Corporate Finance Theory

Lecture 17

The Commitment Role of Equity Financing (2)

Fahn et al. (2019)

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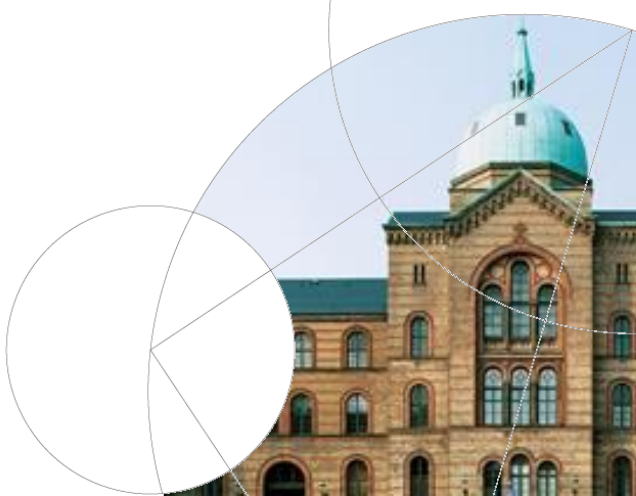


Intended outcomes for the day:

1. To derive how debt affects value in the **dynamic setting** of Fahn et al. (2019), focusing on **punishments** and the interactions between **contracting frictions.**

2. To relate the motivating examples in Levin et al. (2003) to the analysis here, and **discuss** whether they provide support for the mechanism proposed by Fahn et al. (by which debt affects value)

Review from last time

Fahn et al. (2019) argue that classical trade-off theory cannot explain why some firms have little debt.

In particular, firms with strong commitment to workforce.

Additional agency cost: related to Creditor-Owner-Employee relationships

Effectively two potential conflicts: Creditor-Owner and Owner-Employee

Model

Principal has project, requires total investment K > 0. Borrow D (may be large) in competitive credit market, interest rate r. Creditors do not observe interactions been principal and agent.

Principal offers agent contract (w, b), fixed wage and bonus.

Review from last time (continued)

If **accepted**, Agent receives w and chooses effort $e \in \{0,1\}$.

Low effort, $e = 0$: zero cost, value $f(0) + K$ (low performance)
High effort, $e = 1$: cost $c > 0$, value $f(1) + K - c > f(0) + K$ (high performance)

Principal observe performance, chooses whether to pay b.

If effort was low, then shock occurs with probability $1 - \rho$, project liquidated

No Shock -> no capital destroyed, creditors repaid $D(1 + r)$

Shock -> destroys captial $(1 - \gamma)K > 0$, creditors repaid $\min\big(\gamma K, D(1 + r)\big)$.

Limited liability: after shock, creditors reclaim at most remaining capital. No claim on f(0), f(1) or any D borrowed, over and above γK.

Results from last time

Two commitment problems:

(1) principal-creditors -> observability, (2) principal-agent -> verifiability

Static setting:

- If the principal can commit both to creditors and to the agent, then debt does not affect value (efficiency)
- If the principal cannot commit to the agent, then debt does not affect value (inefficiency)
- If the principal can commit to the agent but not to creditors, then high debt can reduce value. Occurs when D > D* > K, so (Losses imposed on creditors) > (inefficiency from low effort).

Suggests that the crucial commitment problem (for explaining why capital structure matters) is the one with respect to creditors.

Dynamic setting

Two commitment problems:
(1) principal-creditors -> observability, (2) principal-agent -> verifiability

Dynamic setting:

- If the principal can commit to creditors and to the agent, then debt does not affect value (efficiency). Identical argument to that in a static setting: principal implements efficient (high) effort level in every period, captures all surplus.

- **We now show:** if the principal can commit to the agent but not to creditors, then high debt can reduce value. But problem is less severe than in a static setting: $D > D^{**} > D^{*}$.

- We then look at what happens if the principal cannot commit to anyone (neither agent nor creditors)

Dynamic – no commitment to creditors

Consider a setting with infinite horizon: t = 1,2,3… Discount factor δ<1.

Is it possible to implement high effort when D>D*?

Principal **cannot commit to creditors** to offer agent particular contract (non-observability). But given contract $(b\ ,\ w)$ actually offered, **commits to agent** to pay b after high performance (verifiability)

If the agent exerts low effort -> possibility of a shock

Just like before, we assume a shock will destroy some of the capital

NEW: if a shock occurs in period t, then the project is liquidated. No cash flows in period t + 1, t +2, etc.

Aside

Recall from Lecture 16, that in a static situation, where creditors expect the principal to implement high effort:

Principal's expected payoff, given contract $(b = c \ , \ w = \bar{u})$:

Note: if principal implements high effort, as expected by creditors, then creditors break even on average (after lending at interest rate r = 0)

$$\pi_H = f(1) - c - \bar{u}$$

Principal's expected payoff, given $D > \gamma K$, deviating to contract $(b = 0 \ w = \bar{u})$:

This "pi_L" is equal to "pi_L(D)", in blue, when r = 0

$$\pi_L = -(K - D) + f(0) - \bar{u} + \rho[-(1 + r)D \ + K] + (1 - \rho)(0)$$

Plug in r = 0 and simplify

pi_L (in green) = project value, given low effort

Extra term: (1 - rho)(D - gamma K) are the expected costs imposed on creditors.

$$\pi_L(D) = -K + f(0) - \bar{u} + \rho K + \ (1 - \rho) \ D$$

$$= [-K + f(0) - \bar{u} + \rho K + (1 - \rho)\gamma K] + \ (1 - \rho) \ (D - \ \gamma K)$$

$$= \pi_L \ + (1 - \rho) \ (D - \ \gamma K)$$

Aside (continued)

Recall from Lecture 16, that in a static situation, where creditors expect the principal to implement high effort:

$$\pi_H = f(1) - c - \bar{u}$$

$$\pi_L(D) = -K + f(0) - \bar{u} + \rho K + (1-\rho)\, D$$

$$= \pi_L + (1-\rho)\,(D - \gamma K)$$

The latter payoff is increasing in D.

Moreover, $\pi_L(D) > \pi_H$ for D > D*, so that the principal then implements low effort for sufficiently high debt levels.

Define D* as the value of D such that pi_H = pi_L(blue), i.e. that makes the principal indifferent.

For D > D*, the principal has a strict incentive to implement low effort.

Dynamic – no commitment to creditors

$\delta < 1$
$\rho < 1$; $\rho\delta < \delta$

Consider a setting with infinite horizon: t = 1,2,3… Discount factor δ<1.

Is it possible to implement high effort when D>D*?

Suppose creditors believe $(b = c\ ,\ w = \bar{u})$ will be offered, expect high effort, so that r = 0. Does the principal have an incentive to actually offer this contract?

Principal's expected payoff, given debt D, contract $(b = c\ ,\ w = \bar{u})$:

$$\frac{1}{1-\delta}\pi_H = \frac{1}{1-\delta}\ (f(1) - c - \bar{u})$$

Principal's expected payoff, given debt $D > D^* > \gamma K$, contract $(b = 0\ w = \bar{u})$:

$$\frac{1}{1-\rho\delta}\pi_L(D) = \frac{1}{1-\rho\delta}\ (-K + f(0) - \bar{u} + \rho K + (1-\rho)\ D)$$

$\pi_L + (1-\rho)(D - \gamma K)$

Effectively discount each period by $\rho\delta$, due to possible liquidation

High effort: $\pi_H\left(1+\delta+\delta^2+\ldots\right)=\frac{\pi_H}{1-\delta}$

Deviate low effort:

$\pi_L(D)\left(1+\delta\rho+\delta^2\rho^2+\ldots\right)=\frac{\pi_L(D)}{1-\rho\delta}$

effective discounting is $\delta\rho$ per period

Discount future payoffs "more heavily" when implementing low effort.

Dynamic – no commitment to creditors

Principal will implement high effort if

$$\frac{1}{1-\delta}\pi_H \geq \frac{1}{1-\rho\delta}\pi_L(D)$$

Condition violated when debt exceeds a threshold value, defined by

$$\frac{1}{1-\delta}\pi_H = \frac{1}{1-\rho\delta}\pi_L(D^{**})$$

Notice that $D^{**} > D^*$, by $\pi_H = \pi_L(D^*)$ and $\rho < 1$

Conclusion: unlike in the static case, the principal can implement high effort when D*<D≤ D**.

Conclusion: the fact that low effort can induce a shock, which reduces the principal's future payoff, implies that now the principal has greater incentive to implement high effort, compared to a static setting. Hence, high debt levels D > D* (close to D*) may still result in high effort

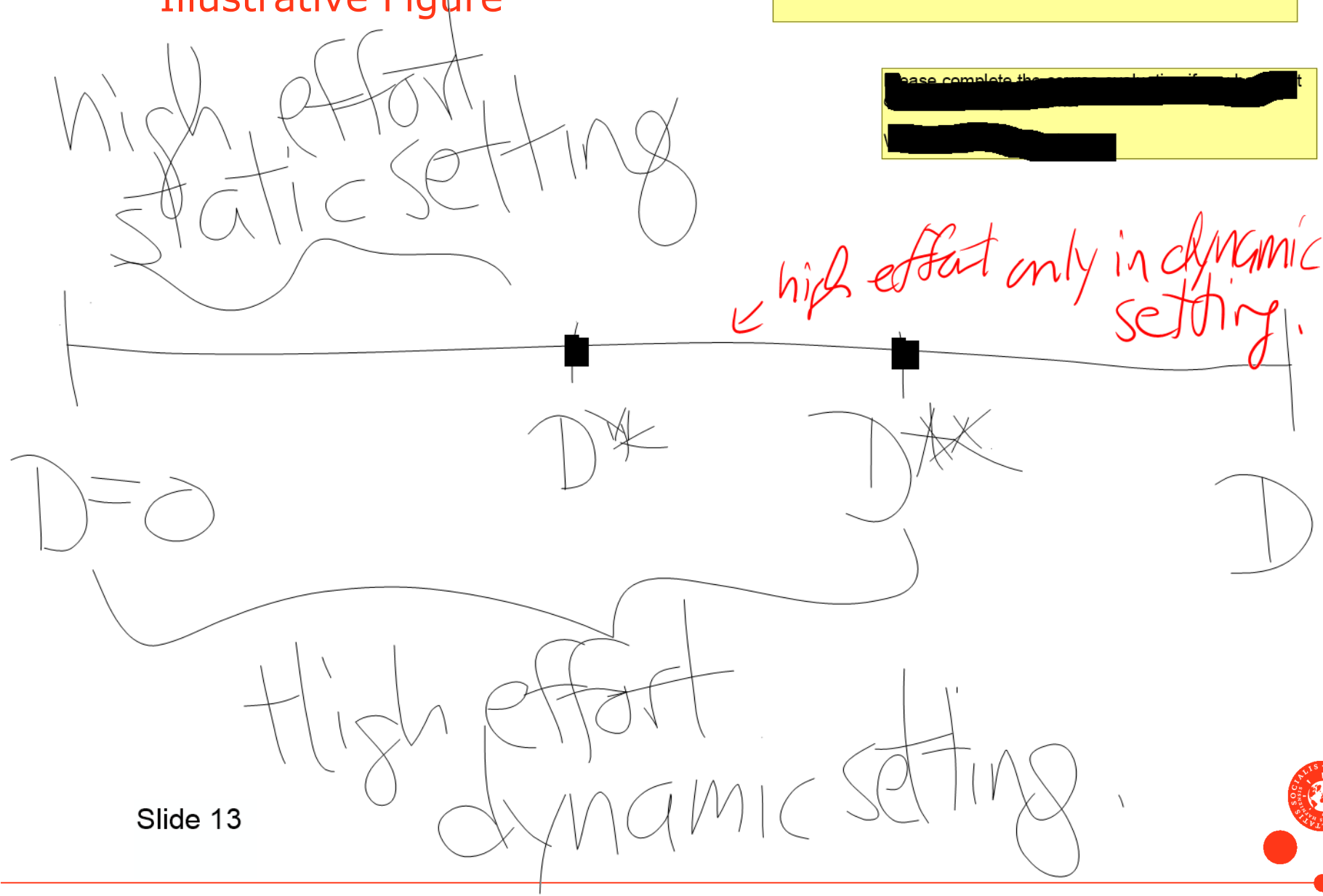
Capital structure still matters, but repeated int
”less likely” to reduce firm value. In particular if the principal is patient:

-> D** is increasing in δ, with D** = D* iff δ = 0.

Illustrative Figure

Setting with commitment to agent but not to creditors

[redacted]



Dynamic, no commitment

Conclusion: ability of the principal to take advantage of the agent, by not paying the expected bonus at t = 1, makes it more tempting for the principal to "take advantage" of creditors (i.e. not implement high effort in every period, as creditors expected).

Principal **cannot commit to creditors** to offer (b,w), or reveal bonus paid (observability). Given contract (b,w) offered, **cannot commit to agent** to pay b after high performance (non-verifiability).

Suppose the principal offers $(b = c\ ,\ w = \bar{u})$. Creditors expect high effort, so that r = 0. Does the principal have an incentive to pay b after high performance?

Principal's expected payoff, given debt D, paying bonus:

$$\frac{1}{1-\delta}\pi_H = \frac{1}{1-\delta}\ (f(1) - c - \bar{u})$$

Non payment bonus

Suppose agent chooses low effort in all periods after principal reneges. Then Principal's expected payoff, given D, reneging in period 1 (best deviation):

$$(\pi_H + c) + \frac{\delta}{1-\rho\delta}\pi_L(D) = \ (f(1) - \bar{u}) + \frac{\delta}{1-\rho\delta}\ (-K + f(0) - \bar{u} + \rho K + \ (1-\rho)\ D)$$

seen before

Assume that after the Principal reneges on the promised bonus at t = 1, then the agent exerts low effort in every future period.

Dynamic, no commitment

Principal will pay bonus if:

$$\frac{1}{1-\delta}\pi_H \geq (\pi_H + c) + \frac{\delta}{1-\rho\delta}\pi_L(D)$$

Thus, in equilibrium, the principal will implement high effort whenever the above condition holds, and will otherwise implement low effort.

Recall that the corresponding condition, when the principal could commit to the agent, was:

$$\frac{1}{1-\delta}\pi_H \geq [\quad] + \frac{\delta}{1-\rho\delta}\pi_L(D)$$

$\pi_L(D)$

$\pi_L(D)\left[1 + \delta\rho + \delta^2\rho^2 + \ldots\right]$

$= \frac{\pi_L(D)}{1-\delta} = 1\cdot\pi_L(D) + \frac{\delta}{1-\delta}\pi_L(D)$

Dynamic, no commitment

Define D*** by

$$\frac{1}{1-\delta}\pi_H = (\pi_H + c) + \frac{\delta}{1-\rho\delta}\pi_L(\text{D***})$$

no commitment at all

so the principal will implement high effort iff D < D***

Recall that D** was defined by

$$\frac{1}{1-\delta}\pi_H = \pi_L + \frac{\delta}{1-\rho\delta}\pi_L(\text{D*})$$

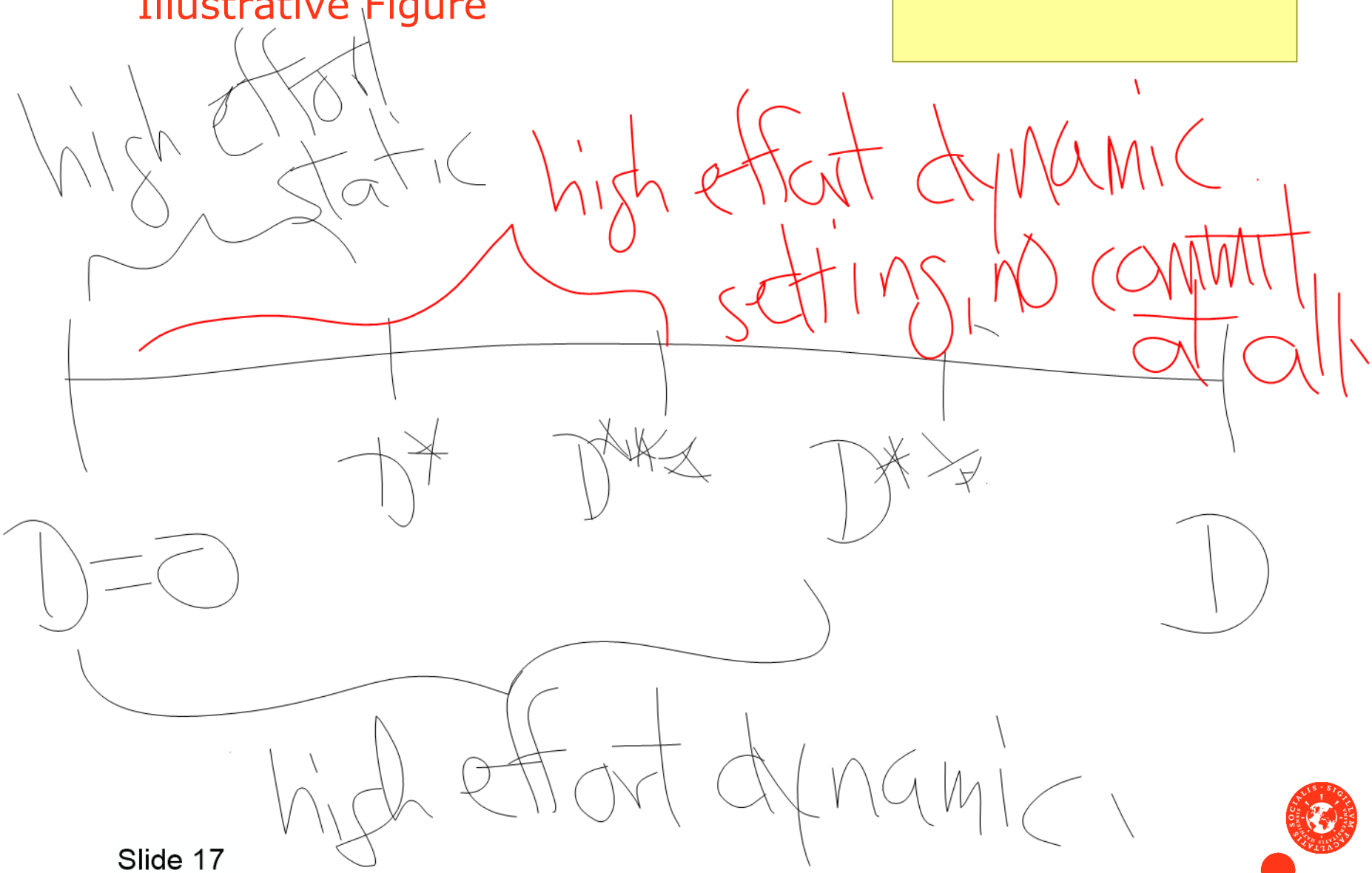
→ commit to agent

so that, with commitment to the agent, the principal would implement high effort iff D < D**.

We have D*** < D**: the principal's ability to "cheat" the agent will mean that low effort is now implemented for a wider range of debt levels.

Illustrative Figure

No commitment to creditors



From: Slide 15

Rewrite the principal's incentive constraint to pay the promised bonus to the agent:

$$c \leq \delta\left(\frac{\pi_H}{1-\delta} - \frac{\pi_L(D)}{1-\rho\delta}\right)$$

Where:

$$\pi_H = f(1) - c - \bar{u}$$

$$\pi_L = -K + f(0) - \bar{u} + \rho K + (1-\rho)\gamma K$$

$$\pi_L(D) = \pi_L + (1-\rho)\,(D - \gamma K)$$

Commitment role of equity financing?

High debt levels (i.e. debt financing) can make it more difficult to effectively commit to your workforce.

Thus:

$$c \leq \delta\left[\left(\frac{\pi_H}{1-\delta} - \frac{\pi_L}{1-\rho\delta}\right) - \frac{(1-\rho)(D-\gamma K)}{1-\rho\delta}\right]$$

i.e. (future efficiency loss from low effort – **costs imposed on creditors**) exceeds immediate gain of reneging

The higher the debt level, the more tempting to renege on promise to the agent, because more costs can then be shifted to the creditors

Discussion and summing up

In a dynamic setting where the principal cannot commit to creditors or to the agent, as analyzed by Fahn et al. (2019), **capital structure may matter**.

Assumption that principal cannot commit to creditors is particularly important

Given extra commitment problems towards agent, **relational contracts** are key: the agent will punish the principal for reneging, which can be particularly important if players are sufficiently patient

Such relational contracts then only enforceable if **debt is sufficiently low**

Debt is a larger problem than in setting where principal can commit to agent, because principal can now shifts costs to both agent and creditors

Interaction between frictions: ability to cheat creditors, given high debt, makes it more attractive to cheat agent. *Commitment role of equity financing*

Cheating agent gives immediate gain. Future losses from punishment, but some are passed onto creditors

Question

We have seen the mechanism by which debt affects firm value in Fahn et al. (2019) depends (in particular) on three features :

Unobservability:

- Creditors cannot observe interactions between principal and agent (contract, bonus payments)

Discretion:

- Principal can renege on promised bonus to agents

Punishment:

- Agent can punish principal if reneging occurs.

Please take 5 minutes or so to discuss. Then go to socrative.com and write a short answer.

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Question: Consider the examples in the first two pages of "Relational Incentive Contracts" by J. Levin (2003) (First Boston, Credit Suisse etc.). Do these examples provide support for the above features? Why or why not?

Discussion

Introduction of Levin (2003) supports idea of discretion:

"50 percent of law firms report using subjective measures of performance to determine partner compensation"

Examples support idea of punishment:

-United Airlines labor dispute in 2001
-Turmoil at First Boston
-Departure at Goldman Sachs

But what about unobservability?

Then again, in practice, it is often not completely clear, if firms have reneged on promises workers.

Ambiguity: external circumstances (hard times).

Reason why it is not immediately clear to outsiders, if there has been reneging on promises inside the firm.

-If researchers, journalists can find out when workers are punishing management for reneging, then perhaps creditors can find out as well.
-If so, difficult to pass costs generated by reneging on to creditors

Intended outcomes revisited

1. To derive how debt affects value in the dynamic setting of Fahn et al. (2019), focusing on **punishments** and the interactions between **contracting frictions.**

Capital structure can matter when principal faces commitment problems with both creditors and agent. Principal may keep promise to agent because of potential punishment. But high debt allows it to pass costs from this punishment onto creditors, increasing incentive to renege.

2. To relate the motivating examples in Levin et al. (2003) to the analysis here, and **discuss** whether they provide support for the mechanism proposed by Fahn et al. (by which debt affects value).

Examples suggest that discretion is important and workers may engage in punishment. But perhaps creditors will observe when punishment occurs.