Tigers and Flies: Expertise and Discretion in an Anti-corruption Campaign

(Preliminary Results)

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习近平：要坚持“老虎”、“苍蝇”一起打。

Xi, Jinping: We must crack down on both “tigers” and “flies”.

The Chinese anti-corruption campaign, starting in 2012, has many features, including an austerity campaign, a public-relations campaign, as well as an actual anti-corruption campaign. The austerity campaign restricts the use of the public funds for food, drink, gifts and entertainment. The public-relation campaign restricts self-promoting announcements and ostentatious behaviors. For instance, there should not be a welcoming banner, red carpet, floral arrangement, or a grand reception celebrating official visits. Also, public servants are not allowed to borrow the government’s vehicle for visiting relatives or going on holiday.

We are going to focus on the true anti-corruption campaign.

Main results

- Fighting the flies without fighting the tigers reduces welfare. If the tigers are very corrupt, reducing flies' corruption helps the tigers to implement their corruption.
- Strict rules and fighting corruption are substitutes. To take full advantage of the aligned incentives, a reduction of corruption should be accompanied by more discretion.
- Fighting corruption and enhancing expertise are complements. If corruption is high, it makes sense to constrain flies a lot, which neutralizes expertise. With low corruption and high expertise, the economy can flourish. Fighting corruption may start the path from a bureaucracy with strict rules to a technocracy with aligned incentives and more expertise.

Three economic agents in the model: Society

- Social preferences are given by the social welfare function

$$W^S(X;S) = E[-(X-S)^2] - C_T(\gamma_T) - C_F(\gamma_F) - C_n(\sigma_n)$$

- X is the choice that comes out of the process, and S represents the society's ideal choice, follows $N(0, \sigma_S^2)$;
- $\gamma_T > 0$ represents the level of corruption opportunities for the tiger;
- $\gamma_F > 0$ represents the level of corruption opportunities for the fly;
- $\sigma_n > 0$ represents the level of noise in the fly's signal;
- $C_T(\gamma_T)$ and $C_F(\gamma_F)$ denote the costs paid by society to reduce the corruption of tigers and flies;
- $C_n(\sigma_n)$ denote the costs paid by society to reduce the noise and increase fly's expertise.

Three economic agents in the model: Tiger

- The tiger's utility is

$$\begin{aligned} U^T(X; S, \zeta_T) &= k_T E[-(X-S)^2 + 2\zeta_T(X-S)] \\ &= k_T[\gamma_T^2 + E(-(X-T)^2)] \end{aligned}$$

  where $T \equiv S + \zeta_T$;
- $\zeta_T \sim N(0, \gamma_T^2)$, drawn independently of S;
- $2\zeta_T(X-S)$ are the corrupt rents extracted by the tiger;
- We take $k_T = 1$, which is without loss of generality.

Three economic agents in the model: Fly

- The fly's utility is

$$U^F(X;T,\zeta_F) = k_F E[-(X-T)^2 + 2\zeta_F(X-T)]$$

- Recall $T \equiv S + \zeta_T$ is the tiger's ideal choice.
- $\zeta_F \sim N(0, \gamma_F^2)$, drawn independently of S and ζ_T;
- $2\zeta_F(X-T)$ are the corrupt rents extracted by the fly;
- We take $k_F = 1$, which is without loss of generality;
- The tiger knows the joint distribution of S, ζ_T, ζ_F and fly's information I, but does not know the realizations.
- The fly knows ζ_F but does not know S or ζ_T. However, the fly knows some information I which is a noisy signal of $T = S + \zeta_T$.

Information, Expertise, Tiger's ideal choice T, Fly's ideal choice F given I and ζ_F

- The fly's information about T is

$$I = T + \varepsilon_n$$

- $\varepsilon_n \sim N(0, \sigma_n^2)$ drawn mutually independently of S, ζ_T, and ζ_F.
- The tiger's ideal choice T can be decomposed as

$$T = \beta^I I + \eta_I$$

where $\beta^I \equiv \sigma_T^2/(\sigma_T^2 + \sigma_n^2)$ and $\beta^I I = E[T|I]$.

- The fly's ideal choice F given I and ζ_F is

$$F = \beta^I I + \zeta_F$$

- We think of smaller σ_n as corresponding to more expertise.

Choice problems for the tiger and the fly

The fly chooses X and the tiger decides (through $\underline{X}$ and $\bar{X}$) how much discretion the fly has. Formally:

- Although this is an agency setting, we think the tiger cannot design a full incentive contract as in Ross [1973] or Holmstrom [1979]. However, we follow Ross's approach of looking at the optimization from the principal's perspective subject to an incentive compatibility constraint.
- The tiger chooses $\underline{X}$, $\bar{X}$, and the fly chooses $X(I, \zeta_F)$ to maximize

$$E[-(X(I,\zeta_F) - S)^2 + 2\zeta_T(X(I,\zeta_F) - S)]$$

  subject to the fly wanting to follow tiger's plan, i.e. $X(I, \zeta_F)$ solves the fly's choice problem.
- The fly chooses $X(I, \zeta_F)$ to maximize

$$E[-(X(I,\zeta_F) - T)^2 + 2\zeta_F(X(I,\zeta_F) - T)]$$

  s.t. $\underline{X} \leq X(I, \zeta_F) \leq \bar{X}$. $\left[\text{Solution: } X = proj(F, [\underline{X}, \bar{X}]) = min(\bar{X}, max(\underline{X}, F))\right]$

Solution

- Alignment of preferences between the tiger and the fly

$$T = \beta^T F + \eta_T$$

- $0 \leq \beta^T \equiv \beta^I \sigma_T^2 / \sigma_F^2 = \frac{\beta^I(\sigma_S^2+\gamma_T^2)}{\beta^I(\sigma_S^2+\gamma_T^2)+\gamma_F^2} = \frac{1}{1+\gamma_F^2/(\sigma_T^2\beta^I)} \leq 1,$
- $\eta_T \sim N(0, \sigma_T^2(1-\beta^I\beta^T))$.
- The tiger's optimal choice $\bar{X}$ $(= -\underline{X})$ is equal to $\sigma_F \bar{x}(\beta^T)$ where $\bar{x}(\beta^T)$ is the unique solution of

$$\beta^T = \bar{x}N(-\bar{x})/n(\bar{x}),$$

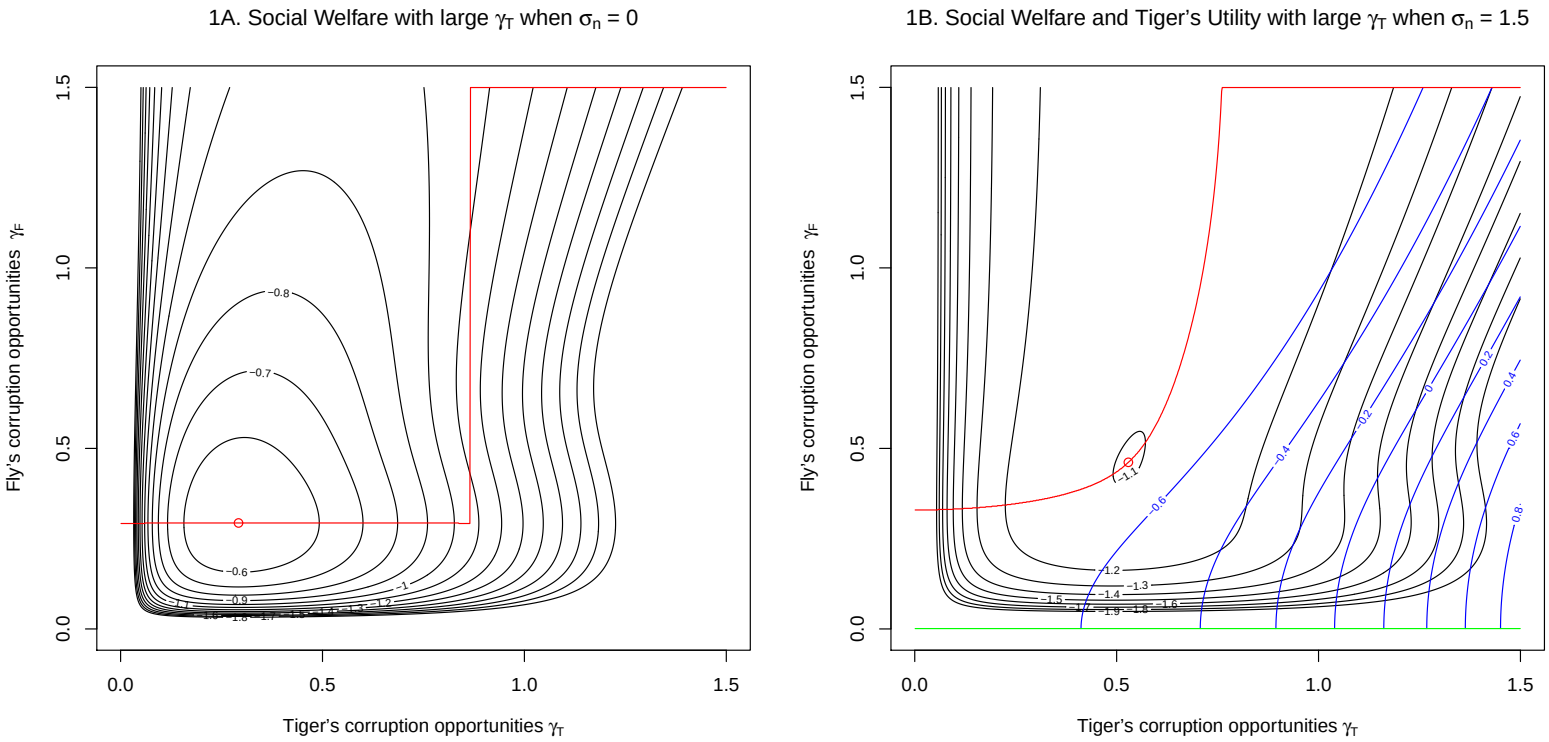
  $n(x) = \exp(-x^2/2)/\sqrt{2\pi}$ is the unit normal density function, and $N(x) = \int_{t=-\infty}^{x} n(t)dt$ is the unit normal CDF. The function $f(x) \equiv xN(-x)/n(x)$ is a monotonically increasing 1-1 function mapping $(0, \infty)$ onto $(0, 1)$.
- Most of the the proofs use the chain rule and properties of the normal distribution.

First Main Result: Both Tigers and Flies

- It would be relatively easy to conduct an anti-corruption campaign against only the flies, since the tigers are powerful and can fight back.
- Unfortunately, an anti-corruption campaign against only the flies tends to reduce social welfare when corruption is high.
- This is because when corruption is high, fighting corruption of only flies mostly benefits tigers in their corruption, which is bad for society.
- An anti-corruption campaign against both tigers and flies can do better.

side point: If tigers choose the severity of an anti-corruption program for the flies, they will make it more severe than is socially optimal, since they share more than proportionately in the benefits and less than proportionately in the costs.

Both Tigers and Flies: Social Welfare at large γ_T

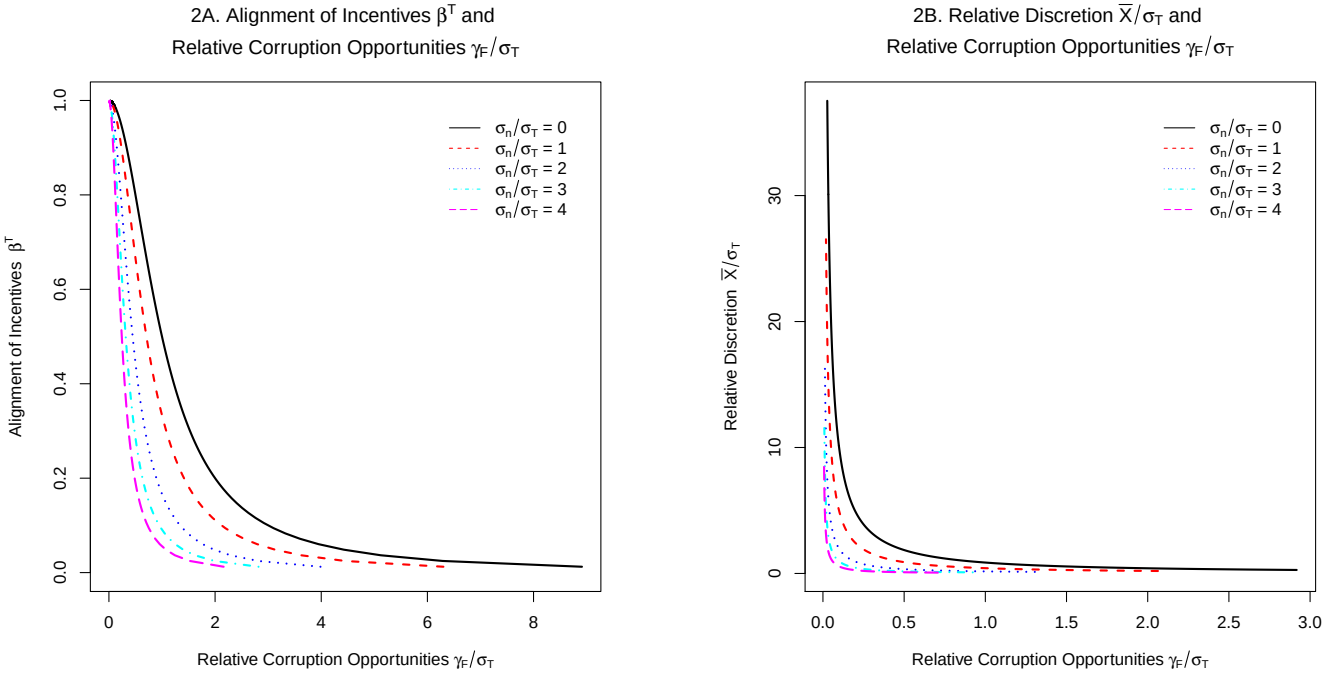


Figures 1A and 1B show that an anti-corruption campaign for only flies tends to reduce the social welfare when corruption is large. In addition, tigers would like to impose a more severe anti-corruption program on flies than is socially optimal.

Second Main Result: Anti-corruption and rigid rules are substitutes

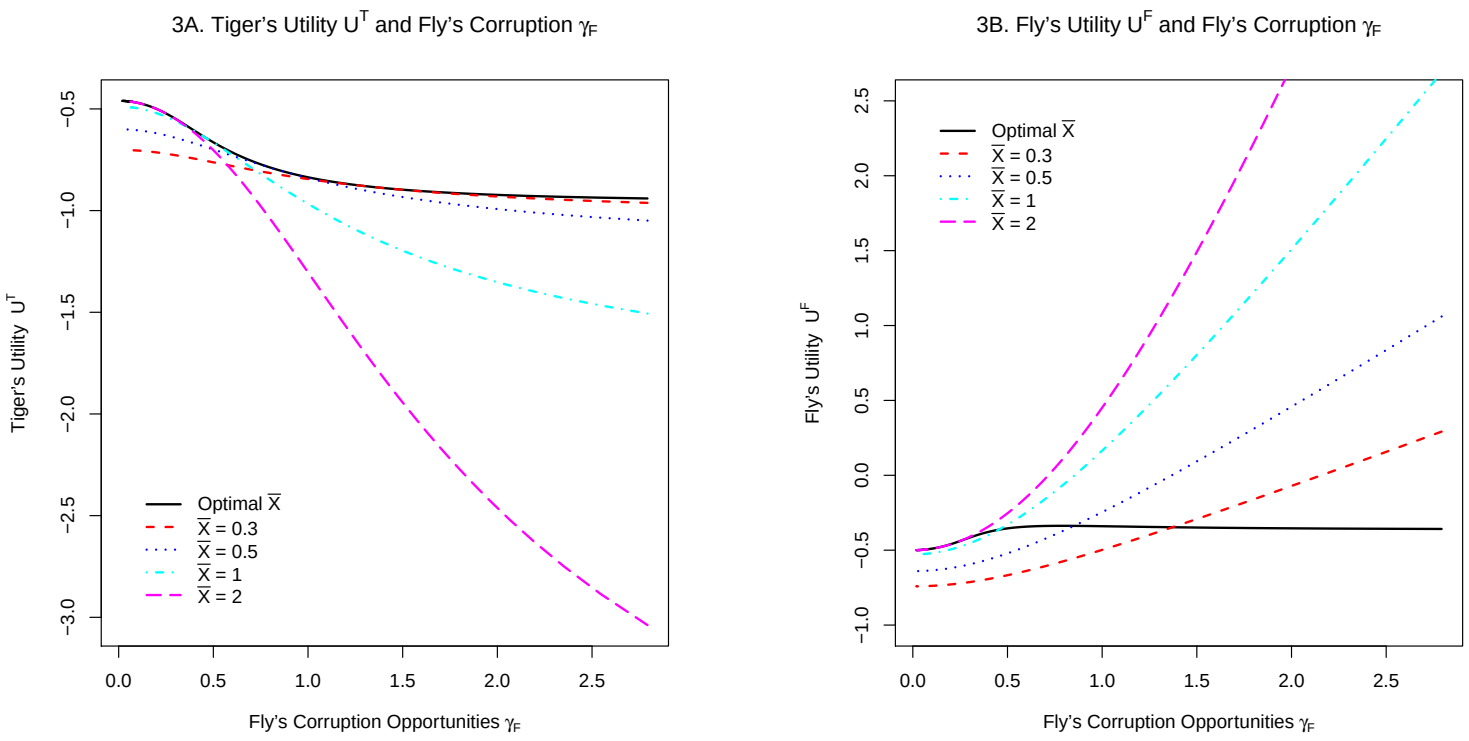
- It is probably tempting to reduce discretion as well as punish corruption in the time of a crackdown. However, this is probably not the right thing to do.
- It is easiest to discuss this from the Tiger's perspective, so for now we fix γ_T and discuss the consequences of reducing γ_F.
- The direct effect is that anti-corruption reform aligns the fly's incentives closer to the tiger's, inducing a choice closer to what the tiger wants given the same level of discretion $\bar{X}$.
- The indirect effect is that the tiger optimally takes advantage of the improved alignment of incentives by decentralizing more power and giving the fly more discretion, putting more of the decision in the hands of the agent with superior information by increasing $\bar{X}$.
- Stated another way, when the anti-corruption campaign is effective so that γ_F is very low, the tiger and the fly are in close agreement about what to do and the tiger will give the fly a lot of discretion by picking $\bar{X}$ very large.
- The results for society are similar, although if the tiger's corruption is high, the tiger may benefit from increasing discretion even though society does not.

Information and Discretion: β^T, $\bar{X}/\sigma_T$ and γ_F/σ_T



Figures 2A and 2B: Given σ_T^2, having more relative corruption opportunities (higher γ_F/σ_T) reduces the alignment (β^T) of the fly's and tiger's preferences (absent any constraint). γ_F/σ_T is the scale of profitability for the relative corruption and β^T is the regression coefficient of tiger's ideal point T on the fly's ideal point F. The tiger chooses the range of $[\underline{X}, \bar{X}]$ to constrain the fly's choices of X. Having more relative corruption opportunities (higher γ_F/σ_T) reduces the discretion given to the fly. The optimal interval is symmetric around 0, i.e. $\underline{X} = -\bar{X}$ in equilibrium and $\bar{X} > 0$. Larger $\bar{X}$ corresponds to larger discretion given to the fly. Therefore, the larger γ_F is, the worse the alignment between the tiger's and fly's incentives, and the smaller the discretion granted, i.e., the more the tiger constrains the fly.

Benefit of reducing flies' corruption: two channels

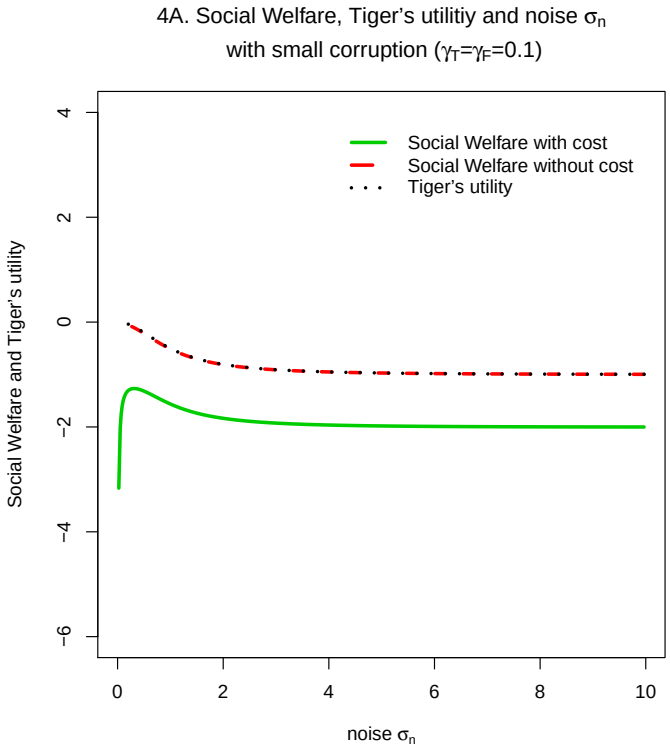


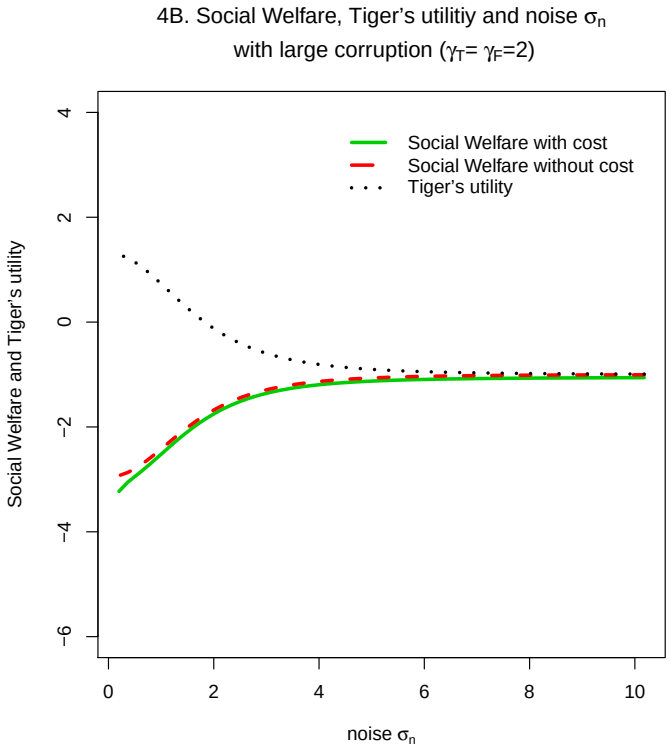
Return to Figure 2A: Given $\bar{X}$, the tiger is always better off if the corruption opportunities γ_F for the fly are reduced because this aligns their incentives better. The tiger can further exploit the improved alignment of incentives by giving the fly more discretion.

Third Main Result: Fighting corruption and enhancing expertise are complements.

- Again, it is useful to think about this from the perspective of the tiger.
- If corruption is high, $\bar{X}$ will be close to zero, and expertise will not matter much. Strict rules tend to neutralize expertise.
- If expertise is low, the benefit of discretion is small no matter how low corruption is, and corruption will not matter much. If expertise is low, both the direct and indirect benefits of reducing corruption are small.
- Conversely, if corruption is small and expertise is high, $\bar{X}$ will be chosen to be large and the expertise will have a big impact on the choice.
- The results for society are similar, but if the tiger's corruption is large enough both expertise and anti-corruption for flies may benefit the tiger but not society.

Expertise: Social welfare W^S, Tiger's utility U^T and noise σ_n





In Figure 4A, when corruption is small, training the flies (to reduce σ_n) helps society if the costs are not too high. In this case, the main difference between society's preference and that of tigers is the cost of training. In Figure 4B, when corruption is large, training that benefits the tigers hurts society because it helps the tigers to implement their corruption. In both cases, tigers prefer training the flies because they do not bear the cost and the flies are working for them.

Conclusion

- Fighting the flies without fighting the tigers reduces welfare. If the tigers are very corrupt, reducing flies' corruption helps the tigers to implement their corruption.
- Strict rules and fighting corruption are substitutes. To take full advantage of the aligned incentives, a reduction of corruption should be accompanied by more discretion.
- Fighting corruption and enhancing expertise are complements. If corruption is high, it makes sense to constrain flies a lot, which neutralizes expertise. With low corruption and high expertise, the economy can flourish.

Theorem 1

The anti-corruption campaign should crack down on both tigers and flies together to be effective. It is because when both the fly and the tiger are very corrupt, reducing the fly's corruption opportunities γ_F reduces the social welfare.

Theorem 2

The tiger always prefers a higher level of anti-corruption campaign for the flies than is socially optimal. In particular, given σ_S, γ_T and σ_n, the tigers want the flies to have no corruption ($\gamma_F = 0$), but society is better off with some positive level of corruption ($\gamma_F > 0$).

Theorem 3

Reducing the fly's corruption opportunities γ_F always makes the tiger better off because the reduction aligns the fly's incentives better with the tiger's. Reducing the fly's corruption opportunities γ_F also generates indirect benefits to the tiger because the tiger optimally gives the fly more discretion so that more decisions are made by the agent with superior information.

Theorem 4

Reducing the fly's corruption opportunities γ_F makes the fly worse off initially when γ_F is small and then better off when γ_F is big.

Theorem 5

Increasing the fly's expertise (through training that reduces σ_n), always makes the tiger better off because the expertise aligns the fly's incentives better with the tiger's. Increasing the fly's expertise also generates indirect benefits to the tiger because the tiger optimally gives the fly more discretion so that more decisions are made by the agent with superior information.

Theorem 6

The anti-corruption campaign should be accompanied by training flies to have more expertise. With low corruption and high expertise, the economy can flourish.