Corporate Finance Theory

Lecture 9

A theory of LBO activity … (2)
Malenko and Malenko (2015)

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Intended outcomes for the day:

1. **To mathematically analyze** how LBO activity depends on various sponsor-specific and economy-wide factors

2. **To intuitively explain** the impact of sponsor competition on LBO activity

3. **To relate and apply** the theoretical ideas to a recent lawsuit alleging collusion in LBOs (article from Reuters and Bloomberg)

Recap from last time

→ one-shot game.

Single-deal setting: shareholder-creditor conflict leads to inefficiently low levels of debt.

LBOs may help by providing operational benefit (high sponsor skill), but not financing benefit (debt remains inefficiently low)

↳ last lecture: debt was D_L regardless of whether acquisition D_H took place.

Sponsor competition makes LBOs more effective, driving up average skill of sponsors who make successful acquisitions.

Let's see this now, before moving on to a repeated setting.

↳ let's take a look now!

Single-deal with competition

Now assume two types of sponsors in the market, high and low skilled

Denote low skill level by q, same as in earlier slides. Denote high skill level by q_H, with $q_H > q$ and $q_H > q_T$

Fraction of high-skilled sponsors is α, fraction of low-skilled sponsors is $1-\alpha$

For the acquisition phase, compare two scenarios:

1) **"No competition"** As before, each target is randomly matched with a sponsor. Sponsor makes a take-it-or-leave-it offer, and target decides whether to accept

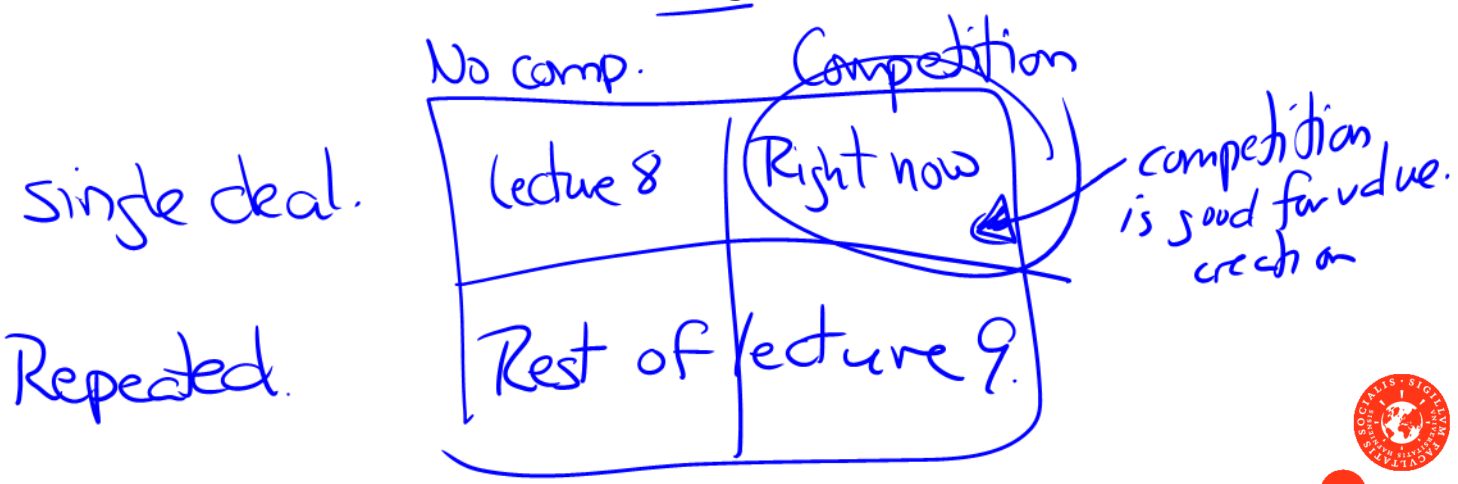
2) **"Competition"** Each target is randomly matched with two sponsors. Sponsors bid for the target in an open ascending auction, which ends when one sponsor drops out of the bidding. The remaining sponsor then makes a take-it-or-leave it offer (equal to his final auction bid) and the target decides whether to accept.

Question: Single-deal with competition

How will competition between sponsors ~~should~~ affect LBO activity in this market? Specifically, **what** will be the difference between the "Competition" and "No Competition" scenarios, and **why**?

Specific points to consider:

-Will competition lead to more or fewer acquisitions?
-Will competition lead to higher or lower acquisition prices?
-Will competition lead to more or less value being created?



Single-deal with competition: $q_H > q > q_T$

Both high, low skilled sponsor can create more value than the target

No competition

Prob. 1- α: match with low-skill sponsor. Offer of $V(q_T,D_L)$, accepted
Prob. α: match with high-skill sponsor. Offer of $V(q_T,D_L)$, accepted

↳ value standalone target, given skill q_T, debt D_L. from lecture 8

Competition

Prob. $(1-\alpha)^2$: match with two low-skill sponsors. Offer is $V(q,D_L)$, accepted
Prob. $2(\alpha)(1-\alpha)$: match with low- and high-skill. Offer is $V(q,D_L)$, accepted
Prob. α^2: match with two high-skill sponsors. Offer is $V(q_H,D_L)$, accepted

WTP of low-skilled sponsor

↳ bid until the other firm drops out; That means: bid will reflect all the value the high-skill sponsor can create.

Number of acquisitions: **UNCHANGED**
Acquisition price: **INCREASE**
Value created: **INCREASE**

$\alpha < \alpha^2 + 2\alpha(1-\alpha)$. (check).

Sponsor competition is good, in term of value created.

Repeated setting, no competition

Stand-alone firm: borrow once, backed only by own assets

Sponsor: (infinitely lived) borrow multiple times, backed by all assets of the targets it will eventually acquire.

→ higher interest rate.

If a sponsor diverts cash now, creditors can punish it when it tries to borrow in the future. **Reputational capital.**

Assume all targets have skill q_T, all sponsors have skill $q > q_T$, and that a target is matched with a single sponsor.

→ economy-wide interest rate.

Let $r > 0$ time discount rate, where $1/(1+r) < 1$ is the discount factor. (often denoted by δ)

Let $\gamma \in (0,1]$ denote the probability that a given sponsor is matched with some target in a period. Assume γ is constant across sponsors and over time.

High γ, ⇒ high future activity.

Punishment, trigger Strategies

So far, firms have only borrowed D_L, when it would be more efficient to borrow D_H … if shareholders could credibly promise not to divert cash flows.

Equilibrium where sponsors always borrow D_H? **Trigger strategies**.

look for a candidate equilibrium with efficient debt.

Sponsor. After acquiring a target, always borrow D_H and never divert cash flows.

Zero interest rate on loan ($V = D$) (i.e. creditors believe, repaid in all)

Creditors. If a sponsor has never diverted cash flows, then pay price of debt $p = 1$. If it ever diverted cash flows in a previous period, then pay price $p = 1$ it the sponsor issues debt D_L, and $p = q$ if the sponsor issues debt D_H.

just like lecture 8. $V_H = q D_H$ (positive interest rate on loan).

Cheat. Immediate temptation to divert cash flows after project failure (with debt D_H).

Punishment. But the sponsor suffers in all future periods; worse deal in the credit market, since creditors believe cash flows may be diverted again.

Question: Repeated setting

An equilibrium exists where sponsors always borrow D_H and never divert cash if

Immediate gain from diverting cash after project failure (1) ≤

prob. of future activity.

$\frac{\gamma}{r}$ [Sponsor payoff per acquisition in equilibrium (2) –

discounting.

Sponsor payoff per acquisition while being punished (3)]

Think about which of the following expressions represents the term in red: "the immediate gain from diverting cash after project failure", and why. Then write you answer in the Zoom chat.

Zoom poll.

A. $D_H - (1-\lambda)X_B$ → Answer A is correct: gain D_H, but you also suffer deadweight loss!

B. $D_L - \lambda X_G$

C. $q(X_G + g(D_L)) + (1-q)X_B - V(q_T, D_L)$

D. $q(X_G + g(D_H)) + (1-q)X_B - V(q_T, D_L)$

Repeated setting, no competition

An equilibrium exists where sponsors always borrow D_H and never divert cash if

Immediate gain from diverting cash after project failure (1) ≤

$\frac{\gamma}{r}$ [Sponsor payoff per acquisition in equilibrium (2) –

Sponsor payoff per acquisition while being punished (3)]

LBOs tend to create more value when sponsors are patient (low r) and expected future activity is high (high γ).

(1) $D_H - (1-\lambda)X_B$ ← cheat today

(2) $q\,(X_G + g(D_H)) + (1-q)X_B - V(q_T, D_L)$ ← on the equil. path; trigger strategy, borrow D_H; collect all surplus. (all value)

(3) $q\,(X_G + g(D_L)) + (1-q)X_B - V(q_T, D_L)$

↳ lecture 8: creditors charge higher rate for D_H.

⇒ sponsor borrowing low debt D_L, less efficient

Repeated setting, no competition

Plugging into the inequality:

$$D_H - (1-\lambda)X_B \leq \left(\frac{\gamma}{r}\right) q(g(D_H) - g(D_L))$$

condition from slide 10.

Rearranging:

$$q \geq \frac{r}{\gamma} \frac{D_H - (1-\lambda)X_B}{g(D_H) - g(D_L)} = q^*$$

Equilibrium will exist with efficient debt levels iff

Denote the right-hand-side of this last expression by q*, which is increasing in r. For intermediate values of r, we can have

$$\mathbf{q_T < q^* < \bar{q}}$$

Discussion

-If $q \leq q_T$, then LBOs provide no benefits.
-If $q_T < q < q^*$, then LBOs provide operational benefits
-If $q \geq q^*$, then LBOs provide both operational and financing benefits

↳ equil. from slide 11: sponsor borrow D_H at low interest rate / price of debt = 1.

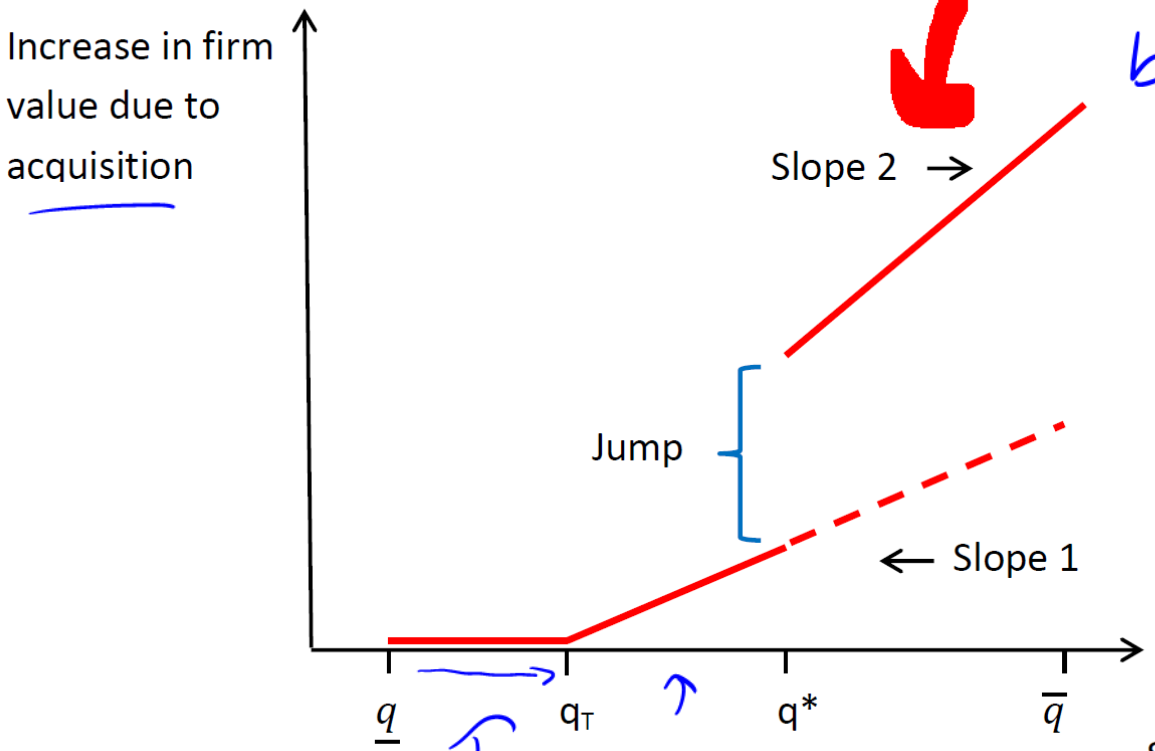
As before, **positive operational benefits** (increased skill) are necessary for LBOs to take place.

Positive operational benefits are now reinforced by **positive financing benefits**, **amplifying the skill difference** between sponsors.

Compare:

Value of target firm after successful acquisition
Value of target firm if it had remained independent

"Gain in firm value"



LBOs take place both operational and operational benefit.

1. High sponsor skill makes sponsors more "trustworthy" to creditors. Why? A high-skilled sponsor really suffers in the future when being punished, because they are the ones with the "very good" projects.

2. Financial benefits from LBOs depend on economy-wide factors. Look at q*! Increasing in r and decreasing in gamma. We would expect LBOs to be more effective, create financial value, when interest rates are low and when expected future activity is high.

no LBO.

LBO's take place operational benefit

Repeated setting with competition

Now assume two types of sponsors in the market, high and low skilled

Low skill: q, same as before. High skill: q_H, with $q_H > q > q_T$

Assume even low-skilled sponsors provide opreation benefit; create more value than the independent target

Assume $q_H > q > q^*$, where q^* is defined on the previous slides.

→ in no competition, LBO provide financial benefits

For the acquisition phase, compare two scenarios (each scenario applies to all periods, t = 1,2,…)

"No competition" As before, each target is randomly matched with a sponsor. Sponsor makes a take-it-or-leave-it offer, and target decides whether to accept

"Competition" Each target is randomly matched with two sponsors. Sponsors competitively bid in an open ascending auction, which ends when one sponsor drops out of the bidding. The remaining sponsor then makes a take-it-or-leave it offer (equal to his final auction bid) and the target decides whether to accept.

Impact of competition: $q_H > q > q^*$

Focus on the most efficient equilibrium (with highest debt). Compare how much LBOs contribute to firm value. Denote fraction of high-skilled sponsors by α.

No competition

Prob. $(1-\alpha)$: match with low-skill. Low pays $V(q_T, D_L)$, issues $\mathbf{D_H}$

Prob. α: match with high-skill. High pays $V(q_T, D_L)$, issues $\mathbf{D_H}$

Competition

Prob. $(1-\alpha)^2$: match with two low-skills. Low pays $V(q, D_L)$, issues $\mathbf{D_L}$

Prob. $2(\alpha)(1-\alpha)$: match with low- and high-skill. High pays $V(q, D_L)$, issues ___

Prob. α^2: match with two high-skills. High pays $V(q_H, \_\_\_)$, issues ___

Why are low-skill sponsors no longer able to issue efficient debt $\mathbf{D_H}$?

Repeated setting, competition

Recall from before: an equilibrium exists where sponsors always borrow D_H and never divert cash if

Immediate gain from diverting cash after project failure (1) ≤

$\frac{Y}{r}$ [Sponsor payoff per acquisition in equilibrium (2) –

Sponsor payoff per acquisition while being punished (3)]

(1) $D_H - (1-\lambda)X_B$
(2) 0 for low-skilled sponsors under competition (see previous slide)
(3) 0 for low-skilled sponsors under competition (see previous slide)

-> low-skilled sponsors always want to deviate by diverting cash.
-> the above inequality is violated, since the effective punishment is zero!

Low skilled sponsors never make any profits! Either they get outbid by a high-skilled sponsor and don't make the acquisition; or they compete fiercely with another low-skilled sponsor, make an acquisition, but at a very high price.

Rather deviate, divert cash now, obtain a positive payoff. Conclusion: low skilled sponsors cannot "be trusted" in a setting with competition, to borrow high amounts.

Question: Repeated setting, impact of competition

Competition

Prob. $(1-\alpha)^2$: match with two low-skills. Low pays $V(q,D_L)$, issues D_L
Prob. $2(\alpha)(1-\alpha)$: match with low- and high-skill. High pays $V(q,D_L)$, issues ___
Prob. α^2: match with two high-skills. High pays $V(q_H$, ___), issues ___

Question: under competition, is total firm value created by LBOs increasing in α, the fraction of high-skilled sponsors? Please write down your answer in the Zoom poll.

a) Yes; high α increases the expected operational benefit from LBOs
b) Yes; high α increases the expected financing benefit from LBOs
c) Sometimes yes and no; high α increases the expected operational benefit but can decrease the expected financing benefit from LBOs
d) Sometimes yes and no; high α decreases the expected operational benefit but can increase the expected financing benefit from LBOs
e) No; high α decreases the expected financing benefit from LBOs

Question: Repeated setting, impact of competition

Competition

Prob. $(1-\alpha)^2$: match with two low-skills. Low pays $V(q,D_L)$, issues D_L
Prob. $2(\alpha)(1-\alpha)$: match with low- and high-skill. High pays $V(q,D_L)$, issues ___
Prob. α^2: match with two high-skills. High pays $V(q_H, \_\_\_)$, issues ___

Question: under competition, is total firm value created by LBOs increasing in α, the fraction of high-skilled sponsors? Please write down your answer in the ~~Zoom chat~~. Poll ; c most popular and also best answer.

a) Yes; high α increases the expected operational benefit from LBOs
b) Yes; high α increases the expected financing benefit from LBOs
c) Sometimes yes and no; high α increases the expected operational benefit but can decrease the expected financing benefit from LBOs
d) Sometimes yes and no; high α decreases the expected operational benefit but can increase the expected financing benefit from LBOs
e) No; high α decreases the expected financing benefit from LBOs

Discussion

Assume $q_H > q^* > q \approx q_T$

By the same logic as before, an equilibrium exists where high-skill sponsors always borrow D_H and never divert cash if

Immediate gain from diverting cash after project failure (1) ≤

$\frac{\gamma}{r}$ [Sponsor payoff per acquisition in equilibrium (2) –

Sponsor payoff per acquisition while being punished (3)]

(1) $D_H - (1-\lambda)X_B$

(2) $(1-\alpha)[\, q\,(X_G + g(D_H)) + (1-q)X_B - V(q_T, D_L)]$

(3) $(1-\alpha)[\, q\,(X_G + g(D_L)) + (1-q)X_B - V(q_T, D_L)]$

a high α: competition is fierce between high-skilled sponsors

-> The equilibrium exists for iff $\alpha < a^*$, with $a^* \in (0,1)$ because $q_H > q^*$.

-> More high-skill sponsors always increases expected operational benefits

-> But too many of these sponsors will decrease expected financing benefits

→ $\alpha \approx 1$, (2), (3) ≈ 0, high-skilled sponsor compete so fiercely, low/zero profits.

Question: relation to $590M collusion settlement

In the preparation instructions for Lecture 9, I asked you to read two articles from Reuters and Bloomberg.

Goldman Sachs, Blackstone, and other firms were accused of holding down LBO prices "by forming groups to take the sought-after companies private, agreeing not to compete for some deals and allocating transactions among themselves."

Question: which insights, if any, from Malenko and Malenko can help shed light on this lawsuit and the impact of the alleged collusion? Why?

Two angles often taken in anti-trust work: first, how does the alleged collusion affect total surplus (here, total firm value created); second, how does the alleged collusion affect consumer surplus (here, the payoff of target's initial shareholders, who were bought out).

Take 5 minutes to discuss in breakout groups or rooms. Please, participate in the discussion. I would encourage you to turn the camera on!

Discussion: collusion settlement

At general level, **good match** between certain elements in the academic article and case: sponsors, targets, "club deals" (from the article), repeated interactions.

Lawsuit more about collusion on price -> not considered in the academic article

Effectively moving from "Competition" scenario to "No Competition". **Drives down** price and operational benefit (total surplus, consumer surplus)

But increased sponsor rents may **drive up** financing benefits (total surplus)

Theory suggests that sponsor collusion on price ***might*** not necessarily be bad for society.

Don't want to oversell it!

But: there is some potential benefit from sponsors having a long term stake in maintaining a good reputation. May require that competition is not too fierce.

Caveat: that should not be an excuse an engage collusion!

Intended outcomes for the day:

1. To mathematically analyze how LBO activity depends on various sponsor-specific and economy-wide factors. LBOs depend positively on sponsor skill, expected future activity; negatively on the interest rate. Financing benefit can amplify operational benefit.

2. To intuitively explain the impact of sponsor competition on LBO activity Competition can help by increasing average skill, hurt by decreasing expected future rents.

3. To relate and apply the theoretical ideas to a recent lawsuit alleging collusion in LBOs (article from Reuters and Bloomberg) Decent match on a general level, but key issue in the case is collusion on price. Theory suggests that increased/decreased competition can have an ambiguous effect on value creation.

For next time

Next week: no lectures due to the Fall Holiday

Wednesday October 25: Drop-in session where you can work on the assignment and ask questions. Usual lecture time and place

Friday October 27: Take a first look through Banal-Estañol et al. (2013). For the sake of the course, we will stick to their model with binary outcomes (cash flow either high or low)

1. Focus on the parts up to and including Section 2.6

2. In particular, make sure you understand the model, along with Proposition 1 and 2 (also go through the proofs).

3.When reading, think about the following quote from the Introduction: *"a rule of thumb that prescribes adopting the financing regime associated with the lowest interest rate can be suboptimal"*. What is the intuition underlying this results? Be ready to share your thoughts next time.