Remote delivery of STEM and entrepreneurship role models at scale changes college major choice

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Abstract

Youth often decide what to study with limited exposure to anyone working in many high-paying careers they could consider. In-person visits from role models can change behaviors through information and inspiration, but are difficult to scale and typically give youth exposure to only one person in one career path. We conduct a large-scale randomized trial with 29,243 students in 813 high schools across Ecuador to test the impacts of providing students video interviews with multiple role models in both STEM and entrepreneurship careers. Girls treated with these role models increase their stereotypes about STEM, express less interest in studying and working in science, and reduce their likelihood of choosing a STEM major by 6.3 percentage points (s.e. 2.3), increasing enrolment in business majors instead. Boys also express less interest in studying and working in science, and shift their major choice away from STEM (by 6.5 percentage points (s.e. 3.0)) and towards business and to other majors like agriculture and humanities. These impacts do not vary significantly with the gender mix of the role models, and reflect students seeing the STEM role models as showing their careers to be more challenging and to involve more stigma than for business.

Introduction

Historically youth have relied only on very local information for making decisions about careers, basing it on the experience of family, friends, and community members. But this means that if they have limited exposure to people in high-paying careers, they may not know what is involved nor consider alternative career choices (Wilson 1987, Jensen 2010, Nguyen, 2008). This may be particularly important for emerging careers in STEM (science, technology, engineering, and mathematics) and high-growth entrepreneurship, where few children may have parents in these fields. Yet these fields are crucial for innovation and job creation, and policymakers around the world are interested in boosting enrolment in these fields.

A popular approach to overcoming this lack of exposure to alternative career paths is to provide youth with short presentations by role models (Serra, 2022). A role model can represent what is

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possible, provide information and behaviors that students can act on and copy, and provide inspiration to consider something new (Morgenroth et al, 2015). A common approach is to have a recent graduate or someone successful with a relatable background come and do an in-person presentation to a classroom of students. Multiple evaluations have found these personal visits to shift student educational aspirations and choices (Nguyen, 2008, Kipchumba et al, 2021), especially when female role models are used to encourage female students to consider male-dominated careers such as those in STEM (Breda et al, 2023, Agurto et al, 2021), entrepreneurship (Lafortune et al, 2018), and economics (Porter and Serra, 2020). However, such in-person visits can be highly dependent on the personality of a single person, be less effective for those who do not relate to the role model, may be difficult and expensive to scale while maintaining the quality of the role model used, and often give youth a view of only one career path.

Digital tools and technology offer the potential to enable youth to be exposed to a much broader variety of role models and for this to be done at scale. Youth may indirectly connect with role models through watching soap operas (La Ferrera et al, 2012, Banerjee et al, 2019), reality shows (Bjorvatn et al, 2020), and movies (Riley, 2024). A more direct approach has been to film video interviews with role models and then screen these in schools (Bahn, 2020, Ahmed et al, 2024). To date such approaches have typically focused on interviews with only a small number of role models, all of the same gender, with an emphasis on getting students to continue in school or work after graduation.

This study tests the effectiveness of remote delivery of role models at scale by providing high school students with online video interviews. We conduct an experiment in Ecuador with 29,243 students in 813 schools, and provide them with not just one career path, but with role models in both STEM and entrepreneurship careers. Students are exposed to both same gender and opposite gender role models. Exposure to a variety of role models provides students with multiple perspectives on different career paths, with the goal of enabling them to make a more informed choice of college major. We demonstrate the feasibility of online delivery at low cost (86 cents per student) in a developing country setting.

We find online delivery of role models does change both student beliefs and attitudes towards STEM and business, as well as college major choices, but in unexpected ways that differ from the majority of role model experiments. Both male and female students shift beliefs, study interest, and college major enrollment away from STEM, towards alternative career paths, irrespective of the gender mix of role models they were shown. We attribute these results in part due to

presenting them with role models that also show an alternative career path (of entrepreneurship). We had students score the STEM and business role models on a variety of dimensions, and find large differences in how they compare in relative terms: with the STEM role models being seen as showing STEM careers to be harder and more male-dominated endeavors than business, and to involve more social stigma.

Reaching students when they are about to make a career-impacting choice of what to study is an intervention that can have lasting impacts (Hastings et al, 2016, Chetty et al, 2016). However, since treatment may have such long-lasting career effects, a less paternalistic approach than simply using role models to nudge students towards one career path may be preferred. This may especially be the case when intervening at scale in high schools. Impacts of successful smaller scale interventions can diminish with scale due to difficulties maintaining treatment quality, and to the variety of participants increasing to include those who may benefit less (List, 2022). Our online intervention enables quality to be maintained at scale and a wider variety of student interests to be catered to. We find that scaling up to present more choice options may reverse typically observed role model treatment effects.

Results

In March 2020, the coronavirus outbreak hit Ecuador, forcing it to call off regular classes. The school year started again on May 4, 2020, but remotely. To deal with learning disruptions, the Ministry of Education established the program “Aprendamos Juntos en Casa” (*Let’s learn together at home*) to offer online education to students nationwide. Our intervention takes place as part of a larger project of collaboration with the Ministry called “Showing Life Opportunities”, designed to promote learning in science and entrepreneurship. This content was inserted for technical students in their last year of high school.

A customized online learning platform was developed that had self-paced lessons for students to work through, with a combination of student, teacher, and system-level nudges used to encourage students accessed and completed the material (Asanov et al, 2023). We chose this platform as it allows students to work on multiple gadgets such as phones, tablets, or laptops. Indeed, a rapid response survey found that three-quarters of students could access the Internet from their homes, while some others were able to use hotspots or manage to visit their neighbors or teachers with an Internet connection (Asanov et al. 2021). This suggests a large heterogeneity in Internet speed. We anticipated such an issue and managed to reduce the differences in exposure by uploading the videos to a commercial platform that adapts the videos to the user's Internet speed. Video quality gets slightly reduced when students experience a low Internet speed and comes

back to the regular quality when the speed improves. Since this material was part of the public policy during COVID-19, the Ministry of Education worked together with other public entities to improve Internet connection in remote areas by expanding the hotspots and financing mobile connectivity. Teachers organized students in such a way most of them manage to access the content. This study is then restricted to those who could get online.

Half (n=407) of the schools were assigned to the role model intervention, in which students were assigned to watch two 30-minute videos featuring interviews with ten entrepreneurs and ten scientists from Ecuador, while students in the control schools instead viewed regular educational content from the Ministry of Education's EducaTV channel on unrelated topics such as "Love" and "Music". In these interviews the role models discuss what a typical day looks like in their work, why they chose this work, the skills needed for success, what inspires them, and their advice for those considering this career. Examples of STEM role models include an electrical engineer who had developed a device to help the blind, an environmental scientist who had received a patent for an invention that uses crab waste for environmental remediation, and a molecular biologist working on cancer. Examples of entrepreneurial role models include business owners running companies in sustainable coffee, tourism, and creative baby clothing. The Methods section provides more details on the selection and characteristics of these role models, who were all relatively young (aged 24-34) so that they would be relatable to students, and contained a mix of genders and ethnicities.

Using technology enabled us to deliver exposure to a wide variety of role models in both STEM and entrepreneurship careers at scale, reaching over 29,000 students throughout the country. Data from the platform suggest that all students watched at least one role model or placebo segment, and 94% of treated students watched between 19 and 20 segments (10 STEM professionals and 10 Entrepreneurs) while 94.1% of placebo students watched the targeted four placebo videos. These high take-up rates reflect both efforts made to ensure access to the internet, as well as the content being required of students.

We examine how this first changed attitudes and beliefs around studying science and business, and then the subsequent choice of university major.

Impact on Beliefs and Attitudes towards STEM and Business

After watching the videos students were asked which 2-digit occupations they were most interested in working in, which we use to code a preference for a STEM job. A midline survey was administered to a sample of the students through the online platform 2 to 6 weeks after seeing the role model (or placebo) videos. This survey collected data on student beliefs about the income

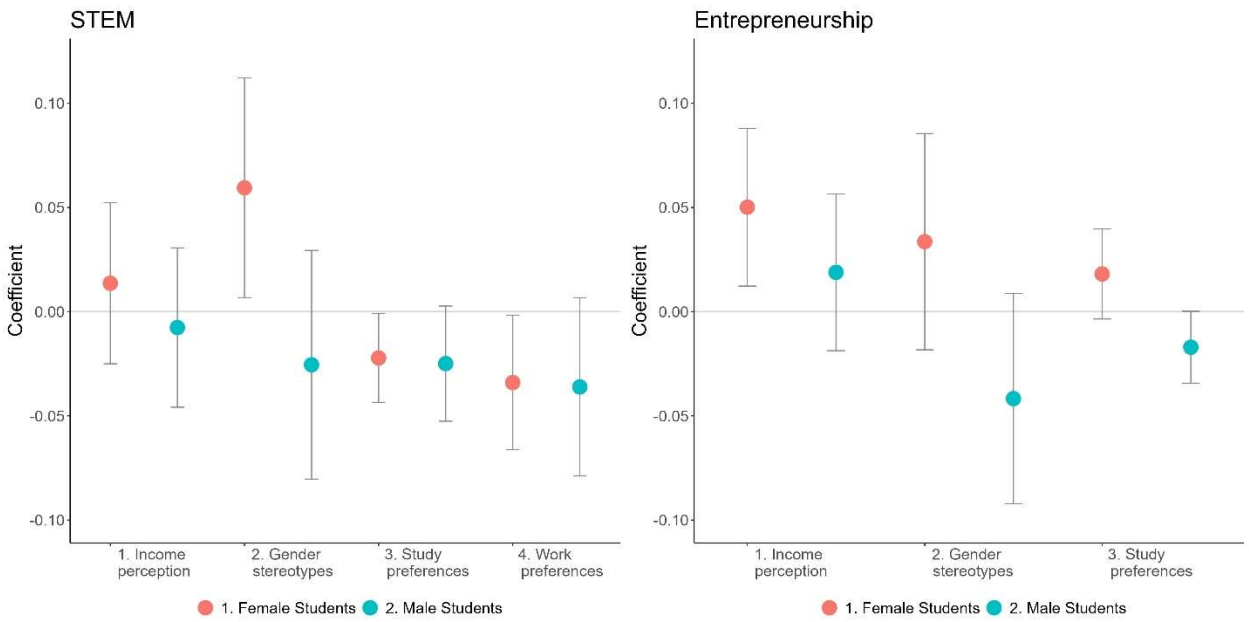
to be earned in STEM and entrepreneurship careers, and on their preferred choice of major if they were to attend college. An endline survey three months after the intervention (collected in half the sample) also collected perceptions about gender stereotypes. Figure 1 shows the treatment impacts on these beliefs and attitudes for the sample who proceed to higher education (Table S1 in the supplementary materials provides sample means, sharpened q-values, and tests of equality of means by gender, and Table S2 shows results for the full sample, which includes many students who are not intending to engage in further study).

Students in the control group believe that STEM occupations pay 50 to 60 percent more than entrepreneurship. The role model videos do not change this perception very much, although female students increase their perceived returns from entrepreneurship by 5 percent after exposure to the role models. Although we include both female and male role models, the role model videos increased the extent to which female students agreed with stereotypes such as thinking men have more natural aptitude in these subjects than women, or have more chance to succeed than women. In contrast, watching the videos has a negative, but not statistically significant, impact on the extent to which male students agree with these stereotypes. Since male students in the control group were more likely to agree with these stereotypes than female students, treatment therefore reduces the gender gap in agreement with stereotypes.

Being assigned to the role model videos reduces girls' preference for studying STEM by 2.2 percentage points relative to a control mean of 21 percent, a 10 percent reduction, and reduces their preference for working as a STEM professional by 3.4 percentage points. Boys have a much higher preference for studying STEM in the control group, at 53 percent. We find the role model videos result in a similar magnitude reduction of 2.5 percentage points in preferences for studying STEM ($p=0.685$ for testing equality of impacts with girls), and 3.6 percentage point reduction in preferences for working in STEM ($p=0.385$ for testing equality of impacts with girls).

Business is preferred more as a major among girls in the control group (24%) than boys (10%). The role model videos increase this gap further. The reduction in interest in studying STEM among girls is largely offset by a 1.8 percentage point increase in a preference for studying business, whereas boys further reduce interest in studying business by 1.7 percentage points. The gender difference is statistically significant, even though the individual point estimates for female students are not, and the decline in interest among male students does not hold unconditionally, nor after correcting for multiple testing ($q=0.184$).

Figure 1: Changes in beliefs and attitudes about STEM and business majors and careers



Note*:* Impacts are for the students continuing to higher education. The figure illustrates the treatment effects of watching Business and STEM role models, irrespective of their gender composition, on the preferences for study and work, income beliefs, and stereotype beliefs. It separately shows the impact of boys (blue dots) and girls (red dots), along with 95 percent confidence intervals based on standard errors clustered at the school level. We collect work preferences immediately after watching the treatment videos. We gather data on study preferences and income beliefs from a mid-term survey two weeks (Highlands and Amazon) or six weeks (Coast) after watching the treatment videos. Finally, we collected gender stereotype beliefs three months after watching the intervention for students at the Coast regime (half of the sample). The solid grey line accounts for no effect. Table S1 provides adjusted q-values and tests of equality of impacts by gender, while Table S2 provides impacts unconditional on continuing to further education.

Impact on Choice of College Major

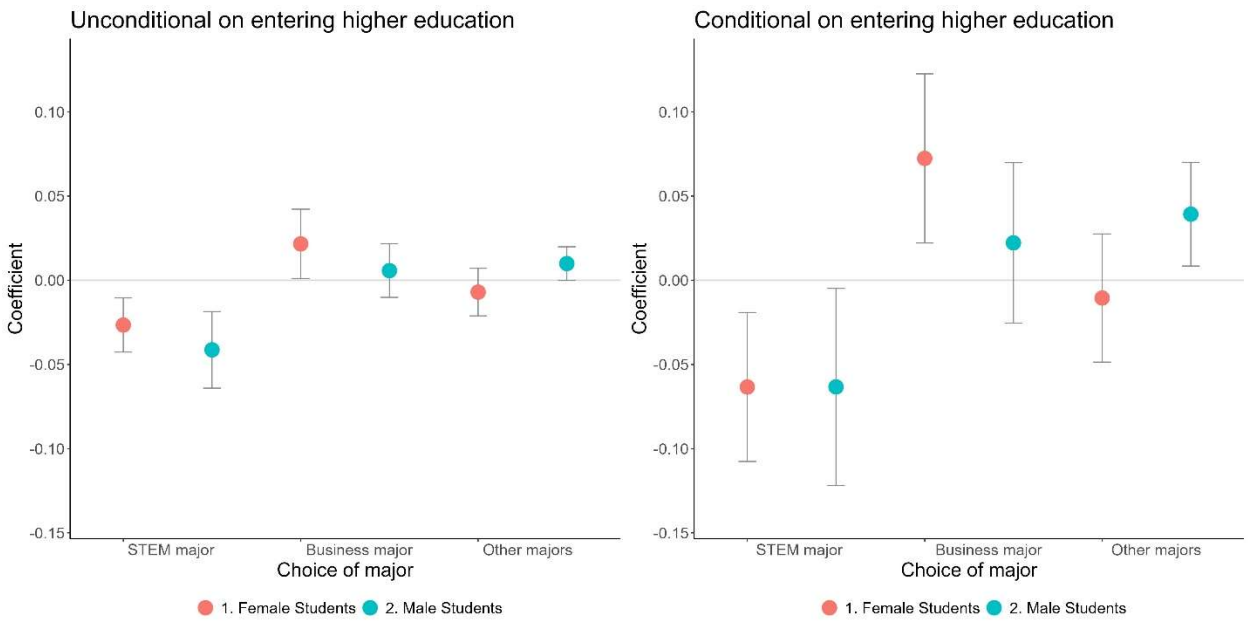
We use administrative records from the Secretary of Higher Education (Senescyt) to track these students after graduation and see whether they enroll in university and their choice of major. 33% of students enroll in higher education, with this rate being slightly higher for girls (35%) than boys (32%). STEM majors such as engineering and information and computational technologies are heavily male-dominated, while business majors are female-dominated. In our control group, conditional on enrolling, 68.6% of male students chose a STEM major, 12.7% business, and 18.7% another subject, whereas only 28.5% of female students chose a STEM major, 30.2% business, and the plurality of 41.2% chose something other than STEM or business.

Being assigned to the role model treatment causes both male and female students to be less likely to choose STEM as a major. Figure 2 summarizes the treatment impacts of our role models intervention on choice of major, with the left panel showing results for the full sample including

those who do not enroll in college, and the right panel conditioning on enrollment (Table S3 in the supplementary materials provides additional detail and shows that treatment has a small negative impact on the likelihood of enrolling at all). Female students are 6.3 percentage points less likely to chose STEM as a major after enrolling, reducing further the low representation of women in this field by 22% relative to the control mean. Male students have a similar magnitude reduction of 6.3 percentage points (p=0.836 for testing equality of impacts by gender), although this is a smaller proportional reduction of 9% relative to the control mean. These impacts remain statistically significant, but are smaller in magnitude when we do not condition on enrolment.

The reduction in STEM is offset by a similar magnitude increase in enrolment in business programs for female students, with a 7.2 percentage point increase conditional on enrolling in college. The increase in business enrolment is much smaller for male students at 2.2 percentage points, which is not statistically significant, and is significantly less than the increase for female students (p=0.016). The result is that business majors become even more female-dominated. More of the male students switch to other majors apart from STEM or business, with a 3.9 percentage point increase. Looking in more detail within these other majors, the main increases appear to be in agriculture, and in humanities and arts, which have very low initial enrolment rates, and double the number of male students enrolling in them after the role model treatment.

Figure 2: Impact on Actual Major Choices



Note: The figure illustrates the treatment effects of watching Business and STEM role models, irrespective of gender composition, on the choice of major unconditional (Panel 1) and conditional (Panel 2) on entering college. It separately shows the impact of boys (blue dots) and girls (red dots). We collect students' choice of major by examining administrative records of the Ministry of Higher Education of Ecuador (Senescyt). Thus, it captures actual postsecondary academic decisions. The solid grey line accounts for null effects. Table S3 provides adjusted q-values and tests for equality of impacts by gender.

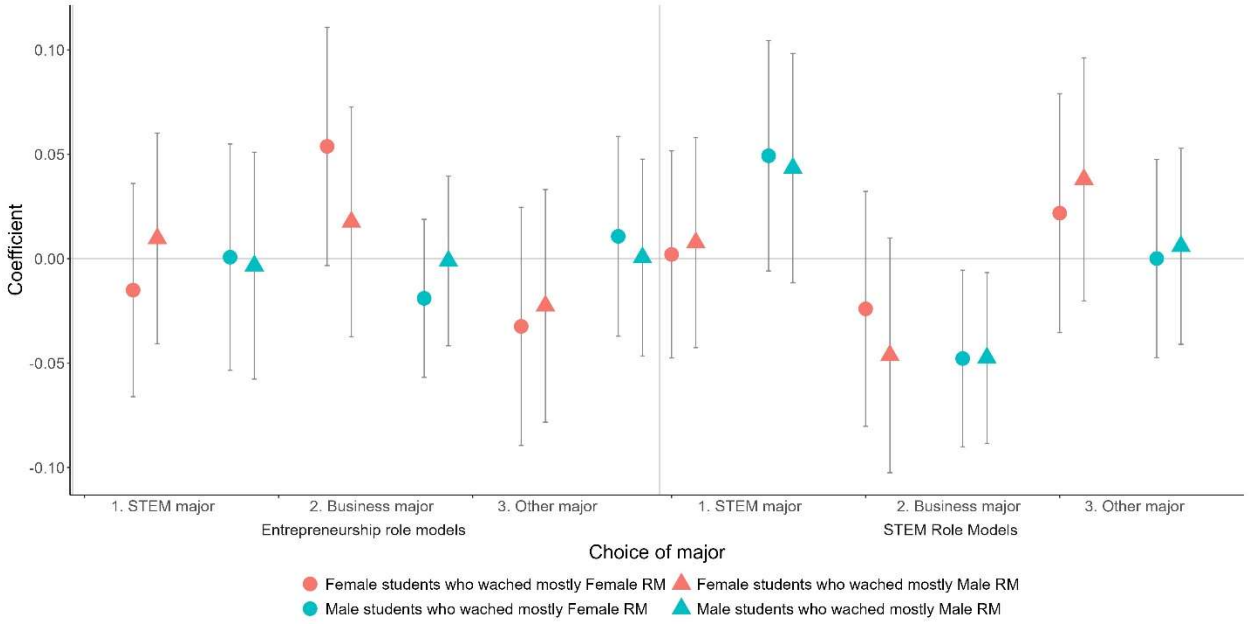
We use the generic machine learning approach of Chernozhukov et al. (2023) to examine whether there is detectable heterogeneity in the treatment effect on major choice by baseline characteristics that capture student academic ability, socioeconomic status, motivation, initial beliefs and preferences towards STEM and business, and knowledge of people working in these fields. For both male and female students we are unable to reject the null hypothesis of no predictable heterogeneity (Table S4 in the supplementary materials).

Does the gender mix of the role models matter?

Students in the treatment group watched 10 different video segments featuring STEM professionals, and 10 featuring entrepreneurs. We randomized at the individual level which role models they saw segments from, with each segment having an equal probability of featuring a male or female role model. This ensures that on average students were exposed to a balanced gender mix of role models. However, this design also enables us to examine whether impacts differ according to whether they were randomly assigned to view more female or male role models of a particular type. We then look only within the treatment group, and test whether outcomes differ for those exposed to a gender-imbalanced mix of role models compared to a balanced mix.

Figure 3 shows that the gender mix of the role models has a limited impact on the choice of major among those assigned to the role model treatment. The differential impact of having an imbalanced set of role models is typically small in magnitude and statistically insignificant. For example, 22.5% of female students select a STEM major when exposed to a balanced mix of STEM role models, and this is only 0.2 percentage points lower when the STEM role models are mostly male, and 0.4 percentage points higher when the STEM role models are mostly female. Table S5 in the supplementary materials shows that we can never reject that the effect on female students of having mostly female role models is the same as this effect on male students, and similarly for having male role models. The only significant difference occurs for male students, who are less likely to choose business majors when they see mostly male STEM role models, or mostly female STEM role models, with this effect not significant after correcting for multiple testing.

Figure 3: Choice of major does not vary much with the gender mix of the role models



Note: Analysis only for those assigned to treatment who enroll in college. The figure illustrates the difference in college major chosen conditional on entering college, among the treatment group for those randomly selected to see mostly role models of one gender (circles for mostly female, triangles for mostly male) compared to those randomly selected to see a balanced gender mix. Table S5 provides adjusted q-values and tests for equality of impacts.

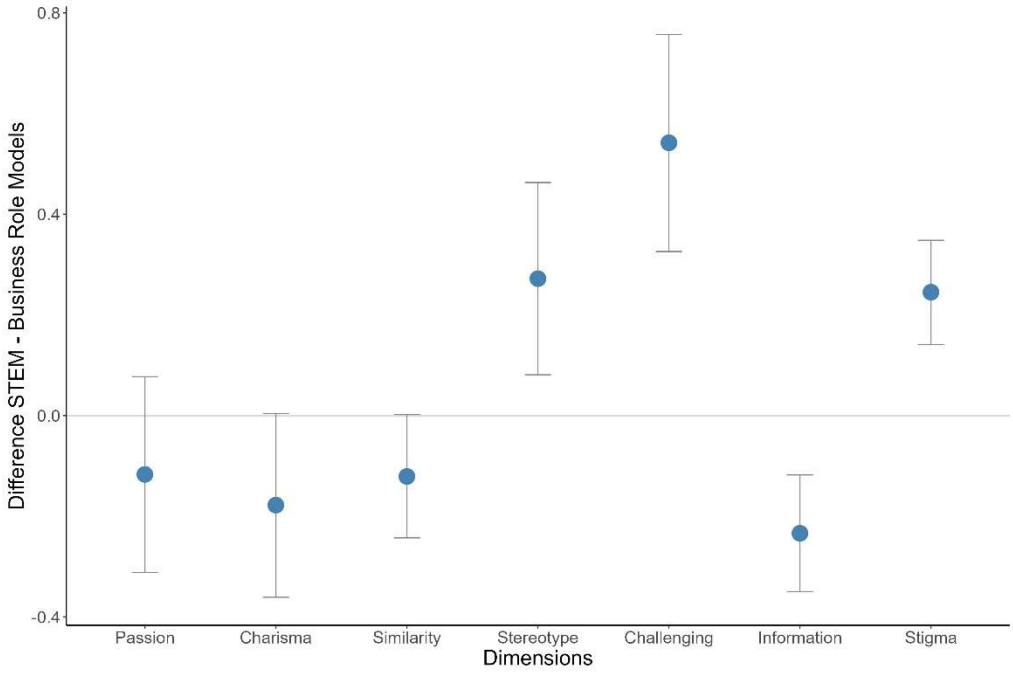
Do students perceive the STEM and business role models differently?

Given our results that seeing both STEM and business role models caused students to move away from STEM and towards business, we conducted an additional data collection exercise that had 110 students watch the videos and score role models on seven different dimensions: how

passionate they were about their subject, their charisma, how similar the person was to them and their friends, the extent to which they felt the role model reinforced gender stereotypes about which occupations are suitable for women, the extent to which they made their subject seem more challenging than traditional occupations, the extent to which the role model provided new and relevant information, and stigma (such as whether the role model suggests people in this profession are weird and lack social skills).

Figure 4 shows that students indeed view business role models more favorably on multiple dimensions than STEM role models. The largest difference between STEM and entrepreneurial role models is in how challenging they make the subject seem, with STEM seen as much more challenging and requiring more study and skills. Students also few the STEM role models as complying with stigmatized ideas of a scientist, seeing them as weirder and with poorer social skills than entrepreneurs. Despite having a balanced gender mix on average, they also see the STEM role models as more likely to reinforce stereotypes about STEM being a field where it is easier for men to succeed than women, relative to business. They also see the STEM role models as providing less relevant information, having less passion, less charisma, and being less similar to themselves than entrepreneurial role models. Table S6 in the supplementary materials shows these point estimates and that they remain significant after adjustments for multiple hypothesis testing, while Table S7 show that these perceptions of the difference between STEM and entrepreneur role models does not vary with the gender of the student.

Figure 4: Students view STEM and Business Role Models Differently



Note: Students scored STEM and business role models on seven different dimensions. Figure shows difference in the mean index score for each dimension, along with 95 percent confidence intervals. Positive differences indicate that STEM role models are scored higher in this dimension, while negative indicate that STEM role models are scored lower than business role models in this dimension. Table S6 in the supplementary materials provides means, p-values, and adjusted q-values.

Discussion

Providing students with access to customized online video interviews with multiple scientists and entrepreneurs enabled the remote delivery of a role model intervention at scale. The cost of the video production, lesson development, electricity, internet, and platform-related costs such as hosting, customization and maintenance totaled US$14,271, or US$0.86 per student. Unit costs would fall even further if extended to more students, and technology thereby provides a low cost way of enabling role models to reach many thousands of students while keeping quality constant.

In contrast to most of the existing literature on role models, this approach enabled us to provide students with multiple role models and for them to compare role models in two different broad career paths: STEM and entrepreneurship. Offering students exposure to role models in multiple fields is less paternalistic than emphasizing one field only, and enables them to compare and contrast different options.

We find that being assigned to watch two thirty-minute videos featuring these different role models not only changes short-term survey responses on preferences for working in STEM and business, but also results in subsequent changes in behavior, changing choice of college major. There is a

large shift away from enrolling in STEM majors, with female students substituting into business majors, and male students into a mix of business majors and other subjects. While on average students saw on a gender-balanced mix of role models, impacts do not vary much when exposed to relatively more scientific role models of the same gender as the students. As a result, in contrast to the goal of encouraging more students into science and high-growth entrepreneurship careers, our role model intervention reduced the number studying science.

Why do we see a reduction in interest in STEM as a career, and less enrolment in STEM majors in university, when many other role model interventions find that exposure to role models (especially those of the same gender) lead to students following the path of the role model? Our results suggest that a key reason is the contrast between how students see the scientist and entrepreneur role models. Both groups were chosen to be successful examples of Ecuadorians who could demonstrate what is possible, with the scientists having registered a patent or having published multiple articles, and the entrepreneurs having businesses which earned at least US$300,000 in annual revenue. But comparing individuals in both groups, students viewed the career path for entrepreneurs as less challenging, and the entrepreneurs to be more similar to them and to have better charisma and social skills. So even though both types of role models offered examples of successful career paths, the contrast of seeing both types at once attracted students towards business careers.

Seeing interview segments with multiple role models of each career type provided students with a broader, more realistic, view of a range of experiences and showed the possibility that students of both genders and of different regions and ethnicities could succeed. This also offers the possibility that when such content is delivered nationwide to a broad variety of students, that they see someone they can relate to. However, by seeing many role models, there is also the possibility that students get less inspired by a single compelling and salient individual story, and instead focus on the commonalities across role models, such as how hard they work, and their general appearance and presentational skills. Moreover, even if female students randomly get to see mostly female STEM role models, even the appearance of one or two male role models amongst the mix may be enough to remind them that science is a male-dominated field.

While we have shown that providing access to role models through remote delivery can result in changes in student study preferences and enrolment behaviors, a limitation of our work is that we are unable to say whether or not this is welfare-enhancing. Under rational choice models of educational decision-making, providing diverse information should enable students to make more informed and accurate decisions (e.g. DesJardins and Toutkoushian, 2005; Harrison 2017).

Moreover, there is less risk of students being overly influenced by a single role model, and potentially having false expectations around the ease of overcoming gender constraints that can arise with exposure only to a same-gender role model (e.g. Seron et al, 2015; Fouad et al. 2017; Bertrand and Duflo, 2017). Yet it would only be after tracking students for a decade or more into their working lives that one could learn whether they do in fact end up more satisfied with their careers and earning more. Even then, individually optimal decisions may not be optimal for society given the externalities that can come from scientific innovation, and the role that today's graduates play in shaping the gender balance of occupations facing the next generation of students making career choices. Further experimentation with the optimal mix of role models in countries where administrative data would allow this long-term tracking of career outcomes would be a productive avenue for future work.

Methods

Sample Context and Randomization

Public secondary schooling is free in Ecuador, and 75 percent of students attend public institutions. The last three years of upper secondary or high school (grades 10 through 12) are divided into two specializations: technical and science. Both specializations have a common core curriculum and sit a national standardized examination to graduate and to gain admission to university. The difference is in the elective subjects offered, where technical specialization schools provide more skills geared towards the labor market, including an entrepreneurship elective. Our experiment takes place as a component in a larger online education project offered in these technical specialization schools, called Showing Life Opportunities, conducted in collaboration with the Ministry of Education in Ecuador. The broader program also provides online courses in entrepreneurial skills, statistics, English and Spanish. The program replaced a mandatory internship that was not possible during the COVID-19 pandemic and was a mandatory part of the curriculum for final year students. The project received human subjects approval from the Universidad San Francisco de Quito, Institutional review board (IRB) approval number 2018-208E and by the IRB Committee of Innovations for Poverty Action IRB-USA, IPA IRB Protocol #: 15629 with a waiver of consent.

The education system in Ecuador splits the country into two separate regimes which offer on different school calendars. We work with a nationwide representative sample of 813 schools. We cross-randomize the role models intervention against another intervention taking place which randomized whether schools got entrepreneurial online courses, or statistics and languages. Schools were then stratified by regime, and formed into strata of 16 comparable schools based

on matched Mahalanobis distance on educational zone, total number of students, number of students in the final year, and average performance on the national final year exam (SER Bachiller). Within each of these strata, schools were randomly assigned with equal probability to be part of the role model intervention, or to instead receive placebo videos. This gives an experimental sample of 407 treatment schools and 406 control schools, containing 29,243 students in total. Figure S2 in the supplementary materials shows this experimental design and Table S0 shows the treatment and control groups are balanced on student baseline characteristics.

Role Model Intervention

The role model intervention in this study is part of a 26-lesson course, taking part in lessons 3 and 4. Students in the treatment group were assigned to watch treatment videos featuring successful Ecuadorian scientists and entrepreneurs, while those in the control group were assigned to watch the program “Teenagers XY” which is part of the Ministry of Education’s EducaTV channel and covers unrelated topics such as “Love” and “Music”.

The role models were chosen through an open call and consist of 20 Ecuadorian professionals who exhibit outstanding success in either STEM or entrepreneurship at a young age (24 to 34). Entrepreneurs had to have a yearly revenue of at least US$300,000, while STEM professionals had to have an h-index of 5 or more, or have registered a patent. The role models showcased were diverse, including Mestizo, Afro-Ecuadorian, Montubio, and indigenous individuals from various regions of Ecuador. The supplementary material contains more information on how they were chosen and details of each role model. They were recorded through structured interviews that provided five video segments per role model, aimed at providing relatable and inspiring content for students.

Each of the two treatment lessons included 30 minutes of video interviews, divided into segments addressing specific dimensions of the decision process and focusing on either entrepreneurship or STEM careers. The structure of each lesson randomized the order in which students viewed these segments to control for order effects, with each student watching five segments on entrepreneurship and five on STEM. These segments were chosen from the total pool of 100, ensuring an equal probability (50%) of featuring female role models, thus maintaining gender balance.

Each lesson involved a segment randomly chosen among the available ones in each of the five following categories:

1. What job they have: Describing their work position, a typical workday, and the main skills they use.
2. Why did they choose this job: Discussing reasons for choosing and staying in their profession and its impact on the community.
3. What is needed to be able to do this job: Highlighting additional preparation and addressing misconceptions about their careers.
4. What inspired or motivated them: Sharing sources of motivation and influential figures.
5. What advice do they have for those considering this job: Offering their views on whether anyone can do this job, and advice for aspiring professionals.

Across the two lessons the treatment group therefore watched 10 video segments from entrepreneurs and 10 from scientists.

Measurement and Analysis of Impacts

The role model videos were shown in May 2020 in treatment schools in the Highlands-Amazon region of the country, and in September 2020 in treatment schools in the Coastal region. We then measure changes in beliefs and preferences through surveys collected several weeks after watching the videos, and subsequent choice of major after graduating and enrolling in higher education by using administrative data from the Ministry of Higher Education. Figure S1 in the supplementary material provides a full timeline.

We have four measures of beliefs and preferences: (i) income perceptions, measured as the log of the monthly salary they think a STEM professional or entrepreneur earns; (ii) gender stereotypes, a standardized index of attitudes about women in science and in business (with components defined in the supplementary materials); (iii) study preferences, based on their first choice of major they would like to study if they enroll in college; and (iv) work preference for STEM, based on whether their preferred occupation is in STEM. Since our interest is in explaining the change in major choices of those who enroll in higher education, we restrict our main analysis to this subsample, but then also provide unconditional results. We then observe whether students enroll in higher education and their choice of major, which we classify as in STEM, business, or other.

Our main analysis then estimates the impact on outcome $Y_{i,s}$ for individual *i* in school *s* of being assigned to the role model treatment through estimating treatment effects in the following Ancova equation:

$$Y_{i,s} = \alpha_0 + \beta_{RM} RM_s + Strata_s + \pi Y_{i,0} + \delta M_{i,0} + Controls_{i,0} + \varepsilon_{i,s} \qquad (1)$$

Where, RM takes the value of 1 if student *i's* school is in the treatment group. The estimate β_{RM} captures the Intention-to-Treat (ITT) effect of the intervention. Estimation controls for randomization strata ($Strata_s$), the lagged outcome ($Y_{i,0}$) where available and a dummy variable for it being missing at baseline ($M_{i,0}$), and a set of baseline variables ($Controls_{i,0}$) selected by the post-double Lasso method of Belloni et al. (2014). Standard errors are clustered at the school level. In addition, in the supplementary materials we also provide sharpened q-values that hold constant the false discovery rate when examining multiple outcomes (Anderson, 2008). We estimate this specification separately for male and female students.

We also use the individual-level random assignment of which role model segments students were shown to examine the impact on choice of major of watching mostly male (or mostly female) STEM and business role models compared to a gender-balanced set. We estimate the following equation among the treated students, again separately by student gender, for student *i* in class *k*:

$$Y_{i,k} = \beta_0 + \beta_M Mostly\ Male\ RM_i + \beta_F Mostly\ Female\ RM_i + \pi Y_{i,0} + \delta M_{i,0} + Controls_{i0} + u_k + \varepsilon_{i,k} \quad (2)$$

Where $Mostly\ Male\ RM$ is a binary variable that takes the value of 1 if most of the segments that the student *i* watched feature a male role model, and, $Mostly\ Female\ RM$ is a binary variable that takes the value of 1 if most of the segments that the student watched feature a female role model. The estimates β_M and β_F capture the treatment effect of gender concentration compared to a gender-balanced set of role models. Since we randomize the female segments at the individual level, we introduce class-fixed effects (u_l), and calculate robust standard errors without clustering.

Scoring of Student Perceptions of Role Models

Given the differential impacts we find of STEM and entrepreneurial mentors, in September and October 2023 we conducted a detailed scoring exercise to measure student perceptions of these different role models. We used a sample of 110 students aged 18 to 20 year olds in pre-college training at the Universidad Central, the largest public university in Ecuador. Each student was randomly assigned to watch three segments of a STEM role model, and three of an entrepreneurial role model, with the order of which shown first randomized for each student. Each video lasted 8 to 10 minutes, after which they completed a detailed scoring rubric (provided in the supplementary materials) which scores role models on multiple questions covering seven different dimensions: passion, charisma, similarity, stereotype, challenge, information, and stigma. For each measure we construct a standardized index, and then run a paired t-test to test for equality of scores. We also test whether the difference between STEM and entrepreneur role models

varies with gender by running unpaired t-tests which test whether the STEM score minus entrepreneur score difference is equal for male and female students.

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Author Contributions

I.A., T.Å., G.B., B.C., F.P.F.T., D.M., M.M., M.S. designed research; I.A., F.P.F.T. performed research, F.P.F.T. analyzed data, T.Å., B.C., F.P.F.T., D.M. wrote the paper.

Competing Interests

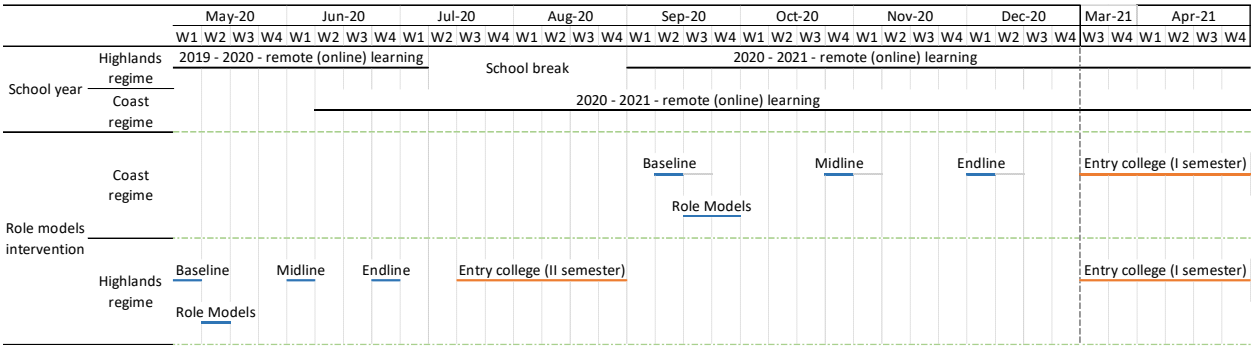
The authors declare no competing interests.

Supplementary Material

Timeline and Experimental Design

Ecuador has two different school year calendars depending on region: in the Highlands-Amazon region school runs from September through to July, while in the Coastal region classes are from April through to January. Figure S1 shows that the experiment first took place at the end of the 2019-2020 school year in the Highlands region, with the role model videos shown in May 2020, and then was introduced into the Coast region, with role model videos shown in September 2020.

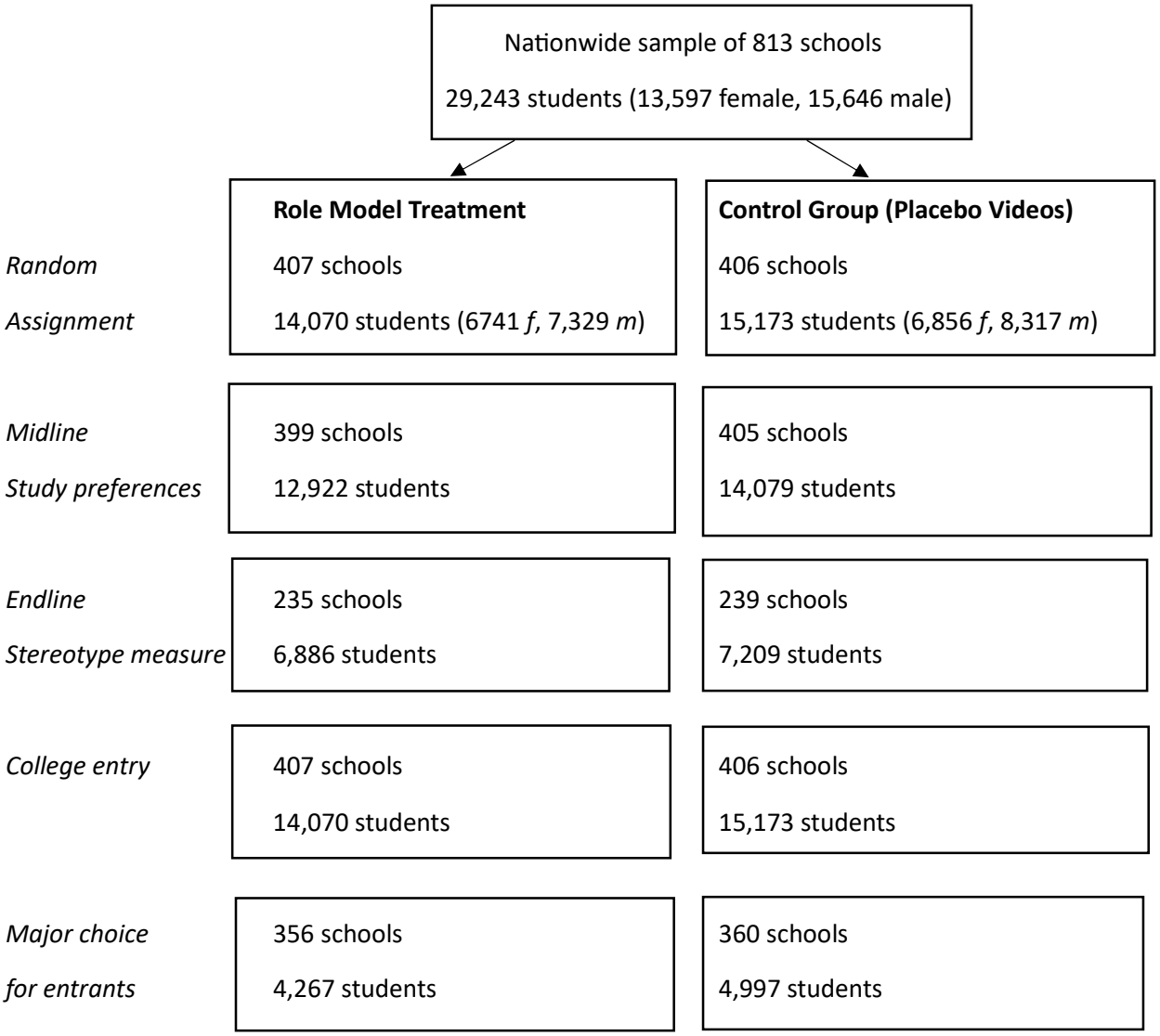
Figure S1: Timeline of the Experiment



Note: The black lines show the length of the school year in Highlands-Amazon and Coast regimes. The blue lines indicate the time we collect information (baseline, midline, and endline). Moreover, it shows the time when students receive the role model intervention. Since the school year depends on the regime, we deliver the role models in two phases. First, we introduce the component in Highlands-Amazon schools. Second, we offer the same material to Coast schools. The orange lines indicate the college entry period. The Higher Education Ministry (Senescyt) opens this process twice per year. We collected administrative records after the first 2021 call. Hence, we observed students from the Highlands and Amazon regimes twice since they could apply for the second call in 2020 and the first call in 2021. On the contrary, we observed students from the Coast regime only once. This is relevant as students who could not enter college in one of the calls can try again in the second one. They can apply to enter college for up to two years. The registration process to take the exam starts after the second week of July and March. Students took the exam the last week of August and April.

Our sample of 813 schools, 1043 classes and 29,243 were randomly assigned at the school level to treatment (role models) or control (placebo videos). Figure S2 shows the experimental design and sample sizes available for measuring different key outcomes.

Figure S2: Experimental Design and Outcome Data Availability



Notes: *f* denotes female students, *m* male students. The nationwide sample includes students in the Highlands and Amazon region, as well as in the Coast region. Midline data on income beliefs and preferences for studying STEM and business, and Endline data on gender stereotypes (beliefs that men have a natural predisposition or are more likely to be successful) were collected through the online platform. The smaller endline sample is because gender stereotypes were only collected in the Coastal region. Administrative data on college entry, and major choice conditional on entry are available for all students from administrative data.

Table S0: Balance on Baseline Characteristics

More details on Role Models

Our target role models were Ecuadorian professionals successful in STEM or entrepreneurship. Entrepreneurs should have a yearly revenue of at least US$300,000, while STEM professionals should have an h-index of 5 or more, or have registered a patent. We worked with an external contractor to identify, screen, and recruit these role models through an open call through social networks, specialized newspapers and magazines, and business and scientific networks. We also desired role models of both genders, a range of ethnicities, and from different regions of the country. We ended up screening more than 70 individuals to select the 20 role models with the most relevant profiles. Summary details of these role models are as follows:

Sex	Age	City	State	Region	Reason for selection	Field
STEM Role Models						
Male	35	Quito	Pichincha	Highlands	Patent - Scientific advancements in medicine	Cell Biologist
Female	30	Guayaquil	Guayas	Coast	Contribution in the fight against cancer	Biological Engineer
Male	31	Puyo	Pastaza	Amazonia	Contribution in the sustainable agriculture	Industrial Engineer
Male	26	Loja	Loja	Highlands	Patent - Device for support blind individuals	Electronic Engineer
Male	24	La Maná	Cotopoxi	Highlands	Patent - Device for non-invasive medicine inoculation	Mechatronics Engineer
Male	34	Ibarra	Imbabura	Highlands	Patent - Device for restore life to polluted rivers	Mechanical Engineer
Female	24	Quito	Pichincha	Highlands	Patent - Multiple applicates for crab waste	Environmental Engineering
Female	25	Quito	Pichincha	Highlands	Contribution in the sustainable agriculture	Environmental Engineer
Female	37	Ambato	Cotopoxi	Highlands	Patent - Commercialization of biodegradable dishes	Business and Administration
Female	34	Quito	Pichincha	Highlands	Patent - Device for precise eye surgery	Electronic and Control Engineering
Entrepreneurship Role Models						
Female	27	Loreto	Orellana	Amazonia	CEO of an associative agricultural company	Agro-Industrial Engineering
Male	28	Tena	Napo	Amazonia	CEO of an associative chemical cleaning company	Chemical Engineering
Female	38	Pifo	Pichincha	Highlands	CEO of a organic food company	Agronomy Engineering
Male	33	San Miguel	Bolivar	Highlands	CEO of an IT for agriculture company	Electronic Engineering
Female	38	Quito	Pichincha	Highlands	CEO of a food company using native ingredients	Chemical Engineering
Female	30	Puyo	Pastaza	Amazonia	CEO of an innovative supplier for infants	Marketing and Business
Male	26	Machachi	Pichincha	Highlands	CEO of an online learning company	Electronic Engineering
Male	26	Lago Agrio	Sucumbios	Amazonia	CEO of a touristic company	Tourism and Hospitality
Male	28	Ibarra	Imbabura	Highlands	Patent - Device for supporting handicapped individuals	Mechanical Engineering
Female	29	Otavalo	Imbabura	Highlands	CEO of a fashion company based on native designs	Business and Administration

A video interview was conducted following a standardized Q&A format with each role model, where the role models were asked different questions around their studies and professional lives. These were divided into five segments, as follows:

Segment 1 (2 min.): What is the job they have?

- Could you describe your work position?
- How is your typical workday?
- What did you do to become a scientist/entrepreneur?
- What skills are particularly useful in your work?

Segment 2 (3 min.): Why did they choose this job and what makes it a desirable profession?

- Why did you choose this profession?
- What did you feel on your first day of work?
- Why did you decide to stay in this profession?
- Why is yours is a critical profession?
- How do you think your profession helps your community?

Segment 3 (3 min.): What is needed to be able to do this job?

- What kind of preparation in addition to what you learned in school did you need to start up your business/choose a career in science?
- Was there something you had to learn outside the classroom? What was that?
- Is there a particular topic/subject that a person should study to become an entrepreneur/scientist?
- What would you say to those who believe you must be a genius to study STEM sciences or careers? (for scientists)

Segment 4 (4 min.): What inspired or motivated them?

- Where did you get the idea or motivation to become an entrepreneur/scientist?
- Were there any people who encouraged/inspired you to follow the profession you have now? Who was?
- How did that person motivate you (did he mention something to you, did you like his way of being)?

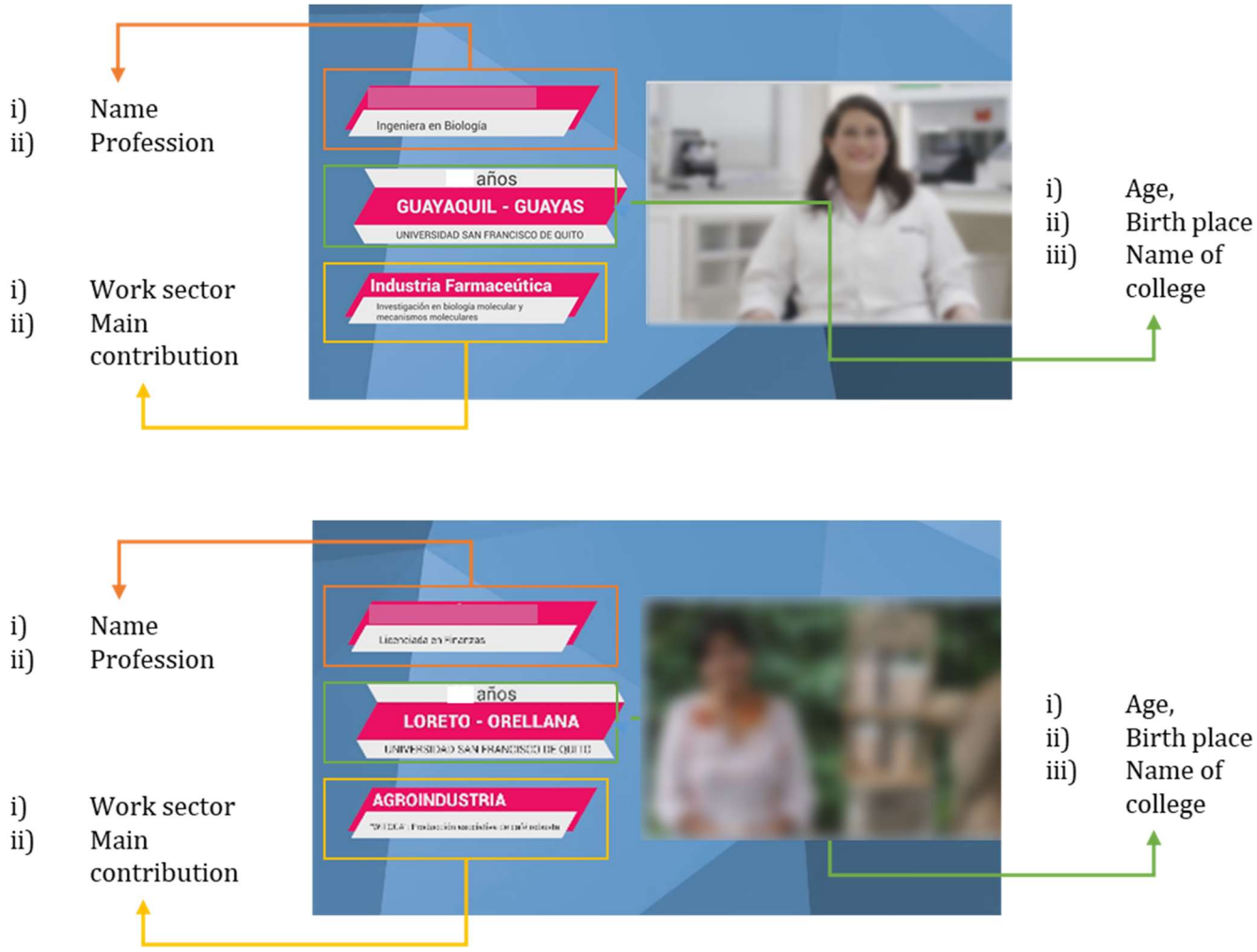
Segment 5 (4 min.): What advice do they have for those considering this job?

- Do you think that anyone can choose this profession?
- Do you think that everyone can become a scientist/entrepreneur?
- What should be expected if this profession is chosen?
- What would you say to the person who wants to choose this profession?

Each student then watched 5 segments from STEM professionals and 5 segments from entrepreneurs in a first lesson, and then another 5 of each in a second lesson. The ordering of STEM versus entrepreneur was randomly assigned. For each one of the five segments, they were randomly allocated a segment from one of the 10 role models interviewed of the specific type. Since the role models were balanced by gender, this meant a 50% probability of seeing a female role model in any given segment. This random assignment was done at the student level, and the

segments were spliced together. At the start of each segment, students were shown a cover screen which highlighted key information such as profession, age, place of birth, and sector. An anonymized example appears below:

Figure S3: Anonymized examples of video segment cover screen



Outcome Definitions

Survey measures on beliefs and preferences

Data on student beliefs and study preferences were collected through the online platform.

STEM Earnings beliefs: The log of a student's answer to the question "What is the monthly salary of a STEM professional in Ecuador?". Before answering, students are reminded what types of jobs are STEM professionals. Collected in the midline.

STEM gender stereotypes: A standardized index that measures students' beliefs about women in science. It is the average of standardized z-scores of answers of the following questions answered on a Likert scale "men are more gifted than women in math", and "women are as

successful as men in STEM activities" (reverse coded). This was only collected in the Coastal region, during the endline.

Preferences for studying STEM: a binary variable indicating that the student plans to pursue a STEM major at college. Students are asked an open-ended question about their preferred major to study at college. We classify majors according to the ISCED (International Standard Classification of Education), and select 05 (natural sciences, mathematics and statistics), 06 (information and communication technologies), and 07 (engineering, manufacturing, and construction) as STEM majors. Collected in the midline survey.

Preference for working in STEM: a binary variable indicating that students plan to work as a STEM professional. Immediately after watching the videos, students are asked which ISCO-08 2-digit occupation they would want to work in the future. We code 21 (science and engineering professionals), 22 (health professionals), 25 (ICT professionals), 31 (science and engineering associate professionals), 32 (health associate professionals), and 35 (ICT associate professionals) as STEM professional careers.

Entrepreneurship Earnings beliefs: The log of a student's answer to the question "What is the monthly salary of an entrepreneur in Ecuador?". Before answering, students were reminded what an entrepreneur is. Collected in the midline.

Entrepreneurial gender stereotypes: A standardized index measuring beliefs about women in business. It is the average of standardized z-scores of answers of the following questions answered on a Likert scale "men have a natural capacity to be an entrepreneur", and "women are as successful as men in business activities" (reverse coded). This was only collected in the Coastal region, during the endline.

Preferences for studying business: a binary variable indicating that the student plans to pursue a business major at college. Students are asked an open-ended question about their preferred major to study at college. We classify majors according to the ISCED (International Standard Classification of Education), and select 04 (business administrative and law, except 042 (law)), and 0311 (economics) as business majors. Collected in the midline survey.

Administrative Data on College Entry and Major Choice

Administrative records from the Ministry of Higher Education of Ecuador (Senescyt) are used to observe whether students enroll in higher education, and their choice of major:

Entry into higher education: A binary variable taking the value 1 if a student enrolls in higher education.

Chooses STEM major: A binary variable taking the value 1 if a student is enrolled in a STEM major. We classify majors according to the ISCED (International Standard Classification of Education), and select 05 (natural sciences, mathematics and statistics), 06 (information and communication technologies), and 07 (engineering, manufacturing, and construction) as STEM majors

Chooses Business major: A binary variable taking the value 1 if a student is enrolled in a business major. We classify majors according to the ISCED (International Standard Classification of Education), and select 04 (business administrative and law, except 042 (law)), and 0311 (economics) as business majors.

Chooses Other Subject major: A binary variable taking the value 1 if a student is enrolled in a major other than STEM or business.

Scoring of Perceptions of Role Models

We create standardized indices for seven dimensions of student perceptions of the role models by constructing the average of z-scores of components as follows, where we create z-scores by standardizing by the mean and standard deviation of the STEM response, to enable comparison of STEM and business role models. Some items are reverse-coded to ensure all items align in the same direction when constructing the indices:

Passion:

- How passionate and enthusiastic is the speaker about their career?
- How happy do you think the speaker is with having chosen the career they work in?

Charisma: We measure three sub-dimensions, and then create a standardized index across all three:.

Subdimension 1. Please tell us to what extent you agree with the following statements on a scale of 1 (not at all) to 7 (very much)

Imagine you encounter the person in the video and accompany him in his day-to-day activities. Would you expect this person…

- …has a presence in a room (influence)
- … can influence people (influence)
- …is a good leader (influence)
- …has a magnetic persona (influence)
- …knows how to lead a group (influence)
- …makes people feel comfortable (affability)
- …smiles at people often (affability)
- …is approachable (affability)
- …projects positive energy (affability)
- …can get along with anyone (affability)

Subdimension 2. How charismatic did you find the speech? Please give your opinion on the level of charisma in the speech using a scale from 1 to 7, where 1 is 'Not charismatic at all' and 7 is 'Extremely charismatic'.

Subdimension 3. Please, rate the person's communication tone using the next scale:

Does the person in the video sound…

- (1) dominant / aggressive - submissive / passive (7)
- (1) consistent/performed - uniformly-inconsistent/performed erratically (7)
- (1) unexpressive/dull - expressive/lively (7)
- (1) fast/hurried - slow/unhurried;
- (1) calm/relaxed - anxious/tense (7);
- (1) natural/sounds spontaneous - stiff/ sounds like a script (7)
- (1) warm/ friendly - cold/unfriendly (7).

Similarity:

- How similar do you think this person is to you?
- Would you like this person to be your neighbor?
- Do you like this person?
- How likely is it that you would become friends with this person?
- Could you imagine yourself becoming this person?
- Do you want to learn more about this person?

Stereotype. We code the data as follows: S1=0 if they think equal, +1 if they think women face more challenges, and -1 if they think men face more challenges. Then, we subtract S3 from S2, which shows how much more students think the video attracts men to the career vs. women (S4). Then, we compute the average of the z-scores of items S1 and S4.

After watching the video, I believe that (S1)

- Men and women can be equally capable of succeeding in this career
- Women face more challenges than men in this career
- Men face more challenges than women in this career

Please tell us to what extent you agree with the following statements on a scale from 1 (not at all) to 7 (very much).

- The video made women want to pursue this career (S2)
- The video made men want to pursue this career (S3)

Challenge. We measure two subdimensions, and aggregate into a single index:

Subdimension 1. Now that you know more about this profession, please compare it with a traditional profession according to the following statements using a scale from (very low than a traditional profession) to 7 (very high than a traditional profession)

- The time needed to study this career is…
- The investment (expenditure) needs to study this career is…
- The difficulty in convincing parents to study this career is…
- The difficulty of getting accepted to study a major related to this career is…
- The materials needed to study this career (i.e., books, lab materials) are…

Subdimension 2. From the information you get watching the video, please tell us the following,

- Do you think it is necessary to have a college degree to pursue the same career path as the person in the video? Yes/No/IDK
- Do you think it is necessary to have a postgraduate education (i.e., a Master's or more) to be as successful in this career as the person in the video?
- Do you think it is necessary to go abroad to be as successful in this career as the person in the video?

Information:

- I found that the person in the video offered information relevant to my future decisions.
- The video made me understand something new.
- I did not find it easy to forget the information in the video.
- The information in the video gave me new ideas for the future.
- I think the profession of the person in the video is a common one.

Stigma:

When I think of the person in the video, I think of someone who

- …is attractive
- …does not have friends
- …has good social skills
- …has bad hygiene
- …spends all their time alone
- …is good athlete
- …is weird
- …finds it easy making friends

Supplementary Analysis

Table S1: Changes in beliefs and attitudes for the sample who continue to higher education

	STEM				Entrepreneurship		
	Beliefs		Preferences		Beliefs		Preferences
	Earnings (1)	Stereotypes (2)	Study (3)	Work (4)	Earnings (5)	Stereotypes (6)	Study (7)
Panel 1: Female students							
Placebo mean	6.898	-0.299	0.211	0.34	6.261	-0.284	0.24
Treatment (RM)	0.014	0.059**	-0.022**	-0.034**	0.050***	0.034	0.018
	(0.020)	(0.027)	(0.011)	(0.016)	(0.019)	(0.026)	(0.011)
q-values	0.489	0.072	0.072	0.072	0.066	0.239	0.141
N. obs	4,522	2,187	4,450	4,428	4,522	2,187	4,450
N. clusters	643	375	637	644	643	375	637
Panel 2: Male students							
Placebo mean	6.981	0.059	0.526	0.471	6.424	0.063	0.102
Treatment (RM)	-0.008	-0.025	-0.025*	-0.036*	0.019	-0.042	-0.017*
	(0.020)	(0.028)	(0.014)	(0.022)	(0.019)	(0.026)	(0.009)
q-values	0.696	0.423	0.184	0.184	0.423	0.184	0.184
N. obs	4,589	1,795	4,429	4,484	4,589	1,795	4,429
N. clusters	593	338	587	593	593	338	587
H0: Girls = Boys	0.830	0.054	0.685	0.385	0.352	0.052	0.037

Note: The table reports the treatment effects of a nationwide sample of students from the Coast, Highlands, and Amazon regions. The treatment is watching Business and STEM role models, irrespective of their gender composition, on students' beliefs and preferences conditional to entering higher education. Columns 1 to 4 examine mechanisms that drive STEM choice of major; meanwhile, columns 5 to 7 report mechanisms that influence the choice of Business as a major. Due to the atypical organization of the country, we collect midline data between two (Highlands and Amazon region) to six weeks (Coast regime) after watching the treatment videos. Furthermore, we collected endline data six (Highlands and Amazon

region) and 12 weeks (Coast regime) after beings exposed to the treatment. The survey instrument was embedded in the e-learning platform that hosts the treatment and placebo videos. The estimation controls for the difference in timing and the strata of random allocation. The table reports clustered standard errors at the school level in parenthesis. Moreover, it reports sharpened p-values (q-values) following Anderson (2008) for the False Discovery Rate (FDR). The q-values account for corrections by subject (Entrepreneurship and STEM) and gender (male and female). The bottom panel tests the null hypothesis that girls and boys exhibit equal treatment effects. To select the control variables, we compute the post-Double Lasso selection approach. * p < 0.1, ** p < 0.05, *** p < 0.01

Table S2: Changes in beliefs and attitudes for the full sample of students

	STEM				Entrepreneurship		
	Beliefs		Preferences		Beliefs		Preferences
	Earnings (1)	Stereotypes (2)	Study (3)	Work (4)	Earnings (5)	Stereotypes (6)	Study (7)
Panel 1: Female students							
Placebo mean	6.861	-0.17	0.168	0.305	6.253	-0.159	0.205
Treatment (RM)	-0.012	0.031*	-0.012*	-0.029***	0.021*	0.012	0.007
	(0.013)	(0.019)	(0.007)	(0.010)	(0.012)	(0.017)	(0.007)
q-values	0.328	0.139	0.139	0.035	0.139	0.412	0.328
N. obs	13,162	7,020	12,768	12,815	13,162	7,020	12,768
N. clusters	779	459	777	782	779	459	777
Panel 2: Male students							
Placebo mean	6.953	0.176	0.387	0.384	6.413	0.165	0.094
Treatment (RM)	-0.017	-0.009	0.005	-0.020	-0.001	-0.004	-0.006
	(0.012)	(0.016)	(0.009)	(0.012)	(0.012)	(0.013)	(0.006)
q-values	0.560	0.816	0.816	0.560	0.932	0.905	0.748
N. obs	15,109	7,075	14,233	14,655	15,109	7,075	14,233
N. clusters	762	450	758	759	762	450	758

Note: The table reports the treatment effects of a nationwide sample of students from the Coast, Highlands, and Amazon regions. The treatment is watching Business and STEM role models, irrespective of their gender composition, on students' beliefs and preferences. Columns 1 to 4 examine mechanisms that drive STEM choice of major; meanwhile, columns 5 to 7 report mechanisms that influence the choice of Business as a major. Due to the atypical organization of the country, we collect midline data between two (Highlands and Amazon region) to six weeks (Coast regime) after watching the treatment videos. Furthermore, we collected endline data six (Highlands and Amazon region) and 12 weeks (Coast regime) after beings exposed to the treatment. The survey instrument was embedded in the e-learning platform that hosts the treatment and placebo videos. The estimation controls for the difference in timing and the strata of random allocation. The table reports clustered standard errors at the school level in parenthesis. Moreover, it reports sharpened p-values (q-values) following the suggestions in Anderson (2008) for the False Discovery Rate (FDR). The q-values account for corrections by subject (Entrepreneurship and STEM) and gender (male and female). The bottom panel tests the null hypothesis that girls

and boys exhibit equal treatment effects. To select the control variables, we compute the post-Double Lasso selection approach. * p < 0.1, ** p < 0.05, *** p < 0.01

Table S3: Impact on Actual Major Choices (Behavior)

		Choice of academic majors					
	Entry into	STEM majors		Business majors		Other majors	
	College	Unconditional	Conditional	Unconditional	Conditional	Unconditional	Conditional
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel 1: Female students							
Placebo mean	0.347	0.108	0.285	0.113	0.302	0.159	0.412
Treatment (RM)	-0.016*	-0.027***	-0.063***	0.022**	0.072***	-0.007	-0.011
	(0.010)	(0.008)	(0.023)	(0.011)	(0.026)	(0.007)	(0.019)
q-values	0.097	0.004	0.007	0.079	0.007	0.283	0.294
N. obs	13,597	13,597	4,591	13,597	4,591	13,597	4,591
N. clusters	790	790	646	790	646	790	646
Panel 2: Male students							
Placebo mean	0.315	0.238	0.686	0.045	0.127	0.069	0.187
Treatment (RM)	-0.017*	-0.041***	-0.063**	0.006	0.022	0.010*	0.039**
	(0.010)	(0.012)	(0.030)	(0.008)	(0.024)	(0.005)	(0.016)
q-values	0.097	0.002	0.025	0.360	0.216	0.079	0.012
N. obs	15,646	15,646	4,673	15,646	4,673	15,646	4,673
N. clusters	771	771	597	771	597	771	597
H0: Girls = Boys	0.745	0.131	0.836	0.057	0.016	0.036	0.028

Note: The table reports the treatment effects of a nationwide sample of students from the Coast, Highlands, and Amazon regions. The treatment is watching Business and STEM role models, irrespective of their gender composition. Unconditional refers to the full sample; meanwhile, conditional indicates that results come from the subsample of students who got a place to attend college. The table reports a linear probability model testing the treatment effect on choosing STEM as a major (columns 1 and 2), Business as a major (columns 3 and 4) or choosing an alternative major other than STEM and Business (Columns 5 and 6). We assess administrative records from the Ministry of Higher Education of Ecuador (Senescyt). Since the timing of the intervention varies by region, we control for it in the estimation. We also account for the strata of random allocation. The table reports clustered standard errors at the school level in parenthesis. Moreover, it reports sharpened p-values (q-values) following Anderson (2008) for the False Discovery Rate (FDR). The q-values account for corrections by academic choice (conditional or unconditional and gender (male and female). The bottom panel tests the null hypothesis that girls and boys exhibit equal treatment effects. To select the control variables, we compute the post-Double Lasso selection approach. * p < 0.1, ** p < 0.05, *** p < 0.01

Table S4: No Predictable heterogeneity in treatment effects

	Female students			Male students		
	Estimate	p-values	Cbounds	Estimate	p-values	Cbounds
Panel 1: Choosing STEM as a Major						
ATE	-0.02	0.00	[-0.03;-0.01]	-0.04	0.00	[-0.06;-0.02]
BLP	0.06	0.45	[-0.12;0.24]	0.09	0.27	[-0.08;0.25]
Panel 2: Choosing Business as a Major						
ATE	0.01	0.21	[-0.01;0.03]	0.00	0.55	[-0.01;0.01]
BLP	0.04	0.47	[-0.07;0.13]	0.02	0.79	[-0.16;0.25]
Panel 3:Choosing Other subject as a Major						
ATE	-0.01	0.36	[-0.02;0.01]	0.00	0.35	[-0.01;0.02]
BLP	-0.01	0.81	[-0.11;0.1]	0.02	0.73	[-0.09;0.13]

Note: The table reports estimates using the generic machine learning approach of Chernozhukov et al. (2023). The ATE is the fitted average treatment effect using this method, and the term BLP is the heterogeneity parameter. The following characteristics were used in fitting the model: *Academic ability* (students' intentions to enter college; students' expectation of school performance; actual academic performance in Statistics, Spanish, English, and overall; results in the Cognitive Reflexion test); *Socioeconomic characteristics* (income level, father, mother, and sibling level of education, and ethnicity); *Motivation* (GRIT, growth mentality, self-efficacy, time devoted to studying on the platform and autonomy as measured by self-concept); *STEM and Business interest and background* (whether students believe they can be successful in STEM or Entrepreneurship, parents' and siblings' work status and whether parents and siblings are entrepreneurs, whether students know adults working in STEM or Entrepreneurship, attitudes, intentions, and income beliefs toward STEM and Entrepreneurship).

Table S5: Do impacts vary with the gender mix of role models?

	Choice of academic major		
	STEM	Business	Other subject
	(1)	(2)	(3)
Panel 1: Science Role Models - Female students			
Mean Gender Balanced science RM	0.225	0.384	0.391
Mostly Male science RM	0.002	-0.024	0.022
	(0.025)	(0.029)	(0.029)
q-values	1	0.91	0.91
Mostly Female science RM	0.008	-0.046	0.038
	(0.026)	(0.029)	(0.030)
q-values	1	0.91	0.91
N. obs	2,214	2,214	2,214
Panel 2: Science Role Models - Male students			
Mean Gender Balanced science RM	0.608	0.176	0.217
Mostly Male science RM	0.049*	-0.048**	0.000
	(0.028)	(0.022)	(0.024)
q-values	0.48	0.32	1
Mostly Female science RM	0.043	-0.048**	0.006
	(0.028)	(0.021)	(0.024)
q-values	0.49	0.32	1
N. obs	2,053	2,053	2,053
H0: Girls watched mostly male STEM scientists = Boys watched mostly male STEM scientists	0.25	0.44	0.75
H0: Girls watched mostly female STEM scientists = Boys watched mostly female STEM scientists	0.36	0.96	0.44
Panel 3: Entrepreneurial Role Models - Female students			
Mean Gender Balanced entrepreneurship RM	0.246	0.34	0.415
Mostly Male entrepreneurship RM	-0.015	0.054*	-0.032
	(0.026)	(0.029)	(0.029)
q-values	0.97	0.48	0.8
Mostly Female entrepreneurship RM	0.010	0.018	-0.023
	(0.026)	(0.028)	(0.028)
q-values	1	0.97	0.91
N. obs	2,214	2,214	2,214
Panel 4: Entrepreneurial Role Models - Male students			
Mean Gender Balanced entrepreneurship RM	0.622	0.145	0.233
Mostly Male entrepreneurship RM	0.001	-0.019	0.011
	(0.028)	(0.019)	(0.024)
q-values	1	0.87	1
Mostly Female entrepreneurship RM	-0.003	-0.001	0.001
	(0.028)	(0.021)	(0.024)
q-values	1	1	1
N. obs	2,053	2,053	2,053
H0: Girls watched mostly male entrepreneurs = Boys watched mostly male entrepreneurs	0.50	0.04	0.32
H0: Girls watched mostly female entrepreneurs = Boys watched mostly female entrepreneurs	0.87	0.76	0.73

Note: The table reports the treatment effects of a nationwide sample of students from the Coast, Highlands, and Amazon regions. The treatment is watching mostly male (female) STEM and business role models compared to students watching a gender-balanced set of business role models (omitted group). We test the treatment at the individual level. Thus, we report the results of the subset of students enrolled in treated schools (T.RM=1). We report results conditional on entering college education. Column 1 reports the likelihood of pursuing STEM education. Column 2 reports the likelihood of studying business. Finally, Column 3 reports the likelihood of choosing non-STEM and non-business majors. We assess administrative records from the Ministry of Higher Education of Ecuador (Senescyt). Since the timing of the intervention varies by region, we control for the Coast regime in the estimation. The estimation also introduces class-fixed effects to account for

environmental differences among students. We report robust standard errors at the individual level in parenthesis along with sharpened p-values (q-values) following Anderson (2008) for the False Discovery Rate (FDR). The q-values account for corrections by all 24 specifications. The bottom panel tests the null hypothesis that girls and boys exhibit equal treatment effects. To select the control variables, we compute the post-Double Lasso selection approach.

* p < 0.1, ** p < 0.05, *** p < 0.01

Table S6: Students view STEM and Business Role Models Differently

	STEM		Business		Difference			
Variables	Mean	SD	Mean	SD	((1) - (3))	p-values	q-values	Sample size
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Similarity	0	0.758	0.121	0.648	-0.121	0.054	0.009	110
Charisma	0	1.000	0.178	0.811	-0.178	0.056	0.009	110
Stigma	0	0.614	-0.245	0.536	0.245	0.000	0.000	110
Stereotype	0	0.646	-0.272	0.797	0.272	0.006	0.002	110
Information	0	0.590	0.234	0.618	-0.234	0.000	0.000	110
Passion	0	0.943	0.117	0.786	-0.117	0.234	0.033	110
Challenging	0	1.000	-0.542	1.084	0.542	0.000	0.000	110

Note: the table shows the results of the aggregate index per dimension. We standardized the indexes concerning the STEM dimensions, so the mean in the STEM outcomes is close to 0 and the SD is close to 1. Column 5 accounts for the mean difference of STEM minus Business. Column 6 captures p-values from a paired t-test comparing students' perceptions of STEM scientists against entrepreneurs. Since the data rejects the normality assumption, we also compute the Wilcoxon rank sum test for paired samples in Column 7. This increases the consistency of results. We complement this approach by computing sharped p-values (q-values).

Table S7: Perceptions of Role Models do not vary with student gender

Variables	Male students		Female students		Difference			
	Mean (1)	SD (2)	Mean (3)	SD (4)	((1) - (3)) (5)	p-values (6)	q-values (7)	Sample size (7)
Similarity	-0.157	0.589	-0.070	0.727	-0.087	0.491	0.687	110
Charisma	-0.190	1.020	-0.162	0.897	-0.029	0.879	0.879	110
Stigma	0.199	0.562	0.308	0.530	-0.109	0.309	0.687	110
Stereotype	0.434	1.080	0.046	0.873	0.388	0.047	0.329	110
Information	-0.197	0.551	-0.285	0.695	0.088	0.460	0.687	110
Passion	-0.145	1.114	-0.079	0.906	-0.066	0.743	0.867	110
Challenging	0.471	1.148	0.640	1.136	-0.170	0.443	0.687	110

Note: the table shows the results of the differences in the aggregate index for STEM role models minus the aggregate index for business role models per dimension for male and female students. Column 5 accounts for the mean difference between boys' dimensions and girls' dimensions. Column 6 captures p-values from an unpaired t-test of the difference in Column 5. Since the data rejects the normality assumption, we also compute the Wilcoxon rank test for unpaired samples in Column 7. This increases the consistency of results. We complement this approach by computing sharpened p-values (q-values).