Online Appendix “Irrational Statistical Discrimination”

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A Theoretical Results: Exogenous Case

A.1 Proof of Proposition 1

For the naive employer we have that $\pi_N(e,g) = g_l X_{e,l} + g_m X_{e,m} + g_h X_{e,h}$ and $\pi_N(e,r) = r_l X_{e,l} + r_m X_{e,m} + r_h X_{e,h}$. Given the assumption on payoffs we can replace $X_{e,m}$ by $X_{e,l} + \beta_e$ and $X_{e,h}$ by $X_{e,l} + 2\beta_e$. After these substitutions we get that $\pi_N(e,g) > \pi_N(e,r)$ whenever $g_m - r_m > 2(r_h - g_h)$, which is condition **(N)**. We also assumed that, as in Phelps (1972), the red group has on average lower ability with all ability levels carrying equal marginal weight (i.e. $(h-m) = (m-l)$). Noting that the average ability level of group i is given by $i_l l + i_m(l + (m-l)) + i_h(l + 2(m-l))$, we see that this assumption is equivalent to $g_m - r_m \geq 2(r_h - g_h)$ which is the same condition as condition **(N)**. The naive employer hence always discriminates against the red group.

For the Bayesian employer we derived that their expected payoff of hiring an educated worker of identity i is

$$\pi_B(e,i) = \frac{p_l i_l X_{e,l} + p_m i_m X_{e,m} + p_h i_h X_{e,h}}{p_l i_l + p_m i_m + p_h i_h}$$

or

$$\pi_B(e,i) = \frac{p_m i_m X_{e,m} + i_h(X_{e,m} + \beta_e)}{p_m i_m + i_h}.$$

Hence $\pi_B(e,r) > \pi_B(e,g)$ is equivalent to $X_{e,m} + \beta_e \frac{g_h}{p_m g_m + g_h} > X_{e,m} + \beta_e \frac{r_h}{p_m r_m + r_h}$ which is equivalent to condition **(B)**.

A.2 More general payoff schemes

We now consider a more general payoff scheme in which the employer's payoffs do not necessarily increase linearly in worker's ability. More concretely, we define $\alpha_1 \equiv X_{e,m} - X_{e,l}$ and $\alpha_2 \equiv X_{e,h} - X_{e,m}$, where $\alpha_i \in \mathbb{R}_+ \ \forall i \in \{1,2\}$ and $\beta_1 \equiv X_{ne,m} - X_{ne,l}$ and $\beta_2 \equiv X_{ne,h} - X_{ne,m}$, where $\beta_i \in \mathbb{R}_+ \ \forall i \in \{1,2\}$.

We show the results for the case of hiring educated workers. The analysis for non-educated workers is equivalent and yields similar results, as we will discuss below.

Table A.1 represents in which situations Naive and Bayesian employers prefer green or red workers for different assumptions on the ability distributions among the two groups. Note that the case $g_m < r_m$ and $g_h < r_h$ is ruled out by the assumption that green workers are on average better.

With this setting, we can prove that when $\alpha_1 \leq \alpha_2$ (i.e., the employer prefers to go from medium to high ability than from low to medium ability), Proposition 1 holds. We will discuss the case when $\alpha_1 > \alpha_2$ below.

Proposition A.1*. When $\alpha_1 \leq \alpha_2$, if bayesians discriminate against educated red workers, Naive employers will discriminate against educated red workers too.*

Proof. We will prove the proposition studying each of the parameter combinations considered in Table A.1.

1. *Case 1.* If $g_h > r_h$ and $g_m > r_m$ bayesians prefer green for some parameter combinations, while naives always prefer green.

Table A.1. Employer preferences for educated workers

	$g_h > r_h$	$g_h < r_h$
$g_m > r_m$	N: Green B: ?	N: ? B: Red
$g_m < r_m$	N: ? B: Green	- -

Note: This table represents what kind of educated workers naive and Bayesian employers prefer for different parameter combinations. "?" means that the choice depends on additional parameters.

2. *Case 2.* If $g_h < r_h$ and $g_m > r_m$ bayesians always prefer red and naives sometimes prefer red and sometimes green. So bayesians never prefer green workers.
3. *Case 3.* If $g_h > r_h$ and $g_m < r_m$ bayesians prefer green whenever $\frac{g_h}{g_m} > \frac{r_h}{r_m}$ and naives prefer green if $\frac{\alpha_1}{\alpha_1+\alpha_2} < \frac{r_h - g_h}{g_m - r_m}$. Note that $\frac{r_h - g_h}{g_m - r_m} = \frac{g_h - r_h}{r_m - g_m} \geq \frac{1}{2}$ since $g_m - r_m \geq 2(r_h - g_h) \iff r_m - g_m \leq 2(g_h - r_h)$ (that ensures that reds are on average worse than greens) must hold. Since we have assumed that $\alpha_1 \leq \alpha_2$, then $\frac{\alpha_1}{\alpha_1+\alpha_2} \leq \frac{1}{2}$ and hence naives will always prefer green workers (like bayesians do). □

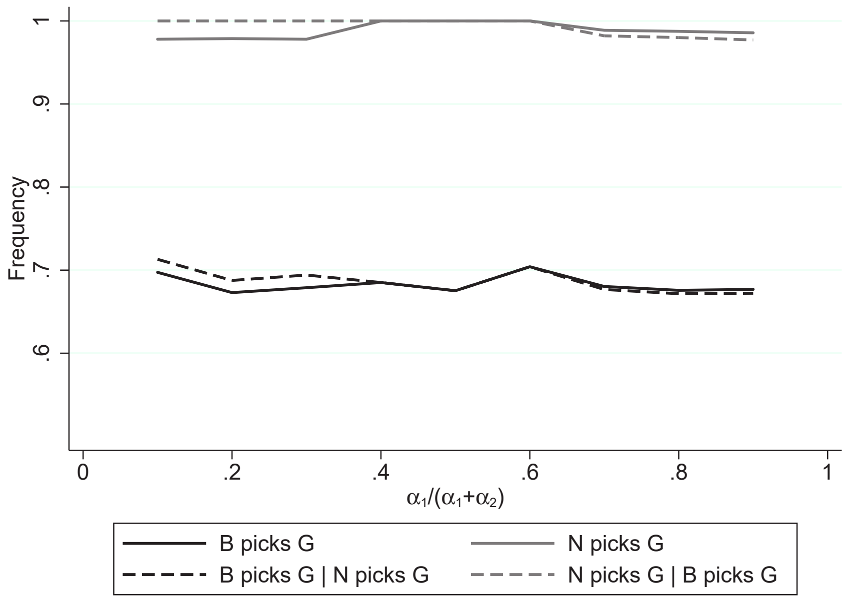


Figure A.1. Numerical simulations where Bayesian (B) and Naive (N) employers choose whether to hire green (G) or red (R) workers.

To understand whether the essence of our results (i.e., that Naive employers discriminate more against the disadvantaged group than Bayesian employers) also holds when $\alpha_1 > \alpha_2$, we perform numerical simulations. In these simulations, we assume that four green and four red workers are drawn with random ability (we pick four to mimic the lab experiment, but the same intuition holds regardless of the size of the urn), such that on average the green workers have higher ability than the red workers. These workers form the baseline distribution that employers know. We then study employers' hiring decision from very low $\frac{\alpha_1}{\alpha_1+\alpha_2}$ (implying increasing marginal returns to ability) to very high $\frac{\alpha_1}{\alpha_1+\alpha_2}$ (implying decreasing marginal returns to ability). When $\frac{\alpha_1}{\alpha_1+\alpha_2} \leq \frac{1}{2}$, we have the case above in which whenever naive employers hire red educated workers, Bayesian employers hire red educated workers as well. When $\frac{\alpha_1}{\alpha_1+\alpha_2} > \frac{1}{2}$, while this proposition is no longer true, we see that naive employers still hire green workers to a much larger extent than bayesians. Hence, even when $\alpha_1 > \alpha_2$ is not satisfied, the results are in line with what we expect: naive employers discriminate against the disadvantaged group much more often than bayesians.

The case for hiring of uneducated workers is equivalent to the one described above, with the difference that the equivalent of Proposition A.1 for uneducated workers requires that $\alpha_1 \geq \alpha_2$ rather than $\alpha_1 < \alpha_2$.

Proposition A.2*. When $\alpha_1 \geq \alpha_2$, if bayesians discriminate against uneducated red workers, Naive employers will discriminate against uneducated red workers too.*

Proof. Very similar to Proposition A.1's proof. □

Once again, the simulations show an equivalent case to that of Figure A.1.

A.3 Continuous ability

We now assume that ability come from a continuous distribution, rather than the discrete distribution containing low, medium and high ability workers discussed in the main text. Denote by $N_i(s)$ the distribution from which ability for individuals of identity $i \in \{r, g\}$ are drawn. We assume that $N_i(s)$ follows a normal distribution $N_i(\mu_i, \sigma_i)$ for $i \in \{r, g\}$, where $\mu_r < \mu_g$ (meaning that red workers are worse on average). In line with the main text, we assume that the payoff of the employer is $X(s) = a + bs$ where $b > 0$. We denote $P_e(s)$ the probability that an individual of ability s obtains a university degree. For simplicity, we assume that $P_e = 0$ if $s < l$ and $P_e = 1$ if $s \geq l$, although we expect results to hold for most increasing functions of $P_e(s)$ with respect to ability.

Bayesians will then prefer educated green workers whenever

$$\int_{-\infty}^{\infty} \frac{N_g(s)P_e(s)X(s)}{\int_{-\infty}^{\infty} N_g(s)P_e(s)ds} ds > \int_{-\infty}^{\infty} \frac{N_r(s)P_e(s)X(s)}{\int_{-\infty}^{\infty} N_r(s)P_e(s)ds} ds,$$

and green uneducated green workers whenever

$$\int_{-\infty}^{\infty} \frac{N_g(s)(1-P_e(s))X(s)}{\int_{-\infty}^{\infty} N_g(s)(1-P_e(s))ds} ds > \int_{-\infty}^{\infty} \frac{N_r(s)(1-P_e(s))X(s)}{\int_{-\infty}^{\infty} N_r(s)(1-P_e(s))ds} ds.$$

In contrast, since naives do not update based on the information signal, they prefer green workers (whether educated or not educated) whenever

$$\int_{-\infty}^{\infty} N_g(s)X(s)ds > \int_{-\infty}^{\infty} N_r(s)X(s)ds.$$

Then, the following result follows.

Proposition A.3. *When ability is normally distributed, naive employers discriminate against red educated workers strictly more than Bayesian employers.*

Proof. Note that for naives

$$\int_{-\infty}^{\infty} N_i(s)X(s)ds = \int_{-\infty}^{\infty} N_i(\mu_i, \sigma_i)(a + bs)ds = \int_{-\infty}^{\infty} \frac{\exp \frac{(s-\mu_i)^2}{2\sigma_i^2}}{\sqrt{2\pi}\sigma_i}(a + bs)ds = a + b\mu_i.$$

Therefore, naives will prefer green workers whenever

$$a + b\mu_g > a + b\mu_r \implies \mu_g > \mu_r,$$

which is always true.

For bayesians, the expected payoff of hiring an educated worker of identity i is

$$\int_{-\infty}^{\infty} \frac{N_g(s)P_e(s)X(s)}{\int_{-\infty}^{\infty} N_g(s)P_e(s)ds} ds = \frac{\int_{-\infty}^{l} N_i(\mu_i, \sigma_i)(a + bs)0ds + \int_{l}^{\infty} N_i(\mu_i, \sigma_i)(a + bs)ds}{\int_{-\infty}^{l} N_i(\mu_i, \sigma_i)0ds + \int_{l}^{\infty} N_i(\mu_i, \sigma_i)ds} =$$

$$= \frac{(a + b\mu_i)\text{erfc}\left(\frac{l-\mu_i}{\sqrt{2}\sigma_i}\right) + \frac{2b\sigma_i \exp\left(\frac{-(l-\mu_i)^2}{2\sigma_i^2}\right)}{\sqrt{2\pi}}}{\text{erfc}\left(\frac{l-\mu_i}{\sqrt{2}\sigma_i}\right)} =$$

$$= a + \frac{\sqrt{\frac{2}{\pi}} b\sigma_i \exp(-\frac{(l-\mu_i)^2}{2\sigma_i^2})}{\operatorname{erfc}\left(\frac{l-\mu_i}{\sqrt{2}\sigma_i}\right)} + b\mu_i.$$

Therefore, bayesians will prefer green workers whenever

$$a + \frac{\sqrt{\frac{2}{\pi}} b\sigma_g \exp(-\frac{(l-\mu_g)^2}{2\sigma_g^2})}{\operatorname{erfc}\left(\frac{l-\mu_g}{\sqrt{2}\sigma_g}\right)} + b\mu_g > a + \frac{\sqrt{\frac{2}{\pi}} b\sigma_r \exp(-\frac{(l-\mu_r)^2}{2\sigma_r^2})}{\operatorname{erfc}\left(\frac{l-\mu_r}{\sqrt{2}\sigma_r}\right)} + b\mu_r.$$

$$\mu_g - \mu_r > \frac{\sqrt{\frac{2}{\pi}} \sigma_r \exp(-\frac{(l-\mu_r)^2}{2\sigma_r^2})}{\operatorname{erfc}\left(\frac{l-\mu_r}{\sqrt{2}\sigma_r}\right)} - \frac{\sqrt{\frac{2}{\pi}} \sigma_g \exp(-\frac{(l-\mu_g)^2}{2\sigma_g^2})}{\operatorname{erfc}\left(\frac{l-\mu_g}{\sqrt{2}\sigma_g}\right)}.$$

Naives always prefer green workers. Therefore, we only need to find an example in which, given these assumptions, bayesians prefer red workers. Let $\mu_g = 0$, $\sigma_g = 1$, $\mu_r = -1$, $\sigma_r = 1.5$, and $l = 1$. Then, the expected payoff of hiring a green worker is $a + 1.52b$ and the expected payoff of hiring a red worker is $a + 1.69b$. Since $b > 0$, Bayesian employers will prefer red workers while naive employers will prefer green workers. □

Proposition A.4. *When ability is normally distributed, naive employers discriminate against uneducated red workers strictly more than Bayesian employers.*

B Theoretical Results: Endogenous Case

This section derives the results for the case in which workers choose whether to pursue education. First we consider the case in which all employers are either Bayesian or naive, which corresponds to Proposition 2. Next we consider the case in which a share of the employers are Bayesians and a share are naive employers, which corresponds to Proposition 3.

B.1 Proof of Proposition 2

Full Set of Equilibria if Employers are Naive. Recall that employers observe a red and a green worker, their education level, and have to decide whom to hire. Hence, the worker's game when they face a Naive employer can be captured by Table B.1, where the row player is the red worker and the column player is the green worker. There, p^i_a is the (expected) probability that the worker of identity i and type a attains education.

	E	¬ E
E	$(1-p^g_{a'})p^r_a w - c$, $p^g_{a'} w - c$	$p^r_a w - c$ 0
¬ E	$0, p^g_{a'} w - c$	$0, 0$

Table B.1. Worker payoffs if employer is naive. Row player is red worker of ability i and column player is green worker of ability s'.

From this payoff matrix we can study under what conditions each of the equilibria would hold. This is, each worker knows his ability, the distribution of ability across both colors, and the decisions that the employer would make given these parameters and the education signals. With these parameters, both workers weigh the expected payoff of pursuing education against the expected payoff of not pursuing it. The table illustrates the parameter conditions needed to sustain each equilibrium. We summarize them here.

1. $(E, E; E, E)$ is part of an equilibrium iff $(1-(g_m p_m + g_h))p_m w - c > 0$.
2. $(\neg E, E; E, E)$ is part of an equilibrium iff:
   - $(1-(g_m p_m + g_h))p_m w - c < 0$
   - $(1-(g_m p_m + g_h))w - c > 0$
   - $p_m w - c > 0$
3. $(\neg E, \neg E; E, E)$ is part of an equilibrium iff:
   - $(1-(g_m p_m + g_h))w - c < 0$
   - $p_m w - c > 0$
4. $(\neg E, E; \neg E, E)$ is part of an equilibrium iff:
   - $(1-g_h)\pi_w - c > 0$
   - $p_m w - c < 0$

5. $(\neg E, \neg E; \neg E, E)$ is part of an equilibrium iff

   - $(1 - g_h)w - c < 0$
   - $w - c > 0$

Full Set of Equilibria if Employers are Bayesian. The payoffs for workers facing a Bayesian employer are depicted in Table B.2. The left payoff matrix corresponds to the case where condition **B** is satisfied ($\frac{g_h}{g_m} > \frac{r_h}{r_m}$), meaning that the employer prefers the green worker, while the right payoff matrix corresponds to the case where **B** is not satisfied. We assume that the employer randomizes between hiring one or the other worker if both are equally preferred.

	E	¬ E
E	$(1-p^g_{s'})p^r_s w - c$, $p^g_{s'} w - c$,	$p^r_s w - c$ 0
¬ E	$0, p^g_{s'} w - c$	$0, 0$

	E	¬ E
E	$p^r_s w - c$, $(1-p^r_s)p^g_{s'} w - c$,	$p^r_s w - c$ 0
¬ E	$0, p^g_{s'} w - c$	$0, 0$

Table B.2. Worker payoffs if the employer is Bayesian depending on whether condition **(B)** is satisfied (left panel) or not (right panel). Row player is red worker of type a and column player green player of type a'.

By considering this scenario, the following set of equilibria exist:

1. $(E, E; E, E)$ is part of an equilibrium iff:
   - $(1 - (g_m p_m + g_h))p_m w - c > 0$ and condition **(B)** holds or
   - $(1 - (r_m p_m + r_h))p_m w - c > 0$ and condition **(B)** does not hold.
2. $(E, E; \neg E, E)$ is:
   - Not an equilibrium if condition **(B)** holds. (In this case, either g_m wants to pursue education or r_m does not want to pursue education).
   - Part of an equilibrium if condition **(B)** does not hold, $(1 - g_h)p_m w - c > 0$, and $(1 - (r_m p_m + r_h))p_m w - c < 0$.
3. $(\neg E, E; E, E)$ is:
   - Not an equilibrium if condition**(B)** does not hold. (In this case, either r_m wants to pursue education or g_m does not want to pursue education).
   - Part of an equilibrium if condition**(B)** holds, if $(1 - r_h)p_m w - c > 0$, and $(1 - (g_m p_m + g_h))p_m w - c < 0$.
4. $(\neg E, E; \neg E, E)$ is part of an equilibrium. It requires:
   - $(1 - r_h)w + r_h \frac{w}{2} - c > 0$
   - $(1 - g_h)w + g_h \frac{w}{2} - c > 0$
   - $(1 - g_h)p_m w - c < 0$
   - $(1 - r_h)p_m w - c < 0$

These conditions imply that $p_m < \frac{2-i_h}{2-2i_h} \geq 1$

5. $(\neg E, E; \neg E, \neg E)$ is part of an equilibrium iff
   - $(1-r_h)w + r_h\frac{w}{2} - c < 0$.
6. $(\neg E, \neg E; \neg E, E)$ is part of an equilibrium iff
   - $(1-g_h)w + g_h\frac{w}{2} - c < 0$.

To sum up, Table B.3 shows the full set of equilibria when education is endogenous for Bayesian and Naive employers. Note that this analysis proves Proposition 2, which states that red workers study weakly less than green workers of the same ability when the employer is Naive. More concretely, there are no equilibria in which red workers are more likely to educate than green workers when the employers are Naive, although such equilibria exist if employers are Bayesian.

		Symmetric Equilibria		
		$(E, E; E, E)$	$(\neg E, E; \neg E, E)$	
Bayesian	**B**	$c < (1-(g_m p_m + g_h))p_m w$	$(1-i_h)p_m w < c < (1-\frac{i_h}{2})w, \forall i = r, g$	
	not B	$c < (1-(r_m p_m + r_h))p_m w$	$(1-i_h)p_m w < c < (1-\frac{i_h}{2})w, \forall i = r, g$	
Naive		$c < (1-(g_m p_m + g_h))p_m w$	$p_m w < c < (1-g_h)w$	
		Asymmetric Equilibria - More Green		
		$(\neg E, \neg E; \neg E, E)$	$(\neg E, \neg E; E, E)$	$(\neg E, E; E, E)$
Bayesian	**B**	$c > (1-\frac{g_h}{2})w$	-	$(1-r_h)p_m w > c > (1-(g_m p_m + g_h))p_m w$
	not B	$c > (1-\frac{g_h}{2})w$	-	-
Naive		$c > (1-g_h)w$	$(1-(g_m p_m + g_h))w < c < p_m w$	$(1-(g_m p_m + g_h))p_m w < c < (1-(g_m p_m + g_h))w$
		Asymmetric Equilibria - More Red		
		$(\neg E, E; \neg E, \neg E)$	$(E, E; \neg E, \neg E)$	$(E, E; \neg E, E)$
Bayesian	**B**	$c > (1-\frac{r_h}{2})w$	-	-
	not B	$c > (1-\frac{r_h}{2})w$	-	$(1-g_h)p_m w > c > (1-(r_m p_m + r_h))p_m w$
Naive		-	-	-

Table B.3. Equilibrium education decisions and parameter conditions under which they can be supported in equilibrium. Condition **B** is $\frac{g_h}{g_m} > \frac{r_h}{r_m}$.

B.2 Endogenous case with more general payoffs

In the theory section of the main body of the paper we consider the simplest case in which employer's payoff increases linearly in worker's ability. In that case, condition **(N)** is always satisfied and the result for Proposition 2 follows. The theoretical result, however, may be lost when one considers more general payoff schemes, for example situations in which employers are especially interested in hiring a high-ability worker.

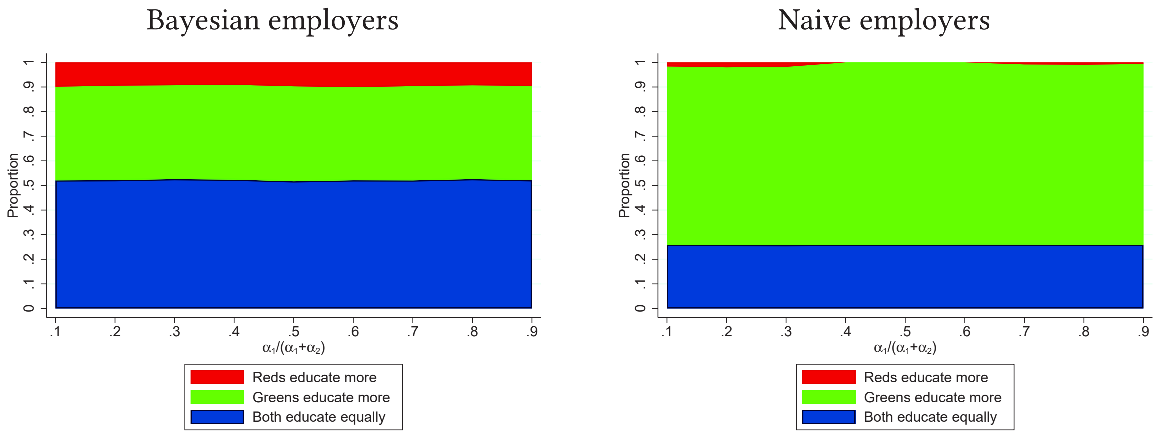


Figure B.1. Proportion of equilibria when hiring costs are high

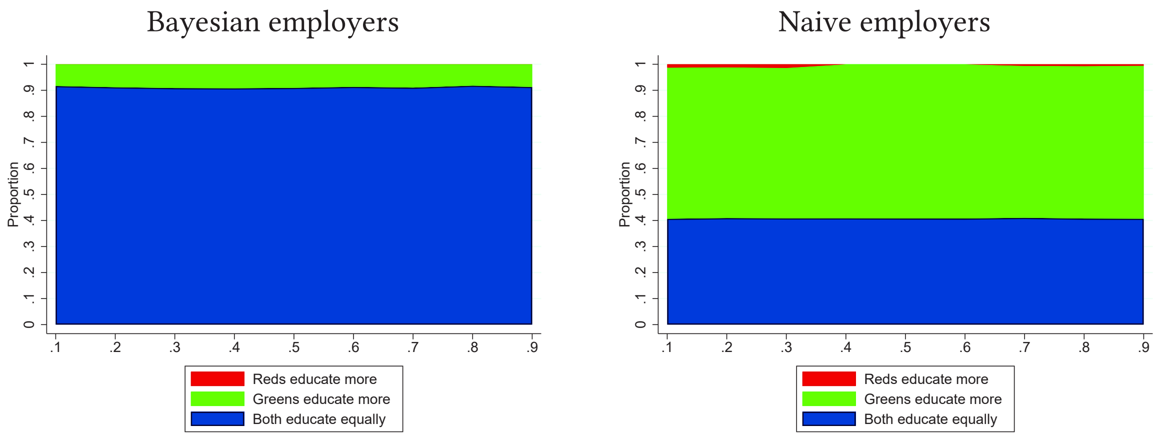


Figure B.2. Proportion of equilibria when hiring costs are low

Figures B.1 and B.2 study these more general scenarios using numerical simulations. More concretely, we generate parameter combinations and study what proportion of each of the equilibria survives under each setting. To do so, in each simulation we generate two groups of 4 workers where each worker is randomly assigned an ability l, m, or h (we generate groups based on 4 workers to mimic the experiment in the paper, but results are very similar assuming larger groups). The group that on average has the higher average ability is defined as the green group, and the other one is defined as the red group. We assume that $p_m = 0.5$ (the results are similar assuming different values). Figure B.1 further assumes relatively high costs, where $w = 10$ and $c = 8$, while Figure B.2 assume relatively low costs, where $w = 10$ and $c = 2$. As in Figure A.1, the X-axis captures $\frac{\alpha_1}{\alpha_1+\alpha_2}$, where a low value implies increasing marginal returns to ability, and a high value implies decreasing marginal returns to ability. For each value $\frac{\alpha_1}{\alpha_1+\alpha_2} \in \{0.1, 0.2, ..., 0.8, 0.9\}$ we generate 10,000 numerical simulations and for each of those we count the number of equilibria in which reds educate more, green educate more, and both educate equally. The graphs display the proportion of each kind of equilibrium across all the simulations.

Both figures show that the intuitions of the results in the main text largely carry over to this more general setting. While Naive employers can sometimes support equilibria in which red workers educate more, these cases are extremely uncommon. More generally, across all parameter combinations naive employers are much more likely to support equilibria in which greens educate more than reds, while most equilibria with Bayesian employers imply that both workers educate equally.

B.3 Proof of Proposition 3

In this section, we derive the full set of equilibria in a situation in which γ firms are naive and $1 - \gamma$ firms are Bayesian. We assume workers to know the proportion of firms that are naive and Bayesian, but to not know whether the firm that they are applying to is Bayesian or naive.

Note that there can only exist 8 possible equilibria. To see this, note that since $p_l = 0$, a low ability worker would never want to pursue education. Since $p_h = 1$ and $w - c > 0$, there cannot exist any equilibrium in which no one pursues education (since a high ability worker would then decide to study). Note also that there cannot exist any equilibrium in which, for a given color, high ability workers do not study while medium ability workers study. To see this, note first that, since firms cannot see workers' ability, if it is not worth it for a high ability to study (because the cost of studying is higher than the expected benefit), neither is it worth it for a medium ability worker to study (since the cost to study is the same as high ability workers, but the potential benefit is reduced by p_m). Therefore, it can only be that, within a given color, medium ability workers study but high ability workers do not if, when only medium ability workers study, firms are more likely to choose this color. However, this will never be the case: if firms are naive, they only rely on the base-rate and they therefore do not react to knowing that high ability workers are not studying. If firms are Bayesian, these firms will learn that any worker that studies from the color in which mediums study is medium ability. They will therefore always prefer to choose the other color if in the other color high abilities are studying. If in the other color only mediums are studying, then it would become dominant for high abilities to start studying because then firms would always pick them.

Here, we consider these eight equilibria, how they depend on the condition (B) discussed in the main text, and how γ interacts with them:

1. $(E, E; E, E)$ is part of an equilibrium iff:
   - If **(B)**:
     $(1 - (g_m p_m + g_h))p_m w - c > 0$
   - If ¬**(B)**
     $\gamma((1 - g_m p_m - g_h)p_m w) + (1 - \gamma)(p_m w) - c > 0$
     $\gamma(p_m w) + (1 - \gamma)((1 - r_m p_m - r_h)p_m w)) - c > 0$
2. $(E, E; \neg E, E)$ is part of an equilibrium if:
   - If **(B)**: Not an equilibrium
   - If ¬**(B)**:
     $(1 - g_h)p_m w - c > 0$
     $\gamma(p_m w) + (1 - \gamma)((1 - r_m p_m - r_h)p_m w)) - c < 0$
3. $(\neg E, E; E, E)$ is part of an equilibrium iff:
   - If **(B)**:
     $((1 - g_m p_m - g_h)p_m w) - c < 0$
   - If ¬**(B)**:
     $\gamma((1 - g_m p_m - g_h)p_m w) + (1 - \gamma)p_m w - c < 0$
     $\gamma((1 - g_m p_m - g_h)w) + (1 - \gamma)w - c > 0$
     $\gamma(p_m w) + (1 - \gamma)((1 - r_h)p_m w) - c > 0$
4. $(E, E; \neg E, \neg E)$ is not part of an equilibrium.

5. $(\neg E, \neg E; E, E)$ is part of an equilibrium iff:

    - $p_m w - c > 0$
      $\gamma((1 - p_m g_m - g_h)w) + (1 - \gamma)w - c < 0$

6. $(\neg E, E; \neg E, E)$ is part of an equilibrium iff:

    - $((1 - g_h)p_m w) - c < 0$
      $\gamma((1 - g_h)w) + (1 - \gamma)((1 - g_h)w + g_h \frac{w}{2}) - c > 0$
      $\gamma(wp_m) + (1 - \gamma)((1 - r_h)p_m w) - c < 0$
      $\gamma w + (1 - \gamma)((1 - r_h)w + r_h \frac{w}{2}) - c > 0$

7. $(\neg E, E; \neg E, \neg E)$ is part of an equilibrium iff

    - $wp_m - c < 0$
      $\gamma w + (1 - \gamma)((1 - r_h)w + r_h \frac{w}{2}) - c < 0$

8. $(\neg E, \neg E; \neg E, E)$ is part of an equilibrium iff

    - $\gamma((1 - g_h)w) + (1 - \gamma)((1 - g_h)w + g_h \frac{w}{2}) - c < 0$
      $wp_m - c < 0$

Note that by Proposition 2 we know that when $\gamma = 1$ (all employers are Naive) there exist no equilibria in which red workers educate more, while when $\gamma = 0$ (all employers are Bayesian) these equilibria do exist. Note further that γ enters all the expressions above linearly, which implies that there exist a γ^* such that for $\gamma > \gamma^*$ there will only exist equilibria where greens educate more than reds. This proves Proposition 3.

C Additional tables

Table C.1. Sample characteristics from Experiment I

Demographics		*Ethnicity*		*Social class*		*Decisions*	
Female	0.633	White	0.461	Working class	0.461	Quiz correct	0.209
Age between 20-24 years old	0.506	Black	0.104	Middle class	0.474	Cognitive ability (max 6)	2.19
Age between 25-30 years old	0.159	Asian	0.156	Upper class	0.065	Risk aversion (max 10)	5.93
Age between >30 years old	0.182	Other	0.279				
British	0.312						
Europe	0.354						
Asia	0.205						

Table C.2. Worker Beliefs Experiment I

	% employers hiring red	*% green workers investing*	*% red workers investing*	*Intermediate Beliefs*	
Green Workers	35%	73%	60%	**Green Workers**	49%
Green Low Ability	52%	72%	71%	Low Ability Green	3%
Green Medium Ability	36%	80%	66%	Medium Ability Green	53%
Green High Ability	26%	65%	50%	High Ability Green	68%
Red Workers	34%	71%	58%	**Red Workers**	12 %
Red Low Ability	32%	75%	66%	Low ability Red	2%
Red Medium Ability	31%	69%	53%	Medium Ability Red	14%
Red High Ability	38%	65%	55%	High Ability Red	20%
Correct Answer	13%	93%	58%		

Note: The table shows the mean response in the quiz to the questions of (i) which percent of employers hired a red worker, (ii) which percent of green workers of medium ability invested in education, (iii) which percent of red workers of medium ability invested in education. It also shows (iv) the average intermediate belief (after observing education outcomes of both workers) of being hired oneself.

Table C.3. Name perceptions from Experiment II

	Origin UK	White	Christian	Working class	Intelligence	Likability
Julia	66	94	89	14	6.07	6.34
Becky	80	94	82	50	5.19	5.83
Anna	70	90	91	27	6.06	6.26
Megan	68	89	87	36	5.53	5.91
Liam	91	93	85	62	5.15	5.93
Joseph	74	85	87	25	5.97	6.08
Alan	96	97	87	60	5.56	5.95
Matthew	88	97	91	24	6.08	6.08
Average females	71	91.75	87.25	31.75	5.71	6.09
Average males	87.25	93	87.5	42.5	5.69	6.01

D Additional Figures

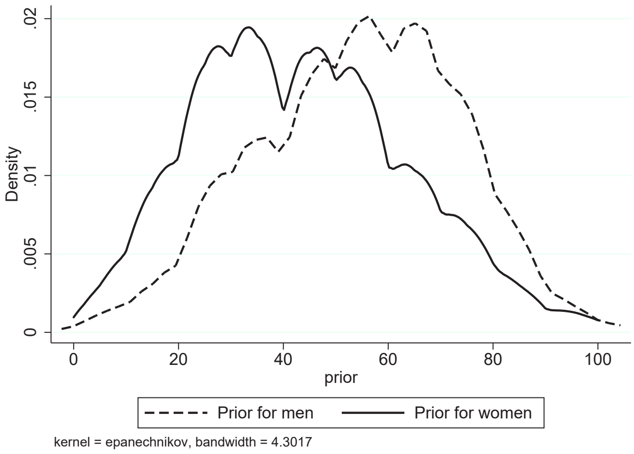
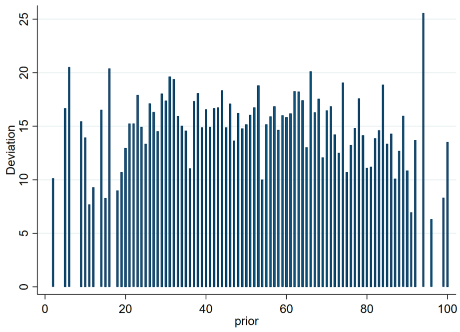
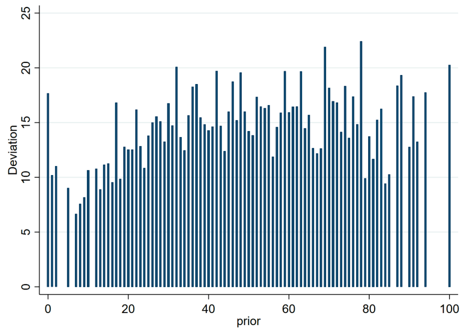


Figure D.1. Distribution of prior beliefs in Experiment 2.

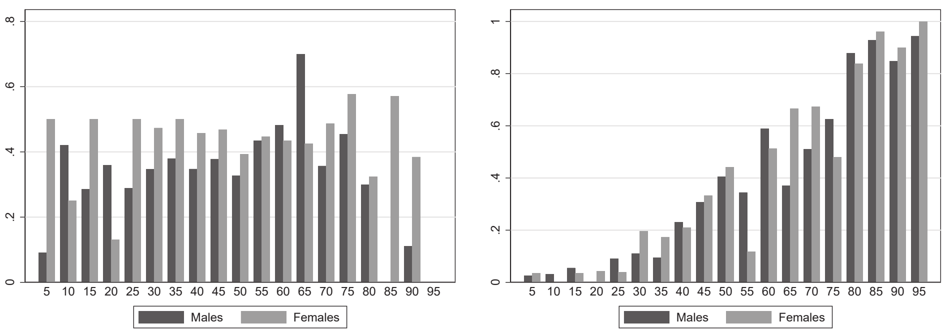


(a) Male Candidates



(b) Female Candidates

Figure D.2. Average Deviation from Bayesian posterior depending on prior for male, Panel(a), and female, Panel (b), candidates.



(a) Priors (b) Posteriors

Figure D.3. Fraction of hired workers by (a) Priors and (b) Posteriors for male and female candidates. Note that the most common priors for men are between 50-65 and the most common priors for women between 35-50.

E Instructions Experiment I

Welcome and thanks for participating in this experiment. Please read these instructions carefully. They are identical for all the participants with whom you will interact during this experiment. If you have any questions please raise your hand. One of the experimenters will come to you and answer your questions. From now on communication with other participants is not allowed. Please do also switch off your mobile phone at this moment. If you do not conform to these rules we are sorry to have to exclude you from the experiment.

You will receive 4 GBP just for showing up. During the experiment you can earn additional monetary rewards. How much you earn depends on your choices and those of others and is explained below. All your decisions will be treated confidentially.

This session consists of two parts. The first part consists of the main body of the experiment, and will take approximately 1 hour and 15 minutes. The second part is a questionnaire that will take approximately 30 minutes. Hence, we expect this experiment to take a bit less than 2 hours.

THE EXPERIMENT In the experiment you will be randomly assigned either the role of worker or the role of employer. If you are assigned the role of worker, you will also be randomly assigned an ability level (high, medium or low) and a colour (yellow or orange). Your role, ability level and colour will remain fixed during the entire experiment.

The experiment consists of 60 rounds. In each round, the computer will create one pool of 4 yellow workers and one pool of 4 orange workers. The computer will then randomly pick one yellow worker and one orange worker and assign them to an employer. Both the employer and the workers will see how many workers of each ability there are in each pool, but the employer will not see the ability of the particular workers that he/she is assigned to. There are then two decisions:

1. Each of the workers decide whether to pursue education or not. Pursuing education is costly and might or might not lead to graduation. The higher a worker's ability, the higher the chance that they graduate.
2. The employer sees whether each of the workers graduated. Then the employer decides whether to hire the yellow worker, the orange worker, or not hire any worker.

Workers' decisions As a worker you decide whether to pursue education or not. Pursuing education costs 1 GBP. If you decide to pursue education you will successfully graduate

- with a 100% chance (for sure) if you have high ability
- with an 80% chance if you have medium ability and
- with a 0% chance (for sure NOT) if you have low ability.

If you decide not to pursue education you will for sure NOT graduate.

In addition you receive

- a payment of 8 GBP if you are hired.
- a payment of 0 GBP if you are NOT hired.

In the second part of the experiment, you will be offered additional money if you correctly answer a quiz about other participants' behavior during the experiment. We will tell you more when you reach that part.

Employers' decisions As an employer you decide whether to hire the yellow worker, the orange worker, or neither worker. You cannot hire both workers.

When you make your decision you will see each worker's colour and whether they graduated. You will NOT be able to see their ability level. However you will see for each colour, how many workers of low, medium and high ability there are in the pool of yellow and in the pool of orange workers.

You receive

- 20 GBP if you hire a graduated and high-skilled worker
- 15 GBP if you hire a graduated and medium-skilled worker
- 10 GBP if you hire a graduated and low-skilled worker
- 0 GBP if you hire a worker who did NOT graduate
- 8 GBP if you decide NOT to hire

At the end of each round you will be informed about the ability level of the worker you hired and your round payment. You will then move to the next round.

Payment: At the end of the experiment we will pay you:

- Your earnings in one of the 60 randomly drawn rounds of the experiment
- + the amount that you receive for answering the quiz (only as a worker)
- + the amount that you receive for answering the questionnaire
- + 4 GBP show up fee

Enjoy the Experiment!

E.1 Screenshots of Experiment I

After reading the instructions and answering a set of 12 questions that made sure that participants understood the experiment, the experiment started. Below, we attach screenshots from the experiment from the perspective of the worker.

Figure E.1 represents an example of the first screen that workers saw in each round, in which they were asked whether they would like to pursue education. After answering it, and while they waited for the employers to make their decision, they were asked whether they thought they would be hired or not. Figure E.2 represents an example of the last screen that workers saw, summarizing their earnings for the round.

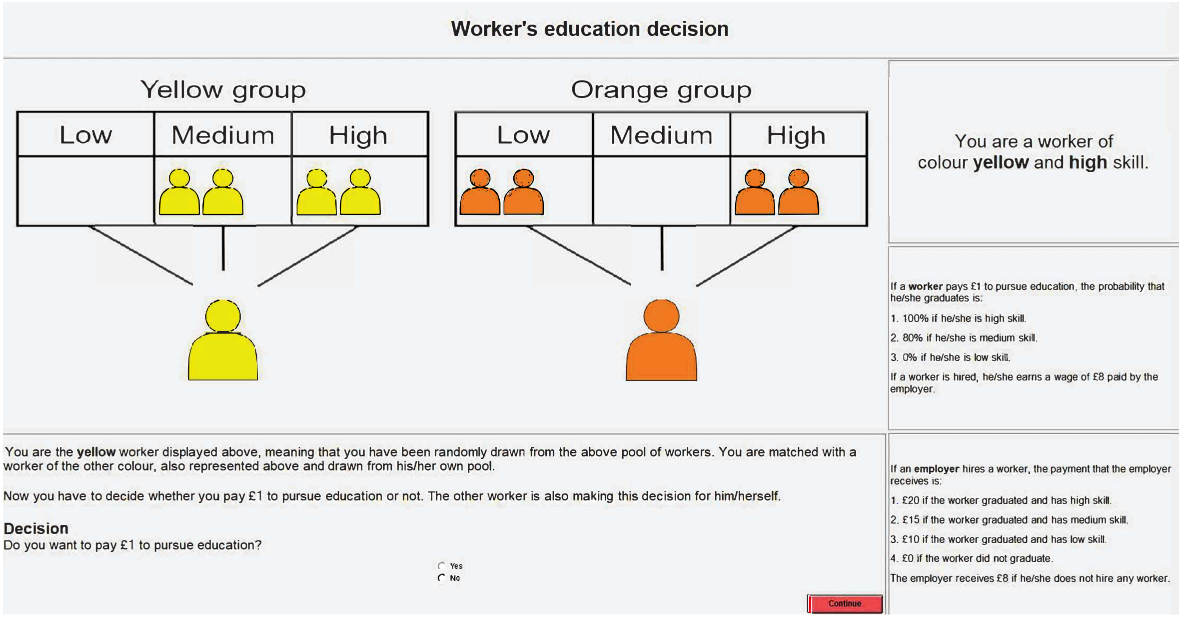


Figure E.1. Education decision from a yellow worker with high skill

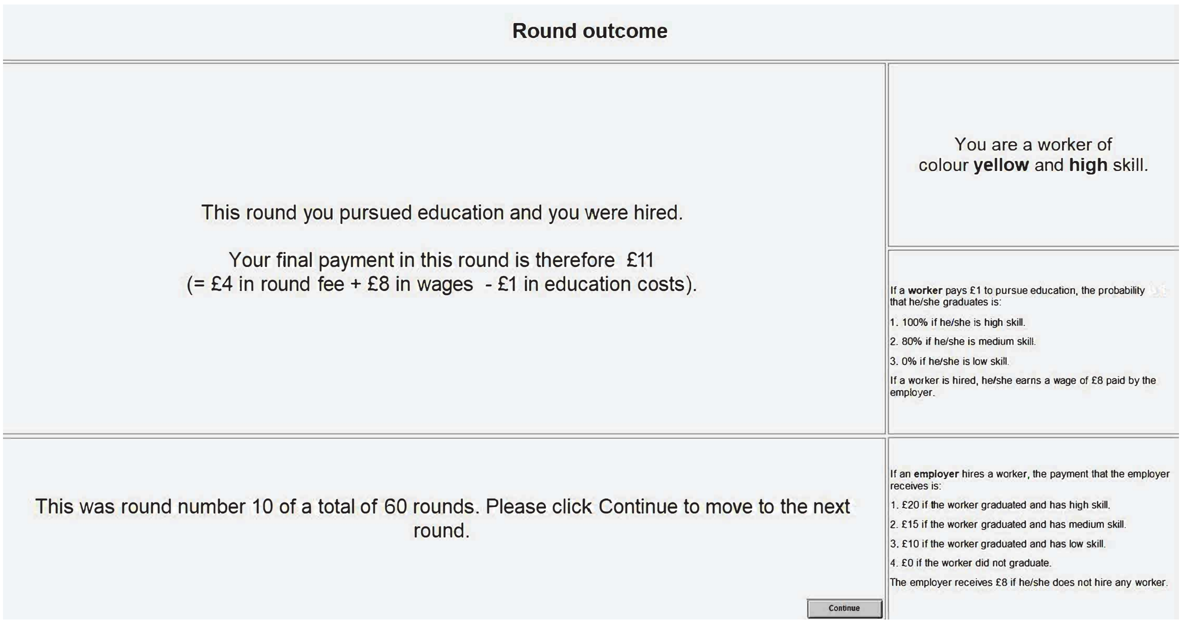


Figure E.2. Round outcome from a yellow worker with high skill

Below, we attach screenshots from the experiment from the perspective of the employer. Employers first saw the same picture shown to the workers, represented in E.1, and had to wait while workers made their decision. After the workers made their decisions, Figure E.3 represents an example of the screen employers saw when they had to make their decision. Finally, Figure E.4 represents an example of the last screen that employers saw, summarizing their earnings for the round.

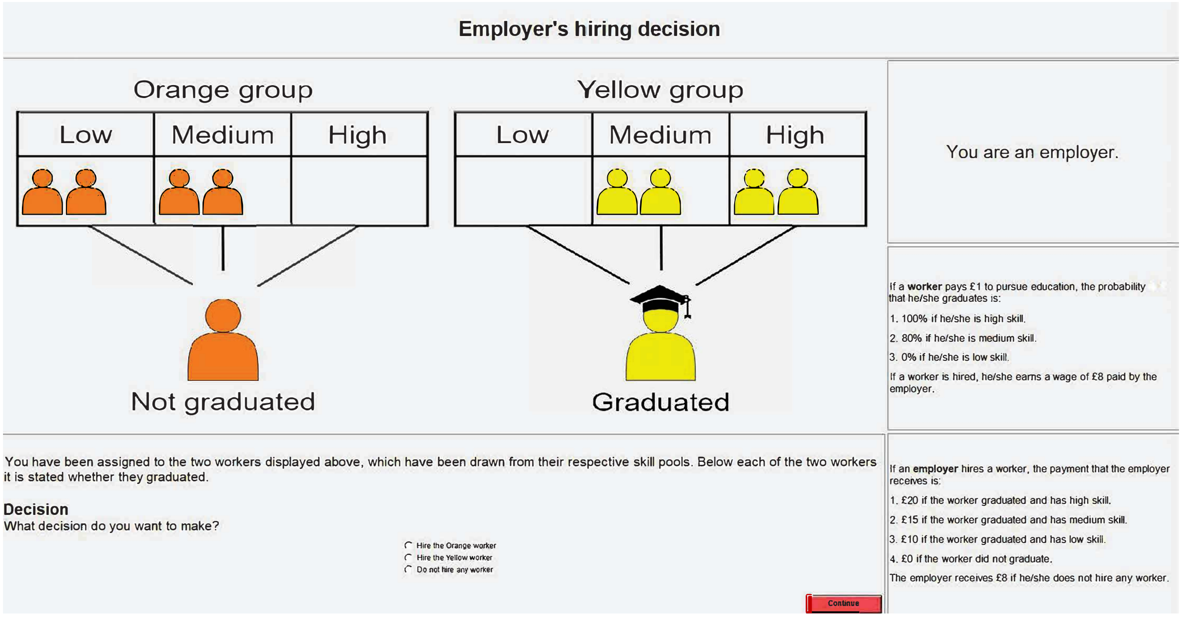


Figure E.3. Hiring decision from an employer

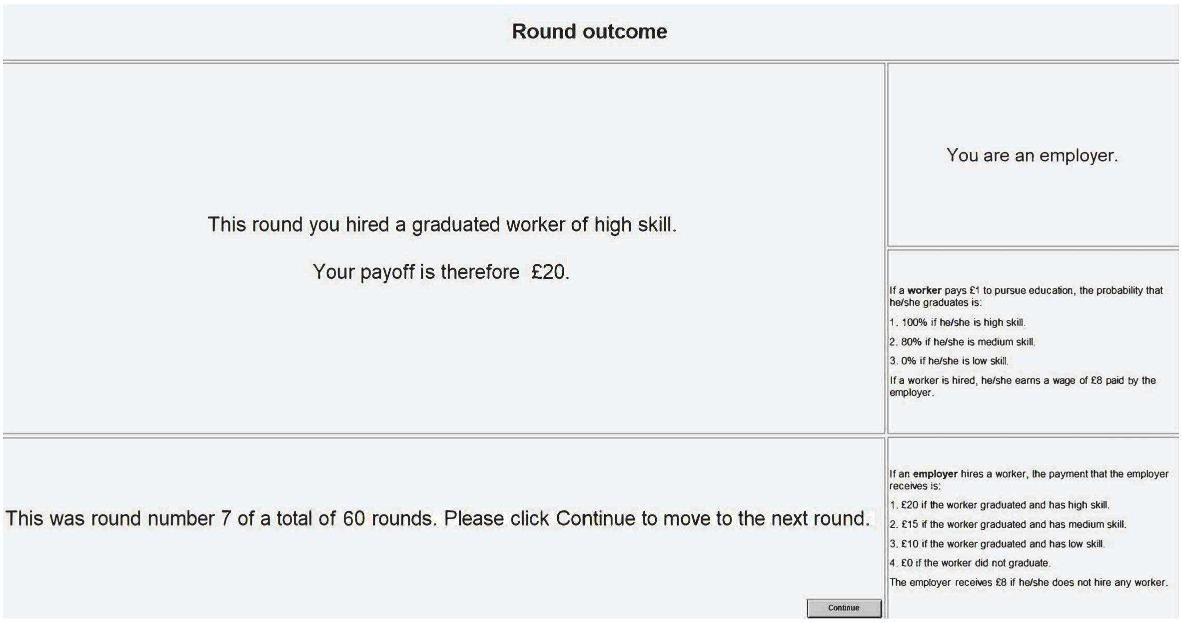


Figure E.4. Round outcome from an employer

After finishing the experiment, subjects were shown the following final questionnaire.

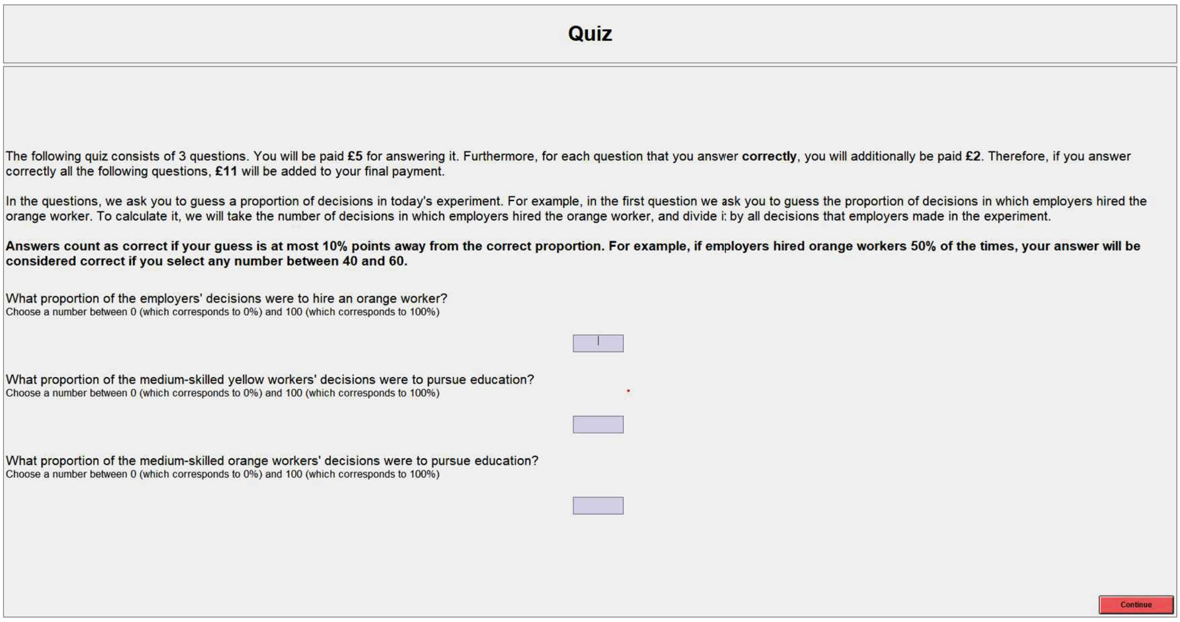


Figure E.5. Final questionnaire

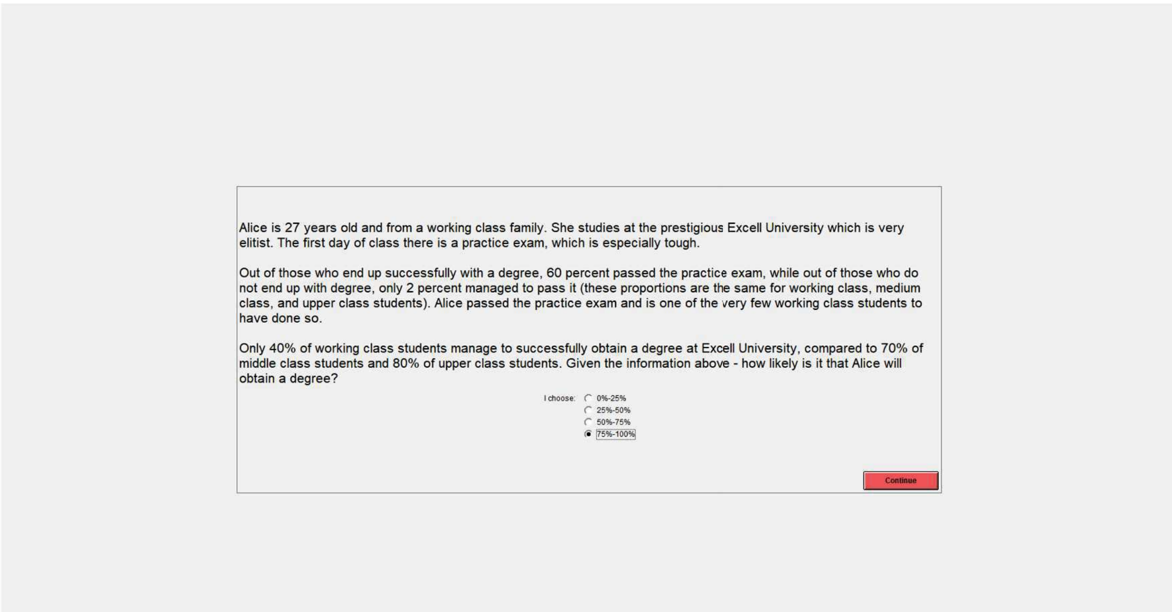


Figure E.6. Final questionnaire

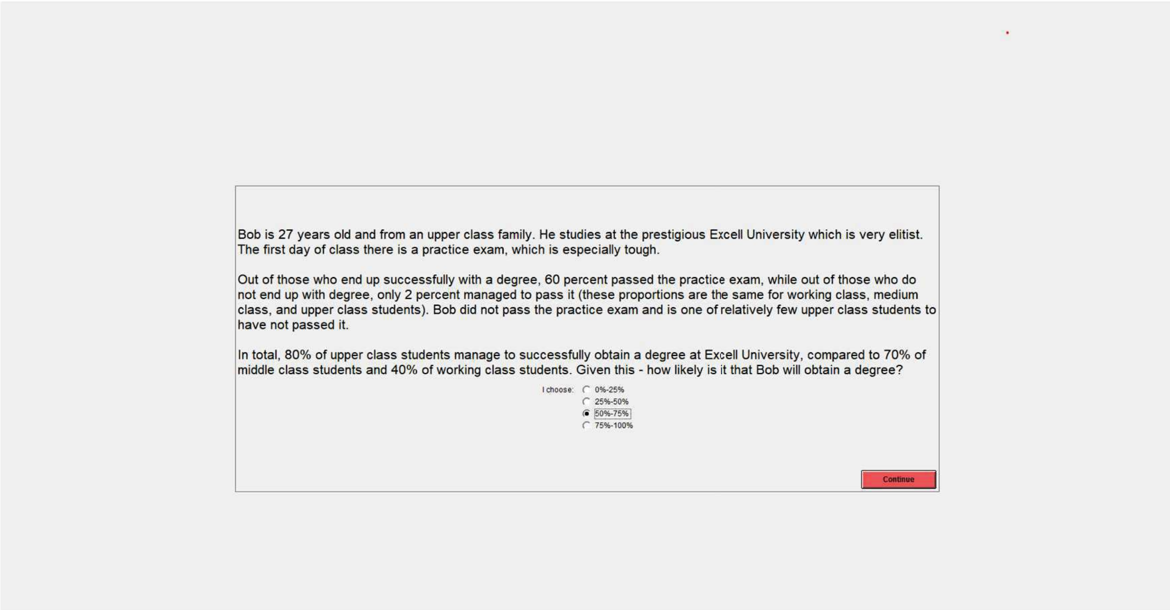


Figure E.7. Final questionnaire

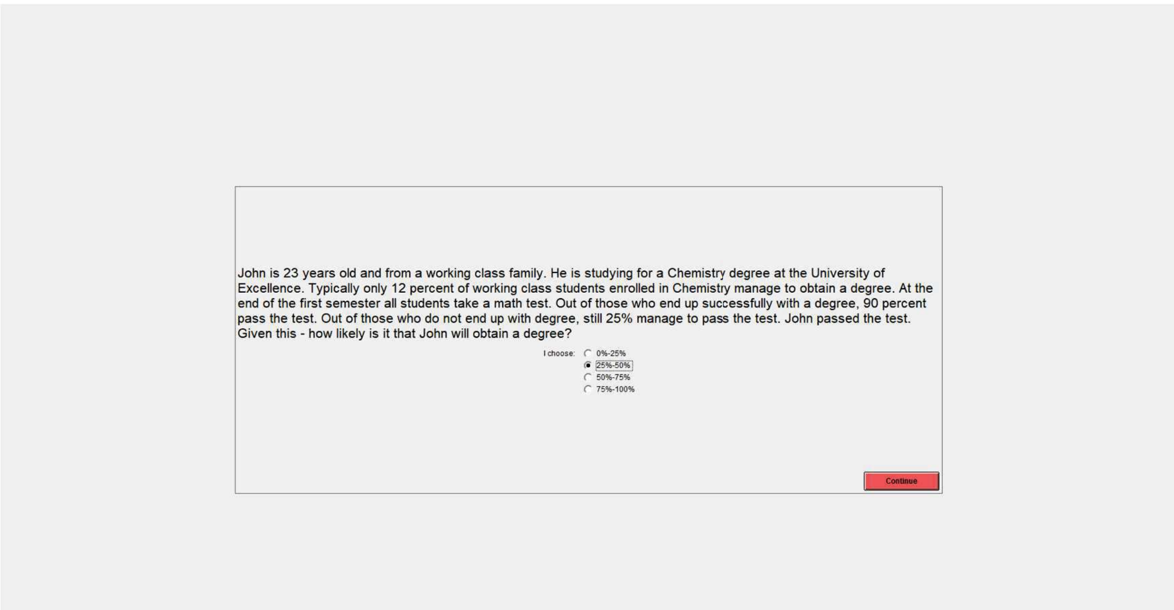


Figure E.8. Final questionnaire

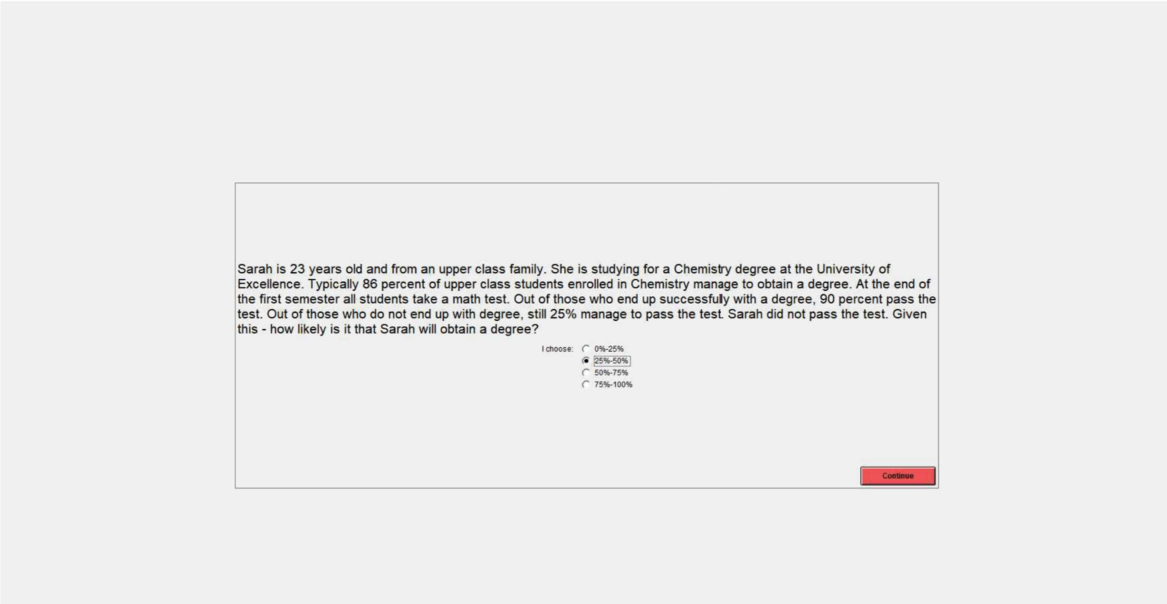


Figure E.9. Final questionnaire

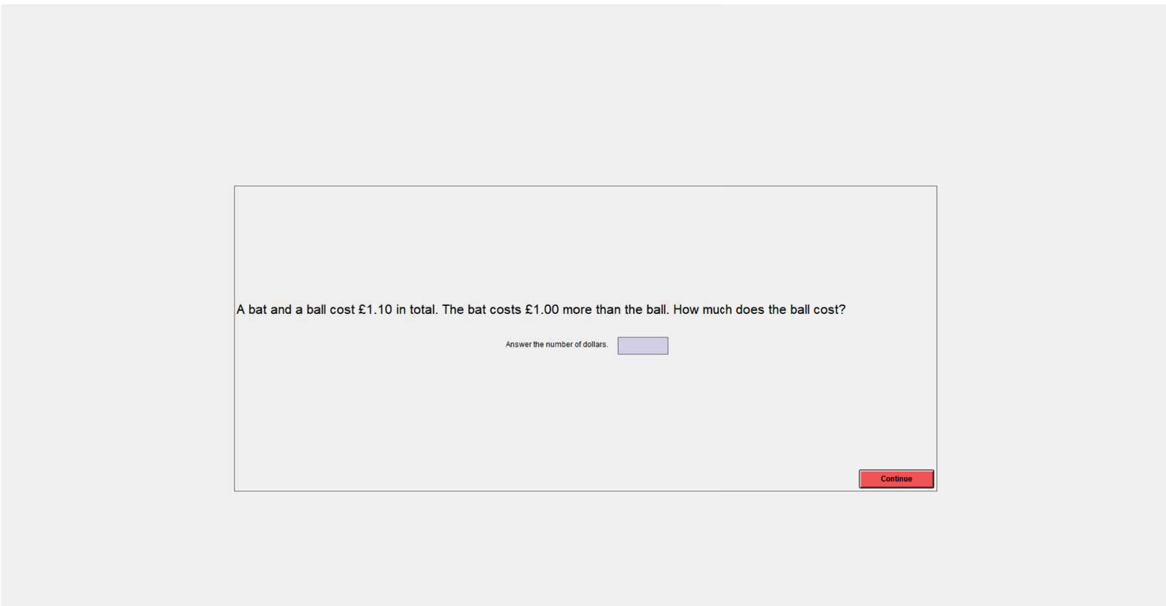


Figure E.10. Final questionnaire

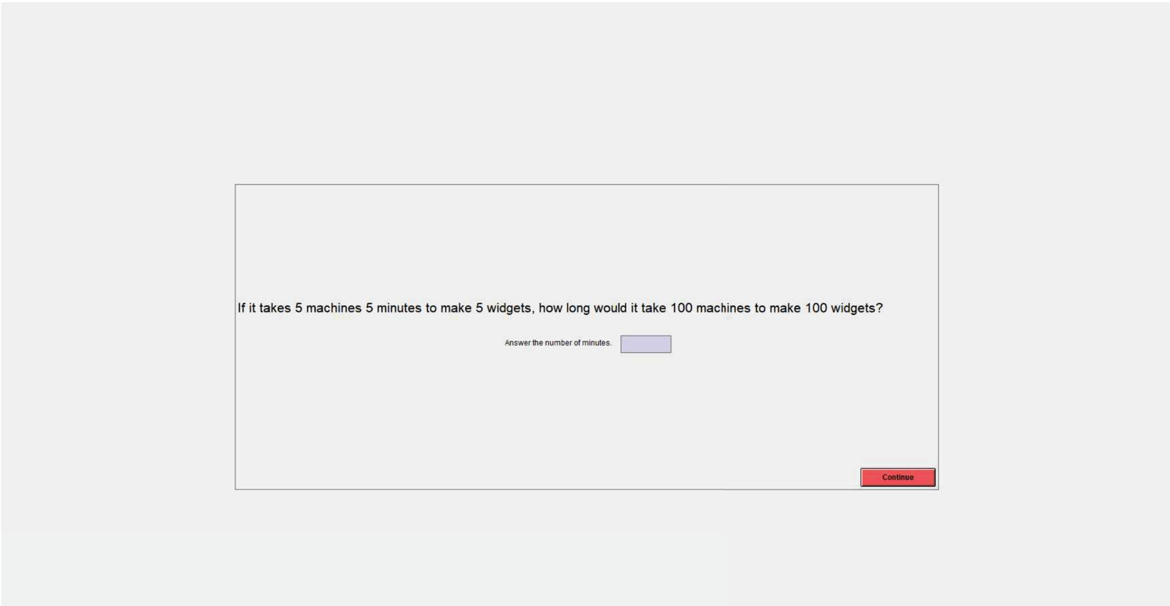


Figure E.11. Final questionnaire

Figure E.12. Final questionnaire

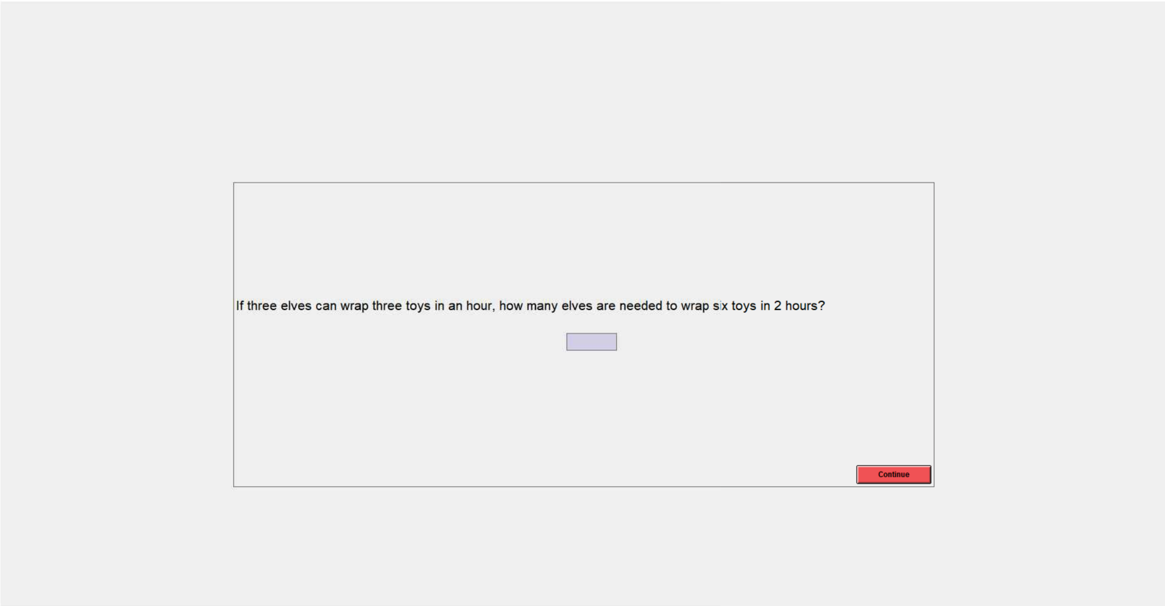


Figure E.13. Final questionnaire

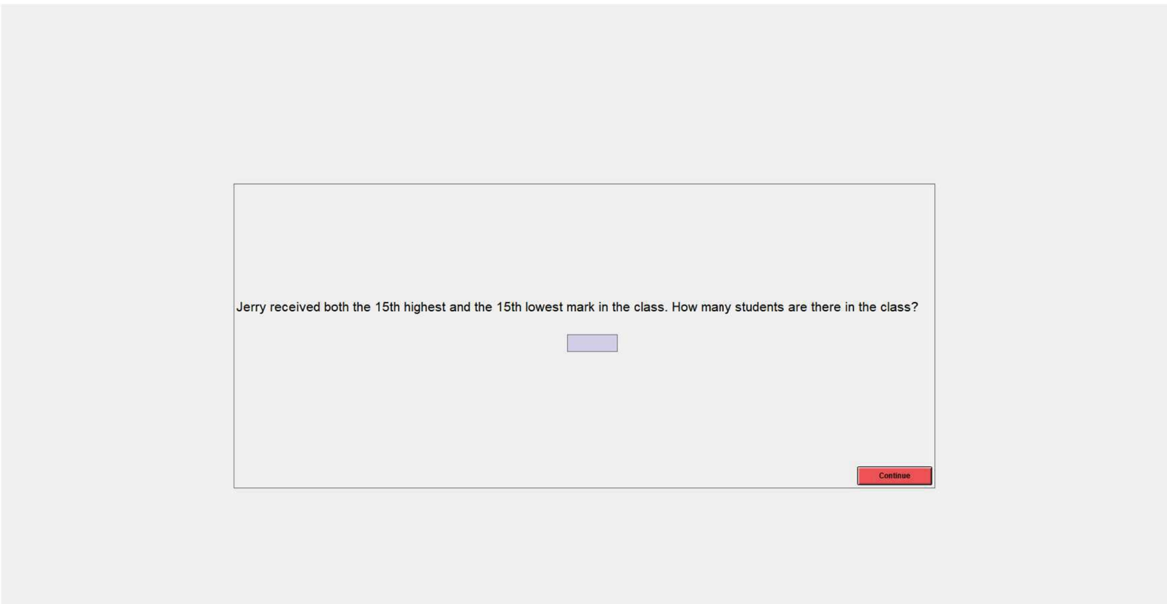


Figure E.14. Final questionnaire

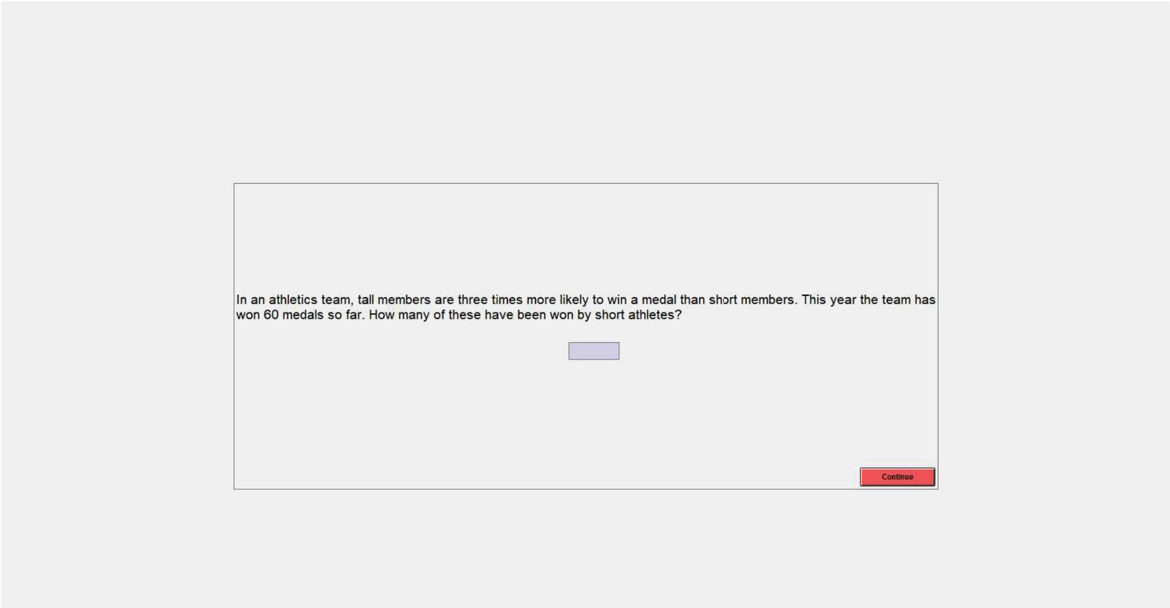


Figure E.15. Final questionnaire

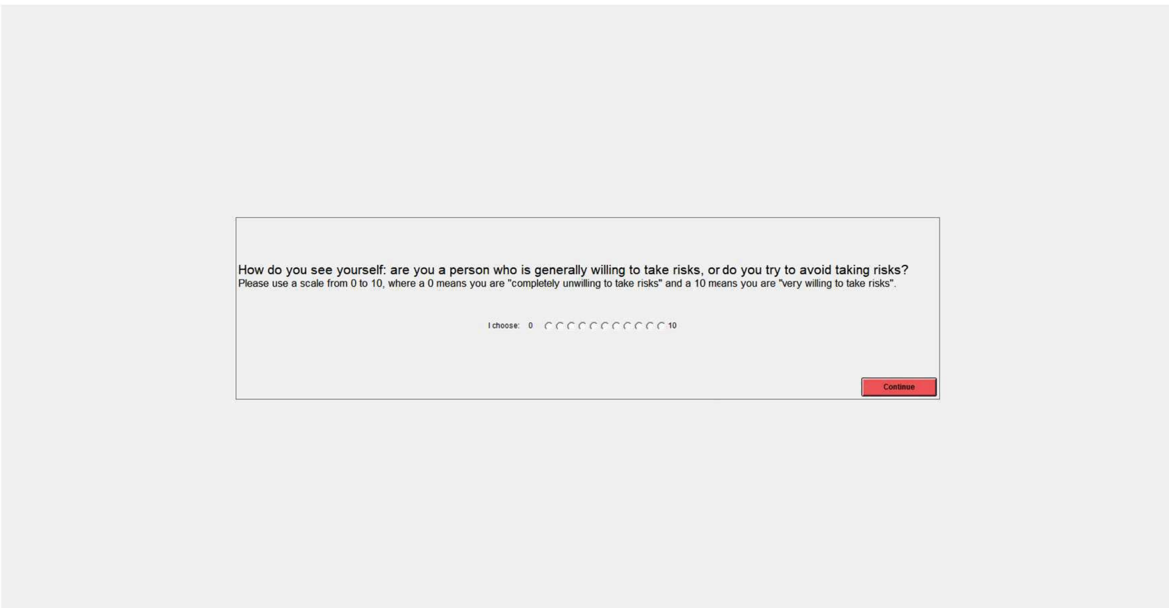


Figure E.16. Final questionnaire

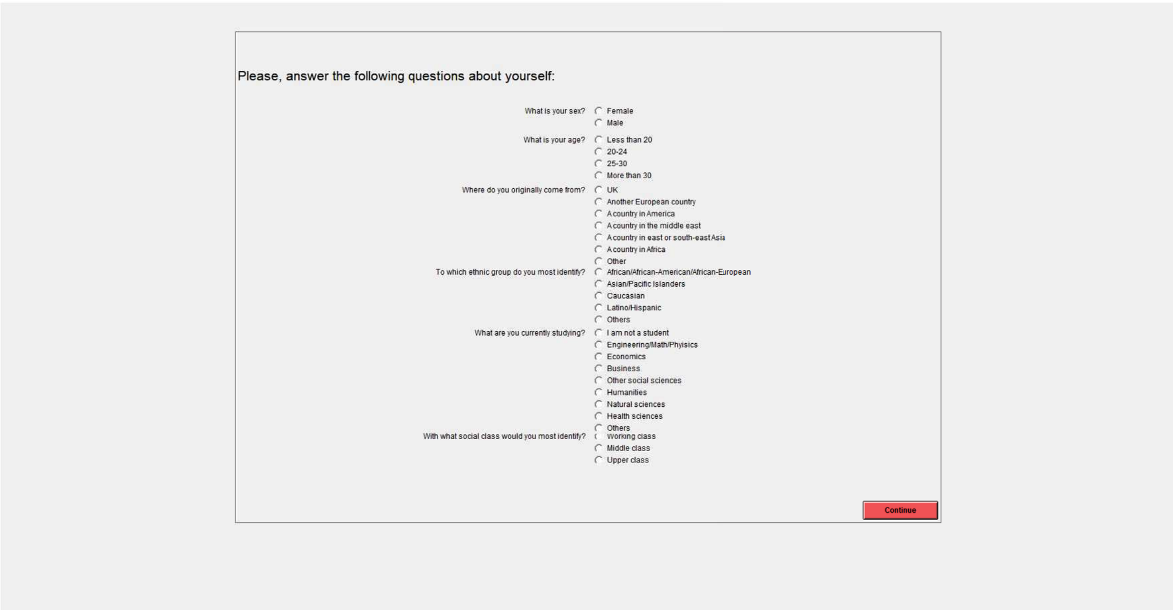


Figure E.17. Final questionnaire

F Instructions Experiment II

These are the Instructions given to participants at the very beginning of the online experiment. Please read the following lines very carefully, you will only be able to proceed with the study if you answer correctly a set of understanding questions below. This survey consists of two parts: PART 1 takes about 10 minutes to complete and PART 2 takes about 2 minutes to complete. We will first describe PART 1 and, after you have filled it out, describe PART 2.

BACKGROUND. We performed a Math and Logic test with 80 young university students from a university in the East of England, who we will call the candidates. The candidates were placed in 4 groups of 20 candidates each.

ASSESSMENT. In the following screens, we will show you a CV of one of the candidates, which includes the candidate's first name, age, gender, region of residence, marital status, and field of study at the university. You do not know the performance of this candidate: your goal is to assess how likely it is that the performance of this candidate is in the top half of his/her group. In this case we will say the candidate is a "Top Performer". In other words, you will have to guess how likely it is that the performance of this person is within the top 10 of his/her group of 20 candidates.

INFORMATION SIGNALS. After you have made your first assessment, we will give you a signal of the candidate. The signal will be either Positive or Negative.
If the candidate is a Top Performer, the signal is Positive with a 70% chance and Negative with a 30% chance.
If the candidate is not a Top Perfomer, the signal is Positive with a 30% chance and Negative with a 70% chance.

YOUR CHOICES. You will make six choices. For each of the choices, you will have to indicate how likely it is that the candidate is a Top Performer.
Choice 1. You will see the CV.
Choice 2. You will see the CV and one signal.
Choice 3. You will additionally see a second signal.
Choice 4. You will additionally see a third signal.
Choice 5. You will additionally see a fourth signal.
Choice 6. You will additionally see a fifth signal.

You will have to assess in total 4 candidates. So you will make Choice 1-6 four times, one for each different candidate. Hence you will make 24 choices in total in PART 1.

PAYMENT. At the end of the study, a computer will randomly pick one of the 28 choices that you made (which consist of 24 choices in PART 1 and 4 choices in PART 2) and you will be paid according to this choice. In PART 1, you will be paid either £0 or £5 based on the accuracy of your reported probability. The higher the accuracy, the higher the chances that you receive £5. Click here to see the exact method used to determine the probabilities. This method ensures that the best for you is to report your best guess. We will explain the payment structure from PART 2 later on.

In addition to this payment, you will be paid £1 fixed fee.

After answering the control questions to make sure that they understood the instructions, participants were briefly shown an example of the tasks that the candidates had to solve. Then, they were shown summary statistics on the candidates' average performance in the task. In particular, we wrote "Finally, before we begin with the assessments, we will show you information about the proportion of Top Performers with different characteristics." They then saw the following graphs and understanding questions:

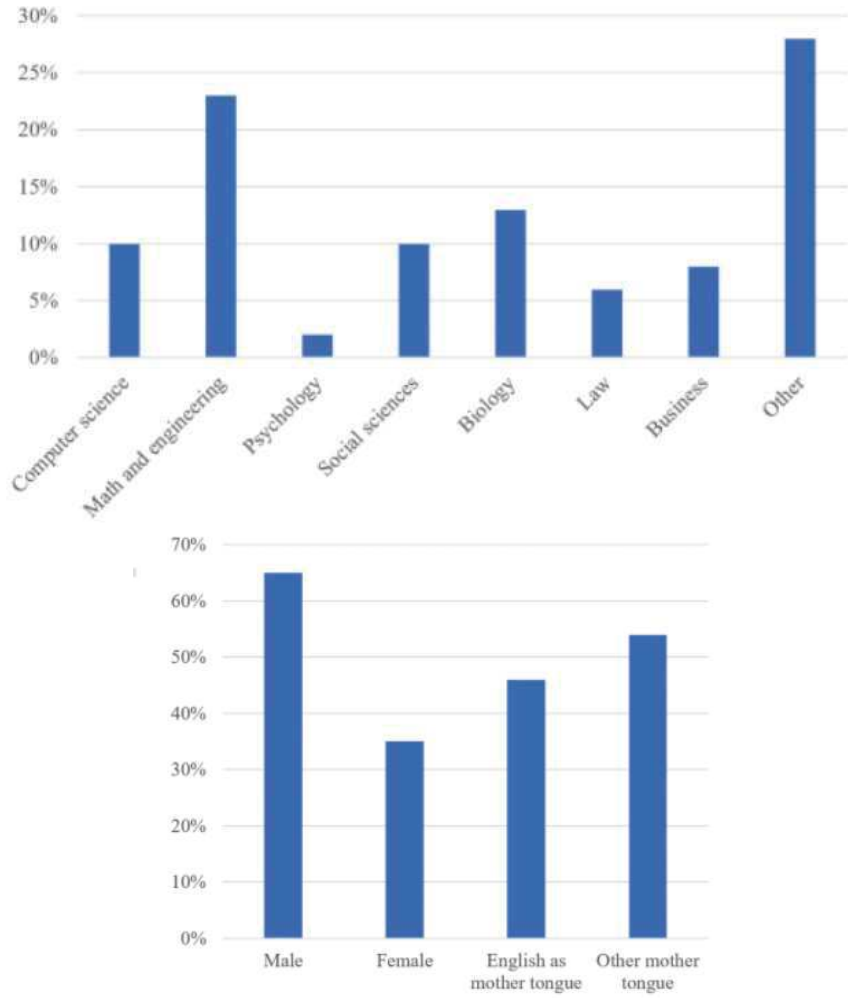


Figure F.1. Summary statistics of top performers - Part 1

What proportion of top performers study Math and Engineering?

- 0%
- 23%
- 28%
- 38%

What proportion of top performers are male?

- 35%
- 55%
- 65%
- 68%

Figure F.2. Summary statistics of top performers - Part 2

Participants then started evaluating candidates. In what follows, we attach examples of the screens that participants saw during the experiment. The signals were then added to Figure F.4, one by one, as described in the main text of the paper.

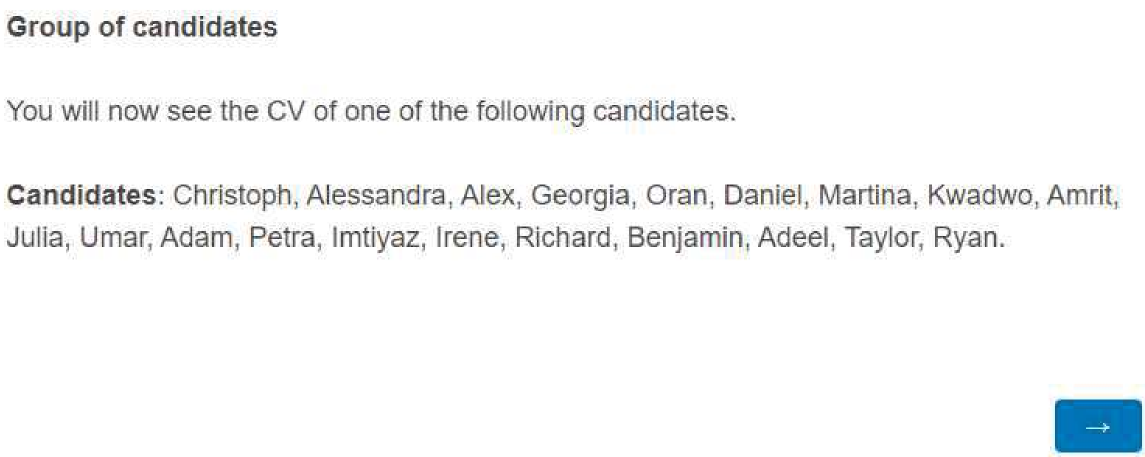


Figure F.3. Decision screens for Experiment 2

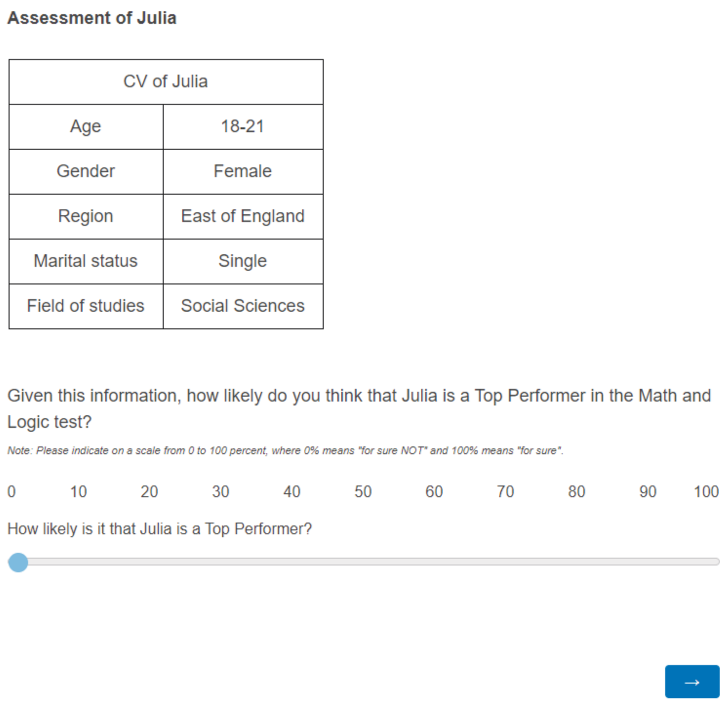
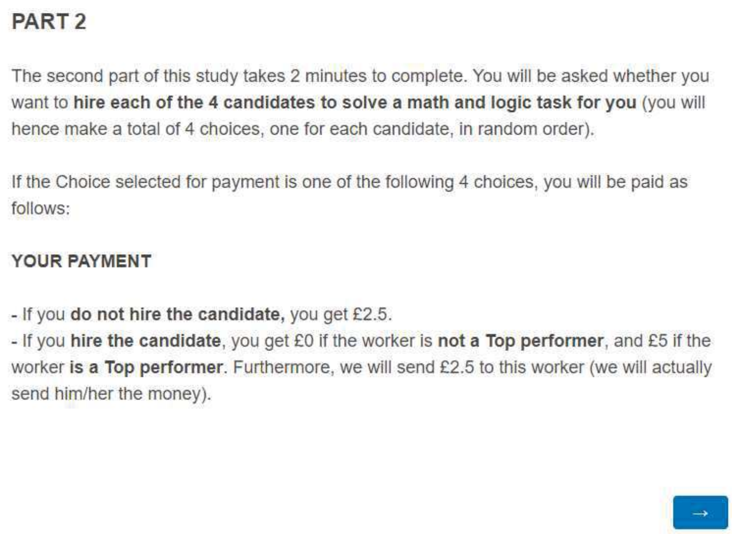


Figure F.4. Decision screens for Experiment 2

Participants then faced the hiring decisions, where they had to decide whether they hired each of subjects they evaluated (note that participants were again reminded of the signals that they had seen)


PART 2

The second part of this study takes 2 minutes to complete. You will be asked whether you want to **hire each of the 4 candidates to solve a math and logic task for you** (you will hence make a total of 4 choices, one for each candidate, in random order).

If the Choice selected for payment is one of the following 4 choices, you will be paid as follows:

YOUR PAYMENT

- If you **do not hire the candidate,** you get £2.5.
- If you **hire the candidate**, you get £0 if the worker is **not a Top performer**, and £5 if the worker **is a Top performer**. Furthermore, we will send £2.5 to this worker (we will actually send him/her the money).

→

Figure F.5. Decision screens for Experiment 2

Hiring decision - Julia

CV of Julia	
Age	18-21
Gender	Female
Region	East of England
Marital status	Single
Field of studies	Social Sciences
Signal 1	
Signal 2	
Signal 3	
Signal 4	
Signal 5	

Note: Remember that if Julia is a Top Performer you see a Positive signal with 70% chance and a Negative signal with 30% chance. If Julia is not a Top Performer, you see a Positive signal with 30% chance and a Negative signal with 70% chance.

Now you have to choose whether to hire Julia:

- If you do not hire Julia, you get £2.5.
- If you hire Julia, we will pay her £2.5. You will then receive £5 if Julia was a Top Performer, and £0 if Julia was not a Top Performer.

What do you do?

Not hire Julia

Hire Julia

→

Figure F.6. Decision screens for Experiment 2

Afterwards, participants answered the final questionnaire.

What is your sex?

- Male
- Female

What year were you born?

Where do you originally come from?

- UK
- Another European country
- A country in Africa
- A country in America
- A country in East Asia
- A country in the Middle East
- A country in South Asia
- Other

Which ethnic group do you most identify as?

- Black African
- Black Carribean
- Other Black
- East Asian
- South Asian
- White British
- Other White
- Others

Is English your mother tongue?

- Yes
- No (please insert the name of your mother tongue)

Which social class do you most identify with?

- Working class
- Middle class
- Upper class

What is the highest level of education you have completed?

- Primary school
- Secondary school up to 16 years
- Higher or secondary or further education (A-levels, BTEC, etc.)
- College or university
- Post-graduate degree

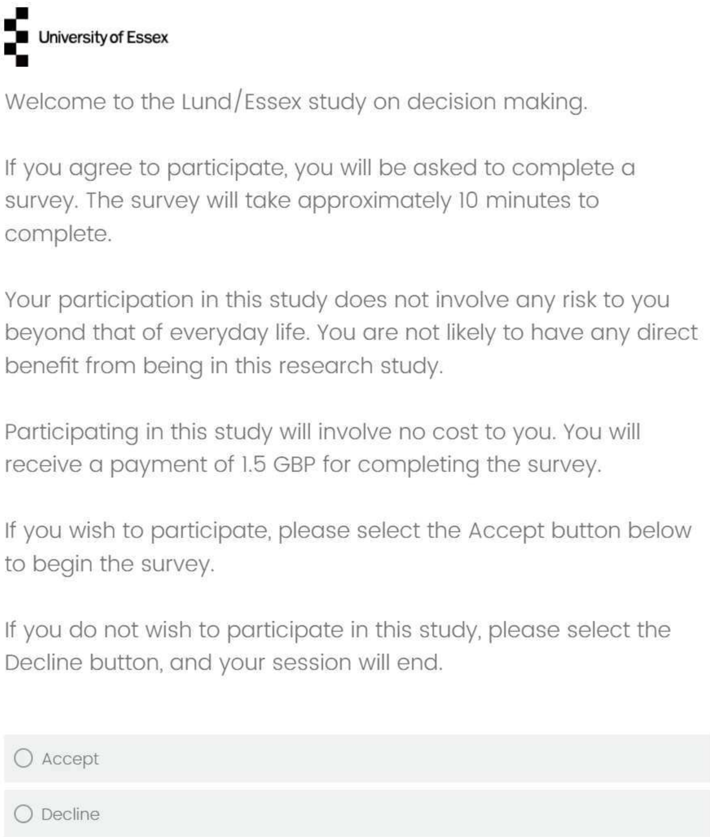
On a scale from 0 to 10, where 0 means "not at all intelligent" and 10 means "extremely intelligent", how **intelligent** do you consider yourself to be?

	0 (Not at all intelligent)	1	2	3	4	5	6	7	8	9	10 (Extremely intelligent)
Intelligence	○	○	○	○	○	○	○	○	○	○	○

→

Figure F.7. Final questionnaire for Experiment 2

Our perceptions study was run with a sample of 217 subjects on Prolific, who were asked for their perceptions on a number of names displayed in random order. They were paid a fixed amount of 1.50 GBP for participating. Below, we include the consent form that they were given and an example of the questions that they were asked. In the interest of space, we include only an example on their intelligence perception, but they were also asked similarly for the country of origin, ethnic group, religion, and likability. We further gather sociodemographic data on each of the participants, including sex, age, country of origin, self-identified ethnic group, mother tongue, religion, social class, and self-evaluated intelligence.


University of Essex

Welcome to the Lund/Essex study on decision making.

If you agree to participate, you will be asked to complete a survey. The survey will take approximately 10 minutes to complete.

Your participation in this study does not involve any risk to you beyond that of everyday life. You are not likely to have any direct benefit from being in this research study.

Participating in this study will involve no cost to you. You will receive a payment of 1.5 GBP for completing the survey.

If you wish to participate, please select the Accept button below to begin the survey.

If you do not wish to participate in this study, please select the Decline button, and your session will end.

- ◯ Accept
- ◯ Decline

Figure F.8. Perceptions study - Study description

On a scale from 0 to 10, where 0 means "not at all intelligent" and 10 means "extremely intelligent", how **intelligent** do you think that a typical person with the following name is?

	0 (not at all intelligent)	1	2	3	4	5	6	7	8	9	10 (extremely intelligent)
Adeel	○	○	○	○	○	○	○	○	○	○	○
Megan	○	○	○	○	○	○	○	○	○	○	○
Georgia	○	○	○	○	○	○	○	○	○	○	○
Becky	○	○	○	○	○	○	○	○	○	○	○
Ian	○	○	○	○	○	○	○	○	○	○	○
Anna	○	○	○	○	○	○	○	○	○	○	○
Pamela	○	○	○	○	○	○	○	○	○	○	○
Amelia	○	○	○	○	○	○	○	○	○	○	○
Mumba	○	○	○	○	○	○	○	○	○	○	○
Julia	○	○	○	○	○	○	○	○	○	○	○
Liam	○	○	○	○	○	○	○	○	○	○	○
Joseph	○	○	○	○	○	○	○	○	○	○	○
Umar	○	○	○	○	○	○	○	○	○	○	○
Matthew	○	○	○	○	○	○	○	○	○	○	○
Richard	○	○	○	○	○	○	○	○	○	○	○
Benjamin	○	○	○	○	○	○	○	○	○	○	○

Figure F.9. Perceptions study - Question example