescents perceiving less cultural resistance to pursuing their educational and career interests. Future follow-up of this sample will help us ascertain whether these aspirations will actually be realized.

Like all studies, this study is not without its limitations. Although we used a survey experiment research design to ensure internal validity of our results, our sample is still based on a selected sample from Ghana. Hence our results may not be generalizable to other areas outside Ghana. We need more replication studies in many sub-Saharan African (SSA) countries and LMICs before attaining generalizable results and gaining better external validity. These replication studies offer promising avenues, opportunities, and directions for future research work in this area.

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7. APPENDIX

Figure A1: Bar graphs of University aspiration against some covariates



Bar graphs of University aspiration against some covariates

Figure A2: Bar graphs of Education expectation against some covariates



Bar graphs of Education expectation against some covariates







Figure A3: Bar graphs of STEM jobs against some covariates



Bar graphs of STEM against some covariates



Figure A4: Bar graphs of Female-dominated jobs against some covariates



Bar graphs of Female-dominated jobs against some covariates



Figure A5: Bar graphs of Job expectation against some covariates

Bar graphs of Job expectation against some covariates



Variables		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1)	University aspiration	1.00										
2)	Education expectation	0.05**	1.00									
3)	STEM	0.11***	0.04**	1.00								
4)	Female-dominated jobs	-0.05**	-0.02	0.07***	1.00							
5)	Job expectation	0.03*	0.33***	-0.01	0.00	1.00						
6)	Older adolescent	-0.13***	-0.09***	-0.12***	0.03	-0.04**	1.00					
7)	Low caregiver education	-0.11***	0.00	-0.03	0.07***	-0.02	0.17***	1.00				
8)	Male adolescent gender	-0.08***	0.00	-0.13***	-0.43***	0.05**	0.08***	-0.01	1.00			
9)	Caregiver gender biased	0.10***	-0.01	0.02	0.03	0.03	-0.04*	-0.08***	-0.12***	1.00		
10)	Matched enumerator gender	0.00	-0.03	-0.01	-0.13***	0.01	0.02	0.01	0.33***	-0.06***	1.00	
11)	Bottom wealth tercile	-0.15***	-0.02	-0.05**	0.02	0.00	0.09***	0.21***	0.03	-0.07***	0.01	1.00

Note: For the description of the variables see Table 2. ***, **, * imply significance at the 1%, 5% and 10% levels