

Appendix A: Additional Details on Reverse-Audit Design

The ideal way to test our hypotheses would be to create two perfectly identical firms, but with different founders, and then have them each post identical calls for identical positions at the same time and in the same place. Given that this approach is not practically viable, the alternative approach we employed was to work with an existing startup that was about to post advertisements for multiple positions, and then to manipulate the apparent race and gender of the firm's founders. The purpose of this appendix is to explain, in as plain language as we can muster, what this 'reverse-audit' approach entailed.¹

First, we began by approaching a group of recently founded startups looking to expand their operations. It was critical to our design that these firms have a minimal (or zero) web presence so that curious applicants would not instantly discover that the firm's founders differed from what they saw as part of our study. The firm we selected met this criteria; their web domain listed only a "coming soon" page and no information about the founders was listed on any prominent tech or investment sites (e.g. Crunchbase). When the firm was ready to post a job, the ad was placed on a prominent job search site and we established a two-step application process whereby a candidate (1) informed the firm of their interest in the position (and had the option to include additional information, like a CV) and then (2) received a dedicated link to complete the application.

The first stage in this process gave us our set of respondents, or people who expressed an interest in the position. These people were then divided randomly into one of the three conditions and sent a unique URL through which they could complete their application. When they clicked on their unique URL it sent them to one of three pages we created, each completely identical except for the photographs and names of the founders (Figure 1, Appendix A). In order to complete the application, the respondent had to scroll down past the information on the founders, it was not possible to submit the application without seeing this information. The dependent variable of interest was whether or not a person completed their application, and if they did so, what salary they requested. All the applicants were then forwarded on to the firm, any respondents that reached an interview stage were informed that the firm had participated in a research project on the challenges facing female and minority founders and that the firm's actual founders were different from the people listed on the firm's site.

Discussion of Design Choices

Field vs. Laboratory

As in all research designs the choice of field or laboratory imposes trade-offs that should be elucidated. For one, it is important to reiterate that all the participants in our experiment were actual job seekers, responding to actual job postings and not laboratory subjects considering hypothetical positions. This imposes a few notable constraints: we can only observe responses to the positions the startup wanted to hire, in the locations they were interested in, and for the duration that they set. Second, we chose a very early-stage firm that had bootstrapped their own

¹ In contrast to the popular "audit design" in which people vary the candidates seen by an employer, here we vary the employers seen by the candidates.

development up until that point to limit the potential for contamination, and this may also alter the applicant pool as some candidates may prefer to apply to firms with more established histories. However, by accepting these constraints we were able to model actual application choices, whereas a laboratory design would be forced to only consider hypothetical decisions. Therefore we are able to test the revealed preferences of job candidates, albeit only the subset interested in these types of jobs and in these cities, at this time.

Number of Conditions

In a laboratory condition, where there are few limitations on the number of respondents, you can test a great number of treatment conditions. However, in a field experiment you must first consider the likely total number of participants when selecting the maximum number of treatments. In our case, given that this was an unknown startup posting for only a few positions we did not anticipate the total number of observations would exceed 500 (pooled across all positions). Therefore, to ensure that we had appropriate statistical power to conduct our analyses we compared only three conditions: *white men*, *white women*, and *black men*. We hope that future researchers will complement this work by conducting the analyses we could not on mixed gender or mixed-race teams, and teams with founders from a greater variety of ethnic backgrounds or teams of different sizes. We intended this paper to serve as an initial inquiry into the topic and hope that future work helps us refine the finding by determining how broadly it applies and under what conditions the penalty dissipates.

Creation of Treatments

The three conditions varied in two ways: 1) the founder's names and 2) photographs. To select the names we conducted a pre-test in which 250 people hired via mTurk were asked to predict the name, gender, race, and mother's level of education, for a hypothetical person given only their first name. From this we were able to select six names that respondents consistently identified as indicting a single race or gender and yet were reasonably similar in SES prediction. The results of this pre-test are displayed in Table 1 (Appendix A).

We followed a similar procedure for the selection of the photographs, again hiring 250 people on mTurk and then asking them to identify the age, race, and gender of the photographed individual. In addition, we asked the respondent to estimate the person's age and to rate (5pt scale) their attractiveness and to select their likely employment status. From these pre-tests we selected six names to use in the experiments so that everyone placed in the "white female" condition saw the same two photos. Reviewers correctly pointed out that there is an alternate approach, where some photo-dependent studies researchers are able to create a pool of equivalent "white female" photos and then randomize which two are shown. This is done to reduce the likelihood that any observed effect is picture-specific and not general to the class. However, in our setting, because applicants often return to a site multiple times before completing their application we needed to ensure that the images were constant within-person and, at this time, we were not able to create the websites in such a way to allow for that (presumably people with better programming backgrounds will solve this quandary). Therefore, rather than risk contamination we used the pre-tested photos.

It is also important to note that, because we had inconsistent amounts of information about the candidates when they first indicated their interest, we could not attempt a form of block

randomization that tried to balance the people within each treatment and instead opted for a purely random assignment. Table 2 (Appendix A) provides a balance table that identifies the ways in which these groups ended up differing.

Firm-Specific Information

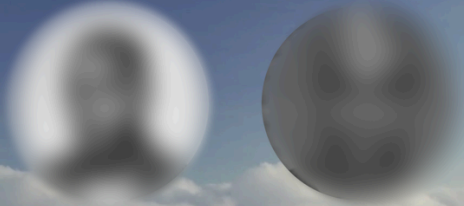
As mentioned, to the best of our knowledge there was no available information on the firm or founders outside of that which we provided on the site. This was, in fact, one of the reasons that we selected the partner startup. The site we created for the study did describe the general type of business and the motivation of the founders, in a statement that was identical across all treatments, but the site did not include any specific information on the size or age of the firm.

Pre-Registration

During the time we have worked on this project there has been a notable shift in the expectations for experiments in management toward pre-registering the hypotheses and design. As we designed this and worked with IRB, this was not as common and as we were inexperienced in it, not something we felt necessary. In part, this reflects our naïve belief that the design of this experiment does not allow for much of the manipulation pre-registration seeks to avoid—there are only two dependent variables, we cannot extend the sample once the position closes, and we do not exclude any observations from our analyses. That said, we did pre-register the subsequent survey-based experiments as our understanding of the pros/cons of the practice evolved and we now believe it would have been preferable to have pre-registered the field experiment as well.

Appendix A, Figure 1: Example of Treatment Conditions

The Founders



On their first day of college Jabari met Malcolm and a partnership was born. After a decade of working for others, in national firms and at startups, the two friends have finally found a project of their own: WeeVent. Building upon Jabari's experience as an engineer at a tech startup and Malcolm's experiences as an event marketer and in real estate, the two seasoned professionals have combined to launch a new way to throw parties. It's about time.

Join Our Team

$u(\cdot, t) \in L^2(\mathcal{D}_t)$
 $(\mathcal{E}_1)$ know $\mathcal{F}_t$ $(\omega) \in \mathbb{K}$ $x \in \mathcal{D} \subset \mathbb{R}^{2 \times 1, n}$
 $dW_t + \frac{1}{2} \sigma^2(t, x) dt$ $W \in \mathbb{K}$ $\mathbb{K}$ -val. B_t
 $u(t, x) = \sum_{j \in \mathbb{N}} B_j(t) dW_j$

The Founders



On their first day of college Zach met Joe and a partnership was born. After a decade of working for others, in national firms and at startups, the two friends have finally found a project of their own: WeeVent. Building upon Joe's experience as an engineer at a tech startup and Zach's experiences as an event marketer and in real estate, the two seasoned professionals have combined to launch a new way to throw parties. It's about time.

Join Our Team

$u(\cdot, t) \in L^2(\mathcal{D}_t)$
 $(\mathcal{E}_1)$ know $\mathcal{F}_t$ $(\omega) \in \mathbb{K}$ $x \in \mathcal{D} \subset \mathbb{R}^{2 \times 1, n}$
 $dW_t + \frac{1}{2} \sigma^2(t, x) dt$ $W \in \mathbb{K}$ $\mathbb{K}$ -val. B_t
 $u(t, x) = \sum_{j \in \mathbb{N}} B_j(t) dW_j$

Appendix A, Figure 2: Job Posting Example

Are you looking for an opportunity to accelerate your career and work in a collaborative environment on cutting edge ideas? Do you want to join a fast-growing tech startup? Then this opportunity might be perfect for you!

We are looking for a Marketing Assistant to join our startup team at Fusion Digital Solutions, this person will report directly to the Chief Marketing Officer and will have an opportunity to grow into more significant roles as the company continues to grow.

We are not just another ad platform or mobile app, we are building something where real customers pay real money for a real product. We empower our team with personal autonomy on team projects. That means you have to be self-directed and self-motivated to succeed. If that seems awesome and you like the idea of our core values -- Build Trust, Question Assumptions, and Validate Direction -- you'll fit right in.

As the Marketing Assistant, you will be responsible for the day-to-day execution of marketing campaigns such as email, text, social and web push which would include setup, testing, launch, post deployment analysis, and optimization working in coordination with the Marketing Team. You will play a key role in answering big strategic questions and day to day operational questions.

Job Duties:

- Execute local and potentially national-scale marketing campaigns and experiments (e.g., Super Bowl promotion)
- Run analytics to answer key strategic growth questions (e.g., what behaviors/demographics predict customer LTV)
- You will also be involved in executing complex multi-step campaigns, setting up multivariate tests, and optimizing email content.
- Help with campaign execution from idea creation to deployment, including scheduling, segmentation, production, A/B testing, and further optimization
- Pull weekly campaign marketing reports and regularly analyze performance
- Help develop our growth strategy to improve product efficiency, as well as to launch and optimize lead nurturing and win-back campaigns
- Keep on top of email marketing trends and best practices, including mobile design, layout design, calls-to-action, dynamic content, testing and compliancy requirement

Qualifications and Skills:

- Bachelor degree in business, marketing, or related field
- Excellent verbal and written communication skills
- Skilled at planning, organizing, prioritizing, and executing simultaneous email campaigns
- Develop product launch and go-to-market plans.
- Excellent written and oral communication/presentation skills including ability to create and deliver effective presentations.
- Familiar with: Adobe Creative Suite: InDesign, Illustrator, Photoshop, and Microsoft Office

Benefits

- Competitive salary and stock options
- Great culture and team spirit
- Generous paid medical/dental/vision coverage plus medical and dependent FSA
- Take a vacation when you need it – open PTO

Appendix A, Table 1: Selection of Names and Photographs

	Black	SES	Male
Race - Amy	0.10	4.21	0.03
Race - Malcolm	0.72	4.10	0.98
Race - Zach	0.06	4.12	0.98
Race - Joe	0.13	3.43	0.92
Race - Jabari	0.63	3.43	0.80
Race - Jane	0.04	4.04	0.00
Observations	226.00	226.00	226.00

	<u>Attractive</u>	<u>Age</u>
BM #1	3.8	31.65
WF #1	3.9	31.75
WM #1	4.1	31.95
WM #2	3.3	31.1
BM #2	3.3	31.75
WF #2	3.3	33.2

Appendix A, Table 2: Effect of Founder Characteristics on Full Sample (Study 2)

Logit Models	Success (1)	Potential (2)	Failure (3)	Risk (4)	Fit (5)	Work/Life (6)	Mentor (7)	Applicants (8)	Salary (9)	Resume (10)
<i>Conditions</i>										
White Male Founders	0.28 (0.29)	0.11 (0.29)	-0.41 (0.29)	-0.22 (0.29)	0.52† (0.29)	0.35 (0.29)	0.20 (0.29)	-0.19 (0.28)	0.09 (0.31)	0.04 (0.31)
White Female Founders	0.23 (0.29)	0.36 (0.29)	-0.37 (0.29)	0.44 (0.29)	0.38 (0.30)	0.18 (0.30)	0.42 (0.30)	0.41 (0.29)	0.48 (0.33)	0.45 (0.34)
<i>Respondent Characteristics</i>										
Age	-0.03 (0.17)	0.09 (0.17)	0.29+ (0.17)	0.05 (0.17)	0.09 (0.17)	-0.15 (0.17)	0.34+ (0.18)	-0.05 (0.17)	-0.08 (0.19)	-0.12 (0.19)
Male	0.24 (0.24)	0.08 (0.23)	-0.07 (0.24)	-0.28 (0.24)	0.19 (0.23)	0.18 (0.24)	0.04 (0.24)	0.17 (0.23)	0.22 (0.26)	-0.16 (0.26)
Race	0.08 (0.09)	0.04 (0.09)	-0.07 (0.09)	0.15 (0.09)	0.06 (0.09)	-0.19+ (0.10)	-0.05 (0.09)	0.04 (0.09)	-0.00 (0.10)	-0.09 (0.10)
Education	0.17 (0.17)	0.15 (0.17)	-0.17 (0.17)	0.15 (0.17)	0.17 (0.17)	0.30+ (0.17)	0.11 (0.17)	0.20 (0.17)	0.34+ (0.19)	0.36+ (0.20)
Work Experience (yrs)	0.00 (0.04)	0.04 (0.04)	0.02 (0.04)	0.04 (0.04)	0.04 (0.04)	-0.05 (0.04)	-0.08+ (0.05)	0.02 (0.04)	-0.04 (0.05)	0.01 (0.05)
Currently Searching	-0.59* (0.25)	-0.34 (0.25)	0.80** (0.25)	-0.33 (0.26)	-0.50+ (0.26)	0.05 (0.25)	-0.81** (0.25)	-0.55* (0.25)	-1.25*** (0.27)	-0.59* (0.28)
Occupation Indicators	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Constant	-0.23 (0.95)	-0.99 (0.94)	-0.26 (0.95)	-0.34 (0.96)	-1.61+ (0.96)	-0.93 (0.95)	0.09 (0.97)	-0.68 (0.94)	0.52 (1.06)	1.62 (1.33)
Observations	319	319	319	319	319	319	319	319	319	319
Pseudo R-squared	0.029	0.032	0.049	0.050	0.068	0.056	0.065	0.034	0.104	0.061

Note: Coefficients for the treatment conditions are relative to the Black Male founder condition.
Standard errors in parentheses. †<.10, * p <.05, ** p <.01, *** p <.001

Appendix A, Table 3: Effect of Founder Characteristics on White Applicant Assessments (Study 2)

OLS Models	Success	Potential	Failure	Risk	Fit	Work/Life	Mentor	Applicants	Salary	Resume
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Conditions</i>										
White Male Founders	0.13† (0.08)	0.03 (0.08)	-0.15† (0.08)	-0.12 (0.08)	0.20* (0.08)	0.13 (0.08)	0.13 (0.08)	-0.02 (0.08)	0.07 (0.07)	0.14* (0.07)
White Female Founders	0.08 (0.08)	0.07 (0.09)	-0.10 (0.08)	0.10 (0.08)	0.11 (0.08)	0.12 (0.08)	0.18* (0.08)	0.08 (0.09)	0.12 (0.08)	0.18* (0.07)
<i>Respondent Characteristics</i>										
Age	-0.01 (0.05)	0.00 (0.05)	0.09* (0.05)	0.03 (0.05)	0.02 (0.05)	-0.01 (0.05)	0.06 (0.05)	0.00 (0.05)	0.01 (0.04)	-0.01 (0.04)
Male	0.06 (0.07)	0.12† (0.07)	-0.07 (0.07)	-0.04 (0.07)	0.05 (0.07)	0.10 (0.07)	-0.04 (0.07)	0.08 (0.07)	0.04 (0.06)	-0.04 (0.06)
Education	0.04 (0.05)	0.01 (0.05)	-0.08† (0.05)	0.02 (0.05)	0.05 (0.05)	0.06 (0.05)	0.01 (0.05)	0.07 (0.05)	0.06 (0.04)	0.05 (0.04)
Work Experience (yrs)	0.00 (0.01)	0.02 (0.01)	0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	-0.01 (0.01)	-0.02 (0.01)	0.00 (0.01)	-0.02† (0.01)	-0.00 (0.01)
Currently Searching	-0.14† (0.07)	-0.05 (0.07)	0.19* (0.07)	-0.09 (0.07)	-0.09 (0.07)	-0.03 (0.07)	-0.14† (0.07)	-0.08 (0.08)	-0.22** (0.07)	-0.02 (0.06)
Occupation Indicators	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Constant	0.44† (0.25)	0.23 (0.25)	0.60* (0.24)	0.47† (0.25)	0.08 (0.25)	0.18 (0.25)	0.63* (0.24)	0.15 (0.25)	0.59** (0.22)	0.72*** (0.21)
Observations	231	231	231	231	231	231	231	231	231	231
Pseudo R-squared	0.057	0.056	0.098	0.073	0.107	0.077	0.093	0.058	0.133	0.091

Note: Coefficients for the treatment conditions are relative to the Black Male founder condition.

Standard errors in parentheses. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Appendix B, Table 1: Survey Questions (Study #2 & #3)

1. What field do you work in (or do you hope to work in)?
2. How many years have you worked in this field?
3. Are you currently looking for a job?

Please take a look at the site for this new firm and then answer the questions that follow.

1. How would you rate the overall quality of their website?
2. Some startups have a hard time explaining what they do. Was it clear to you how the company will make money?
3. If the founder's were looking to hire an entry-level person in **XXX** what would be a fair annual salary?
4. Just from the information available on their site, how would you rate the founders (relative to typical startup founders)?
 - a. Experienced
 - b. Qualified

Now take a look at the site for another new firm and answer the questions that follow.

1. How would you rate the overall quality of their website?
2. Some startups have a hard time explaining what they do. Was it clear to you how the company will make money?
3. If the founder's were looking to hire an entry-level person in **XXX** what would be a fair annual salary?
4. Just from the information available on their site, how would you rate the founders (relative to typical startup founders)?
 - a. Experienced
 - b. Qualified

Now we would like to ask you a few questions that compare the two firms (**choose one**):

[order is randomized]

1. Will be more successful in 5 years
2. Has more potential to grow
3. Is more likely to fail
4. Is taking more risks
5. Will attract more job candidates
6. Will pay better
7. Would offer you a mentor
8. Would look better on your resume
9. Would encourage work/life balance
10. Would fit you better

If both firms were located in your town, where would you rather work?

Last, we would like to ask you a few questions about the **second** firm you saw:

1. If you were interviewing with this firm, how worried would you be about the risk that the company would fail?
2. Some firms invest in their employees, other firms focus on the work product. From what you've seen on their site, what do you think it might be like to work at this startup?

Thanks for all your help, we just have a few demographic questions and then you're done!

1. Age
2. Gender
3. Education
4. Race

Appendix B, Table 1: Effect of Founder Characteristics on Black Applicant Assessments (Study 3)

Logit Models	Failure (1)	Success (2)	Fit (3)	Mentorship (4)	Work/Life (5)	Resume (6)	Pay Better (7)
<i>Conditions</i>							
White Male Founders	-0.04 (0.32)	-0.28 (0.31)	0.31 (0.30)	0.00 (0.30)	-0.15 (0.30)	-0.10 (0.36)	0.05 (0.35)
<i>Respondent Characteristics</i>							
Age	-0.06 (0.20)	-0.17 (0.19)	0.05 (0.18)	-0.07 (0.19)	0.04 (0.18)	-0.46+ (0.25)	-0.27 (0.26)
Male	0.65* (0.33)	-0.71* (0.32)	-0.46 (0.28)	-0.41 (0.29)	-0.15 (0.28)	-0.50 (0.36)	-0.27 (0.35)
Education	0.29+ (0.17)	-0.31+ (0.17)	-0.42* (0.17)	-0.15 (0.17)	0.12 (0.16)	-0.32+ (0.19)	-0.03 (0.20)
Work Experience (yrs)	0.02 (0.07)	0.08 (0.06)	0.05 (0.06)	0.01 (0.06)	-0.04 (0.06)	0.17* (0.08)	-0.05 (0.08)
Currently Searching	0.41 (0.37)	-0.49 (0.36)	-0.13 (0.35)	0.15 (0.37)	0.27 (0.35)	-0.02 (0.42)	-0.47 (0.41)
US-based	0.44 (0.34)	-0.17 (0.34)	0.08 (0.32)	-0.21 (0.33)	0.02 (0.33)	-0.08 (0.39)	-0.27 (0.38)
Occupation Indicators	Y	Y	Y	Y	Y	Y	Y
Constant	-1.53+ (0.83)	1.80* (0.83)	1.80* (0.81)	0.03 (0.80)	0.12 (0.78)	0.63 (0.93)	0.13 (0.92)
Observations	216	216	216	216	216	216	216
Pseudo R-squared	0.066	0.065	0.049	0.032	0.021	0.056	0.053

Note: Coefficients for the treatment conditions are relative to the Black Male founder condition.

Appendix B, Table 2: LPM Model of Founder Characteristics on White Applicant Assessments (Study 3)

OLS Models	Failure (1)	Success (2)	Fit (3)	Mentorship (4)	Work/Life (5)	Resume (6)	Pay Better (7)
<i>Conditions</i>							
White Male Founders	-0.12* (0.06)	0.05 (0.06)	0.12† (0.07)	0.06 (0.07)	0.04 (0.06)	0.08 (0.05)	0.11* (0.05)
<i>Respondent Characteristics</i>							
Age	-0.01 (0.04)	0.01 (0.04)	0.03 (0.04)	-0.03 (0.04)	-0.07† (0.04)	0.05† (0.03)	0.03 (0.03)
Male	0.06 (0.05)	-0.05 (0.05)	-0.07 (0.05)	-0.03 (0.05)	-0.03 (0.05)	0.04 (0.04)	-0.01 (0.04)
Education	0.04 (0.03)	-0.03 (0.03)	-0.04 (0.03)	-0.01 (0.03)	-0.00 (0.03)	0.01 (0.03)	-0.01 (0.02)
Work Experience (yrs)	-0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.00 (0.01)	-0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Currently Searching	0.08 (0.08)	-0.03 (0.08)	-0.07 (0.09)	-0.20* (0.09)	-0.15† (0.08)	-0.12† (0.06)	-0.09 (0.06)
US-based	0.01 (0.11)	-0.08 (0.11)	-0.23* (0.11)	0.12 (0.11)	0.04 (0.11)	-0.11 (0.08)	-0.06 (0.08)
Occupation Indicators	Y	Y	Y	Y	Y	Y	Y
Constant	0.70*** (0.21)	0.27 (0.22)	0.70** (0.22)	0.50* (0.22)	0.82*** (0.22)	0.12 (0.17)	0.24 (0.16)
Observations	229	229	229	229	229	229	229
Pseudo R-squared	0.076	0.043	0.105	0.063	0.080	0.092	0.066

Note: Coefficients for the treatment conditions are relative to the Black Male founder condition.

Appendix B, Figure 1: Example of Comparison Startup (Study #2 & #3)

