Selection and Gratitude

Luigi Balletta and Salvatore Modica*

October 24, 2017

Abstract

What kind of candidate is selected into a job when the principal has to appoint a committee to measure the candidate's ability and select a winner through a call specifying a wage for the job? In a model where the principal fixes the wage anticipating the committee's choice, under a rather natural assumption about the committee's objective we find that if the committee takes into account the candidate's gratitude a candidate with less than first best ability will be selected in equilibrium. First best selection is achieved if the committee is anonymous to the candidates. If the committee could also set the wage the first best candidate would be selected, but the principal would be worse off hence he would not implement full delegation.

JEL Classification Numbers: C72; D02; M51

Keywords: Principal-agent model; Selection of job candidates; Gratitude and reciprocity

1 Introduction

On moral grounds gratitude is certainly a good thing. For Cicero "being and appearing grateful [...] is not only the greatest, but is also the parent of all the other virtues." [1] To some extent the instinct to reciprocate which it implies seems deeply rooted in human nature, as is well recognized in formal game theory since Rabin (1993) and confirmed in experiments and data.[2] Diverse experiments have found in particular that candidates selected for a job show definite signs of thankfulness towards the selectors,[3] and the data analyzed by Baron (2013) suggest that gratitude is higher on the part of low performers. Now suppose the selecting

*University of Palermo, Italy.

[1] As translated at the University of Chicago, see http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=LatinAugust2012&getid=1&query=Cic.%20Planc.%2080#80

[2] The theoretical literature includes Levine (1998), Bolton and Ockenfels (2000), Falk and Fischbacher (2006), Levine et al. (2010). Experiments are carried out by Fehr et al (1993), Fehr et al (1997), Ben-Ner et al (2004). Empirical findings are contained in Baron (2013), Bechtel and Hainmueller (2011).

[3] Fehr et al (1993), Maggian et al. (2015), Montinari et al. (2016)

committee may anticipate that the selected candidate will be grateful towards them; and consider a situation where this committee has been appointed by a principal who is unable to carry out the selection procedure but who is ultimately the one for whom the candidate will work and is also the one who will pay her. This situation is common in the public sector but it is just as relevant in career advancements within firms.[4] Suppose in particular that the principal sets a wage for the job and the committee then selects a candidate. What wage will the principal set, and what type of candidate will be selected? Will the equilibrium differ from a suitably defined first best outcome, and if so how depending on whether the committee takes the candidate's gratitude into account?

In the model we study the outcome is always the first best if the committee does not take into account the candidate's gratitude - as is necessarily the case when the committee is anonymous to the candidate. If the committee's choice is also determined by the candidate's gratitude the intuition is that since given the wage this gratitude is higher the lower is reservation utility there may be a tendency towards selection of candidates with lower than first best ability. The model we analyze strongly confirms this presumption.

We also ask what would happen if the committee is given the power to choose the wage as well as the candidate. In this case we show that the first best candidate would be chosen, but that the principal would be worse off than under partial delegation - hence he will retain the power to set the wage whenever he can, even though this is worse from a welfare point of view.

2 Model structure

There are a principal and a continuum of candidates indexed by ability $0 \leq \theta \leq 1$. Candidate θ has on-the-job productivity $s(\theta)$ strictly increasing concave and reservation utility $u(\theta)$ strictly increasing convex with $u'(0) = 0$. Concavity of $s - u$ is assumed to be strict. We assume $s(0) = u(0) = 0$ and $s(\theta) \geq u(\theta)$ for all θ.

The candidate is to be selected through a call for the job at wage w and relative selection procedure which selects a candidate among applicants, namely those with $u(\theta) \leq w$.

Suppose first the principal is able to measure θ through a selection procedure. Then since candidate θ must be paid at least $u(\theta)$ the principal's desired candidate will be the argmax $0 < \theta^{fb} \leq 1$ of the difference $s(\theta) - u(\theta)$;[5] he will then set wage w^{fb} such that $u(\theta^{fb}) = w^{fb}$; and will issue a call for the job at this wage. All θ with $u(\theta) \leq w^{fb}$ apply, and the principal will be able to select the desired first best θ^{fb}.

If the principal cannot measure θ directly, then he will have to appoint a committee with that capacity (we are assuming it exists) to select a candidate after setting a wage w for the

[4] In the latter context an early paper based on this premise is Prendergast and Topel (1996).

[5] The first best θ^{fb} cannot be zero since $s'(0) - u'(0) > 0$.

position. At the end of the selection phase the principal observes the candidate θ^c chosen by the committee; if $s(\theta^c) \geq w$ he accepts it, otherwise he rejects it and everyone gets zero.[6]

In choosing the wage the principal will anticipate the committee's choice, that is, denoting by $\theta^c(w)$ the committee's choice as a function of wage, the principal will choose w to maximize $s(\theta^c(w)) - w$. We will denote the principal's optimal choice by w^p so that the selected candidate in equilibrium is $\theta^c(w^p)$.

Given w the committee is appointed to select a candidate θ. If $s(\theta) < w$ the candidate will be rejected and everyone gets zero. Otherwise the committee chooses a θ which the principal will accept, that is such that $s(\theta) \geq w$. Since applying candidates are only those with $u(\theta) \leq w$ the committee will also have to choose θ satisfying this constraint. Define $\theta^{\min}(w)$ as the minimal acceptable θ which is determined by $s(\theta) = w$, that is $\theta^{\min}(w) = s^{-1}(w)$. Similarly $\theta^{\max}(w)$ is defined as the θ of the highest applicant at w; for $w \leq u(1)$ this is the θ defined by $u(\theta) = w$, but for $w > u(1)$ all will apply and the highest will have $u(\theta) < w$; thus we define $\theta^{\max}(w) = \min\{u^{-1}(w); 1\}$.[7] Then the committee's feasibility constraint for an acceptable candidate is then $\theta^{\min}(w) \leq \theta \leq \theta^{\max}(w)$. We specify the committee's problem and examine the relative choice in the next section.

Observe that the model is not well behaved if the committee's choice $\theta^c(w)$ is decreasing in the wage. Indeed if this is the case the principal's payoff unambiguously decreases in w hence the optimum is at $w^p = 0$; but the only feasible choice at that wage is $\theta = 0$. We will check that the committee's choice is increasing below.

Remark. One may wonder whether the principal can offer the committee a transfer in exchange for the sure selection of a desired candidate. Indeed it is easy to check that the principal would be willing to offer the full amount $w^p - u(\theta^c(w^p))$ to the committee in exchange for selection of θ^{fb}. The problem is that, if the principal cannot commit ex-ante to reject any candidate different from θ^{fb}, this is not incentive compatible: the committee would behave as before, ignoring the transfer.

3 Committee's choice and equilibrium

First observe that the committee might have the same objective as that of a principal capable of measuring θ, that is to maximize $s(\theta) - u(\theta)$. In this case a principal anticipating the committee's choice would set $w = w^{fb}$, for then the committee would choose θ^{fb} - which

[6] We are assuming that the principal cannot condition acceptance on productivity. Otherwise he could just write a contract whereby whoever wishes to may be enrolled for the job at wage w^{fb} provided s will be not smaller than $s(\theta^{fb})$; in that case the only applying candidate would be θ^{fb} and nothing else is needed. Inability to commit implies that the principal will only reject candidates with $s(\theta) < w$.

[7] For $\theta^{\min}(w)$ the analysis can be restricted to $w \leq s(1)$ because the principal would never choose to pay more than the productivity of the highest candidate. Note also that if $u(1) \leq s(1)$ is satisfied with equality then since it must be $w \leq s(\theta) \leq s(1) = u(1)$ then $\theta^{\max}(w)$ is always defined by $u(\theta) = w$.

would be feasible since by definition $w^{fb} = u(\theta^{fb}) \leq u(1)$ whence $\theta^{\max}(w^{fb}) = u^{-1}(w^{fb}) = \theta^{fb}$. We start by putting on record a couple of simple points related to this observation:

Proposition 1. *If the committee's objective is to maximize the net social benefit $s(\theta) - u(\theta)$ then the principal will set $w^p = w^{fb}$ and the committee will choose candidate $\theta^c(w^p) = \theta^{fb}$. The outcome is the same if given w the committee maximizes the principal's payoff $s(\theta) - w$. More generally, the first best candidate will be selected whenever the committee's choice is $\theta^{\max}(w)$ for all w.*

Proof. The first has already been proven. With objective $s(\theta) - w$ the committee's choice is $\theta^{\max}(w)$, so as before by setting $w = w^{fb}$ the principal induces the first best outcome θ^{fb} (again $w^{fb} = u(\theta^{fb}) \leq u(1)$ whence $\theta^{\max}(w^{fb}) = \theta^{fb}$). For the last assertion: we have just proved that when the committee's choice is $\theta^{\max}(w)$ the first best is induced by setting $w = w^{fb}$. $\square$

Note that in these cases the rent of the selected candidate $w - u(\theta)$ is zero. Now it might be that if the selected candidate's rent were positive the committee would benefit too, the argument being that the candidate would be grateful to the committee and may be willing to reciprocate at least to some extent - something that the committee will not fail to realize. Of course this cannot happen if the committee is anonymous to the candidate; in this case it would be natural to assume that the committee maximizes the principal's payoff $s - w$ and as the stated result says the equilibrium outcome will be the first best. In other words, under anonymity the first best is guaranteed. But if on the contrary the committee is known to the candidates then the committee may have an interest in the candidate rent $w - u(\theta)$ - and crucially this rent increases as the candidate becomes weaker. At the very extreme the committee may value this rent only and choose the candidate $\theta^{\min}(w)$ - which would leave the principal with zero payoff - but more realistically one may presume that the committee will also take into account the principal's payoff $s(\theta) - w$ to some extent. What happens in this case, that is if the committee maximizes some smooth function $V(w - u(\theta), s(\theta) - w)$ increasing in both arguments? The answer is the following, where subscripts denote partial derivatives:

Proposition 2. *Assume $V_i > 0, V_{ii} \leq 0$ for $i = 1, 2$ and the boundary conditions $\lim(V_1/V_2)_{w-u\to 0} = \infty$, $\lim(V_1/V_2)_{s-w\to 0} = 0$. If $V_{ij} > 0$, then whenever $0 < \theta^{fb} < 1$ the equilibrium choice is lower than first best: $\theta^c(w^p) < \theta^{fb}$.*[8]

Proof. We shall show that at any w such that $\theta^c(w) \geq \theta^{fb}$ the principal's marginal payoff at w is strictly negative, which implies the result. The derivative of the committee's payoff is $dV/d\theta = -V_1 u' + V_2 s'$.

[8] As will be clear from the proof it is sufficient that any one of $V_{ii} \leq 0$ and $V_{ij} \geq 0$ be strict.

If $s(1) = u(1)$ then $w \leq u(1)$ hence $s(\theta^{\min}(w)) = w$ and $u(\theta^{\max}(w)) = w$ so that the boundary conditions imply that the optimal choice $\theta^c(w)$ is interior; then $\theta^c(w)$ satisfies the first order condition $V_1 u' = V_2 s'$.[9] Differentiating this with respect to w we find

$$\frac{d\theta^c(w)}{dw} = \frac{V_{11}u' + V_{22}s' - V_{12}(u' + s')}{V_{11}(u')^2 + V_{22}(s')^2 - 2s'u'V_{12} - V_1 u'' + V_2 s''} > 0$$

where the sign follows because both numerator and denominator are negative under the maintained assumptions. Now take w such that $\theta^c(w) \geq \theta^{fb}$; we show that the derivative of the principal's payoff $s(\theta^c(w)) - w$ is negative. At any such θ it is $s' \leq u'$ so $s'[V_{12}(u' + s') - V_{11}u' - V_{22}s'] \leq 2V_{12}s'u' - V_{11}u'^2 - V_{22}s'^2$ which implies that

$$\begin{aligned} s'\frac{d\theta^c(w)}{dw} &= \frac{s'[V_{12}(u' + s') - V_{11}u' - V_{22}s']}{2V_{12}s'u' - V_{11}u'^2 - V_{22}s'^2 + V_1 u'' - V_2 s''} \\ &\leq \frac{2V_{12}s'u' - V_{11}u'^2 - V_{22}s'^2}{2V_{12}s'u' - V_{11}u'^2 - V_{22}s'^2 + (V_1 u'' - V_2 s'')} < 1 \end{aligned}$$

as was to be shown.

Suppose now $s(1) > u(1)$. As $w \uparrow s(1)$, for $\theta = 1$ we have $dV/d\theta \to V_2 s' > 0$ hence there is a threshold $\tilde{w} > u(1)$ - defined by $dV(\tilde{w} - u(1), s(1) - \tilde{w})/d\theta = 0$ - such that for $w > \tilde{w}$ the committee chooses $\theta^c(w) = 1$ and $dV/d\theta > 0$ at $\theta^c(w)$. But the principal would never choose a $w > \tilde{w}$ as that would entail a lower payoff than $\tilde{w}$. Therefore $w^c \leq \tilde{w}$, $dV/d\theta = 0$ at $\theta^c(w^c)$ and the above argument holds, where derivatives at $\tilde{w}$ are taken to be left derivatives ($s'(1) < u'(1)$ by the assumption $\theta^{fb} < 1$). □

The complementarity condition $V_{12} > 0$ says that if $s - w$ is higher a marginal drop in $w - u$ hurts more. Under this condition, if the first best θ^{fb} is interior the selected candidate's ability is unambiguously lower than first best - no matter how little the committee is interested in $w - u$. A notable example satisfying the stated assumptions is the Cobb-Douglas family $V(w - u, s - w) = (w - u)^\alpha (s - w)^\beta$ with $0 \leq \alpha, \beta \leq 1$.[10]

The case of homothetic V delivers a simple intuition behind the result. In this case $V_1/V_2 = F((w - u)/(s - w))$ so that the committee's first order condition $V_1 u' = V_2 s'$ can be written as $(s - w)F^{-1}(s'/u') = (w - u)$; this implies that the principal's payoff $s(\theta^c(w)) - w = \mu(w)[s(\theta^c(w)) - u(\theta^c(w))]$, where $\mu(w) = 1/(1 + F^{-1}(s'/u'))$ is the share of the surplus that the principal obtains in equilibrium; and it can be checked that μ is decreasing.[11] The principal's

[9] The assumptions imply that the objective function of the committee is strictly concave. Indeed, $d^2V/d\theta^2 = -V_1 u'' + V_2 s'' + V_{11}(u')^2 - 2V_{12}u's' + V_{22}(s')^2 < 0$, so the first order condition is also sufficient for a maximum.

[10] The reader may notice that in the multiplicative case$\alpha = \beta = 1$ we get $V_1 = 0$ when $\theta = \theta^{\min}$ and $V_2 = 0$ when $\theta = \theta^{\max}$. The result above goes through because at no point can they be both null.

[11] Indeed, for any $x, y > 0$ it is defined by $V_1(x, y)/V_2(x, y) = F(x/y)$. Differentiating both sides with respect to x gives $(V_{11}V_2 - V_{12}V_1)/V_2^2 = F'x$ and thus $F' < 0$ by our assumptions on V. By our maintained

marginal gain is thus $\mu(s' - u')\theta^{c\,\prime} + (s - u)\mu'$ and at first best $s' - u' = 0$; hence what drives the result is that lowering w leaves surplus unchanged but raises the principal's share.

The theorem is silent on the case $\theta^{fb} = 1$, because in that case the equilibrium may as well be $\theta^c(w^p) = \theta^{fb}$; by inspecting the proof this is seen to be the case when $s'(1) - u'(1)$ is large enough. The two cases - $\theta^{fb} < 1$ and $\theta^{fb} = 1$ - correspond to different economic contexts. In the case of $\theta^{fb} = 1$ the principal is willing to pay the reservation wage of even the very best types - we may think of top sport teams or universities or more generally firms with a high product value. In this case selection via a committee may not lead to distortions. The case of interior first best applies on the other hand to situations where the productivity of the candidate in the principal's concern is lower - second division teams or lower-tier universities - so that the principal finds it optimal to exploit the more abundant supply of average individuals for whom owing to competition the reservation wage is lower relative to their productivity. In this case, which in the end is more typical, delegation to a committee that will profit from the candidate's rent distorts the outcome unambiguously towards employing less than first best candidates.

A function which does not fall in the class covered by Proposition 2 is the convex combination

$$V(w - u, s - w) = \gamma \cdot [s(\theta) - w] + (1 - \gamma) \cdot [w - u(\theta)]$$

with $0 < \gamma < 1$. All the second derivatives are zero, and depending on γ the boundary conditions may also fail. We next ask what happens in this case - but notice that here the committee's choice does not depend on w, a feature which makes this formulation somewhat unappealing.

Proposition 3. *Assume $V = \gamma \cdot (s - w) + (1 - \gamma) \cdot (w - u)$. If $\gamma < 1/2$ one has $\theta^c(w^p) < \theta^{fb}$ while if $\gamma \geq 1/2$ equilibrium is θ^{fb}; in all these equilibria $w - u$ is zero.*

Proof. In this case $dV/d\theta = \gamma s' - (1 - \gamma)u' \propto \frac{\gamma}{1-\gamma}s' - u'$. We know that this is positive at $\theta = 0$ (since $u'(0) = 0$ and $s'(0) > 0$) so the unconstrained maximum, say θ^γ, of V is positive. Recall that at θ^{fb} it is $u' = s'$, and that w^{fb} is defined by $u(\theta^{fb}) = w^{fb}$ so that $\theta^{\max}(w^{fb}) = \theta^{fb}$. If $\gamma \geq 1/2$ then $dV/d\theta > 0$ for all $\theta < \theta^{fb}$ so $\theta^\gamma \geq \theta^{fb}$. In this case equilibrium has $w^p = w^{fb}$ and $\theta^c(w^p) = \theta^{\max}(w^p) = \theta^{fb}$ so that indeed $w - u = 0$. The argument is this: for all w such that $\theta^{\max}(w) \leq \theta^\gamma$ the committee chooses $\theta^{\max}(w)$ so since $\theta^\gamma \geq \theta^{fb}$ its optimal choice at $w^p = w^{fb}$ is $\theta^{\max}(w^p)$ which is θ^{fb}; to show that the principal does not want to deviate observe at the given profile he gets $s(\theta^{fb}) - w^p = s(\theta^{fb}) - u(\theta^{fb})$. For $w < w^{fb}$ and for $w > w^{fb}$ such that $\theta^{\max}(w) \leq \theta^\gamma$ his payoff is $s(\theta^{\max}(w)) - w = s(\theta^{\max}(w)) - u(\theta^{\max}(w)) \leq s(\theta^{fb}) - u(\theta^{fb})$;

assumption s'/u' is strictly decreasing and θ^c is strictly increasing. Thus $F^{-1}(s'/u')$ is increasing in w and μ decreasing.

for $w > w^{fb}$ such that $\theta^{\max}(w) > \theta^{\gamma}$ the committee would choose θ^{γ} so the principal would get $s(\theta^{\gamma}) - w < s(\theta^{\gamma}) - (\theta^{\max})^{-1}(\theta^{\gamma}) = s(\theta^{\gamma}) - u(\theta^{\gamma})$ which is again lower than $s(\theta^{fb}) - u(\theta^{fb})$.

Consider now $\gamma < 1/2$. In this case $\theta^{\gamma} < \theta^{fb}$ and equilibrium has w^p such that $\theta^{\max}(w^p) = \theta^{\gamma} = \theta^c(w^p)$ so that indeed $\theta^c(w^p) < \theta^{fb}$ and the committee's rent is zero. Again, given w^p the committee's choice is clear. As to the principal, in the proposed equilibrium he gets $s(\theta^{\gamma}) - u(\theta^{\gamma})$; a higher wage does not change the committee's choice and lowers his payoff; a lower wage forces the committee to choose $\theta^c = \theta^{\max}(w) < \theta^{\gamma} < \theta^{fb}$ so the principal would get $s(\theta^c) - u(\theta^c) < s(\theta^{\gamma}) - u(\theta^{\gamma})$ because for $\theta < \theta^{fb}$ the function $s - u$ is increasing. $\square$

Thus with convex combination V if the committee's incentives are sufficiently aligned with the principal's (precisely $\gamma \geq 1/2$) then the first best candidate is selected. Notice however that this equilibrium involves a corner solution on the part of the committee.

Remark. The committee's preferences on x and y may be interpreted as reflecting the committee's attitude towards fairness in the allocation of benefits between itself and the principal. Consider then the pioneering formulation of Fehr and Schmidt (1999), which in the present context is given by

$$V(w - u, s - w) = w - u - \alpha \cdot \max\{s - w - (w - u), 0\} - \beta \cdot \max\{w - u - (s - w), 0\}.$$

Clearly this function does not satisfies the hypotheses of Proposition 2, but as it turns out it is covered by Proposition 3. To see this first observe that the second term can be written as $2\alpha \cdot \max\{\frac{s(\theta)+u(\theta)}{2} - w, 0\}$ and similarly the last term is $2\beta \cdot \max\{w - \frac{s(\theta)+u(\theta)}{2}, 0\}$. That is the inequity is given by deviations of w from the midpoint between s and u. Now for w below the midpoint (θ high enough) the payoff above is proportional to $-[s(\theta) + \frac{1+\alpha}{\alpha} u(\theta)]$ so the committee would reduce θ; the same goes at the midpoint, where the right derivative if V is $-u' - \beta(u' + s') < 0$; thus at the optimum w must be above the midpoint. But in that range the committee's payoff becomes proportional to $s(\theta) - \frac{1-\beta}{\beta} u(\theta)$, which is the case covered in Proposition 3.

A parametric example

Going back to Proposition 2 it is instructive to see what happens in a parametric example. We take $V = (w-u)^{1-\alpha}(s-w)^{\alpha}$ with $0 < \alpha < 1$, $s = \theta, u = \theta^2$. Here $s(1) = u(1)$ so $w \leq u(1)$ and the committee's choice is always interior. The example is instructive because the parameter α has a natural interpretation as the degree of anonymity of the committee, since the larger it is the less the committee cares about the rent $w - u$ which the agent obtains out of getting the job. Here $s(\theta) = w$ gives $\theta^{\min}(w) = w$ and from $u(\theta) = w$ we get $\theta^{\max}(w) = \sqrt{w}$.

To solve the model start with the committee's choice given w. The committee maximizes

$(w-\theta^2)^{1-\alpha}(\theta-w)^\alpha$, whose solution is given by

$$\theta^c(w;\alpha)=\frac{w(1-\alpha)+\sqrt{w\alpha^2+w2\alpha(1-\alpha)+(1-\alpha)^2w^2}}{2-\alpha}.$$

The principal chooses the wage to maximize $s(\theta^c(w;\alpha))-w=\theta^c(w;\alpha)-w$ and the solution is easily found to be

$$w^p(\alpha)=\frac{\sqrt{\alpha(2-\alpha)}-\alpha(2-\alpha)}{2(1-\alpha)^2}.$$

We note for later that this increases from $w^p(0)=0$ to 0.25 as α goes up. The equilibrium θ as a function of the anonymity parameter α can be finally computed as

$$\theta^c(w^p(\alpha);\alpha)=\frac{\sqrt{\alpha(2-\alpha)}-\alpha}{2(1-\alpha)}.$$

As α goes from zero to 1 this increases from zero to the first best $\theta^{fb}=1/2$: the more detached the committee is from the candidate the better the outcome.

Also the equilibrium payoff of the principal

$$\theta^c(w^p(\alpha);\alpha)-w^p(\alpha)=\frac{\alpha\left(1-\sqrt{\alpha(2-\alpha)}\right)}{2(1-\alpha)^2}$$

increases in α, and as expected converges to the first best surplus $s(\theta^{fb})-u(\theta^{fb})$ as $\alpha\to 1$, while it converges to zero as $\alpha\to 0$.

Finally, the equilibrium payoff of the selected candidate is

$$w^p(\alpha)-(\theta^c(w^p(\alpha),\alpha))^2=\frac{(1+\alpha)\sqrt{\alpha(2-\alpha)}-\alpha(3-\alpha)}{2(1-\alpha)^2}.$$

As expected this goes to zero if $\alpha\to 1$: in that case $\theta^c(w)=\sqrt{w}=\theta^{\max}(w)$ for all w - the committee always leaves zero rent to the candidate. The more interesting fact is that the candidate's payoff goes to zero also for $\alpha\to 0$; this is because when the committee gives little weight to the principal's payoff $s-w$ the latter reacts by setting w very low (as we noted $w^p(\alpha)$ goes to zero with α) - so *everyone* ends up being worse off. As can be checked the the candidate's payoff is non-monotone, concave with an interior maximum (1/5 for the record).

4 Random selection

Could the principal do better without the committee by setting the wage and selecting a candidate at random in the relevant pool? Precisely this would mean setting w optimally to maximize $\mathbb{E}_w s(\theta)-w$ where $\mathbb{E}_w$ is the expectation with respect to the conditional of θ

on $[\theta^{\min}(w), \theta^{\max}(w)]$. Without a closed form solution the question is hard to answer, so we take a simple case to see how it might go . Specifically we take again $V(w-u, s-w) = (w-u)^{1-\alpha}(s-w)^{\alpha}$, linear $s(\theta) = \theta$, quadratic $u(\theta) = \theta^2$ and assume θ is distributed uniformly in $[0,1]$.

Given w the expected θ on the relevant interval is the midpoint $(\theta^{\min}(w) + \theta^{\max}(w))/2$ for all w. In this case as we observed $\theta^{\min}(w) = w$ and $\theta^{\max}(w) = \sqrt{w}$. Hence $\mathbb{E}_w s(\theta) - w = (\sqrt{w} - w)/2$ which is solved by $w^r = 1/4$. Expected θ is the midpoint $\theta^r = 3/8 < \theta^{fb}$ and the principal's payoff $\theta^r - w^r = 1/8$. This is the random selection benchmark.

From what we know about the delegation case it is to be expected that in the if α is small enough the principal is better off without the committee, an vice versa for large enough α - and same for welfare. The only question is what happens for intermediate values, and that gives an interesting answer - which is easy to get since we know everything about delegation under the current assumptions:

Proposition 4. *There exist $0 < \alpha_l < 1/2 < \alpha_h < 1$ such that: (i) for $\alpha < \alpha_l$ random selection is better both for welfare $s-u$ and for the principal; (ii) for $\alpha > \alpha_h$ delegation to the committee is better for welfare and for the principal; (iii) for $\alpha_l < \alpha < \alpha_h$ random selection is better for welfare but the principal prefers delegation to the committee.*

Proof. The benchmark of random selection delivers $\theta^r = 3/8$ with payoff for the principal 1/8. Under delegation as we know the equilibrium θ increases from zero to first best; it equals θ^r at $\alpha_h = 9/17 > 1/2$ and thus it is closer to first best than random selection for $\alpha > \alpha_h$. We also know that under delegation the principal's payoff increases with α from zero to $s(\theta^{fb}) - u(\theta^{fb}) = 1/4$; it equals the payoff 1/8 of the random selection at $\alpha_l = (2\sqrt{2} + 5)/17 < 1/2$ and thus for $\alpha > \alpha_l$ the committee prefers committee partial delegation to random selection. □

The conclusion in the intermediate range is interesting: the distortion in the delegation scenario is substantial - the committee's selection is further away from first best than purely random selection - but the principal is better off so he will choose to appoint the committee (assuming of course that has a negligible cost).

5 Full delegation

We lastly investigate what happens if the principal delegates the committee to set the wage as well. We call this one the full delegation case and refer to the previous section as the partial delegation case. The first result is the following:

Proposition 5. *Assume the committee's preferences are described by $V(w-u, s-w)$ with V concave increasing in each argument with the same boundary conditions as in Proposition*

2: $\lim(V_1/V_2)_{w-u\to 0} = \infty$ *and* $\lim(V_1/V_2)_{s-w\to 0} = 0$*. With full delegation the committee will select* $\theta = \theta^{fb}$*. If* $V_{ij} > 0$ *then the principal is worse off than in the partial delegation case.*

Proof. The assumptions on V ensure that the committee's optimum is characterized by the first order conditions $-V_1 u' + V_2 s' = 0, V_1 - V_2 = 0$ which give $u' = s'$ that is $\theta = \theta^{fb}$. If $V_{ij} > 0$ then the principal must be worse off than in the partial delegation case because in that case he could set w such that $\theta^c(w) = \theta^{fb}$ - namely, since the committee's choice was given by $V_1 u' = V_2 s'$, he could set w such that $V_1(w - u(\theta^{fb}), s(\theta^{fb}) - w) = V_2(w - u(\theta^{fb}), s(\theta^{fb}) - w)$ - but he did not. □

Thus in this case - assuming $V_{ij} > 0$ - full delegation maximizes welfare but it will not be implemented. Welfare maximization is easy to understand: out of a larger $s - u$ the committee can choose w to increase both $w - u$ and $s - w$ thus getting a higher payoff V. We next consider the convex combination $V = \gamma \cdot (s - w) + (1 - \gamma) \cdot (w - u)$.

Proposition 6. *Assume* $V = \gamma \cdot (s - w) + (1 - \gamma) \cdot (w - u)$*. With full delegation candidate* $\theta = \theta^{fb}$ *is selected for all* γ*. If* $\gamma \leq 1/2$ *then the principal is worse off than in partial delegation (weakly if* $\gamma = 1/2$*), while if* $\gamma > 1/2$ *he obtains the same payoff.*

Proof. Since $s-w$ and $w-u$ are nonnegative for all feasible w, θ it is $V \leq \max\{\gamma, 1-\gamma\}(s-u)$. If $\gamma < 1/2$ this is $(1-\gamma)(s-u)$ and is attained by setting $\theta = \theta^{fb}$ and $w = s(\theta^{fb})$; if $\gamma > 1/2$ it is attained with θ^{fb} and $w = u(\theta^{fb})$; if $\gamma = 1/2$ then θ^{fb} and any $u(\theta^{fb}) \leq w \leq s(\theta^{fb})$ solve the problem. The comparison with partial delegation is straightforward: when $\gamma < 1/2$ the principal obtains 0 with full delegation and a positive payoff with partial delegation; when $\gamma \geq 1/2$ he obtains $s(\theta^{fb}) - u(\theta^{fb})$ with partial delegation while with full delegation he gets the same if $\gamma > 1/2$ and something between this and zero when $\gamma = 1/2$. □

6 Conclusion

We have seen that a committee selecting a candidate given a wage set by a principal will select a candidate with lower than first best ability if it takes into account the candidate's gratitude - except in the limit case where the first best is the individual with highest ability in the market, in which case a non distorted outcome may result. We observe that the weight on gratitude depends on the closeness of the relationship between the committee and the selected candidate after the selection procedure, so that the more the committee is detached from the candidate the better. Anonymity, like that of the referees in academic publishing, always leads to first best selection since by construction the committee is only interested in the principal's payoff in that case. The first message of the paper is that this is the "best practice" which all selections should emulate. The other lesson we learn from the model is that from the point of view of social welfare it would be a good idea not to separate the power to set the wage from the power to select the candidate. Since on the other hand the principal - who is the one who will pay the selected candidate ultimately - is worse off under full delegation this is a somewhat weak point to make from a practical point of view. The right direction to follow seems to be anonymity of the committee, the more the better.

References

Baron, James N. (2013): "Empathy wages?: Gratitude and gift exchange in employment relationships", *Research in Organizational Behavior* 33: 113-134

Ben-Ner, Avner , Louis Putterman, Fanmin Kong and Dan Magan (2004): "Reciprocity in a two-part dictator game", *Journal of Economic Behavior & Organization* 53: 333-352

Bechtel, Michael M. and Jens Hainmueller (2011): "How Lasting Is Voter Gratitude? An Analysis of the Short- and Long-Term Electoral Returns to Beneficial Policy", *American Journal of Political Science* 55: 851-867

Bolton, Gary E. and Axel Ockenfels (2000): "ERC: A Theory of Equity, Reciprocity, and Competition", *The American Economic Review* 90: 166-193

Falk, Armin and Urs Fischbacher (2006): "A theory of reciprocity", *Games and Economic Behavior* 54: 293-315

Fehr, Ernst, Simon Gachter and Georg Kirchsteiger (1997): "Reciprocity as a Contract Enforcement Device, Experimental Evidence", *Econometrica* 65: 833-860

Fehr, Ernst, Georg Kirchsteiger and Arno Riedi (1993): "Does Fairness Prevent Market Clearing: An Experimental Investigation", *Quarterly Journal of Economics* 108: 437-459

Fehr, Ernst and Klaus M. Schmidt (1999): "A Theory of Fairness, Competition and Cooperation", *Quarterly Journal of Economics* 114: 817-868

Levine, David K. (1998): "Modeling Altruism and Spitefulness in Experiments", *Review of Economic Dynamics* 1: 593-622

Levine, David K, Federico Weinschelbaum and Felipe Zurita (2010): "The Brother-in-law Effect", *International Economic Review* 51: 497-507

Maggian, Valeria, Natalia Montinari and Antonio Nicolò (2015): "Backscratching in Hierarchical Organizations", available at `https://ssrn.com/abstract=2592936`

Montinari, Natalia, Antonio Nicolò and Regine Oexl (2016): "The gift of being chosen", *Experimental Economics* 19(2):460-479.

Prendergast, Canice and Robert H. Topel (1996): "Favoritism in Organizations", *Journal of Political Economy* 104: 958-978.

Rabin, Matthew (1993): "Incorporating Fairness into Game Theory and Economics", *American Economic Review* 83(5): 1281-1302.