Written Exam at the Department of Economics summer 2018

Foundations of Behavioral Economics

Final Exam

June 11, 2018

(3-hour open/closed book exam)

Note: The following illustrations are a sketch of how to solve the exam questions, rather than a full-fledged "solution manual". Some derivations of results are omitted for brevity and some responses only exemplify possible solutions to the questions (in both cases, further details can be found in the lecture notes of the respective sections).

Question 1: (weight: 27%)

a) During the course we discussed the model of belief-dependent (simple) guilt aversion. *[Note: the label 'simple' refers to the first notion of guilt aversion discussed in Battigalli and Dufwenberg (2007), Guilt in Games, American Economic Review, Papers & Proceedings, 97, 170-76]*.

Please define and intuitively explain their notion of simple guilt aversion. How do they formalize their concept of 'guilt'?

Tentative answer: *Points that should be included can be found on the slides of lecture 6 (6-16) as well as the mandatory reading: Dufwenberg and Battigalli (2007), Guilt in Games, American Economic Review, Papers & Proceedings, 97, 170-76 [Section II, p 171]*

b) Consider the following two-player sequential prisoner's dilemma (the upper payoff refers to player 1 and the lower to player 2)

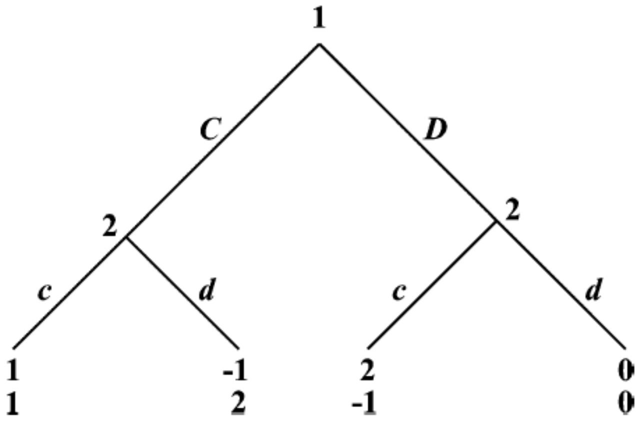


Fig. 2. Game Γ_2—the sequential prisoners' dilemma.

(b.1) Under what circumstances is (C,cd) an equilibrium if players are motivated by inequality aversion? Intuitively explain your result.

Tentative answer: *Use backward induction. First, player 2 chooses c after player 1's choice C if*

$$1 \geq 2 - \beta_2[2-(-1)]$$
$$1 \geq 2 - 3\beta_2$$
$$\beta_2 \geq \frac{1}{3}$$

Furthermore, player 2 chooses d after D if

$$0 \geq -1 - \alpha_2[2-(-1)]$$
$$0 \geq -1 - 3\alpha_2$$
$$-(1/3) \leq \alpha_2$$

That is for any $\alpha_2 \geq 0$ player 2 will optimally choose d after D.

Assume now $\beta_2 \geq \frac{1}{3}$ and $\alpha_2 \geq 0$.

Player 1 will optimally choose C independent of β_1 and α_1 as 1 is better than 0 and both options do not involve any inequality.

(b.2) Furthermore, consider the model of belief-dependent reciprocity and assume that player 2's sensitivity to reciprocity is 0< Y_2<0.5, what is the unique sequential reciprocity equilibrium?

Tentative answer: *The unique equilibrium behavior is (D,dd). See Observations 1, 2 and 3 in Dufwenberg and Kirchsteiger (2004). A theory of sequential reciprocity. Games and Economic Behavior, 47(2), 268-298 and the proof of these observations in Appendix A.*

Question 2: (weight: 20%)

a) What is the "endowment effect"?
   - Please give a precise definition.
   - Illustrate the effect by briefly describing the classic experiment with which the effect was first established (sketch the design idea, the identification strategy, and the main finding of the experiment).

   Tentative answer:
   - *Endowment effect = an individual's (perceived) value of a good depends on whether the individual is endowed with the good or not*
   - *See description of the experiment by Kahneman et al. (1990) on slides 13-14 of lecture notes for lecture 8*

b) Sketch graphically how the endowment effect can be explained with a Kahneman-Tversky value-function.

   Tentative answer: *see slide 16 of lecture notes for lecture 8*

c) How has the endowment effect typically been interpreted? How should the expected-utility model be modified according to this interpretation?

   Possible interpretation: endowment effect is caused by loss aversion / reference-dependent preferences. Modification: use reference-dependent utility function $U_i(x_i|r, s_t)$ *instead of* $U_i(x_i, |s_t)$

d) What are potential implications if the interpretation from part c) is correct? Give an example of an important economic decision that might be affected.

   Tentative answer: *see discussion on slides 14,26, 27 of lecture notes for lecture 8*

Question 3: (weight: 33%)

Consider an agent who maximizes the following intertemporal utility function featuring quasi-hyperbolic discounting with discounting parameters β , $\delta \leq 1$

$$U_t = u_t + \beta \sum_{\tau=1}^{T-t} \delta^\tau u_{t+\tau}$$

e.g., in period t=1:

$$U_1 = u_1 + \beta(\delta u_2 + \delta^2 u_3)$$

The agent faces a task that he has to complete within any of the next three periods (i.e., at the latest in *t=3*). If he manages to complete the task in time, he receives a bonus of *B = 20* in period *t=3*.

In order to complete the task, the agent has to exert costly effort *once* during the next three periods. The agent's effort costs in the different periods are:

$c_1 = 3$ if he completes the task in $t=1$,
$c_2 = 4$ if he completes the task in $t=2$,
$c_3 = 6$ if he completes the task in $t=3$.

Assume that the agent's period utility u_t is simply the sum of any positive payments (e.g., the bonus) minus the costs incurred in a given period t.

a) When does the agent complete the task if his discounting parameters are β = 1, δ=1 (i.e., the agent is not present-biased)?

Tentative answer: *Let t^* denote the date at which the agent completes the task. Since*

$$U_1(t^* = 3) = 0 + 0 + 1^2(20 - 6)$$
$$< U_1(t^* = 2) = 0 + 1(-4) + 1^2(20)$$
$$< U_1(t^* = 1) = -3 + 0 + 1^2(20)$$

the time-consistent agent completes the task in period 1.

b) When does the agent complete the task if he is present-biased and naive?
- Assume that his discounting parameters are β=0.6, δ=1, and the agent's period-t "self" beliefs that all future selves will not be present-biased (i.e., $\hat{\beta} = 1$).
- Does the agent actually stick to his work plan from period t = 1? Explain.

Tentative answer: *Let $\hat{t}$ denote the date at which the agent plans to complete the task. With β=0.6 , δ=1 and naïve beliefs, his initial plan is to complete the task in t=2:*

$$U_1(\hat{t} = 2) = 0.6(-4) + 0.6 * 20 > U_1(\hat{t} = 1) = -3 + 0.6 * 20 > U_1(\hat{t} = 3) = 0.6 * (20 - 6)$$

In t= 2,

$$U_2(\hat{t} = 3) = 0.6(20 - 6) > U_2(\hat{t} = 2) = -4 + 0.6 * 20,$$

so he breaks his original plan an postpones completing the task to t=3. This is because from t=1's perspective, both t=2 and t=3 lie in the future and are therefore discounted with factor β. In t=2, however, the cost of completing the task immediately get an additional weight due to the agent's present bias, whereas the cost of doing it only in t=3 are still discounted with β. In t=1, he is thus overly optimistic regarding his willingness to work in period 2.

c) When does the agent complete the task if he is present biased but fully sophisticated?
- Assume that the agent's discounting parameters are again β=0.6, δ=1, but that in contrast to part b), the agent is fully aware of his future self-control problems (i.e., $\hat{\beta}$=0.6).

- How does the agent's work plan in period t = 1 differ from the one of the naive agent from part b)? What it the intuition behind this result?

Tentative answer: *The sophisticated agent foresees that* $U_2(\hat{t}=3) = 0.6(20-6) > U_2(\hat{t}=2) = -4 + 0.6 * 20$ *and that, in t=2, he thus will prefer postponing the task to t=3.*

In t=1, he is thus realistically pessimistic about his future willingness to work (in contrast to the agent from part b). He therefore only compares the alternative $\hat{t} = 3$ *vs.* $\hat{t} = 1$*. Since*

$$U_1(\hat{t}=1) = \; -3 + 0.6 * 20 \; > \; U_1(\hat{t}=3) = 0.6(20-6),$$

he completes the task immediately in t=1.

d) Assume now that, in period *t=1*, the agent can set a deadline for himself to do the task in period *t=2*. The features of the deadline are as follows:
   - If the agent imposes the deadline on himself and manages to complete the task in *t=2*, he still gets *B=20* in period *t=3*.
   - If he does not complete the task by the deadline (i.e., in period 1 or 2), he can still finish the task in *t=3*, but then only receives a bonus of *B=15* in period *t=3*.

   Consider period *t=1*. Which of the three agents from parts a), b), and c) decides to impose the deadline on himself? Explain.
   - Note: Assume that the agent does *not* make use of the deadline if he is indifferent between imposing and not imposing the deadline for himself.

Tentative answer:
d1) Exponential discounter from part a):

- *Without the deadline, he completes the task in t=1 (see above).*
- *With the deadline, he would still complete the task in t=1, since the lifetime utility of doing so is higher than completing the task in t=2 or t=3 (see above).*
- *The time-consistent agent is therefore indifferent and does not make use of the deadline.*

d2) Naïve agent from part b):

- *In period t=1, the naïve agent beliefs that he will work in t=2 anyways (i.e., with or without the deadline).*
- *Hence, he is indifferent and does not make use of the deadline*

d3) Sophisticated agent from part c):

- *Without deadline: From part c) we know that, without deadline, the agent completes the task in t=1, yielding a lifetime utility of* $U_1(t^* = 1) = -3 + 0.6 * 20$
- *With deadline (solve again by backward induction):*
  If the agent arrives in t=2 and has set the deadline for himself (and not completed the task before), he faces a tradeoff between
  (i) working immediately and meeting the deadline: $U_2(\hat{t} = 2) = -4 + 0.6 * 20$
  (ii) Or missing the deadline and instead completing the task only in t=3 (yielding a lower bonus of 15): $U_2(\hat{t} = 3) = 0.6(15 - 6)$

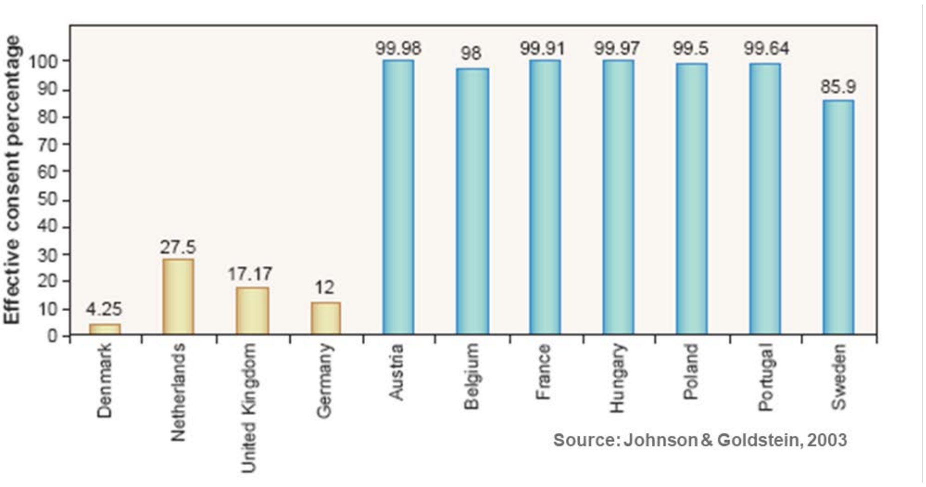
Since the first expression is larger than the second, he will complete the task in t=2 if he has set the deadline for himself.

In period t=1, the agent anticipates that setting the deadline implies that we will do the task in t=2. He thus has to compare
$U_2(\hat{t} = 2) = 0.6\,(20 - 4) > U_1(\hat{t} = 1) = -3 + 0.6 * 20$

Hence, the sophisticated agent makes use of the deadline (the deadline functions as a commitment device with which the period-1 agent can force the period-2 agent to actually complete the task in t=2).

Question 4: (weight: 20%)

Consider the following figure displaying effective consent rates to post-mortem organ donation across different European countries



a) What is the difference between the countries on the left vs. right side of the figure?

Tentative answer: *The difference between countries is the "default" rule regarding consent to organ donation:*

- *the countries on the left have legislations involving explicit consent (individuals who want to register for donation have to actively opt in)*
- *the countries on the right have presumed-consent legislation (individuals have to opt out if they do not want to be organ donors)*

b) Consider the different forms of non-standard preferences, non-standard beliefs, and non-standard decision making that we covered throughout the course and discuss (at least) three possible explanations for the observed differences in consent rates.

Possible answers include the following mechanisms:

- *Present bias*
- *Status-quo bias / loss aversion*
- *Unawareness / inattention / limited attention*
- *Default rules are perceived as a recommended action*
- *Defaults shape social norms*

c) For one of your candidate explanations from part b), propose an empirical test that could demonstrate that this explanation is indeed relevant.

Tentative answer: *Dependent on the candidate to be tested. E.g., reminders to test for relevance of unawareness/limited attention*

d) It is sometimes argued that generating a market system in which alive donors can sell organs (e.g., kidneys) could help to overcome shortages for patients who need a transplantation. Most societies, however, consider such a system "morally repugnant". What factors are commonly discussed as reasons for this repugnance?

Possible factors to be discussed:

- *Fairness (purchasing power determines access to organs)*
- *Danger of coercion*
- *Corruption of moral values ("slippery slope")*

See paper by Elias, J.J., Lacetera, N., Macis, M. (2016) for further factors and a more extensive discussion.