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Can Job Training Decrease Women's Self-Defeating Biases?

Experimental Evidence from Nigeria

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Abstract

Occupational segregation is a central contributor to the gap between male and female earnings worldwide. As new sectors of employment emerge, a key question is whether this pattern is replicated. This paper examines this question by focusing on the emerging information and communications technology sector in Nigeria. Using a randomized control trial, the paper examines the impacts of an information and communications technology training intervention that targeted university graduates in five major cities. The analysis finds that after two years the treatment group was 26 percent more likely to work in the information and communications technology sector. The program appears to have succeeded only in shifting employment to the new sector, as it had no average impact on the overall likelihood of being employed. However, viewed through the lens of occupational segregation, the program had a surprising effect. For women who at baseline were implicitly biased against associating women with professional attributes, the likelihood that the program induced switching into the information and communications technology sector was more than three times as large than that of unbiased women. These results suggest that training programs can help individuals overcome self-defeating biases that could hamper mobility and reduce efficiency in the labor market.

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Can Job Training Decrease Women's Self-Defeating Biases? Experimental Evidence from Nigeria[1]

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1. Introduction

Globally, women face twin disadvantages in the labor market that contribute to lower earnings. The first disadvantage is that women are overrepresented in informal sector employment and unpaid work. The second, and closely related disadvantage comes from occupational segregation – i.e. that women are concentrated in lower paying occupations. The World Development Report, using data from 33 low and middle-income countries and 14 high income countries, shows that this segregation accounts for 10-50 percent of the wage gap (World Development Report 2012, p. 206).

Some of these disadvantages may stem from biases that women themselves hold about their own potential. Women who hold gender-based stereotypes with respect to their mathematical abilities, for example, perform worse in math exams and demonstrate lower interest in mathematical careers (Spencer, Steele, and Quinn, 1999; Kiefer and Sekaquaptewa, 2006). In the Netherlands, even when boys and girls may demonstrate similar levels of academic ability, boys tend to choose more academically prestigious tracks (Buser, Niederle, and Oosterbeek, 2014).

We study the relationship between gender and occupational segregation using experimental data from a training intervention in Nigeria. The training program, targeting recent university graduates, taught them about basic software packages and sought to improve their oral and written communication skills to prepare them for work in the emerging information and communications technology (ICT) sector. This offers us a unique opportunity to examine the impacts of training on occupational segregation, in addition to estimating the effectiveness of the training intervention itself on employment outcomes. In Nigeria, while this sector is still emerging, it is already male dominated, with government figures indicating that 67% of those employed in the information services sector in 2010 were men (National Bureau of Statistics, 2010).[2] We find that two years after the training program ended, the treatment group was 26 percent (1.7 percentage points against a control mean of 6.4 percent) more likely to work in the ICT sector. The program appears to have succeeded only in shifting employment to the new sector, as it had no average impact on the overall likelihood of being employed. In line with evaluations of other job training programs in low-income countries, we also find no significant impact on earnings (see for example Betcherman et. al 2004).

[2] There is no direct mapping between the goals of the training program and occupational categories in government statistics. All other possible categories (office support, telecommunications) are also male dominated.

Individuals' biases can affect their aspirations and employment choices, particularly when these biases represent internalized social norms (World Development Report 2015). Recent evidence suggests that experience and exposure to particular social patterns shape individuals' preferences, self-confidence, aspirations, and behavior. For example, the experience of having a female village chief in India increased parents' aspirations for their teenage daughters, as well as the daughters' own aspirations for themselves (Beaman et al., 2012). A history of reliance in agriculture on animal-drawn plows, which typically only men have the upper body strength to manage, led historically to representations of gender roles—men in the field, women at home—that were passed down across generations and even today result in a lower fraction of women in the labor market, in entrepreneurial roles, and in national legislatures (Alesina et al. 2013).

However, such biases are difficult to measure using standard survey techniques either because individuals are unaware of the biases they harbor, or because self-reported biases often conform to what the respondent thinks the listener would like to hear. In this study, we use a tool developed by psychologists to measure implicit biases, the Implicit Association Test. This enables us to estimate how treatment effects vary based on baseline levels of bias. For women who at baseline were implicitly biased *against* associating women with professional attributes, the likelihood that the program induced switching into the ICT sector was more than three times as large as for unbiased women. This shows that training programs have the potential to overcome self-defeating biases that reinforce occupational segregation, even when they do not explicitly set out to do so. In this particular case, training to work in the ICT sector changed women's ability to imagine themselves as professionals in ICT.

This paper sits at the intersection of literatures on occupational segregation and the impacts of job training programs. A small body of literature provides some insight into how gender stereotypes can translate into worse labor market outcomes for young women. Escriche (2007) models the persistence of occupational segregation, arguing that the intergenerational transmission of norms leads women to be sorted into jobs with less on-the-job training. Looking at cross-country data, Fortin (2005) documents a significant correlation between endorsement of traditional gender roles and negative employment outcomes for women, such as employment levels and differences in pay. This holds even while controlling for average male attitudes. These norms can be compounded by lower occupational mobility among women. Fitzenberger and Kunze (2005) find that low

occupational mobility in Germany is associated with a higher likelihood of being locked in low-wage careers over time for women than for men.

While job training programs typically focus primarily on the transfer of skills, they also offer a potential opportunity to shift norms about the appropriate sectors for men and women to work in and thus reduce occupational segregation (Campos et. al. 2015). Nopo, Robles and Saavedra (2008) examine the impact of a vocational training program, ProJoven, in Peru, which explicitly sought to reduce occupational segregation by encouraging females to enter male-dominated occupations. Using propensity score matching, the authors find that 18 months after the end of training, women were 15 percent more likely to be employed and had a 93 percent increase in earnings, while the program reduced occupational segregation (as measured with the Duncan index) by 30 percent. Our paper builds on Nopo et al. by showing that training programs can reduce occupational segregation, even without explicitly encouraging participants to defy social norms.

The second strand of literature that this paper contributes to is on the effect of job training programs for youth. Youth unemployment is of increasing concern to policy makers across the world, especially in countries in the Middle East and Sub-Saharan Africa currently experiencing a significant youth bulge (Filmer and Fox, 2014). Bleak job prospects are not limited to populations with low levels of formal education. Indeed, for the low-income countries in Sub-Saharan Africa, the unemployment rate is higher among those with tertiary/vocational or university education (at 18.8 percent) than for other education groups (African Economic Outlook, 2012).

Many youth employment interventions globally have focused on improving skills of the unemployed, under the assumption that there may be poor match of skills between young people emerging from the formal education system and the profiles sought after by the private sector. Experimental evidence for the effectiveness of this strategy in low-income countries, however, is limited, as noted by Betcherman et al (2004). More recently, Card et al. (2015) aggregated over 200 econometric evaluations of active labor market programs (but including only 6 from Sub-Saharan Africa), finding no average effects on employment in the short run but positive effects over longer time horizons. Taking a broader look at labor market and entrepreneurship programs in low-income countries, Blattman and Ralston (2015) argue that "it is hard to find a skills training program that passes a simple cost-benefit test." In line with much of this literature, we find no statistically significant impacts on overall employment and earnings. However, our results on sectoral

switching in the context of an emerging industry suggest that training can play a role in changing norms and aspirations and thereby move workers into nascent sectors.

The next section describes the intervention in Nigeria, including the experimental allocation of training slots. Section 3 presents the data sources used for evaluating the program and outlines the empirical strategy for estimating treatment impacts. Section 4 presents results, and Section 5 concludes with a discussion of their relevance for policy.

2. Program background

In 2010, ICT was an emerging industry in Nigeria. There were approximately 400 mostly small and medium-sized ICT firms, and they catered mostly to the domestic market (primarily the public sector and big corporations in banking and telecommunications) (World Bank, 2012). A long-term goal of the government was to break into the international market for information technology enabled services (e.g. call centers and other forms of business processing outsourcing) by taking advantage of Nigeria's low labor costs and abundant supply of English speakers, just as emerging economies like India, the Philippines, and the Arab Republic of Egypt had successfully done in the previous decade. Industry consultations suggested that a large skills gap among potential workers prevented the industry from being internationally competitive.

In the second half of 2010, the Government of Nigeria and the World Bank worked with a consulting firm specializing in ICT services to launch the ACCESS ("Assessment of Core Competency for Employability in the Service Sector") Nigeria program with the immediate goal of training recent university graduates, equipping them with sufficient skills to work in Nigeria's ICT sector, and certifying these skills. They expected the training to improve skills in three competency areas: communication (oral and written), computers, and cognitive skills, which are considered "foundational competencies" for employment in the business processing outsourcing (BPO) sector (Eduquity 2012).

The ACCESS Nigeria IT job skills training program was implemented across five cities in Nigeria in 2012. Slots in the program were randomly assigned to applicants. Those offered slots in the program had access to 85 hours of classroom-based training spread across 10 weeks, while all applicants could post their resumes on a web-based employment network and attend a job-fair where prospective employers could meet with job candidates interested in working in the sector. At the end of training, program participants could also take an assessment exam which had been

recognized by the domestic ICT industry as a form of certification to work in business processing activities.

The consulting firm designed a curriculum based on an initial evaluation of recent university graduates in Lagos and an assessment examination that was endorsed by an industry consortium as certification for the sector. The government chose training providers in five major cities (Lagos, Abuja, Kano, Kaduna, and Enugu) through a competitive bidding process, and training providers were expected to transform the curriculum into concrete lesson plans. Selected training providers were private firms, except in Abuja, where a public sector institution won the bid. In addition to the core competencies, these training providers also were required to cover "soft" skills, such as cultural sensitivity, teamwork, stress management, and time management.

Radio advertisements and outreach activities in local universities attracted 3,018 applicants to the program. ACCESS Nigeria funds paid for the training slots, with an average cost of approximately $600 per trainee. From March to April 2011, all applicants were invited to come to training centers to take the computer-based, self-administered assessment exam designed by the consulting firm. Scores on this pre-assessment, as well as gender, test center location, and an applicant's academic status (final year student in university, participant in the National Youth Service Corps – a mandatory internship that must be completed prior to formal sector employment – and all others) formed the strata in the random assignment of program slots to approximately 60 percent of the applicants. Considerable delays in program implementation led to a lengthy interval between the pre-assessment of applicants (March/April 2011) and the communication of treatment status to applicants (November/December 2011). All applicants, regardless of treatment status, were invited to a post-training job fair which took place in Lagos in late 2012.

Training finally commenced in February 2012 during a politically unstable period, shortly after the resolution of a national crisis over the removal of fuel price subsidies and also after a Boko Haram bombing that killed over 150 people and led to the imposition of a dusk to dawn curfew in the program state of Kano. All training was completed by mid-April 2012. Those who completed training could take the assessment again and receive a certificate.

3. Empirical strategy

3.1. Data

The computer-based pre-assessment provided a platform to collect baseline data on the 3,018 applicants of the program. A self-administered questionnaire on applicants' socio-economic and demographic backgrounds, education history, and labor market experiences and expectations followed the assessment. While not ideal because of potential fatigue and potential inconsistency in how respondents interpreted questions without the aid of survey enumerators, obtaining baseline data through this method solved the logistical and financial obstacles of physically tracking down a potentially scattered and extremely mobile population for face-to-face interviews, as they had been targeted through universities and therefore did not necessarily reside in the cities where pre-assessment testing took place.

The baseline instrument included Implicit Association Tests, which social psychologists use to measure an individual's automatic associations between a social group and a stereotypic attribute (Greenwald, McGhee, and Schwartz, 1998; Nosek, Banaji, and Greenwald, 2002) and that have been used by economists to measure stereotypes related to gender and occupation (Beaman et al., 2009) and race and intelligence (Bertrand et al., 2005), and attitudes towards other ethnic groups (Lowes et al., 2015). The IAT requires sorting of exemplars from four concepts, say male, female, office, home--using just two response options—say Left for either male or office, and Right for either female or home. If it is easier to mentally pair pictures of *men* with words associated *office* and *women* with words associated with the *home*, then subjects should be able to make these pairings faster than the opposite pairings (*women* and the *office* and *men* and the *home*). That is, an individual biased by traditional gender roles should be faster in sorting words when the option are {Left: male or office; Right: female or home} than when they are {Left: male or home; Right: female or office)}. Because the differences in sorting times are often less than a second, these associations are considered implicit and automatic, or beyond conscious control. Indeed, they often differ from explicitly expressed attitudes. Females, for example, often exhibit stronger implicit attitudes linking males with career and females with family than males, despite reporting weaker explicit attitudes (Nosek, Banaji, and Greenwald, 2002).

Interviews with the target population and training center directors prior to the experiment suggested that women in Nigeria may face higher obstacles in obtaining employment in an office setting, not only because of labor market discrimination but also because of women's own confidence in seeking work in the formal sector. The IATs attached to the assessment and baseline survey consisted of

tests measuring the ease of associations between gender and a number of attributes relevant for women's labor market participation in Nigeria. One test measured associations between gender and the concepts of *home* and *office*, a test commonly used in the IAT literature (see, for example, Nosek et al., 2002). A second test was designed for the urban Nigerian context and measured associations between gender and the concepts of *office* and *petty trade*, as initial fieldwork suggested that women might be more associated with less remunerative self-employment activities, such as the sale of phone cards or prepared food. A final test measured a more subtle distinction but one that is possibly important for applicants already interested in training for the ICT sector: associations between gender and the concepts of *professionalism* and *unprofessionalism*.[3] Prior to the sorting tasks, respondents were asked explicit questions about gender and professionalism. Appendix Table 1 presents the basic format of the IATs used during the baseline survey, and Appendix Table 2 lists the wording of the explicit question and the words used to represent *home*, *office*, *petty trade*, *professionalism*, and *unprofessionalism*.

The endline survey took place by phone between February and April 2014. Enumerators in call centers contacted applicants using the contact information provided during the baseline survey and administered a relatively short end line questionnaire over the phone. They reached 2,733 applicants for a response rate of 91 percent. Training providers also collected attendance data for all trainees and post-assessment scores for applicants who accepted treatment and took the assessment (1,007 individuals). There was not sufficient funding to pay for post-assessments for the comparison group.

3.2. Estimation

Our main outcome of interest is employment in the ICT sector, the objective of the program, specifically defined as working in the BPO sector or information and communications technology more generally. We also check for impacts on employment, formal sector employment, and self-employment to assess whether any measured gains in participation in the targeted sector represent sectoral shifts or an increase in overall employment. Finally, we investigate whether any employment gains or sectoral shifts result in any gains in earnings.

To measure the average impact of the training program, we first estimate intention-to-treat effects by regressing employment outcomes on an indicator for treatment offer and all stratifying variables

[3] Working with Project Implicit (https://implicit.harvard.edu/implicit/) and local focus groups, we collected a set of words that the target group associated with the relevant concepts (home, office, petty trade, professionalism).

(gender, whether the respondent was in National Youth Service Corp (NYSC) or final year of education, whether the respondent was above or below the median baseline skills assessment score, and a vector of indicators for the initial assessment site):

$$y_i = \beta_0 + \beta_1 treat_i + \beta_2 gender_i + \beta_3 NYSC_i + \beta_4 final\ year_i + \beta_5 above\ median_i + \vec{\delta} + \varepsilon_i$$

This specification only makes use of the end line data since most of the sample was in school or in national service at baseline and hence questions such as sector of employment were not applicable. For a sub-set of variables that are measured at baseline, we can also estimate an ANCOVA specification that controls for baseline realizations of the employment outcomes and a vector of controls. We also estimate heterogeneous effects for each stratifying variable.

We can also estimate treatment-on-the-treated effects, in which treatment assignment serves as an instrument for program participation:

$$y_i = \gamma_0 + \gamma_1 program_i + \gamma_2 gender_i + \gamma_3 NYSC_i + \gamma_4 final\ year_i + \gamma_5 above\ median_i + \vec{\delta} + u_i$$

$$program_i = \theta_0 + \theta_1 treat_i + \theta_2 gender_i + \theta_3 NYSC_i + \theta_4 final\ year_i + \theta_5 above\ median_i + \vec{\delta} + \omega_i$$

We define program participation in two different ways, although they are highly correlated. The first uses respondents' self-reports of participation, while the second treats a respondent as a participant only if he or she appears in the attendance records of training providers.

Finally, we use the data from the IATs to measure heterogeneous impacts with respect to biases exhibited at baseline,

$$y_i = \mu_0 + \mu_1 treat_i + \mu_2 bias_i + \mu_3 treat_i * bias_i + \mu_4 NYSC_i + \mu_5 final\ year_i + \mu_6 above\ median_i + \vec{\delta} + \tau_i$$

where bias can be measured explicitly (the difference between self-reported rankings of women's and men's professionalism) or implicitly through the D-score, a within-participant standardized difference between the sorting times for the different pairings of groups (men and women) with concepts (home and office). For the specific gender-based IATs implemented at baseline, positive D-scores indicate stronger implicit bias against women for a particular domain. For example, a positive D-score in the gender and professionalism IAT corresponds to a relatively longer time required to associate women with professionalism (and men with unprofessionalism) than men with professionalism (and women with unprofessionalism). In the above specification, $\mu_3 > 0$ would

suggest that applicants exhibiting bias against women at baseline benefit from the program more. We also use indicators of bias defined using ranges of D-scores provided by the Project Implicit team to indicate different levels of bias (none, moderate, strong).

4. Results

In this section, we describe the baseline characteristics of the sample and present the results of empirical specifications outlined in the previous section. The program increased the average likelihood of working in an ICT job by 1.7 percentage points, an effect driven by more skilled participants, as measured by baseline skills assessment scores. Two years after the training program, the effect can be considered purely a sectoral shift, as overall employment and earnings did not significantly increase. We also present evidence of an average impact that is 2 to 3 times higher for women who at baseline harbored preexisting biases against women's professional work.

4.1. Descriptive statistics

Random allocation of treatment assignment produced balance across the treatment and control groups, with no significant differences across 22 covariates, as shown in Table 1. As one might expect given that college graduates were the target population, the sample appears to be relatively well-off in the Nigerian context. For example, 81 percent of respondents' mothers and 94 percent of fathers are literate, while the literacy rates overall for Nigerians aged 45-49 are 36 percent for women and 65 percent for men. (Macro International 2014).

Appendix Table 3 shows that while over 90 percent of participants were re-interviewed at end line, there was some differential attrition, as we could complete the end line with 92 percent of the treatment group, but only 88 percent of the comparison group responded to the survey. The implications of this for our results are discussed in section 4.4.

Given the lag between the initial assessment and the final allocation of program slots and the political instability immediately before the start of the program, compliance was relatively high. Approximately 54 percent of the treatment group took the offer of training and attended at least one training session (Table 2). There was no "contamination" or crossover attendance in training by the control group. However, administrative attendance data from training providers shows that average attendance at individual training sessions was far lower. In Lagos, Kano, and Kaduna, for example,

training sessions were on average attended by only one-third of those who were selected into treatment.[4]

Figures 1 to 3 present the basic results of the Implicit Association Tests.[5] In general, both female and male applicants on average exhibited little bias against associating women with professionalism (Figure 1). Female applicants exhibited less bias – both explicit and implicit. These biases were stronger when contrasting the concepts of home and office (Figure 2). Consistent with results from large web-based samples (Nosek, Banaji, and Greenwald, 2002), women on average showed a larger implicit bias than men in associating women with the home rather than the office. When it comes to associations between women and petty trade (as opposed to the office), male applicants demonstrated stronger implicit biases than women on average (Figure 3).

Table 3 presents variation in bias across genders, but also (for women) its association with mother's educational and occupational background, program uptake, and attendance. Rows sum to 100 percent. Comparing the overall female averages to females with mothers working in white collar jobs, we see some increase in associating females with professionalism, as 56 percent of women whose mothers have a white-collar job exhibit a pro-female bias, compared to 50 percent of women overall, although this difference is not statistically significant. For the office-vs.-home contrast, however, the averages suggest that having a mother in a white-collar job appears to increase bias against associating women with a career. In Panel B, we can see that women who are more likely to associate women with the office and professionalism, are less likely to enroll in the program and less likely to attend individual sessions. It appears for this population of women, those with less implicit bias may feel less need for this type of training. This pattern is particularly pronounced for professionalism, compared to the office-home or office-petty trade contrasts, indicating the potential for this program to substitute for confidence in one's place in the professional world.

4.2. Basic results

Intention-to-treat estimates suggest a moderate impact of the program on ICT employment (Table 4, Column 1). Two years after training, those offered treatment had a 1.7 percentage point higher likelihood of being employed in the ICT sector, from a base of 6.4 percent, representing a 26

[4] We do not have aggregate attendance figures for training in Enugu.

[5] Appendix Table 4 checks for differences between the full sample and the sample of baseline respondents who took the Implicit Association Tests. Female applicants, final year students, and those taking the assessment in Kano, Kaduna, and Enugu were less likely to take the tests.

percent increase employment in the sector. Impacts on other employment variables (Columns 2 and 3) suggest this gain in ICT employment was only a shift in sectors, as neither overall employment, formal sector employment, nor self-employment significantly increased in response to the program. With currently available data, it is not possible to isolate a specific explanation for this. The program could have provided skills that did not increase the target population's general employability but rather just their potential in the ICT sector. It is also possible that firms outside the sector did not recognize the value of the certification exam that trainees took at the end of the course.

Total hours worked during the week were not significantly different between treatment and comparison groups (Table 4 Column 5). While total earnings did not increase significantly (Column 5), the magnitude of the estimate is quite large, as is the standard error. Moreover, inverse power coefficients (Andrews, 1989) suggest our study had statistical power sufficient to distinguish only effects larger than 42 percent from a zero increase in earnings. Appendix Tables 5 and 6 show that an ANCOVA specification that controls for baseline values of the employment outcomes and a specification that includes a set of demographic and socio-economic variables do not yield qualitatively different results.

In addition to the treatment coefficients, there are several other notable patterns in the data. In all regressions, scoring above the median on the pre-program assessment test is strongly associated with better outcomes, suggesting that the certification assessment does capture skills that are highly valued in the labor market. Applicants that had scored above the median are 90 percent more likely to work in the ICT sector and 42 percent more likely to work in the formal sector. They are 13 percent less likely to be self-employed. Scoring above the median is also associated with an approximately 77 percent premium in earnings. Women, however, have a significant disadvantage in the labor market, even in this relatively high skill/high socio-economic status sample. They are much less likely to work in the ICT sector, they earn half as much as men, and they work 28 percent fewer hours. Applicants initially assessed in Lagos (Nigeria's largest city) also demonstrate a significantly higher likelihood of working in the ICT sector.

Treatment-on-the treated results suggest an impact that is twice as high, both when program participation is self-reported and when it is measured by attendance records (Table 5). This should not be surprising since there was no spillover from the control group into treatment, making the TOT coefficients essentially the ITT coefficients divided by the proportion of the sample that took

up treatment (0.55). All other employment outcomes show the same sign and significance as in the ITT specification, although the effects are notably larger.

4.3. Heterogeneous effects

To check for heterogeneous effects, we first interact treatment with each of the variables that were used to stratify applicants when assigning treatment: gender, test center site, educational status (participation in the National Youth Service Corps versus those in their final year of university or those who had already graduated), and whether the respondent was above or below the median pre-training assessment score (Table 6).

The results in Table 6 Column 1 suggest that the average gains in ICT employment are entirely driven by the applicants who had scored above the median score on the assessment administered at baseline. For this group, the training led to a 4.8 percentage point increase in employment in this sector.

While women are less likely to work in the ICT sector in general, the training program was equally effective for male and female students (Column 2).

The treatment interactions with the geographical location of the applicants' initial assessment sites suggest that all of the gains in ICT employment were concentrated in Abuja (the omitted category), where those offered treatment were 7.7 percentage points more likely to find a job in the ICT sector (Column 3). In the other locations, the training was not effective in increasing employment in this sector. Part of this difference could be due to political issues in Nigeria that intervened between baseline and end line. As indicated above, terrorism affected a number of northern areas during this period (e.g. curfews in Kano after Boko Haram attacks in 2012 (see for example Al Jazeera, 2012)), and we can see significantly lower effects for cities located in these zones.

Finally, applicants applying during their NYSC internship did not benefit any more from the program than final year students, individuals not participating in the internship program, or individuals who had graduated from university much earlier (Column 4).

Table 7 examines the extent to which gender bias mediates program impact. Given that applicants who took the Implicit Association Tests were significantly different than those who skipped this component along some dimensions (Appendix Table 4), we first estimate the basic ITT specification on the sample of applicants who took the IAT. The estimated impact of the program for this sample

is statistically indistinguishable from the full sample estimate presented in Column 1 of Table 4, although the point estimate is larger (Column 1). The remaining specifications examining the relationship between gender attitudes and treatment effects are limited to female applicants.

When bias against thinking of women as professionals is measured explicitly (i.e. through direct survey questions rather than by the IAT), the results suggest that this kind of bias plays no role in making treatment more or less effective (Column 2). An implicit measure of this bias, however, appears to affect treatment impact considerably (Column 3). Panel A shows these results using the D-score, a continuous measure, which is standard in the social psychology literature but does not lend itself to easy comparisons. To construct an indicator variable for easier interpretation, Panel B utilizes the D-score ranges Project Implicit uses to evaluate the strength of measured implicit biases. Both panels indicate that female applicants who were more implicitly biased against associating women with professionalism appear to have benefitted the most from the program. Panel B shows that the treatment effect was three times as large for women with any pro-male bias, as the estimated coefficient of the interaction of treatment and pro-male bias (0.057) is nearly two times as large as the estimated coefficient for the main treatment effect (0.027), where the omitted category is women with no gender-professionalism bias. It is worth noting that given the lower comparison group mean for ICT employment when the sample is restricted to women (2.26 percent), the magnitude of the main treatment effect - 119 percent for unbiased females – is much larger than the average treatment effect estimated for the entire sample estimated in Table 4 (26 percent). The negative coefficient on the interaction of treatment with pro-female bias perhaps explains why on average women did not demonstrate treatment effects that were statistically or economically different from that of men (Table 6). Panel B also shows that, in the absence of treatment, women with a pro-female bias with respect to professionalism are 4.1 percentage points more likely to find employment in the ICT sector. Taken together, these results suggest that the provision of the training program helped women overcome biases that would have otherwise held them back from employment in this sector, which is consistent with other research that has found stereotypes to be malleable to external influences, such as exposure to female politicians (Beaman et al., 2009).[6] Finally, the difference between the results using explicit versus implicit biases with respect to professionalism in modifying treatment impact is also consistent with evidence from social

[6] While there is a literature examining whether changes in IAT measures reflect malleability of attitudes or malleability of the IAT measure itself (for example, Han et al., 2010), this paper is only inferring a change in attitudes from a group's greater employment response to the treatment. The end line survey did not include a second administration of the IAT.

psychology that suggests explicit and implicit biases are separate constructs (Nosek et al, 2009; Nosek et al, 2002).

The other biases related to associating women with the home as opposed to an office (Column 4) or associating women with petty trade as opposed to an office job (Column 5) do not appear to significantly alter the impact of treatment. The treatment interaction with the home-office bias is close to zero (0.006), while the interaction with the petty trade-office bias is larger (0.02) but insignificant. It is possible that these biases are more deep-seated and less malleable than the bias related to women's professionalism, which would also be consistent with the relative variation across different subsamples that we observed in Table 3, where we saw less variation in the office-home bias across sub-samples defined by the educational and occupational background of the respondent's mother and the respondent's engagement with the training program.

Table 8 provides some suggestive evidence that the training experience in the ACCESS Nigeria program could have changed how women viewed their own abilities relative to men's. It lists the subject specific scores on the final assessment. While their total scores were statistically indistinguishable from men's, women did score significantly higher on precisely the oral skills that would have been observable to peers (voice clarity, fluency and vocabulary, grammar, accent, message clarity, language, grammar, and sentence construction), as opposed to those for which trainees would have been tested via computer (such as keyboard skills, internet and browsing skills, MS Office tools, numerical ability, analytical and logical ability).

4.4 Robustness: Attrition

One challenge to the robustness of results in our sample is attrition. While 91% of the sample was successfully reached for end line interviews, there is a correlation between treatment status and attrition: 92% of treatment respondents responded to our survey compared to 88% of control. In other words, 7.75% (142 out of 1,832) of the treatment respondents could not be reached for the end line survey, compared to 12.06% (143 out of 1,186) of the control group.[7]

[7] Other correlates of attrition include geographic variables and parental education. The results are robust to controlling for all of these variables.

To address this issue, we simulate alternate scenarios in which attrition rates were equivalent in treatment and control groups, under increasingly conservative assumptions about labor market outcomes for the attritors, in order to test the robustness of our results.[8] If 52 fewer respondents had attrited in control, attrition proportions would have been equal between treatment and control groups. Therefore, of the actual group of 143 control attritors, we randomly select 52 individuals and generate a simulated data set in which we assign outcome measures to them. (Adding these 52 individuals back into the sample makes the treatment and control attrition rates equivalent, with a treatment attrition of 7.75% (142/1832) and control attrition of 7.67% (91/1186)). We then simulate a world in which the 52 members of this "simulation" respondent group are more likely to get IT jobs compared to the true respondent control group rate of 5.8%. We estimate a range of scenarios, ranging from one where these new simulation respondents are 10% more likely than the rest of the control group to have gotten an ICT job, to scenarios where they are 200% more likely. We take 50 random draws of this group of 52 "simulation attritors" from the population of 143 total attritors, run the same regressions that we reported earlier for the regular sample, and report the p values on coefficients of interest including this simulated group. (We report average p values over the 50 simulations.)

The results of this simulation are shown in Figure 4, which show that the treatment effect for the whole sample with and without strata controls loses significance at the 10% threshold if the attritors reach 90% more likely to have obtained ICT jobs (represented by the value 1.9 on the x-axis of figure 1). However, the heterogeneous effects are highly robust, remaining significant for conventional levels of significance (p=0.05) even if the simulated non-attritors were three times more likely to get ICT jobs than the rest of the control sample (Figure 4, x-axis value of 3).

5. Discussion and conclusion

The program cost to deliver training to each individual was about $606. We observe no impact on earnings and net employment two years after the training. Thus, on the face of it, this training falls into the group of skills programs that do not pass a simple cost-benefit test, as Blattman and Ralston (2015) argue. However, in this paper we document two important non-pecuniary benefits which resulted from the training.

[8] One way that many researchers handle this kind of attrition is with Lee bounds. However, in our main specification, Lee bounds cannot be calculated due to cells without variation in attrition.

First, the program induced switching into the nascent ICT sector in Nigeria. Given the government's focus on developing this sector and its identification of a skills gap as a major constraint to sectoral growth, this policy lever has proved somewhat effective in increasing the employment of people with relevant skills in ICT. The program effects were larger for individuals who had higher baseline skill levels, suggesting that, if labor markets are efficient, the aggregate stock of skills in this emerging sector should grow over time.

More importantly, training programs in new sectors open up the possibility set for workers. On one level, this is evident from our switching results. The switching, however, is significantly more pronounced for women who hold deep-seated biases against women's professionalism and it induced their movement into a currently male-dominated sector. This matters for the economy as a whole on two levels. First, occupational segregation is a major contributor worldwide to the gap between male and female earnings. Second, the lack of mobility across professions based on gender norms is a significant barrier to the efficient functioning of labor markets. This program contained no special gender focus. However, by expanding the possibility set, particularly for women who were less likely to take advantage of jobs in this sector, it contributed to increased efficiency in the labor market. If this or a similar program were taken to a larger scale, the improved efficiency in labor allocation could potentially contribute to the growth of the ICT sector and the economy as a whole.

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Table 1: Descriptive statistics and treatment balance at baseline

	(1)	(2)	(3)	(4)	(5)	(6)
	Descriptive statistics			Balance at baseline		
	Full sample mean	Full sample st dev.	Full sample N	Treatment mean	Comparison mean	p-value of difference
Female	0.36	0.48	3018	0.36	0.35	0.93
Age	25.96	2.91	3018	26.01	25.88	0.26
Christian	0.71	0.45	3018	0.72	0.70	0.21
National Youth Service Corp	0.35	0.48	3018	0.35	0.35	0.95
Final year student	0.46	0.50	3018	0.46	0.47	0.79
Any labor market experience	0.82	0.39	3017	0.82	0.81	0.43
Currently employed	0.17	0.37	3018	0.16	0.18	0.17
Self-employed	0.11	0.31	3018	0.11	0.11	0.99
Any IT training	0.75	0.43	3018	0.76	0.74	0.22
Total score on assessment	3.27	0.70	3018	3.28	3.26	0.37
Above median assessment score	0.50	0.50	3018	0.50	0.50	0.81
Abuja state	0.12	0.32	3018	0.12	0.12	0.85
Kano state	0.30	0.46	3018	0.30	0.30	0.90
Kaduna state	0.20	0.40	3018	0.20	0.20	0.89
Enugu state	0.20	0.40	3018	0.20	0.20	0.96
Lagos state	0.18	0.39	3018	0.18	0.18	0.94
Household size	7.55	5.57	2991	7.48	7.67	0.35
Mother has university education	0.25	0.43	2921	0.24	0.26	0.30
Father has university education	0.29	0.45	2791	0.29	0.29	0.68
Lives with parents	0.43	0.49	3018	0.43	0.42	0.72
Wealth index	0.00	1.57	3013	0.00	0.00	0.96
Financed school with scholarship	0.10	0.30	3018	0.10	0.11	0.46
Aspires to work in IT industry	0.19	0.39	3018	0.20	0.19	0.49
Took Implicit Association Test module	0.64	0.48	3018	0.65	0.63	0.49
Found at endline	0.91	0.29	3018	0.92	0.88	0.00

Notes: States refer to the state in which program applicants took the baseline assessment, survey, and IAT module. The wealth index has been calculated using principle components analysis based on ownership of the following items: television, computer, phone, car, bicycle, motorbike, and camera. The following variables were used to stratify treatment assignment and are thus balanced by construction: female, National Youth Service Corps, final year student, above median assessment score, and all state variables. Appendix Tables 3 and 4 present balance across the baseline and endline samples and across applicants that took the IAT modules and those that did not.

Table 2: Compliance

	(1)	(2)
	Accepts treatment (self-report)	Accepts treatment (administrative data)
Treatment group	0.55	0.54
	(0.01)	(0.01)
Comparison group	0.00	0.00
	(0.00)	(0.00)
Number of observations	3018	3018

Notes: Standard errors in parentheses.

Table 3: Implicit gender biases among applicants and trainees

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Professionalism			**Office vs. Home**			**Office vs. Petty trade**		
	No bias	Pro-female bias	Pro-male bias	No bias	Pro-female bias	Pro-male bias	No bias	Pro-female bias	Pro-male bias
Panel A: Overall means									
Females	0.30	0.50	0.20	0.13	0.04	0.83	0.23	0.14	0.63
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
Males	0.26	0.18	0.57	0.17	0.11	0.72	0.14	0.07	0.79
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Mother works in white collar job (females only)	0.28	0.56	0.17	0.10	0.03	0.87	0.23	0.16	0.61
	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)
Mother has university education (females only)	0.26	0.54	0.19	0.12	0.06	0.82	0.23	0.13	0.64
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)
Panel B: Means by training status (females only)									
Takes up program when offered	0.33	0.44	0.23	0.14	0.02	0.83	0.25	0.13	0.62
	(0.03)	(0.03)	(0.03)	(0.02)	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)
Does not take up program when offered	0.26	0.55	0.19	0.12	0.04	0.84	0.24	0.16	0.60
	(0.03)	(0.03)	(0.03)	(0.02)	(0.01)	(0.03)	(0.03)	(0.03)	(0.03)
Program attendance is at least 50%	0.31	0.43	0.26	0.13	0.00	0.87	0.27	0.12	0.61
	(0.05)	(0.05)	(0.05)	(0.03)	(0.00)	(0.03)	(0.05)	(0.03)	(0.05)
Program attendance less than 50%	0.30	0.51	0.19	0.13	0.04	0.83	0.24	0.15	0.61
	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)

Notes: Overall means and standard errors (in parentheses) provided for full sample in Panel A. Panel B presents means and standard errors for different samples described in the rows.

Table 4: Employment impacts of training program - ITT effects

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed in ICT sector	Employed	Formal sector employment	Self-employment	Hours worked	Ln earnings
Treatment	0.017*	-0.0080	-0.024	0.017	0.73	0.18
	(0.0100)	(0.018)	(0.018)	(0.015)	(1.24)	(0.21)
Female	-0.060***	-0.10***	0.0049	-0.064***	-9.49***	-1.00***
	(0.0094)	(0.019)	(0.018)	(0.015)	(1.20)	(0.21)
National Youth Service Corps	0.013	0.053*	0.073**	-0.025	2.82	-0.024
	(0.016)	(0.028)	(0.029)	(0.025)	(1.97)	(0.32)
Final year student	-0.010	-0.0098	-0.011	-0.030	-1.07	-0.21
	(0.013)	(0.025)	(0.023)	(0.021)	(1.73)	(0.27)
Above median assessment score	0.058***	0.083***	0.14***	-0.042***	2.63**	0.62***
	(0.010)	(0.019)	(0.018)	(0.016)	(1.26)	(0.21)
Kano state	0.025	-0.091***	-0.058*	-0.044	-5.37**	-0.48
	(0.017)	(0.030)	(0.033)	(0.028)	(2.18)	(0.36)
Kaduna state	-0.0042	-0.11***	-0.10***	-0.054*	-7.85***	-0.92**
	(0.017)	(0.033)	(0.034)	(0.030)	(2.35)	(0.38)
Lagos state	0.045**	-0.048	-0.052	-0.011	-1.32	0.0070
	(0.020)	(0.034)	(0.037)	(0.032)	(2.47)	(0.40)
Enugu state	0.0054	-0.22***	-0.16***	-0.075**	-9.41***	-1.48***
	(0.018)	(0.034)	(0.034)	(0.030)	(2.42)	(0.40)
Number of observations	2,709	2,733	2,733	2,733	2,673	2,694
Comparison group mean	0.06	0.64	0.33	0.19	34.37	6.45

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions contain a constant term, not reported here. A total of 2,733 respondents were interviewed at end line. Sufficient information to classify the sector of respondents and calculate hours worked and earnings could only be obtained for subsets of these respondents.

Table 5: Employment impacts of training program -TOT effects

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed in ICT sector	Employed	Formal sector employment	Self-employment	Hours worked	Ln earnings
PANEL A: Program take-up from self-report						
Training	0.030*	-0.014	-0.042	0.030	1.30	0.32
	(0.018)	(0.033)	(0.032)	(0.028)	(2.21)	(0.37)
Number of observations	2,733	2,733	2,733	2,733	2,673	2,694
PANEL B: Program take-up from administrative records						
Training	0.031*	-0.015	-0.043	0.031	1.33	0.33
	(0.018)	(0.034)	(0.033)	(0.028)	(2.26)	(0.38)
Number of observations	2,733	2,733	2,733	2,733	2,673	2,694

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions contain a constant term, not reported here and indicators for all stratifying variables used in the randomized assignment to treatment: gender, being above the median assessment score, state where assessment taken, being a final year student, and participation in National Youth Service Corps.

Table 6: Heterogeneous impacts of training program on employment in ICT sector- ITT effects

	(1)	(2)	(3)	(4)
	By assessment score	By gender	By location	By NYSC-status
Treatment	-0.0064	0.018	0.077***	0.015
	(0.011)	(0.014)	(0.024)	(0.012)
Female	-0.060***	-0.059***	-0.060***	-0.060***
	(0.0093)	(0.014)	(0.0093)	(0.0093)
National Youth Service Corps	0.013	0.014	0.014	0.010
	(0.016)	(0.016)	(0.016)	(0.020)
Final year student	-0.010	-0.010	-0.010	-0.010
	(0.013)	(0.013)	(0.013)	(0.013)
Above median assessment score	0.029*	0.058***	0.059***	0.058***
	(0.016)	(0.010)	(0.010)	(0.010)
Kano state	0.025	0.025	0.064***	0.025
	(0.017)	(0.017)	(0.020)	(0.018)
Kaduna state	-0.0045	-0.0041	0.058***	-0.0042
	(0.017)	(0.017)	(0.021)	(0.017)
Lagos state	0.044**	0.045**	0.079***	0.045**
	(0.020)	(0.020)	(0.025)	(0.021)
Enugu state	0.0051	0.0054	0.036*	0.0053
	(0.018)	(0.018)	(0.020)	(0.018)
Treat x Above median assessment score	0.048**			
	(0.020)			
Treat x Female		-0.0019		
		(0.018)		
Treat x Kano state			-0.063**	
			(0.031)	
Treat x Kaduna state			-0.100***	
			(0.031)	
Treat x Lagos state			-0.056	
			(0.037)	
Treat x Enugu state			-0.050	
			(0.031)	
Treat x National Youth Service Corps				0.0054
				(0.022)
Number of observations	2,733	2,709	2,709	2,733

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions contain a constant term, not reported here. Abuja FCT is the omitted geographical location.

Table 7: Gender bias and heterogeneous impacts of training program on female employment in ICT sector- ITT effects

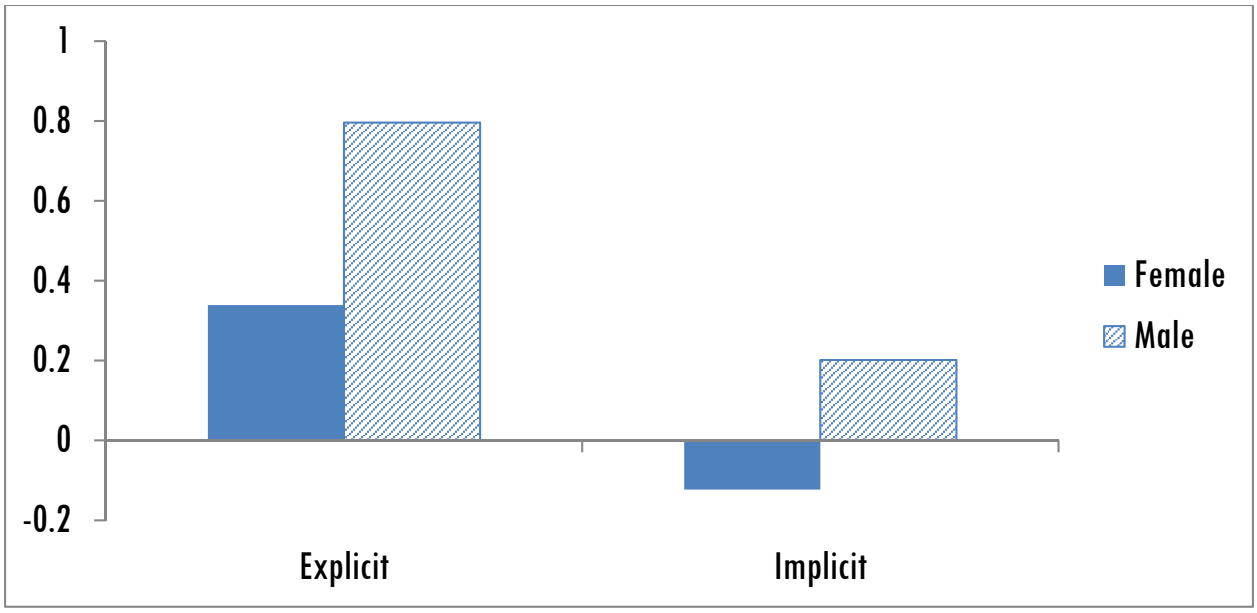
	(1)	(2)	(3)	(4)	(5)
	IAT sample	By explicit bias	By implicit bias	By implicit bias	By implicit bias
Panel A: Continuous D-Score measures bias					
Treatment	0.028**	0.022	0.029**	0.016	0.013
	(0.013)	(0.014)	(0.014)	(0.021)	(0.015)
Gender-professionalism		0.0013	-0.023		
		(0.0037)	(0.015)		
Treat x Gender-professionalism		-0.0072	0.078**		
		(0.0080)	(0.036)		
Home vs. office				0.0094	
				(0.023)	
Treat x Home vs. office				0.0067	
				(0.034)	
Small business vs. office					0.0086
					(0.010)
Treat x Small business vs. office					0.026
					(0.029)
Panel B: Categories of bias					
Treatment			0.027*	0.026	0.0028
			(0.016)	(0.024)	(0.024)
Pro-female bias			0.041**	-0.0011	-0.019
			(0.018)	(0.011)	(0.020)
Pro-male bias			-0.0068	0.016	0.014
			(0.0074)	(0.013)	(0.023)
Treatment x Pro-female bias			-0.037	-0.041	0.049
			(0.027)	(0.028)	(0.037)
Treatment x Pro-male bias			0.057*	-0.0070	0.018
			(0.033)	(0.029)	(0.030)
Number of observations	1,735	682	678	677	672
Comparison group mean	0.07	0.02	0.02	0.02	0.02

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions contain a constant term, not reported here and indicators for all stratifying variables used in the randomized assignment to treatment: gender, being above the median assessment score, state where assessment taken, being a final year student, and participation in National Youth Service Corps. Sample sizes vary across different biases measured because of the way Implicit Association Tests are scored. Data is considered missing for respondents who make too many classification errors or take too long to respond to an item. Scores between 0 and ±0.15 are considered to indicate little to no bias, and this is the omitted category. Positive deviations greater than 0.15 are considered to indicate pro-male bias. Negative deviations less than -0.15 are considered to indicate pro-female bias.

Table 8: Final assessment scores by subject and gender

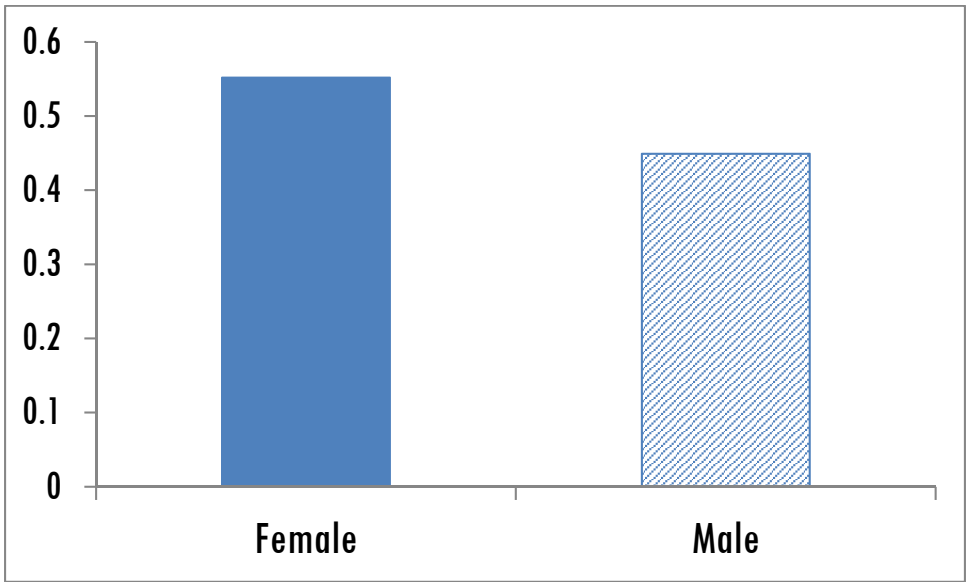
	(1)	(2)	(3)
	Females	Males	p-value
Voice clarity	3.73	3.51	0.001
Fluency and vocabulary	3.70	3.54	0.021
Grammar	3.55	3.42	0.043
Accent	3.35	3.21	0.016
Message clarity	4.00	3.81	0.006
Language, grammar, and sentence construction	5.10	4.88	0.000
Listening comprehension	4.34	4.42	0.286
Reading comprehension	5.27	5.12	0.036
Keyboard skills	3.49	3.50	0.892
Internet and browsing skills	3.24	3.35	0.171
MS Office tools	2.78	2.95	0.045
Numerical ability	3.52	3.61	0.193
Analytical and logical ability	4.08	4.10	0.817
Attention to detail	4.79	4.67	0.116
Total score	3.92	3.86	0.153
Number of observations	350	657	

Figure 1 : Explicit and implicit biases related to gender and professionalism



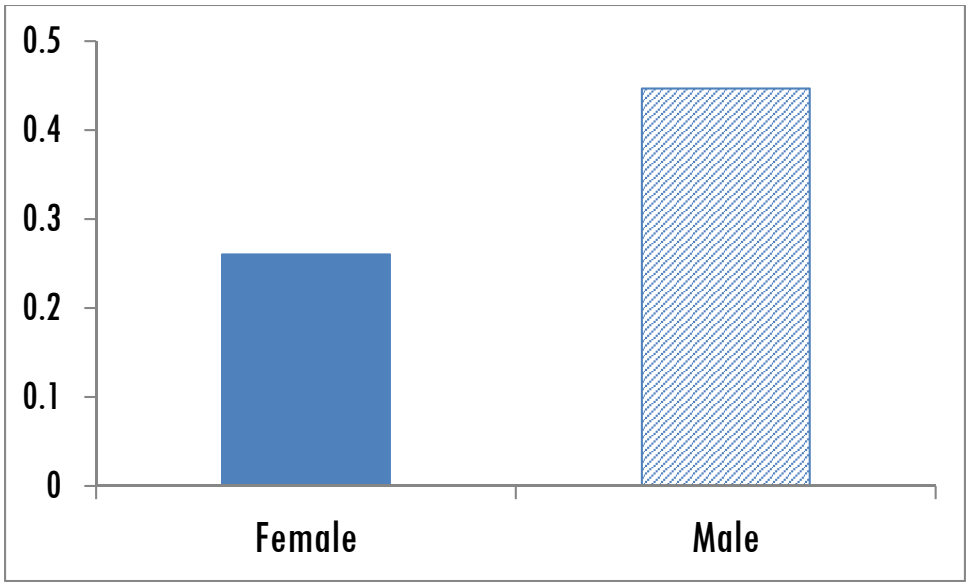
Notes: Explicit and implicit scores are not directly comparable. Explicit associations were measured by questions that asked respondents to rate the professionalism of university educated men and women on a scale of 0 to 10. This graph presents the average of the within-respondent normalized difference between men and women's ratings. Implicit associations were measured by Implicit Association Tests. This graph presents the D-score (Greenwald et al, 1998), or the within-participant standardized difference between the sorting times for the different pairings of groups (men and women) with concepts (professional and unprofessional). For both explicit and implicit ratings, higher scores indicate an easier association between men and professionalism. D-scores between 0 and ±0.15 are considered to indicate little to no bias. Absolute deviations between 0.15 and 0.35, 0.35 to 0.65, and greater than 0.65 are considered to be slight, moderate, and strong associations, respectively.

Figure 2 : Implicit biases related to gender and career



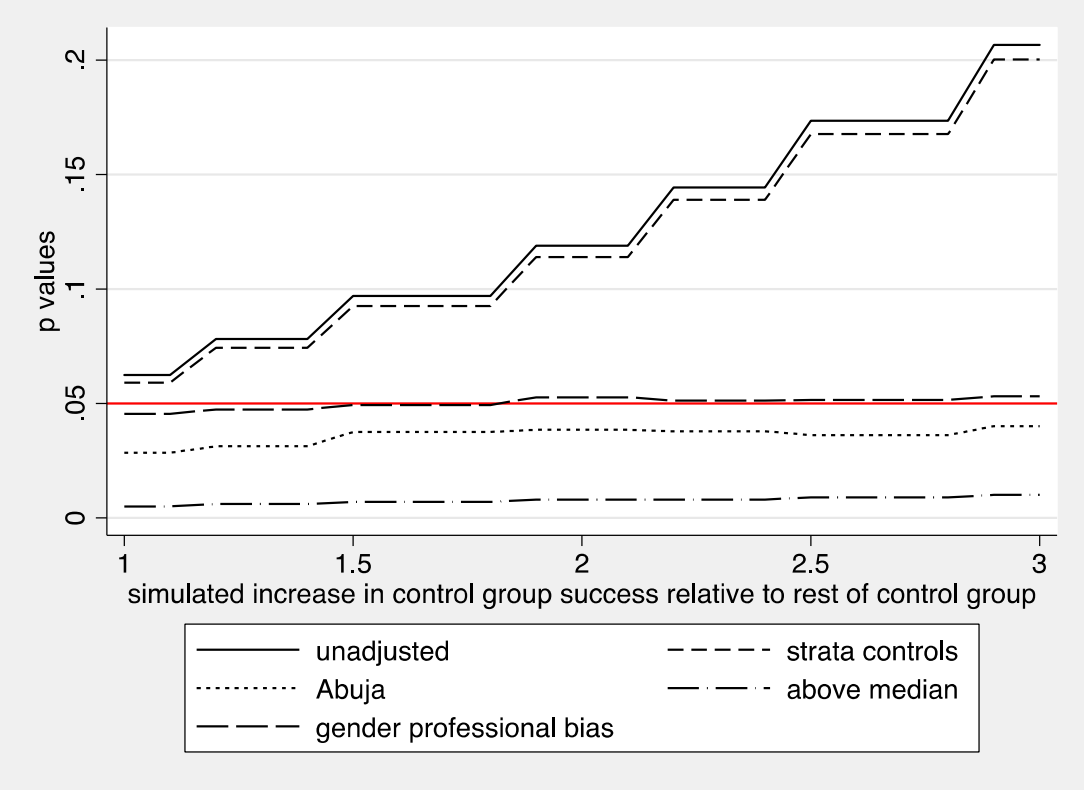
Notes: Implicit associations were measured by Implicit Association Tests. This graph presents the D-score (Greenwald et al, 1998), or the within-participant standardized difference between the sorting times for the different pairings of groups (men and women) with the concepts home and office. Higher scores indicate an easier association between men and a career. Scores between 0 and ±0.15 are considered to indicate little to no bias. Absolute deviations between 0.15 and 0.35, 0.35 to 0.65, and greater than 0.65 are considered to be slight, moderate, and strong associations, respectively.

Figure 3 : Implicit biases related to gender and sector



Notes: Implicit associations were measured by Implicit Association Tests. This graph presents the D-score (Greenwald et al, 1998), or the within-participant standardized difference between the sorting times for the different pairings of groups (men and women) with the concepts office and petty trade. Higher scores indicate an easier association between men and an office career. Scores between 0 and ±0.15 are considered to indicate little to no bias. Absolute deviations between 0.15 and 0.35, 0.35 to 0.65, and greater than 0.65 are considered to be slight, moderate, and strong associations, respectively.

Figure 4: Attrition simulation p-values



Appendix

Appendix Table 1: Example test structure for gender and professionalism Implicit Association Test

Block	Number of trials	Items assigned to left-key response	Items assigned to right-key response
1	16	Faces of males	Faces of females
2	16	Professional words	Unprofessional words
3	16	Professional words + faces of males	Unprofessional words + faces of females
4	32	Professional words + faces of males	Unprofessional words + faces of females
5	32	Faces of females	Faces of males
6	16	Professional words + faces of females	Unprofessional words + faces of males
7	32	Professional words + faces of females	Unprofessional words + faces of males

Note: This table presents one of two sequences of blocks used for the gender-professionalism IAT. In another sequence, respondents were first asked to pair professional words with female faces and unprofessional words with male faces. Respondents were randomly assigned to a sequence. Blocks 3, 4, 6, and 7 are used to compute the d-score, the main measure of implicit association used in the analysis.

Appendix Table 2: Stimuli for Implicit Association Test module

Bias	Stimuli
Explicit: Gender and professionalism	*A professional has high expertise and is honest, responsible, and hardworking. Those who have low expertise and are dishonest, careless, or lazy are unprofessional. How professional are younger females with a university degree* (10=very professional, 0=very unprofessional)? *How professional are younger males with a university degree* (10=very professional, 0=very unprofessional)?
Implicit: Gender and professionalism	Terms for professional: *Honest, competent, hardworking, responsible* Terms for unprofessional: *Lazy, incompetent, dishonest, careless*
Implicit: Office and home	Terms for office: *Conference, executive, manager, salary* Terms for home: *Family, marriage, kitchen, children*
Implicit: Office and petty trade	Terms for office: *Conference, executive, manager, salary* Terms for petty trade: *Trading, secondhand, market, keke napep*

Appendix Table 3: Attrition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Full			Treatment			Control		
	Reached at endline	Attrite	p value	Reached at endline	Attrite	p value	Reached at endline	Attrite	p value
Female	0.35	0.39	0.26	0.35	0.39	0.33	0.35	0.38	0.55
Age	25.98	25.70	0.12	26.02	25.79	0.36	25.92	25.62	0.24
Christian	0.71	0.71	0.93	0.72	0.72	0.98	0.70	0.70	0.97
National Youth Service Corp	0.34	0.42	**0.01**	0.34	0.42	**0.06**	0.34	0.41	**0.09**
Final year student	0.46	0.45	0.62	0.47	0.42	0.25	0.46	0.48	0.68
Any labor market experience	0.82	0.83	0.53	0.82	0.83	0.78	0.81	0.83	0.49
Currently employed	0.17	0.17	0.79	0.16	0.14	0.54	0.17	0.20	0.41
Self-employed	0.11	0.11	0.81	0.11	0.12	0.64	0.11	0.10	0.90
Any IT training	0.75	0.79	0.14	0.76	0.82	**0.07**	0.74	0.76	0.68
Total score on assessment	3.26	3.37	**0.01**	3.27	3.39	**0.05**	3.24	3.35	**0.08**
Above median assessment score	0.49	0.55	**0.09**	0.50	0.54	0.31	0.49	0.55	0.15
Abuja state	0.12	0.15	**0.08**	0.11	0.18	**0.03**	0.12	0.13	0.73
Kano state	0.29	0.39	**0.00**	0.29	0.37	**0.04**	0.29	0.40	**0.01**
Kaduna state	0.21	0.12	**0.00**	0.21	0.09	**0.00**	0.21	0.15	**0.09**
Enugu state	0.21	0.15	**0.02**	0.21	0.12	**0.01**	0.20	0.17	0.41
Lagos state	0.18	0.20	0.50	0.18	0.24	**0.07**	0.19	0.15	0.36
Household size	7.57	7.44	0.73	7.48	7.50	0.95	7.71	7.39	0.51
Mother has university education	0.24	0.31	**0.02**	0.23	0.34	**0.01**	0.26	0.27	0.72
Father has university education	0.28	0.36	**0.01**	0.28	0.39	**0.01**	0.28	0.33	0.18
Wealth index	0.01	-0.10	0.27	0.01	-0.08	0.51	0.01	-0.12	0.37
Lives with parents	0.42	0.44	0.57	0.42	0.48	0.21	0.42	0.41	0.66
Financed school with scholarship	0.10	0.12	0.48	0.10	0.09	0.71	0.10	0.14	0.20
Aspires to work in IT industry	0.19	0.21	0.33	0.19	0.22	0.50	0.18	0.21	0.44
Took IAT module	0.63	0.69	**0.08**	0.64	0.72	**0.07**	0.62	0.66	0.44

Notes: States refer to the state in which program applicants took the baseline assessment, survey, and IAT module.
The wealth index has been calculated using principle components analysis based on ownership of the following items: television, computer, phone, car, bicycle, motorbike, and camera.

Appendix Table 4: Participation in Implicit Association Test

	Took IAT
Treatment	-0.017
	(0.016)
Female	-0.077***
	(0.017)
National Youth Service Corps	-0.032
	(0.025)
Final year student	-0.10***
	(0.022)
Above median assessment score	0.0037
	(0.017)
Kano state	0.12***
	(0.026)
Kaduna state	0.49***
	(0.030)
Lagos state	-0.031
	(0.028)
Enugu state	0.35***
	(0.032)
Christian	-0.0042
	(0.020)
Age	-0.0017
	(0.0031)
Any labor market experience	-0.021
	(0.022)
Wealth index	0.0097*
	(0.0052)
Any IT training	-0.017
	(0.019)
Employed	0.00076
	(0.022)
Self-employed	-0.042
	(0.026)
Took endline	-0.0018
	(0.027)
Number of observations	3,012

Appendix Table 5: Employment impacts of training program - ITT effects with controls

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed in ICT sector	Employed	Formal sector employment	Self-employment	Hours worked	Ln earnings
Treatment	0.017*	-0.011	-0.024	0.016	0.39	0.16
	(0.0099)	(0.018)	(0.018)	(0.015)	(1.23)	(0.21)
Female	-0.058***	-0.077***	0.013	-0.050***	-8.29***	-0.84***
	(0.0097)	(0.019)	(0.019)	(0.016)	(1.23)	(0.22)
National Youth Service Corps	0.012	0.045	0.066**	-0.022	2.48	-0.044
	(0.016)	(0.028)	(0.029)	(0.025)	(1.97)	(0.32)
Final year student	-0.0077	0.020	0.0018	-0.013	0.80	0.022
	(0.014)	(0.025)	(0.024)	(0.021)	(1.72)	(0.28)
Above median assessment score	0.057***	0.11***	0.15***	-0.032*	3.55***	0.79***
	(0.011)	(0.019)	(0.019)	(0.016)	(1.27)	(0.21)
Kano state	0.030*	-0.070**	-0.051	-0.033	-4.14*	-0.34
	(0.017)	(0.030)	(0.033)	(0.028)	(2.15)	(0.36)
Kaduna state	0.0079	-0.11***	-0.10***	-0.049	-6.67***	-0.90**
	(0.017)	(0.033)	(0.035)	(0.031)	(2.39)	(0.39)
Lagos state	0.051**	-0.045	-0.047	-0.0070	-1.27	0.068
	(0.020)	(0.033)	(0.037)	(0.032)	(2.44)	(0.40)
Enugu state	0.0090	-0.16***	-0.12***	-0.048	-6.85***	-0.95**
	(0.019)	(0.035)	(0.035)	(0.031)	(2.46)	(0.41)
Age	0.0012	0.026***	0.012***	0.010***	1.23***	0.16***
	(0.0019)	(0.0032)	(0.0032)	(0.0030)	(0.22)	(0.037)
Wealth index	-0.00018	-0.0047	-0.0063	0.0078	-0.27	-0.0013
	(0.0030)	(0.0057)	(0.0051)	(0.0050)	(0.39)	(0.062)
Christian	0.020*	-0.023	-0.026	-0.00094	1.47	-0.31
	(0.012)	(0.023)	(0.022)	(0.020)	(1.56)	(0.25)
Any experience at baseline	-0.0073	0.065***	0.017	0.022	2.36	0.44
	(0.012)	(0.025)	(0.022)	(0.020)	(1.61)	(0.27)
Employed at baseline	0.011	0.065***	0.085***	0.019	3.29*	0.79***
	(0.014)	(0.024)	(0.026)	(0.022)	(1.71)	(0.27)
Self-employed at baseline	0.037**	0.045	-0.0012	0.054**	6.91***	0.57*
	(0.018)	(0.028)	(0.029)	(0.027)	(2.13)	(0.32)
Any IT training at baseline	0.037***	0.012	-0.0018	0.011	2.45*	0.076
	(0.0098)	(0.021)	(0.020)	(0.018)	(1.40)	(0.24)
Number of observations	2,728	2,728	2,728	2,728	2,668	2,689
Comparison group mean	0.075	0.644	0.330	0.187	34.369	6.445

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions contain a constant term, not reported here. A total of 2,733 respondents were interviewed at endline. Sufficient information to classify the sector of respondents and calculate hours worked and earnings could only be obtained for subsets of these respondents.

Appendix Table 6: ANCOVA estimates - ITT effects

	(2)	(3)	(4)	(6)
	Employed	Formal sector employment	Self-employment	Ln earnings
Treatment	-0.0067	-0.024	0.017	0.056
	(0.018)	(0.018)	(0.015)	(0.039)
Female	-0.11***	0.0031	-0.062***	-0.15***
	(0.019)	(0.018)	(0.015)	(0.040)
National Youth Service Corps	0.050*	0.070**	-0.021	0.060
	(0.028)	(0.029)	(0.025)	(0.062)
Final year student	-0.0044	-0.012	-0.026	-0.056
	(0.025)	(0.023)	(0.021)	(0.053)
Above median assessment score	0.082***	0.14***	-0.040**	0.12***
	(0.019)	(0.018)	(0.016)	(0.039)
Kano state	-0.089***	-0.061*	-0.042	-0.27***
	(0.030)	(0.033)	(0.028)	(0.066)
Kaduna state	-0.11***	-0.10***	-0.054*	-0.39***
	(0.033)	(0.034)	(0.030)	(0.069)
Lagos state	-0.039	-0.055	-0.010	-0.23***
	(0.034)	(0.037)	(0.031)	(0.071)
Enugu state	-0.21***	-0.16***	-0.071**	-0.55***
	(0.035)	(0.034)	(0.030)	(0.071)
Employed at baseline	0.086***			
	(0.024)			
Employed in formal sector at baseline		-0.035		
		(0.023)		
Self-employed at baseline			0.070***	
			(0.027)	
Ln expenditures at baseline				0.012***
				(0.0031)
Number of observations	2,733	2,733	2,733	2,714

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions contain a constant term, not reported here. A total of 2,733 respondents were interviewed at endline. Sufficient information to classify the sector of respondents and calculate hours worked and earnings could only be obtained for subsets of these respondents.