A. Appendix

A1 Optimal Effort Levels of Competing Agents and Proof of Proposition 1

Equation (1.1) shows the utility of a category C agent from prevailing over others:

$$U_{CE} = \frac{e_{CE}}{\sum e_{CE} + \sum e_{RE}}(v + I_C^P) - e_{CE} - n(1-\gamma)I_C^o$$

$$U_{CE} = \frac{e_{CE_i}}{e_{CE_i} + (n\gamma p_c - 1)e_{CE_j} + n(1-\gamma)p_r e_{RE}}(v + I_C^P) - e_{CE_i} - n(1-\gamma)I_C^o$$

Calculating the derivative for e_{CE_i} yields:

$$\frac{\partial U_{CE}}{\partial e_{CE_i}} = \frac{\left[e_{CE_i} + (n\gamma p_c - 1)e_{CE_j} + n(1-\gamma)p_r e_{RE}\right] - e_{CE_i}}{\left[e_{CE_i} + (n\gamma p_c - 1)e_{CE_j} + n(1-\gamma)p_r e_{RE}\right]^2}(v + I_C^P) - 1 \qquad (1.1.1)$$

Calculating the second derivative for e_{CE_i} yields:

$$\frac{\partial^2 U_{CE}}{\partial^2 e_{CE_i}} = \frac{-2\left\{\left[e_{CE_i} + (n\gamma p_c - 1)e_{CE_j} + n(1-\gamma)p_r e_{RE}\right] - e_{CE_i}\right\}\left[e_{CE_i} + (n\gamma p_c - 1)e_{CE_j} + n(1-\gamma)p_r e_{RE}\right] - e_{CE_i}}{\left[e_{CE_i} + (n\gamma p_c - 1)e_{CE_j} + n(1-\gamma)p_r e_{RE}\right]^4}(v + I_C^P)$$

(1.1.2)

Since $\frac{\partial^2 U_{CE}}{\partial^2 e_{CE_i}} < 0$, equation (1.1.1) describes a maximum!

Using symmetry of $e_{CE_i} = e_{CE_j} = e_{CE}$ yields for (1.1.1):

$$0 = \frac{[e_{CE} + (n\gamma p_c - 1)e_{CE} + n(1-\gamma)p_r e_{RE}] - e_{CE}}{[e_{CE} + (n\gamma p_c - 1)e_{CE} + n(1-\gamma)p_r e_{RE}]^2}(v + I_C^P) - 1$$

$$1 = \frac{[n\gamma p_c e_{CE} + n(1-\gamma)p_r e_{RE}] - e_{CE}}{[n\gamma p_c e_{CE} + n(1-\gamma)p_r e_{RE}]^2}(v + I_C^P) \qquad (1.1.3)$$

Equation (1.2) shows the utility of a category R agent from prevailing over others:

$$U_{RE} = \frac{e_{RE}}{\sum e_{CE} + \sum e_{RE}}(v + I_R^P) - e_{RE} - n\gamma I_R^o$$

$$U_{RE} = \frac{e_{RE_i}}{n\gamma p_c e_{CE} + e_{RE_i} + [n(1-\gamma)p_r - 1]e_{RE_j}}(v + I_R^P) - e_{RE_i} - n\gamma I_R^o$$

Calculating the derivative for e_{RE_i} yields:

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$$\frac{\partial U_{RE}}{\partial e_{RE_i}} = \frac{\left[n\gamma p_c e_{CE}+e_{RE_i}+[n(1-\gamma)p_r-1]e_{RE_j}\right]-e_{RE_i}}{\left[n\gamma p_c e_{CE}+e_{RE_i}+[n(1-\gamma)p_r-1]e_{RE_j}\right]^2}(v+I_R^P)-1 \tag{1.2.1}$$

Since $\frac{\partial^2 U_{RE}}{\partial^2 e_{RE_i}}$ is analog to $\frac{\partial^2 U_{CE}}{\partial^2 e_{CE_i}}$ equation (1.2.1) describes a maximum!

Using symmetry of $e_{RE_i} = e_{RE_j} = e_{RE}$ yields for (1.2.1):

$$0 = \frac{[n\gamma p_c e_{CE}+e_{RE}+[n(1-\gamma)p_r-1]e_{RE}]-e_{RE}}{[n\gamma p_c e_{CE}+e_{RE}+[n(1-\gamma)p_r-1]e_{RE}]^2}(v+I_R^P)-1$$

$$1 = \frac{[n\gamma p_c e_{CE}+n(1-\gamma)p_r e_{RE}]-e_{RE}}{[n\gamma p_c e_{CE}+n(1-\gamma)p_r e_{RE}]^2}(v+I_R^P) \tag{1.2.2}$$

Setting (1.1.3) equal to (1.2.2) results in the following condition:

$$e_{RE} = e_{CE}\frac{(v+I_C^P)-n\gamma p_c(I_C^P-I_R^P)}{(v+I_R^P)+n(1-\gamma)p_r(I_C^P-I_R^P)} \tag{1.1.4}$$

Since as per assumption $I_C^P > I_R^P$ it is always true that $e_{CE} > e_{RE}$ if n is sufficiently large.

Optimal efforts can be derived by using condition (1.1.4) for equations (1.1.3) and (1.2.2), resulting as follows:

$$e_{CE}^* = \frac{[n\gamma p_c+n(1-\gamma)p_r-1]\left[n(1-\gamma)p_r(I_C^P-I_R^P)+(v+I_R^P)\right]}{\left[n\gamma p_c(v+I_R^P)+n(1-\gamma)p_r(v+I_C^P)\right]^2}(v+I_C^P)(v+I_R^P) \tag{1.1.5}$$

$$e_{RE}^* = \frac{[n\gamma p_c+n(1-\gamma)p_r-1]\left[(v+I_C^P)-n\gamma p_c(I_C^P-I_R^P)\right]}{\left[n\gamma p_c(v+I_R^P)+n(1-\gamma)p_r(v+I_C^P)\right]^2}(v+I_C^P)(v+I_R^P) \tag{1.1.6}$$

Setting $I_C^P = I_R^P = 0$ leads for both (1.1.5) and (1.1.6) to $e_{CE}^* = e_{RE}^* = \frac{[n\gamma p_c+n(1-\gamma)p_r-1]}{[n\gamma p_c+n(1-\gamma)p_r]^2}v$, which represents the optimal effort level in the symmetric "Winner-Take-All" contest as described in chapter 3.1.2.

It is always true that $e_{CE}^* > 0$ since all of the following conditions are met:

a) $[n\gamma p_c + n(1-\gamma)p_r - 1] > 0$
b) $[n(1-\gamma)p_r(I_C^P - I_R^P) + (v+I_R^P)] > 0$
c) $[n\gamma p_c(v+I_R^P) + n(1-\gamma)p_r(v+I_C^P)]^2 > 0$
d) $(v+I_C^P) > 0$
e) $(v+I_R^P)$

In regard to $e_{RE}^* > 0$ the following conditions have to be met:

a) $[n\gamma p_c + n(1-\gamma)p_r - 1] > 0$
b) $[(v + I_C^P) - n\gamma p_c(I_C^P - I_R^P)] > 0$ as long as $v > n\gamma p_c(I_C^P - I_R^P) - I_C^P$
c) $[n\gamma p_c(v + I_R^P) + n(1-\gamma)p_r(v + I_C^P)]^2 > 0$
d) $(v + I_C^P) > 0$
e) $(v + I_R^P)$

The optimal effort in competition of a category C agent is driven as follows:

- increasing n leads to decreasing $\mathrm{e}_{\mathrm{CE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{CE}}^*}{\partial \mathrm{n}} < 0$;
- increasing v leads to increasing $\mathrm{e}_{\mathrm{CE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{CE}}^*}{\partial \mathrm{v}} > 0$;
- increasing $\mathrm{p_c}$ leads to decreasing $\mathrm{e}_{\mathrm{CE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{CE}}^*}{\partial \mathrm{p_c}} < 0$;
- increasing $\mathrm{p_R}$ leads to decreasing $\mathrm{e}_{\mathrm{CE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{CE}}^*}{\partial \mathrm{p_R}} < 0$;
- increasing γ leads to decreasing $\mathrm{e}_{\mathrm{CE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{CE}}^*}{\partial \gamma} < 0$ if $\mathrm{p_c} > \mathrm{p_R}$;
- increasing γ leads to increasing $\mathrm{e}_{\mathrm{CE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{CE}}^*}{\partial \gamma} > 0$ if $\mathrm{p_c} < \mathrm{p_R}$;
- increasing $\mathrm{I_C^P}$ leads to increasing $\mathrm{e}_{\mathrm{CE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{CE}}^*}{\partial \mathrm{I_C^P}} > 0$;
- increasing $\mathrm{I_R^P}$ leads to increasing $\mathrm{e}_{\mathrm{CE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{CE}}^*}{\partial \mathrm{I_R^P}} > 0$ (but not as strong as with $\mathrm{I_C^P}$);

The optimal effort in competition of a category R agent is driven as follows:

- increasing n leads to decreasing $\mathrm{e}_{\mathrm{RE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{RE}}^*}{\partial \mathrm{n}} < 0$, this effect is stronger than for an agent of category C;
- increasing v leads to increasing $\mathrm{e}_{\mathrm{RE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{RE}}^*}{\partial \mathrm{vn}} > 0$;
- increasing $\mathrm{p_c}$ leads to decreasing $\mathrm{e}_{\mathrm{RE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{RE}}^*}{\partial \mathrm{p_c}} < 0$, this effect is stronger than for an agent of category C;
- increasing $\mathrm{p_R}$ leads to decreasing $\mathrm{e}_{\mathrm{RE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{RE}}^*}{\partial \mathrm{p_R}} < 0$, this effect is stronger than for an agent of category C;
- increasing γ leads to decreasing $\mathrm{e}_{\mathrm{RE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{RE}}^*}{\partial \gamma} < 0$;
- increasing $\mathrm{I_C^P}$ leads to increasing $\mathrm{e}_{\mathrm{RE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{RE}}^*}{\partial \mathrm{I_C^P}} > 0$ (but not as strong as with $\mathrm{I_R^P}$);
- increasing $\mathrm{I_R^P}$ leads to increasing $\mathrm{e}_{\mathrm{RE}}^*$ since $\frac{\partial \mathrm{e}_{\mathrm{RE}}^*}{\partial \mathrm{I_R^P}} > 0$;

A2 Optimal Choice of Activities and Proof of Proposition 2

A category C agent is indifferent to competing and working to rule if the following condition is met:

$$U_{CE} = U_{CW}$$

$$\frac{e_{CE}}{\sum e_{CE}+\sum e_{RE}}(v + I_C^P) - e_{CE} - n(1-\gamma)I_C^o \quad = w - e_{CW} + I_C^A - n(1-\gamma)I_C^o \tag{1.9}$$

$$\frac{e_{CE}}{\sum e_{CE}+\sum e_{RE}}(v + I_C^P) - e_{CE} \quad = w - e_{CW} + I_C^A \tag{1.9.1}$$

$$\frac{e_{CE}}{n\gamma p_c e_{CE} + n(1-\gamma)p_r e_{RE}}(v + I_C^P) - e_{CE} \quad = w - e_{CW} + I_C^A \tag{1.9.2}$$

Using optimal efforts e_{CE}^*, e_{RE}^*, e_{CW}^* and solving equation (1.9.2) for p_c leads to the following result:

$$p_c = \frac{[n(1-\gamma)p_r(I_C^P - I_R^P) + (v+I_R^P)]\sqrt{v+I_C^P} - n(1-\gamma)p_r(v+I_C^P)\sqrt{w+I_C^A}}{n\gamma(v+I_R^P)\sqrt{w+I_C^A}} \tag{1.10}$$

Obviously the decision is also dependent on the routine-oriented agents' decisions whether to compete or not. This means that the following condition must also be considered:

$$U_{RE} = U_{RW}$$

$$\frac{e_{RE}}{\sum e_{CE}+\sum e_{RE}}(v + I_R^P) - e_{RE} - n\gamma I_R^o = w - e_{RW} + I_R^A - n\gamma I_R^o \tag{1.11}$$

$$\frac{e_{RE}}{\sum e_{CE}+\sum e_{RE}}(v + I_R^P) - e_{RE} = w - e_{RW} + I_R^A \tag{1.11.1}$$

$$\frac{e_{RE}}{n\gamma p_c e_{CE} + n(1-\gamma)p_r e_{RE}}(v + I_R^P) - e_{RE} = w - e_{RW} + I_R^A \tag{1.11.2}$$

Using optimal efforts e_{CE}^*, e_{RE}^*, e_{RW}^* and solving equation (1.11.2) for p_R yields the following result:

$$p_R = \frac{[(v+I_C^P) - n\gamma p_C(I_C^P - I_R^P)]\sqrt{v+I_R^P} - n\gamma p_C(v+I_R^P)\sqrt{w+I_R^A}}{n(1-\gamma)(v+I_C^P)\sqrt{w+I_R^A}} \tag{1.12}$$

The results for p_C and p_R are only feasible within the context of the model if the conditions $0 \le p_C \le 1$ and $0 \le p_R \le 1$ are fulfilled. From equation (1.12) it can be derived that $0 \le p_R \le 1$ is only true if

$$(v + I_C^P) - n\gamma p_C(I_C^P - I_R^P) - n\gamma p_C\sqrt{v + I_R^P}\sqrt{w + I_R^A} > 0 \tag{1.12.1}$$

Based on (1.12.1) it can be assumed that p_R is negative when p_C is positive and n sufficiently large, so the solution proceeds with $p_R = 0$.
Using $p_R = 0$ yields the following result for p_C:

$$p_C = \frac{\sqrt{v+I_C^P}}{n\gamma\sqrt{w+I_C^A}} \tag{1.13}$$

The condition that $0 \leq p_C \leq 1$ is met if:

a) $\sqrt{\mathrm{v} + \mathrm{I_C^P}} > 0$, always true;

b) $\mathrm{n\gamma}\sqrt{\mathrm{w} + \mathrm{I_C^A}} > 0$, always true;

c) $\sqrt{\mathrm{v} + \mathrm{I_C^P}} < n\gamma\sqrt{\mathrm{w} + \mathrm{I_C^A}}$, whenever enough agents belong to category C;

However, item (c) shows that the principal has the option to set p_C if it is possible to set v as large enough.

The optimal activity choice for an agent in category C is driven as follows:

- increasing v leads to increasing p_C since $\frac{\partial p_C}{\partial v} = \frac{1}{2\mathrm{n\gamma}\sqrt{\mathrm{v+I_C^P}}\sqrt{\mathrm{w+I_C^A}}} > 0;$
- increasing I_C^P leads to increasing p_C since $\frac{\partial p_C}{\partial I_C^P} = \frac{\frac{1}{2\sqrt{\mathrm{v+I_C^P}}}}{\mathrm{n\gamma}\sqrt{\mathrm{w+I_C^A}}} > 0;$
- increasing n leads to decreasing p_C since $\frac{\partial p_C}{\partial n} = \frac{-\gamma\sqrt{\mathrm{v+I_C^P}}\sqrt{\mathrm{w+I_C^A}}}{\left[\mathrm{n\gamma}\sqrt{\mathrm{w+I_C^A}}\right]^2} < 0;$
- increasing γ leads to decreasing p_C since $\frac{\partial p_C}{\partial \gamma} = \frac{-\mathrm{n}\sqrt{\mathrm{v+I_C^P}}\sqrt{\mathrm{w+I_C^A}}}{\left[\mathrm{n\gamma}\sqrt{\mathrm{w+I_C^A}}\right]^2} < 0;$
- increasing w leads to decreasing p_C since $\frac{\partial p_C}{\partial w} = \frac{\frac{-\mathrm{n\gamma}\sqrt{\mathrm{v+I_C^P}}}{2\sqrt{\mathrm{w+I_C^A}}}}{\left[\mathrm{n\gamma}\sqrt{\mathrm{w+I_C^A}}\right]^2} < 0;$
- increasing I_C^A leads to decreasing p_C since $\frac{\partial p_C}{\partial I_C^A} = \frac{\frac{-\mathrm{n\gamma}\sqrt{\mathrm{v+I_C^P}}}{2\sqrt{\mathrm{w+I_C^A}}}}{\left[\mathrm{n\gamma}\sqrt{\mathrm{w+I_C^A}}\right]^2} < 0;$

A3 Optimal Choice of Social Category and Proof of Proposition 3

An agent is indifferent between being a careerist or preferring routine if the following condition is met:

$$U_C = U_R$$

As already stated in chapter 3.2.4.4 simplification leads to:

$$p_C\left[\frac{e_{CE}}{\sum e_{CE}+\sum e_{RE}}(v+I_C^P)-e_{CE}-n(1-\gamma)I_C^o\right]+(1-p_C)\left[w-e_{CW}+I_C^A-n(1-\gamma)I_C^o\right]= [w-e_{RW}+I_R^A-n\gamma I_R^o] \quad (1.15)$$

$$p_C\left[\frac{e_{CE}}{n\gamma p_C e_{CE}+n(1-\gamma)p_r e_{RE}}(v+I_C^P)-e_{CE}-n(1-\gamma)I_C^o\right]+(1-p_C)\left[w-e_{CW}+I_C^A-n(1-\gamma)I_C^o\right]= [w-e_{RW}+I_R^A-n\gamma I_R^o] \quad (1.15.1)$$

Using optimal efforts e_{CE}^*, e_{CW}^*, e_{RW}^* yields:

$$p_C\left[\frac{\frac{[n\gamma p_C+n(1-\gamma)p_r-1]\left[n(1-\gamma)p_r\left(I_C^P-I_R^P\right)+\left(v+I_R^P\right)\right]}{\left[n\gamma p_C\left(v+I_R^P\right)+n(1-\gamma)p_r\left(v+I_C^P\right)\right]^2}(v+I_C^P)(v+I_R^P)}{n\gamma p_C\frac{[n\gamma p_C+n(1-\gamma)p_r-1]\left[n(1-\gamma)p_r\left(I_C^P-I_R^P\right)+\left(v+I_R^P\right)\right]}{\left[n\gamma p_C\left(v+I_R^P\right)+n(1-\gamma)p_r\left(v+I_C^P\right)\right]^2}(v+I_C^P)(v+I_R^P)+n(1-\gamma)p_r\frac{[n\gamma p_C+n(1-\gamma)p_r-1]\left[\left(v+I_C^P\right)-n\gamma p_C\left(I_C^P-I_R^P\right)\right]}{\left[n\gamma p_C\left(v+I_R^P\right)+n(1-\gamma)p_r\left(v+I_C^P\right)\right]^2}(v+I_C^P)(v+I_R^P)}(v+I_C^P)\frac{[n\gamma p_C+n(1-\gamma)p_r-1]\left[n(1-\gamma)p_r\left(I_C^P-I_R^P\right)+\left(v+I_R^P\right)\right]}{\left[n\gamma p_C\left(v+I_R^P\right)+n(1-\gamma)p_r\left(v+I_C^P\right)\right]^2}(v+I_C^P)(v+I_R^P)-n(1-\gamma)I_C^o\right]+(1-p_C)[w+I_C^A-n(1-\gamma)I_C^o]=[w+I_R^A-n\gamma I_R^o] \quad (1.15.2)$$

Using $p_C = \frac{\sqrt{v+I_C^P}}{n\gamma\sqrt{w+I_C^A}}$ and $p_R = 0$ and solving for γ yields:

$$\gamma = \frac{I_R^A-I_C^A+nI_C^o}{nI_C^o+nI_R^o} \quad (1.16)$$

The condition that $0 \leq \gamma \leq 1$ is met if:

a) $I_R^A - I_C^A + nI_C^o > 0$
   $nI_C^o > I_C^A - I_R^A$, can be true. It is always true for $I_R^A > I_C^A$, if $I_R^A < I_C^A$ the condition will depend on n and I_C^o.
b) $nI_C^o + nI_R^o > 0$, always true;
c) $I_R^A - I_C^A + nI_C^o < nI_C^o + nI_R^o$
   $I_R^A - I_C^A < nI_R^o$
   $-nI_R^o < I_C^A - I_R^A$, can be true. It is always true for $I_R^A < I_C^A$, if $I_R^A > I_C^A$ the condition will depend on n and I_R^o.

However conditions (a) and (b) are always fulfilled together since$-nI_C^o < nI_C^o$.

The optimal choice for a social category is driven as follows:

- increasing n leads to decreasing γ since $\frac{\partial\gamma}{\partial n} = \frac{-(I_R^A - I_C^A)}{n^2(I_C^o + I_R^o)} < 0$ if $I_R^A > I_C^A$;
- increasing n leads to increasing γ since $\frac{\partial\gamma}{\partial n} = \frac{-(I_R^A - I_C^A)}{n^2(I_C^o + I_R^o)} > 0$ if $I_R^A < I_C^A$;
- increasing I_R^A leads to increasing γ since $\frac{\partial\gamma}{\partial I_R^A} = \frac{1}{n(I_C^o + I_R^o)} > 0$;
- increasing I_C^A leads to increasing γ since $\frac{\partial\gamma}{\partial I_C^A} = \frac{-1}{\mathrm{n}(I_C^o + I_R^o)} > 0$;
- increasing I_C^o leads to increasing γ since $\frac{\partial\gamma}{\partial I_C^o} = \frac{nI_R^o - I_R^A + I_C^A}{n(I_C^o + I_R^o)^2} > 0$, only not if I_R^A is sufficiently large and n sufficiently small;
- increasing I_R^o leads to decreasing γ since $\frac{\partial\gamma}{\partial I_R^o} = \frac{-(I_R^A - I_C^A + nI_C^o)n}{n(I_C^o + I_R^o)^2} < 0$, only if $(I_R^A - I_C^A + nI_C^o) > 0$, which is also requested for $0 \le \gamma \le 1$;

A4 Optimal Contest Structure and Proof of Proposition 4

As already stated in chapter 3.2.4.5, the principal's optimization problem can be simplified to:

$$U_{Pr} = \sqrt{n\gamma p_C e_{CE}} - v - [n\gamma(1 - p_C) + n(1 - \gamma)]w \qquad (1.18)$$

Using e_{CE}^*, $p_R = 0$ and $p_C = \frac{\sqrt{v + I_C^P}}{n\gamma\sqrt{w + I_C^A}}$ yields:

$$U_{Pr} = \sqrt{n\gamma p_C \frac{\left[n\gamma p_c + n(1-\gamma)p_r - 1\right]\left[n(1-\gamma)p_r(I_C^P - I_R^P) + (v + I_R^P)\right]}{\left[n\gamma p_c(v + I_R^P) + n(1-\gamma)p_r(v + I_C^P)\right]^2}(v + I_C^P)(v + I_R^P)} - v - [n\gamma(1 - p_C) + n(1 - \gamma)]w$$

$$U_{Pr} = \sqrt{\frac{n\gamma p_c - 1}{n\gamma p_C}(v + I_C^P)} - v - [n - n\gamma p_C]w$$

$$U_{Pr} = \sqrt{\frac{n\gamma\frac{\sqrt{v + I_C^P}}{n\gamma\sqrt{w + I_C^A}} - 1}{n\gamma\frac{\sqrt{v + I_C^P}}{n\gamma\sqrt{w + I_C^A}}}(v + I_C^P)} - v - \left[n - n\gamma\frac{\sqrt{v + I_C^P}}{n\gamma\sqrt{w + I_C^A}}\right]w$$

Simplifying the above term yields:

$$U_{Pr} = \sqrt{v + I_C^P - \sqrt{v + I_C^P}\sqrt{w + I_C^A}} - v - wn + w\frac{\sqrt{v + I_C^P}}{\sqrt{w + I_C^A}} \qquad (1.19)$$

As already stated in chapter 3.2.4.5 the equation (1.19) depends negatively on v, thus making it necessary to introduce a side condition. The solution will proceed using the following constraint as an example:

$$v = n\left(w + I_C^A\right) - I_C^P \qquad (1.22)$$

Using Lagrange yields the following function:

$$L = \sqrt{v + I_C^P - \sqrt{v + I_C^P}\sqrt{w + I_C^A}} - v - wn + w\frac{\sqrt{v+I_C^P}}{\sqrt{w+I_C^A}} - \lambda\left[n\left(w + I_C^A\right) - I_C^P\right] \qquad (1.19.1)$$

The following derivatives are to be considered:

1) $$\frac{\partial \mathrm{L}}{\partial \mathrm{w}} = -\frac{\sqrt{v+I_C^P}}{4\sqrt{v+I_C^P-\sqrt{v+I_C^P}\sqrt{w+I_C^A}}\sqrt{w+I_C^A}} - n + \frac{\sqrt{v+I_C^P}}{\sqrt{w+I_C^A}} - \frac{w\sqrt{v+I_C^P}}{2\sqrt{w+I_C^A}\left(w+I_C^A\right)} - n\lambda$$

Setting $\frac{\partial \mathrm{L}}{\partial \mathrm{w}} = 0$ and solving for λ yields:

$$\lambda = -\frac{\sqrt{v+I_C^P}}{4n\sqrt{v+I_C^P-\sqrt{v+I_C^P}\sqrt{w+I_C^A}}\sqrt{w+I_C^A}} - 1 + \frac{\sqrt{v+I_C^P}}{n\sqrt{w+I_C^A}} - \frac{w\sqrt{v+I_C^P}}{2n\sqrt{w+I_C^A}\left(w+I_C^A\right)} \qquad (1.19.1.2)$$

2) $$\frac{\partial \mathrm{L}}{\partial \mathrm{v}} = \frac{1-\frac{\sqrt{w+I_C^A}}{\sqrt{v+I_C^P}}}{2\sqrt{v+I_C^P-\sqrt{v+I_C^P}\sqrt{w+I_C^A}}} - 1 + \frac{w\sqrt{w+I_C^A}}{2\sqrt{v+I_C^P}\left(w+I_C^A\right)} + \lambda$$

Setting $\frac{\partial \mathrm{L}}{\partial \mathrm{v}} = 0$ and solving for λ yields:

$$\lambda = -\frac{2\sqrt{v+I_C^P}-\sqrt{w+I_C^A}}{4\sqrt{v+I_C^P-\sqrt{v+I_C^P}\sqrt{w+I_C^A}}\sqrt{v+I_C^P}} - \frac{w}{2\sqrt{v+I_C^P}\sqrt{w+I_C^A}} + 1 \qquad (1.19.1.2)$$

3) $$\frac{\partial \mathrm{L}}{\partial \mathrm{n}} = -w - \lambda\left(w + I_C^A\right)$$

Setting $\frac{\partial \mathrm{L}}{\partial \mathrm{n}} = 0$ and solving for λ yields:

$$\lambda = -\frac{w}{(w+I_C^A)} \tag{1.19.1.3}$$

4) $\frac{\partial L}{\partial \lambda} = -\left[n\left(w + I_C^A\right) - I_C^P\right]$

Setting $\frac{\partial L}{\partial \lambda} = 0$ and solving for v yields the side condition:

$$v = n\left(w + I_C^A\right) - I_C^P \tag{1.19.1.4}$$

From (1.19.1.1) and (1.19.1.3) it can be deduced that:

$$-\frac{\sqrt{v+I_C^P}}{4n\sqrt{v+I_C^P-\sqrt{v+I_C^P}\sqrt{w+I_C^A}}\sqrt{w+I_C^A}} - 1 + \frac{\sqrt{v+I_C^P}}{n\sqrt{w+I_C^A}} - \frac{w\sqrt{v+I_C^P}}{2n\sqrt{w+I_C^A}(w+I_C^A)} = -\frac{w}{(w+I_C^A)}$$

Solving for n yields:

$$n = \frac{\sqrt{v+I_C^P}\sqrt{w+I_C^A}}{I_C^A} - \frac{\sqrt{v+I_C^P}\sqrt{w+I_C^A}}{4I_C^A\sqrt{v+I_C^P-\sqrt{v+I_C^P}\sqrt{w+I_C^A}}} - \frac{w\sqrt{v+I_C^P}}{2I_C^A\sqrt{w+I_C^A}} \tag{1.19.1.5}$$

From (1.19.1.2) and (1.19.1.3) it can be deduced that:

$$-\frac{2\sqrt{v+I_C^P}-\sqrt{w+I_C^A}}{4\sqrt{v+I_C^P-\sqrt{v+I_C^P}\sqrt{w+I_C^A}}\sqrt{v+I_C^P}} - \frac{w}{2\sqrt{v+I_C^P}\sqrt{w+I_C^A}} + 1 = -\frac{w}{(w+I_C^A)}$$

Rearrangement leads to:

$$\left(2\sqrt{v+I_C^P} - \sqrt{w+I_C^A}\right)\left(w+I_C^A\right) + 2\sqrt{v+I_C^P-\sqrt{v+I_C^P}\sqrt{w+I_C^A}}\left(w\sqrt{w+I_C^A} - 2I_C^A\sqrt{v+I_C^P}\right) = 0 \tag{1.19.1.6}$$

Equation (1.19.1.6) is only fulfilled if $-I_C^A < w < 0$, hence the principal will set $w^* = 0$!

Using this for (1.19.1.5) yields:

$$n^* = \frac{\sqrt{(v+I_C^P)I_C^A}}{I_C^A} - \frac{\sqrt{(v+I_C^P)I_C^A}}{4I_C^A\sqrt{v+I_C^P-\sqrt{(v+I_C^P)I_C^A}}}$$

$n^* > 0!$

Analyzing the dependence of n^* the principal has to consider in regards to v, I_C^P and I_C^A yields the following results:

$$\frac{\partial n^*}{\partial v} = \frac{1}{2\sqrt{(v+I_C^P)I_C^A}} - \frac{1}{8\sqrt{v+I_C^P-\sqrt{(v+I_C^P)I_C^A}}\sqrt{(v+I_C^P)I_C^A}} + \frac{2\sqrt{(v+I_C^P)I_C^A}-I_C^A}{16I_C^A\left[v+I_C^P-\sqrt{(v+I_C^P)I_C^A}\right]\sqrt{v+I_C^P-\sqrt{(v+I_C^P)I_C^A}}}$$

$\frac{\partial n^*}{\partial v} > 0!$

Obviously $\frac{\partial n^*}{\partial I_C^P}$ is analogue to $\frac{\partial n^*}{\partial v}$, hence $\frac{\partial n^*}{\partial I_C^P} > 0!$

$$\frac{\partial n^*}{\partial I_C^A} = -\frac{\sqrt{(v+I_C^P)}}{2I_C^A\sqrt{I_C^A}} - \frac{v+I_C^P}{16I_C^A\left[v+I_C^P-\sqrt{(v+I_C^P)I_C^A}\right]\sqrt{v+I_C^P-\sqrt{(v+I_C^P)I_C^A}}} + \frac{\sqrt{(v+I_C^P)I_C^A}}{8(I_C^A)^2\sqrt{v+I_C^P-\sqrt{(v+I_C^P)I_C^A}}}$$

$\frac{\partial n^*}{\partial I_C^A} < 0!$

Using above results for (1.19.1.4) yields:

$$v = n\left(w + I_C^A\right) - I_C^P$$
$$v = nI_C^A - I_C^P$$
$$v = \left(\frac{\sqrt{(v+I_C^P)I_C^A}}{I_C^A} - \frac{\sqrt{(v+I_C^P)I_C^A}}{4I_C^A\sqrt{v+I_C^P-\sqrt{(v+I_C^P)I_C^A}}}\right)I_C^A - I_C^P$$

Rearrangement leads to:

$$1 = \sqrt{\frac{I_C^A}{v+I_C^P}} - \frac{1}{4}\sqrt{\frac{I_C^A}{(v+I_C^P)^2-(v+I_C^P)\sqrt{(v+I_C^P)I_C^A}}}$$

Since $(v + I_C^P) > I_C^A$ is always true, the above condition cannot be met. The principal therefore has no optimal v to define. However, due to the side condition, the principal cannot set n arbitrarily since the constraint requires a minimum number of leaders and an increasing n leads to agents increasingly deciding to become routine-oriented and not to compete.

A5 Optimal Effort Levels of Competing Agents and Proof of Proposition 5

Equation (2.1) shows the utility of an agent of category C in group 1 from prevailing against others:

$$U_{C1E} = \frac{\sum e_{C1E}}{\sum e_{C1E} + \sum e_{C2E}} \frac{e_{C1E}}{\sum e_{C1E}} (v + I_C^P) - (1+\varepsilon) e_{C1E} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)] I_C^O$$

$$U_{C1E} = \frac{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j}\right]}{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j} + n_2\gamma_2 p_{C2} e_{C2E}\right]} \frac{e_{C1E_i}}{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j}\right]} (v + I_C^P) - (1+\varepsilon) e_{C1E_i} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)] I_C^O$$

Calculating the derivative for e_{C1E_i} yields:

$$\frac{\partial U_{C1E}}{\partial e_{C1E_i}} = \left[\frac{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j} + n_2\gamma_2 p_{C2} e_{C2E}\right] - \left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j}\right]}{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j} + n_2\gamma_2 p_{C2} e_{C2E}\right]^2} \frac{e_{C1E_i}}{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j}\right]} + \frac{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j}\right]}{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j} + n_2\gamma_2 p_{C2} e_{C2E}\right]} \frac{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j}\right] - e_{C1E_i}}{\left[e_{C1E_i} + (n_1\gamma_1 p_{C1} - 1) e_{C1E_j}\right]^2} \right] (v + I_C^P) - (1+\varepsilon) \tag{2.1.1}$$

Since SOC for e_{C1E_i} is negative equation (2.1.1) describes a maximum!

Using symmetry of $e_{C1E_i} = e_{C1E_j} = e_{C1E}$ yields for (2.1.1):

$$0 = \frac{(n_1\gamma_1 p_{C1} - 1) e_{C1E} + n_2\gamma_2 p_{C2} e_{C2E}}{[n_1\gamma_1 p_{C1} e_{C1E} + n_2\gamma_2 p_{C2} e_{C2E}]^2} (v + I_C^P) - (1+\varepsilon)$$

$$(1+\varepsilon) = \frac{(n_1\gamma_1 p_{C1} - 1) e_{C1E} + n_2\gamma_2 p_{C2} e_{C2E}}{[n_1\gamma_1 p_{C1} e_{C1E} + n_2\gamma_2 p_{C2} e_{C2E}]^2} (v + I_C^P) \tag{2.1.2}$$

Equation (2.2) shows the utility of a category C agent in group 2 from prevailing over others:

$$U_{C2E} = \frac{\sum e_{C2E}}{\sum e_{C1E} + \sum e_{C2E}} \frac{e_{C2E}}{\sum e_{C2E}} (v + I_C^P) - (1-\varepsilon) e_{C2E} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)] I_C^O$$

$$U_{C2E} = \frac{\left[e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right]}{\left[n_1\gamma_1 p_{C1} e_{C1E} + e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right]} \frac{e_{C2E_i}}{\left[e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right]} (v + I_C^P) - (1-\varepsilon) e_{C2E_i} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)] I_C^O$$

Calculating the derivative for e_{C2E_i} yields:

$$\frac{\partial U_{C2E}}{\partial e_{C2E_i}} = \left[\frac{\left[n_1\gamma_1 p_{C1} e_{C1E} + e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right] - \left[e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right]}{\left[n_1\gamma_1 p_{C1} e_{C1E} + e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right]^2} \frac{e_{C2E_i}}{\left[e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right]} + \frac{\left[e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right]}{\left[n_1\gamma_1 p_{C1} e_{C1E} + e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right]} \frac{\left[e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right] - e_{C2E_i}}{\left[e_{C2E_i} + (n_2\gamma_2 p_{C2} - 1) e_{C2E_j}\right]^2} \right] (v + I_C^P) - (1 - \varepsilon)$$

(2.2.1)

Since $\frac{\partial U_{C2E}}{\partial e_{C2E_i}}$ is analog to $\frac{\partial U_{C1E}}{\partial e_{C1E_i}}$ equation (2.2.1) describes a maximum!

Using symmetry of $e_{C2E_i} = e_{C2E_j} = e_{C2E}$ yields for (2.2.1):

$$0 = \frac{n_1\gamma_1 p_{C1} e_{C1E} + (n_2\gamma_2 p_{C2} - 1) e_{C2E}}{[n_1\gamma_1 p_{C1} e_{C1E} + n_2\gamma_2 p_{C2} e_{C2E}]^2} (v + I_C^P) - (1 - \varepsilon)$$

$$(1 - \varepsilon) = \frac{n_1\gamma_1 p_{C1} e_{C1E} + (n_2\gamma_2 p_{C2} - 1) e_{C2E}}{[n_1\gamma_1 p_{C1} e_{C1E} + n_2\gamma_2 p_{C2} e_{C2E}]^2} (v + I_C^P) \quad (2.2.2)$$

Combining (2.1.2) with (2.2.2) yields:

$$\frac{(1-\varepsilon)}{(1+\varepsilon)} = \frac{\frac{n_1\gamma_1 p_{C1} e_{C1E} + (n_2\gamma_2 p_{C2} - 1) e_{C2E}}{[n_1\gamma_1 p_{C1} e_{C1E} + n_2\gamma_2 p_{C2} e_{C2E}]^2} (v + I_C^P)}{\frac{(n_1\gamma_1 p_{C1} - 1) e_{C1E} + n_2\gamma_2 p_{C2} e_{C2E}}{[n_1\gamma_1 p_{C1} e_{C1E} + n_2\gamma_2 p_{C2} e_{C2E}]^2} (v + I_C^P)} \quad (2.2.3)$$

Simplification results in the following condition:

$$e_{C2E} = e_{C1E} \frac{1 + 2\varepsilon n_1\gamma_1 p_{C1} - \varepsilon}{1 - 2\varepsilon n_2\gamma_2 p_{C2} + \varepsilon} \quad (2.2.4)$$

From (2.2.4) the relation between e_{C1E}^* and e_{C2E}^* can be derived for any possible distortion:

a) If group 1 is advantaged with $\varepsilon < 0$ then $e_{C1E}^* > e_{C2E}^*$;
b) If group 1 is disadvantaged with $\varepsilon > 0$ then $e_{C1E}^* < e_{C2E}^*$;
c) If no distortion between group 1 and group 2 with $\varepsilon = 0$ then $e_{C1E}^* = e_{C2E}^*$;

Optimal efforts can be derived by using condition (2.2.4) for equations (2.1.2) and (2.2.2), resulting as follows:

$$e_{C1E}^* = \frac{[n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} - 1][1 - 2\varepsilon n_2\gamma_2 p_{c2} + \varepsilon]}{[(1+\varepsilon) n_1\gamma_1 p_{c1} + (1-\varepsilon) n_2\gamma_2 p_{c2}]^2} (v + I_C^P) \quad (2.2.5)$$

$$e^*_{C2E} = \frac{[n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} - 1][1 + 2\varepsilon n_1\gamma_1 p_{c1} - \varepsilon]}{[(1+\varepsilon)n_1\gamma_1 p_{c1} + (1-\varepsilon)n_2\gamma_2 p_{c2}]^2}(v + I_C^P) \qquad (2.2.6)$$

It is true that $e^*_{C1E} > 0$ if all of the following conditions are met:

a) $[n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} - 1] > 0$
b) $[1 - 2\varepsilon n_2\gamma_2 p_{c2} + \varepsilon] > 0$
c) $[(1+\varepsilon)n_1\gamma_1 p_{c1} + (1-\varepsilon)n_2\gamma_2 p_{c2}]^2 > 0$
d) $(v + I_C^P) > 0$

All the above listed conditions are met as per the assumptions in the model, except condition (b). This condition tends to be negative in the event of group 1 being disadvantaged (i.e. $\varepsilon > 0$) leading to $e^*_{C1E} < 0$ and therefore to boundary solution $e^*_{C1E} = 0$. Only if the distortion is very low is there a chance of e^*_{C1E} being positive. In the event of group 1 being advantaged (i.e. $\varepsilon < 0$) condition (b) is always true as well, leading to $e^*_{C1E} > 0$.

It is true that $e^*_{C2E} > 0$ if all of the following conditions are met:

a) $[n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} - 1] > 0$
b) $[1 + 2\varepsilon n_1\gamma_1 p_{c1} - \varepsilon] > 0$
c) $[(1+\varepsilon)n_1\gamma_1 p_{c1} + (1-\varepsilon)n_2\gamma_2 p_{c2}]^2 > 0$
d) $(v + I_C^P) > 0$

All the above listed conditions are met as per the assumptions in the model, except condition (b). This condition tends to be negative in the event of group 2 being disadvantaged (i.e. $\varepsilon < 0$) leading to $e^*_{C2E} < 0$ and therefore to boundary solution $e^*_{C2E} = 0$. Only if the distortion is very low is there a chance of e^*_{C2E} being positive. In the event of group 2 being advantaged (i.e. $\varepsilon > 0$) condition (b) is always true as well, leading to $e^*_{C1E} > 0$.

The optimal effort in competition for an agent in category C of group 1 is driven as follows:

- increasing n_1 leads to decreasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial n_1} < 0$ if group 1 is preferred; if group 1 is only slightly discriminated this relation applies as well;
- increasing p_{c1} leads to decreasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial p_{c1}} < 0$ if group 1 is preferred; if group 1 is only slightly discriminated this relation applies as well;
- increasing γ_1 leads to decreasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial \gamma_1} < 0$ if group 1 is preferred; if group 1 is only slightly discriminated this relation applies as well;
- increasing n_2 leads to increasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial n_2} > 0$ if group 1 is preferred;

- increasing n_2 leads to decreasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial n_2} < 0$ if group 1 is discriminated;
- increasing p_{c2} leads to increasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial p_{c2}} > 0$ if group 1 is preferred;
- increasing p_{c2} leads to decreasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial p_{c2}} < 0$ if group 1 is discriminated;
- increasing γ_2 leads to increasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial \gamma_2} > 0$ if group 1 is preferred;
- increasing γ_2 leads to decreasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial \gamma_2} < 0$ if group 1 is discriminated;
- increasing v leads to increasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial v} > 0$;
- increasing I_C^P leads to increasing $\mathrm{e}^*_{\mathrm{C1E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C1E}}}{\partial I_C^P} > 0$;

The optimal effort in competition for a category C agent in group 2 is driven as follows:

- increasing n_2 leads to decreasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial n_2} < 0$ if group 2 being preferred, if group 2 is only slightly discriminated this relation applies as well;
- increasing p_{c2} leads to decreasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial p_{c2}} < 0$ if group 2 is preferred, if group 2 is only slightly discriminated this relation applies as well;
- increasing γ_2 leads to decreasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial \gamma_2} < 0$ if group 2 is preferred, if group 2 is only slightly discriminated this relation applies as well;
- increasing n_1 leads to increasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial n_1} > 0$ if group 2 is preferred;
- increasing n_1 leads to decreasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial n_1} < 0$ if group 2 is discriminated;
- increasing p_{c1} leads to increasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial p_{c1}} > 0$ if group 2 is preferred;
- increasing p_{c1} leads to decreasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial p_{c1}} < 0$ if group 2 is discriminated;
- increasing γ_1 leads to increasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial \gamma_1} > 0$ if group 2 is preferred;
- increasing γ_1 leads to decreasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial \gamma_1} < 0$ if group 2 is discriminated;
- increasing v leads to increasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial v} > 0$;
- increasing I_C^P leads to increasing $\mathrm{e}^*_{\mathrm{C2E}}$ since $\frac{\partial \mathrm{e}^*_{\mathrm{C2E}}}{\partial I_C^P} > 0$;

A6 Optimal Choice of Activities and Proof of Propositions 6 and 7

A category C agent in group 1 is indifferent about competing or working to rule if the following condition is met:

$$U_{C1E} = U_{C1W}$$

$$\frac{\sum e_{C1E}}{\sum e_{C1E}+\sum e_{C2E}}\frac{e_{C1E}}{\sum e_{C1E}}(v + I_C^P)-(1+\varepsilon)e_{C1E} - [n_1(1-\gamma_1)+n_2(1-\gamma_2)]I_C^O = w-e_{C1W} + I_C^A - [n_1(1-\gamma_1)+n_2(1-\gamma_2)]I_C^O \quad (2.14)$$

$$\frac{\sum e_{C1E}}{\sum e_{C1E}+\sum e_{C2E}}\frac{e_{C1E}}{\sum e_{C1E}}(v + I_C^P)-(1+\varepsilon)e_{C1E} = w-e_{C1W} + I_C^A \quad (2.14.1)$$

$$\frac{e_{C1E}}{\sum e_{C1E}+\sum e_{C2E}}(v + I_C^P)-(1+\varepsilon)e_{C1E} = w-e_{C1W} + I_C^A \quad (2.14.2)$$

$$\frac{e_{C1E}}{n_1\gamma_1 p_{c1} e_{C1E}+n_2\gamma_2 p_{c2} e_{C2E}}(v + I_C^P)-(1+\varepsilon)e_{C1E} = w-e_{C1W} + I_C^A \quad (2.14.3)$$

Using optimal efforts e_{C1E}^*, e_{C2E}^*, e_{C1W}^* and solving equation (2.14.3) for p_{c1} yields the following result:

$$p_{c1} = \frac{[1-2\varepsilon n_2\gamma_2 p_{c2}+\varepsilon]\sqrt{v+I_C^P}}{(1+\varepsilon)n_1\gamma_1\sqrt{w+I_C^A}} - \frac{(1-\varepsilon)n_2\gamma_2 p_{c2}}{(1+\varepsilon)n_1\gamma_1} \quad (2.15)$$

Obviously this decision depends on the category C agents in group 2, hence the following condition must be met as well:

$$U_{C2E} = U_{C2W}$$

$$\frac{\sum e_{C2E}}{\sum e_{C1E}+\sum e_{C2E}}\frac{e_{C2E}}{\sum e_{C2E}}(v + I_C^P)-(1-\varepsilon)e_{C2E} - [n_1(1-\gamma_1)+n_2(1-\gamma_2)]I_C^O = w-e_{C2W} + I_C^A - [n_1(1-\gamma_1)+n_2(1-\gamma_2)]I_C^O \quad (2.16)$$

$$\frac{\sum e_{C2E}}{\sum e_{C1E}+\sum e_{C2E}}\frac{e_{C2E}}{\sum e_{C2E}}(v + I_C^P)-(1-\varepsilon)e_{C2E} = w-e_{C2W} + I_C^A \quad (2.16.1)$$

$$\frac{e_{C2E}}{\sum e_{C1E}+\sum e_{C2E}}(v + I_C^P)-(1-\varepsilon)e_{C2E} = w-e_{C2W} + I_C^A \quad (2.16.2)$$

$$\frac{e_{C2E}}{n_1\gamma_1 p_{c1} e_{C1E}+n_2\gamma_2 p_{c2} e_{C2E}}(v + I_C^P)-(1-\varepsilon)e_{C2E} = w-e_{C2W} + I_C^A \quad (2.16.3)$$

Using optimal efforts e^*_{C1E}, e^*_{C2E}, e^*_{C1W} and solving equation (2.16.3) for p_{c2} leads to the following result:

$$p_{c2} = \frac{[1+2\varepsilon n_1\gamma_1 p_{c1}-\varepsilon]\sqrt{v+I_C^P}}{(1-\varepsilon)n_2\gamma_2\sqrt{w+I_C^A}} - \frac{(1+\varepsilon)n_1\gamma_1 p_{c1}}{(1-\varepsilon)n_2\gamma_2} \tag{2.17}$$

Before finally solving p_{c1} and p_{c2} it must first be determined whether the principal is intending to distort the contest or not.

Analysis in the case of distortion (i.e. $\varepsilon \neq 0$):

$$p_{c1} = \frac{[1-2\varepsilon n_2\gamma_2 p_{c2}+\varepsilon]\sqrt{v+I_C^P}}{(1+\varepsilon)n_1\gamma_1\sqrt{w+I_C^A}} - \frac{(1-\varepsilon)n_2\gamma_2 p_{c2}}{(1+\varepsilon)n_1\gamma_1} \tag{2.15}$$

Using (2.17) as p_{c2} and solving for p_{c1} yields after simplification

$$p_{c1} = -\frac{(1-\varepsilon)}{2\varepsilon n_1\gamma_1} \tag{2.15.1}$$

Using (2.15.1) for (2.17) and solving for p_{c2} yields after simplification

$$p_{c2} = \frac{(1+\varepsilon)}{2\varepsilon n_2\gamma_2} \tag{2.17.1}$$

The conclusion from (2.15.1) and (2.17.1) is that with any given $\varepsilon \neq 0$, career-oriented agents of the two groups will not enter into competition simultaneously, i.e. either $p_{c1} = 0$ and $0 \leq p_{c2} \leq 1$ or vice versa.

If $p_{c1} = 0$ than p_{c2} can be calculated from (2.17) as follows

$$p_{c2} = \frac{\sqrt{v+I_C^P}}{n_2\gamma_2\sqrt{w+I_C^A}} \tag{2.17.2}$$

The condition that $0 \leq p_{c2} \leq 1$ is met if:

a) $\sqrt{\mathrm{v} + \mathrm{I}_\mathrm{C}^\mathrm{P}} > 0$, always true;

b) $n_2\gamma_2\sqrt{\mathrm{w}+\mathrm{I}_\mathrm{C}^\mathrm{A}} > 0$, always true;

c) $\sqrt{\mathrm{v}+\mathrm{I}_\mathrm{C}^\mathrm{P}} < n_2\gamma_2\sqrt{\mathrm{w}+\mathrm{I}_\mathrm{C}^\mathrm{A}}$, whenever enough agents belong to category C in group 2;

The optimal activity choice for an agent in category C of group 2 is driven as follows:

- increasing v leads to increasing p_{c2} since $\frac{\partial p_{c2}}{\partial v} > 0$;
- increasing I_C^P leads to increasing p_{c2} since $\frac{\partial p_{c2}}{\partial I_C^P} > 0$;
- increasing n_2 leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial n_2} < 0$;
- increasing γ_2 leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial \gamma_2} < 0$;
- increasing w leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial w} < 0$;
- increasing I_C^A leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial I_C^A} < 0$;

If $p_{c2} = 0$ than p_{c1} can be calculated from (2.15) as follows

$$p_{c1} = \frac{\sqrt{v+I_C^P}}{n_1\gamma_1\sqrt{w+I_C^A}} \tag{2.15.2}$$

The condition that $0 \leq p_{c1} \leq 1$ is met if:

a) $\sqrt{\mathrm{v}+\mathrm{I}_\mathrm{C}^\mathrm{P}} > 0$, always true;

b) $n_1\gamma_2\sqrt{\mathrm{w}+\mathrm{I}_\mathrm{C}^\mathrm{A}} > 0$, always true;

c) $\sqrt{\mathrm{v}+\mathrm{I}_\mathrm{C}^\mathrm{P}} < n_1\gamma_1\sqrt{\mathrm{w}+\mathrm{I}_\mathrm{C}^\mathrm{A}}$, whenever a sufficient number of agents belong to category C in group 1;

The optimal activity choice for an agent in category C of group 1 is driven as follows:

- increasing v leads to increasing p_{c1} since $\frac{\partial p_{c1}}{\partial v} > 0$;
- increasing I_C^P leads to increasing p_{c1} since $\frac{\partial p_{c1}}{\partial I_C^P} > 0$;
- increasing n_1 leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial n_2} < 0$;
- increasing γ_1 leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial \gamma_2} < 0$;
- increasing w leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial w} < 0$;
- increasing I_C^A leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial I_C^A} < 0$;

Analysis in the case of no distortion (i.e. $\varepsilon = 0$):

If the principal decides not to manipulate the competition, equations (2.15) and (2.17) will be as follows

$$p_{c1} = \frac{\sqrt{v+I_C^P}}{n_1\gamma_1\sqrt{w+I_C^A}} - \frac{n_2\gamma_2 p_{c2}}{n_1\gamma_1} \tag{2.15.3}$$

$$p_{c2} = \frac{\sqrt{v+I_C^P}}{n_2\gamma_2\sqrt{w+I_C^A}} - \frac{n_1\gamma_1 p_{c1}}{n_2\gamma_2} \tag{2.17.3}$$

Using (2.15.3) in (2.17.3) leads to the result that $p_{c2} = p_{c2}$ which means that there is no unique equilibrium, the equilibrium relation between p_{c1} and p_{c2} is rather represented by an equilibrium condition. The equilibrium function can easily be derived from (2.15.3) and is as follows

$$n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} = \frac{\sqrt{v+I_C^P}}{\sqrt{w+I_C^A}} \tag{2.18}$$

From (2.15.3) and (2.17.3) it can be followed that if $0 \leq p_{c1} \leq 1$ it is also possible that $0 \leq p_{c2} \leq 1$ and vice versa.

The optimal activity choice for a category C agent in group 1 is driven as follows:

- increasing v leads to increasing p_{c1} since $\frac{\partial p_{c1}}{\partial v} > 0$;
- increasing I_C^P leads to increasing p_{c1} since $\frac{\partial p_{c1}}{\partial I_C^P} > 0$;
- increasing n_2 leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial n_2} < 0$;
- increasing γ_2 leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial \gamma_2} < 0$;
- increasing p_{c2} leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial p_{c2}} < 0$;
- increasing n_1 leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial n_1} < 0$, only if $n_2\gamma_2 p_{c2} < \frac{\sqrt{v+I_C^P}}{\sqrt{w+I_C^A}}$, otherwise increasing n_1 leads to increasing p_{c1};
- increasing γ_1 leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial \gamma_1} < 0$, only if $n_2\gamma_2 p_{c2} < \frac{\sqrt{v+I_C^P}}{\sqrt{w+I_C^A}}$, otherwise increasing γ_1 leads to increasing p_{c1};

- increasing w leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial w} < 0$;
- increasing I_C^A leads to decreasing p_{c1} since $\frac{\partial p_{c1}}{\partial I_C^A} < 0$;

The optimal activity choice for a category C agent in group 2 is driven as follows:

- increasing v leads to increasing p_{c2} since $\frac{\partial p_{c2}}{\partial v} > 0$;
- increasing I_C^P *leads* to increasing p_{c2} since $\frac{\partial p_{c2}}{\partial I_C^P} > 0$;
- increasing n_1 leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial n_1} < 0$;
- increasing γ_1 leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial \gamma_1} < 0$;
- increasing p_{c1} leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial p_{c1}} < 0$;
- increasing n_2 leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial n_2} < 0$, only if $n_1\gamma_1 p_{c1} < \frac{\sqrt{v+I_C^P}}{\sqrt{w+I_C^A}}$,

  otherwise increasing n_2 leads to increasing p_{c2};
- increasing γ_2 leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial \gamma_2} < 0$, only if $n_1\gamma_1 p_{c1} < \frac{\sqrt{v+I_C^P}}{\sqrt{w+I_C^A}}$,

  otherwise increasing γ_2 leads to increasing $p_{p_{c2}}$;
- increasing w leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial w} < 0$;
- increasing I_C^A leads to decreasing p_{c2} since $\frac{\partial p_{c2}}{\partial I_C^A} < 0$;

Finally it must be analyzed how the utility of a careerist in one group is influenced by the careerists in the other group if there is no distortion.

$$U_{C2E} = \frac{\sum e_{C2E}}{\sum e_{C1E} + \sum e_{C2E}} \frac{e_{C2E}}{\sum e_{C2E}} (v + I_C^P) - (1-\varepsilon) e_{C2E} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)] I_C^O$$
$$U_{C2E} = \frac{e_{C2E}}{\sum e_{C1E} + \sum e_{C2E}} (v + I_C^P) - e_{C2E} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)] I_C^O$$
$$U_{C2E} = \frac{e_{C2E}}{n_1\gamma_1 p_{c1} e_{C1E} + n_2\gamma_2 p_{c2} e_{C2E}} (v + I_C^P) - e_{C2E} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)] I_C^O$$

Using optimal efforts e_{C1E}^*, e_{C2E}^* and p_{c2} in connection with $p_{c1} = 0$ yields the following result:

$$U_{C2E} = \mathrm{w} + \mathrm{I_C^A} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)] I_C^O \quad (2.19)$$

Using optimal efforts e_{C1E}^*, e_{C2E}^* and p_{c2} in connection with $p_{c1} = 1$ yields the following result:

$$U_{C2E} = \mathrm{w} + \mathrm{I_C^A} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)] I_C^O \quad (2.19)$$

Using optimal efforts e^*_{C1E}, e^*_{C2E} and p_{c2} in connection with $p_{c1} = a$ $(0 \leq \mathrm{a} \leq 1)$ yields the following result:

$$U_{C2E} = \mathrm{w} + \mathrm{I}^{\mathrm{A}}_{\mathrm{C}} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)]I^o_C \tag{2.19}$$

A7 Optimal Choice of Social Category and Proof of Proposition 8

As already stated in chapter 3.3.4.4, a group 1 agent is indifferent as regards being a careerist or preferring routine if the following condition is met:

$$U_{C1} = U_{R1}$$

$$p_{c1}\left\{\frac{\sum e_{C1E}}{\sum e_{C1E}+\sum e_{C2E}}\frac{e_{C1E}}{\sum e_{C1E}}(v+I^P_C) - (1+\varepsilon)e_{C1E} - [n_1(1-\gamma_1)+n_2(1-\gamma_2)]I^o_C\right\} +$$
$$(1-p_{c1})\{w - e_{C1W} + I^A_C - [n_1(1-\gamma_1)+n_2(1-\gamma_2)]I^o_C\} = w - e_{R1W} + I^A_R - [n_1\gamma_1 + n_2\gamma_2]I^o_R \tag{2.20}$$

Since this decision is dependent on the agents in the other group, the following condition must also be met:

$$U_{C2} = U_{R2}$$

$$p_{c2}\left\{\frac{\sum e_{C2E}}{\sum e_{C1E}+\sum e_{C2E}}\frac{e_{C2E}}{\sum e_{C2E}}(v+I^P_C) - (1-\varepsilon)e_{C2E} - [n_1(1-\gamma_1)+n_2(1-\gamma_2)]I^o_C\right\} +$$
$$(1-p_{c2})\{w - e_{C2W} + I^A_C - [n_1(1-\gamma_1)+n_2(1-\gamma_2)]I^o_C\} = w - e_{R2W} + I^A_R - [n_1\gamma_1 + n_2\gamma_2]I^o_R \tag{2.21}$$

The proof of proposition 8 will first proceed with the analysis in the case of contest distortion (i.e. $\varepsilon \neq 0$).

Since contest manipulation causes career-oriented agents in the disadvantaged group to refrain from entering into competition, it is either true that $0 \leq p_{c1} \leq 1$ and $p_{c2} = 0$ or vice versa. The proof of proposition 8 is conducted assuming that $\varepsilon > 0$ and therefore $p_{c1} = 0$ and $0 \leq p_{c1} \leq 1$.

Applying this assumption to (2.20) results in

$$w - e_{C1W} + I^A_C - [n_1(1-\gamma_1)+n_2(1-\gamma_2)]I^o_C = w - e_{R1W} + I^A_R - [n_1\gamma_1 + n_2\gamma_2]I^o_R \tag{2.20.1}$$

Simplification and solving for γ_1 yields

$$\gamma_1 = \frac{I_R^A - I_C^A + (n_1+n_2)I_C^o - n_2\gamma_2(I_C^o + I_R^o)}{n_1(I_C^o+I_R^o)} \tag{2.22}$$

Applying this assumption to (2.21) results in

$$p_{c2}\left\{\frac{1}{n_2\gamma_2\, p_{c2}}(v + I_C^P) - (1-\varepsilon)e_{C2E} - [n_1(1-\gamma_1) + n_2(1-\gamma_2)]I_C^o\right\} + (1-p_{c2})\{w - e_{C2W} + I_C^A - [n_1(1-\gamma_1) + n_2(1-\gamma_2)]I_C^o\} = w - e_{R2W} + I_R^A - [n_1\gamma_1 + n_2\gamma_2]I_R^o \tag{2.21.1}$$

Using now $p_{c2} = \frac{\sqrt{v+I_C^P}}{n_2\gamma_2\sqrt{w+I_C^A}}$ together with optimal efforts $e_{C2E}^*, e_{C2W}^*, e_{R2W}^*$ and solving equation (2.21.1) for γ_2 yields:

$$\gamma_2 = \frac{I_R^A - I_C^A + (n_1+n_2)I_C^o - n_1\gamma_1(I_C^o + I_R^o)}{n_2(I_C^o+I_R^o)} \tag{2.23}$$

The same results apply in the case of no contest manipulation (i.e. $\varepsilon \neq 0$) by setting $p_{c2} = \frac{\sqrt{v+I_C^P}}{n_2\gamma_2\sqrt{w+I_C^A}} - \frac{n_1\gamma_1 p_{c1}}{n_2\gamma_2}$ (as stated in equation 2.17.3 above) and substituting $p_{c1} = a$ with $0 \leq a \leq 1$.

Using (2.22) in (2.23) leads to the result that $\gamma_2 = \gamma_2$ which means that there is no unique equilibrium. The equilibrium condition can easily be derived from (2.21) and is as follows:

$$n_1\gamma_1(I_C^o + I_R^o) + n_2\gamma_2(I_C^o + I_R^o) = I_R^A - I_C^A + (n_1+n_2)I_C^o \tag{2.24}$$

From (2.22) and (2.23) it can be followed that if $0 \leq \gamma_1 \leq 1$ it is also possible that $0 \leq \gamma_2 \leq 1$ and vice versa.

The optimal choice for a social category in group 1 is driven as follows:

- increasing I_R^A leads to increasing γ_1 since $\frac{\partial\gamma_1}{\partial I_R^A} > 0$;
- increasing I_C^A leads to decreasing γ_1 since $\frac{\partial\gamma_1}{\partial I_C^A} < 0$;
- increasing I_C^o leads to increasing γ_1 since $\frac{\partial\gamma_1}{\partial I_C^o} > 0$ if $I_C^A > I_R^A$;
- increasing I_R^o leads to decreasing γ_1 since $\frac{\partial\gamma_1}{\partial I_R^o} < 0$ as long as $0 \leq \gamma_1 \leq 1$;
- increasing n_1 leads to decreasing γ_1 since $\frac{\partial\gamma_1}{\partial n_1} < 0$ as long as $I_C^A - I_R^A \leq n_2 I_C^o - n_2\gamma_2(I_C^o + I_R^o)$;

- increasing n_2 leads to decreasing γ_1 since $\frac{\partial \gamma_1}{\partial n_2} < 0$ as long as $(1-\gamma_2)I_C^o \leq \gamma_2 I_R^o$;
- increasing γ_2 leads to decreasing γ_1 since $\frac{\partial \gamma_1}{\partial \gamma_2} < 0$;

The optimal choice for a social category in group 2 is driven as follows:

- increasing I_R^A leads to increasing γ_2 since $\frac{\partial \gamma_2}{\partial I_R^A} > 0$;
- increasing I_C^A leads to decreasing γ_2 since $\frac{\partial \gamma_2}{\partial I_C^A} < 0$;
- increasing I_C^o leads to increasing γ_2 since $\frac{\partial \gamma_2}{\partial I_C^o} > 0$ if $I_C^A > I_R^A$;
- increasing I_R^o leads to decreasing γ_2 since $\frac{\partial \gamma_2}{\partial I_R^o} < 0$ as long as $0 \leq \gamma_2 \leq 1$;
- increasing n_2 leads to decreasing γ_2 since $\frac{\partial \gamma_2}{\partial n_2} < 0$ as long as $I_C^A - I_R^A \leq n_1 I_C^o - n_1\gamma_1(I_C^o + I_R^o)$;
- increasing n_2 leads to decreasing γ_2 since $\frac{\partial \gamma_2}{\partial n_2} < 0$ as long as $(1-\gamma_1)I_C^o \leq \gamma_1 I_R^o$;
- increasing γ_1 leads to decreasing γ_2 since $\frac{\partial \gamma_2}{\partial \gamma_2} < 0$;

In principle, the above-listed results are comparable to the basic model. Only in the case of variables that consider the number of agents (i.e. n, γ) is the decision for any of the categories additionally influenced by the perceived identity utilities of all affected agents in the other group.

Finally it must be analyzed how the utility of an agent in one group is influenced by the agents in the other group

The total utility of a group 2 agent is yielded by the following equation

$$U_{C2} = \frac{e_{C2E}}{\sum e_{C1E} + \sum e_{C2E}} p_{c2}(v + I_C^P) - (1-\varepsilon)p_{c2}e_{C2E} + w + I_C^A - [n_1(1-\gamma_1) + n_2(1-\gamma_2)]I_C^o - p_{c2}(w + I_C^A) \qquad (2.25)$$

Simplifying (2.25) with $\varepsilon \neq 0,\ p_{c1} = 0, 0 \leq p_{c2} \leq 1,\ \gamma_1 = 0$ and $0 \leq\ \gamma_2 \leq 1$ yields

$$U_{C2} = w + I_C^A - (n_1 + n_2)I_C^o - \left(\frac{I_R^A - I_C^A + (n_1 + n_2)I_C^o}{(I_C^o + I_R^o)}\right) I_C^o \qquad (2.25.1)$$

Simplifying (2.25) with $\varepsilon \neq 0,\ p_{c1} = 0, 0 \leq p_{c2} \leq 1,\ \gamma_1 = 1$ and $0 \leq\ \gamma_2 \leq 1$ yields

$$U_{C2} = w + I_C^A - n_2 I_C^o - \left(\frac{I_R^A - I_C^A + (n_1 + n_2)I_C^o - n_1(I_C^o + I_R^o)}{(I_C^o + I_R^o)}\right) I_C^o \qquad (2.25.2)$$

Simplifying (2.25) with $\varepsilon = 0, 0 \le p_{c1} \le 1, 0 \le p_{c2} \le 1,\ \gamma_1 = 0$ and $0 \le\ \gamma_2 \le 1$ yields

$$U_{C2} = w + I_C^A - (n_1 + n_2)I_C^o - \left(\frac{I_R^A - I_C^A + (n_1+n_2)I_C^o}{(I_C^o + I_R^o)}\right) I_C^o \tag{2.25.3}$$

Simplifying (2.25) with $\varepsilon = 0, 0 \le p_{c1} \le 1, 0 \le p_{c2} \le 1,\ \gamma_1 = 1$ and $0 \le\ \gamma_2 \le 1$ yields

$$U_{C2} = w + I_C^A - n_2 I_C^o - \left(\frac{I_R^A - I_C^A + (n_1+n_2)I_C^o - n_1(I_C^o + I_R^o)}{(I_C^o + I_R^o)}\right) I_C^o \tag{2.25.4}$$

The above listed variations of U_{C2} show clearly that an agent's utility in group 2 remains the same independently of the distortion factor and her decision to enter into competition (endogenous entry) but it differs with the decision of group 1 agents. The same applies to an agent in group 1.

A8 Proof of Proposition 9

To prove proposition 9, the principal's utilities must be compared whether distortion is selected or not.

The following equation describes the principal's utility in the case of no distortion (i.e. $\varepsilon = 0$)

$$U_{Pr} = \sqrt{n_1\gamma_1 p_{c1} e_{C1E} + n_2\gamma_2 p_{c2} e_{C2E}} - v - [n_1\gamma_1(1 - p_{c1}) + n_1(1 - \gamma_1) + n_2\gamma_2(1 - p_{c2}) + n_2(1 - \gamma_2)]w \tag{2.27}$$

The following equation describes the principal's utility in the case of distortion in favor of group 2 (i.e. $\varepsilon > 0$)

$$U_{Pr} = \sqrt{n_2\gamma_2 p_{c2} e_{C2E}} - v - [n_1\gamma_1 + n_1(1 - \gamma_1) + n_2\gamma_2(1 - p_{c2}) + n_2(1 - \gamma_2)]w \tag{2.28}$$

Proposition 9 describes the possibility of the utility in equation (2.28) exceeding the utility in equation (2.27) using the condition that the principal will not compensate an agent who works to rule (i.e. $w = 0$):

$$n_2\gamma_2 p_{c2} e_{C2E} > n_1\gamma_1 p_{c1} e_{C1E} + n_2\gamma_2 p_{c2} e_{C2E} \tag{2.28.1}$$

As already proven, the optimal effort of a competing agent in group 1 and 2 is defined as follows:

$$e^*_{C1E} = \frac{[n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} - 1][1 - 2\varepsilon n_2\gamma_2 p_{c2} + \varepsilon]}{[(1+\varepsilon)n_1\gamma_1 p_{c1} + (1-\varepsilon)n_2\gamma_2 p_{c2}]^2}(v + I_C^P) \quad (2.11)$$

$$e^*_{C2E} = \frac{[n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} - 1][1 + 2\varepsilon n_1\gamma_1 p_{c1} - \varepsilon]}{[(1+\varepsilon)n_1\gamma_1 p_{c1} + (1-\varepsilon)n_2\gamma_2 p_{c2}]^2}(v + I_C^P) \quad (2.12)$$

In the case of no distortion (i.e. $\varepsilon = 0$) equations (2.11) and (2.12) can be simplified to:

$$e^*_{C2E} = \frac{(n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} - 1)}{(n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2})^2}(v + I_C^P) \quad (2.12.2)$$

In the case of distortion in favor of group 2 (i.e. $\varepsilon > 0$) it can be inferred that $p_{c1} = 0$, so (2.12) can be simplified to:

$$e^*_{C2E} = \frac{(n_2\gamma_2 p_{c2} - 1)}{(1-\varepsilon)(n_2\gamma_2 p_{c2})^2}(v + I_C^P) \quad (2.12.2)$$

Applying these optimal effort levels to (2.28.1) produces the following inequality that is subject to the results derived from proposition 9:

$$n_2\gamma_2 p_{c2}\frac{(n_2\gamma_2 p_{c2} - 1)}{(1-\varepsilon)(n_2\gamma_2 p_{c2})^2} > n_1\gamma_1 p_{c1}\frac{(n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} - 1)}{(n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2})^2} + n_2\gamma_2 p_{c2}\frac{(n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2} - 1)}{(n_1\gamma_1 p_{c1} + n_2\gamma_2 p_{c2})^2} \quad (2.12.3)$$

$$\frac{(n_2\gamma_2 p^*_{c2} - 1)}{(1-\varepsilon)(n_2\gamma_2 p^*_{c2})} > \frac{(n_1\gamma_1 p_{c1} + n_2\gamma_2 p^{**}_{c2} - 1)}{(n_1\gamma_1 p_{c1} + n_2\gamma_2 p^{**}_{c2})} \quad (2.12.4)$$

Since the optimal choice of activity in the case of distortion (i.e. $p^*_{c2} = \frac{\sqrt{v + I_C^P}}{n_2\gamma_2\sqrt{w + I_C^A}}$) exceeds the optimal choice of activity in the case of no distortion (i.e. $p^{**}_{c2} = \frac{\sqrt{v + I_C^P}}{n_2\gamma_2\sqrt{w + I_C^A}} - \frac{n_1\gamma_1 p_{c1}}{n_2\gamma_2}$) inequality (2.12.4) can be fulfilled if either one of the following conditions is met:

- the number of competing agents in group 1 (i.e. $n_1\gamma_1 p_{c1}$) is significantly lower than the number of competing agents in group 2 (i.e. $n_2\gamma_2 p_{c2}$);
- if both groups are of similar size, the principal can fulfill the inequality by setting the distortion factor close to 1

B. Model variables

B1 Basic Model

n	- group size, number of agents
γ	- ratio of category C agents
$(1-\gamma)$	- ratio of category R agents
p_C	- ratio of category C agents engaging in competition
$(1-p_C)$	- ratio of category C agents working to rule
p_R	- ratio of category C agents engaging in competition
$(1-p_R)$	- ratio of category R agents working to rule
e_{CE}	- effort expended in competition by category C agent
e_{RE}	- effort expended in competition by category R agent
e_{CW}	- effort expended by category C agent who works to rule
e_{RW}	- effort expended by category R agent who works to rule
v	- extrinsic payoff when successful in competition
I_C^P	- intrinsic payoff when successful in competition
w	- extrinsic payoff when working to rule
I_C^A	- intrinsic payoff of category C agent when working to rule
I_R^A	- intrinsic payoff of category R agent when working to rule
I_C^o	- identity externality of category C agent when meeting category R agent
I_R^o	- identity externality of category R agent when meeting category C agent

B2 Extended Model

n_1	- size of group 1
n_2	- size of group 2
γ_1	- ratio of category C agents in group 1
γ_2	- ratio of category C agents in group 2
$(1-\gamma_1)$	- ratio of category R agents in group 1
$(1-\gamma_2)$	- ratio of category R agents in group 2
p_{C1}	- ratio of category C agents engaging in competition in group 1
p_{C2}	- ratio of category C agents engaging in competition in group 2
$(1-p_{C1})$	- ratio of category C agents working to rule in group 1
$(1-p_{C2})$	- ratio of category C agents working to rule in group 2
p_{R1}	- ratio of category C agents engaging in competition in group 1
p_{R2}	- ratio of category C agents engaging in competition in group 2
$(1-p_{R1})$	- ratio of category R agents working to rule in group 1

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$(1-p_{R2})$	- ratio of category R agents working to rule in group 2
e_{C1E}	- effort expended in competition by category C agent in group 1
e_{C2E}	- effort expended in competition by category C agent in group 2
e_{R1E}	- effort expended in competition by category R agent in group 1
e_{R2E}	- effort expended in competition by category R agent in group 2
e_{C1W}	- effort expended by category C agent who works to rule in group 1
e_{C2W}	- effort expended by category C agent who works to rule in group 2
e_{R1W}	- effort expended by category R agent who works to rule in group 1
e_{R2W}	- effort expended by category R agent who works to rule in group 2
v	- extrinsic payoff when successful in competition
I_C^P	- intrinsic payoff when successful in competition
w	- extrinsic payoff when working to rule
I_C^A	- intrinsic payoff of category C agent when working to rule
I_R^A	- intrinsic payoff of category R agent when working to rule
I_C^o	- identity externality of category C agent when meeting category R agent
I_R^o	- identity externality of category R agent when meeting category C agent

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