Selection by Committee: Anonymity and Gratitude

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Abstract

What kind of candidate is selected into a job when the principal has to appoint a committee to measure the candidates' ability and select a winner? We find that if the committee takes into account the candidate's gratitude a candidate with less than first best ability will be selected. A relevant exception may occur if the first best is the overall best candidate. First best selection is always achieved if the committee is anonymous to the candidates. If the committee is not detached enough from the candidates delegation fares even worse than random selection.

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1 Introduction

On moral grounds gratitude is certainly a good thing, and to some extent the instinct to reciprocate which it implies seems deeply rooted in human nature. It has been incorporated in formal game theory since Rabin (1993), and it has been confirmed empirically.[1] Diverse experiments have found that candidates selected for a job show definite signs of thankfulness towards the selectors,[2] and the data analyzed by Baron (2013) suggest that gratitude is higher on the part of low performers. Now suppose the selecting committee anticipates 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. Suppose in particular that the principal sets a wage for the job and the committee

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[1] 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).

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

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?

These situations where the principal is not in a position to directly evaluate the candidates' ability and hence has to appoint a committee to carry out the selection procedure are common in the public sector but they are just as relevant within private firms, in career advancements where the committee is formed by supervisors (as in the pioneering paper Prendergast and Topel (1996)) as in the selection of a CEO by an executive board appointed by shareholders.[3] Is the choice going to be distorted on account of the gratitude the selected candidate will express to the committee?

As in the the psychology literature we define the candidate's gratitude as the difference between the wage that the principal will pay him and the utility he would obtain if he did not get the job, i.e. his reservation utility. The larger this difference the more the candidate will be prone to give back to the committee, provided that he knows who is responsible for his hiring. We find that the outcome of the selection procedure 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 (Proposition 1). If the committee's choice is also determined by the candidate's gratitude intuitively there may be a tendency towards selection of candidates with lower than first best ability, and the model strongly confirms this presumption (Proposition 2). The result suggests that committees should be as anonymous as possible to the candidates, as is the case for example in the academia when the referees are unknown to the authors. Indeed from a welfare point of view unless the committee is detached enough from the candidates delegation may fare even worse than randomization, that is the principal should just set the wage and select a candidate at random among the applicants (Proposition 4).

2 The model

There is a principal who has to hire a worker, and there is a continuum of candidates indexed by ability $0 \leq \theta \leq 1$. Candidate θ has on-the-job productivity $s(\theta)$ which we assume strictly increasing and concave, and reservation utility $u(\theta)$ assumed strictly increasing and convex with $u'(0) = 0$. Concavity of the difference $s - u$ is assumed to be strict. We also 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 a selection procedure which selects a candidate among applicants. By construction the pool of candidates

[3] The management literature on distortion in evaluations by committees with some kind of ties to the candidates is rather vast; we cite for example McDaniel (2009), Andres et al (2014), Breuer et al (2013), Delfgaauw and Souverijn (2016), Sol (2016), Gillenkirch and Kreienbaum (2017), Heywoode et al (2017). On favoritism, following Prendergast and Topel (1996), see Levine et al. (2010) and Tikkanen (2016).

comprises those whose reservation utility is not higher than the given wage, that is 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 is the one with ability θ such that the difference $s(\theta) - u(\theta)$ is largest; we denote this by θ^{fb} and observe that it is unique by strict concavity of $s - u$ and that $0 < \theta^{fb} \leq 1$. [4] The principal can then set wage w^{fb} such that $u(\theta^{fb}) = w^{fb}$, and 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}.

Suppose however that the principal cannot measure θ directly. In this case 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 position. At the end of the selection phase the principal will observe the productivity of 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.[5]

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 $\theta^c(w^p)$. The pair $(w^p, \theta^c(w^p))$ is a subgame perfect equilibrium of this two-stage game.

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 even the highest will have $u(\theta) < w$; thus we define $\theta^{\max}(w) = \min\{u^{-1}(w); 1\}$.[6] 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.[7] [8]

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

[5]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 $s(\theta) < w$.

[6]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, since it must be $w \leq s(\theta) \leq s(1) = u(1)$ then $\theta^{\max}(w)$ is always defined by $u(\theta) = w$.

[7]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.

[8]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

3 Committee's choice and equilibria

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 benchmark case a principal anticipating the committee's choice would set $w = w^{fb}$, for then the committee would choose θ^{fb} - which 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:[9]

Proposition 1 (Aligned incentives). *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.*

In these cases the rent of the selected candidate $w - u(\theta)$ is always zero. The point of the paper is that if the selected candidate's rent were positive the committee might 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 above 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. 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 (Main result). *Assume that $V_i > 0, V_{ii} \leq 0$ for $i = 1, 2$ and that the boundary conditions $\lim(V_1/V_2)_{w-u\to0} = \infty$, $\lim(V_1/V_2)_{s-w\to0} = 0$ hold. If $V_{ij} > 0$, then whenever $0 < \theta^{fb} < 1$ the equilibrium choice is lower than first best: $\theta^c(w^p) < \theta^{fb}$.*[10]

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

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.

[9]Proofs, which are elementary, are collected in the Web Appendix.

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

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 $0 \leq \alpha, \beta \leq 1$.[11]

The suboptimality result was to be expected but the analysis yields more than that. Indeed, the theorem is silent on the case $\theta^{fb} = 1$, and in that case the equilibrium may 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 more typical case of interior first best applies on the other hand to situations where the productivity of the candidate is lower (second division teams or lower-tier universities): here the committee exploits the more abundant supply of average individuals for whom owing to competition the reservation wage is lower relative to their productivity and ends up employing less than first best candidates.

Remark. 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 deal with this case in the Web Appendix.

A parametric example

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. In the example 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. As we expect we find that the principal's payoff is increasing in anonymity; the less obvious result is that too much proximity (low α) lowers also the candidate's rent.

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

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

[11] 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.

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

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

Note that this increases from $w^p(0) = 0$ to 0.25 as α goes up from zero to one. 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 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 it goes to zero if $\alpha \to 1$: in that case $\theta^c(w) = \sqrt{w} = \theta^{\max}(w)$ for all w - in the limit the committee leaves zero rent to the candidate.[12] The more interesting fact is that the candidate's payoff goes to zero also for $\alpha \to 0$;[13] the reason is that when the committee gives little weight to the principal's payoff 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 (welfare $s-u$ also vanishes as $\alpha \to 0$).

Remark: Full delegation

If the committee could also set the wage welfare would be maximized because out of a larger $s-u$ the committee can choose w to increase both $w-u$ and $s-w$ thus raising V. But such full delegation would not be implemented if $V_{ij} > 0$ because as the next result shows it would be contrary to the principal's interest.

Proposition 3. *With full delegation the committee will select* $\theta = \theta^{fb}$. *If* $V(w-u, s-w)$ *is as in Proposition 2 concave in each argument, with* $\lim(V_1/V_2)_{w-u\to 0} = \infty$, $\lim(V_1/V_2)_{s-w\to 0} = 0$ *and* $V_{ij} > 0$ *then the principal is worse off than in the partial delegation case.*

[12] In the present case $\theta^{\min}(w) = w$ and $\theta^{\max}(w) = \sqrt{w}$.

[13] As can be checked the candidate's payoff is non-monotone, concave with an interior maximum at $\alpha = 0.2$.

Random selection

We have seen that delegation to the committee typically distorts the outcome towards selection of candidates with less than first best ability. Could the principal do better without the committee by just setting the wage and selecting a candidate at random in the relevant pool? This means 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 $[\theta^{\min}(w), \theta^{\max}(w)]$. We look at a simple case: $V(w-u, s-w) = (w-u)^{1-\alpha}(s-w)^{\alpha}, s(\theta) = \theta, u(\theta) = \theta^2$ 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 $\theta^{\min}(w) = w$ 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.

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.*

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). The result suggests that, unless the committee is detached enough from the candidates, to maximize welfare delegation should be avoided altogether.

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Appendix

1. Proofs of the results in the text

Proposition (Proposition 1 in the text). *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 $w = w^{fb}$. □

Proposition (Proposition 2, Main Result, in the text). *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: $\theta^c(w^p) < \theta^{fb}$.*

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 $dV/d\theta = -V_1 u' + V_2 s'$.

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 $V_1 u' = V_2 s'$.[14] 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.

[14]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.

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 $\theta^{fb} < 1$). □

Proposition (Proposition 4 in the text). *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. □

Proposition (Proposition 3 in the text). *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. □

2. The Convex Combination Case

We consider 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. It is clear by inspection that in this case the committee's choice does not depend on w, a feature which makes this formulation somewhat unappealing.

Proposition 5. *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 $s(\theta^{\max}(w)) - w = s(\theta^{\max}(w)) - u(\theta^{\max}(w)) \leq s(\theta^{fb}) - u(\theta^{fb})$; 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. □

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.

We lastly compare partial and full delegation for the convex combination case.

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 $\gamma = 1/2$. □

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 satisfy the hypotheses of Proposition 2, but as it turns out it is covered by Proposition 5. 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 5.