1 Introduction
Firms can get financing: -directly by issuing secutiries -indirectly by getting loans from intermediares (banks)

Definition Financial Intermediary (FI) is an economic agent who specializes in **buying and selling financial claims**

1.1 uniqeuness of banks
A bank is an institution whose current operations consist in granting loans and receiving depositios from individuals and business.
Banks transfer assets to most productive use and contribute to GDP growth by: - reducing information asymmetry - improving capital allocations
Banks exist because of:

- liquidity insurance
- delegated monitors

2 Liquidity provision
Banks loans cannot be sold quickly because of assymetries (lemons problem).
Banks boost economy, because they provide liquidity on demand, By that, long-term investment projects can take place, because of the pooled capital, which would otherwise lock the capital for individuals, which would be averse to invest it, should they need it quickly.
At $t = 0$ consumers choose investment level $I \in [0, 1]$ that maximizes ex-ante expected utility Ex-ante expected utility is given by the following:

$$E(u) = \pi u\left(C_1\right) + (1-\pi)\rho u\left(C_2\right)$$

where $\rho \leq 1$ is the discount rate and π is the probability of being impatient.

$$\text{The efficient line: } \left(C_1, C_2\right) \text{ such that } \pi C_1 + (1-\pi)\frac{C_2}{R} = 1$$

Autarky
Autarky = no trade betweens agents, full economic indepence.
If agent is **impatient** (needs to consume at t=1) - amount invested in *storage* technology : 1 - l - amount invested in the *long run technology* : l*I
$C_1 = 1 - I + \ell I$
If agent is **patient** (needs to consume at t=2) - amount invested in *storage* technology : 1 - l - amount invested in the *long run technology* : RI
$C_2 = 1 - I + RI$
$\begin{cases} C_1 = 1 - I + \ell I = & 1 - (1-\ell)/ \\ C_2 = 1 - I + RI = & 1 + (R-1)/ \end{cases}$ Q We have $C_1 \leq 1$, with equality only if $I = 0$ - We have $C_2 \leq R$, with equality only if $I = 1$ e Therefore, the expected consumption per head is

$$\pi C_1 + (1-\pi)\frac{C_2}{R} < 1$$

Autarky is not Pareto optimal because investment is inefficient (there are always some costly liquidations)
If $I = 0$ then $C_1 = 1$ and $C_2 = 1$, and if $I = 1$ then $C_1 = \ell$ and $C_2 = R$. Therefore, points $(1, 1)$ and (ℓ, R) are on the autarky line, which can be defined by the following equation:

$$\frac{R-1}{R-\ell}C_1 + \frac{1-\ell}{R-\ell}C_2 = 1$$

2.1 Optimal allocation
The optimal allocation $\left(C_1^*, C_2^*\right)$ satisfies the following condition

$$R\rho = \underbrace{\frac{u'\left(C_1^*\right)}{u'\left(C_2^*\right)}}_{\text{marginal rate of substitution}}$$

3 Banks as delegated monitors
Main issue: solve information assymetries. Banks have expertise in screening, monitoring and auditing.

- ex ante: *adverse selection* (or unobsservable heterogeneity)
- interim: *moral hazard*
- ex post: *cash-flow manipulation*

3.1 Banks as monitors
Small investors don't monitor, it is too costly
Three necessary conditions:

- **small investor capacity**: each project needs the funds of several investors
- **scale economies in monitoring**: the marginal cost of monitoring decreases with the number of projects
- **low costs of delegation**: the cost of *monitoring the monitor* has to be relatively low

Model for monitoring

- **n** identical risk-neutral firms seek to finance risky projects
- Initial investment normalized to 1
- Risk-free rate normalized to zero
- Net returns $\tilde{y}$ are identically and independently distributed
- (Small) Investors
- Each investor can invest only $1/m \Rightarrow m$ investors are needed to finance one project
- Investors are risk neutral
- Direct monitoring
- Lenders can monitor borrowers at a cost K
- Projects are profitable $\Rightarrow$ $\underbrace{E[\tilde{y}]}_{\text{Expected Return}} \geq \underbrace{1+K}_{\text{Project Cost}}$

Cost of delegation

- Default occurs when

$$\underbrace{\tilde{y}_1 + \tilde{y}_2 + \ldots + \tilde{y}_n}_{\text{Return to the portfolio of loans}} - \underbrace{nK}_{\text{Monitoring Cost}} \leqslant \underbrace{n}_{\text{Return to Depositors}}$$

- Default induces a bankruptcy cost γ • $\Longrightarrow$ Total expected cost of default is

$$C_n = \gamma \Pr\left(\tilde{y}_1 + \tilde{y}_2 + \ldots + \tilde{y}_n - nK < n\right)$$

Result: delegated monitoring dominates direct lending if - investors are small (m>1) - the number "n" of projects is high enough: diversification eliminates risk in the limit

3.2 Monitoring and access to credit
Individual Credit Rationing When positive NPV projects are not financed, occurs because of moral hazard problem. Bank reduces this problem.

Borrower's incentive compatibility constraint

- Borrowers' Incentive Compatibility Constraint (ICC)

$$\underbrace{p_H(Y-R)}_{\text{Borrower's payoff with the good project}} \geq \underbrace{p_L(Y-R)+B}_{\text{Borrower's payoff with the bad project}}$$

$$\Leftrightarrow R \leq \underbrace{Y - \frac{B}{\Delta p}}_{\text{Pledgeable Income}}$$

B is the privaete benefit part
Pledgeable income maximum amount of income that the agent can pay to external financiers without losing the incentive to take the good action- exert high effort
R satisfies

$$\underbrace{p_H(Y-R)}_{\text{Borrower's payoff with the good project}} \geq \underbrace{p_L(Y-R)+B}_{\text{Borrower's payoff with the bad project}}$$

Hence, the pledgeable income is $Y - \frac{B}{\Delta p}$
Ledner's Participation constraint The participation constraint sets the conditions that havet o be dsatisfied so that the principal wants to participate

$$\underbrace{p_H R}_{\text{Lender's return with the good project}} + 0(\text{no bad projects}) \geq \underbrace{I - A}_{\text{Lender's investment in the project}}$$

- Therefore, a market for loans exists if and only if both the (ICC) and (PC) constraints are satisfied
- It implies

$$I - A \leq p_H\left(Y - \frac{B}{\Delta p}\right)$$
$$\Leftrightarrow A \geq \bar{A} = I - p_H\left(Y - \frac{B}{\Delta p}\right)$$

- $\bar{A} > 0$ when the NPV of the project $\left(p_H Y - I\right)$ is lower than the informational rent of the borrower $p_H \frac{B}{\Delta p}$