Formalizing Coordination Equilibria, or When Deals Need Help Getting Done

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Lopsided deals are a ubiquitous problem that are core to many strategic questions.

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Definition

Transactions where in order for one party to reap a benefit, another must suffer an initial loss or sunk investment

Examples

Class A: Specific investments
- *Zara and clothing suppliers*
- *Toyota and dealerships*

Class B: Differences in horizon
- *SolarCity and customers*

Class C: Decision / property rights
- *Pepsi and Carts of Colorado*

Prototypical normal game structure

Supplier – Firm B

	Option A (Invest)	*Option B (Status Quo)*
Buyer – Firm A *Option A (Invest)*	**Cooperative Equilibrium** $A + \varepsilon_{0\alpha}$, $B + \varepsilon_{1\beta}$	$A - \varepsilon_{2\alpha}$, $\underline{B} + \varepsilon_{1\beta} + \varepsilon_{2\beta}$
Option B (Status Quo)	**"Coordination" Equilibrium** $\underline{A} + \varepsilon_{0\alpha} + \varepsilon_{1\alpha}$, $B - \varepsilon_{2\beta}$	**Nash Equilibrium** $\underline{A}$, $\underline{B}$

Maximum Value Achievable

We know that this problem has is solved for in the wild for specific cases but many such deals remain incomplete.

Many of these solutions took several years for one party to develop (e.g., SolarCity).

Examples of lopsided transactions

- Zara and clothing suppliers

- Toyota and dealerships

- SolarCity and customers

- Pepsi and Carts of Colorado

Solutions in the field

- Soft-financing to suppliers to enable provision of spare production capacity (Ghemawat and Nueno, 2003)

- Incentives for dealerships to maintain excess inventory (Canis and Platzer, 2009)

- Offering consumer leases despite higher borrowing costs (Sistek, 2008; Wang, 2013)

- Vertical integration to pre-empt sales to competitors (Montgomery, 2001)

Potential transactions that remain unsolved
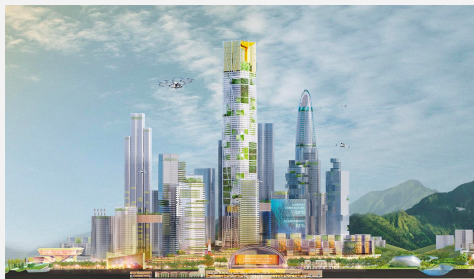
 Mixed-use, high density development for sustainable mid-sized cities

Source: National Geographic Magazine, April 2019.

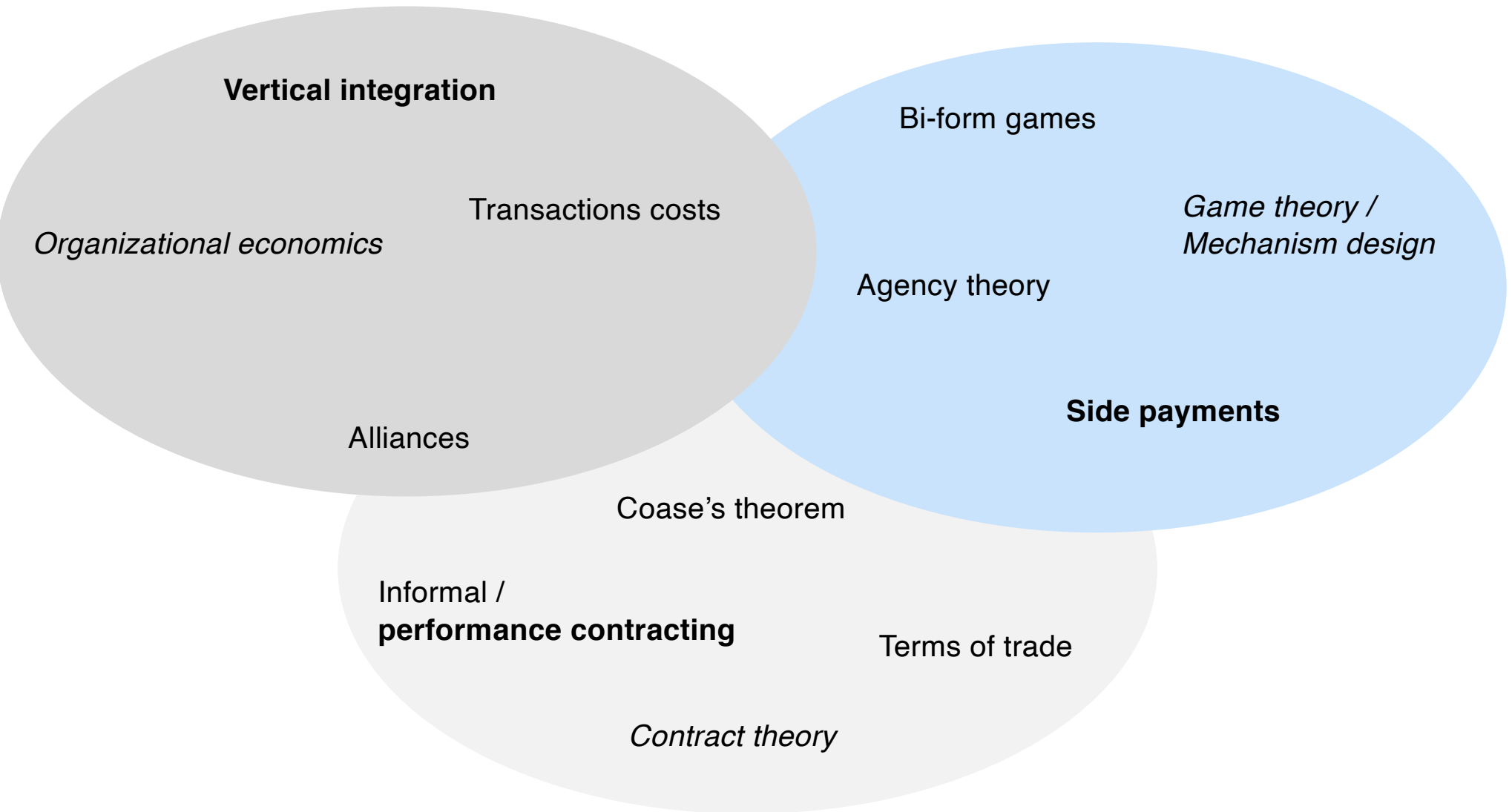# This pattern of partial solutions begs the question:

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How do firms coordinate their activities when the largest potential for joint value is created through a strategy that makes at least one party worse off?

Source: Cartoon Collections.com.

While existing solutions can be found by drawing upon existing concepts spread across a number of different fields…

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Aside: It is unlikely managers are familiar with all such refinements, and instead intuit a solution.

Vertical integration

Bi-form games

Game theory / Mechanism design

Transactions costs

Organizational economics

Agency theory

Alliances

Side payments

Coase's theorem

Informal / **performance contracting**

Terms of trade

Contract theory

Note: Typical solutions cited in the literature are shown in bold, with broader theoretical traditions identified in italics.

… our model required elements from several traditions to be combined to define the bounds of feasible solutions.

We use a bi-form game to define feasible side payments and consider how a) enforceability influences those bounds and b) how this solution compares to alternatives such as integration.

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λ_u —— $A - \alpha - E$

$\{\lambda_l < \lambda < \lambda_u\}$

λ_l —— 0

$\{\emptyset\}$

Does buyer offer a side payment?

Option 1 (Chosen by default)

Is contract enforceable?

Yes with probability 1-ρ
$\{A - \alpha - \lambda, B + \alpha + \lambda\}$

Option a
$\{A - \alpha - \lambda, B + \alpha + \lambda\}$ Coordination Equilibrium
$s.t.\,\alpha = D - B;\, \lambda > 0$

Option b
$\{C, D\}$

No with probability ρ
$\{C - \alpha - \lambda, D + \alpha + \lambda\}$

Option a
$\{A - \alpha - \lambda, B + \alpha + \lambda\}$

Option b
$\{C - \alpha - \lambda, D + \alpha + \lambda\}$ Opportunistic Behavior
$s.t.\ \alpha, \lambda \geq 0$

$\{(1-\rho)(A-\alpha-\lambda) + \rho(C-\alpha-\lambda),$
$(1-\rho)(B+\alpha+\lambda) + \rho(D+\alpha+\lambda)\}$

Yes
$\{A - \alpha - \lambda, B + \alpha + \lambda\}$
$s.t.\,\alpha = D - B, \lambda < A - \alpha - E, \rho < \dfrac{A - a - E}{A - C}$

No
$\{E, F\}$
$s.t.\,\alpha = D - B$
$\lambda > A - \alpha - E$
OR $\rho \geq \dfrac{A-a-E}{A-C}$

Option 1
$\{C, D\}$

Option a
$\{A, B\}$ Unachievable without Side Payment

Option b
$\{C, D\}$ Simultaneous Game Nash Equilibrium

Option 2
$\{E, F\}$

Option a
$\{E, F\}$ Cooperative Equilibrium

Option b
$\{G, H\}$ Model Mismatch

Sufficient Conditions:
$(A+B) > \max(C+D, E+F, G+H)$
$A > E > C > G$
$D > B$
$F > H$

LEGEND

■ Buyer Choice
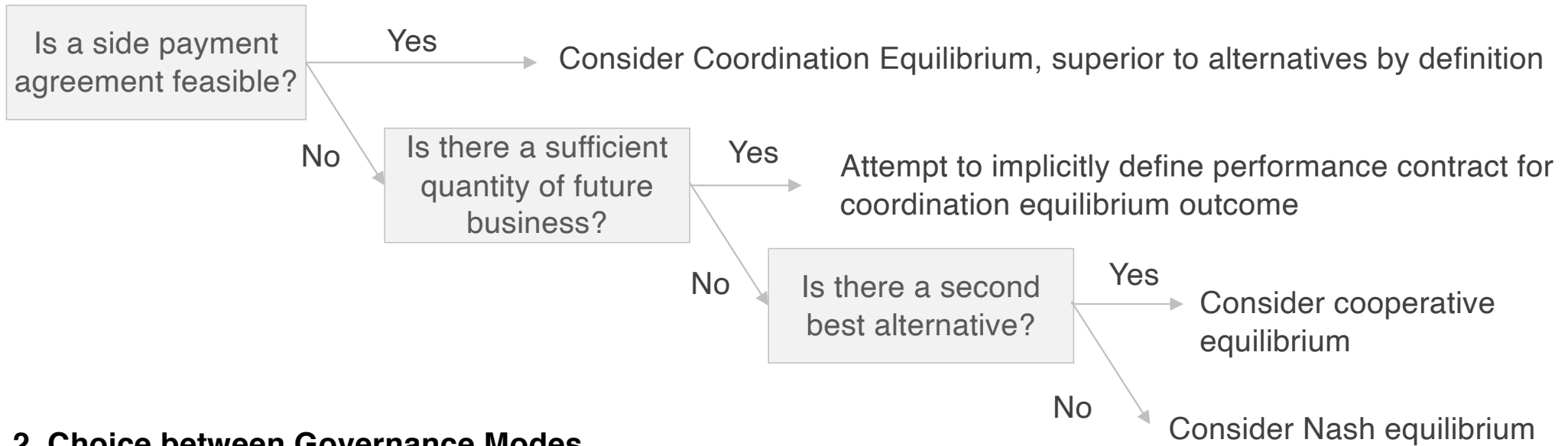
▨ Seller Choice

□ Nature's Choice

Notes: While this model defines the conditions for the existence of a coordination equilibrium and the size of the set of potential side payment solutions, we use additional assumptions and refinements to compare the relative gains from this solution versus alternative governance modes (e.g., integration).
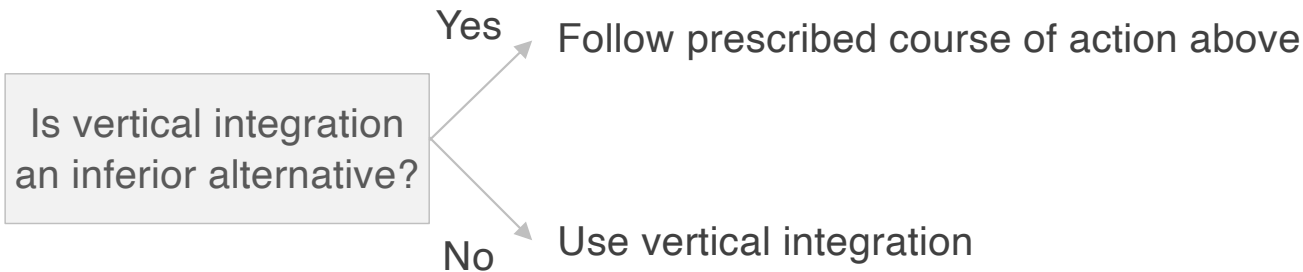
Such a model may help us to understand why certain deals are either a) not completed or b) pursued via alternative means.

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By providing a model that captures several of these refinements, we offer a tool to managers.
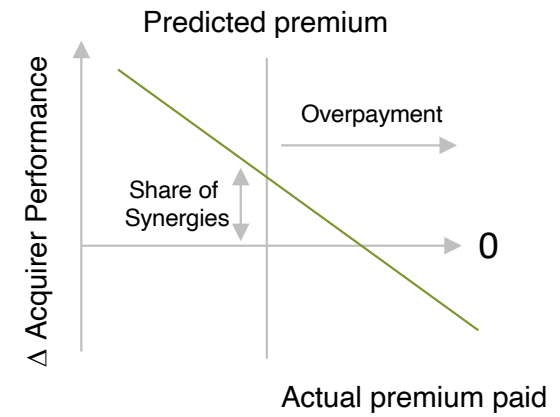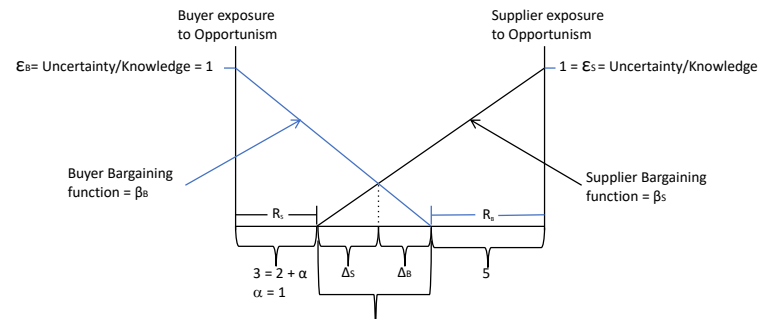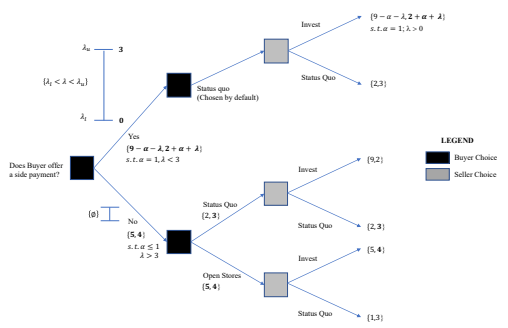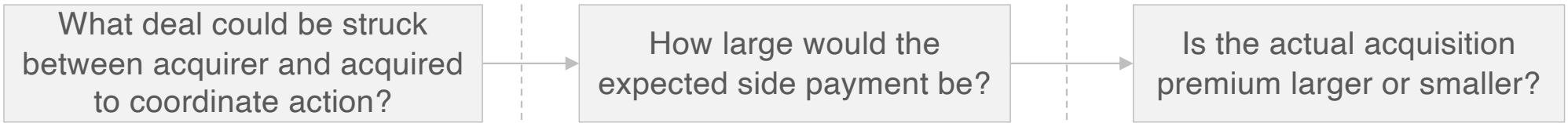
1. Choice between Strategic Alternatives, then

Is a side payment agreement feasible? — **Yes** → Consider Coordination Equilibrium, superior to alternatives by definition

No ↓

Is there a sufficient quantity of future business? — **Yes** → Attempt to implicitly define performance contract for coordination equilibrium outcome

No ↓

Is there a second best alternative? — **Yes** → Consider cooperative equilibrium

No → Consider Nash equilibrium

2. Choice between Governance Modes

Is vertical integration an inferior alternative? — **Yes** → Follow prescribed course of action above

No → Use vertical integration

This model can also give us traction to generate counterfactuals for empirical applications, such as mergers and acquisitions.

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An alternative to an acquisition is a side payment agreement.

This side payment should be the size of the acquisition premium, otherwise a deal would be preferred.

What deal could be struck between acquirer and acquired to coordinate action?

How large would the expected side payment be?

Is the actual acquisition premium larger or smaller?

We need your help to identify what is interesting and what is still needed to make a meaningful advance.

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Questions to consider

- What kind of paper is this?

    - Is it a formal model / biform game paper?

    - Is it an advance for TCE research?

    - Is it a pedagogical tool?

- What examples, if any, do you have that are consistent with this idea of lopsided transactions?

- Should we motivate our paper more strongly with an example?

    - Should it be a success story?

    - or should it center on a situation where a solution has not emerged?

Some current ideas are to look at trailing sales volatility to capture uncertainty / nascency / dynamism. We are also processing more data to increase sample size and associated statistical power.

Appendices

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Slide structure
1 - here is the problem => motivated by frustration with prisoner's dilemma - addressed to some degree by how deals do get done
2 - the story is more complicated than this, not parameterized in line with management problems

4 - can you help us figure out how to tell the story better?
5 - in David's understanding - two parties maximizing their own utility; your understanding of the other's utility dictates your behavior
6 - what isn't well covered is the opportunity to bend the other party to your well through utility sharing
7 - side payment can happen under many frames, but game theory explicitly asking you to ask for the likely behavior of the other
8 - if people were teaching people to do it at this level of nuance, what we are talking about would not be novel - but because prisoner's dilemma
9 - prisoner's dilemma picture
10 - here is the alternative math to factor in the realism but no one teaches that
11 - this is why we see value in using a game theory approach to derive predicted values of important constructs
12 - this allows us to look at party A's reactions to party B - the predicted value isn't "real" ; judgments being formed based on that prediction
13 - back to good deals not getting done -if done, it is done by intuition since the game theory tool is complex, and we think that many are left on the table
14 - let the theory guide the creation of a tool that generates predicted value
15 - we are using game theory not only to help managers but to strategy scholars as well; need to show that it could for acquisitions too

Pictures and enough on the slide / put some notes in on the bottom

4 - if you buy the model, then it gives you predicted values for what deals should get there