Financial Structure and Asymmetric Information

ECON 40364: Monetary Theory & Policy

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Spring 2025

Readings

Mishkin Ch. 8

Financial Structure

Firms all have balance sheets – they finance assets with some mix of equity and debt (liabilities)

- Non-financial firms: these assets are real assets (capital)
- Financial firms: these assets are financial assets (contractual claims)

Forms of Financial Structure

How do non-financial firms finance their assets? Does it matter? Why does it matter?

A couple of useful distinctions:

- External vs. internal: raise funds externally or use retained earnings
- Equity vs. debt: promised share of cash flows from assets (equity) or promised fixed payments (debt)
- Direct vs. indirect: raise funds directly from lender/equity investor or indirectly through financial intermediary

Modigliani-Miller: firm financial structure is irrelevant, but assumptions underlying this don't seem particularly realistic

Financial intermediation is process by which external funds get routed from savers to non-financial firms

How Do Businesses Finance Their Activities?

A significant fraction of business investment comes from external funds

Two sources of external funds:

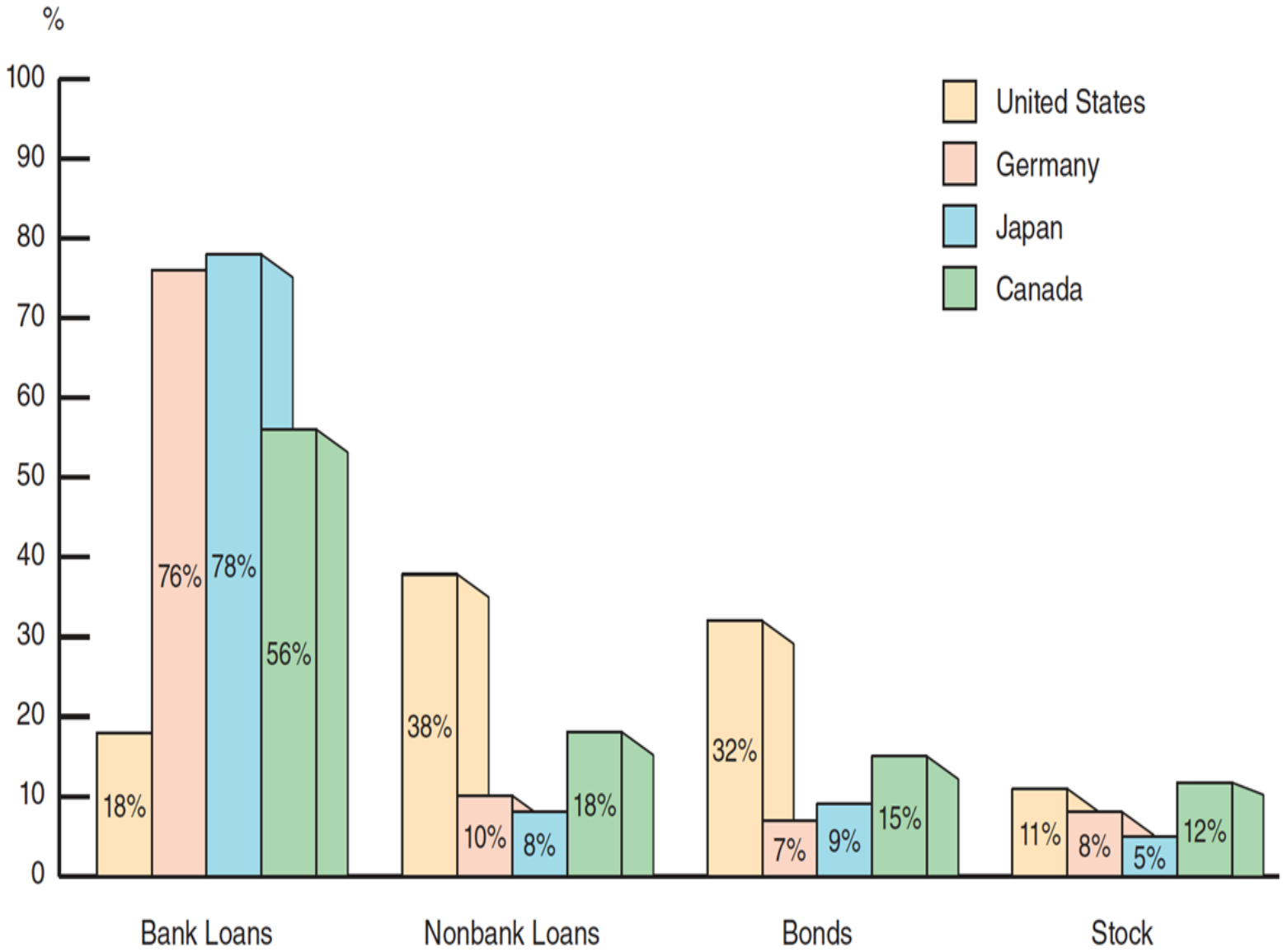
1. Direct: get funds directly from a lender or equity investor
2. Indirect: get funds indirectly from a financial intermediary (e.g. a bank)

Indirect finance is mostly comprised of debt contracts, whereas direct finance could either be debt (e.g. issue corporate bonds) or equity (e.g. issue new stock)

Fact: indirect finance is more important than direct finance, particularly for all but the very largest firms, and bank loans (use of financial intermediary) are really important

This is why financial structure is relevant for monetary policy – so much depends on banking

Sources of External Funding



Why is Financial Intermediation so Important?

1. Transactions costs

2. Informational asymmetries

Transaction costs: cheaper to finance projects on a large scale (economies of scale), which means it is efficient to pool lots of small resources and have an intermediary invest it rather than each small saver doing the investment directly

We will focus mostly on informational asymmetries. Basic idea:

- Only very large and well-established firms can rely on direct finance (issuing equity or debt into capital markets)
- Smaller and mid-size firms: information about them is poorer, so they need to rely on intermediaries who specialize in overcoming asymmetric information

Asymmetric Information

Asymmetric information generally refers to a situation in which different parties to a transaction are not equally informed about characteristics or actions of the other parties to the transaction

1. Adverse Selection: information asymmetry that occurs before a transaction takes place

2. Moral Hazard: information asymmetry about what might happen after a transaction takes place

Both types of asymmetric information can help us understand the kind of financial structure we observe in the real world – in particular, why indirect finance is so important (and hence why financial intermediation is important)

Adverse Selection

The buyer of a product (e.g., a car, a stock) doesn't know the true "type" of the seller of the product (e.g. good or bad, risky or safe)

Only knows the average type of the seller

Hence, buyer will only be willing to pay the average valuation, which is more than the bad type but less than the good type

This tends to drive sellers who are a good type away and attract sellers who are a bad type

But then buyer knows this, and entire market can fall apart

Easy to understand through an example – "lemons" in the market for used cars

Lemons Example

After Ackerlof (1970)

Suppose there are two types of used cars: lemons (bad) and peaches (good) Sellers know whether they have a lemon or a peach, but buyers only know the fraction of lemons and peaches out there

Suppose each type has the following valuations:

Valuation	Peach	Lemon
Buyer	\$20,000	\$15,000
Seller	\$18,000	\$13,000

Without informational asymmetry, both kinds of cars would be sold – buyers value each type more than sellers

Asymmetric Information

Suppose buyer doesn't know whether she is meeting a seller of a peach or a lemon

She only knows there is a 50 percent chance it's a peach, and 50 percent chance it's a lemon

The average valuation for the buyer is \$17,500, which is the maximum she will pay for a car

But since this is less than a peach owner's valuation, peaches will not be sold

But then the buyer will know only lemons are on the market

Only lemons will sell for a price between \$13,000 and \$15,000

The "good" cars get driven out of the market by the presence of bad cars – inefficient!

Alternative Example

Suppose valuations are now:

Valuation	Peach	Lemon
Buyer	\$20,000	\$12,000
Seller	\$18,000	\$13,000

Buyer values lemons less than seller. With symmetric information, only peaches would be sold

Suppose probabilities of peaches and lemons are same as above. Average valuation from buyer's perspective is now is \$16,000

Since this is less than seller's valuation, peaches will not be sold

But then buyer knows she can only buy a lemon, but doesn't want a lemon

End result: market breaks down and no cars are sold

Dealing with the Lemons Problem in the Used Car Market

Most used car sales are through dealerships, not person-to-person transactions

Sort of easy to understand why

The dealership serves as an intermediary and helps solve the informational problem

The dealership gets good at determining lemons vs. peaches, and can offer warranties to buyers to ensure that the buyer isn't dealing with a lemon

Hence, intermediaries who specialize in resolving informational asymmetry problem naturally arise in the car market

Similarly in financial markets

Lemons Problem and Indirect Finance

Lemons problem helps us understand why direct finance is not that important for external funds

The firms who most want funds are probably those who are the worst type

But savers know this

And hence will not buy stock or debt directly from firms

Financial intermediaries (e.g. banks) can step in

These financial intermediaries can become experts in learning about firms and can therefore alleviate the informational asymmetry problems

Because these financial intermediaries make private loans they can avoid the free-rider problem that arises when third party firms try to produce information about firms

Why is Financial Intermediation Important?

Financial intermediation is important because it (partially) overcomes problems of asymmetric information

Banks and other intermediaries develop relationships and learn about potential borrowers

"Relationship banking" mitigates informational asymmetries and results in more efficient outcomes

Destruction of banking system destroys relationship-specific information that cannot easily be recovered

This is one argument for why it's important to "save the banks" in a crisis, and historical evidence suggests banking collapses are costly precisely because they destroy valuable relationship-specific information (e.g. Bernanke 1983 on the Great Depression)

Intermediation and Borrower Net Worth

Even with "relationship banking" and improved relationship-specific information, financial intermediation cannot completely overcome adverse selection and moral hazard problems

This gives rise to an importance of borrower net worth in the flow of credit

Net worth allows borrowers to post more collateral – pledgable assets recoverable by lender in event of default

Posting collateral mitigates informational asymmetry problems – convinces lenders that borrowers are "good types" (adverse selection) and gives borrowers more "skin in the game" (moral hazard)

Gives rise to a financial accelerator (Bernanke, Gertler, and Gilchrist 1999): changing economic conditions affect borrower net worth and exacerbate or mitigate problems related to the flow of credit

Example: Good and Bad Firms

There are two types of firms who need 1 unit of external funds to undertake a project

Project succeeds or fails with a given probability

Firm types and payoffs are:

	Good Firm	Bad Firm
Payoff in "good" state	1.25	1.5
Payoff in "bad" state	0	0
Prob. of "good" state	0.9	0.5
Expected Payout	1.125	0.75

Lender

A lender (i.e., a bank) has funds to lend to borrowers

The lender's opportunity cost is 1

If it makes a loan, it must get back at least 1 (at least its principal) in expectation to be willing to make a loan

Loan Contract with Perfect Information

Suppose the lender can perfectly tell good and bad firms apart

It can hence charge them different (gross) interest rates, R_G and R_B

Borrowers have limited liability – they only care about the good state, because in the bad state they just default and don't pay back the loan. But the lender cares about both good and bad states

- Good firms will take a loan so long as $R_G \leq 1.25$
- Bad firms will take a loan so long as $R_B \leq 1.5$

Lender Expected Payoffs

If lender loans 1 unit of funds to each firm, its expected gross return is:

$$\mathbb{E}(Payout_G) = 0.9R_G$$

$$\mathbb{E}(Payout_B) = 0.5R_B$$

Lender willing to make loan if $R_G \geq 10/9 = 1.11$ and $R_B \geq 2$

But bad firm will not take a loan for anything more than $R_B = 1.5$!

Result: bad firm doesn't get a loan. Good firm does, for $1.11 \leq R_G \leq 1.25$

- e.g. if bank just breaks even, good firm's expected profit is $0.9(1.25 - 1.11) = 0.125$

Asymmetric Information

Now introduce asymmetric information: firms know if they are good or bad, but bank can't tell them apart

Lender only knows that $\frac{1}{2}$ of firms are good and $\frac{1}{2}$ are bad. Can just charge one gross rate, R. Bank's expected payout:

$$\mathbb{E}(Payout) = \frac{1}{2} \times \underbrace{\left[\frac{9}{10}R\right]}_{\text{Good}} + \frac{1}{2} \times \underbrace{\left[\frac{1}{2}R\right]}_{\text{Bad}}$$

To be willing to make a loan, it must charge:

$$R \geq \frac{10}{7} = 1.43$$

But good firm would never take this. But then lender would know it is dealing with a bad firm, and lender would not want to make a loan at $R = 1.43$. The good firm can't get a loan with asymmetric information

Collateral

Now suppose that the lender can require firms to post some collateral, C

If firm defaults, lender gets to seize C. If they don't default, they pay R

Firm expected payouts:

$$\mathbb{E}(Payout_G) = \frac{9}{10}(1.25 - R) - \frac{1}{10}C$$

$$\mathbb{E}(Payout_B) = \frac{1}{2}(1.5 - R) - \frac{1}{2}C$$

Lender Problem

Pick R and C such that:

1. Good firm finds it profitable to take a loan
2. Bad firm doesn't want to take a loan
3. Bank at least breaks even

Must satisfy:

$$\frac{9}{10}(1.25 - R) - \frac{1}{10}C \geq 0$$

$$\frac{1}{2}(1.5 - R) - \frac{1}{2}C < 0$$

$$\frac{9}{10}R + \frac{1}{10}C \geq 1$$

Suppose Lender Just Breaks Even

Suppose $R = 1.05$. For lender to break even, must have C satisfy:

$$C = 10 - 9R = 0.55$$

With $R = 1.05$ and $C = 0.55$, good firm has expected payout of 0.125. But bad firm has expected payout of -0.05

Result: collateralizable loan contract gets us back to the symmetric information case

Collateral basically forces firms to reveal their type and undoes the asymmetric information friction!

Collateral, Adverse Selection, and Business Cycles

Since collateral consists of assets, asset price fluctuations can affect ability of firms to post collateral and hence to get loans

Financial accelerator:

1. Decline in economic activity (e.g. a recession) causes assets to lose value
2. Declining asset values makes it harder for firms to post collateral
3. Inability to post collateral exacerbates adverse selection problem, limiting ability to pledge collateral, resulting in less investment
4. Less investment causes more declines in economic activity, and further falls in collateral values
5. An adverse feedback loop!

Moral Hazard

Moral hazard: information asymmetry about what happens after a transaction takes place

For example, someone lends you money, but then can't perfectly monitor what you do with the money

Because of limited liability, you have an incentive to "gamble" with someone else's money

In other words, moral hazard can encourage excessive risk taking once a loan has been made

Can be applied to insurance markets too – once you have insurance, you have less incentive to behave safely

But insurer will know that, and may not sell you insurance in first place

Just like adverse selection, markets can break down

Moral Hazard and Financial Structure

Moral hazard can also help us understand why indirect finance is more important than direct finance

Intermediaries (e.g. banks) become experts in monitoring the behavior of borrowers in a way that wouldn't be possible with direct finance: leads to less "gambling" and explains why loan contracts often include covenants restricting behavior

Also helps make sense of preference of debt over equity

With equity, lender needs to monitor profits all the time (since equity owner is due his/her share of profits)

With debt, since payments are fixed, only need to monitor behavior of firm in event of default

So lower monitoring costs (what is called "costly state verification") with debt over equity

Moral Hazard and Loan Contracts

Suppose there is just one type of firm

But once it gets funding, it can take on one of two projects – "risky" or "safe"

	Safe Project	Risky Project
Payoff in "good" state	2	10
Payoff in "bad" state	0	0
Prob. of "good" state	3/4	1/11
Expected Payout	1.5	10/11

It is efficient for the safe project to be undertaken and the risky project to never be undertaken

But lender can't necessarily force firm to not do the risky project once loan has been made

Firm Choices on Standard Loan Contract

Firm gets loan at R. If $2 < R \leq 10$, borrower will for certain undertake the risky project

- But to break even, lender would require $R \geq 11$, which borrower won't take

What about $R \leq 2$? For the firm to take the safe project, must have:

$$\frac{3}{4}(2 - R) \geq \frac{1}{11}(10 - R)$$

But this implies:

$$R \leq 0.8965$$

But lender can't at least break even with $R \leq 0.8965$. Result: firm can't get funding

Collateral

Now suppose lender can require firm to post collateral, C. Gives firm some "skin in the game"

Want to pick R and C such that:

$$\frac{3}{4}(2-R)-\frac{1}{4}C \geq 0$$

$$\frac{1}{11}(10-R)-\frac{10}{11}C < \frac{3}{4}(2-R)-\frac{1}{4}C$$

$$\frac{3}{4}R+\frac{1}{4}C \geq 1$$

1. Firm finds it profitable to get a loan and undertake safe project
2. Conditional on getting loan, firm prefers safe to risky project
3. Lender at least breaks even

Loan Contract

You need (i) C sufficiently big to dissuade firm from doing risky project and (ii) R not so big so as to dissuade firm from doing safe project

Suppose $C = 1/2$ and lender just breaks even. Then:

$$R = \frac{4 - C}{3} = \frac{3.5}{3} = 1.1667$$

Now check that firm wants to do the safe project:

$$\mathbb{E}(Payout_S) = \frac{3}{4}(2 - 1.1667) - \frac{1}{4}0.5 = 0.5$$

$$\mathbb{E}(Payout_R) = \frac{1}{11}(10 - 1.1667) - \frac{10}{11}0.5 = 0.3485$$

Outcome: firm will get a loan and will undertake safe project. This is efficient

Moral Hazard, Collateral, and the Financial Accelerator

We get a similar dynamic at play in the moral hazard example as we did in the adverse selection one

Ability to post collateral effectively commits firm to not behaving recklessly

This makes lender willing to extend them a loan

Inability to post collateral because of low asset values / low net worth: can't get a loan, and productive investment projects are not undertaken

Lack of investment further lowers asset prices, which further weakens borrower balance sheets, which leads to even less investment

Again, an adverse feedback loop

Economic Development and Financial Structure

Developing countries often have poorly developed legal systems and ill-defined property rights

This makes it difficult for collateral to serve the role it does in developed economies like the US

It is also more difficult for lenders to monitor the behavior of borrowers

As a result, the financial system is underdeveloped

This makes it difficult to funnel savings to investments (particularly the most profitable investments), which results in weak economic growth

Relevance for Monetary Policy

Financial intermediation (indirect finance) is much more important than direct finance for external funding for firms

Asymmetric information (adverse selection and moral hazard) can help explain this phenomenon

Asymmetric information also affords an important role to collateral in indirect finance

Possibility of financial accelerator mechanism

Relevance for Monetary Policy:

1. Banking system (over which central banks have some control) really important for functioning of economy
2. Fluctuating asset prices (e.g. bubbles) can impact ability of banking system to funnel savings into productive investments