Means of Payment and Timing of Mergers and Acquisitions in a Dynamic Economy

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Background

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Important decisions for bidding firms

- *Timing:* when to initiate bidding
- *Payment*: how much to bid
- *Means of payment*: cash vs. stock

This paper

A unified model that links bidders' cash constraints to propensity of bidders to make acquisitions and deal characteristics (means of payment and premium)

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Three building blocks:

- Dynamic decision-making: Decision to bid is analogous to an exercise of an American option
- Private information: A bidder privately knows synergies
- Cash constraints: Bidders can only pay cash up to a budget constraint

Preview of the Results

1. *The effect of a bidder's cash constraint is not obvious:*
   - A constraint does not make a bidder weaker
   - Usually: leads to fewer and later acquisitions
   - But: If the target is a high-synergy high-growth firm, cash constraints can lead to more acquisitions

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2. *Both bidder's own and rival's cash constraints matter*
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3. *Implications for means of payment, takeover premium*
   - High-synergy targets are acquired young and small and with cash
   - Low-synergy targets are acquired after they have grown and with stock
   - Cash deals can feature higher takeover premia than stock deals despite the fact that bidders prefer to pay cash

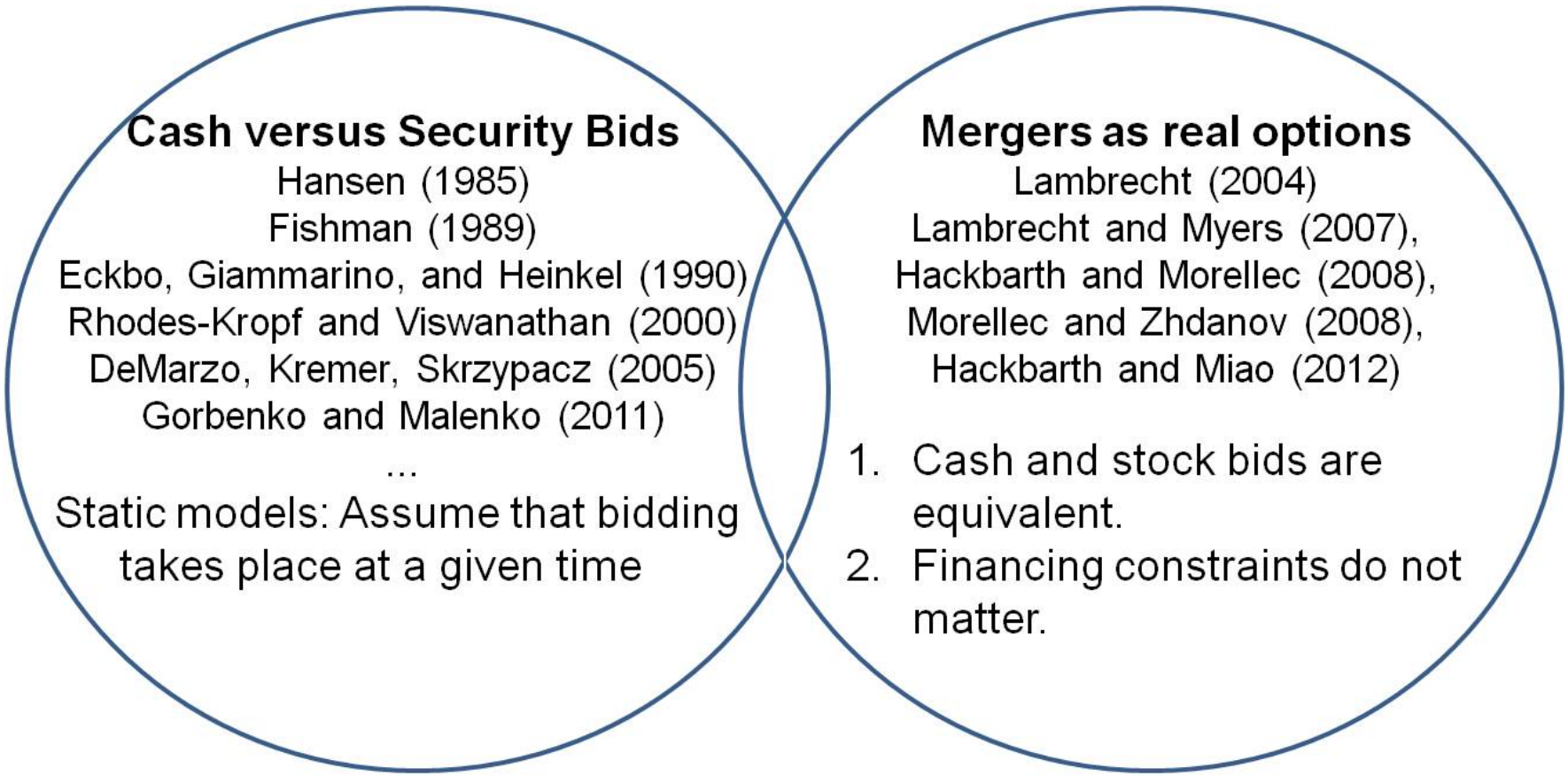
Related Literature

Cash versus Security Bids

Hansen (1985)
Fishman (1989)
Eckbo, Giammarino, and Heinkel (1990)
Rhodes-Kropf and Viswanathan (2000)
DeMarzo, Kremer, Skrzypacz (2005)
Gorbenko and Malenko (2011)
...

Static models: Assume that bidding takes place at a given time

Related Literature



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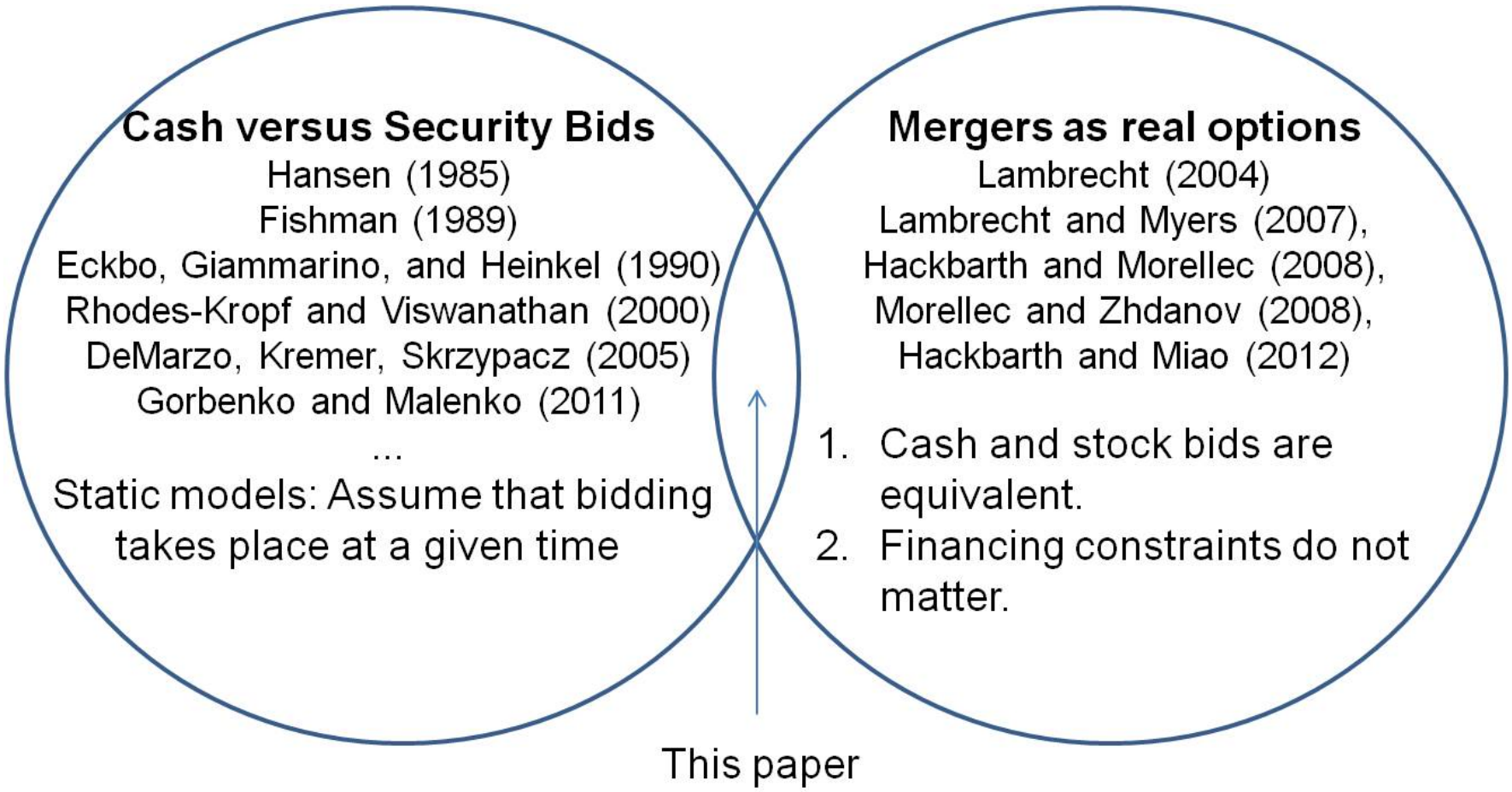

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$$\Pi_b + v_i X_t.$$

Synergies $v_i \in [\underline{v}, \overline{v}]$, $\overline{v} > \underline{v} > 1$ are i.i.d. draws from distribution with p.d.f. $f(v) > 0$. Bidder i learns v_i privately at date 0.

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- If bidder i loses, her new stand-alone value is $\Pi_o < \Pi_b$. Denote $\Delta \equiv \Pi_b - \Pi_o$.

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Introduce cash constraints

- Bidder i can pay up to C_i in cash. C_1 and C_2 are commonly known.

Auction Stage

Formalize competition by extending the "button" model of Milgrom and Weber (1982):

- Price p gradually rises.
- A bidder confirms participation until she chooses to drop.
- The remaining bidder makes an offer (b, α) of $\$b$ and fraction α of the combined firm.
- The offer is accepted if and only if $\mathbb{E}\left[b + \alpha\left(\Pi_b + vX_t\right)|\mathcal{I}^s\right] \geq p$.

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Restrictions:

- Weakly undominated strategies;
- D1 restriction on beliefs off-the-equilibrium path.

Auction Stage: Equilibria

The most ***seller-friendly*** equilibrium:

- A bidder bids up to $p(v) = vX_t + \Delta$;
- If a bidder wins at price $\hat{p}$, offer $(b, \alpha) = \left(\min\{\hat{p}, C_i\}, \max\left\{\frac{\hat{p}-C_i}{\Pi_b + X_t p^{-1}(\hat{p})}\right\}\right)$.

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The most ***bidder-friendly*** equilibrium:

- A bidder bids up to $p_i(v) = vX_t + \Delta + \max\{vX_t + \Delta - C_i, 0\} \frac{X_t \mathbb{E}_t[w-v|w\geq v]}{\Pi_b + X_t v}$.
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Cash constraint is binding ($C < wX_t + \Delta$). The winner's payoff less pre-acquisition value is:

$$\begin{aligned} & (1 - \alpha (C, wX_t + \Delta)) (\Pi_b + vX_t) - C - \Pi_b \\ =& \frac{\Pi_o + C}{\Pi_b + wX_t} (\Pi_b + vX_t) - C - \Pi_b \\ =& \frac{\Pi_o + C}{\Pi_b + wX_t} (v - w) X_t - \Delta. \end{aligned}$$

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Two effects:

1. *Static*. The winner's payoff is higher if the cash constraint does not bind $\Rightarrow$ Wants to delay
2. *Dynamic.* The winner's payoff increases slower as the target grows $\Rightarrow$ Does not want to delay

Outline

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1. **Special Cases**
   - 1.1 Case 1: Unconstrained bidders ($C_1 = C_2 = \infty$)
   - 1.2 Case 2: Extremely constrained bidders ($C_1 = C_2 = 0$)
   - 1.3 Case 3: One unconstrained bidder and one extremely constrained bidder
2. **General cash constraints: Endogenous Means of Payment**

Equilibrium selection: MPBE in separating thresholds

- Type v of bidder i initiates a bid for the target when $X(t)$ reaches threshold $\bar{X}_i(v)$;
- $\bar{X}_i(v_1) = \bar{X}_i(v_2) < \infty \Rightarrow v_1 = v_2$.

Case 1: unconstrained bidders

Conjecture (and later confirm) that type v initiates the auction when $X(t)$ reaches $\overline{X}_c(v)$, where $\overline{X}_c(\cdot)$ is a decreasing function.

If a bidder with valuation v approaches the target at threshold $\overline{X}$, her expected payoff is

$$\underbrace{\left(\frac{X_0}{\overline{X}}\right)^{\beta}}_{\substack{\text{PV of \$1} \\ \text{at initiation} \\ \text{by this bidder}}} \underbrace{\int_{\underline{v}}^{\overline{X}_c^{-1}(\overline{X})} \left(\max(v-w,0)\,\overline{X} + \Pi_o - \Pi_b\right) dF(w)}_{\text{Payoff from the auction}}$$

$$+ \underbrace{\int_{\overline{X}_c^{-1}(\overline{X})}^{\overline{v}} \left(\frac{X_0}{\overline{X}_c(w)}\right)^{\beta} \left(\max(v-w,0)\,\overline{X}_c(w) + \Pi_o - \Pi_b\right) dF(w)}_{\text{PV of payoff from the auction initiated by the rival}}$$

Case 1: unconstrained bidders

Proposition 2 (separating threshold equilibrium). Conditional on the rival not initiating yet, a bidder with valuation v initiates when $X(t)$ reaches threshold

$$\overline{X}_c(v) = \frac{\beta}{\beta - 1} \frac{\overbrace{\Pi_b - \Pi_o}^{\text{Cost of initiation}}}{\underbrace{v - E[w|w \leq v]}_{\substack{\text{Expected increase in} \\ \text{target's efficiency} \\ \text{captured by the acquirer}}}}.$$

$\overline{X}_c(v)$ is decreasing in v. A bidder with the higher valuation initiates and wins.

Case 2: constrained bidders

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Case 2: constrained bidders

Proposition 3 (separating threshold equilibrium). Bidder with the higher valuation v initiates the auction and wins. The initiation strategy is given by threshold

$$\overline{X}_s(v) = \frac{\beta}{\beta - 1} \frac{\overbrace{\Pi_b - \Pi_o}^{\text{Cost of initiation}}}{\underbrace{E\left[\frac{\Pi_o\left(\Pi_b + \frac{\beta}{\beta-1} w \overline{X}_s(v)\right)}{\left(\Pi_b + w\overline{X}_s(v)\right)^2}(v-w) \,|\, w \leq v\right]}_{\substack{\text{Marginal expected increase} \\ \text{in target's efficiency} \\ \text{captured by the acquirer}}}}.$$

Case 2: constrained bidders, intuition

Decompose the denominator into two intuitive parts:

$$\underbrace{E\left[\frac{\Pi_o(v-w)}{\Pi_b + w\overline{X}_s(v)} \middle| w \leq v\right]}_{\text{Paying stock is costlier}} + \underbrace{\frac{1}{\beta - 1} E\left[\frac{\Pi_o(v-w)\, w\overline{X}_s(v)^2}{\left(\Pi_b + w\overline{X}_s(v)\right)^2} \middle| w \leq v\right]}_{\text{Pay a higher fraction of the surplus to the target, as it grows}}$$

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  - Important if the target grows fast or has high asset volatility
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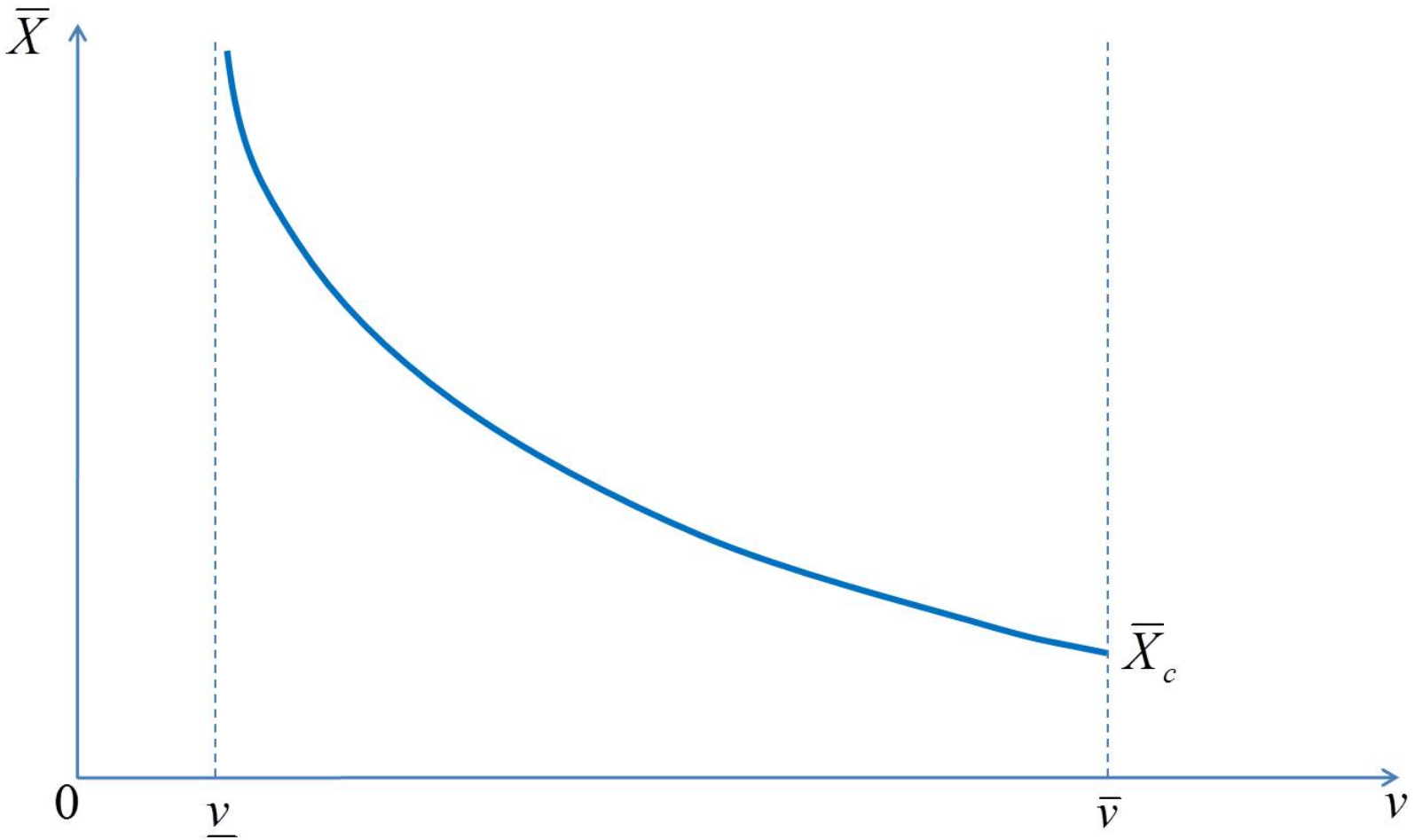
Proposition 4 ("normal" case). If $\frac{\beta}{\beta-1} < 2\frac{\Pi_b}{\Pi_o}$, then for all v, $\overline{X}_c(v) < \overline{X}_s(v)$.

Cases 1 and 2: initiation strategies



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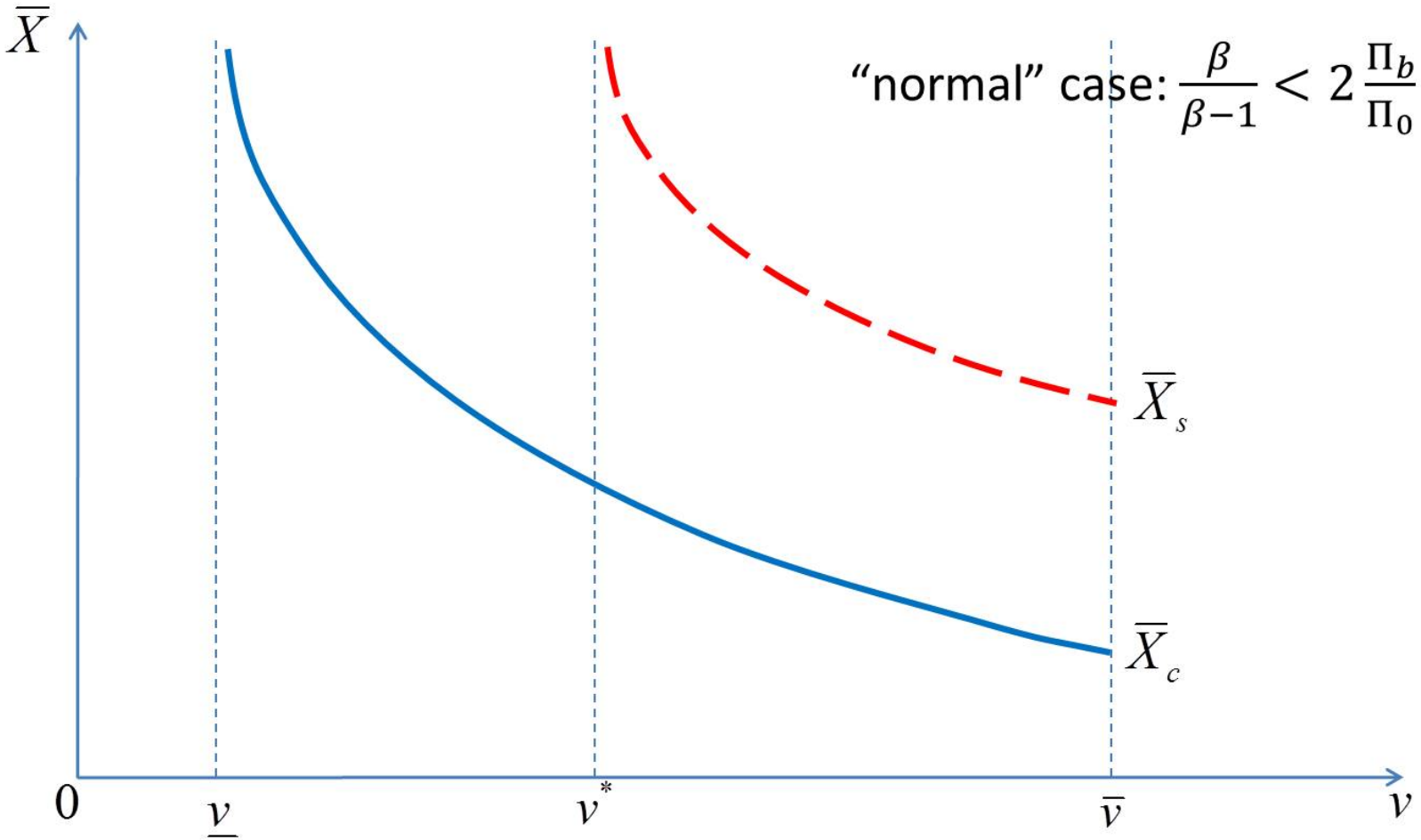

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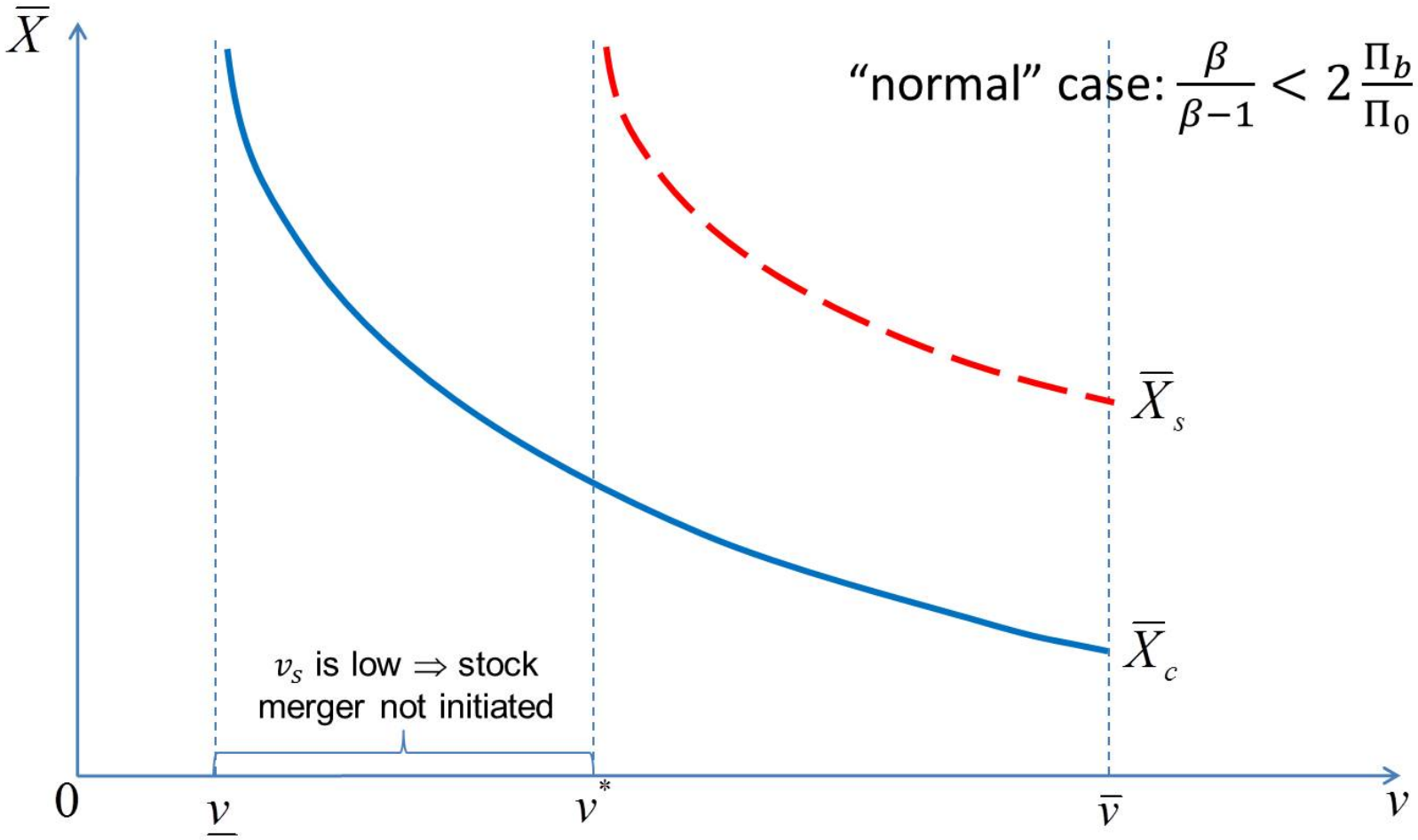

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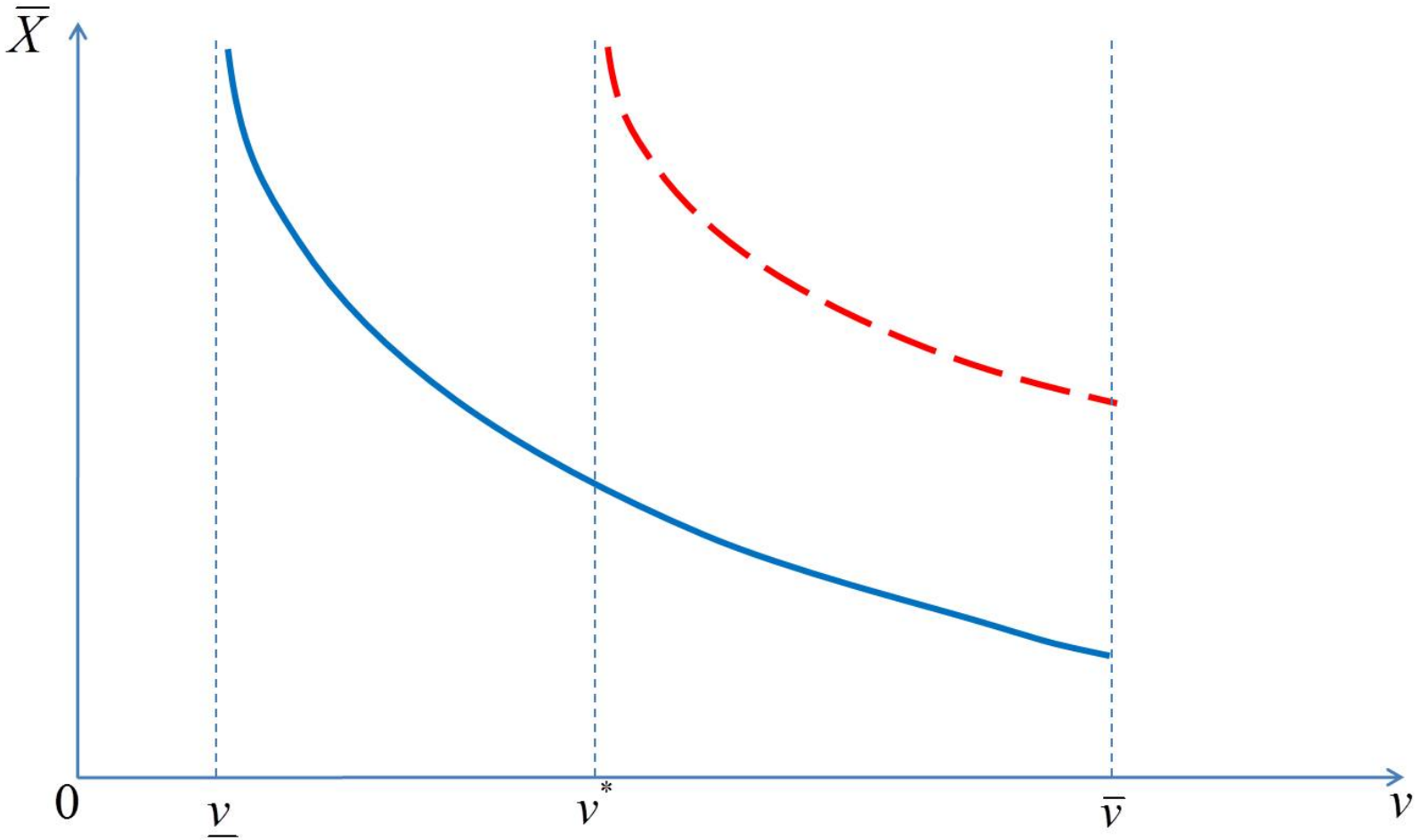

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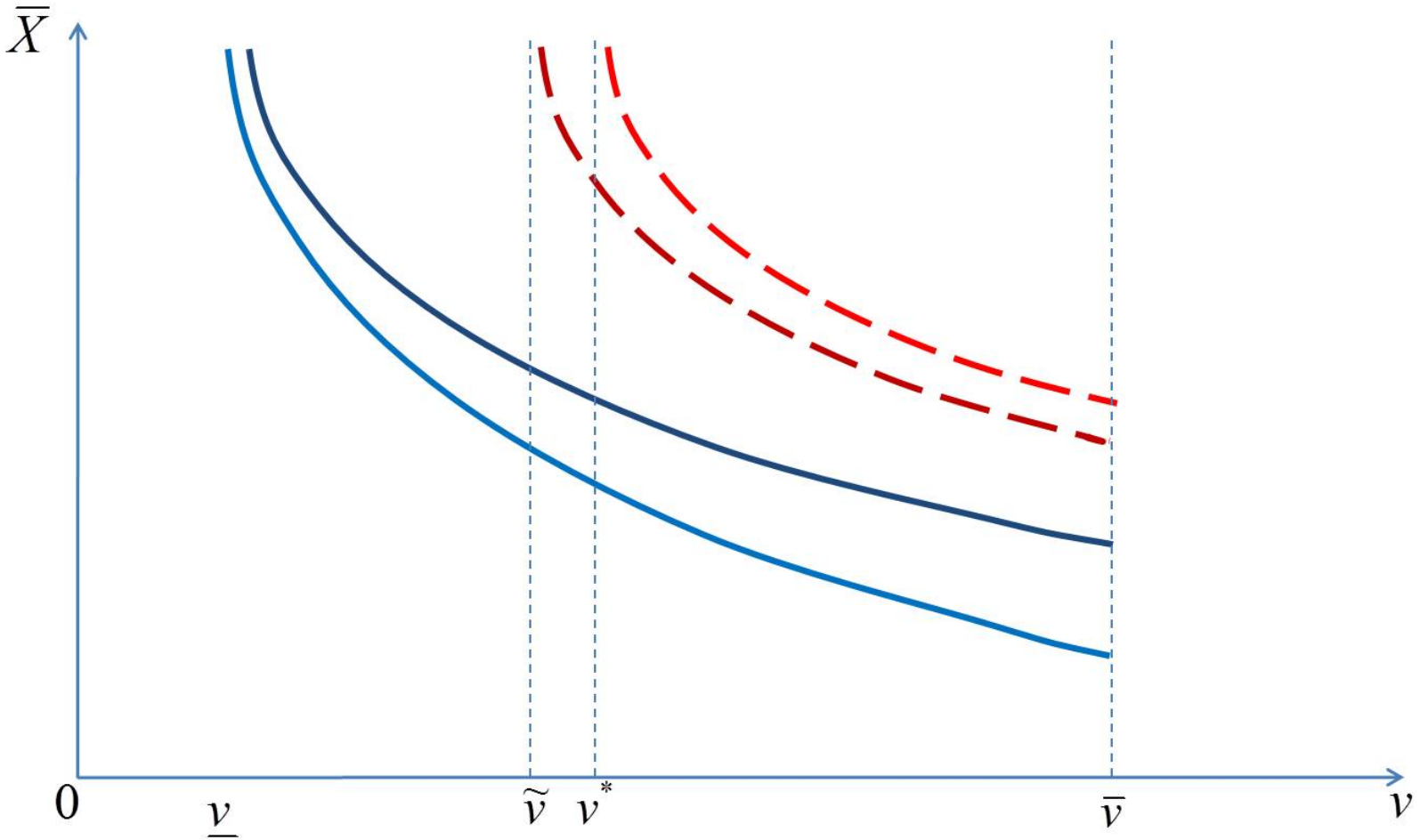

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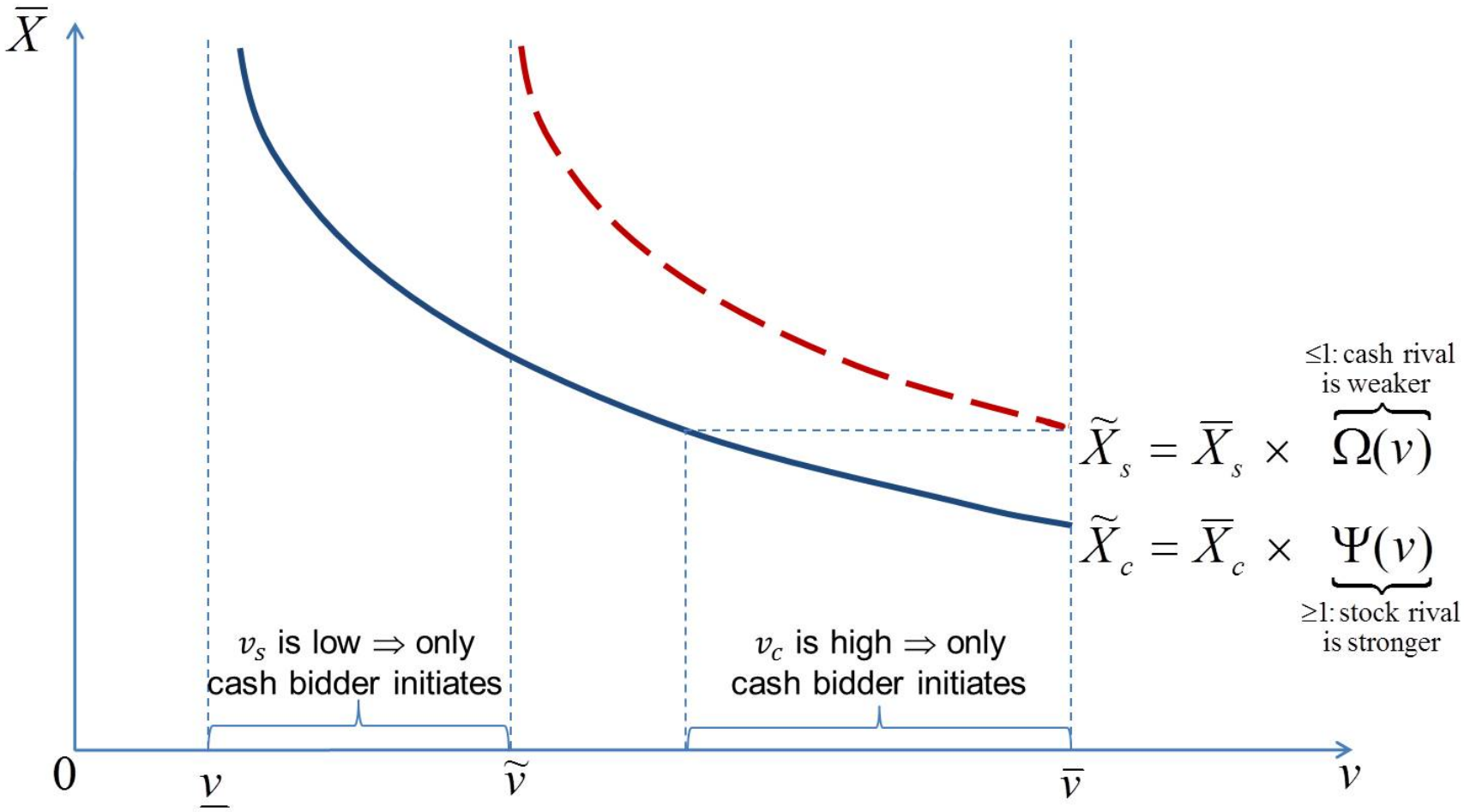

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$$\Longrightarrow$$

Stock will only be used if the cash constraint binds:

- If $C_i \geq \Pi_b + v_i X_t - \Pi_o$, then bidder i bids in cash
- Otherwise, bidder i bids up to C_i in cash and $\alpha_i = \frac{\Pi_b + v_i X_t - \Pi_o - C_i}{\Pi_b + v_i X_t}$ in stock.

Timing, premiums, means of payment

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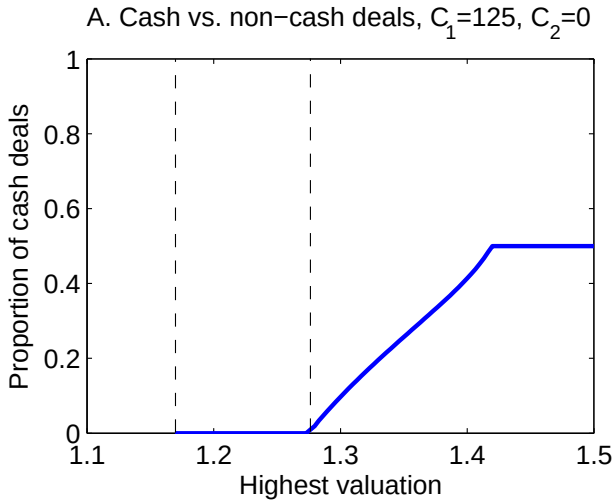
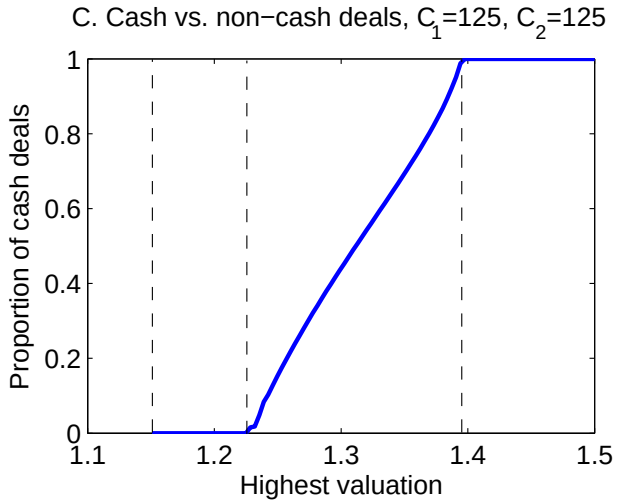
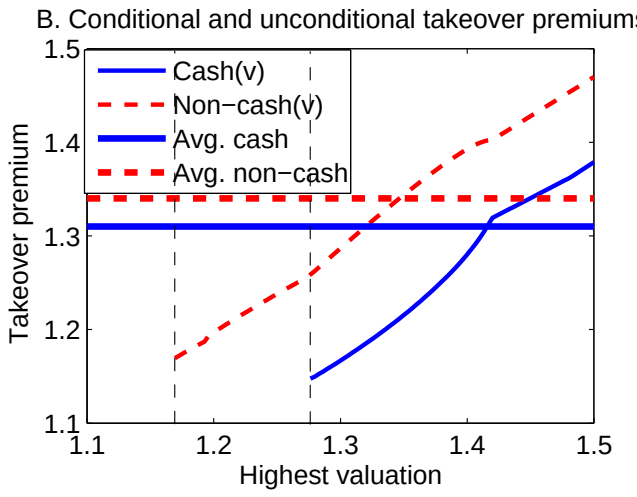
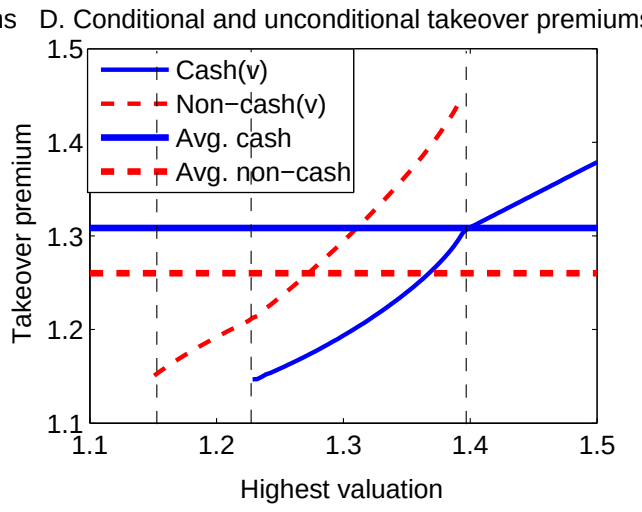
Non-cash bidders receive lower acquirer gains

Takeover premiums, C vs. S

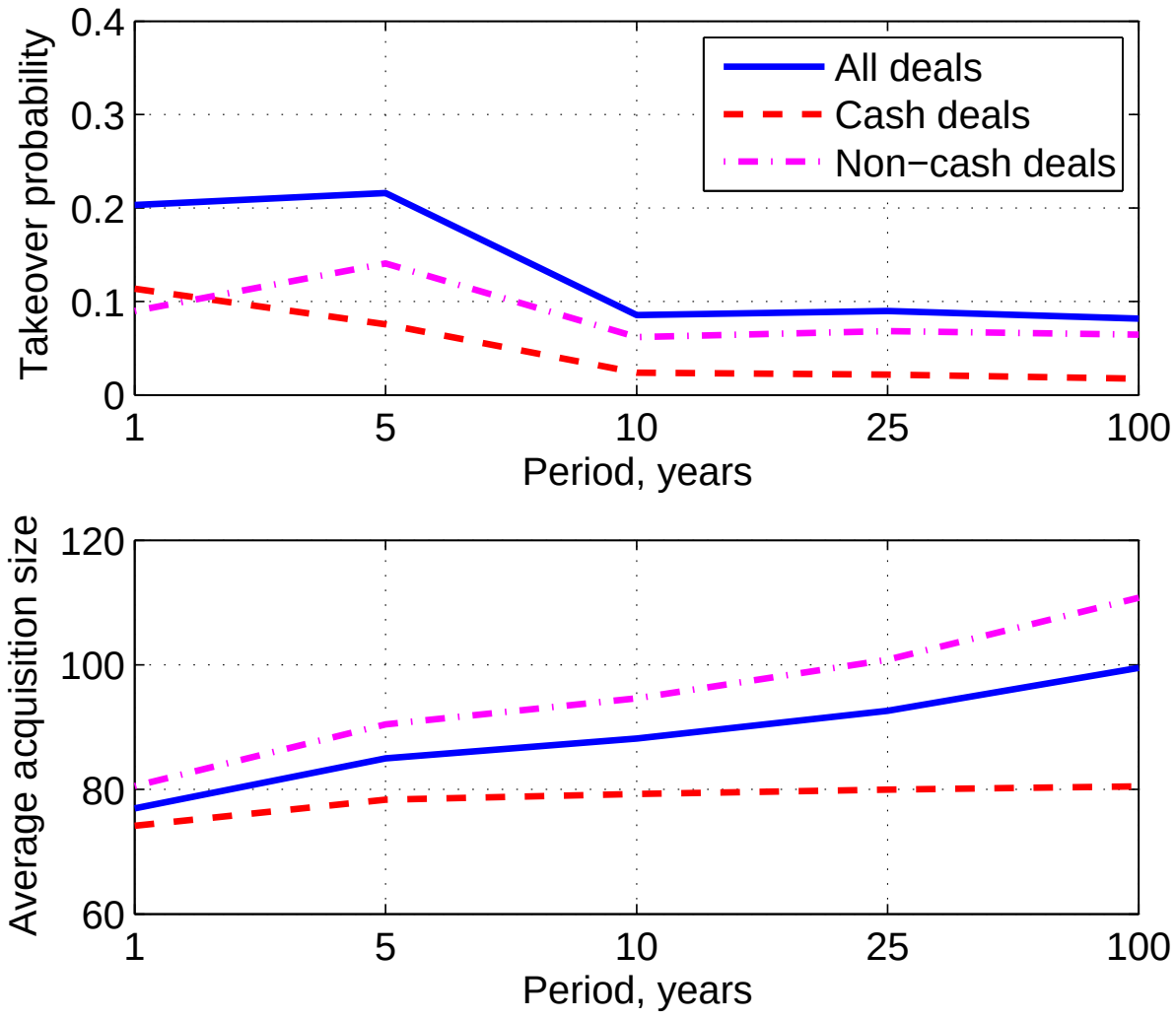








Takeover probabilities and target size



What Happens in the Bidder-Friendly Equilibrium?

If the bidder-friendly equilibrium is played in the auction, then:

- A bidder has incentives to signal that his type is high to dump overpriced equity to the seller.
- In equilibrium, constraints lead to earlier initiation, and the seller is not fooled.
    - The effect is absent for high enough types, since they have enough cash at the acquisition.

Conclusions

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Potential future research:

- Target- versus bidder-initiated takeover contests
- Permanent versus transitory shocks to financial constraints and merger waves