Appendix - A simple model of the choice of minimum payment for speaking in public

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1 Set-up

In section 3.1 of our paper we noted that if variation in the requested minimum payment is driven by heterogeneity in the cost of effort for preparation (rather than heterogeneity in the aversion to public speaking), we would expect a negative correlation between the requested payment and effort spent preparing. The intuition behind this result is simple: if participants are willing to forgo payments for a presentation, giving the presentation must cause disutility. The minimum acceptable payment reflects the disutility of the presentation, as participants would otherwise benefit from deviating. Furthermore, putting costly effort into the preparation reduces the disutility of giving presentations (why else prepare?). Participants with a higher effort cost will put less effort into preparing, which translates into worse presentations and a higher disutility from presenting. They therefore opt for higher minimum payments. The following toy model aims to formalize this intuition.

The general set-up of the model follows our lab experiment. Participant i first chooses the minimum payment m_i they request for giving a presentation and then chooses the effort e_i they spend for the preparation, where $e_i \in [0, 1]$. The computer then draws a random number w_i representing the potential wage for the presentation, where w_i is drawn from the uniform distribution $U[0, W]$. W denotes the publicly known maximum potential payment and is also the maximum of m_i that can be chosen ($m_i \in [0, W]$). A presentation has to be given if and only if $m_i \leq w_i$.

The type of the participant is represented by the vector (c_i, a_i), capturing heterogeneities in cost of effort and aversion to public speaking. $c_i \in [0, \infty)$ is an individual cost parameter which represents how costly effort is for individual i.

The utility derived by participant i is given by:

$$U_i^{c_i,a_i}(m_i, e_i) = \begin{cases} -\frac{1}{2}c_i e_i^2 + w_i - a_i(1 - e_i) & \text{if } w_i \geq m_i \text{ (presentation)} \\ -\frac{1}{2}c_i e_i^2 & \text{if } w_i < m_i \text{ (no presentation)} \end{cases} \tag{1}$$

If a presentation has to be given, the participant receives wage w_i and incurs a psychological cost from presenting. This cost is a function of both the presentation quality, which is simply the effort put into preparing (e_i), and individual aversion to public speaking ($a_i \in [0, \infty)$). Note that although we allow this parameter to differ across individuals, for the main prediction of this model we are interested in the case where this aversion parameter is constant and agents only differ in their cost parameter.

2 Solution

We can solve the optimal choice for rational, risk-neutral agents using backward induction. The participant chooses m_i, e_i to maximize their expected utility:

$$U_i^{c_i,a_i}(m_i, e_i) = \underbrace{\frac{W - m_i}{W}}_{\text{Prob(present)}} [\underbrace{\frac{1}{2}(m_i + W)}_{\text{Expected wage}} - \underbrace{a_i(1 - e_i)}_{\text{Psychological cost}}] - \underbrace{\frac{1}{2}c_i e_i^2}_{\text{Effort cost}} \tag{2}$$

The probability that a presentation has to be given is $P(m_i \leq w_i) = \frac{W - m_i}{W}$. The expected wage (conditional on having to give the presentation) depends on m_i, and is given by $E[w_i | m_i \leq w_i] = \frac{1}{2}(m_i + W)$.

To simplify the notation, we transform the choice of m_i into a choice of the probability p_i that a presentation has to be given ($p_i \equiv P(m_i \leq w_i)$). We will also drop the subscripts i where this could not cause any confusion.

2.1 Optimal effort

Once a minimum payment (or the equivalent probability of presenting) is fixed, the participant only has to choose the optimal effort. Differentiating the utility function w.r.t. e_i yields the FOC:

$$p_i a_i = c_i e_i \tag{3}$$

The marginal cost of preparing a bit extra is given by the right term of the equation above, which depends on the level of effort chosen (since the cost of effort is quadratic in e_i) and the individual cost parameter. The marginal benefit depends on the probability that a presentation has to be given, as well has the aversion parameter. The FOC allows us to solve for the optimal effort level:

$$e_i^* = \frac{p * a}{c} (= \frac{W - m}{W} \frac{a}{c}) \tag{4}$$

2.2 Optimal minimum payment requested

With a solution for the optimal effort level, we can substitute it into the utility function and solve for the optimal p_i. The utility function expressed in p_i is given by:

$$U^{c_i,a_i}(p_i, e_i) = p_i[W - \frac{1}{2}p_i W - a_i * (1 - e_i)] - \frac{1}{2}c_i e_i^2 \tag{5}$$

where $W - \frac{1}{2}p_i W$ represents the expected wage if a presentation has to be given, which decreases in p linearly from W (when $p = 0$) to $\frac{1}{2}W$ (when $p = 1$).

After substituting in the optimal effort level, the FOC and optimal p_i is given by

$$W - pW - a + p\frac{a^2}{c} = 0 \tag{6}$$

$$p_i^* = \frac{W - a}{W - \frac{a^2}{c}} \tag{7}$$

$$e_i^* = \frac{W - a}{W - \frac{a^2}{c}} \frac{a}{c} = \frac{a(W - a)}{cW - a^2} \tag{8}$$

We can convert p_i^* back into a minimum acceptable payment m_i^*

$$m_i^* = W - p^*W = \frac{aW(c - a)}{cW - a^2} \tag{9}$$

This minimum payment has an intuitive relationship with the optimum effort: $m_i^* = a(1 - e_i^*)$. When the wage offered is exactly m_i^*, the agent should be indifferent between presenting and not presenting, so the psychological cost of presenting has to be equal to the minimum wage.[1]

2.3 Comparative statics

Using the optimal effort and minimum payment levels, we can derive the following partial derivatives:

$$\frac{\partial e_i^*}{\partial c_i} = \frac{a^2(a - W)}{(a^2 - cW)^2} < 0 \tag{10}$$

where we used the fact that $a_i < W$ has to be true for this solution to be a local maximum.[2] This partial derivative tells us the intuitive result that in equilibrium, a higher c_i leads to a lower optimal level of effort e_i^*. Furthermore, we have the partial derivative of the optimal minimum payment:

$$\frac{\partial p_i^*}{\partial c_i} = \frac{aW(a - W)}{(a^2 - cW)^2} < 0 \tag{11}$$

$$\frac{\partial m_i^*}{\partial c_i} = \frac{a^2W(W - a)}{(a^2 - cW)^2} > 0 \tag{12}$$

Taking the comparative statics w.r.t. effort and minimum payment together, we find that individuals who face more effort costs in preparations will choose

[1] Disregarding corner solutions

[2] This inequality has to hold for non-corner solutions. If $W < a_i$, for p_i^* to be non-negative $W - \frac{a^2}{c}$ must be negative. In this case the second order condition of $-W + \frac{a^2}{c} < 0$ is not met, and different corner solutions could arise. If $c < W$, the optimal decision would be $(e = 1, m = 0)$ yielding an expected utility of $\frac{1}{2}W - \frac{1}{2}c$. If $c > W$, the optimal decision would be $(e = 0, m = W)$ yielding an utility of 0.

higher minimum payments and lower effort levels. Intuitively, the higher cost to preparations will lead to lower efforts, which makes presenting less rewarding at the same wage, since the presentations are worse and a higher psychological cost has to be incurred. In reaction to worse presentations, participants will lower the probability that they have to present, and therefore ask for higher payments for their presentation.

3 Conclusions

We have studied a simple model of the decision problem from our laboratory experiment, where participants jointly chose a minimum payment and the preparation effort level for a presentation. The main prediction of our model is a negative correlation between the chosen minimum payments and effort spent preparing, if individuals only, or mainly, differ in cost of effort rather than public speaking aversion (and differences in the requested minimum payment across individuals are therefore driven mainly by differences in effort costs rather than differences in public speaking aversion).