Threats and Anger: Theory
Lecture 15, *Experimental Econ. & Psychology*

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Abstract

Trust in promises (and reports) and fear of (possibly implicit) threats are part of the glue that keeps organizations societies together. We studied how guilt aversion enhances trust. Now we study how frustration, anger, and aggression affect economic outcomes and social behavior, e.g., enhancing the credibility of threats. Anger and aggression are assumed to be anchored in frustration. Frustration is assumed to be proportional to the unavoidable shortfall in material payoff (caused by the actions of others) compared to initial expectations. Frustration induces the desire to inflict harm on others even at a cost. This model helps to explain much extant empirical and experimental evidence.

Introduction

Trust in promises (and reports) and fear of (possibly implicit) threats are part of the glue that keeps organizations societies together. We studied how guilt aversion enhances trust. Now we study how frustration, anger, and aggression affect economic outcomes and social behavior, e.g., enhancing the credibility of threats.

- Anger arises from the frustration of non-attainment of an expected outcome; as a behavioral consequence (action tendency), this goal-blockage experience can lead to aggressive behavior.

- Emotions depend on beliefs; hence, we use belief-dependent utility to illustrate anger-like motivations.

- We develop a formal framework and a set of models that incorporate frustration and anger in games.

Motivation

The following is inconsistent with standard social preferences (e.g., inequity aversion), but consistent with our model(s):

- **Psychology**: Frustration-aggression hypothesis (Dollard et al., 1939). "Experiences of anger consist of the experience of an event as obstructing one's goals and as caused by someone else's blameworthy intent." (Frijda, 1993).

- **Facts (empirics):**
  - Unexpected losses by home football/soccer teams are associated with increased domestic violence (Card & Dahl, 2011) or violent crime (Munyo & Rossi 2013).
  - Firms do not want to "antagonize customers" (Anderson & Simester, 2010).
  - Workers who received a pay cut (and that did not subsequently leave the firm) generated abnormally high customer refunds, in a way that hurt both them and the firm (Coviello et al., 2018).

Motivation (cont.)

- **Facts (experimental):**
  - Self-reported anger predicted rejections better than perceived unfairness in ultimatum games (Pillutla & Murnighan, 1996)
  - Self-reported anger correlates with *punishment* of free-riders in *Public Good Games* (Fehr & Gächter, 2002).
  - Rejections in the *Ultimatum Game* correlate with (manipulated) initially expected offers (Sanfey, 2009; Xiang et al., 2013, with fMRI).
  - Deviations from expectations drive both anger and the destruction of endowments in *Power-to-Take Games* (Bosman *et al.* 2002,'05, Reuben & van Winden, 2008).
  - *Agents are blamed by principals* for bad outcomes (Gurdal et al. 2014).
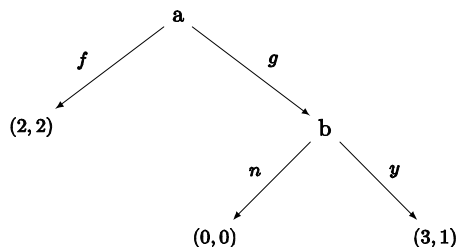
Frustration

Anger is anchored in frustration.

- In Battigalli, Dufwenberg & Smith (2019), **frustration** is given by the *unavoidable shortfall* in expected material payoff; thus, it depends on beliefs about others and on own plan.

- We focus on two-stage games (with observable actions). Player i's frustration, in the second stage given first-stage actions $a^1 = \left(a_j^1 \right)_{j \in I}$, is defined as:

$$\mathrm{F}_i(a^1; \alpha_i) = \left[\mathbb{E}_{\alpha_i} \left(\pi_i \right) - \max_{a_i^2 \in A_i(a^1)} \mathbb{E}_{\alpha_i} \left(\pi_i | a^1, a_i \right) \right]^+$$

where $[x]^+ = \max\{0, x\}$.

Example: Ultimatum mini-Game

If Bob initially expects f (fair offer) with prob. $\alpha_{\mathrm{b}}(f) = 1 - \alpha_{\mathrm{b}}(g)$, his frustration following g (greedy offer) is

$$F_{\mathrm{b}}(g; \alpha_{\mathrm{b}}) = [2 \cdot \alpha_{\mathrm{b}}(f) + 1 \cdot \alpha_{\mathrm{b}}(g)\alpha_{\mathrm{b}}(y|g) - 1]^+ .$$

Given g, Bob is more frustrated (i) the more he expects the fair offer f, and (ii) the less he initially plans to reject the greedy offer g.

- *How do players react to frustration?*

Blame

A frustrated player may go after his co-players depending on appraisal of how much his opponents can be blamed for the outcome which frustrates him.

- B_{ij} measures the amount of frustration i attributes to j, with:

$$0 \leq B_{ij}(a^1; \beta_i) \leq F_i(a^1; \alpha_i).$$

- *Action tendency:* Pl. i moving at the *second stage* chooses a_i to maximize his "decision utility" of the form

$$\bar{u}_i(a^1, a_i; \beta_i) = \mathbb{E}_{\alpha_i}\left(\pi_i | a^1, a_i\right) - \theta_i \sum_{j \neq i} B_{ij}(a^1; \beta_i)\pi_j(a^1, a_i)$$

where $\theta_i \geq 0$ is a sensitivity parameter. *But players' actions at the root maximize expected \$payoff.*

- We consider three approaches to incorporate anger into utility functions according to different levels of cognitive appraisal, reflected by different blame functions.

Simple Anger (SA)

A player's tendency to hurt others is proportional to his frustration, un-modulated by cognitive appraisal of blame:

$$\mathrm{B}_{ij}(a^1; \alpha_i) = \mathrm{F}_i(a^1; \alpha_i).$$

- *Frustration-aggression displacement hypothesis* (Dollard *et al.*, 1939): the existence of frustration leads to some form of aggressive behavior through a displacement effect that directs hostile inclinations at substitute targets.

- *Card & Dahl, 2011*: correlation between an external source of frustration from unexpected loss by local teams and an increasing number of reports of domestic abuse (see also Munyo & Rossi 2013, correlation with violent crimes).

Simple Anger: Ultimatum mini-Game
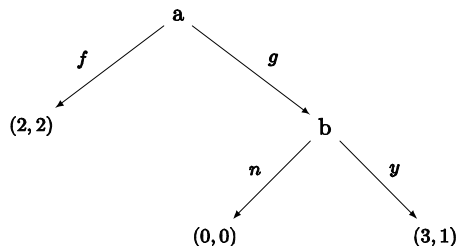
- If Bob initially expects f with certainty, his frustration following g is $F_b(g; \alpha_b) = [2 \cdot 1 + 0 \cdot \alpha_b(y|g) - 1]^+ = 1$. Therefore $\bar{u}_b^{SA}(g, n; \alpha_b) - \bar{u}_b^{SA}(g, y; \alpha_b) = 3\theta_b - 1$. Bob rejects g if $\theta_b \geq 1/3$; otherwise, he accepts.

- If Bob initially expects g with certainty, his frustration following g is $F_b(g; \alpha_b) = [2 \cdot 0 + 1 \cdot \alpha_b(y|g) - 1]^+ = 0$. Bob accepts g for every θ_b and $\alpha_b(y|g)$.

Anger from Blaming Behavior (ABB)

A player blames whoever causes his frustration.

How much i blames j is determined by a continuous function $\mathrm{B}_{ij}(a^1; \alpha_i)$ such that:

$$\mathrm{B}_{ij}(a^1; \alpha_i) = \left\{ \begin{array}{ll} 0, & \text{if } j \notin I(\varnothing) \\ \mathrm{F}_i(g; \alpha_i), & \text{if } \{j\} = I(\varnothing) \\ ... \leq \mathrm{F}_i(g; \alpha_i) & \text{other} \end{array} \right.$$

where $I(\varnothing)$ is the set of active players in the first stage.

- In *leader-followers games,* SA and ABB are equivalent.
  For example, in the Ultimatum Minigame the two models yield the same behavioral prediction.

Example: Hammering One's Thumb
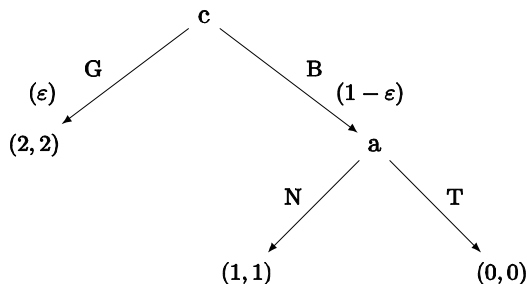
c=chance, a=Andy, b=Bob (inactive, 2nd payoff). Assume that $\alpha_a(G) = \varepsilon < 1/2$. Following **B**ad day, we have:

$$F_a(B; \alpha_a) = (1 - \varepsilon) \cdot 2 + \varepsilon \alpha_a(N|B) \cdot 1 - 1 > 0.$$

Difference between simple anger and anger from blaming behavior:

- **SA:** given B, Andy chooses T for θ_a sufficiently high;
- **ABB:** given B, Andy chooses N regardless of θ_a.

We propose two specific functional forms for ABB:

1. **Could-have-been blame**
   Upon observing a^1, a frustrated player i considers for each co-player j what i would have obtained at most, in expectation, had j chosen differently:

$$B_{ij}(a^1, \alpha_i) =$$

$$\min \left\{ \left[\max_{a'_j \in A_j(\varnothing)} \mathbb{E}_{\alpha_i} \left(\pi_i | (a^1_{-j}, a'_j) \right) - \mathbb{E}_{\alpha_i} \left(\pi_i | a^1 \right) \right]^+ ; F_i(a^1; \alpha_i) \right\}.$$

2 **Blaming unexpected deviations**
Upon observing a^1, a frustrated i assesses for each co-player j how much i would have obtained had j behaved as expected:

$$\mathrm{B}_{ij}(a^1, \alpha_i) =$$

$$\min \left\{ \left[\sum_{a'_j \in A_j(\varnothing)} \alpha_i(a'_j) \mathbb{E}_{\alpha_i} \left(\pi_i | (a^1_{-j}, a'_j) \right) - \mathbb{E}_{\alpha_i} \left(\pi_i | a^1 \right) \right]^+ ; \mathrm{F}_i(a^1; \alpha_i) \right\}$$
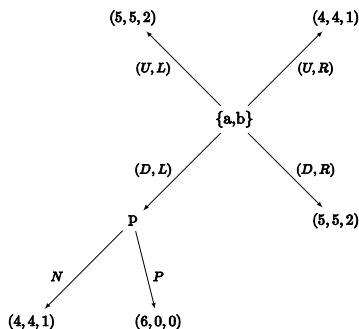
- Suppose Penny expected (U, L), so that $\mathbb{E}_{\alpha_p}(\pi_p) = 2$ and $F_p((D, L); \alpha_p) = [2 - 1]^+ = 1$. If she observes $a^1 = (D, L)$. Then $B_{pa}((D, L); \alpha_p) = B_{pb}((D, L); \alpha_p) = \min\{[2 - \mathbb{E}_{\alpha_p}(\pi_p | (D, L))]^+, F_p((D, L); \alpha_p)\} = 1$.
- Penny *fully blames both Ann and Bob* for her frustration, but can (and does for θ_p high enough) punish only Bob.
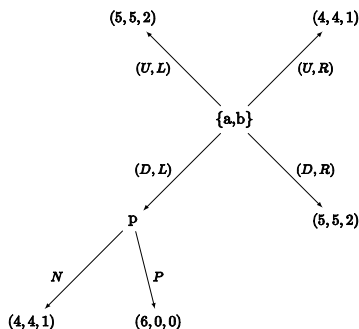
- If Penny is initially certain of (U, L) then $\mathbb{E}_{\alpha_{\mathrm{p}}}(\pi_{\mathrm{p}}) = 2$.
  - Given (D, L), her frustration is $\mathrm{F}_{\mathrm{p}}((D, L); \alpha_{\mathrm{p}}) = [2 - 1]^+ = 1$.
  - Penny fully blames Ann, who deviated from U to D:
    $\mathrm{B}_{\mathrm{pa}}((D, L); \alpha_{\mathrm{p}}) = \min\left\{ \left[2 - \mathbb{E}_{\alpha_{\mathrm{p}}}(\pi_{\mathrm{p}}|a^1)\right]^+ ; 1 \right\} = 1$.
- Penny does not blame Bob, who played L as expected, and hence chooses N, because she cannot punish Ann.

Anger from Blaming Intentions (ABI)

A player blames whoever he believes *intended* to cause his frustration.

- A frustrated player asks herself whether the co-player intended to give her a low expected payoff: let

$$\pi_i^* \left(\alpha_j \right) = \max_{a_j} \sum_{a_{-j}^1} \alpha_{j,-j}(a_{-j}^1) \mathbb{E}_{\alpha_j} \left(\pi_i | (a_j, a_{-j}^1) \right)$$

denote the maximal expected payoff that j may expect to "give" to i, then

$$\mathrm{B}_{ij}(a^1; \beta_i) = \min \left\{ \mathbb{E}_{\beta_i} \left(\pi_i^* \left(\alpha_j \right) - \mathbb{E}_{\alpha_j} \left(\pi_i \right) \middle| a^1 \right), \mathrm{F}_i(a^1, \alpha_i) \right\}$$

that is, upon observing a^1, i blames j to the extent that she believes that j planned to make her earn less than $\pi_i^* \left(\alpha_j \right)$.

- Key issue: is observed behavior interpreted as *intentional*? According to the "trembling-hand" story, deviations from expected behavior are deemed unintentional⇒no blame, no aggression!

Discussion

- *Dynamic Inconsistency of preferences*: implied by F&A models, because anger can only arise after a negative surprise; but we assume sophistication⇒no change of plan (see the discussion of rational planning in PGT).

- ℓ-*stages extension* ($\ell > 2$): fast *vs* slow play version:
  - **fast** play: *one period with ℓ stages* ⇒ benchmark=initial expectation,
  - **slow** play: $k \leq \ell$ *periods with one or more stages in each period t* ⇒ t-benchmark=beginning-of-period expectation,
  - *cooling off* effect: making the agent wait between the time in which she experiences frustration and the time when she can be aggressive at a cost to herself reduces aggressive behavior (see the theory in Battigalli, Corrao & Dufwenberg 2019, and the experiment by Gneezy and Imas, 2014).

Discussion (cont.)

- We make sense of relevant evidence with psychological models where *anger is belief-dependent*: unavoidable shortfall.
- Anger *can also depend on regret* (e.g., unexpected discounts after purchase, see Anderson & Simester, 2010), which is belief-dependent in a different way ...
- ... *or on perceived unfairness* (riots, political unrest), which—however—often is hard to distinguish (in equilibrium) from deviation from expectations.
- *New experimental evidence* designed to test the model suggests that
    - the simple anger model does not explain well the behavior of unlucky losers (Persson, 2018);
    - there may be gender differences in getting angry: our model works better for males, anger from unfairness better explains females' behavior/beliefs (Aina et al. 2020).
- *F&A* vs *Guilt Aversion:* complementary, GA supports on-path promises, F&A supports off-path threats.

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