

Principles of Economics

Information Economics

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Introduction

- One of the conditions for perfect competition is **perfect information**.
- When buyers and sellers do not have perfect information, the market may not function well and may fail to produce the efficient outcome.
- A market suffering from a lack of information is said to have **information friction**.

Search Friction

- One type of information friction is **search friction**: it takes time for buyers to search for sellers and for sellers to search for buyers.
- In the presence of search friction, markets **do not clear**, in the sense that there are both buyers who want to buy and sellers who want to sell who are unable to match with each other.

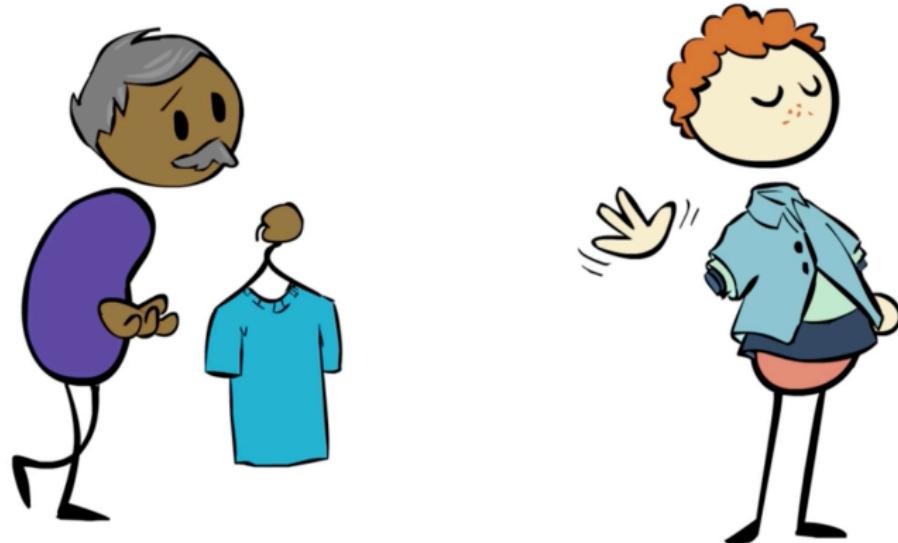
Search Friction in a Bartering Economy

- In a bartering economy, every trade has to involve two parties that both have something the other party wants. This is called a **double coincidence of wants**.
- Search friction: it takes a long time to finding a trade partner in such economy.
- Solution: (1) central market to match buyers and sellers, (2) money as medium of exchange.

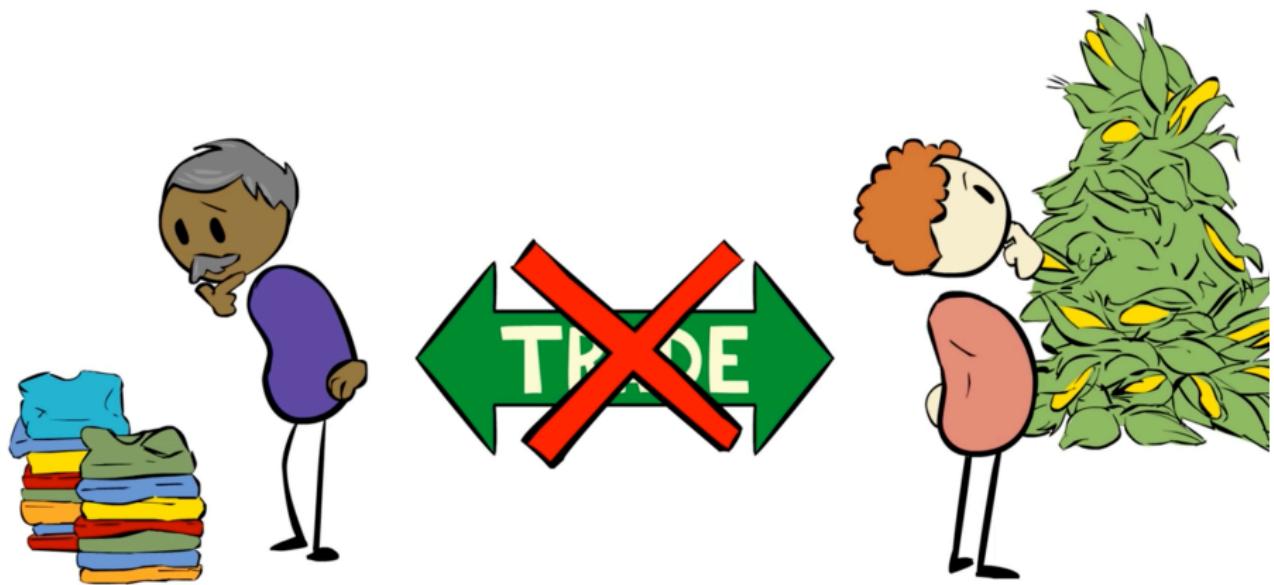
Search Friction in a Bartering Economy



Search Friction in a Bartering Economy



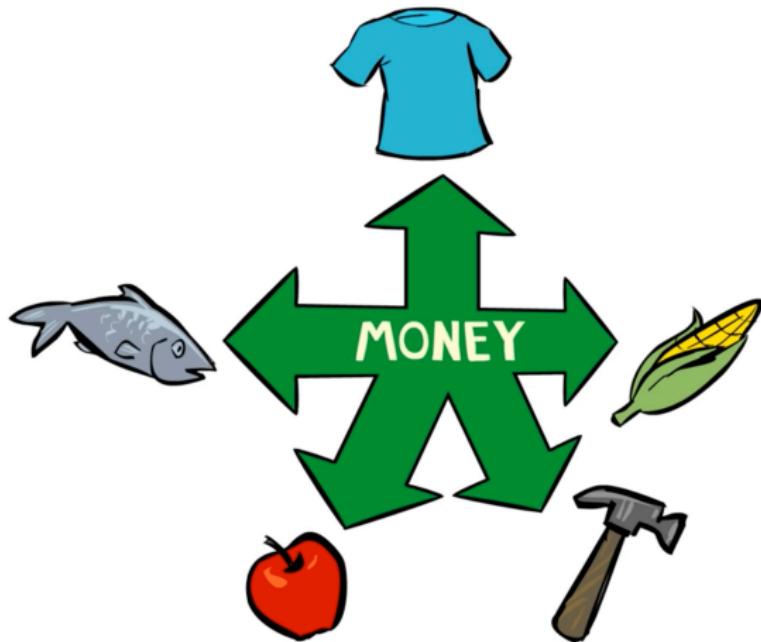
Search Friction in a Bartering Economy



Search Friction in a Bartering Economy



Search Friction in a Bartering Economy



Search Friction in the Taxi Market



Search Friction in the Marriage Market

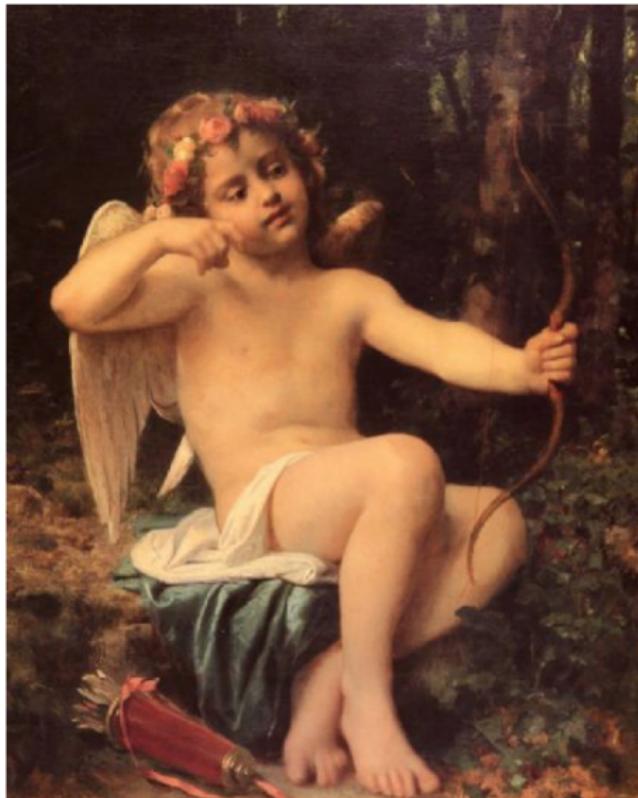
1 剩女，你们单身的原因？



鳳凰網 時尚
fashion.ifeng.com

The Romantic Search for Love

*"Love looks not with the eyes
but with the mind. And there-
fore is winged Cupid painted
blind. Nor hath Love's mind of
any judgment taste— Wings
and no eyes figure unheedy
haste. And therefore is Love
said to be a child, Because in
choice he is so oft beguiled."*
– Shakespeare, *A Midsummer
Night's Dream.*



The Realistic Search for Love (?)



杜克勒 上传于 kds.pchome.net

People's Park, Shanghai

Search Friction in the Labor Market

- In a perfectly competitive labor market, there should be no unemployment.
 - ▶ Demand for labor should equal supply of labor at the equilibrium wage.
- In reality, at any time there are unemployed workers and unfilled vacancies.

Search Friction in the Labor Market

- One reason: in practice, time and effort is needed for individuals to learn about available job vacancies and for firms to search for available job candidates.
 - ▶ Career fairs, recruiting ads, online job and professional networking sites, personal networks, etc.
- As a result, at any time, only *some* individuals are able to find suitable job vacancies and only *some* job vacancies are able to find suitable candidates.

The Search-Matching Model of Employment

- In each period, there are U unemployed workers (job candidates) and V unfilled vacancies who search for each other.
- After a meeting happens between an unemployed worker and a firm with a job vacancy, the worker and the firm will engage in wage negotiation.
- If they can reach an agreement (the worker accepts the firm's wage offer or the firm accepts the worker's wage demand), then both will stop searching. The worker will become employed and the vacancy is filled.
- If they cannot reach an agreement, they will have to continue searching in the next period.

The Search-Matching Model of Employment

$$\frac{V}{U} \uparrow \Rightarrow$$

- the opportunity cost for the worker to accept the vacancy \uparrow
- the opportunity cost for the firm (vacancy) to accept the worker \downarrow
- In such models, the opportunity cost is also called the **outside option**.

The variable $\frac{V}{U}$ represents **labor market tightness**.

The Search-Matching Model of Employment



$$\frac{V}{U} \downarrow$$

The Search-Matching Model of Employment

The Washington Post

December 28, 2017

2018's challenge: Too many jobs, not enough workers

By Danielle Paquette

Employers nationwide are grappling with a problem that threatens to stall economic growth: vacancies — and lots of them.

In Maine, where flurries can fall as late as April, the state transportation department is struggling to find snowplow drivers, thanks to the increasingly tight labor market. Ski resorts in the state, meanwhile, are still looking for employees to run the slopes.

Texas, too, is dealing with a labor shortage. As the price of oil climbs, drillers are ramping up production, but they need more truckers to haul it. Energy companies fear a dearth of



$$\frac{V}{U} \uparrow$$

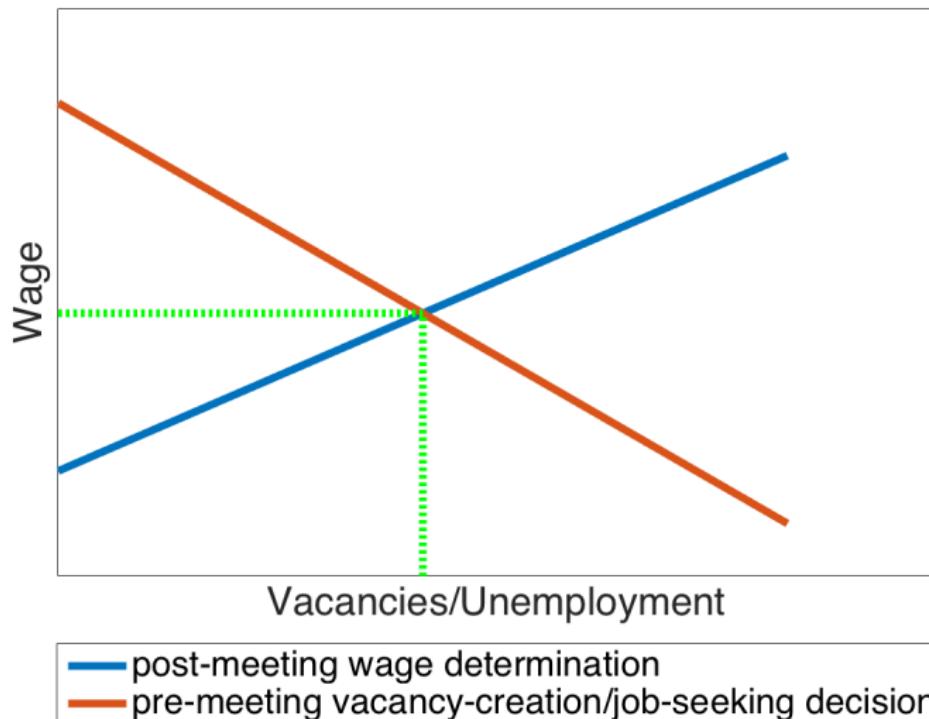
The Search-Matching Model of Employment

- The better the outside option of an unemployed worker, the more likely she is going to demand a higher wage or decline an offer (and continue searching next period). In this case, the worker is said to have more **bargaining power**.
- The better the outside option of a vacancy, the more likely the firm is going to offer a lower wage or refuse to accept a wage demand (and continue searching next period). In this case, the firm has more bargaining power.
- Therefore, $\frac{V}{U} \uparrow \Rightarrow$ higher negotiated wages when unemployed workers and vacancies meet.

The Search-Matching Model of Employment

- On the other hand, when wages are low,
 - ▶ firms have more incentives to create vacancies
 - ▶ unemployed workers have incentives to quit looking for a job
 - ▶ $\Rightarrow \frac{V}{U} \uparrow$
- When wages are high,
 - ▶ firms have less incentives to create vacancies
 - ▶ individuals who are not looking for jobs have incentives to start looking
 - ▶ $\Rightarrow \frac{V}{U} \downarrow$
- This is essentially the classic supply and demand relationship in labor markets

Equilibrium Wage and Labor Market Tightness



Matching Efficiency

- The **matching efficiency** of the labor market governs how many successful matches between job candidates and job vacancies can be produced in a given period.
- Matching efficiency can be described by a matching function $m(U, V)$, where $m(U, V) = k$ means that there will be k matches in a period with U unemployed workers and V vacancies.

Matching Efficiency

- $m(U, V)$ satisfies the following properties¹:
 - ➊ $m(U, V)$ is increasing in U and V .
 - ➋ Matching probability for an unemployed worker²: $p^U = \frac{m(U, V)}{U} \propto \frac{V}{U}$
 - ➌ Matching probability for a job vacancy: $p^V = \frac{m(U, V)}{V} \propto \frac{U}{V}$
- $m(U, V)$ is affected by
 - ▶ Matching technology
 - ▶ Skill mismatch

¹An example of a matching function that satisfies these properties are $m(U, V) = \sqrt{UV}$.

² p^U is called the **job finding rate**.

The Beveridge Curve

Let L be the size of the labor force. Let $u \equiv \frac{U}{L}$ and $v \equiv \frac{V}{L}$ be the **unemployment rate** and the **vacancy rate**. Let λ be the probability that an employed worker becomes unemployed in a given period – λ is the **job separation rate**. Then

$$\Delta u = \frac{\lambda L (1 - u) - m(U, V)}{L}$$

, where Δu is the change in unemployment rate in a given period.

In steady state equilibrium, $\Delta u = 0 \Rightarrow$

$$u = 1 - \frac{m(U, V)}{\lambda L} = \frac{1}{1 + p^U / \lambda} \quad (1)$$

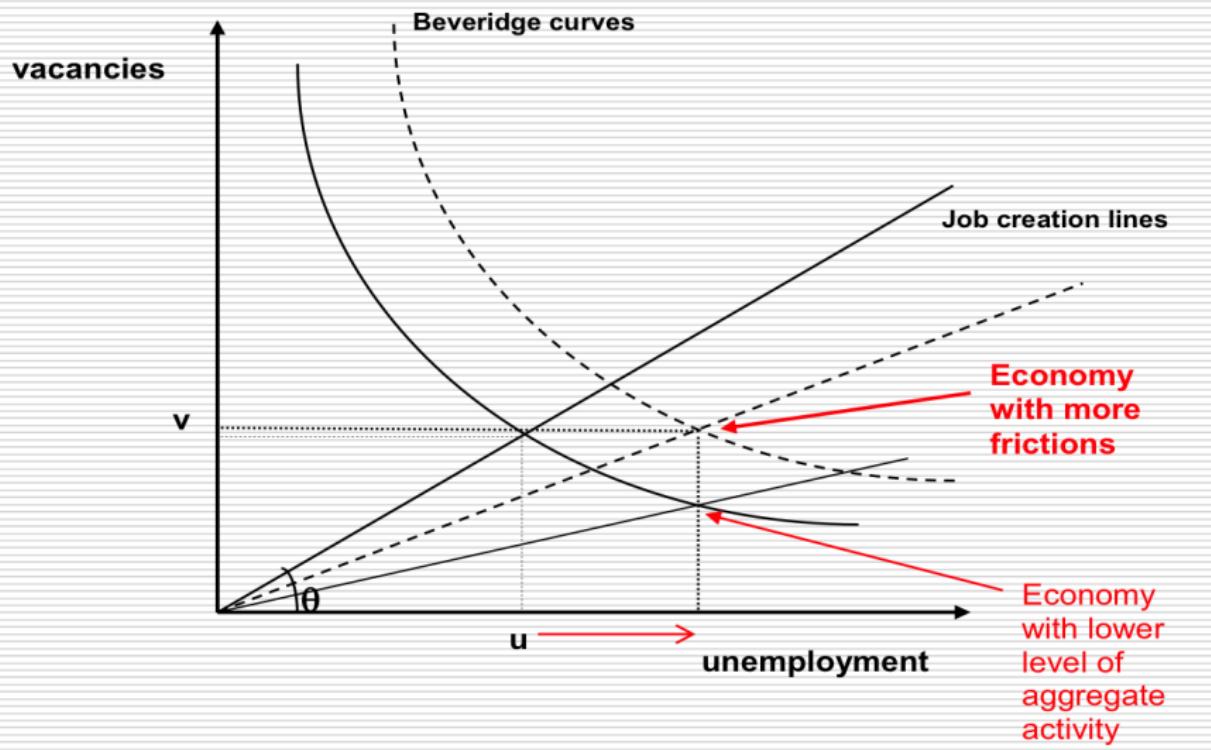
The Beveridge Curve

- (1) depicts a negative relationship between u and v and is called the Beveridge curve.

Beveridge Curve

The **Beveridge Curve**, also called the U-V curve, is a graphical representation of the relationship between unemployment and job vacancy rates *under a given matching efficiency*.

The Beveridge Curve



The Beveridge Curve

- Movements along the Beveridge curve often reflect the state of the economy in the business cycle.
 - ▶ When the economy is booming, firms create more job vacancies at each wage level. Equilibrium wage is high, vacancy rate is high, and unemployment rate is low.
 - ▶ When the economy is bad, firms create fewer job vacancies at each wage level. Equilibrium wage is low, vacancy rate is low, and unemployment rate is high.
- Shifts in the Beveridge curve reflect changes in matching efficiency.

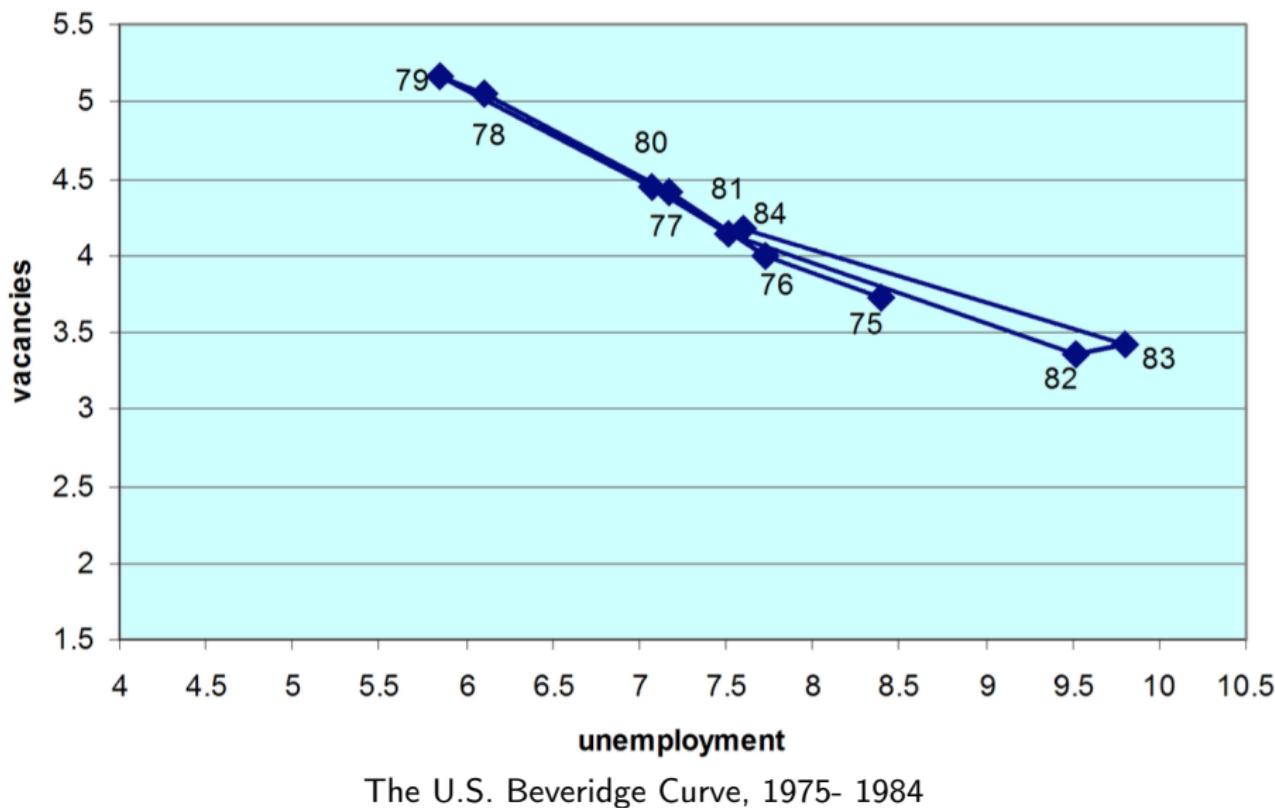
Unemployment

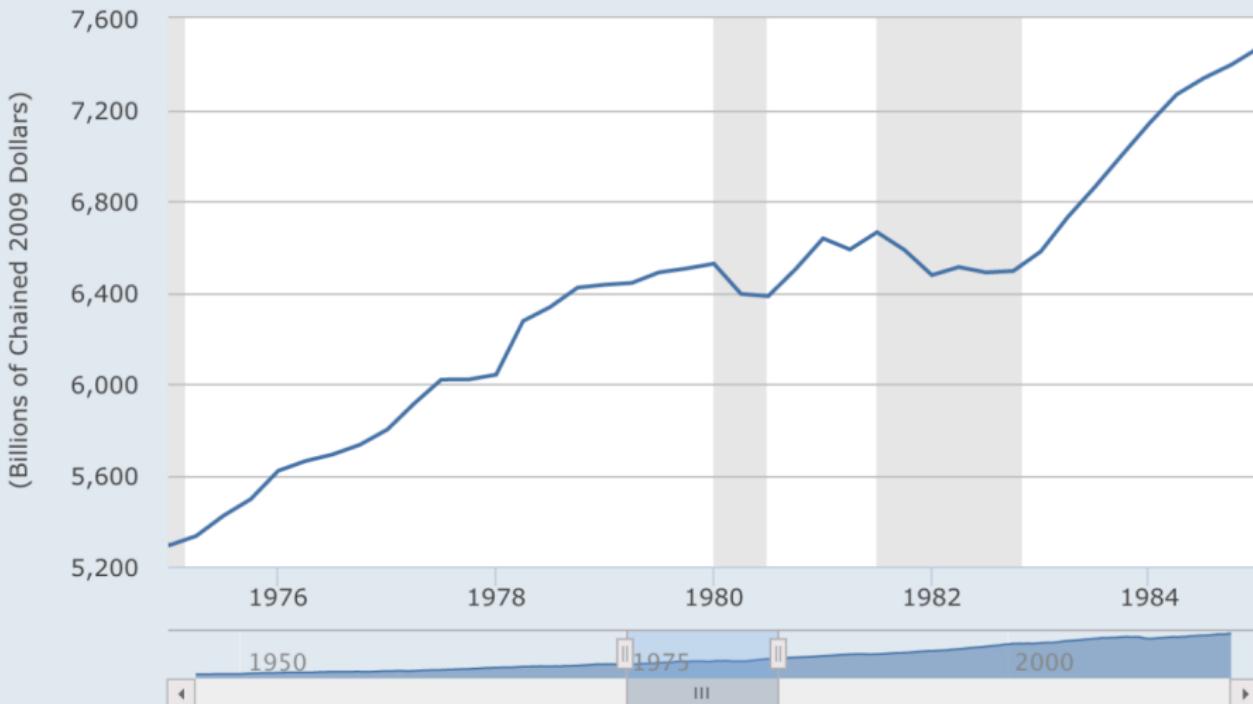
- When unemployment rises because the economy is bad, it is called **cyclical unemployment**.
 - ▶ Changes in cyclical unemployment are typically manifested as movements along the Beveridge curve.
- When unemployment rises due to decreasing matching efficiency or other factors that do not change with the business cycle, it is called **structural unemployment**.
 - ▶ Changes in structural unemployment are typically manifested as shifts of the Beveridge curve.
 - ▶ An example is an economy in transition from a manufacturing-oriented economy to a service-oriented economy: manufacturing workers who become unemployed as a result of this transition may have a harder time finding suitable job vacancies. Such structural unemployment tends to last for longer time, as it takes time to acquire new skills.

Unemployment



Skill Mismatch

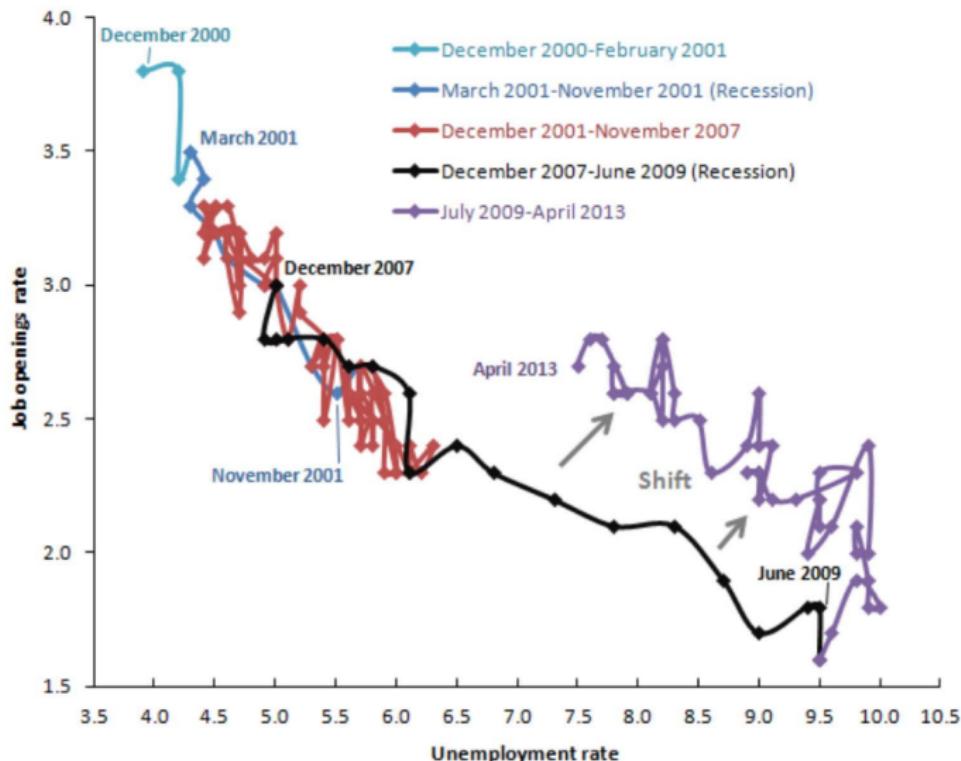




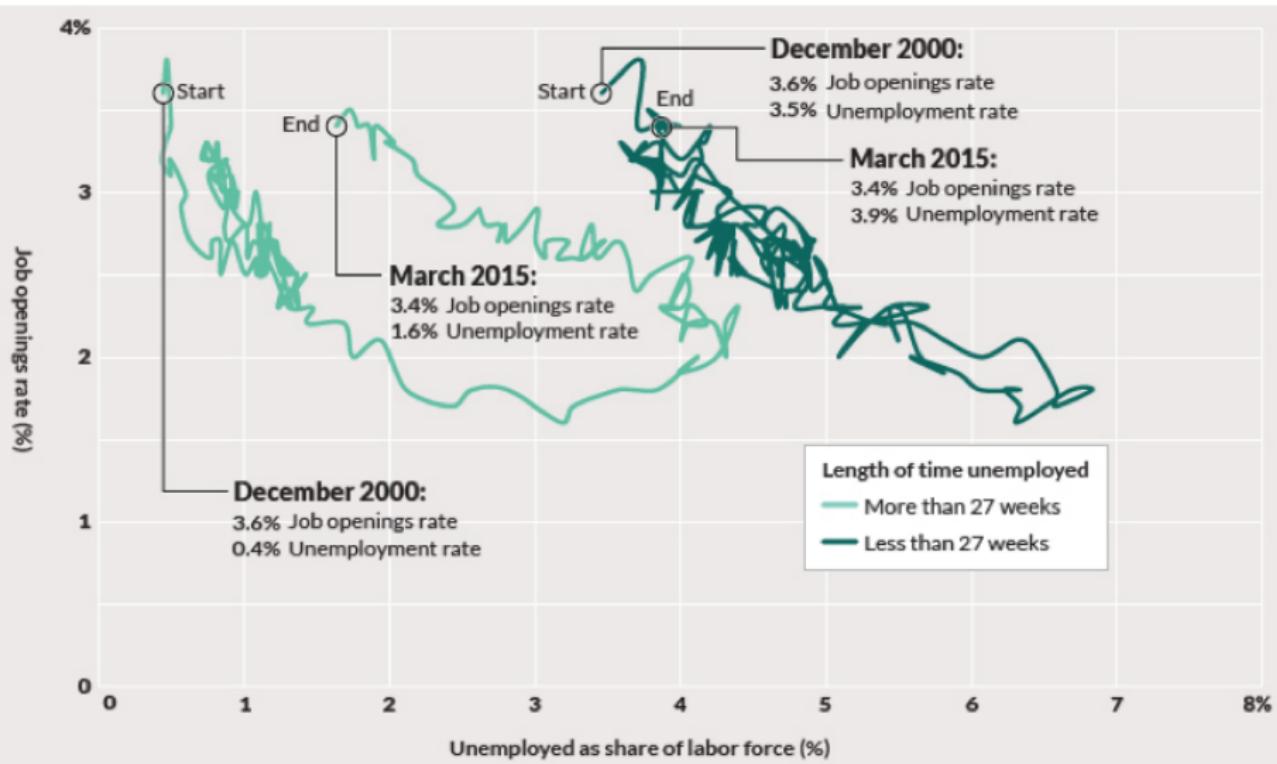
Source: US. Bureau of Economic Analysis

Shaded areas indicate US recessions - 2014 research.stlouisfed.org

**The Beveridge Curve (job openings vs. unemployment rate),
seasonally adjusted, December 2000–April 2013**



Source: U.S. Bureau of Labor Statistics.



Romantic Unemployment

- The search for a romantic partner happens in a “market” with single individuals looking for each other to form relationships.
- Just like in the labor market, it takes time and effort just to be able to meet a suitable partner (let alone to form a relationship): there exists significant search friction. Hence, there will always be individuals who are “*romantically unemployed*”.
- Advances in matching technology, such as online dating websites, should help lower search friction. But does online dating work well in reality?

Asymmetric Information

- Another type of information friction is **asymmetric information** (**information asymmetry**).
- Asymmetric information exists when one party to a transaction knows more than the other party.

Asymmetric Information

- A worker knows more than his employer about how much effort he puts into his job.
 - ▶ Informed party: worker; uninformed party: employer
- A seller of a used good knows more than the buyer about the good's condition.
 - ▶ Informed party: seller; uninformed party: buyer
- A health insurance buyer knows more about his or her health status than the insurance company.
 - ▶ Informed party: seller; uninformed party: buyer
- A doctor knows more than the patient about the quality of his diagnosis and prescription.
 - ▶ Informed party: doctor; uninformed party: patient

Asymmetric Information

- Asymmetric information is a major source of market inefficiency:
When some people know more than others, mutually beneficial trades may no longer happen.
 - ▶ People with good health may have trouble getting low-cost health insurance.
 - ▶ People with low repayment risk may have trouble getting low-interest loans.
- Two types of problem created by asymmetric information: **moral hazard** and **adverse selection**.

Moral Hazard

- **Moral hazard** occurs when, in a contractual relationship between two parties, the party with more information about its actions or intentions has a tendency or incentive to engage in undesirable behavior.
 - ▶ Workers slack.
 - ▶ People with insurance behave more recklessly.
 - ▶ Borrowers use borrowed money to gamble.
- Moral hazard can arise either when
 - ① behavior cannot be well observed, or
 - ② behavior can be well observed but cannot be contracted (often because the behavior cannot be well measured).

Adverse Selection

- Adverse selection is a problem that arises in markets in which the seller knows more about the good being sold than the buyer does. In such a situation, the buyer runs the risk of being sold a good of low quality.
- **Adverse selection:** the tendency for the unobserved attributes of a good to be undesirable to the uninformed party
 - ▶ If a seller is more eager to sell a good, but the good looks the same as the ones sold by others, then the good may be worse in unobserved ways.
 - ▶ People who have the same observable attributes but who are more eager to buy insurance may have higher unobserved health risk^{3,4}.

³ Unobserved to the insurance company. We assume the insurance buyer has more information regarding his/her health status than the insurance company.

⁴ This statement assumes people have the same degree of risk aversion: if not, the reason why some people may be more eager to buy insurance could be because they are more risk-averse.

Adverse Selection

Question

You are a venture capitalist (VC). You are approached by two entrepreneurs. Based on the information they provide, you calculate that their business plans have the same expected returns and risk. One is willing to sell you 50% stake for \$10 million. The other is willing to sell you 90% stake for 5 million. Assume both entrepreneurs will retain whatever you do not buy. Which one do you invest in?

The Lemons Problem

- George Akerlof's classic paper on adverse selection presented an example about used cars to illustrate how adverse selection causes market to malfunction.
- In a used car market, there are good used cars and defective used cars ("lemons").
- Assumption: the buyer of a car does not know whether it is a good car or a lemon, but can observe the average quality of cars in a market.

The Lemons Problem

- So best offer: the price of an average quality car.
 - ① Owners of good cars leave the market.
 - ② Average quality of cars on the market drops.
 - ③ Buyers lower their offer for any given car.
 - ④ Owners of moderately good cars leave the market.
- This results in a process in which the goods that are above average in terms of quality will be continuously driven out of the market.
- The result is a market with only the worst lemons and few buyers who want to buy them. This is called “**the lemons problem**.”

The Lemons Problem



ESSELUNGA
Frutta per la Qualità

John Lemon

Human Capital Contracts and The Lemons Problem

- The Yale Tuition Postponement Plan
- [Higher Education Loan Program \(HELP\)](#): Australia's income-contingent student loan system

Solutions to Adverse Selection in the Used Car Market

- Government regulation
 - ▶ EU: used car sellers are liable for defects for 12 months.
- Third party information production
 - ▶ Consumer reports, carfax, car inspection services.
- Intermediary: used car dealers
 - ▶ Most used cars are not sold directly in the used car market by one individual to another, but rather through an intermediary – a used car dealer.
 - ▶ Used car dealers have the expertise in determining the quality of a used car and sell cars with warranties that signal their quality.

Adverse Selection in the Insurance Market



Adverse Selection in the Insurance Market



Solutions to Adverse Selection in the Insurance Market

- Employer-sponsored group plans
 - ▶ This leaves unemployed, self-employed, and retired people without health insurance.
- Compulsory insurance
 - ▶ Everyone has to purchase insurance.
 - ▶ Insurance companies cannot deny coverage.
 - ▶ E.g., Germany, Switzerland
 - ★ Insurance provided by non-profit insurance funds
 - ★ High-income individuals can purchase plans from for-profit insurance companies.
 - ▶ E.g., U.S. under the Affordable Care Act (ACA) (a.k.a ObamaCare)
 - ★ Insurance provided by for-profit insurance companies

Solutions to Adverse Selection in the Insurance Market

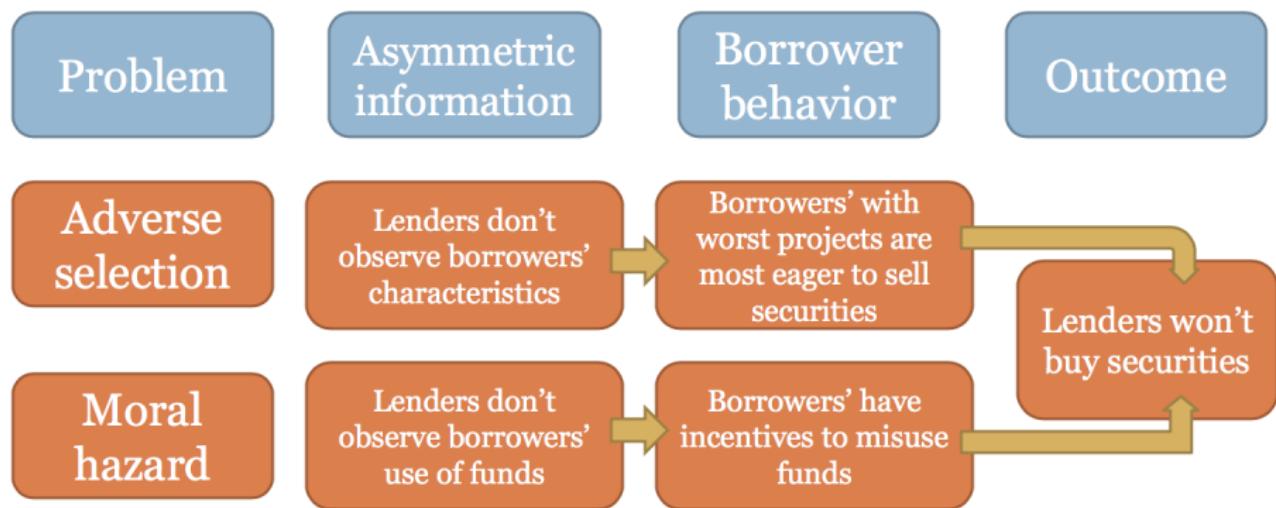
- Government provision of health insurance (single-payer national health insurance)
 - ▶ Private insurance can supplement national public insurance.
 - ▶ E.g., Canada, Taiwan
- Government provision of health care (single-payer national health service)⁵
 - ▶ E.g., UK, New Zealand

⁵ Government provision of health insurance and health care are examples of direct government provision when markets do not work in the presence of severe information problems.

Asymmetric Information in Financial Markets

- In financial markets, firms raise money by issuing securities (stocks, bonds).
- Asymmetric information plays a significant role in financial markets.

Asymmetric Information in Financial Markets



Solutions to Asymmetric Information Problems in Financial Markets

Government Regulation:

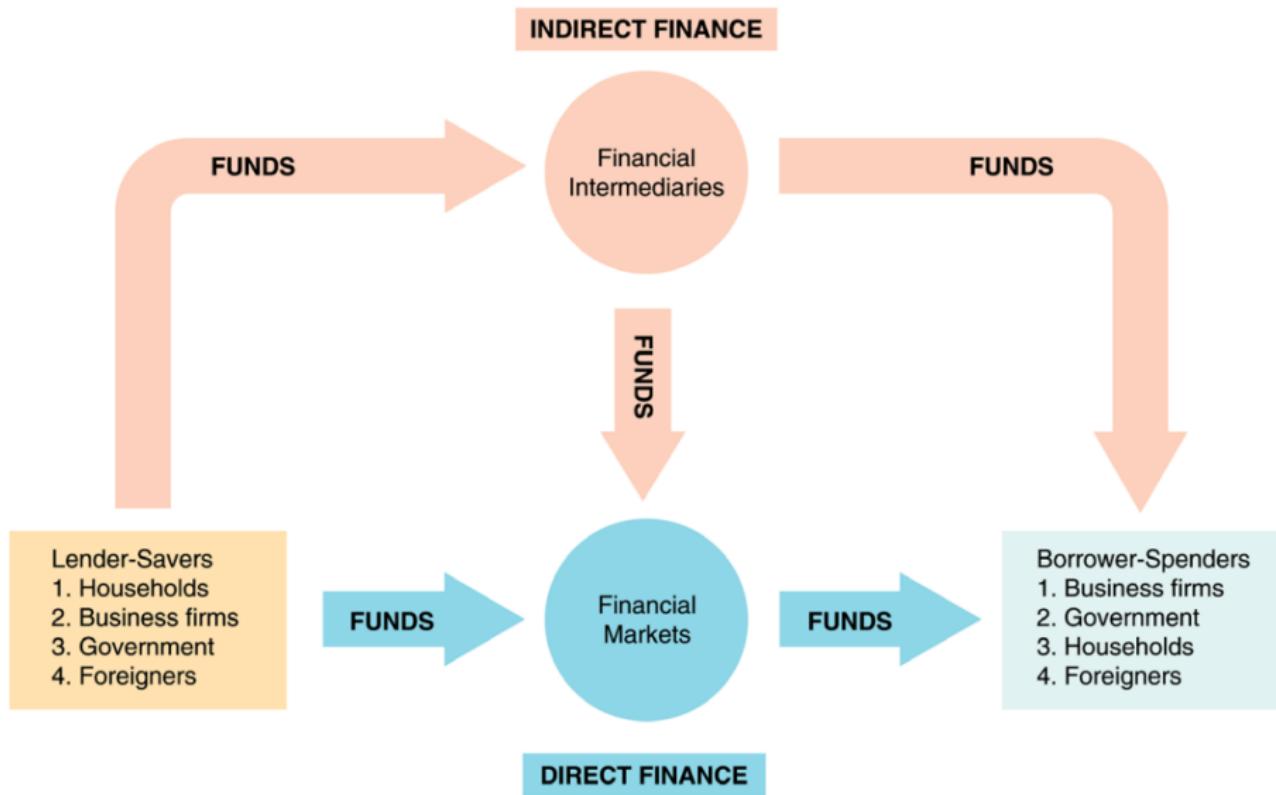
- Firms issuing securities in the U.S. must have independent audits and must file annual and quarterly reports with the SEC that report the company's performance and financial conditions.

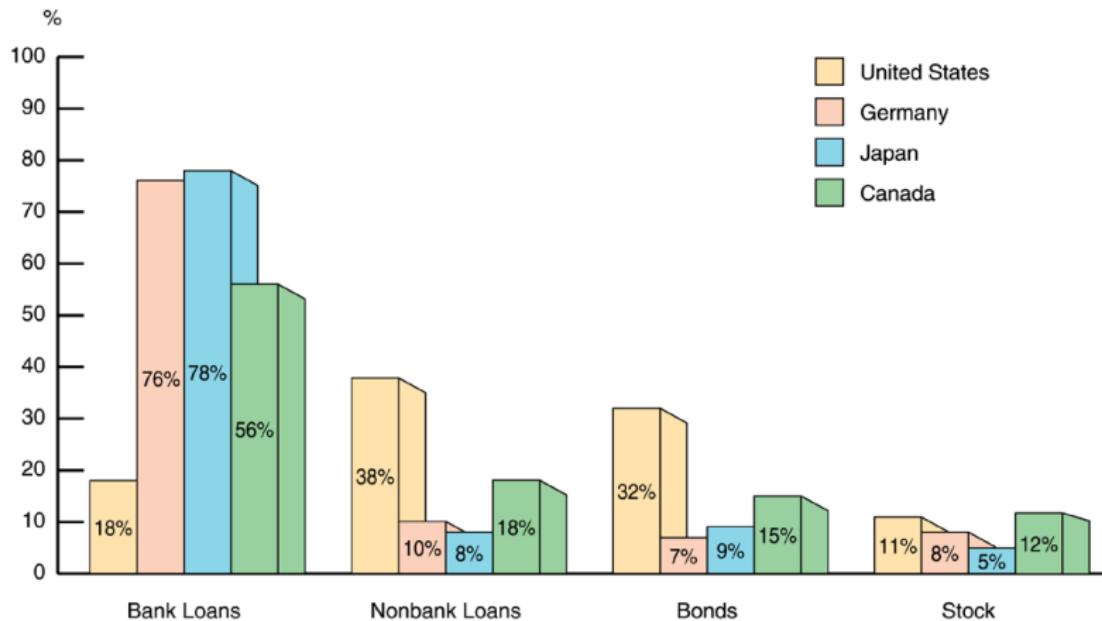
Third Party Information Production:

- Investment banks underwrite IPOs.
- Bond-rating agencies rate bonds.

Financial Intermediation

- A bank is a type of **financial intermediary** that raises money by accepting deposits and uses the money to make loans to companies and individuals.
- Banks overcome asymmetric information by actively collecting information about borrowers and monitoring their activities.
- The importance of banks increases in the financial systems of developing countries, since the quality of information about private firms is low and the asymmetric information problem is severe.
- As information about firms becomes easier to acquire, the role of banks should decline.





**FIGURE 1 Sources of External Funds for Nonfinancial Businesses:
A Comparison of the United States with Germany, Japan, and Canada**

Source: Andreas Hackethal and Reinhard H. Schmidt, "Financing Patterns: Measurement Concepts and Empirical Results," Johann Wolfgang Goethe-Universität Working Paper No. 125, January 2004. The data are from 1970–2000 and are gross flows as percentage of the total, not including trade and other credit data, which are not available.

Asymmetric Information and Bank Run

- Since banks take short-term deposits and invest them in long-term projects⁶, they can be vulnerable to bank runs in the presence of asymmetric information.
- A **bank run** happens when investors, in a panic, are not sure whether a bank is healthy or not, and simultaneously decide to take their money out. This can make even a healthy bank go bankrupt.
- Bank runs can become contagious as banks under a run sell off their assets in fire sales, depressing asset prices, and in this process making other banks insolvent.
- Institutions have been developed to protect banks from runs.
 - ▶ In the U.S., [the Federal Deposit Insurance Corporation \(FDIC\)](#) insures deposits at U.S. commercial banks up to \$250,000 per bank account.

⁶The business of borrowing short-term funds and investing in long-term assets is called **asset transformation**, or simply, “**borrowing short and lending long**”.

Asymmetric Information and Statistical Discrimination

- Asymmetric information can lead to **statistical discrimination**: the differential treatment of people based on the average characteristics of the groups to which they belong (such as gender, race, nationality, etc).
 - ▶ “rational stereotype”
- Prejudice discrimination (or taste discrimination) arises from tastes that inherently prefer one group over another.
- Statistical discrimination arises from asymmetric information.

Examples of Statistical Discrimination

- Health insurance companies may charge higher premia on men because men on average have shorter life-expectancies than women.
- Police search in the U.S. may target African Americans because crime rates among them are higher.
- Employers may be less likely to hire women or may offer them lower wages because women are more likely to exit the labor force to raise children.
- Colleges may prefer to admit students from high-income large cities than those from poor rural areas, as the former may be better educated in areas unreflected by test scores, have more connections, and are better positioned for future success.

Statistical Discrimination

- Markets tend to “punish” taste discrimination based on prejudice, but can “reward” statistical discrimination.
 - ▶ For example, if there are on average no differences between men and women, then a company that discriminates against women based on prejudice will have a smaller pool of talent to choose from and will have lower productivity and profit as a result.
 - ▶ On the other hand, if it is true that women on average are more likely to leave the labor force and if, due to information asymmetry, there is no way for companies to find out before hiring how likely each worker is going to quit, then firms that practice statistical discrimination are likely to perform better than those who don’t.

Statistical Discrimination

Understanding the root causes of discrimination may help us better formulate solutions.

Example

Suppose public schools invested more resources into gender sensitivity training in hopes of lessening gender discrimination in the future. Would you recommend this if you knew that gender discrimination was mainly a form of statistical discrimination?

Statistical Discrimination

- Statistical discrimination could lead to **self-fulfilling prophecies** and perpetuate inequality among groups even when the factors that initially caused their differences have largely disappeared.
 - ▶ i.e., statistical discrimination may lead to a situation in which differences in the outcome of different groups are caused by the practice of statistical discrimination.

Statistical Discrimination and Self-fulfilling Prophesy

- If companies in their hiring discriminate against African American workers because of their higher crime rates, then African Americans will have higher unemployment rates, leading to higher crime rates.
- If Ph.D. programs in science discriminate against women because fewer women have been successful scientists (for example, due to historical reasons), then fewer women will be admitted to these programs, leading to fewer successful female scientists in the future, and fewer talented young women interested in pursuing a career in science.

Signaling

- Individuals who are the informed party can help alleviate the asymmetric information problem by signaling.
- **Signaling:** an action taken by an informed party to reveal its private information to the uninformed party (usually the information that it is offering a product of high quality)

Signaling



Signaling

- For signaling to be useful, it has to be
 - ① a costly action
 - ② less costly, or more beneficial, to the person with the higher-quality product.
- Examples of signaling:
 - ▶ Firm advertising
 - ▶ Sellers offering warranty
 - ▶ Students pursuing advanced degrees

College Premium: Return to Human Capital or Sheepskin Effect?



克萊登大學

Asymmetric Information in the Marriage Market

- The search for a romantic partner is plagued by asymmetric information.
 - ▶ "I don't know you...you don't know me..."
- Dating is a process of information discovery.
 - ▶ Costly, time-consuming, imperfect
- And there can be moral hazard problems after marriage...
 - ▶ which may deter entering into marriage in the first place.

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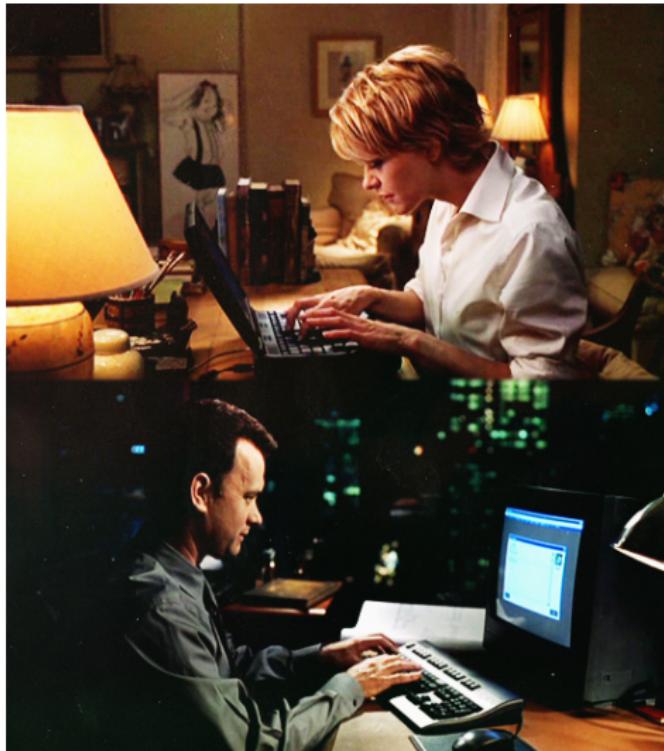


**"I do so help around the house! I keep dust off the recliner
and make sure all of the remotes are working properly!"**

Online Dating and Asymmetric Information

- Online dating markets are particularly affected by asymmetric information.
- Lemons problem: high quality individuals less likely to enter the online dating market.
- Ineffective signaling:
 - ▶ Signals of quality or compatibility are often unverifiable.
 - ▶ Signals of interest are often costless, leading to ineffective signaling.
 - ★ For example, on many dating websites, there is no limit to how many people you can contact.

Online Dating and Asymmetric Information



You've Got Mail

Online Dating and Asymmetric Information

- Credible signaling mechanism in online dating markets:
 - ▶ A Korea dating site runs “special events.” Participants pay \$50 to join.
 - ▶ After joining, each could show only up to 10 people that they were interested in a date and could offer a virtual rose along with two of their date requests.
 - ▶ Result: sending a virtual rose increases the chances of acceptance by 20%.
 - ▶ The effect is particularly large on “less desirable” recipients (almost twice as likely to accept) (Lee and Niederle, 2014).

Online Markets and Asymmetric Information

Other online markets:

- - Online job markets
 - Online used goods markets
 - Online rental markets
 - Peer-to-Peer (P2P) lending markets

Airbnb



“The Boot”, Tasman, New Zealand

ary

Accuracy	★★★★★	Location	★★★★★
Communication	★★★★★	Check In	★★★★★
Cleanliness	★★★★★	Value	★★★★★



Jenn

Wow! This is a model for hospitality. What a wonderful place and what lovely hosts. Steve and Judy ran this like a true B&B, with the added bonus of helping us with some needed ingredients for our self-grilled dinner. They went out of their way to make sure things were comfortable for us. The included breakfast was in their cute cafe, and it

+ More

March 2015

Helpful



Jennifer

I loved this place! It was so romantic with hearts everywhere, there is a gas grill and a small kitchen so you could cook a simple meal. Everything was so clean, and the bed was super comfortable. They left us two delicious chocolate cupcakes, and there was an honesty bar with soft boiled eggs! *Honesty Bar* was the perfect little touch. My

+ More

February 2015

Helpful



Laura

Staying at the boot was an amazing experience! The place was clean, compact, comfortable and had everything we needed for a lovely and relaxing evening. We arrived off the back of a two day kayaking trip, slightly tired and sandy but it didn't phase Judy at all! Judy and Steve

“The Boot” is a unique accommodation located in the Tasman region of New Zealand. It's a converted boat house that has been converted into a cozy and rustic Airbnb listing.

“The Boot”, Tasman, New Zealand

Acknowledgement

Part of this lecture is adapted from the following sources:

- Ball, L. (2011). *Money, Banking and Financial Markets* (2nd ed.). Worth Publishers.

Reference



- Lee, S. and M. Niederle. 2015. "Propose with a rose? Signaling in internet dating markets," *Experimental Economics*, 18(4).