

# CONSUMPTION AND CREDIT

## PAPER 8: CREDIT AND MICROFINANCE

### LECTURE 1

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ABSTRACT. This lecture looks at the role credit constraint play in shaping an individual's outlook towards risk. We find that the cost an agent is ready to pay to insulate herself from income risk increases with as her credit ceiling decreases. This may lead severely credit constrained individuals to choose low mean income low risk occupations over high mean income high risk occupations leading them to get entrapped in poverty.

#### 1. INTRODUCTION

In this section we introduce information problems associated with credit contracts and discuss their classification.

The source of all problems in the credit markets is the risk of default by the borrower. Once the borrower has obtained the loan amount, she could refuse to repay the loan when the repayment is due.

#### 2. TYPES OF DEFAULT

Borrower's refusal to repay could potentially be involuntary or voluntary in nature. *Involuntary default* occurs when the borrower is no longer in position to meet her repayment obligations. Conversely, *Voluntary default* occurs when the borrower has sufficient resources to make the repayment, but chooses not to repay because it is not in her interest to do so. As the decision to not repay the loan is strategic in nature, voluntary default is also called strategic default in the literature.

The lenders find ways and means to reduce the risk of voluntary and involuntary default. If the lenders are able to reduce the risk of default below a critical threshold, they would choose to lend. Conversely, if the risk of default is sufficiently large or pervasive, the credit markets may freeze up with the lenders either not lending or lending extremely selectively to relatively few.

Broadly speaking, individuals do not have a problem in borrowing from a lender if the following two conditions are met.

- (1) *Individuals are wealthy and possess sufficiently large collateral.* A wealthy individual with sufficiently large collateral would always be able to borrow. The collateral goes a long way in compensating the lender for the risk of default. The problem is acute for individuals who do not have a sufficiently large collateral.
- (2) *An effective system for enforcing contracts exists.* This could be a well functioning legal or court system or some alternative informal mechanism for enforcing contracts. For instance, the mafias do not seem to have any problem extracting the payments from individuals.

The two factors above complement each other. A improved legal or court system would decrease the wealth threshold for borrowing and vice versa. Even in the absence of a legal system, the wealthiest never have a problem getting credit.<sup>1</sup> Or with an extremely effective legal system, a poor person has access to credit.<sup>2</sup>

<sup>1</sup>A relatively rich person living in a developing country.

<sup>2</sup>A relatively poor person living in a OECD country.

The problems in the credit markets come down to lack of wealth and collateral and ineffective legal system (or alternative systems for enforcing contracts). The problem of borrowing from the formal credit markets get extremely acute for the poorest of the poor living in the countries with an ineffective legal system.

We will take an information oriented approach to the problems of credit markets. This entails looking at the the credit markets problems as information problems and classifying them accordingly.

*Classification of Information Problems.* In case of an **involuntary default**, the borrower defaults because she is no longer in a position to meet her repayment obligation. For example, the borrower could end up with insufficient resources to meet her repayment obligations due to the following reasons.

- (1) The borrower invests in a risky project that fails.
- (2) The investment loan is diverted for consumption purposes.

We can further divide the reasons for involuntary default. It could either be due to some information that could be ascertained *before* the credit contract is signed or *after* the credit contract is signed. Before the credit contract is signed, the lender would like to ascertain the riskiness of the borrower or her project. The lack of this information gives rise to the problem of *adverse selection*. After the contract is signed the lender lacks the information regarding the use of the borrowed funds and the actions taken by the borrower on the projects. This lack of information gives rise to the problem of *moral hazard*.

The problem of adverse selection can potentially be solved by *screening* the borrower for their risk types. Screening entails the lender distinguishing between borrowers of different risk types. The information component of the problem should be obvious. It is obviously not easy to ascertain the how risky a person would be as a borrower. The risk type of a person here refers to everything that would influence her ability to repay. As we would see further in the course, given the lack of direct knowledge about the potential borrower's ability to repay, the lender resorts indirect ways to ascertain information about the borrowers.

The problem of moral hazard could potentially be solved by getting the borrower *monitored*. Through this monitoring process, the lender obtains information about the borrowers use of the fund and the diligence with which she follows up the project. Through the monitoring process the lender acquires information about the borrowers actions.

The problem of involuntary default thus translates into the problem of finding finding appropriate means and mechanisms to screen and monitor the borrower.

In case of **voluntary** or **strategic default**, the borrower has sufficient resources to repay the loan but chooses not do so because she has no incentive to repay.<sup>3</sup>

From the information point of view, the first step is for the lender to establish the reason for the default. It may not be obvious *prima facie*<sup>4</sup> whether the reason for default is voluntary or involuntary. *Auditing* the borrower establishes the reason for the borrower's default. Auditing in many instances may be an extremely costly process.

If auditing does establish that the default is an voluntary one, the lender needs to enforce the credit contract. *Enforcement* is the problem of ensuring that the borrower meets her contractual obligations, which would entail extracting the repayment from the borrower.

Weak legal system limits the lender's ability to enforce contract. It is interesting to note the symmetry between the international debt and credit contracts in the developing countries.

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<sup>3</sup>Since the borrower takes a decision regarding whether to repay the lender, involuntary default sometimes is referred to as ex post moral hazard. The ex post part refers to borrower's action taken after the project outcome has been realised. The action of choosing the project and making a decision on the effort is taken before the project outcome is realised an is this called ex ante moral hazard.

<sup>4</sup>self-evident before any investigation

*International debt:* There is no effective international court of law with enforces international debt contracts. In case of a threat of default, the lenders often take recourse to extra-ordinary punitive measures to enforce the credit contracts. These measures could include threatening to stop further lending or threatening to impose restrictions on trade with that country.

*Credit Contracts in Developing Countries:* Contracts in developing countries, especially in rural areas and the informal sector, often have enforcement problems that are similar to the problems associated with international debt. The courts, if they exist, are slow, cumbersome and expensive. In some cases, they may be susceptible to corruption or be less than fair.

### 3. CREDIT CEILING AND ITS IMPLICATIONS

3.1. **Eswaran and Kotwal (1990).** Eswaran and Kotwal (1990) suggests that *ability to smooth consumption* affects an agent's *capacity to bear risk*. The borrowing constraints or the credit ceilings restrict the agent's ability to pool risk over time and stabilise his over time consumption, which in turn, increases the cost of risk borne by the agent. Eswaran and Kotwal (1990) shows that the *risk premium* or the price that the agent is ready to pay to insulate himself from risk is increases as his credit ceiling decreases.

The credit constraint has an impact on the occupational choice made by the agents. If volatility increases with expected mean income, a credit constrained agent may choose to stick with low mean income occupations.

An agent can *smooth consumption* if the agent is sufficiently wealthy on her own accord or has access to credit for consumption. An agent who is either sufficiently wealthy or has access to credit can disengage the consumption from the income realised in each period. She can dissave or borrow when her income is low and save or repay the loan when her income is high.

Consequently, this analysis has less bite for societies where financial markets work relatively well<sup>5</sup> leading to low wealth threshold for accessing the financial markets and where everyone in the society is comfortably above this wealth threshold. Consequently, this relationship between ability to smooth consumption and risk bearing capacity becomes significant when

- (1) Credit markets do not work relative well due to information and enforcement problems and
- (2) the wealth distribution is extremely skewed.

We are using this example to understand why the poor may get caught in the vicious circle of poverty. Thus, the credit market in this model is an informal credit market. The informal lenders have their own way to acquiring information cheaply and enforcing contracts. The imperfections in the credit markets reflects itself only in terms of credit ceilings, i.e., the maximum amount a borrower can borrow. The lender use the credit ceilings to manage the risk of default.

Evidence from papers like Aleem (1990), Udry (1990), Ghatak (1976) and Timberg and Aiyar (1984) to name few suggests that informal credit markets in developing countries are extremely segmented. There is considerable variation in the terms of the loan offered to borrowers, even when they are quite similar to each other and live in close geographically proximity to each other. For sake of simplicity, we are ignoring the variation in interest rates on loans and focussing exclusively on the credit ceiling. For the purposes of the model, this means that credit ceiling vary for seemingly homogenous agents in the model.

3.1.1. *Model.* Two period model in which an agent's income in each period is uncertain yet identically and independently distributed. Good and bad states of nature occur with equal probability. The agent's income is  $z + \sigma$  in good state and  $z - \sigma$  in the bad state. The table below shows the agent's total lifetime income in all possible states of nature over the two periods.

<sup>5</sup>The lenders are able to solve the information and enforcement problems for a large part of the individuals in the society. Robert Shiller in his new book calls this process financial democratisation where all individuals can access borrow and save in the financial markets. (Shiller, 2008)

|          |      | Period 2        |                 |
|----------|------|-----------------|-----------------|
|          |      | States          | Good            |
| Period 1 | Good | $2(z + \sigma)$ | $2z$            |
|          | Bad  | $2z$            | $2(z - \sigma)$ |

TABLE 1. Agent's total lifetime income in all possible states of nature

The agents are risk-averse and with identical von-Neumann-Morgenstern utility functions  $U(c^1, c^2) = u(c^1) + u(c^2)$  where  $c^1$  and  $c^2$  denote the first and second period consumption respectively and  $u'(c) > 0$  and  $u''(c) < 0$ . The agents are homogenous in all respects except one. Agents have differing credit ceilings, which are exogenously given. To keep matters simple, we have assumed that the agent's rate of time preference and interest rate are both zero.

The borrower decides his first period consumption  $c^1$  after his first period income has been realised. This may entail borrowing an amount a certain amount from the financial markets. Once the second period income has been realised, the borrower repays back the amount borrowed and consumes the rest of income as  $c^2$ .

The only decision that the agent makes is on  $c^1$ , that is how much to consume in period 1 after the period 1 income has been realised. The decision on  $c^1$  is contingent on how much she can borrow in period 1. In period 2, once the income has been realised, the borrower repays back the loan and consumes the residual amount.

We have assumed that the borrower has full liability and cannot default on her repayment obligations. This is not an unusual assumption in informal markets, where default is not usually an option. As we would see in the the rest of the lectures, when agents borrow from the formal financial institutions or microfinance institutions, defaulting becomes an option.

**3.1.2. Unconstrained Utility Maximisation.** Lets assume the  $b$  is the amount the agent would have liked to borrow if there were no ceiling on the amount she can borrow. If the **bad state** is realised in period 1, the agent would like consume  $c_{bad}$  in period one by borrowing  $b = c_{bad}^1 - (z - \sigma) > 0$ . Once income in period 2 is realised, the agent repays her loan  $b$  and consumes the residual amount. Thus,  $c_{bad}^2$  depends on the income realisation in period 2 and  $c_{bad}^1$ . If good state occurs in period 2,  $c_{bad}^2 = (z + \sigma) - b$ . If bad state occurs in period 2, the  $c_{bad}^2 = (z - \sigma) - b$ .

It is useful to note that decisions are made after period 1 outcome is realised and thus the subscripts *bad* and *good* refer to period one outcome only. By substituting for  $b$  we obtain the following.

$$c_{bad}^2 = \begin{cases} 2z - c_{bad}^1 & \text{if period 2 state is } good \\ 2(z - \sigma) - c_{bad}^1 & \text{if period 2 state is } bad \end{cases}$$

Let  $\tilde{c}_{bad}^1$  be the amount the agent would consume if she did not have any credit ceiling.  $\tilde{c}_{bad}^1$  thus solves the agent's unconstrained utility maximisation problem below.

$$\max_{c_{bad}^1} u(c_{bad}^1) + E(u(c_{bad}^2))$$

At  $\tilde{c}_{bad}^1$ , the marginal utility out of consumption in period one is equated to the expected marginal utility from consumption in the period 2.

If **good state** is realised in period 1, the agent would like to borrow<sup>6</sup>  $b = c_{good}^1 - (z + \sigma) < 0$ . As above we can find  $c_{good}^2$  by substituting for  $b$ .

$$c_{good}^2 = \begin{cases} 2(z + \sigma) - c_{good}^1 & \text{if period 2 state is } good \\ 2z - c_{good}^1 & \text{if period 2 state is } bad \end{cases}$$

<sup>6</sup>This would entail the borrower savings or effectively borrowing negative amounts.

Let  $\tilde{c}_{good}^1$  be the amount the agent would consume if she did not have any credit ceiling.  $\tilde{c}_{good}^1$  solves the agent's unconstrained utility maximisation problem below.

$$\max_{c_{good}^1} u(c_{good}^1) + E(u(c_{good}^2))$$

At  $\tilde{c}_{good}^1$ , the marginal utility out of consumption in period one is equated to the expected marginal utility from consumption in the period 2. Given the income uncertainty in period 2, agent would never consume the full period 1 income of  $(z + \sigma)$  and the credit ceiling would never bind.

|                    |      | Consumption          |                                     |
|--------------------|------|----------------------|-------------------------------------|
|                    |      | Period 1             | Period 2                            |
| States in Period 1 | bad  | $\tilde{c}_{bad}^1$  | Total income - $\tilde{c}_{bad}^1$  |
|                    | good | $\tilde{c}_{good}^1$ | Total income - $\tilde{c}_{good}^1$ |

TABLE 2. Agent's consumption in all states without credit ceiling

3.1.3. *Constrained Utility Maximisation.* Lets solve the problem for a agent with a credit ceiling  $B$ . The agents problem can be written as

$$\begin{aligned} \max_{c^1} u(c_{bad}^1) + E(u(c_{bad}^2)) \\ \text{subject to } b \leq B. \end{aligned} \quad (1)$$

Equation (1) could potentially only bind when bad state occurs in the period 1. Lets call the smallest value of the credit ceiling that will not end up binding  $B_c$ . Then  $B_c$  can be defined by  $B_c = \max[\tilde{c}_{bad}^1 - (z - \sigma), 0]$ . We can use  $B_c$  to determine the agent's optimal consumption function when there is a (1) credit ceiling. This consumption function is given by

$$c_{bad}^*(B) = \begin{cases} (z - \sigma) + B & \text{for } B < B_c \\ \tilde{c}_{bad}^1 & \text{for } B \geq B_c \end{cases} \quad (2)$$

FIGURE 1. Credit Ceiling and Risk Premium

|                    |      | Consumption          |                                     |
|--------------------|------|----------------------|-------------------------------------|
|                    |      | Period 1             | Period 2                            |
| States in Period 1 | bad  | $c_{bad}^*(B)$       | Total income - $c_{bad}^*(B)$       |
|                    | good | $\tilde{c}_{good}^1$ | Total income - $\tilde{c}_{good}^1$ |

TABLE 3. Agent's consumption in all states *with* a binding credit ceiling  $B$

What we finally have is that the agent's expected utility depends on  $\tilde{c}_{bad}^1$  and  $\tilde{c}_{good}^1$  if the credit ceiling does not bind. In this case the expected utility is independent of  $B$  and is given by

$$EU(z, \sigma) = \frac{1}{2} \left[ u(\tilde{c}_{bad}^1) + E(u(c_{bad}^2(\tilde{c}_{bad}^1))) + u(\tilde{c}_{good}^1) + E(u(c_{good}^2(\tilde{c}_{good}^1))) \right]$$

If the credit ceiling  $B$  binds, it would depend on  $c_{bad}^*(B)$  and  $\tilde{c}_{good}^1$ .

$$EU(B, z, \sigma) = \frac{1}{2} \left[ u(c_{bad}^*(B)) + E(u(c_{bad}^2(c_{bad}^*(B)))) + u(\tilde{c}_{good}^1) + E(u(c_{good}^2(\tilde{c}_{good}^1))) \right]$$

$c_{bad}^*$  is agent's optimal consumption in period 1 if a bad state is realised in the period 1. If bad state is realised in period one, the agent would like to borrow. Consequently, the agent's period 1 consumption and expected utility is increasing in credit ceiling  $B$  till  $B_c$  is reached. After that, the expected utility becomes flat in  $B$ .

$\tilde{c}_{good}^1$  is agent's optimal consumption in period 1 if a good state is realised in the period 1. With the realisation of the good state, the borrower would like to save for the next period and thus the credit ceiling does not have an impact on expected utility. Of course, the expected utility is a function of  $Z$  and  $\sigma$  as the  $Z$  and  $\sigma$  has an impact on consumption in both period in all states of nature.

Using  $EU(B, z, \sigma)$ , we can find the agent's certainty equivalent income. The certainty equivalent is the risk-less income that would give the borrower the same utility as the expected utility from the risky income process described above. Let the certainty equivalent income be  $x$  per period and it can be obtained by the expression below.

$$2U(x) = EU(B, z, \sigma).$$

The left hand side of the expression is the lifetime utility out of a risk less income stream  $x$  per period. The left hand side is the expected utility out of a risk income stream which is  $z - \sigma$  and  $z + \sigma$  with equal probability in each period.

The agent's risk premium  $\pi_{risk}$  is implicitly defined by the expression above. The risk premium is the cut in her income the agent is willing to take in order to completely eliminate the risk from her income process. The risk premium  $\pi_{risk}$  is given by the expression  $x = z - \pi_{risk}$  and

$$2U(z - \pi_{risk}) = EU(B, z, \sigma).$$

The risk premium obtained from the expression above would be a function of  $B$  and  $\sigma$ . This risk premium is increasing in the credit ceiling  $B$  till  $B$  reaches  $B_c$ . This implies that smaller the credit ceiling, the larger the cut the agent is willing to take to eliminate the risk from the income process. Beyond  $B_c$ , the risk premium is independent of  $B$ .

Lets take this further and visualise a situation where a agent has a choice of occupation between a low  $z$  with a low  $\sigma$  and a high  $z$  with a high  $\sigma$ . Since the risk premium is increasing in  $B$  (for  $B \leq B_c$ ), it is certainly possible that people with low credit ceiling would be forced to take the occupation with low  $z$  and low  $\sigma$  and people with sufficiently high credit ceiling would be able to take on the high  $z$  and high  $\sigma$  job.

Thus, we have demonstrated how agents in a economy with segmented credit markets could be caught in the vicious cycle of poverty for ever. An external intervention that loosens the credit constraints have the potential of transforming this economy and freeing the poor from the vicious clutches of the poverty trap.

In dealing risk, we can distinguish between risk management and risk coping strategies. The risk management strategies attempt to reduce the riskiness of the income process ex ante. This could entail the process of undertaking a low risk low expected income activity. Conversely, risk coping strategies include self insurance (saving) and risk pooling. The risk coping strategies deal with effect of income risk ex post in order to smooth consumption. As we have seen above, factors like endowment, technology and the formal and informal institutions affect which strategies are used to deal with risk. For a more in depth discussion on this topic see [Dercon \(2004\)](#).

3.1.4. *Reference for Further Reading.* [Karlán and Zinman \(2008\)](#) shows that randomly give credit constrained individuals access to credit improves their welfare. This shows that credit constraint may be one of the causes of poverty. [Dercon and Shapiro \(2005\)](#) revisited the ICRISAT data set after three decades and found that there can a clear threshold below which individuals get entrapped by poverty. Individuals who had income below a threshold in 1980s still had similar incomes where as the individuals with income above the threshold had seen marked improvement in their economic situations.

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