Take the money and run: making profits by paying borrowers to stay home

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Abstract

Can a bank increase its profit by subsidizing inactivity? This paper suggests this may occur, due to the presence of hidden information, in a monopolistic credit market. The subsidy, by sorting worse entrepreneurs, prevents the realization of surplus-destroying projects. Under some conditions, sorting may avoid the collapse of the market and is Pareto -improving.

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1 Introduction

Can a bank increase its profit by giving away money? This paper suggests this may occur, due to hidden information, in a monopolistic credit market. The result arises when the entry of worse, surplus-reducing, borrowers can be avoided by use of a subsidy to inactivity that the bank itself should pay. We show that if when the subsidy policy is profitable, it is also Pareto improving. Under some further conditions, this policy is the only one delivering positive profits and therefore it also avoids the overall collapse of a lemons' credit market (Akerlof, 1970). Moreover the ability to grant the subsidy is clearly specific to a monopolistic credit market and therefore the realized surplus is always larger under monopoly than under competition.

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The literature on the credit market has already discussed the possibility that a subsidy to stay out might increase welfare. Contributions in this field generally suggest that a public subsidy may improve on the private equilibrium (see for example de Meza and Webb, 2000; Gruner, 2003; Reito, 2011). Our idea, instead, is that a monopolistic bank itself can implement the subsidy policy and increase its profits.

2 A simple model

The economy is composed of a large number, N, of potential entrepreneurs, each endowed with one of two possible projects, a and b. Both projects require a fixed investment of L, but differ in their final expected gross (and net) return. Project a, the good one, succeeds with probability p_a and yields y_a. Project b, the bad one, yields in case of success a return $y_b > y_a$, but with a probability $p_b < p_a$. Both projects deliver zero revenues in case of failure. Assume that project a has a positive net value, while project b a negative one, that is:

$$p_b y_b < L < p_a y_a,$$

Accordingly, bad projects should not be undertaken, from a social perspective, as they produce less than the resources employed. But because of limited liability and asymmetric information they can still be financed at a common contract with better entrepreneurs and benefit from an implicit cross subsidy.

Potential entrepreneurs have no endowment, so they are forced to ask for outside finance. There is a single lender/bank endowed with all the contractual power. As regards the informational structure, each entrepreneur knows its own quality while the bank only knows the proportion of good types, α. Assume that the final returns are imperfectly observable in the sense that the bank cannot verify the actual output produced. In this case, the optimal form of financing is the debt contract. We assume universal risk neutrality and an infinitely elastic supply of funds at a risk-free interest rate normalized to 0. A standard loan contract specifies the fixed loan size, L, and the sum that the firm has to repay if the final project is successful, R[1]. As no endowment is available, the bank will offer a pooling contract with a repayment chosen to reap all the surplus. Since a type-i borrower accepts the contract if $R \leq y_i$, if $R > y_a$, only bad firms apply. The best choice for the bank is setting $R = y_a$ and proposing it as a the pooling contract if and only if $\pi_{pool} > 0$,that is for:

$$\alpha \geq \frac{L - p_b y_a}{y_a(p_a - p_b)} = \alpha_{pool}. \tag{1}$$

If the proportion of good types is not high enough, that is if $\alpha < \alpha_{pool}$, the market breaks down. In any case, the equilibrium is clearly inefficient from a social standpoint as only projects type-a deliver a positive net present value.

[1] With full information, the optimal contractual terms would be $R = y_a$ for type a and no contract for the inefficient type b. The monopolistic bank obtains maximum profit by extracting the whole good project's net value.

Now suppose that the lender can make a transfer, G, to induce bad types to stay out of the market. In this case the bank maximizes per-loan profits as follows:

$$\max \alpha p_a R - G(1-\alpha) - \alpha L \tag{2}$$

with the following incentive compatibility constraints

$$\begin{aligned} IC_a &: \; p_a(y_a - R) - G \geq 0, \quad \text{and} \\ IC_b &: \; p_b(y_b - R) - G \leq 0. \end{aligned} \tag{3}$$

Solving IC_a and IC_b, the repayment R and the transfer required G must satisfy:

$$\begin{aligned} R &\leq \frac{p_a y_a - p_b y_b}{p_a - p_b}, \\ G &\geq \frac{p_a p_b (y_b - y_a)}{p_a - p_b}. \end{aligned} \tag{4}$$

Of course the profit maximizing values of R^* and G^* are given by the equality constraints in (4). Substituting in (2) we obtain the per-loan profit under the subsidy policy:[2]

$$\pi_{sep} = \alpha(p_a y_a - L) - G^* \tag{5}$$

Proposition 1 *Under conditions on the parameters values, subsidizing inactivity may be profitable for the bank. When this occurs the subsidy policy must be Pareto welfare improving on a pure interest-rate contract.*

Let us compare both policies to find the range of α values such that $\pi_{sep} \geq \pi_{pool}$. We find that a necessary and sufficient condition is that

$$\alpha \leq 1 - \frac{G}{L - p_b y_a}. \tag{6}$$

Equation (6) shows that the separating policy is profitable in general for comparatively low values of α, depending on the ratio of the optimal transfer to the loss the bank shoulders on bad projects in the pooling case. Intuitively this is plausible: when the proportion of risky entrepreneurs is relatively small, the best policy for the bank is to accept their presence in the borrowers' pool. In this case, bad types will not impact too much on profits. Instead, when α is smaller, a subsidy to keep them out may make sense. Now define α^* as the threshold value for which the subsidy is more profitable. Clearly, condition (6) is relevant only if bank's profit is positive at α^*(see (1)).

It is $\pi_{sep} \geq 0$ when:[3]

$$\alpha \geq \frac{p_a p_b (y_b - y_a)}{(p_a y_a - L)(p_a - p_b)} = \frac{G}{(p_a y_a - L)}. \tag{7}$$

[2] See the Appendix A.

[3] See the Appendix A.

We define α_{sep} as the threshold value for which condition (7) is satisfied. The subsidy policy is profitable only when:[4]

$$\alpha_{sep} \leq \alpha^*. \tag{8}$$

Now note that the repayment under the subsidy policy is lower than that under the pooling policy (this is a necessary condition for the IC_a). This implies that good types are necessarily better off under the subsidy policy. For IC_b, this is true also for bad types and clearly, from (6), for the bank as well. Hence the subsidy policy is Pareto improving on a pure interest rate contract. *QED*.

Proposition 2 *Under a utilitarian welfare function the subsidy policy, when it is profitable for the bank, is the only one allowing full realization of the potential surplus.*

The potential surplus, $\bar{W}$, in this market is the net surplus from the a-projects:

$$\bar{W} = \alpha N(p_a y_a - L) \tag{9}$$

Considering that for $\alpha < \alpha_{sep}$, no credit contract is offered, for $\alpha_{sep} \leq \alpha \leq \alpha^*$, the subsidy-contracts are offered, and for $\alpha > \alpha^*$, only the pooling contract is offered, the realized surplus in the three situations is respectively:

$$\begin{gathered} W = 0 \quad \text{for} \quad \alpha < \alpha_{sep} \\ W = \alpha N(p_a y_a - L) \quad \text{for} \quad \alpha_{sep} \leq \alpha \leq \alpha^* \\ W = N(\alpha p_a y_a + (1-\alpha) p_b y_b - L) \quad \text{for } \alpha > \alpha^* \end{gathered} \tag{10}$$

The potential surplus is realized only under the subsidy policy. *QED*.

Proposition 3 *A competitive credit market can never achieve the potential surplus. For any value of α, the realized surplus is (weakly) lower than the monopoly one.*

A subsidy policy, necessarily requiring a cross-subsidy between contracts, can never be implemented in a competitive credit market. Hence the only contract available for banks is the pooling one. Banks will only offer credit for $\alpha > \alpha_{pool}$. The realized welfare will then be:

$$\begin{aligned} W &= 0 && \text{for} \quad \alpha < \alpha_{pool} \\ W &= N(\alpha p_a y_a + (1-\alpha) p_b y_b - L) && \text{for} \quad \alpha > \alpha_{pool} \end{aligned} \tag{11}$$

QED.

[4]See the Appendix A for a fuller discussion.

Proposition 4 *For a range of parameters' values, a subsidy to inactivity can avoid the collapse of the credit market.*

When $\alpha < \alpha_{pool}$, adverse selection produces the usual lemons' outcome, and no standard interest rate contract can be offered. However depending on parameters a subsidy contract could be still offered. For this to be true, it has to be $\alpha_{sep} < \alpha_{pool}$, i.e.[5]:

$$\frac{L - p_b y_b}{L - p_b y_a} > \frac{L}{p_a y_a} \tag{12}$$

This condition is more likely to be satisfied the smaller is the difference between y_b and y_a, and the larger is the surplus of the good project. Whenever (13) holds, there exist values of α such that the separating policy is profitable while the pooling policy is not. Note that this case is relevant since the subsidy policy, by enlarging the contract space, avoids the collapse of the credit market. Note that also in this case the subsidy policy is Pareto improving. *QED*

3 Concluding remarks

In this paper we have shown that under some conditions, a monopolistic bank can increase profits by subsidizing inactivity of the worse borrowers. The use of a subsidy as a sorting device allows the bank to offer credit only to good quality borrowers. When the conditions for profitability of the subsidy policy are met, the policy is also Pareto improving, and it is the only policy allowing full realization of surplus under a utilitarian welfare function. This is in stark contrast with models of separation through collateral, where the use of collateral delivers a dead-weight cost (Coco, 2000).

The source of the overall increase in welfare is the fact that surplus-destroying projects are not carried out in equilibrium under the subsidy policy. Another interesting feature of this model is that the subsidy policy may avoid the collapse of a 'lemon' credit market. Finally the subsidy policy is unviable in a competitive credit market, as banks would not be able to implement a cross subsidy among contracts. Hence a competitive market would collapse for a wider range of parameters. And anyway, even if banks were able to grant loans, competition could never prevent welfare-destroying entrepreneurs from carrying out their projects.

Our results hold for a certain distribution of projects where the mean return is inversely correlated with the riskiness. A particularly strong form of adverse selection arises as a consequence. Although it is a particular kind of distribution, we show in the Appendices B1 and B2 that the results are confirmed by reasonable numerical examples, and that they are not a product of the two-types/two-points distribution assumption. Of course the implementation of this policy meets some limits in the possibility that,

[5] See the appendix.

enticed by the possibility of gaining the subsidy, any individual would apply for a loan. However a basic evaluation on the investment project, possibly able to sort out the fake projects, is preliminarly performed at any lending institution.

Our result suggests that in a lemons' market, screening by subsidy may increase overall welfare and avoid market collapse. To be feasible however a monopolistic market structure is needed. An interesting extension would entail comparing the subsidy policy to alternative forms of a reverse pre-screening mechanisms. Equally interesting is an extension to a moral hazard setting, where the least motivated entrepreneurs could be deterred from becoming entrepreneurs more easily through a subsidy or a fee.

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