Decision-Making Structures and Incentives

Heikki Rantakari

Introduction

- **Organizations:**
  - As decision-making processes
  - Under dispersed information
  - With self-interested agents
  - With conflicting interests
  - Needing to respond to information while maintaining internal consistency across decisions/behaviors
  - Support initiative while maintaining cooperation among agents

Introduction

”The existence of unresolved conflict is a conspicuous feature of organizations, [making it] exceedingly difficult to construct a useful positive theory of organizational decision making if we insist on internal goal consistency.”

– Cyert and March (1963), *Behavioral Theory of the Firm*

Introduction

"Political models of organizations assume that these control devices, as well as others such as socialization, are not wholly effective in producing a coherent and unified set of goals. … To understand organizational choices using a political model, it is necessary to understand who participates in decision making, what determines each players stand on the issues, what determines each actors relative power, and how the decision process arrives at a decision."

– Pfeffer (1981), *Power in Organizations*

Introduction

“An emphasis on the political character of organizational decision–making is implicitly a focus on the strategic nature of organizational information. … In a conflict system, information is an instrument of consciously strategic actors. Information may be false; it is always serving a purpose ....Thus information is itself a game. Except insofar as the structure of the game dictates honesty as a necessary tactic, all information is self–serving. Consequently, meaning is imputed to messages on the basis of theories of intention that are themselves subject to strategic manipulation. The result is a complicated concatenation of maneuver in which information has considerably less value than it might be expected to have if strategic considerations were not so pervasive.”

– March (1981), "Decisions in Organizations and Theories of Choice", in *Perspectives on Organization Design and Behavior*

Introduction

- **Classics in "economics"**
  - *Strategic information transmission*
    - Crawford and Sobel (1982), "Strategic Information Transmission"
  - *Influence activities*
    - Milgrom and Roberts (1988), "An Economic Approach to Influence Activities in Organizations"
  - *Hard information*
    - Milgrom and Roberts (1986), "Relying on the Information of Interested Parties"
  - *Authority and incentives*
    - Aghion and Tirole (1997), "Formal and Real Authority in Organizations"

Introduction

- **(More) recent progress:**
  - Multiple agents ←→ dispersed information
  - Multiple stages ←→ initiative and cooperation
  - Multiple instruments ←→ decision structures and monetary incentives

    - [Athey and Roberts (2001), Alonso, Dessein and Matouschek (2008), Rantakari (2008), Dessein, Garicano and Gertner (2010), Friebel and Raith (2010), Rantakari (2013), Bonatti and Rantakari (2014), Alonso, Dessein and Matouschek (2014),…]

Introduction

- Today: beyond the allocation of formal authority
  - How decision structures influence the allocation of "real" authority, and its implications for
    - Incentives to share information
    - Incentives to generate ideas
    - Types of ideas generated
  - Rantakari (2014) – conflict resolution by the principal

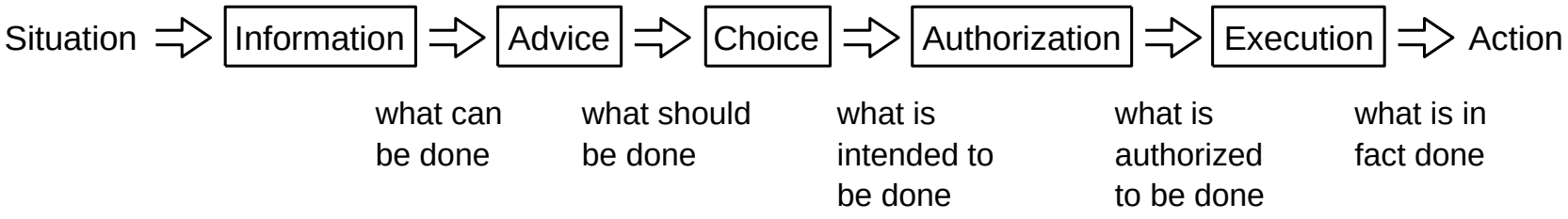
    (Rotemberg and Saloner, contests, focus, favoritism,…)
  - Bonatti and Rantakari (2014) – unanimity among the agents

    (endogenous proposals, compromise,…)

Introduction

- **Outline of the decision-making problem:**

(Mintzberg, 1979:188)



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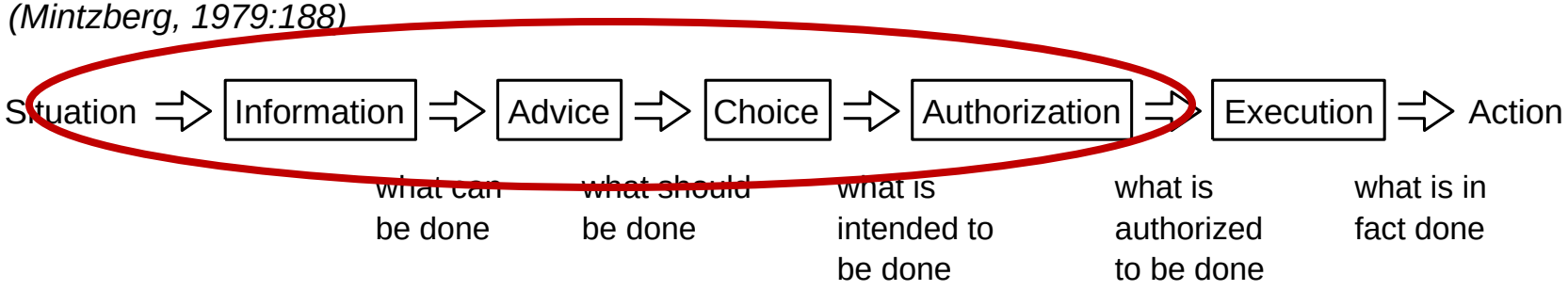

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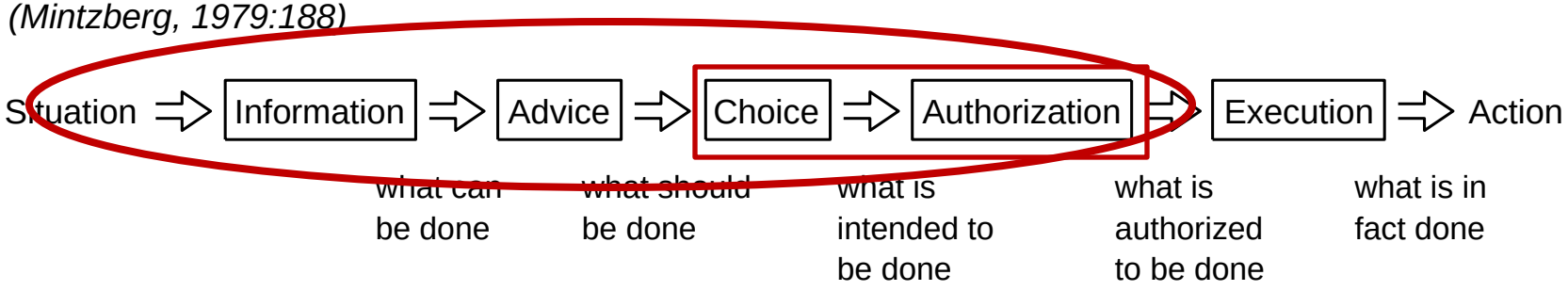
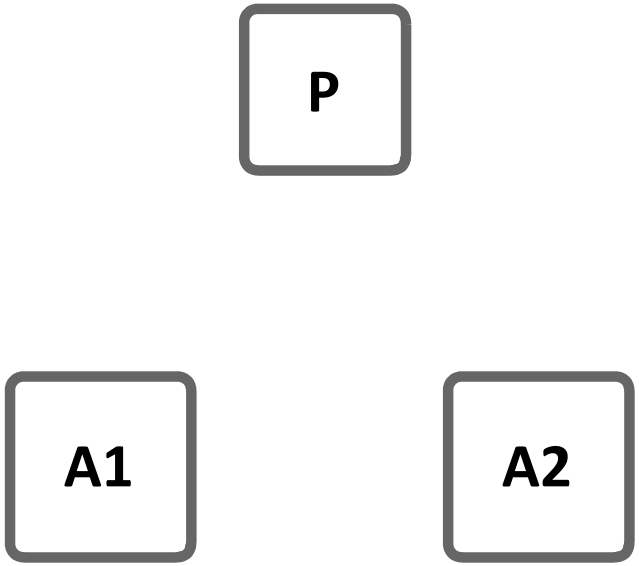


Framework



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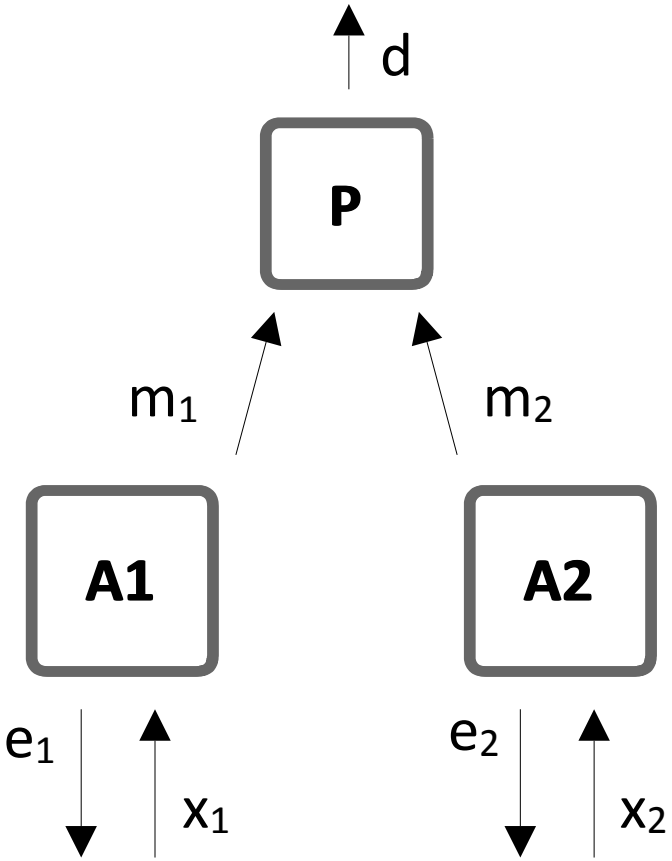

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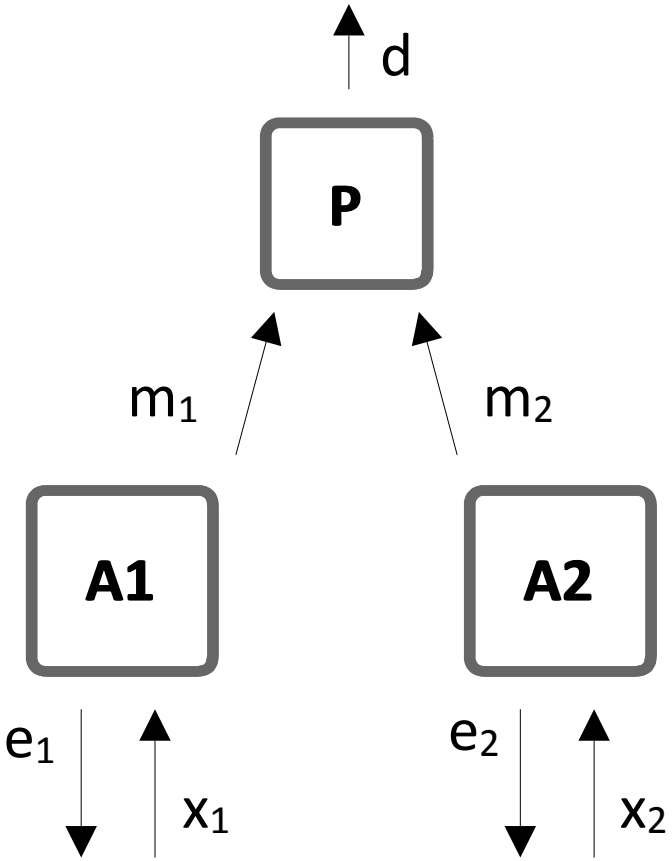
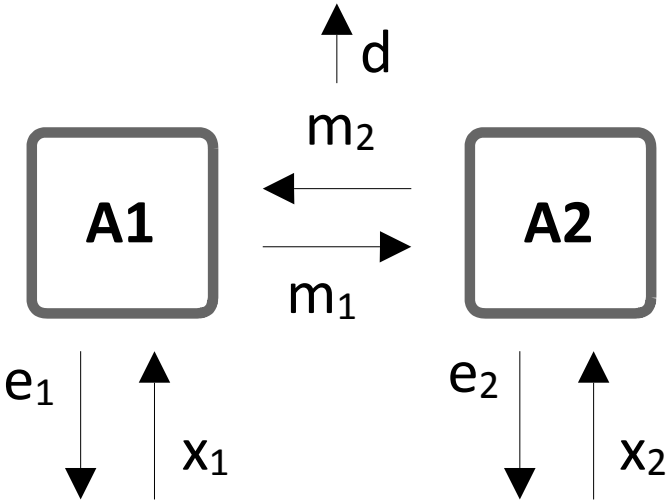




Conflict resolution

- **Setting:**
  - Two agents, create “ideas” for the organization to implement → initiative
  - Constraint: principal can implement only one alternative (resource constraint or technical infeasibility)
  - Challenge: how to motivate the creation of ideas
    - Soft versus hard information
    - Compensation of the agents (limited liability)
    - Disagreement ← → conflict resolution

Conflict resolution

Conflict Resolution:

- *Asymmetric:*
  - Conflict is consistently resolved in favor of one of the organizational members
    - *Focused organizations:* Apple, Walmart,…
      - divisional/functional organizations
- *Symmetric:*
  - In the case of conflict, everybody gets a fair shot
    - *Balanced organizations:* ABB,…
      - Matrix organizations

Conflict resolution

- **Main ideas:**
  - Favored in the case of conflict → more “power”
    - Analogous to AT: real authority
  - Multiple self-enforcing allocations of “power”
    - Agent behavior is endogenous to the allocation of power, which becomes self-enforcing
  - Hard information
    - Balanced organizations dominate
      - Tournaments/contests
  - Soft information
    - Focused organizations dominate
      - Cost of motivating both effort and sharing of info

Related Literature

- **Motivational effects of authority/conflict/focus:**
  - Rotemberg and Saloner (1994,1995,2000), Aghion and Tirole (1997), Dewatripont and Tirole (1999), Rantakari (2012a), Bonatti and Rantakari (2014),…
- **Strategic communication** (Crawford and Sobel 1982)**:**
  - *Information aggregation:* Li, Rosen and Suen (2001), Wolinsky (2002), Alonso, Dessein and Matouschek (2008), Rantakari (2008,2012b,2013), Hagenbach and Koessler (2012), Galeotti et al. (2013), Li and Yang (2013), McGee and Yang (2013),…
  - *Information acquisition:* Pei (2013), Argenziano et al. (2013), Le Quement (2013),…
- **Organizational structures and design:**
  - Athey and Roberts (2001), Friebel and Raith (2010), Dessein, Garicano and Gertner (2010), Rantakari (2013),…

Model

Game:

- *Stage 1: generation of alternatives*
  - Managers choose their effort levels at personal cost $\mu C(p_i)$, with $C'(p_i), C''(p_i), C'''(p_i)>0$.
    - Cost of effort = μ
  - Effort increases stochastically the likelihood that the alternative will be successful, if implemented:

$$\theta_i = \Pr(success|implemented)$$

$$\text{effort } p_i \rightarrow \theta_i \sim U[0, p_i]$$

  - Draws are independent across the managers
  - Managers learn the quality of their alternatives

Model

- *Stage 2: Communication and decision-making*
  - The managers send cheap talk messages (m_i,m_j)
  - The CEO forms beliefs $E(\theta_i|m_i)$ and $E(\theta_j|m_j)$ and implements the one with higher expected success probability. Successful idea is worth 1.

  - Key: what to do when don't know which is better
    - **Conflict resolution strategy:**

$$q = \Pr\left(d = i|E(\theta_i|m_i^k) = E\left(\theta_j|m_j^{k'}\right)\right)$$

  - q = 1/2 → symmetric

Model

- *Stage 0: Design*
  - Compensation structure of the managers
    - pay based on success: $w_i(k = S), k = \{i, j\}$
  - An incentive-compatible conflict resolution strategy, *q*
  - *Goal*: maximize net profits subject to the Perfect Bayesian Nash Equilibrium of the game described

Analysis

Preliminaries:

- **First-best (firm undertakes the task)**
  - For low-enough cost, symmetric effort optimal
  - Otherwise, asymmetric effort optimal

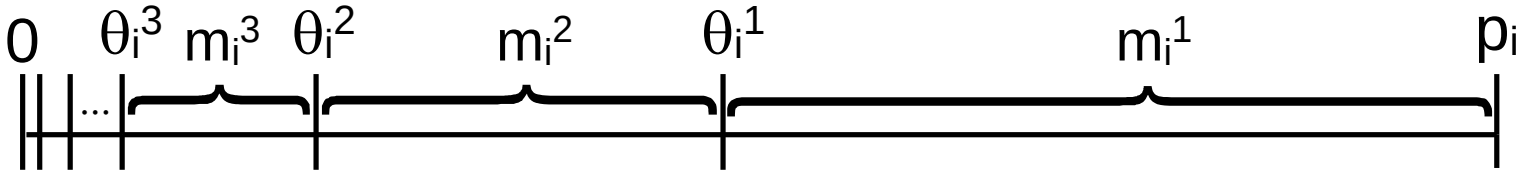
- **Second-best (managers generate ideas of verifiable quality)**
  - Symmetric contracts and thus efforts are optimal
    - Competitive benefits of symmetric agents (tournaments)

Analysis

Analysis

Communication:

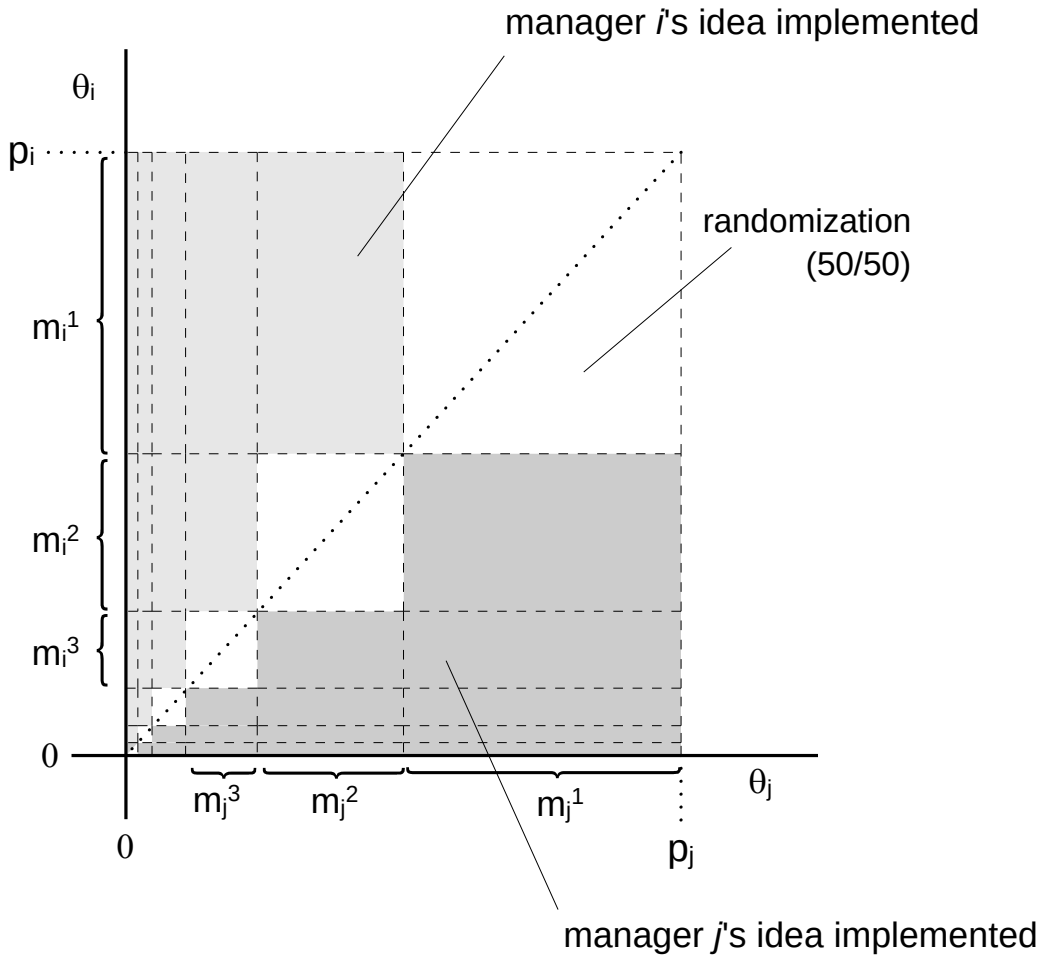
- Cheap talk: The managers send non-verifiable messages (m_i, m_j) to the CEO regarding the quality of their ideas and the CEO forms beliefs $E(\theta_i|m_i)$ and $E(\theta_j|m_j)$ and chooses which alternative to implement
- *Equilibrium:* partition structure (supermodularity in θ_i and probability of acceptance)



- Determinants: compensation structure and expected conflict resolution

Analysis

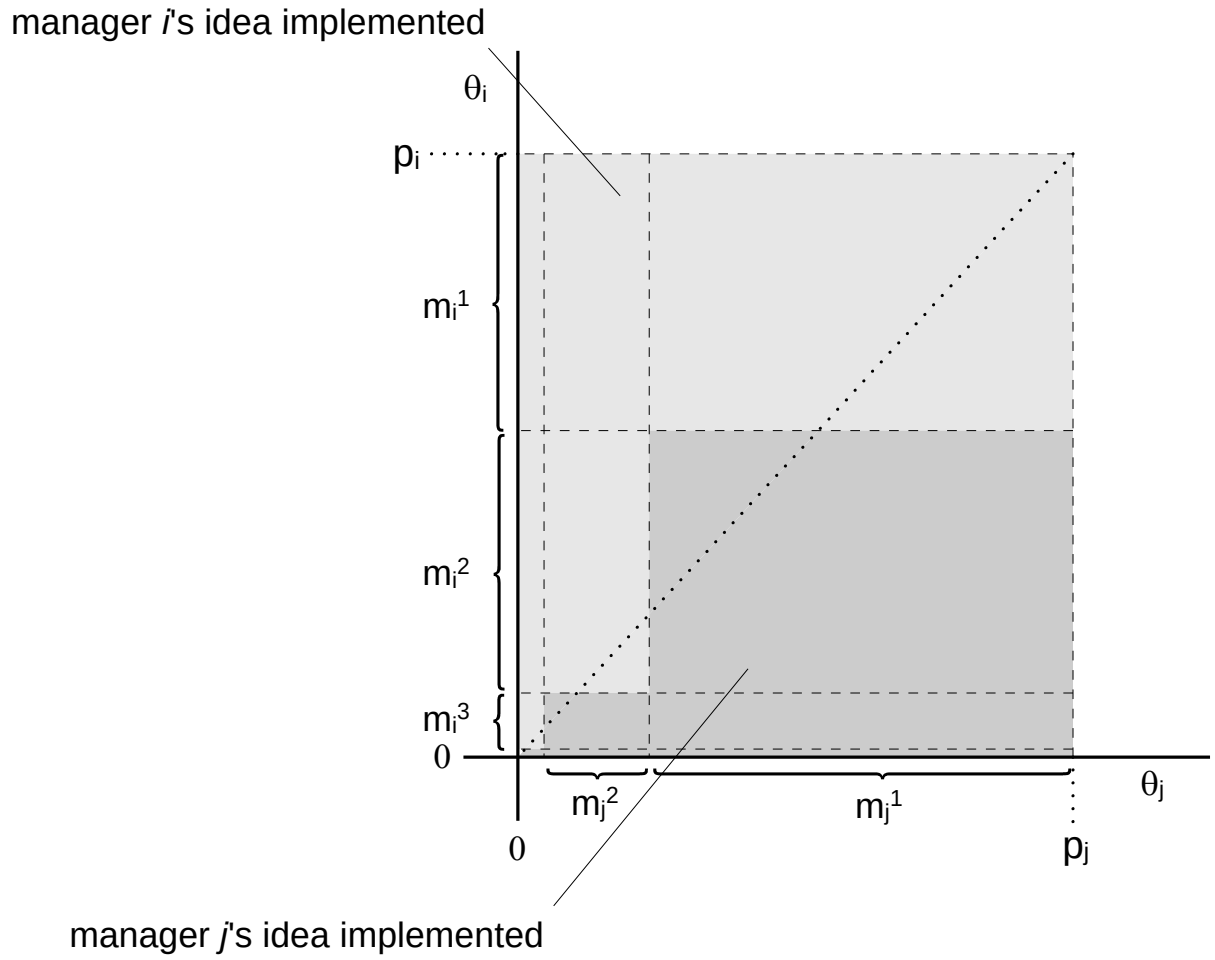
Conflict resolution:



(i) communication in a symmetric organization

Analysis

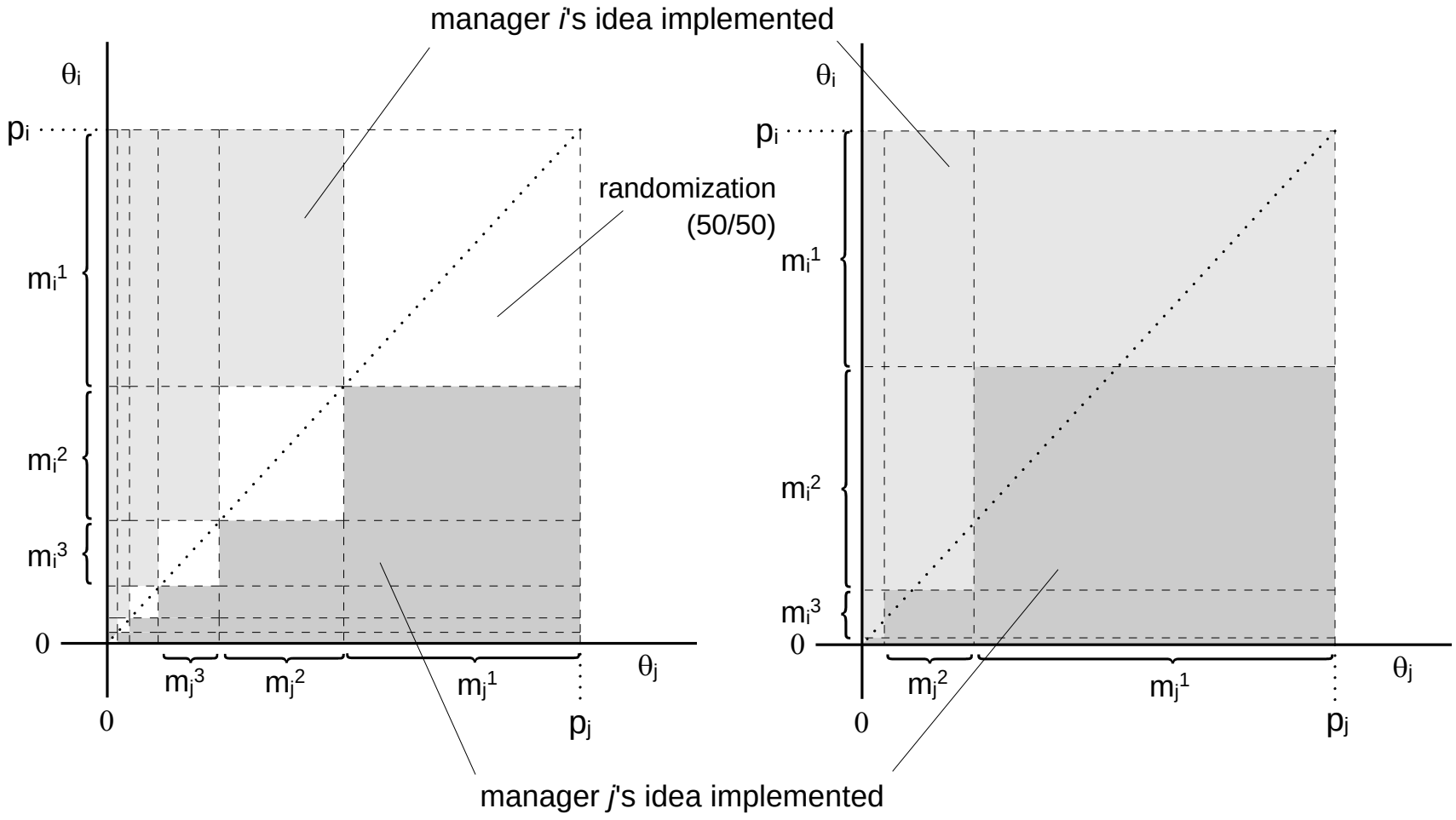
Conflict resolution:



(ii) communication in an asymmetric organization

Analysis

Conflict resolution:



(i) communication in a symmetric organization

(ii) communication in an asymmetric organization

Analysis

Conflict resolution:

- Relative to symmetric conflict resolution, asymmetric conflict resolution induces
  - The favored manager to be more conservative
  - The non-favored manager to be less conservative
    - *Self-enforcing*

- **Under symmetric compensation contracts, the expected success probability is unchanged**
  - Irrelevance of conflict resolution

Analysis

Compensation structure:

- Define alignment as $x_i = w_i(j)/w_i(i)$
- The precision of communication by manager *i* is increasing in both x_i **and** x_j.
  - (main determinant: relative alignment $y = x_i x_j$)

- Under the asymmetric structure, I can increase the asymmetry in the alignments while holding the relative alignment $y = x_i x_j$ constant and improve the precision of communication
  - Information from the favored manager is relatively more valuable

Analysis

- **(Unconditional) expected success probabilities**
  - *Symmetric organization:*
    - Increasing in the level of (shared) alignment
  - *Asymmetric organization:*
    - Favored agent:
      - Decreasing in the levels of alignment
    - Non-favored agent
      - Increasing in the levels of alignment
    - Joint: improving
    - (asymmetry – favored agent becomes more willing to concede to the non-favored agent)

Analysis

Incentives to generate alternatives:

- Simple answer:
  - More likely to have implemented → work harder
- *Symmetric organization:*
  - Increasing in alignment (x) and the strength (w) of incentives
- *Asymmetric organization:*
  - Favored: Decreasing in alignment (x_i,x_j) and increasing in the strength ($w_i(i)$) of incentives
  - Non-favored: Increasing in alignment (x_i,x_j) and the strength ($w_j(j)$) of incentives

Analysis

Effort choices:

Differences in the communication stage

(more precise communication coupled with more frequent implementation by the favored manager)

get compounded in the effort stage

(more effort by the favored manager)

Analysis

- **Design:**
  - Example - Balanced organization:

$$\max_{x,w} \left(\frac{1+x}{2+x}\right)\bar{p}(1-(1+x)w)$$

$$\text{s.t.} \quad \frac{1}{2}\left(\frac{1+x}{2+x}\right)w = \mu C'(\bar{p})$$

Analysis

- **Proposition:**
  - Given flexible compensation contracts, the asymmetric structure always dominates the symmetric structure

- *Logic:* replication argument

Analysis

- **Proposition:**
  - In the optimal focused organization, the favored manager will
    - be provided with more balanced incentives:

$$x_i^* \geq x_j^*, \text{ with } x_j^* = 0 \text{ if } x_i^* \leq \bar{x}_i$$

    - be more influential:

$$\Pr(i) \geq \Pr(j)$$

    - work harder:

$$p_i^* \geq p_j^*$$

Analysis

Observations:

- Improvements in information technology support more balanced organizations
- Interdependency between the adopted conflict resolution strategy and optimal compensation contracts
- The challenge of sustaining balance

Application

- **Corporate strategy:**
  - Porter (1980): focus on differentiation or cost
    - Apple, Southwest,…
  - Bartlett and Ghoshal (1991) (among others)
    - Must do both to be successful → hybrid strategies
    - Big and small, local and global,… (ABB)
  - U-form (functional) → cost
  - M-form (product/region) → differentiation
  - Matrix → both

Application

- **Changes to the framework:**
  - (1) Endogenous compatibility
    - Each manager chooses likelihood of compatibility:

$$\tau_i \in [0,1]$$

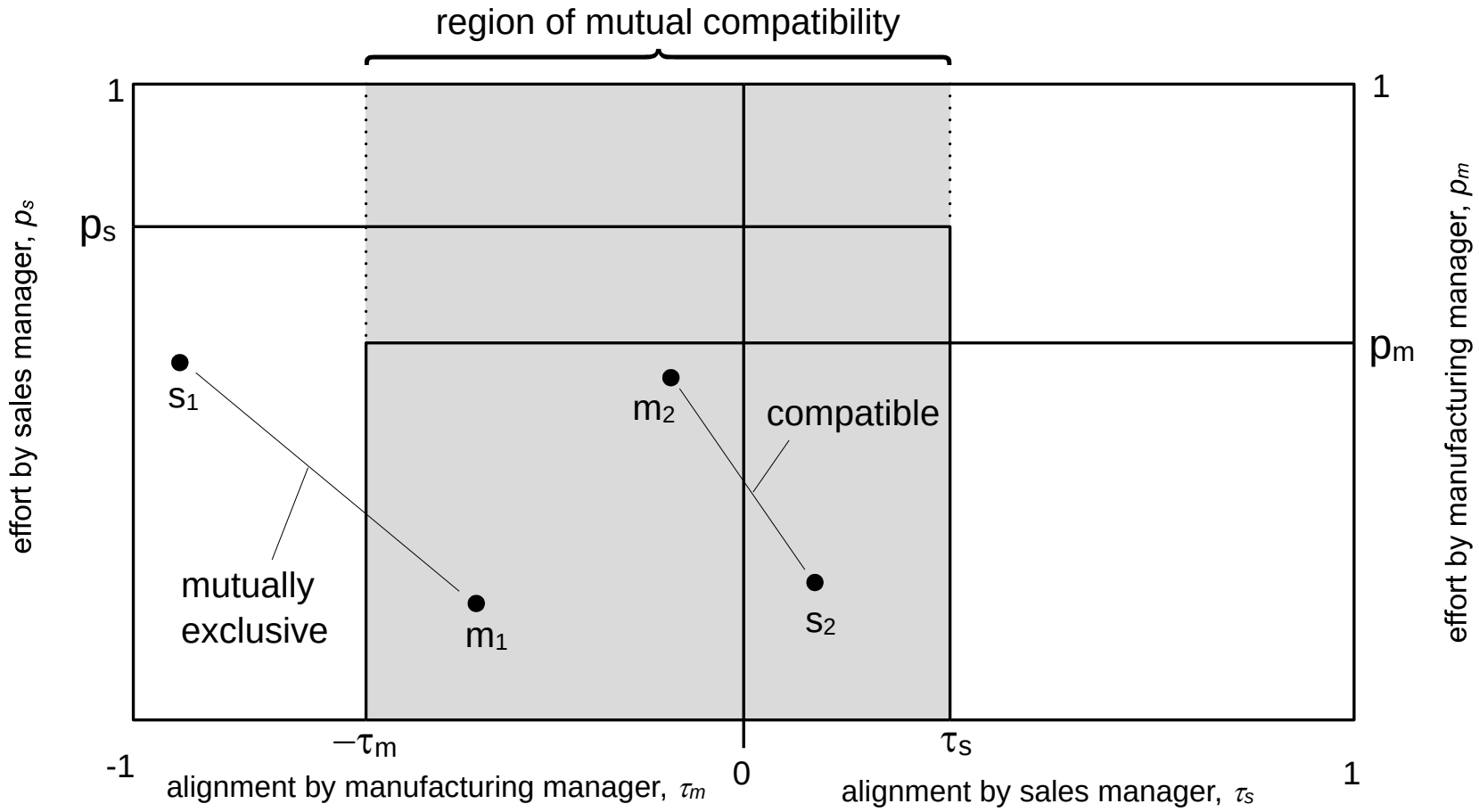
    - Resulting likelihood that both can be implemented:

$$(\tau_i + \tau_j)/2$$

    - Cost of compromise – costlier to generate ideas

$$\frac{\partial^2 C(p_i,\tau_i)}{\partial p_i \partial \tau_i}, \frac{\partial C(p_i,\tau_i)}{\partial \tau_i} > 0$$

Application



Application

- (2) Embed the “firm” in a competitive framework
  - Horizontal Hotelling on a line, located at end-points on the line
  - Innovations:
    - Sales manager: increase value from v_L to v_H
    - Manufacturing manager: reduce cost from c_H to c_L
  - Compete in price after learning the realizations
  - Ex post profit:

$$\pi_i = \frac{K}{2t}\left(\frac{(\Delta v+\Delta c)}{3} + t\right)^2$$

    - Δv, Δc are the value and cost advantages relative to the competitor

Application

- Expected value of a single success

$$\Delta\pi_i^M = K\left[\frac{\Delta}{3} + \frac{\Delta^2}{18t}(1 - 2(p_j^M + 2p_j^H))\right]$$

- Expected value of a double success

$$\Delta\pi_i^H = K\left(\frac{2\Delta}{3} + \frac{4\Delta^2}{18t}(1 - (p_j^M + 2p_j^H))\right)$$

- Complementarity of successes

$$\gamma = \frac{(\Delta\pi^H - 2\Delta\pi^M)}{\Delta\pi^M} = \frac{2\Delta}{\left[6t + \Delta\left(1 - 2\left[p_j^M + 2p_j^H\right]\right)\right]}$$

  - t = degree of product differentiation
  - p_j^H = probability of opponent having both high value and low cost
  - p_j^M = probability of opponent having either high value or low cost

Application

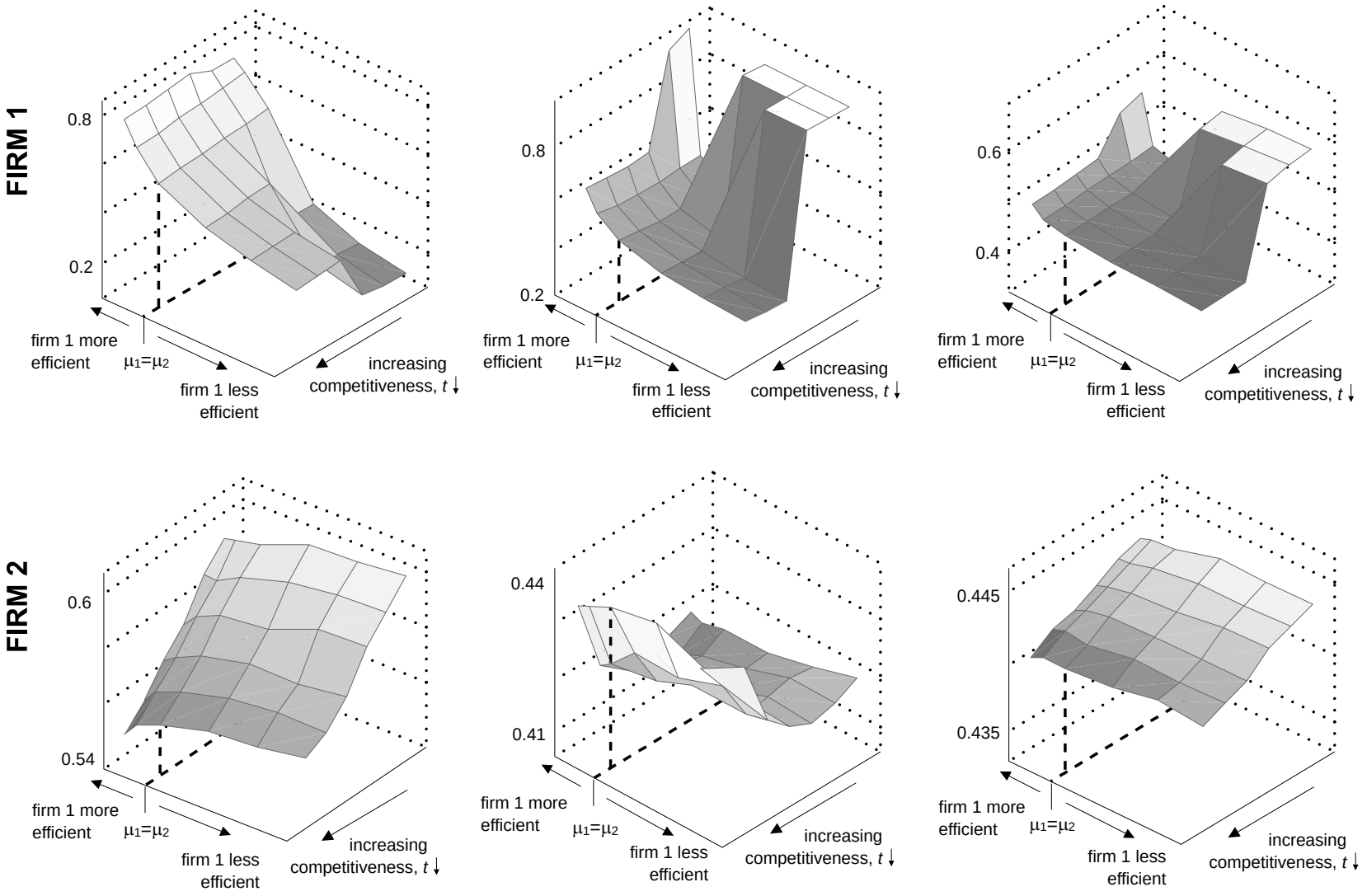
- **Basic observations:**
  - A decrease in product differentiation (an increase in competitiveness)
    - increases the value of a single success as long as
      $$1 \geq 2(p_j^M + 2p_j^H)$$
    - increases the value of a joint success as long as
      $$1 \geq p_j^M + 2p_j^H$$
    - always increases the relative importance of a joint success
  - An increase in the efficiency of my competitor decreases the absolute value of any success but increases the relative value of a joint success

Application

(i) average effort, $(p_s+p_m)/2$

(ii) degree of balance, Pr(m)/Pr(s)

(iii) probability of mutual compatibility, $(\tau_s+\tau_m)/2$



Summary

- Endogeneity of balance and performance
  - Efficiency → balance
  - Inefficiency (sometimes) → balance
- Ambiguous impact of competition
  - Innovation may become less valuable (absolute)
  - But success in both dimensions becomes relatively more valuable

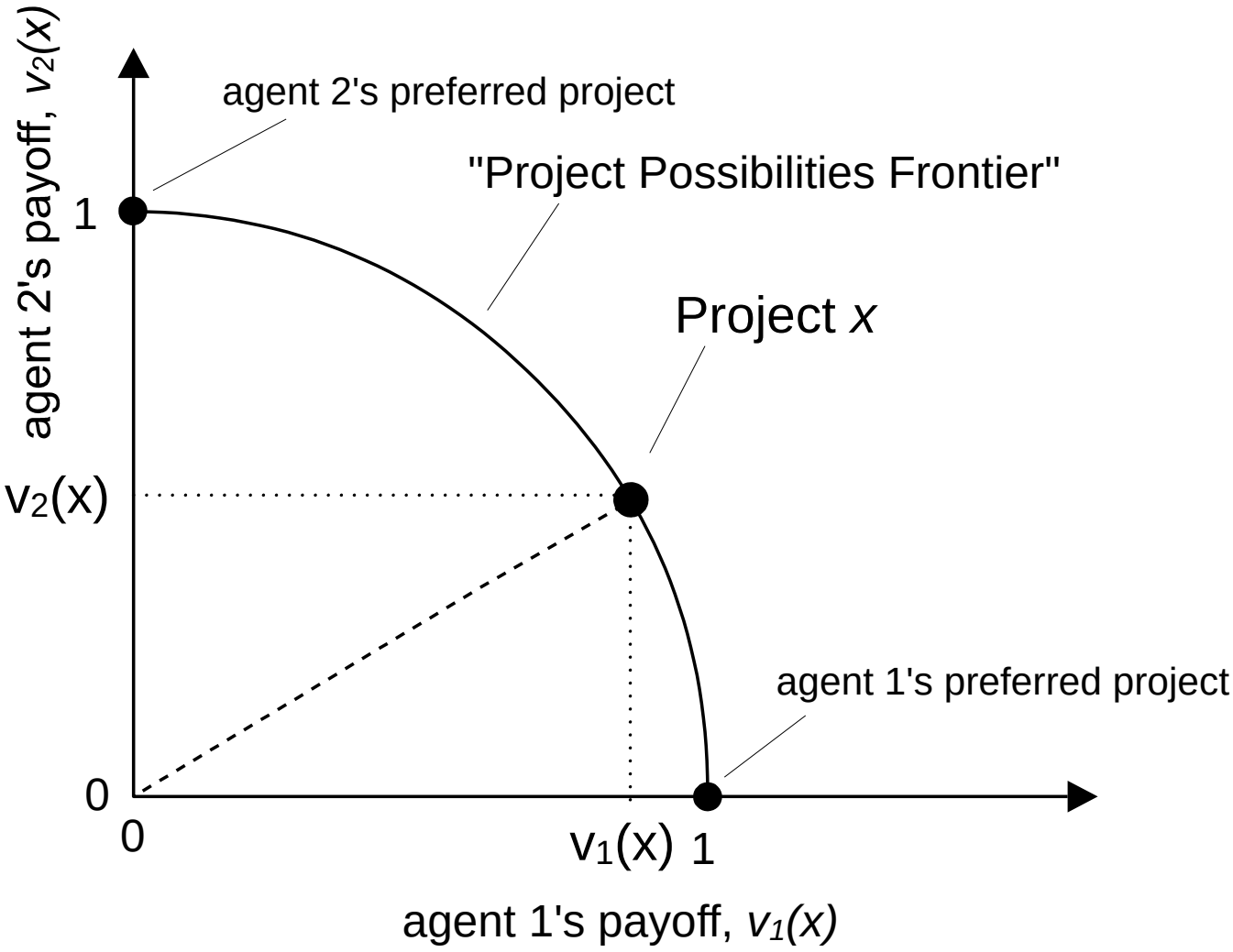
Summary

- Limitations (of the framework):
  - Simple choice problem
  - Limited role for the “boss”/principal
  - Blending hard and soft information?
  - Truly optimal contracts?
  - Does increased power always motivate?
  - Endogeneity of the “types” of proposals
    - Rantakari (2013), Bonatti and Rantakari (2014), Levy (2014)

Politics of compromise

- **Setting:**
  - Two agents generate “ideas”
    - Development takes time, expected time to completion is reduced by working harder
      - Continuous time, Poisson arrival
    - Choose what types of ideas to work on
      - Compromise is valuable
      - Development choices are guided by future implementation decisions
      - Decision process (no monetary transfers):
        - » Simple: right to block
        - » Richer: deadlines, etc.

Politics of compromise



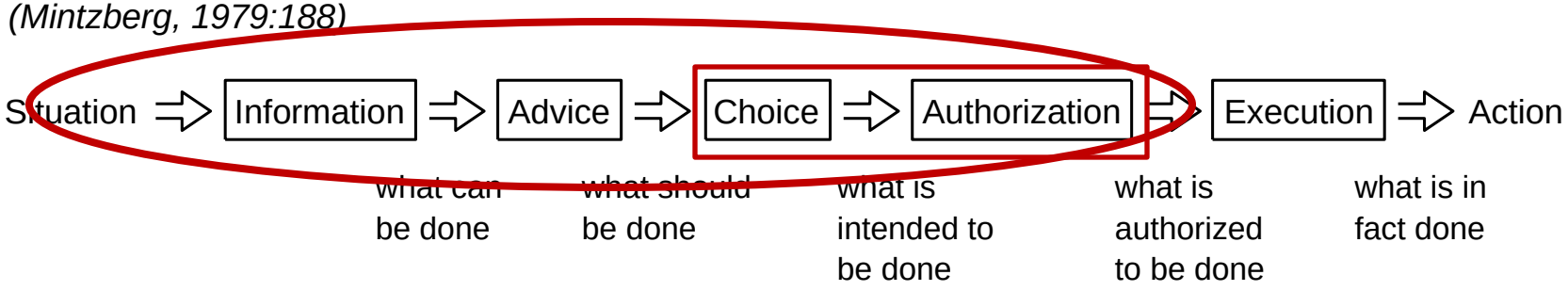
Politics of compromise

- **Basic ideas:**
  - Compromise arises in equilibrium to buy the consent of the other party
    - Unanimity rule can induce efficient effort and compromise
    - Deadlines for counteroffers can achieve the same
  - An impartial third party with no commitment power cannot induce any compromise
  - Conflicting goals may foster both compromise and equilibrium efforts.

Politics of compromise

- **Outline of the decision-making problem:**

(Mintzberg, 1979:188)



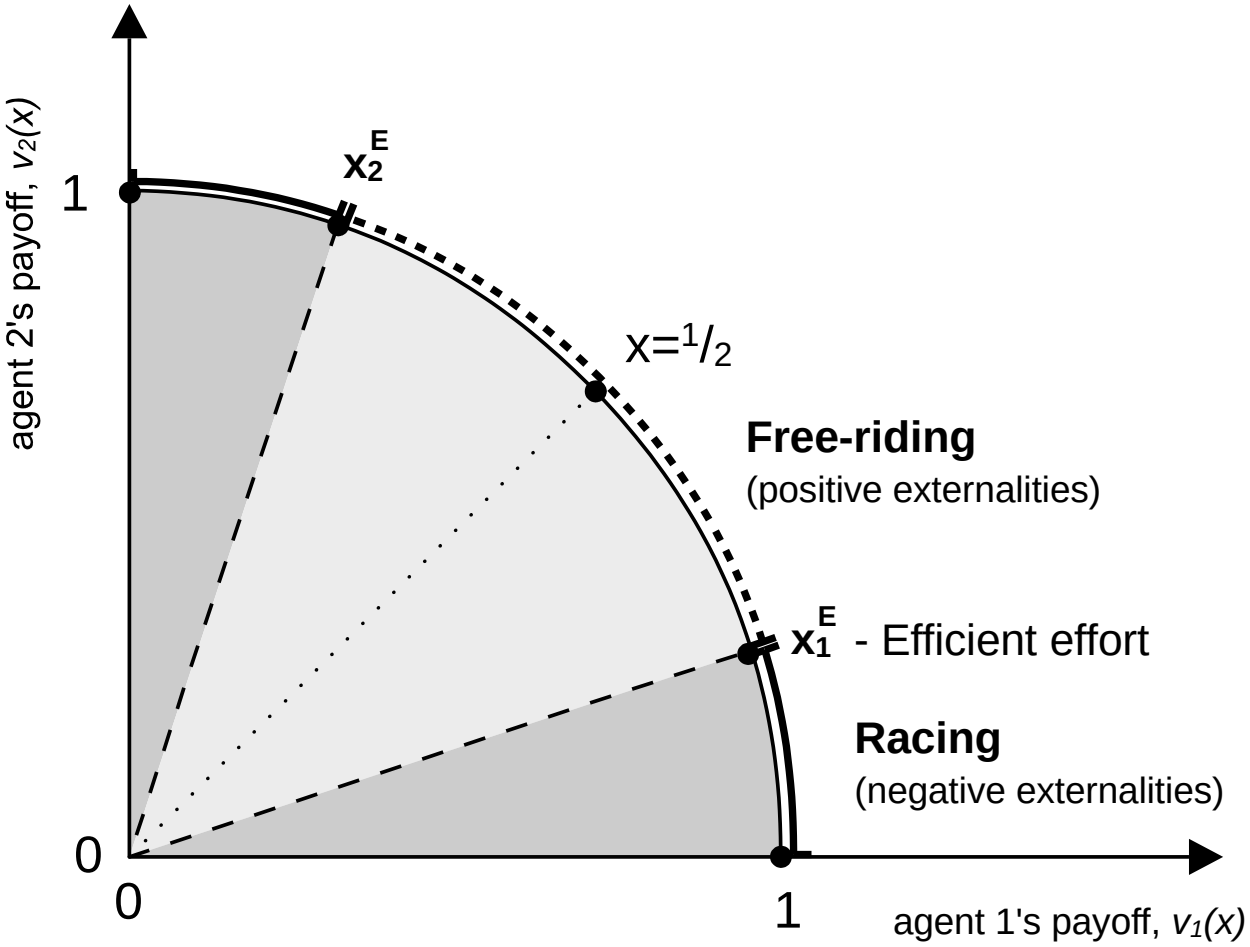
Politics of compromise

- **Fama and Jensen (1983):**
  - Decision process:
    - Initiation and implementation → *decision management*
    - Ratification and monitoring → *decision control*
  - While specific knowledge and skills may necessitate the delegation of decision management, decision control is rarely delegated "to limit the power of individual decision agents to expropriate the interests of the residual claimants.“ (p.309)
- **Alternatively:**
  - Power over initiation and implementation can be a significant source of power

Politics of compromise

- **Equilibrium efforts:**
  - Depending on the equilibrium projects chosen, either substitutes or complements
    - Equilibrium polarization → contest
    - Equilibrium alignment → teams/free-riding
  - Two effects:
    - Opponent works harder:
      - More likely to create positive value to me and save me effort costs → substitutes
      - But pre-empts my chance of implementing something even better → complements

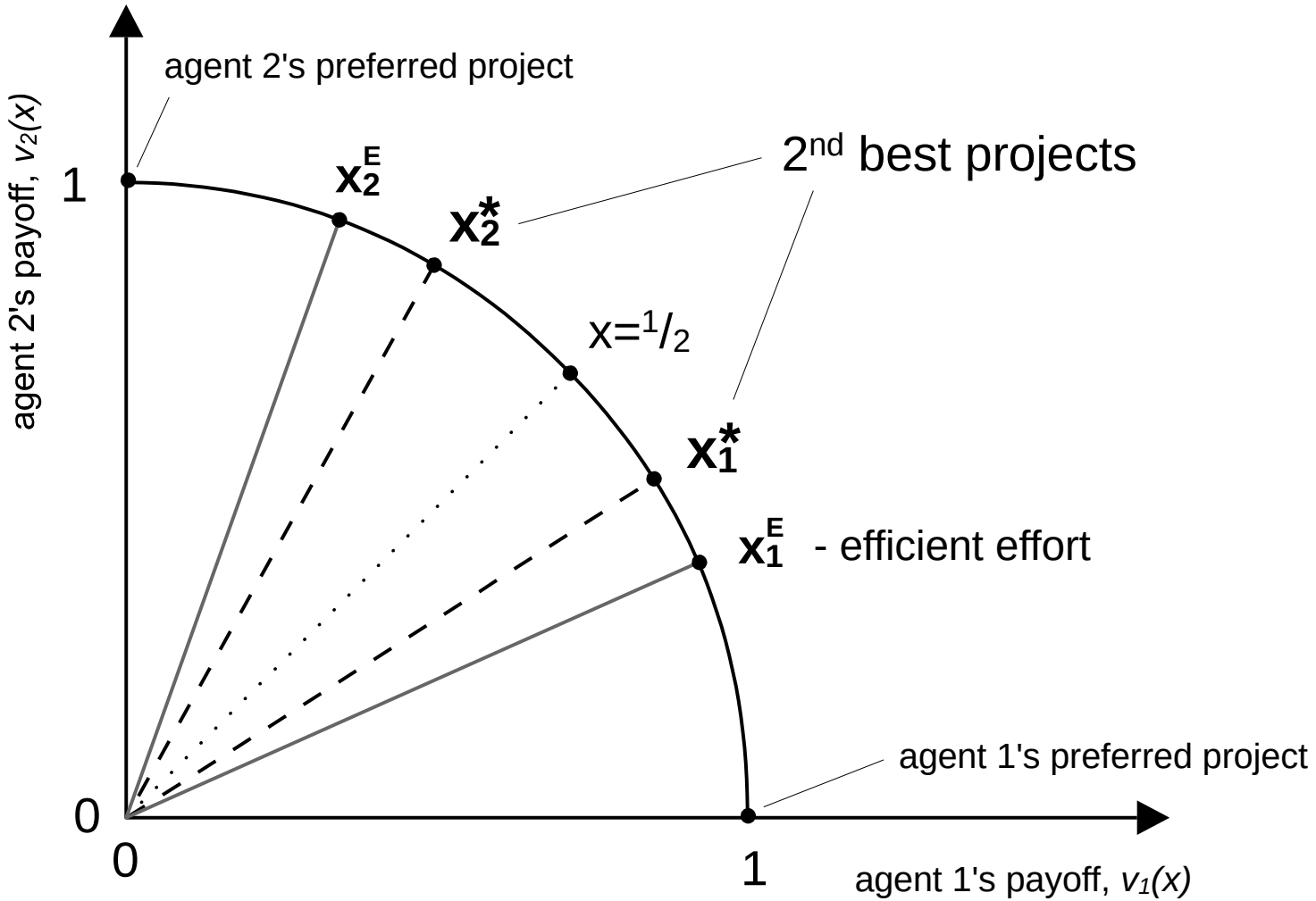
Politics of compromise



Politics of compromise

- **Second-best outcome:**
  - Optimal project choice given incentive-compatible effort levels
  - Solution is always in the substitutes region
    - Envelope theorem

Politics of compromise

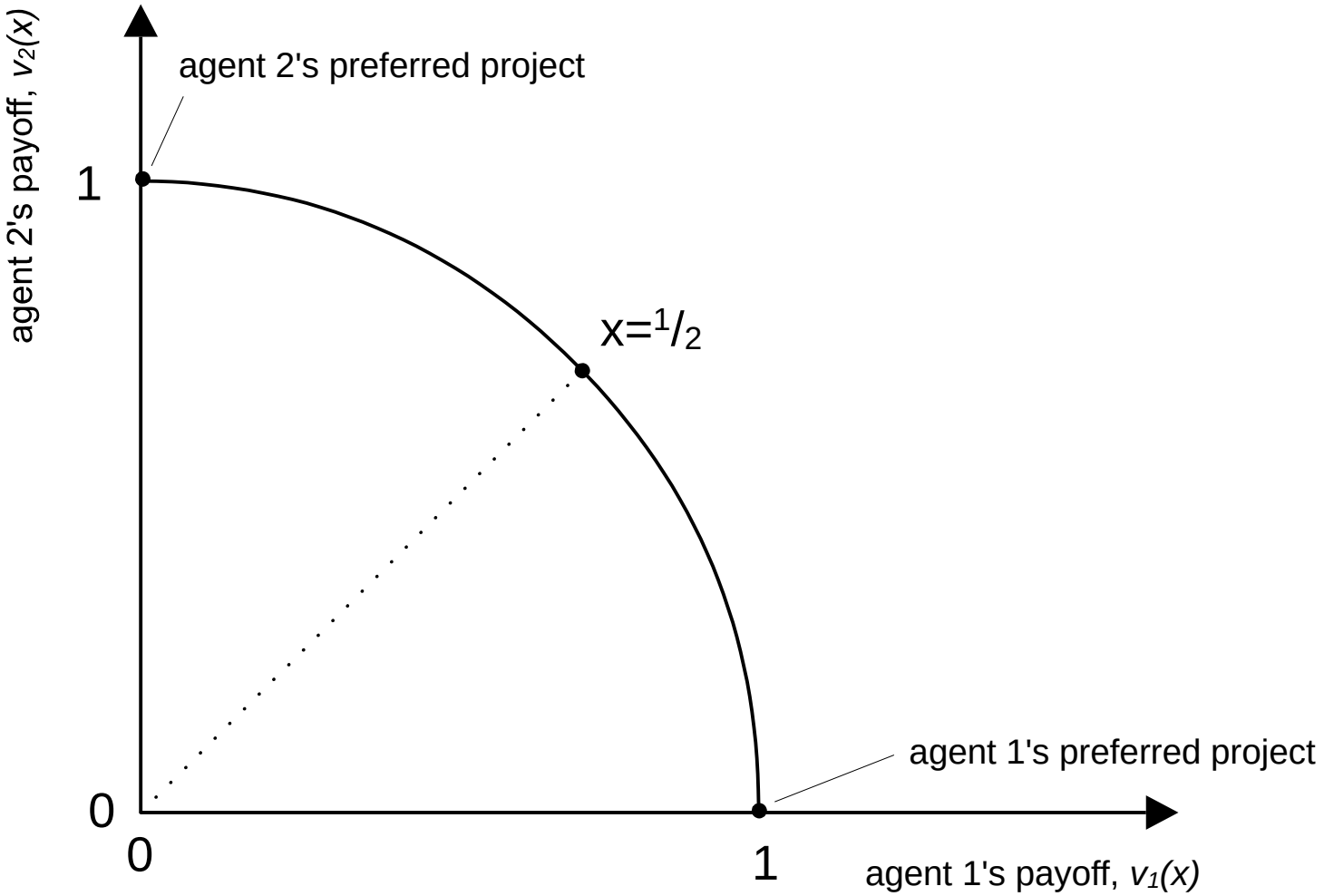


Decision processes

- **Unilateral implementation:**
  - First with a solution can implement it
  - No compromise

- **Authority:**
  - Agent with authority can implement anything he wants → fully selfish choice
  - Agent without authority must obtain the approval of the other agent → compromise
    - But limited by the other agent's ability
    - Threshold: NPV of developing own ideal project

Decision processes



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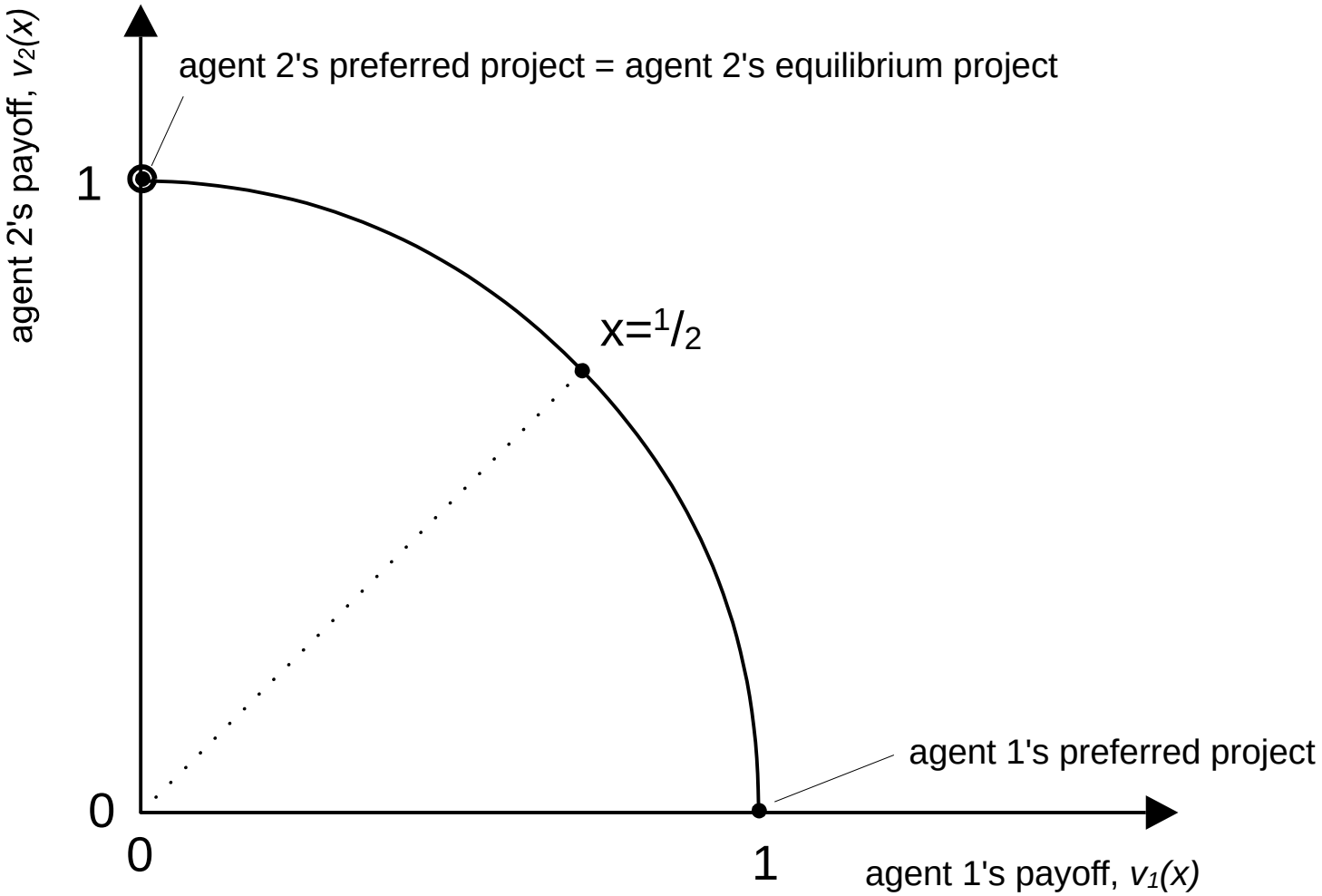

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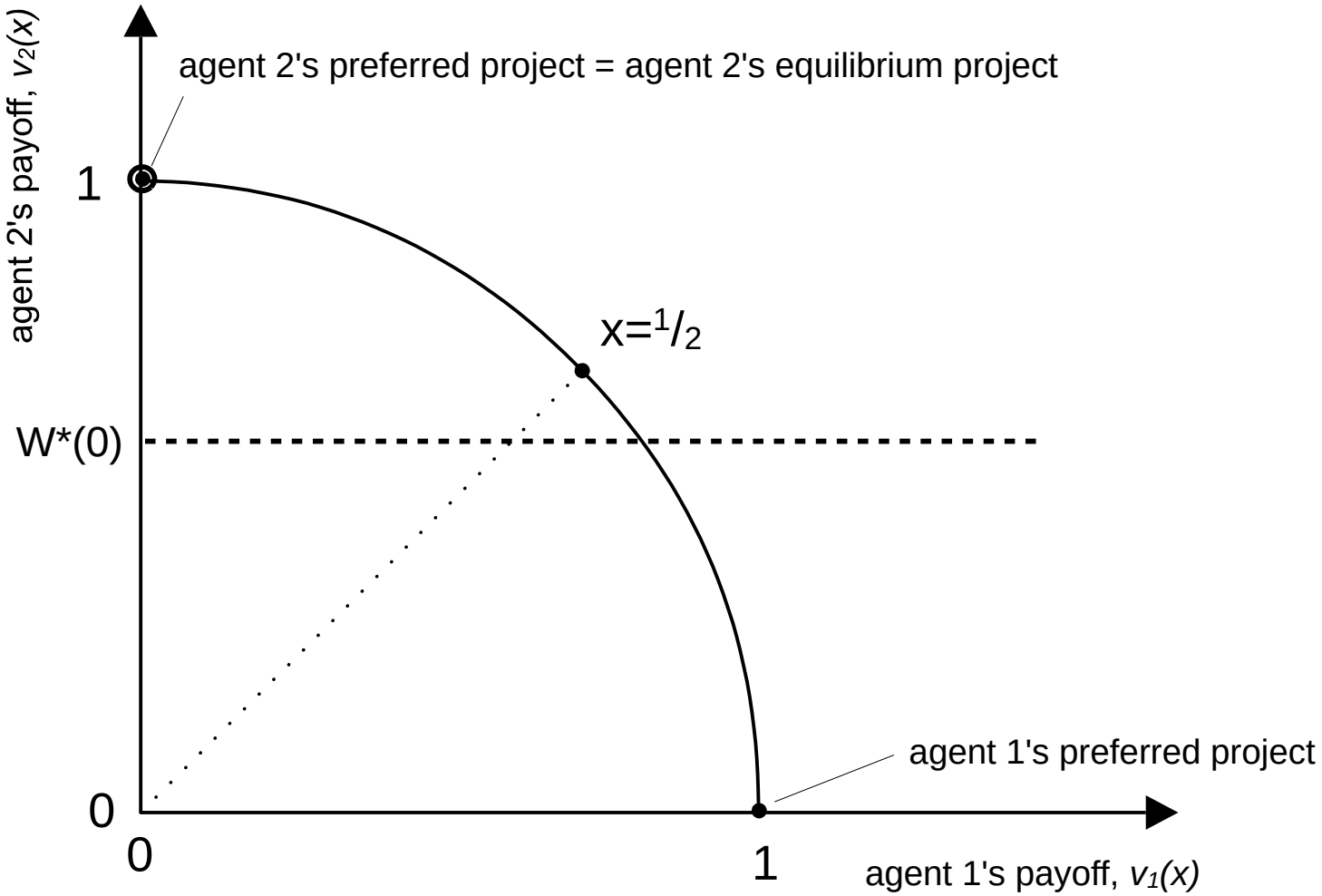

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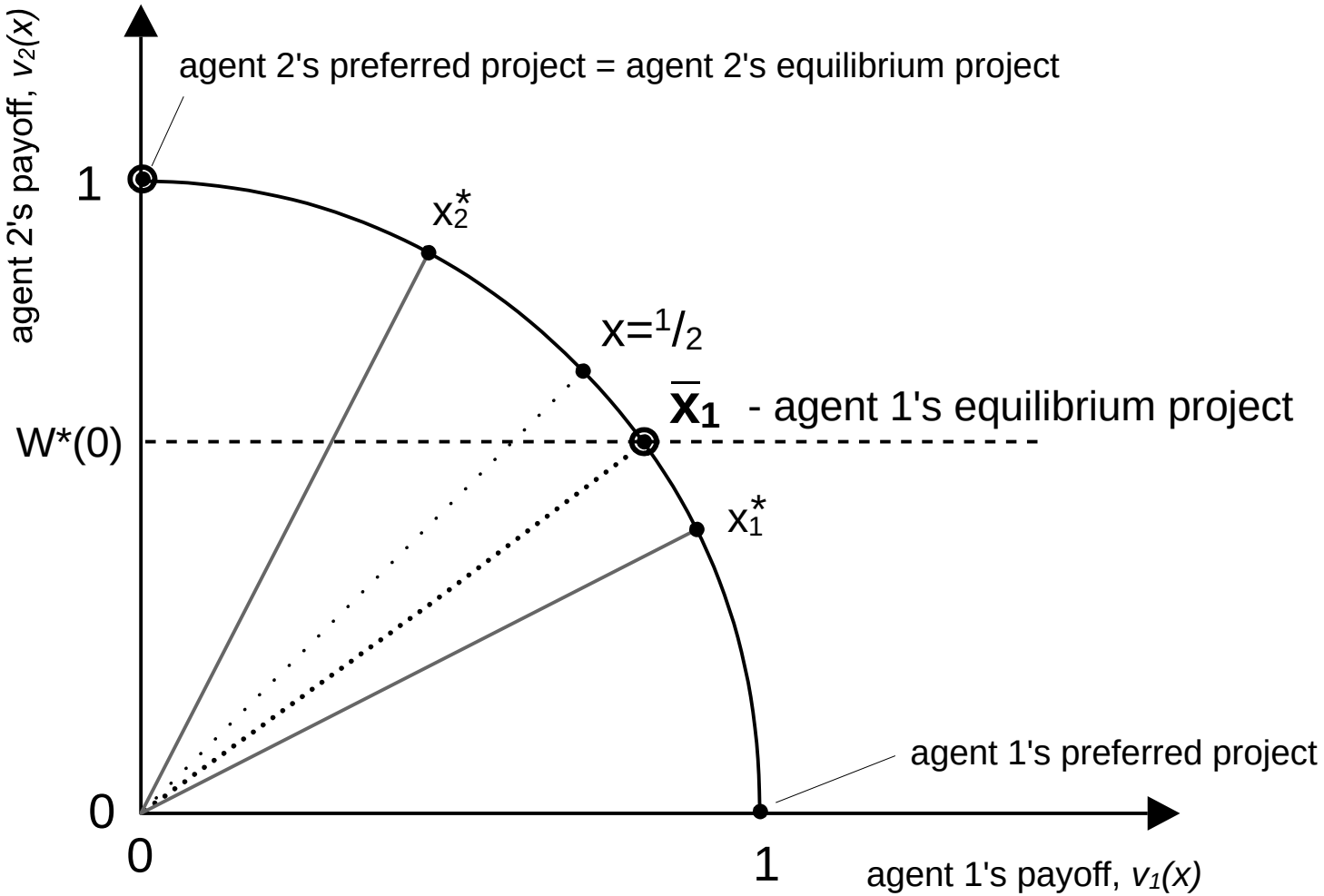
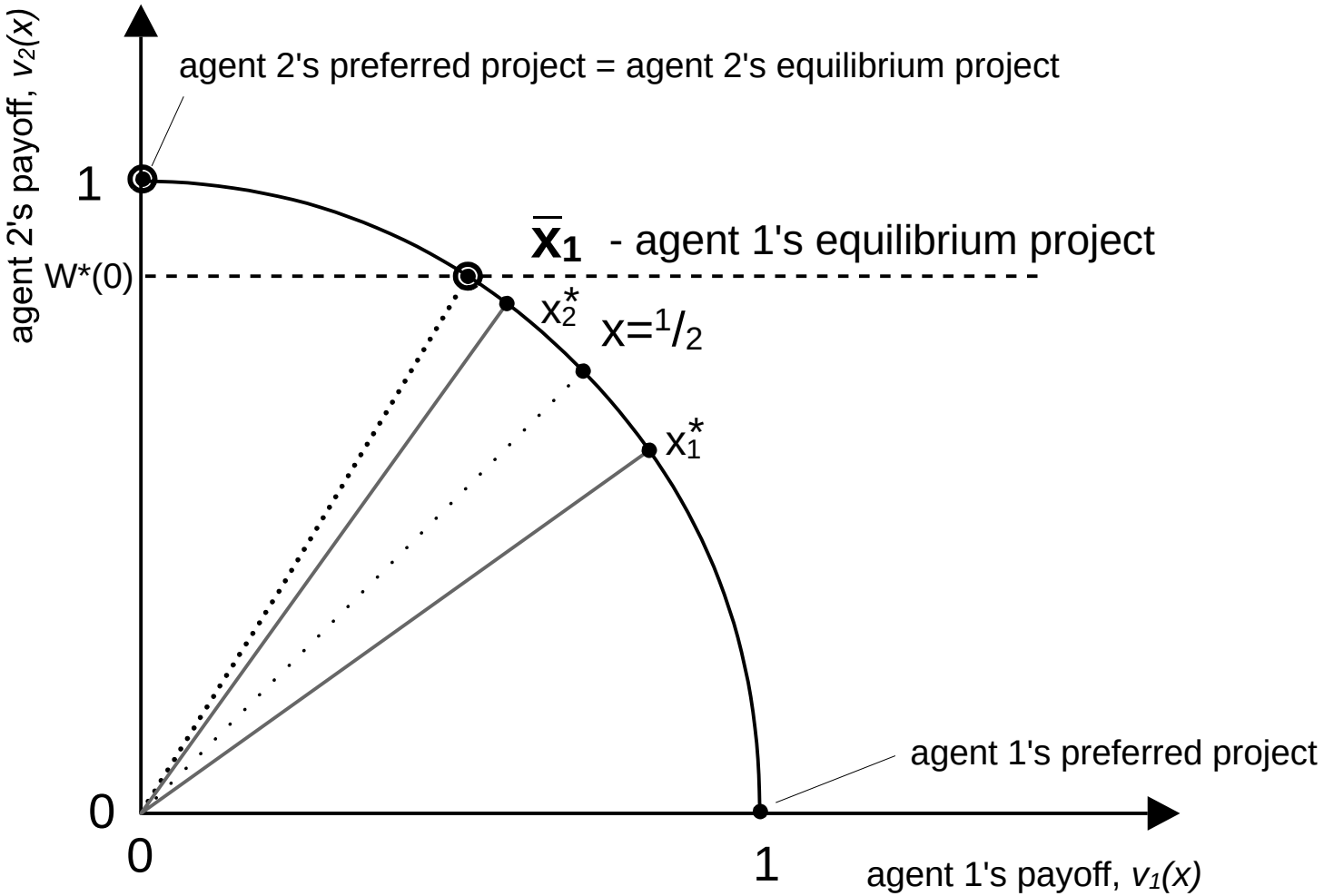
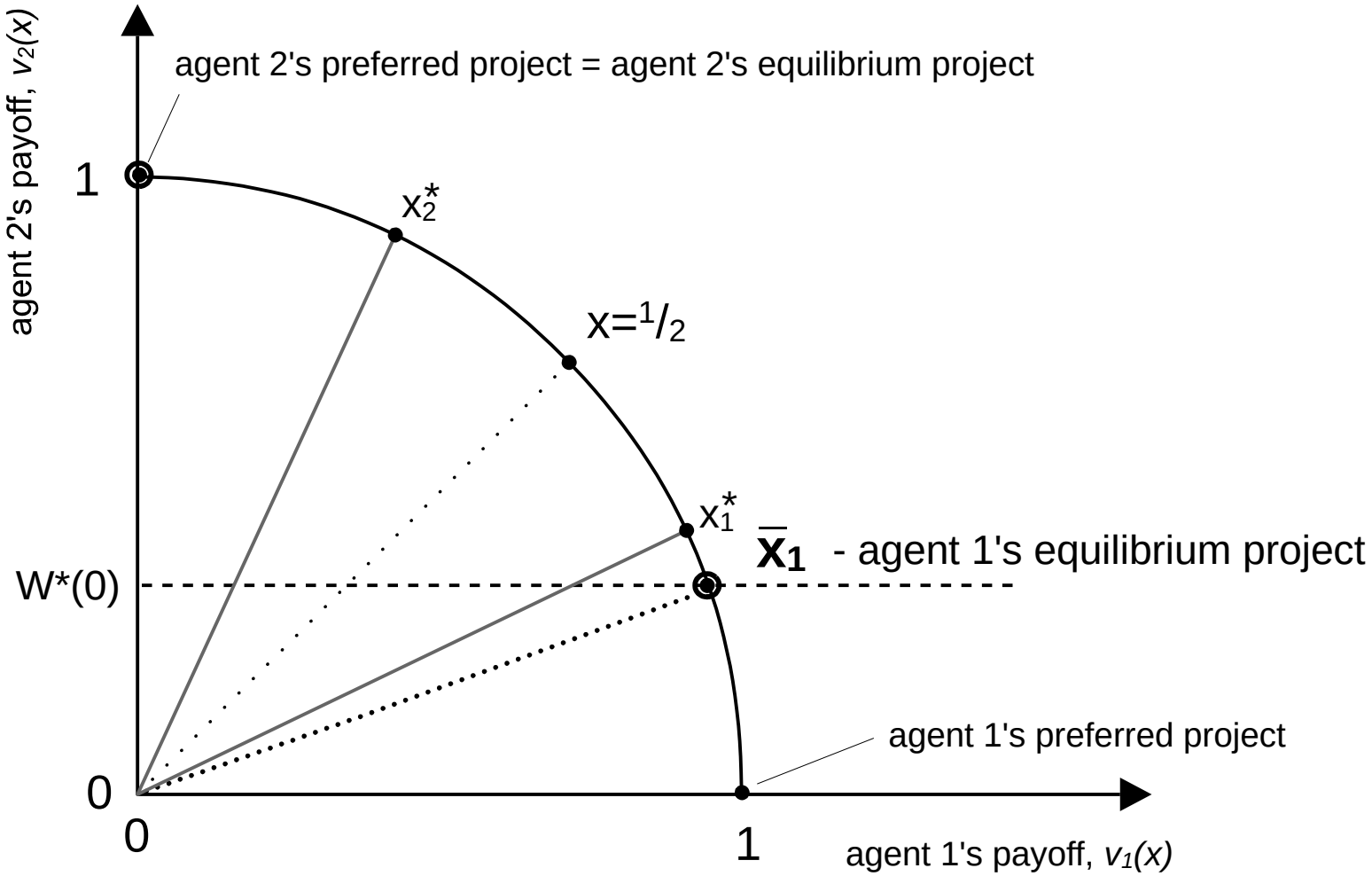


Decision processes



Decision processes

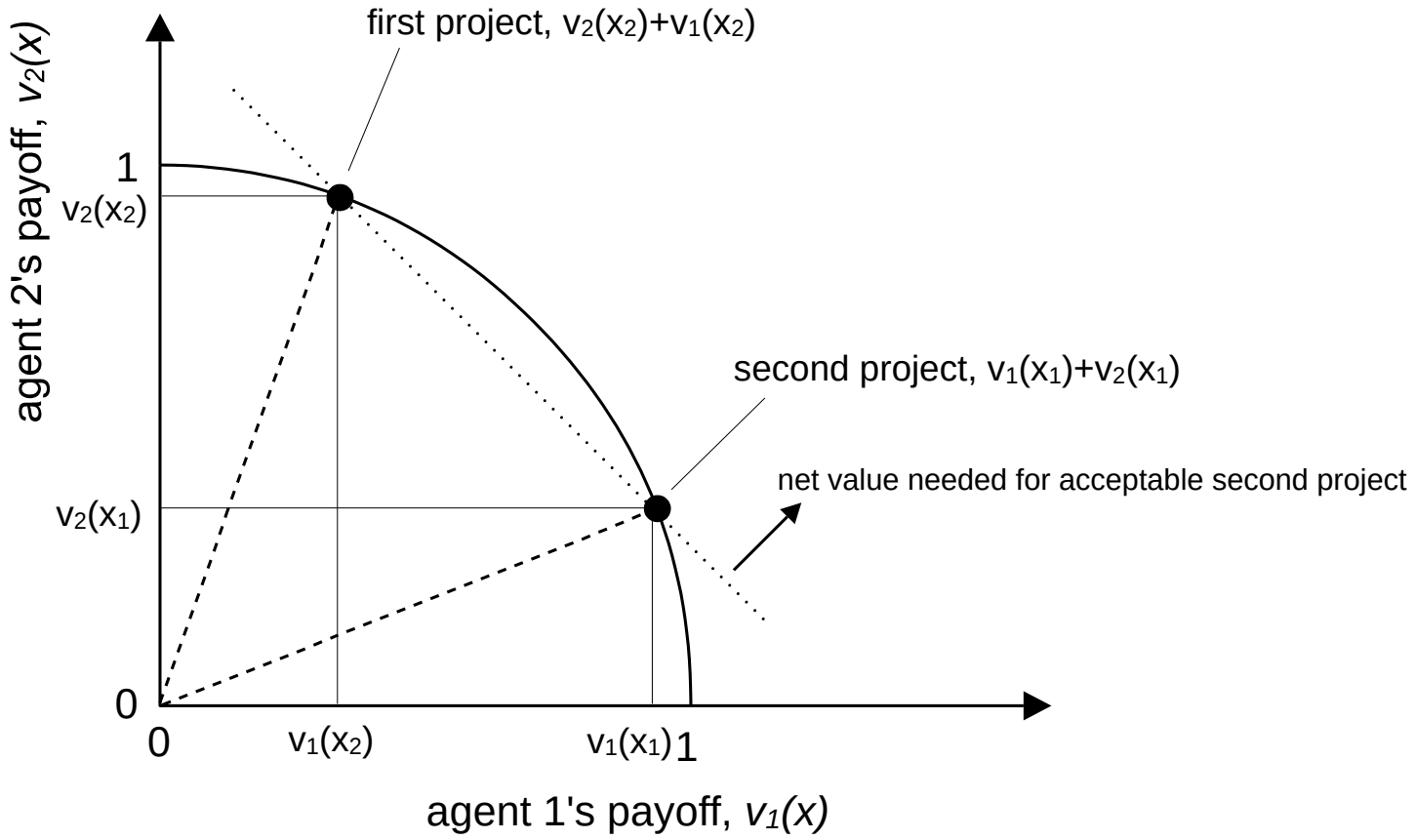


Decision processes

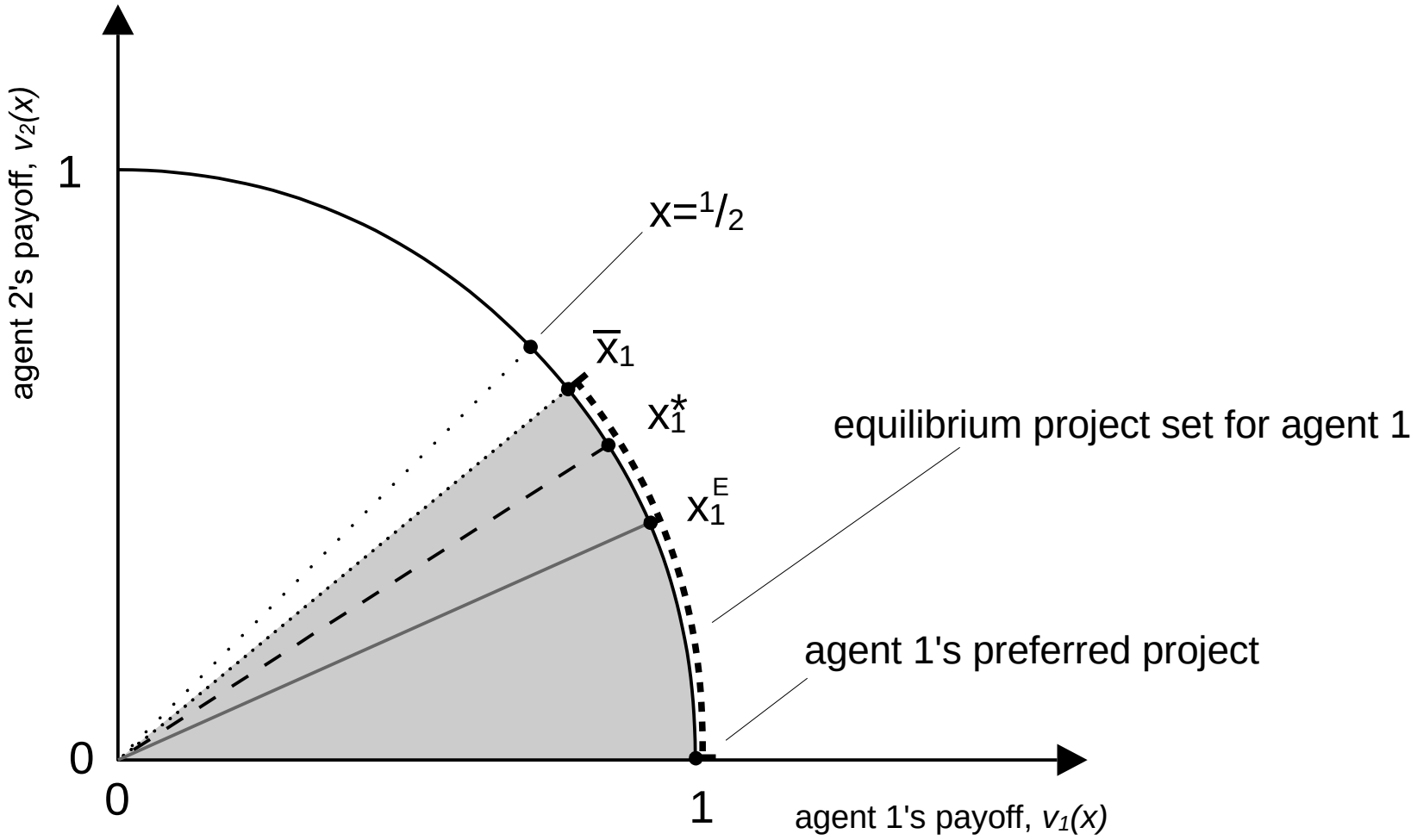
- **Unanimity:**
  - Backward-induction
    - Stage 2 – both projects on the table
      - Bargaining outcome, e.g. war of attrition
    - Stage 1 – one project on the table
      - Accept the proposal or hold out until reaches stage 2
        - » Expectation of stage 2 determines what is acceptable in stage 1
    - Stage 0 – choice of projects
      - Optimal compromise to avoid delay to stage 2
    - Multiple equilibria

Decision processes

- Example: efficient continuation
  - Suboptimal compromise



Decision processes



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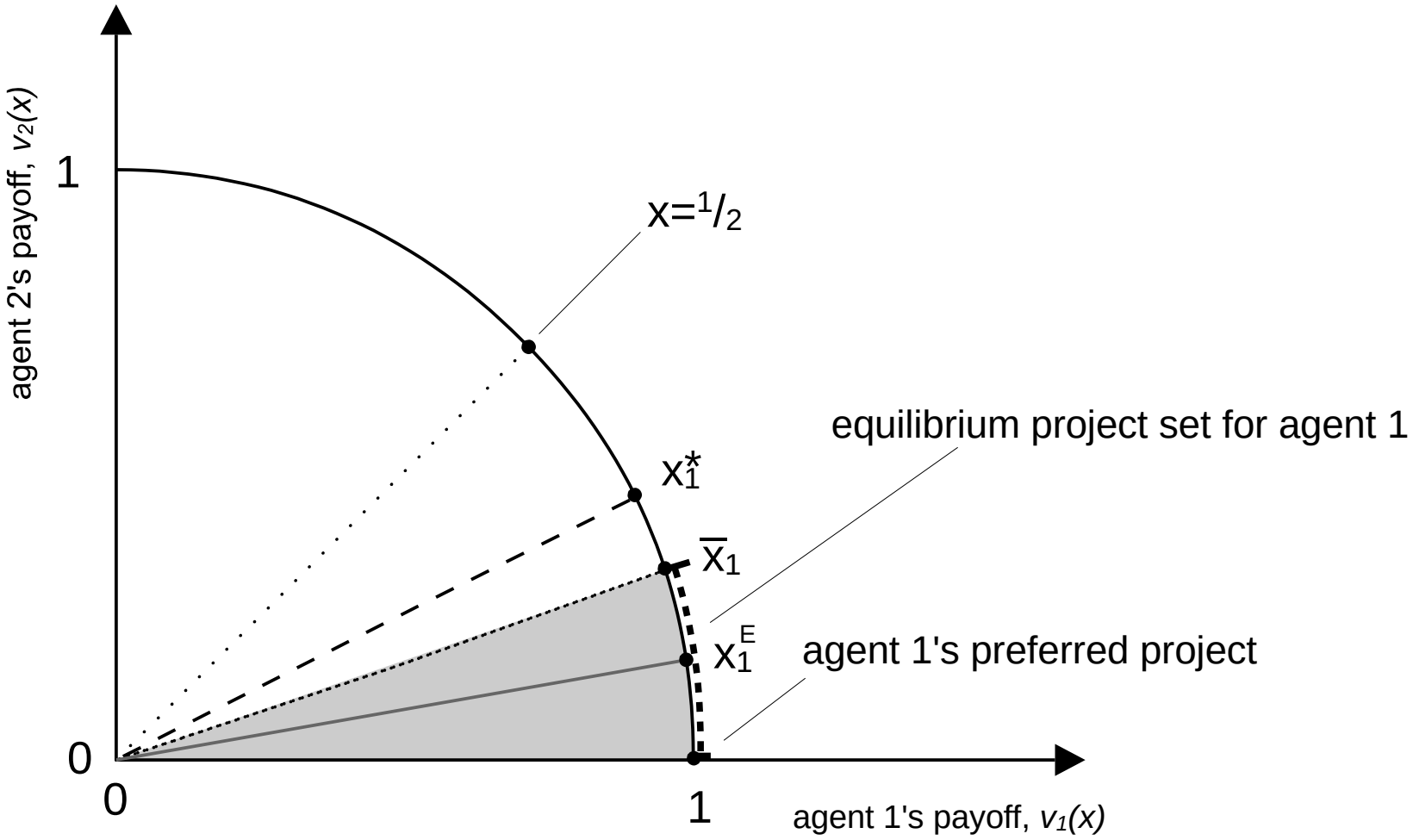
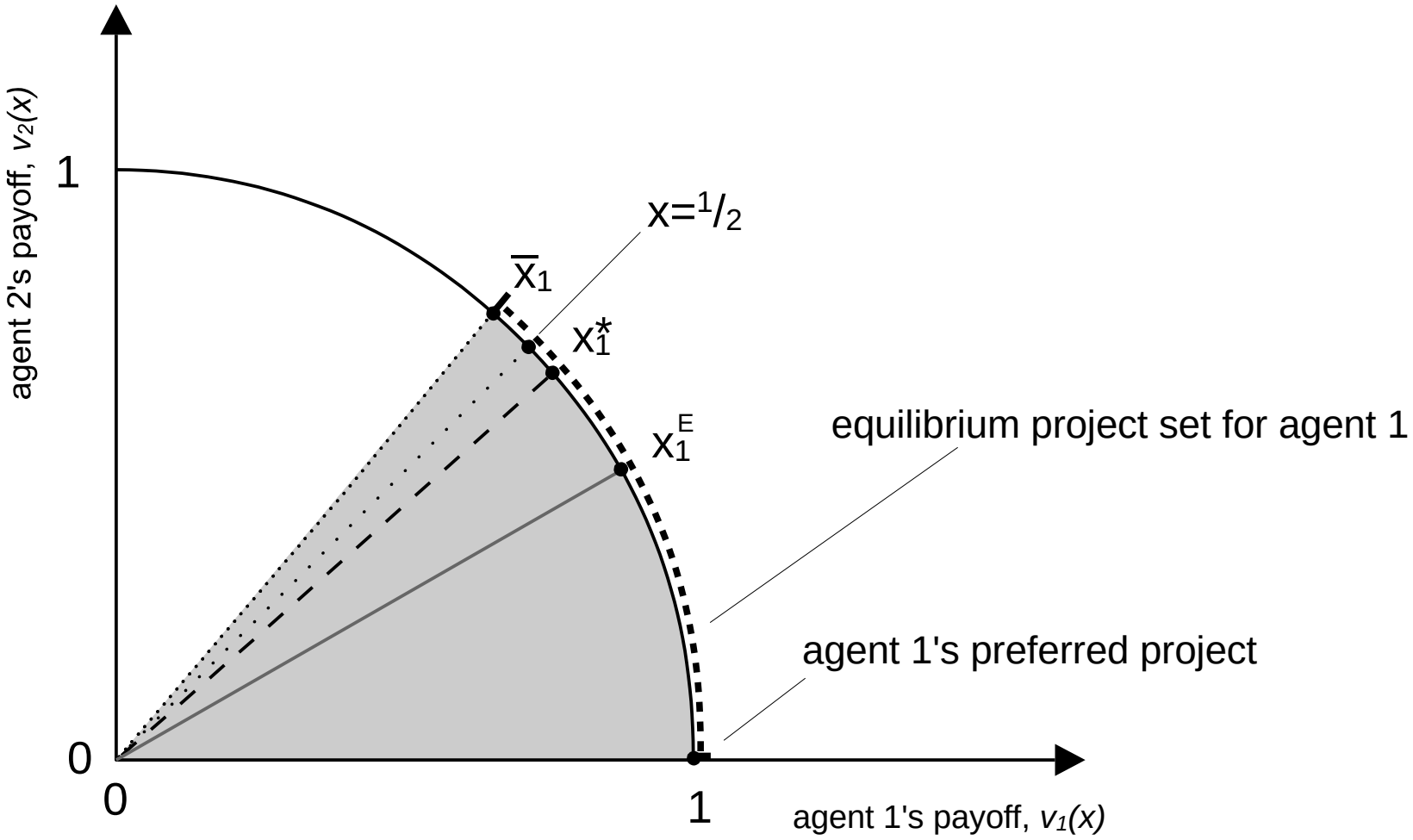
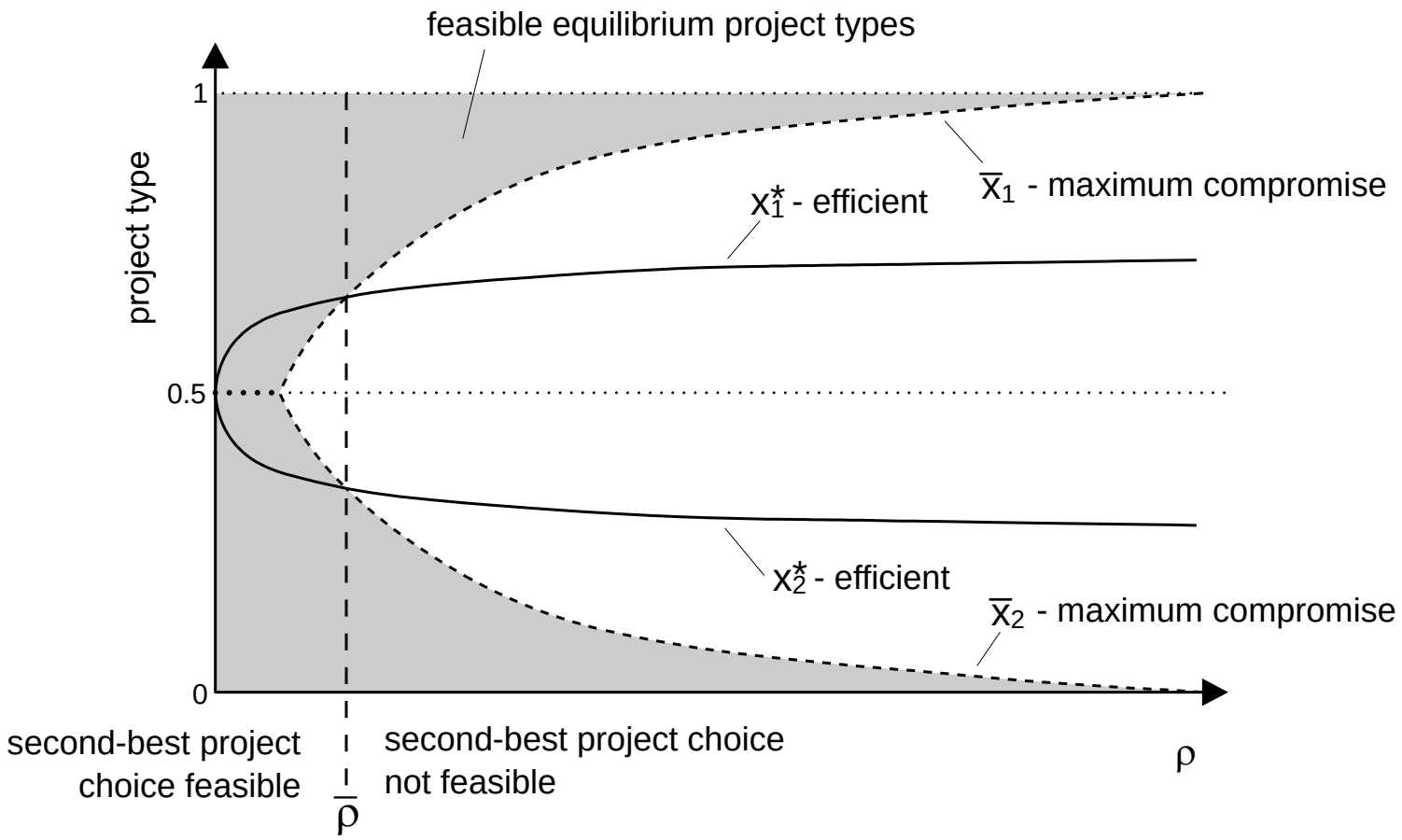


Decision processes



Decision processes

- Equilibrium set as a function of cost of effort (or discounting)



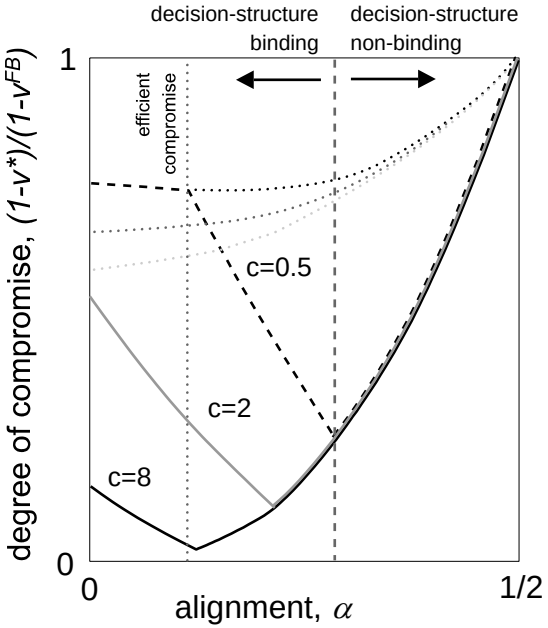
Decision processes

- **Observations:**
  - Unanimity spans the set of possible outcomes
  - Equilibrium selection: more detailed rules for the process (but cannot do better)
    - Ex: deadlines for counteroffers
  - Intuitive decision processes may not work
    - Ex: deadline with the ability to go back to the original proposal
  - Efficiency may require dissipation of value off path

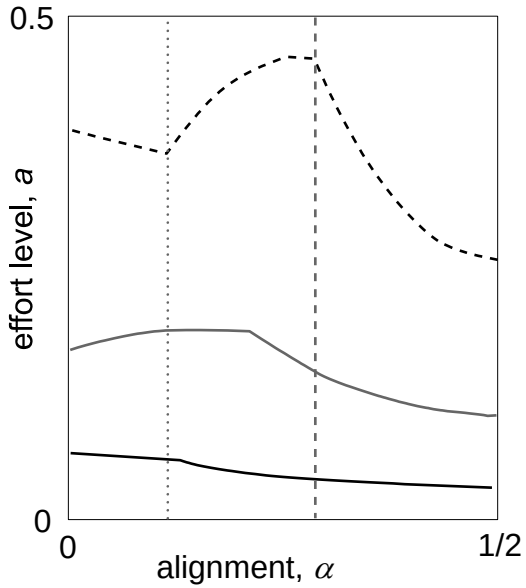
Decision processes

- **Extensions:**
  - Allowing ex post monetary transfers will not eliminate the value of compromise
    - Giving up a dollar gains more than a dollar when compromise is efficient
    - Monetary transfers may be detrimental to compromise ← → risk of hold-up
  - Conflict may foster both compromise and equilibrium effort
    - Polarized preferences make acceptance thresholds more stringent while maintaining incentives to have their own alternative through

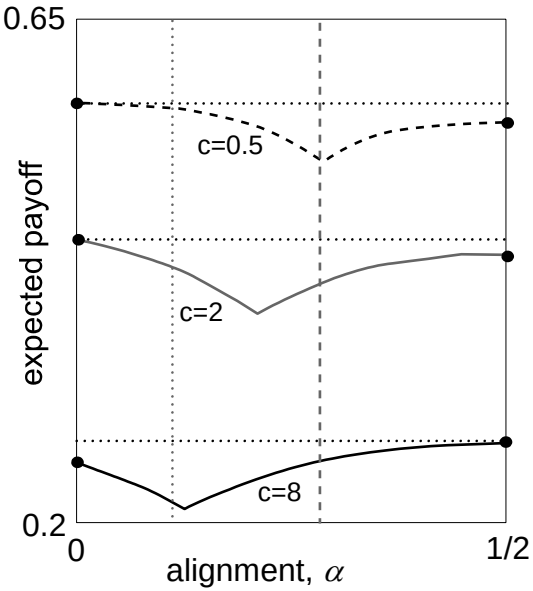
Decision processes



(i) degree of compromise



(ii) effort level



(iii) expected payoff

Wrap-up

- *Management literature:* organizations as decision-making processes
- *Decision processes:* influence the allocation of power among the agents, and thus:
  - The precision at which information is shared
  - The effort that agents put in acquiring information and/or creating alternatives
  - The types of information acquired/activities performed
- The allocation of power depends not only on who has the right to decide, but also who provides the information for choice, who implements the decision,…