Reply to Bernhardt, Koufopoulos, and Trigilia's "Is There a Paradox of Pledgeability?"*

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Abstract

In our paper, Donaldson, Gromb, and Piacentino (2018), we study a firm constrained in its ability to use collateral by "limited pledgeability" (in our baseline model) and "limited collateralizability" as well (in an enriched model). Bernhardt, Koufopoulos, and Trigilia (2020) extend the analysis of our baseline model. Their main result is that higher pledgeability cannot hurt a firm. Here, we clarify how this intuitive result complements our analysis. It contradicts none of it, including our "Paradox of Pledgeability." Then, using their result as a benchmark, we explain our result that higher collateralizability can hurt, obtained in our enriched model. We also argue for the enriched model's plausibility. Finally, we derive a new result on how higher pledgeability can hurt in our enriched model.

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1 Is there a paradox of pledgeability?

In Donaldson, Gromb, and Piacentino (2018, hereinafter DGP), we study a firm's borrowing and investment subject to "limited pledgeability" and "limited collateralizability," both of which limit its ability to use assets as collateral. We focus on limited pledgeability in our baseline model; we include limited collateralizability in an enriched model.

One of our main results is that, in our baseline model, higher pledgeability can impede the firm's ability to borrow unsecured, forcing it to use debt secured by collateral instead (Proposition 1). We found this result counter-intuitive and called it a "Paradox of Pledgeability."

Bernhardt, Koufopoulos, and Trigilia (2020, hereinafter BKT) extend the analysis of our baseline model. Their main result is that higher pledgeability cannot hurt the firm. This intuitive result[1] is a useful complement to ours. It clarifies that, *in our baseline model*, although higher pledgeability can impede the firm's ability to borrow secured (our result), it cannot make the firm worse off (theirs).[2]

Yet, to be clear: Is there a paradox of pledgeability as defined in our paper? Yes.

2 Can higher availability of collateral ever hurt?

Our paper, like BKT, addresses this important question. Many governments expend vast resources to increase the availability of collateral. But some empirical evidence suggests this might do more harm than good (Acharya, Amihud, and Litov (2011) and Vig (2013)).

BKT's result provides a useful benchmark: *in our baseline model*, in which only lim-

[1] It is easily derived from DGP's conditions (9) and (10). For a given pledgeability level θ, both can be satisfied by a suitable level of secured debt σ_0 only if $I_1^H - I_1^L < \theta\big(X_1^H - X_1^L\big)$. Increasing θ relaxes the condition provided $X_1^H > X_1^L$, the only relevant case in our baseline model.

[2] While DGP focuses on secured and unsecured debt contracts, BKT show that more general contracts can implement the first-best. A version of this result was previously derived in the more general environment of Donaldson, Gromb, and Piacentino (2019).

ited pledgeability constrains collateral availability, higher collateral availability cannot hurt, in line with received theory. Thus, studying the issue in our baseline model generates little novel to say. That is why we do not. Instead, we enrich the model to speak to the issue, by allowing limited collateralizability to constrain collateral availability as well. Importantly, we allow future collateralizability to be higher than current collateralizability.

One of our main results is that *in this enriched model*, increasing future collateral availability, i.e. future collateralizability, can hurt (Proposition 4). In that sense, "policies aimed at increasing the supply of collateral can backfire" (see DGP's Abstract).

Why does this unusual result hold in our enriched model, but nothing like it holds in our baseline? Because in the enriched model, future and current collateral availability are different parameters, whereas in the baseline model they are linked, so you cannot change one without changing the other by the same amount. And future and current collateral availability have distinct effects. (i) Higher future collateral availability has a negative effect: it makes diluting existing debt with future secured debt easier. (ii) Higher current collateral availability has a positive effect: it makes it easier to secure current debt as protection against dilution. In the baseline model, secured debt can be chosen so that (ii) offsets (i). Not so in the enriched model.[3]

BKT's result is useful for understanding the conditions under which this result obtains, which, though stated correctly, are admittedly not stressed sufficiently in our paper.

3 Are the conditions for higher collateralizability to hurt plausible?

BKT's discussion indirectly raises the question of whether the conditions under which higher collateralizability hurts are plausible. We believe that they are. Future assets could

[3]In DGP, we show that the distinction between current and future collateralizability is sufficient for higher collateral availability to hurt. BKT show that is it also necessary. Their result follows quickly from our equation (12).

become more collateralizable than current assets if, e.g., creditor rights are expected to improve over time, as is likely in developing countries, if property registries are expected to improve over time, as is likely in periods of technological innovation, or if a firm's fixed assets are expected to grow over time, as is likely for constrained firms. This could matter for policy, e.g., the promise to implement a reform to increase collateralizability in the future could undermine current efficiency.

4 Higher pledgeability can also hurt

Our enriched model distinguishes "pledgeability," i.e. how easily assets can be seized ex post, from "collateralizability," i.e. how easily they can be assigned property rights to ex ante. In DGP, we show that higher collateralizability can hurt, but do not study whether higher pledgeability can. Can it? Or does BKT's "pledgeability cannot hurt" result extend to our enriched model?

It does not. In fact, it can be shown that if future collateralizability is high, higher pledgeability of all assets, current and future, can hurt (see the Appendix for a formal statement, proof, and numerical example). The reason is that pledgeability matters more when assets are more collateralizable. Hence, for high future collateralizability, it affects future borrowing constraints more than current ones. As a result, the positive effect (ii) cannot offset the negative effect (i).

References

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A Higher pledgeability can also hurt (formal statement, proof, and numerical example)

Here we maintain the notation and assumptions of DGP. The following is a corollary of Proposition 4.

Corollary 1. *Assume $p = 0$ and define*

$$\theta^{**} := \frac{I_1^L}{\mu_1 X_1^L + \frac{1}{2}\big((1-\mu_0)X_0 + (1-\mu_1)X_1^L\big)}. \tag{1}$$

If $\theta < \theta^{**}$, B invests at Date 0, but not at Date 1. If $\theta \geq \theta^{**}$, B invests neither at Date 0 nor at Date 1.

Since B captures the NPV of all investments and Project 0 has positive NPV, this result implies immediately that increasing θ can hurt B.

Proof. Since $p = 0$, it is always state L at Date 1.

- Given Assumption 4, B always invests if it is feasible (Lemma 1).
- Given Assumptions 1 and 3, B can invest at Date 0 if and only if he can commit not to invest at Date 1 (Lemma 2 with $p = 0$).

From equation (A.6), he can do this whenever

$$\mu_1 \theta X_1^L + \frac{1}{2}\Bigg((1-\mu_0)\theta X_0 + (1-\mu_1)\theta X_1^L\Bigg) < I_1^L \tag{2}$$

or, rearranging, $\theta < \theta^{**}$. □

A numerical example that satisfies all of our assumptions in a neighborhood of θ^{**} is $p = 0, I_0 = 8, X_0 = 12, I_1^L = 12, X_1^L = 10, \mu_0 = 0$, and $\mu_1 = 1$ (I_1^H and X_1^H are irrelevant given $p = 0$): in this case, $\theta^{**} = \frac{12}{10+\frac{1}{2}\cdot 12} = \frac{3}{4}$. At $\theta = \theta^{**}$ our assumptions (see Section 3.5) are satisfied:

- Assumption 1 says $8 < \frac{3}{4} \cdot 12$, which holds.
- Assumption 2 (for state L only, given $p = 0$) says $12 > 10$, which holds (although it is not actually needed for the result).
- Assumption 3 (for state L only, given $p = 0$) says $\frac{3}{4} \cdot (12+10) < 8+12$, which holds.
- Assumption 4 says $(1 - \frac{3}{4}) \cdot 10 > \frac{3}{4} \cdot 12 - 8$, which holds.
- Assumption 5 is irrelevant since it pertains only to state H and $p = 0$.