An Introduction to Other-Regarding Preferences With An Application to Contract Design

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Introduction

'The first principle of Economics is that every agent is actuated only by self-interest' F. Y. Edgeworth (1881)

'It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own self-interest. We address ourselves not to their humanity but to their self-love, and never talk to them of our own necessities, but of their advantages.' Adam Smith (1776)

Introduction

- **Self-regarding preferences:** Preferences are based on states concerning only oneself.
  - $U_i \rightarrow U_i\left(y_i\right)$
- **Other-regarding preferences:** Valuations are based in part on what occurs to others.
  - $U_i \rightarrow U_i\left(y_i, \vec{\mathbf{y}}_{-i}\right)$

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Experimental Games

- Ultimatum game $*$
- Dictator game
- Gift exchange game $*$
- Trust game

Ultimatum Game

The Ultimatum Game

A one-shot game between 2 players: A Proposer and a Responder. The Proposer is given an integer amount of tokens, x.

- Round 1: The Proposer must offer a share s of x to the Responder
- Round 2: The Responder decides whether to accept s or not.
  - If the Responder accepts then the Proposer gets $(1 - s)\,x$ and the Responder gets sx.
  - If the Responder doesn't accept they both get zero.

Ultimatum Game

What happens if both players have self-regarding preferences?

- Using backwards induction:
  - The Responder has \$0, therefore, he will accept any share.
  - The Proposer, knowing this, will offer the lowest share he can.

Thus the behavioral prediction for the Ultimatum Game is that the Responder will accept any offer made and the Proposer will offer the lowest amount he can.

Ultimatum Game

How do people actually behave?

- Mean offer is between 30% to 40%
  - Median offer is between 40% to 50%
- Rarely do Proposers offer unfair offers ($e.g. s = 0.1$)or overly generous offers ($s > 0.5$)
- Low offers are often rejected
  - Offers below 20% are rejected half the time

The predictions from self-regarding preferences are therefore not supported by the experimental evidence.

Gift-Exchange Game

Two players are each assigned one of two roles: Principal and Agent.

- The Principal makes a job offer, (w_b, e_n) to the Agent
  - w_b - wage
  - e_n - *non-binding* effort level
- The Agent either accepts or rejects the offer
  - If he accepts, he must choose an effort level e to expend
    - The Agent incurs a cost $c(e)$ by exerting an effort e

Gift-Exchange Game

What is the self-regarding prediction?

- The Agent will exert the minimum effort level e_{min}.
- Knowing this, the Principal will offer the lowest w he can.

Gift-Exchange Game

- The topic of how fairness concerns affect employment relationships was first broached in (Akerlof, 1982).
- He is motivated by (Homans, 1954), where a group of women were found to be exceeding the minimum work requirements by a considerable margin.
- Akerlof envisions this relationship as a "gift" exchange mediated by endogenous social norms.
    - The works offer a "gift" to the firm in the form of additional effort.
    - In exchange, the firm offers a "gift" in the form of a wage that is in excess of what they could receive in other jobs.

Gift-Exchange Game

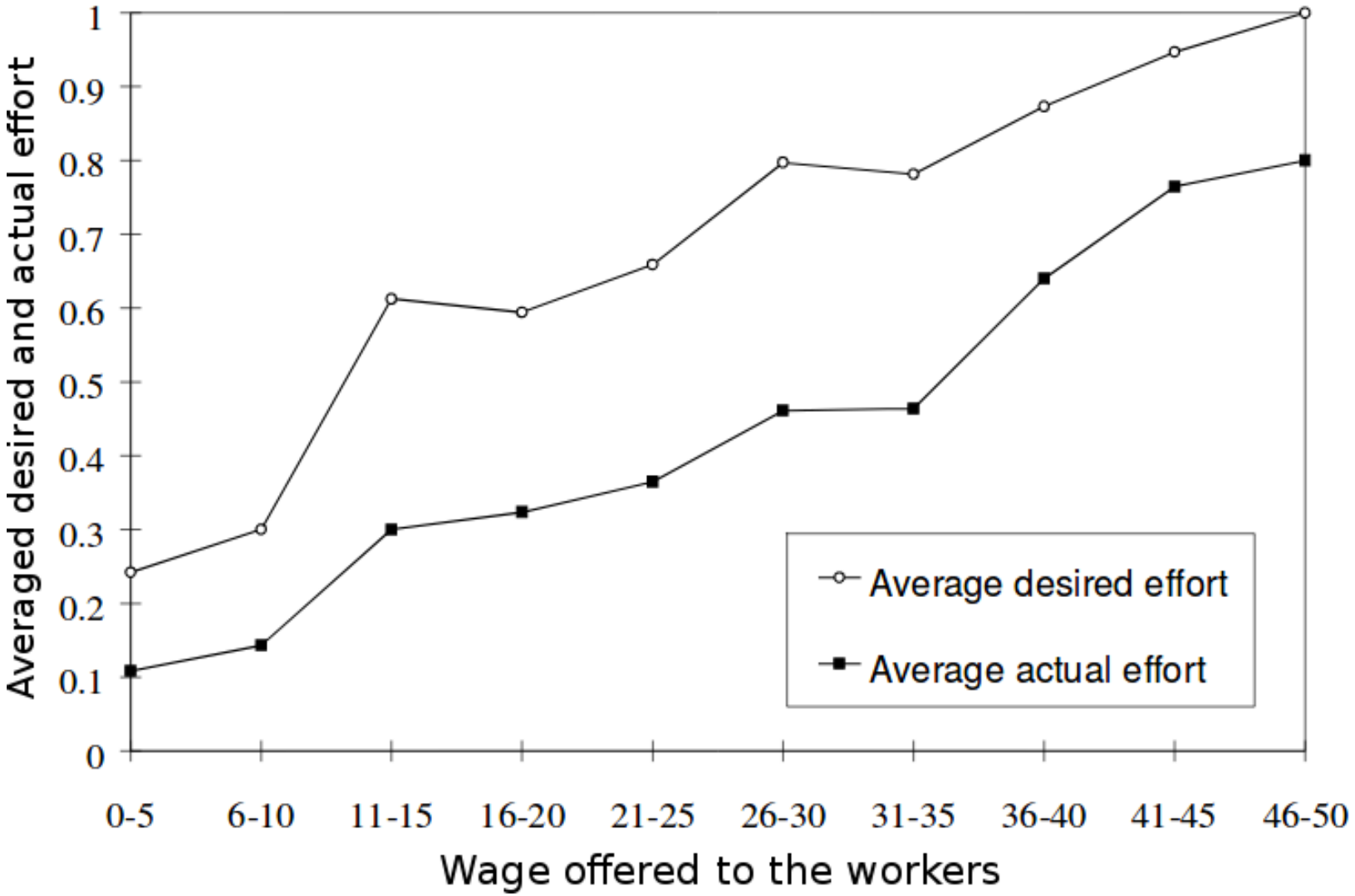

Figure: Source: Fehr and Falk (2002)

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External Validity of Laboratory Experiments

external validity $\rightarrow$ The ability of of experiments to provide findings that are likely to allow for reliable inferences outside the laboratory
A pernicious problem for the social sciences, in general, and Economics in Particular.

- If you measure the value of Earth's gravity in a laboratory you need not concern yourself with whether your results will generalize to outside the lab.
- However, human behavior is highly contextual and so what happens in the laboratory does not necessarily translate into the real world.

External Validity of Laboratory Experiments

If we want to use the laboratory evidence surveyed previously to argue for the existence of other-regarding inferences then we must first establish that the evidence is reliable for the inference of behavior outside the laboratory.

Laboratory experiments are often compared with field studies, this last which purports to provide evidence that is more externally valid than laboratory experiments.

- List (2006) provides an interesting example of this idea.
- In his paper he confirms the basic results of the gift exchange game in the laboratory but also employs the gift exchange game in the field.
- He finds that in the field the behavior of agents, in this case of baseball card dealers, is in line with the predictions of the self-regarding assumption

What does this evidence imply for our inference about the existence of other-regarding preferences?

External Validity of Laboratory Experiments

The answer relies on how much weight we give to one type of evidence versus the other, which will depend on our goals. Colin Camerer distinguishes between the *policy view* and the *scientific view*

- For the *policy view* the external validity of evidence is of paramount importance and thus field studies performed in the same domain as the policy as obvious advantages.
- The *scientific view* is concerned with gathering evidence such that our understanding of human behavior is increased, and thus there is no a priori reason for field studies to trump over laboratory experiments.

Provided the evidence was properly gathered, there is no hierarchical relationship between field studies and laboratory experiments. Both are tools and the evidence of one set of evidence must be contrasted with the other.

External Validity of Laboratory Experiments

More specific criticisms of the evidence for other-regarding preferences has appeared however.

- **Experimenter demand effects**
  - Laboratory experiments are highly artificial environments that put subjects under unprecedental scrutinity. Thus subjects might behave in ways that do not reveal their underlying preferences.
- **Context dependence**:
  - Behavior is context-dependent. It is not clear that laboratory experiments are able to capture this element and control for it.
- **Self-selection bias**:
  - Laboratory experiments are usually performed with college students as subjects, resulting in multiple experiments run with an homogeneous sample of subjects who might be different than the average human population.

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The Fehr-Schmidt Model of Inequity Aversion

Consider n individuals, each with a respective monetary payoff $y_1, y_2, ..., y_n$. For any i, the Fehr-Schmidt utility function, henceforth FS utility function, is defined as:

$$\begin{aligned} U_i\left(y_i, \vec{y}_{-i}; \alpha_i, \beta_i\right) = y_i &- \frac{\alpha_i}{n-1} \sum_{j \neq i} \max\left\{y_j - y_i, 0\right\} \\ &- \frac{\beta_i}{n-1} \sum_{j \neq i} \max\left\{y_i - y_j, 0\right\} \end{aligned} \tag{1}$$

where $\alpha_i \geq \beta_i$ and $0 \leq \beta_i < 1$.

The Fehr-Schmidt Model of Inequity Aversion

$$\frac{\alpha_i}{n-1}\sum_{j\neq i}\max\{y_j - y_i, 0\}$$

Disadvantageous Inequality

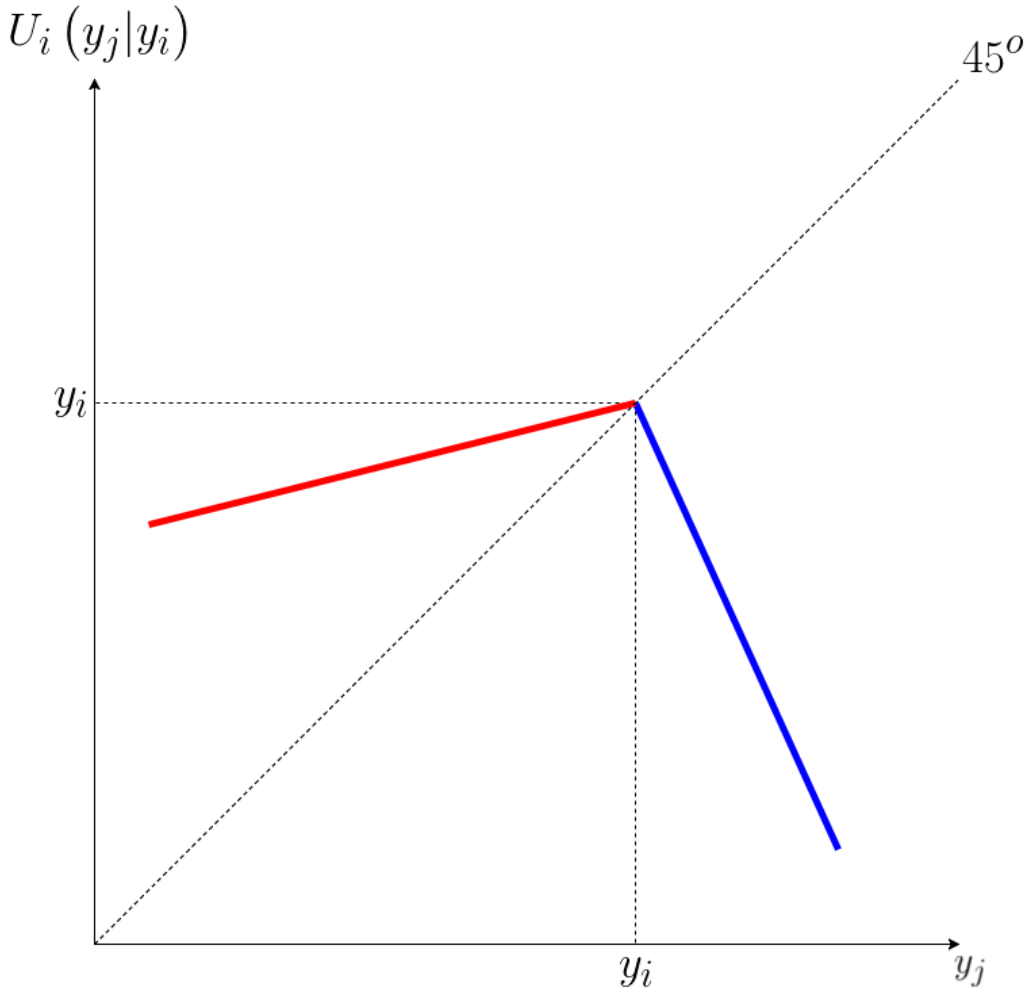
Envy

$$\frac{\beta_i}{n-1}\sum_{j\neq i}\max\{y_i - y_j, 0\}$$

Advantageous Inequality

Altruism

The Fehr-Schmidt Model of Inequity Aversion



$$\frac{\alpha_i}{n-1}\sum_{j\neq i}\max\{y_j-y_i,0\}$$

$$\frac{\beta_i}{n-1}\sum_{j\neq i}\max\{y_i-y_j,0\}$$

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Incomplete contracts under other-regarding preferences

Consider a Principal who wants to hire an Agent. The Agent can expend effort $e \in [\underline{e}, \bar{e}]$ at a cost $c(e)$ such that $c' > 0$ and $c'' > 0$. The principal wants the Agent to expend e_{min}, which he introduces in the contract, but e_{min} is non-binding.

- The principal might invest in a verification technology that costs k
- The verification technology provides evidence of shirking with probability p

The question is: how should the Principal structure the contract he offers to the Agent such that his goals are best achieved?

Incomplete contracts under other-regarding preferences

The three types of contract the Principal has at his disposal are:

- **Incentive contract**: The contract specifies the wage w, the contracted effort level e_c, and the maximum fine $\bar{f}$.
  - $\left(w, e_c, \bar{f}\right)$
- **Trust contract**: The contract specifies the wage w and the contracted effort level e_c, which is non-verifiable.
  - (w, e_c)
- **Bonus contract**: This contract is similar to the trust contract except if $e > e_c$ the principal might reward the agent with a non-enforceable bonus b.
  - (w, e_c, b)

Incomplete contracts under other-regarding preferences

Incentive Contract

- The Principal has invested in the verification technology
- He can induce a positive effort level if the verification technology is potent enough
- This means that $p\bar{f} \geq c(e^*) - c(\underline{e})$

Bonus Contract

- b is non-binding
- The bonus contract is therefore equivalent to the trust contract
- b Since e is non-binding and non-verifiable, the Agent will exert the lowest possible e

The prediction is that the Principal will choose the Incentive contract over the Bonus and Trust contracts.

Incomplete contracts under other-regarding preferences

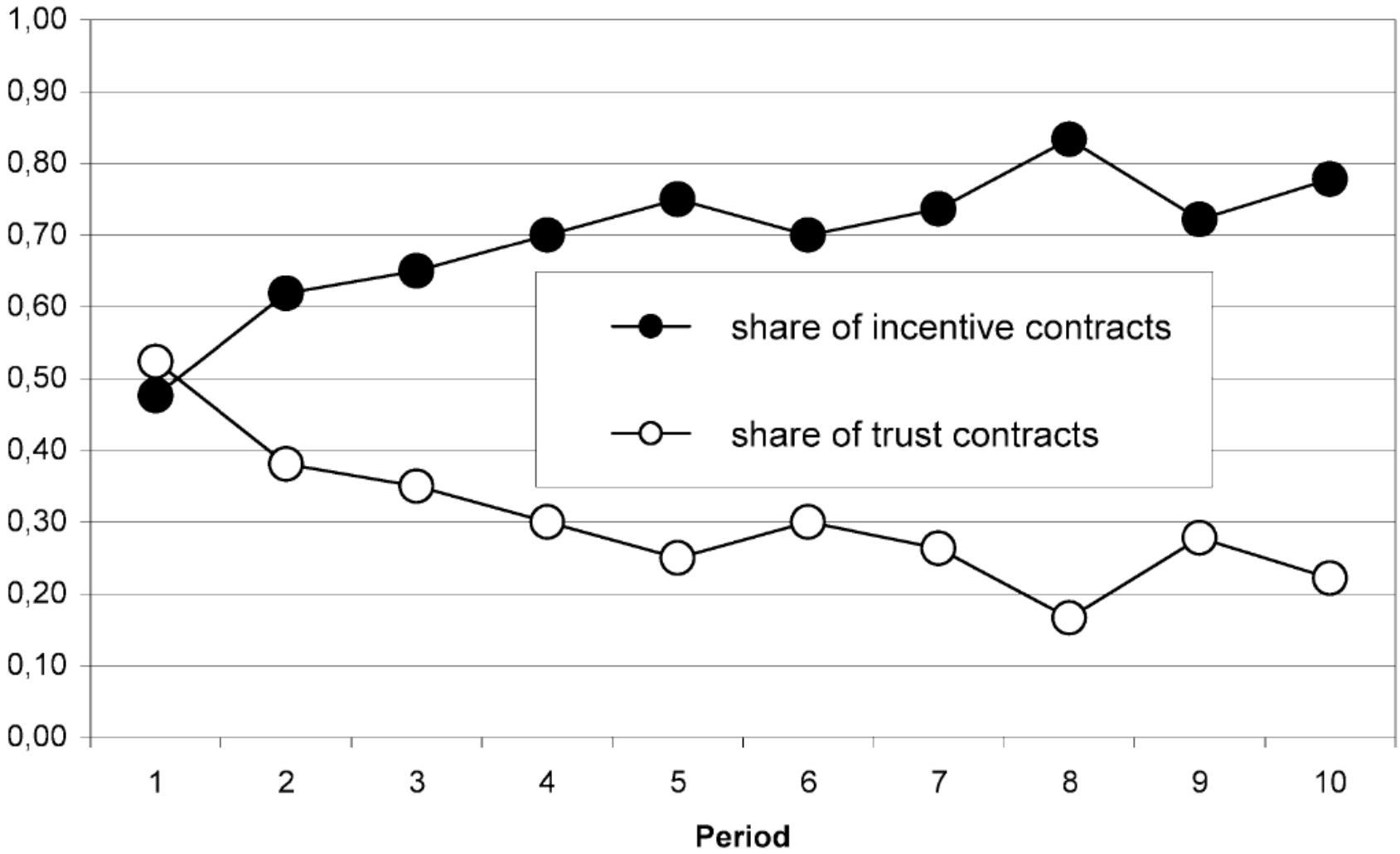

Figure: Source: Fehr et al. (2007)

Incomplete contracts under other-regarding preferences

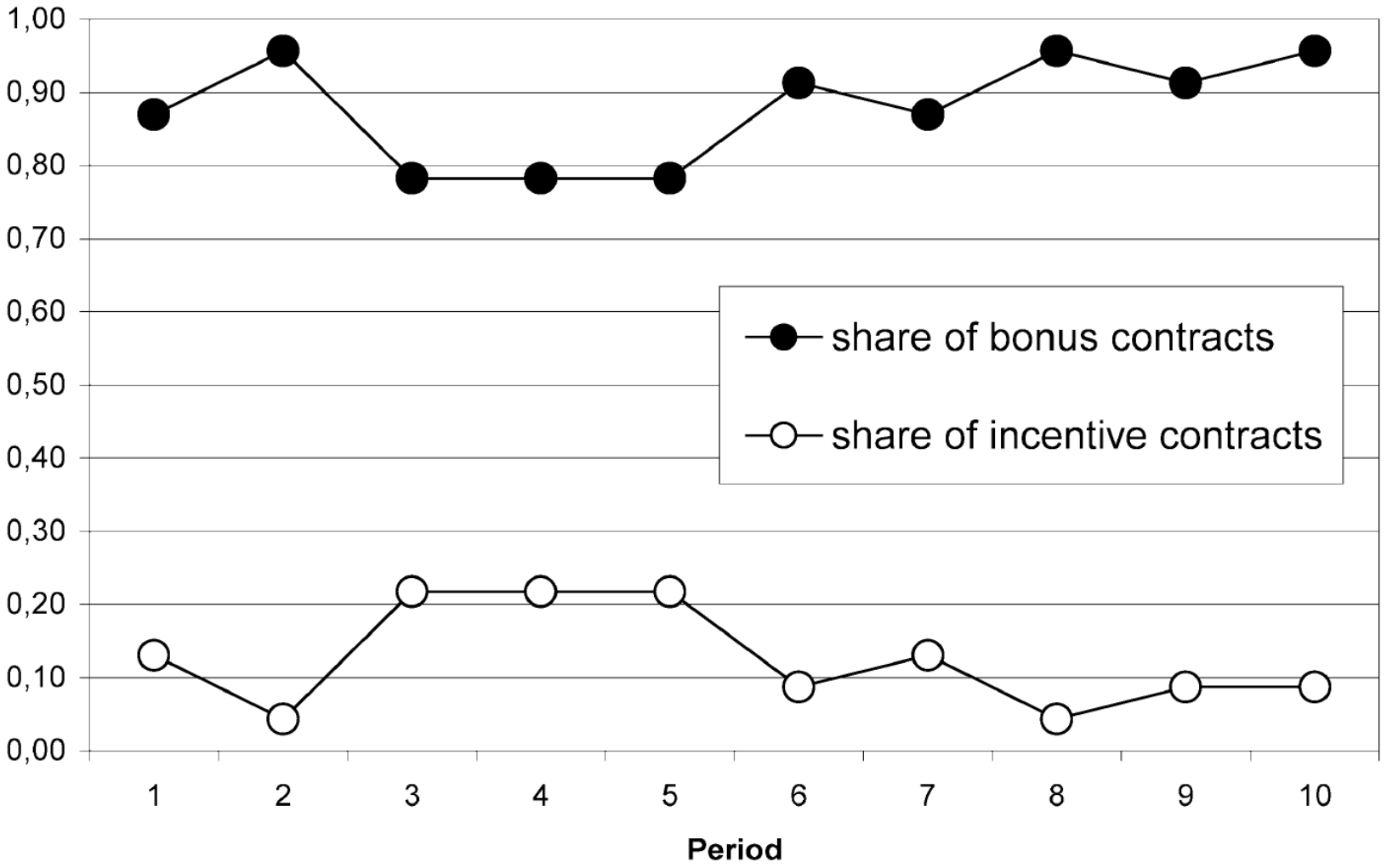

Figure: Source: Fehr et al. (2007)

Incomplete contracts under other-regarding preferences

For simplicity we will assume that the agent's output is equal to e while the effort cost function is $c(e) = \frac{1}{2}e^2$, where $e \in [0, 1]$.

The utility of a self-regarding agent and principal is given by, respectively

$$\begin{cases} u = & w - \frac{1}{2}e^2 - C_A \\ \pi = & e - w - C_p \end{cases} \tag{2}$$

where C_A and C_P are whatever other individual costs the agent and principal, respectively, incur by taking part in the relationship.

We start by describing the expected profits for the principal under the incentive contract.

Incomplete contracts under other-regarding preferences

Incentive contract

The incentive compatibility constraint of the self-regarding agent is

$$(1-p)\,w + p\,(w-f) \leq w - \frac{1}{2}e_c^2 \tag{3}$$

where we assume $C_A = 0$. This gives us $e_c \leq \sqrt{2pf}$ as the set of effort levels that are incentive compatible.

Therefore, since $e \in [0,1]$, in an incentive contract where the Principal wishes to maximize profits the optimal contracted effort level is

$$e_I = \min\{1, \sqrt{2pf}\} \tag{4}$$

Incomplete contracts under other-regarding preferences

To maximize profits, the self-interested principal sets a contract (w, e_c) that maximizes expected profits

$$E(\Pi) = (1-p)(e-w-k) + p(e-w-k+df) = e-w-k+pdf \tag{5}$$

where d is a binary variable dependent on whether $e < e_c$.

If $e_c < \sqrt{2pf}$, $d = 0$ and $E(\Pi) = e - w - k$. Note that $w \geq \frac{1}{2}e_c^2$. Given that,

- If $\sqrt{2pf} \geq 1$ then we have $e_I = 1$ and $w = \frac{1}{2}$.
  - $E(\Pi) = \frac{1}{2} - k$.
- If $\sqrt{2pf} < 1$ then $e_I = \sqrt{2pf}$ and $w = pf$.
  - $E(\Pi) = \sqrt{2pf} - pf - k$.

Incomplete contracts under other-regarding preferences

Bonus Contract

If $e > e_c$, the bonus will be such that the payoffs of both parties are equaled.

$$e - w - b = w + b - \frac{1}{2}e^2 \tag{6}$$

which we solve for b to get

$$b = \frac{1}{2}e - w + \frac{1}{4}e^2 = b(e, w) \tag{7}$$

Incomplete contracts under other-regarding preferences

$$w + b(e, w) - \frac{1}{2}e^2 = e - w - b(e, w) \tag{8}$$

Taking the first derivative of (8) in order to e gets us the result that the payoff is maximized at $e_F^b = 1$.
The other-regarding principal's expected payoff is $E(\Pi) = e - w - b(e, w)$, which when $e = 1$ yields

$$\begin{aligned} E(\Pi_B) &= e - w - \left(\frac{1}{2}e - w + \frac{1}{4}e^2\right) \\ E(\Pi_B) &= 1 - w - \frac{1}{2} + w - \frac{1}{4} \\ E(\Pi_B) &= \frac{1}{4} \end{aligned} \tag{9}$$

Incomplete contracts under other-regarding preferences

So given these options, which contract should the principal prefer?

- Under the self-regarding assumption we would expect the incentive contract to dominate over all others.
- However, taking into account that principals and agents might have other-regarding preferences, we conclude that the answer depends on a number of parameters.
  - Suppose that $\sqrt{2pf} > 1$, in which case $E(\Pi_I) = \frac{1}{2} - k$. For the incentive contract to dominate over the bonus contract it would be needed that $E(\Pi_I) > E(\Pi_B)$, that is, $\frac{1}{2} - k > \frac{1}{4}$. This is only true if $k < \frac{1}{4}$.
  - For the case where $\sqrt{2pf} < 1$ we have that $E(\Pi_I) = \sqrt{2pf} - pf - k$, which means that the incentive contract dominates over the bonus contract only if $\sqrt{2pf} - pdf - k > \frac{1}{4}$.

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Conclusion

- As Aristotle put it once, "Man is by nature a social animal."
- The self-regarding assumption, while useful, does not account for the full set of documented human behavior
- Acknowledging the existence of other-regarding preferences allows economists to extend their studies by taking into account the social aspect of human decision making.

References

- Akerlof, G. A. (1982). Labor contracts as partial gift exchange. The quarterly journal of economics, 97(4), 543-569.
- Homans, G. C. (1954). The cash posters: A study of a group of working girls. American Sociological Review, 19(6), 724-733.
- Fehr, E., & Falk, A. (2002). Psychological foundations of incentives. European economic review, 46(4-5), 687-724.
- Fehr, E., Klein, A., & Schmidt, K. M. (2007). Fairness and contract design. Econometrica, 75(1), 121-154.