『大阪公立大学経済研究』校正前公開原稿

論文タイトル: Collateral and Soft Budget Constraints

著者: Kenji TSUJI

掲載受理日: 2025/9/12

Collateral and Soft Budget Constraints

Kenji TSUJI
Osaka Metropolitan University

Abstract: This paper investigates how collateral affects soft budget constraint problems by using a model where the amount of collateral is determined endogenously. The theoretical analyses indicate that sufficient collateral induces lenders not to refinance their project, hardens entrepreneurs' budget constraint, and resolves the soft budget constraint problem. In particular, they show that insufficient collateral plays no role in alleviating the problem.

Keywords: soft budget constraints, collateral, transaction costs
JEL classification number: G21, G30

1. Introduction

This paper investigates how collateral affects soft budget constraint problems, which were originally posed by Kornai (1980) and have subsequently been studied by Dewatripont and Maskin (1995), Berglöf and Roland (1995, 1997), and others.[1] Berglöf and Roland (1995, 1997, 1998) and Tsuji (2015, 2018) have indicated that a soft budget constraint is more likely to arise when the amount or the liquidation value of collateral is small. Although the amount or the liquidation value of collateral is given exogenously in their model, it is determined endogenously in this paper. As in Barro (1976) and Besanko and Thakor (1987), it is assumed that transaction costs occur in liquidating collateral.

I show that sufficient collateral induces lenders not to refinance their project, hardens entrepreneurs' budget constraint, and resolves the soft budget constraint problem, and that insufficient collateral plays no role in alleviating the problem.

The rest of the paper is structured as follows. Section 2 describes the basic model. Section 3 analyzes the behavior of lenders. Section 4 analyzes the behavior of entrepreneurs. Section 5 derives the subgame perfect equilibrium. Section 6 presents a brief conclusion.

2. The model[2]

Suppose that an entrepreneur launches a project. The project requires one unit of capital at the beginning of the first period. The entrepreneur borrows one unit of capital for one period from a lender at the beginning of the first period in order to launch a project.

There are two possible states. The state is good with probability p (>0, <1) and bad with probability $1-p$. Immediately after the project has been launched, the state, which is not verifiable to outsiders e.g. courts, is determined and is known to both the entrepreneur and the lender.

In the good state, the entrepreneur exerts low effort, and the project generates a

[1] See Maskin (1996, 1999), Maskin and Xu (2001) and Kornai, Maskin and Roland (2003) for surveys on the soft budget constraint problem.
[2] This model is a revised version of Tsuji (2022).

monetary return R (>1, <2) with probability 1 at the end of the first period. It is assumed that $p \cdot R-1>0$. In the bad state, the same return is generated with probability α and no return occurs with probability $1-\alpha$ at the end of the second period, if the entrepreneur exerts high effort or if the entrepreneur exerts low effort and the lender refinances the project, i.e., provides one additional unit of capital, which is used as a second-period investment by the entrepreneur, in the second period. If the entrepreneur exerts low effort and the lender does not refinance the project in the second period, the project yields no return at the end of the second period. However, if the lender terminates the project at the end of the first period, the lender obtains the liquidation value by liquidating collateral, while the entrepreneur has no return. The lender bears transaction costs in liquidating collateral. The transaction costs are defined as $t \cdot C$, where C is the amount of collateral and the distribution of t ($\geqq 0$, $\leqq 1$) is assumed to be uniform. That is, $f(t)=1$, where f(t) is the density function of t. The value of t is known to both the entrepreneur and the lender, after the entrepreneur exerts high or low effort and before the lender decides whether to refinance or terminate the project.

As assumed by Berglöf and Roland (1995) and others, the entrepreneur obtains non-monetary, non-transferable unobservable private benefits, such as job security and various perquisites, if a project is undertaken and completed, i.e., it is not terminated at the end of the first period. The private benefits of the entrepreneur are E_H if he or she exerts high effort and E_L if he or she exerts low effort. Furthermore, it will be assumed that $E_L-1<E_H<E_L$. The entrepreneur maximizes the sum of his or her expected monetary return and private benefits, which is henceforth called his or her expected total benefits.

Lenders are assumed to be ready to provide funds, as long as they at least break even on their loan. That is, they grant the loan if they can earn non-negative expected profits by doing so.

The assumption that $R < 2$ implies that not all the initial and additional investments for the project can be recovered. That is, in the bad state, potential lenders do not grant the second-period loan, since they cannot earn non-negative expected profits by doing so.

Entrepreneurs and lenders are both assumed to be risk-neutral. The risk-free market interest rates are certain and normalized to zero. The monetary transfers between the entrepreneur and the incumbent lender are observable and verifiable. Parameters p and α are considered to be common knowledge.

The structure of the game is depicted in Fig. 1, where the first term in parentheses represents the expected returns to the lender and the second term represents the expected total benefits to the entrepreneur. r ($\geqq 0$, $\leqq R$) represents an interest factor contracted at the beginning of the first period between the lender and the entrepreneur.

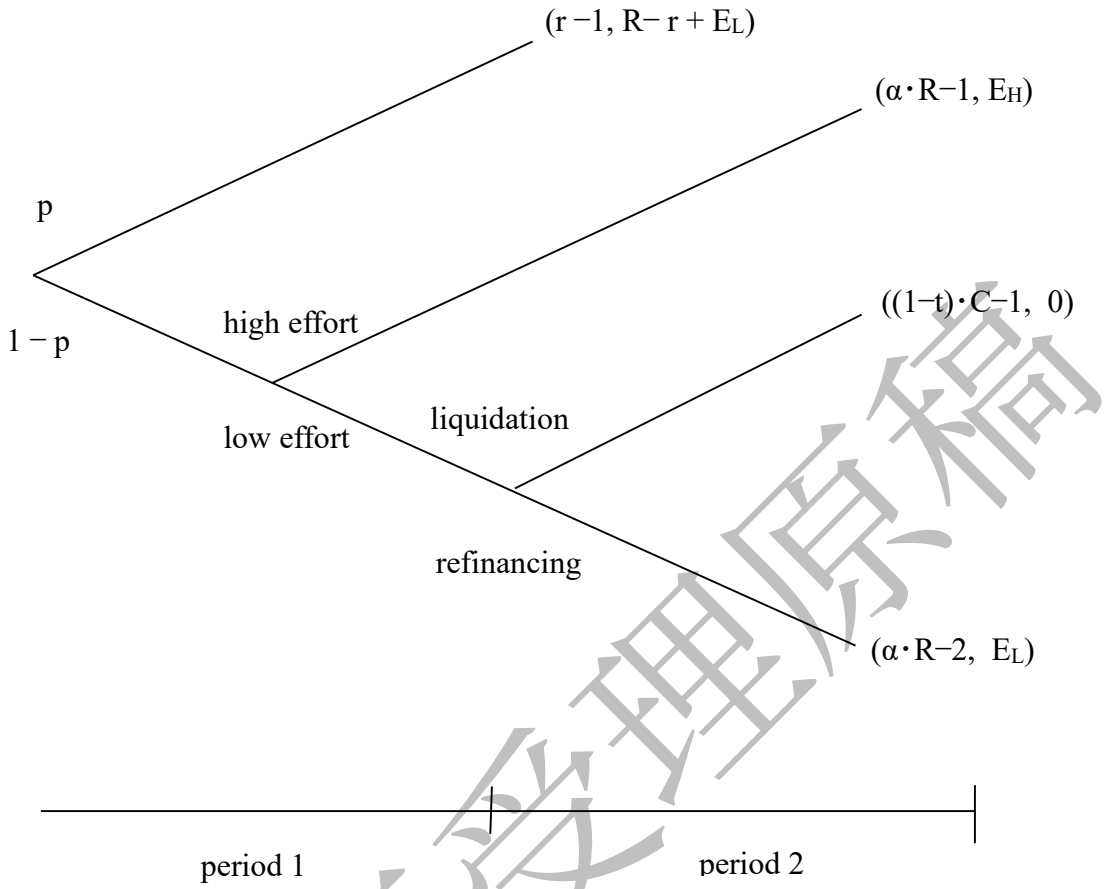

Fig. 1. The structure of the game

3. The behavior of the lender

Here, let us suppose that the state is bad and the entrepreneur exerts low effort. Assume that the lender has all the bargaining power in the bad state, because the entrepreneur cannot repay the first-period loan at the end of the first period.

If the lender makes a loan of one unit of capital in the second period, i.e. refinances the project, then the immediate expected profit of the lender in the second period is $\alpha \cdot R - 1$. Assume that $\alpha \cdot R - 1 > 0$. If the lender does not make a loan of one unit of capital in the second period, i.e. terminates the project, then the immediate expected profit of the lender in the second period is $(1-t) \cdot C$. Hence, if $\alpha \cdot R - 1 \geqq (1-t) \cdot C$, the incumbent lender always grants the loan in the second period, i.e. refinances the project. If $\alpha \cdot R - 1 < (1-t) \cdot C$, the incumbent lender does not grant the loan in the second period, i.e. terminates the project.

Let us denote $(\alpha \cdot R - 1)/C$ by β. If $\alpha \cdot R - 1 \geqq (1-t) \cdot C$, i.e. $\beta \geqq 1-t$, then the incumbent lender refinances the project. If $\alpha \cdot R - 1 < (1-t) \cdot C$, i.e. $\beta < 1-t$, then the incumbent lender terminates the project. Hence, the project is refinanced if $t \geqq 1-\beta$, and the project is terminated if $t < 1-\beta$.

4. The behavior of the entrepreneur

This section assumes that the state is bad. First, let us suppose that the lender refinances the project. The benefit of the entrepreneur is E_H if he or she exerts high effort and E_L if he or she exerts low effort. Since $E_H < E_L$, the entrepreneur chooses low effort.

Next, suppose that the lender does not refinance, i.e. terminates the project. The benefit of the entrepreneur is E_H if he or she exerts high effort and 0 if he or she exerts low effort. Since $E_H > 0$, the entrepreneur chooses high effort.

Suppose that $\beta > 1$. Since $\beta \geqq 1-t$, the project is refinanced and the entrepreneur chooses low effort.

Suppose that $0 < \beta < 1$. The probability of refinancing is

$$\int_{1-\beta}^{1} f(t)dt = [t]_{1-\beta}^{1} = 1-(1-\beta) = \beta,$$

where the first equality comes from $f(t)=1$.

If the entrepreneur chooses low effort, the lender refinances the project with a probability of β and terminates it with a probability of 1-β. Hence, the entrepreneur chooses low effort if $\beta \cdot E_L \geqq E_H$ and chooses high effort if $\beta \cdot E_L < E_H$.

Denoting the expected liquidation costs of collateral by ELCC, we have

$$ELCC = \int_0^{1-\beta} t \cdot C \cdot f(t)dt = (1/2)\cdot(1-\beta)^2 \cdot C .$$

Differentiating ELCC with respect to C, we have

$$\begin{aligned}\frac{dELCC}{dC} &= -(1-\beta)\cdot\frac{d\beta}{dC}\cdot C + (1/2)\cdot(1-\beta)^2 \\ &= -(1-\beta)\cdot\left(-\frac{\beta}{C}\right)\cdot C + (1/2)\cdot(1-\beta)^2 \\ &= (1-\beta)\cdot\{\beta + (1/2)\cdot(1-\beta)\} \\ &= (1/2)\cdot(1-\beta^2) > 0,\end{aligned}$$

where the second equality comes from $\frac{d\beta}{dC} = -\frac{\alpha\cdot R-1}{C^2} = -\frac{\beta}{C}$. Hence, the expected liquidation costs of collateral, ELCC, get larger, as collateral, C, increases.

5. Soft budget constraints

First, let us analyze a benchmark case, where soft budget constraints do not arise. This refers to the situation in which the entrepreneur chooses high effort in the bad state. From the zero expected profit condition of the lender, the expected profit of the entrepreneur, S(I), at the beginning of the first period is

$$S(I) = p\cdot(R+E_L) + (1-p)\cdot(\alpha\cdot R+E_H) - 1.$$

Second, suppose that $\beta > 1$, i.e. $C < \alpha\cdot R-1$. In this case, the incumbent lender

always refinances the project. Hence, the entrepreneur chooses low effort. From the zero expected profit condition of the lender, the expected profit of the entrepreneur, S(II), at the beginning of the first period is

$$S(II) = p\cdot(R+E_L) + (1-p)\cdot(\alpha\cdot R+E_L-1) - 1.$$

Subtracting S(I) from S(II),

$$S(II)-S(I) = (1-p)\cdot\{(E_L-1)-E_H\} < 0.$$

That is, inefficiency occurs and the soft budget constraint problem arises. In this case, the entrepreneur chooses any value of $C \in [0\ ,\ \alpha\cdot R-1)$ and collateral plays no role.

Third, suppose that $\frac{E_H}{E_L} \leqq \beta \leqq 1$, i.e. $\alpha\cdot R-1 \leqq C \leqq(\alpha\cdot R-1)\cdot\frac{E_L}{E_H}$. In this case, the entrepreneur chooses low effort. From the zero expected profit condition of the lender, the expected profit of the entrepreneur, S(III), at the beginning of the first period is

$$\begin{aligned} S(III) &= p\cdot(R+E_L) \\ &\quad +(1-p)\cdot\{\textstyle\int_{1-\beta}^{1}(\alpha\cdot R+E_L-1)\cdot f(t)dt - \int_{0}^{1-\beta} t\cdot C\cdot f(t)dt\} - 1 \\ &= p\cdot(R+E_L) + (1-p)\cdot\{\beta\cdot(\alpha\cdot R+E_L-1)-(1/2)\cdot(1-\beta)^2\cdot C\} - 1. \end{aligned}$$

Differentiating S(III) with respect to C yields

$$\begin{aligned} \frac{dS(III)}{dC} &= (1-p)\cdot[\frac{d\beta}{dC}\cdot\{(\alpha\cdot R+E_L-1)+(1-\beta)\cdot C\}-(1/2)\cdot(1-\beta)^2] \\ &= (1-p)\cdot[\frac{d\beta}{dC}\cdot(\alpha\cdot R+E_L-1) +(1/2)\cdot(1-\beta)\cdot\{2\cdot\frac{d\beta}{dC}\cdot C-(1-\beta)\}] \\ &=(1-p)\cdot[\frac{d\beta}{dC}\cdot(\alpha\cdot R+E_L-1) -(1/2)\cdot(1-\beta)\cdot(1+\beta)] \\ &=(1-p)\cdot[\frac{d\beta}{dC}\cdot(\alpha\cdot R+E_L-1) -(1/2)\cdot(1-\beta^2)] < 0, \end{aligned}$$

where the third equality and the final inequality come from $\frac{d\beta}{dC}=-\frac{\alpha\cdot R-1}{C^2}=-\frac{\beta}{C}<0$. Since the termination of the project entails dead-weight losses, the entrepreneur prefers to decrease collateral, C, in order to increase the probability, β, of refinancing the project. Hence, the entrepreneur chooses the lowest amount of C, i.e. $C=\alpha\cdot R-1$, because $\beta\ (=\frac{\alpha\cdot R-1}{C}) \leqq 1$. When $C=\alpha\cdot R-1$, i.e. $\beta = 1$, the incumbent lender always refinances the project. In this case, the expected profit of the entrepreneur, $S(III \mid \beta=1)$, at the beginning of the first period is

$$S(III \mid \beta=1) = p\cdot(R+E_L) + (1-p)\cdot(\alpha\cdot R+E_L-1) - 1.$$

In this case, collateral plays no role.

Since S(III | β＝1) ＝ S(II), the entrepreneur chooses any value of C ∈ [0 , α･R−1] and collateral plays no role if $0 \leqq C \leqq (\alpha \cdot R-1) \cdot \frac{E_L}{E_H}$.

Finally, suppose that $0 < \beta < \frac{E_H}{E_L}$, i.e. $(\alpha \cdot R-1) \cdot \frac{E_L}{E_H} < C$. In this case, the entrepreneur chooses high effort. From the zero expected profit condition of the lender, the expected profit of the entrepreneur, S(IV), at the beginning of the first period is

$$S(IV) = p \cdot (R + E_L) + (1-p) \cdot (\alpha \cdot R + E_H) - 1 = S(I)$$

That is, inefficiency does not occur and the soft budget constraint problem does not arise. In this case, collateral induces the entrepreneur to choose high effort.

From the above analysis, the following proposition is obtained.

Proposition 1

(1) If $0 \leqq C \leqq (\alpha \cdot R-1) \cdot \frac{E_L}{E_H}$, the lender always refinances the project in the bad state, the entrepreneur exerts low effort, inefficiency occurs and the soft budget constraint problem arises. In this case, collateral plays no role in alleviating the problem. The expected profit of the entrepreneur at the beginning of the first period is

$$S(II) = S(III \mid \beta = 1) = p \cdot (R + E_L) + (1-p) \cdot (\alpha \cdot R + E_L - 1) - 1$$
$$< S(I) = p \cdot (R + E_L) + (1-p) \cdot (\alpha \cdot R + E_H) - 1.$$

(2) If $(\alpha \cdot R-1) \cdot \frac{E_L}{E_H} < C$, the lender does not refinance the project in the bad state, the entrepreneur exerts high effort, inefficiency does not occur and the soft budget constraint problem does not arise. In this case, collateral solves the problem. The expected profit of the entrepreneur at the beginning of the first period is

$$S(IV) = p \cdot (R + E_L) + (1-p) \cdot (\alpha \cdot R + E_H) - 1 = S(I).$$

6. Conclusion

In this paper, I analyzed how collateral affects the soft budget constraint problem. I found that if the entrepreneur is endowed with sufficient collateral, the collateral induces the lender not to refinance the project, hardens the entrepreneur's budget constraint, and solves the problem, and that if the entrepreneur is not endowed with sufficient collateral, the collateral plays no role in alleviating the problem.

REFERENCES

Barro, R. J., 1976, "The Loan Market, Collateral, and Rates of Interest." *Journal of Money, Credit and Banking*, 8, 439-456.

Berglöf, E. and G. Roland, 1995, "Bank Restructuring and Soft Budget Constraints in

Financial Transition." *Journal of the Japanese and International Economies*, 9, 354-375.
Berglöf, E. and G. Roland, 1997, "Soft Budget Constraints and Credit Crunches in Financial Transition." *European Economic Review,* 41, 807-817.
Berglöf, E. and G. Roland, 1998, "Soft Budget Constraints and Banking in Transition Economies." *journal of Comparative Economics,* 26, 18-40.
Besanko, D. and A. V. Thakor, 1987, "Collateral and Rationing: Sorting Equilibria in Monopolistic and Competitive Credit Markets." International Economic Review, 28, 671-689.
Dewatripont, M. and E. Maskin, 1995, "Credit and Efficiency in Centralized and Decentralized Economies." *Review of Economic Studies*, 62, 541-555.
Kornai, J., 1980, *The Economics of Shortage*, New York: North-Holland.
Kornal, J., E. Maskin and G. Roland, 2003, "Understanding the Soft Budget Constraint." *Journal of Economic Literature*, 41, 1095-1136.
Maskin, E. S., 1996, "Theories of the Soft Budget-Constraint." *Japan and the World Economy*, 8, 125-133.
Maskin, E. S., 1999, "Recent Theoretical Work on the Soft Budget Constraint." *American Economic Review*, 89, 421-425.
Maskin, E. and C. Xu, 2001, "Soft Budget Constraint Theories from Centralization to the Market." *Economics of Transition*, 9, 1-27.
Tsuji, K., 2015, "Bank Capital Regulation and Soft Budget Constraints." *International Advances in Economic Research*, 21, 33-40.
Tsuji, K., 2018, "Bargaining Power and Soft Budget Constraints." *Journal of Economics / Keizaigaku Zasshi (Osaka City University)*, 119, 129-137.
Tsuji, K., 2022, "Information and Soft Budget Constraints." *Journal of Economics / Keizaigaku Zasshi (Osaka City University)*, 122, 27-37.