Public Finance Defined
Public finance is about the taxing and spending activities of the government. Also known as “public sector economics” or “public economics.” Focus is on microeconomic functions of government – policies that affect overall unemployment or price levels are left for macroeconomics. Scope of public finance unclear – government has role in many activities, but focus will be on taxes and spending.

Public Finance and Ideology
How should a government function in an economic sphere?

- Organic view – community stressed above individual. Goals of society set by the state.
- Mechanistic view – government is a contrivance created by individuals to better achieve their individual goals. Individual, not group, is at center stage.

Government at a Glance
Legal framework
Federal government
- No real constraints on spending in Constitution
- Taxes must originate in House of Representatives
- Equal tax rates across states.
- Income tax came from 16th amendment to Constitution.
- Can run budget deficits

State and local government
- Can impose spending / taxing restrictions on itself.
- Many states cannot run budget deficits.

Government at a Glance
Size of government – how to measure?
- Number of government employees
- Annual expenditures

Annual expenditures have grown by a factor of 290 from 1929-2001.– Inflation, population also changing. Real, per-capita expenditure still 10 times as large. As percentage of GDP, government expenditure was 9.6% in 1929, and 29.3% in 2001.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Expenditures (billions)</th>
<th>2001 Dollars (billions)*</th>
<th>2001 Dollars per Capita</th>
<th>Percent of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>$ 10</td>
<td>$ 118</td>
<td>$ 979</td>
<td>9.6%</td>
</tr>
<tr>
<td>1945</td>
<td>$ 59</td>
<td>$ 1,132</td>
<td>$ 1,132</td>
<td>10.8%</td>
</tr>
<tr>
<td>1955</td>
<td>$ 61</td>
<td>$ 428</td>
<td>$ 2,812</td>
<td>20.7%</td>
</tr>
<tr>
<td>1965</td>
<td>$ 120</td>
<td>$ 3,272</td>
<td>$ 2,812</td>
<td>22.7%</td>
</tr>
<tr>
<td>1975</td>
<td>$ 286</td>
<td>$ 5,208</td>
<td>$ 2,812</td>
<td>22.7%</td>
</tr>
<tr>
<td>1985</td>
<td>$ 812</td>
<td>$ 6,819</td>
<td>$ 2,812</td>
<td>22.7%</td>
</tr>
<tr>
<td>1995</td>
<td>1,728</td>
<td>12,249</td>
<td>8,921</td>
<td>22.7%</td>
</tr>
<tr>
<td>2005</td>
<td>2,736</td>
<td>10,131</td>
<td>10,131</td>
<td>22.7%</td>
</tr>
</tbody>
</table>

*Conversion to 2001 dollars done using the GDP deflator

Government Expenditure
U.S. public sector is quite small compared to Sweden or France, and smaller than all the countries listed. Although large, the U.S. government is small in relative terms. More reliance on private sector.

<table>
<thead>
<tr>
<th>Year</th>
<th>Defense</th>
<th>Social Security</th>
<th>Medicare</th>
<th>Debt Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>National defense almost half of federal expenditure</td>
<td>Social security small &amp; Medicare non-existent</td>
<td>Debt payments roughly constant</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Defense was less than one-fifth</td>
<td>Social security now largest spending item, Medicare large &amp; growing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Policy Analysis Is Hard
Why is it so hard to tell what’s going on with government actions? Consider lowering income tax rates. Will lowering taxes increase work effort and labor supply? Unlike the physical and natural sciences, difficult to perform carefully controlled experiments on the economy. Oftentimes, there is no “control group” or “comparison group” for a policy.
Alternatives to an Experiment
Use of statistical tools to study impact of public policies. Will use the debate over the effect of taxes on labor supply to illustrate how positive analysis is done in public finance.

Role of Economic Theory
Consider analyzing Table 2.1. As marginal tax rates have increased, average weekly hours have decreased from 1955 to 2001. Can we conclusively say that taxes have depressed labor supply? No.
- Nonlabor income rose (dividends, interest)
- Attitudes may have changed

Table 2.1 Income tax rates and labor supply

<table>
<thead>
<tr>
<th>Year</th>
<th>Marginal Federal Tax Rate (%)</th>
<th>Average Weekly Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>20.00</td>
<td>39.6</td>
</tr>
<tr>
<td>1960</td>
<td>20.00</td>
<td>38.6</td>
</tr>
<tr>
<td>1965</td>
<td>17.00</td>
<td>38.8</td>
</tr>
<tr>
<td>1970</td>
<td>19.48</td>
<td>37.1</td>
</tr>
<tr>
<td>1975</td>
<td>23.00</td>
<td>36.1</td>
</tr>
<tr>
<td>1980</td>
<td>29.13</td>
<td>35.3</td>
</tr>
<tr>
<td>1985</td>
<td>29.05</td>
<td>34.9</td>
</tr>
<tr>
<td>1990</td>
<td>32.65</td>
<td>34.5</td>
</tr>
<tr>
<td>1995</td>
<td>22.65</td>
<td>34.5</td>
</tr>
<tr>
<td>2001</td>
<td>22.65</td>
<td>34.5</td>
</tr>
</tbody>
</table>

Role of Economic Theory
In reality, an unlimited number of factors change over time, and could affect labor supply. Economic theory helps isolate a small set of variables that are important influences on behavior. Theory would suggest that person maximizes utility—and would include factors like the person’s own wage rate. Theory is often too simple—may ignore important considerations. But whole point of model building is to reduce a problem to its essentials. In this labor supply case, the after-tax wage changes with the policy.

- Theory predicts that the effect on hours is ambiguous.
- The substitution effect predicts that as the wage (price of leisure) falls, consumers substitute toward leisure.
- The income effect says that if leisure is a normal good, consumers consume less of it as income falls.

Only empirical work—analysis based on observation as opposed to theory—can answer this question.

Methods of Empirical Analysis
There are three main methods:
- Interviews
- Experiments
- Econometric studies

Interviews
- Most straightforward way to find out whether a policy will affect behavior is to ask.
- Reporters often do this.

Experiments
- Although difficult, it is not impossible to run policy experiments.
- Requires random assignment.

Experiments
- Selection issues, even if initial random assignment.
- Subjects know they are in experiment.
- Cost.

Experiments are some economic theories are tested in laboratory settings, often with college students. Similar approach as used by psychologists. Usually offer different rewards. Setting is artificial, however. College students not really representative of population a whole.

Econometrics—statistical analysis of data.
Effects of policies are inferred from the analysis of observed behavior. Choose specific algebraic form to summarize the relationship. For instance:

\[ L = \alpha_0 + \alpha_1 w_n + \alpha_2 A + \alpha_3 X_1 + \alpha_4 X_2 + \epsilon \]

Where \( L \) is hours worked, \( w_n \) is the net wage, and \( A, X_1 \), and \( X_2 \) are other factors that affect work. \( \alpha_0-\alpha_4 \) are the parameters, and \( \epsilon \) is a random error.

Figure 2.1
Methods of Empirical Analysis
Ignoring all of the other factors except for the wage rate, the goal is to fit a line through these data points. No straight line can fit through them, but the purpose of multiple regression analysis is to find the parameters that has the “best fit.” The slope of such a regression line gives the regression coefficient on the wage rate.

When \( \alpha_1 = 0 \), the net wage has no impact on hours worked.
When \( \alpha_1 > 0 \), the net wage increases work. Substitution effect dominates.
When \( \alpha_1 < 0 \), the net wage decreases work. Income effect dominates.

Presence of random error reflects influences on labor supply that are unobservable to the investigator. In practice, method does not always lead to conclusive results. After \( \alpha_1 \) is estimated, its reliability must be considered. Is it “close” to the truth? The standard error indicates how much the estimated parameter can vary from its true value, and when the standard error is small in relation to the estimated parameter, the coefficient is statistically significant.

Pitfalls of econometric analysis
- Heterogeneity across groups
- Changes in parameters over time
- Omitted variables bias
- Some variables, such as “motivation,” are inherently unmeasurable
- Reverse causality (simultaneity)

Observed variables don’t always correspond to theory
- Hours of work is not the same as “work effort.”

CHAPTER 3
TOOLS OF NORMATIVE ANALYSIS

Welfare Economics
Need systematic framework to assess the desirability of various government actions. Welfare economics is concerned with the social desirability of alternative economic states. Distinguishes cases when private markets work well from cases where government intervention may be warranted. Relies heavily on basic microeconomic tools, particularly indifference curves.

Pure Exchange Economy
Economy with
- 2 people (Adam & Eve)
- 2 commodities (Apples & Figs)
- Fixed supply of commodities (e.g., on a desert island)

An Edgeworth Box depicts the distribution of goods between the two people.

Figure 2.1

Pure Exchange Economy
Each point in the box in Figure 2.1A represents an allocation between Adam and Eve.
Each point in the box fully exhausts the resources on the island. Adam consumes what Eve doesn’t. Adam’s consumption of apples and figs increases as we move toward the northeast in the box. Eve’s consumption of apples and figs increases as we move toward the southwest in the box.

At point v in the figure, Adam’s allocation of apples is Ox, and of figs is Ou. Eve consumes O’v of apples, and O’w of figs. Assume that Adam and Eve each have conventionally shaped indifference curves. Adam’s happiness increases as he consumes more; therefore, his utility is higher for bundles toward the northeast in the Edgeworth Box. We can therefore draw “standard” indifference curves for Adam in this picture. Adam would get even higher utility by moving further to the northeast, outside of the Edgeworth Box, but he is constrained by the resources on the island. Similarly, Eve’s happiness increases as she consumes more; therefore, her utility is higher for bundles toward the southwest in the Edgeworth Box. Eve’s indifference curves therefore are “flipped around.” Her utility is higher on E3 compared to E2 or E1.

Suppose some arbitrary point in the Edgeworth Box is selected, for example, point g in Figure 3.3. This provides an initial allocation of goods to Adam and Eve and, thus, some initial level of utility.

We can now pose the following question: Is it possible to reallocate apples and figs between Adam and Eve to make Adam better off, while Eve is made no worse off? Allocation h in Figure 3.3 is one possibility. We are “moving along” Eve’s indifference curve, so her utility remains unchanged. Adam’s utility clearly increases. Clearly, other allocations achieve this same goal, such as allocation p. Once we reach allocation p, we cannot raise Adam’s utility any more, while keeping Eve’s utility unchanged. An allocation is Pareto efficient if the only way to make one person better off is to make another person worse off. Hence, the standard framework of evaluating desirability of an allocation of resources. Pareto inefficient allocations are wasteful. A Pareto improvement is a reallocation of resources that makes one person better off without making anyone else worse off.

Many allocations are Pareto efficient. Figure 3.5 illustrates three of them -- allocations p, p1 and p2. Among these Pareto efficient allocations, some provide Adam with higher utility than others, and the opposite ones provide Eve with higher utility.

In fact, there are a whole set of Pareto efficient points in the Edgeworth Box. The locus of all the set of Pareto efficient points is called the contract curve.

Mathematically, the slopes of Adam’s and Eve’s indifference curves are equal. The (absolute value of) slope of the indifference curve indicates the rate at which the individual is willing to trade one good for another. Know as the marginal rate of substitution (MRS).

Pareto efficiency requires:

\[ MRS_{Adam} = MRS_{Eve} \]

Production Economy

In pure exchange economy, assumed supplies of commodities were fixed. Now consider scenario where quantities can change. The production possibilities curve shows the maximum quantity of figs that can produced with any given quantity of apples.

For apple production to be increased, fig production must necessarily fall. The marginal rate of transformation (MRT) of apples for figs (MRTaf) shows the rate at which the economy can transform apples to fig leafs. It is the
absolute value of the slope of the production possibilities curve. The marginal rate of transformation can be written in terms of marginal costs:

\[ MRT_{df} = \frac{MC_a}{MC_f} \]

Efficiency with Variable Production

With variable production, efficiency requires:

\[ MRT_{df} = MRS_{Adm}^{Adam} - MRS_{Ef}^{Eve} \]

If this were not the case, it is possible to make one person better off with an adjustment production. Rewriting in terms of marginal costs, we then have:

\[ \frac{MC_a}{MC_f} = MRS_{Adm}^{Adam} - MRS_{Ef}^{Eve} \]

First Fundamental Theorem of Welfare Economics

Assume that

1. All producers and consumers act as perfect competitors (e.g., no market power)
2. A market exists for each and every commodity

Under these assumptions, the first fundamental theorem of welfare economics states that a Pareto efficient allocation will emerge. Implication: Competitive economy automatically allocates resources efficiently, without central planning. Conclusion: Free enterprise systems are amazingly productive.

Second Fundamental Theorem of Welfare Economics

Note that Pareto efficiency (and the first fundamental welfare theorem) does not mean fairness. Either the northeast or southwest corner of the Edgeworth Box is Pareto efficient, but very unequal distribution. Society may care about more than Pareto efficiency. From the contract curve in the Edgeworth Box, could map or derive the relationship between Adam’s and Eve’s utilities, on the utilities possibilities curve.

The frontier of the utilities possibilities curve is, by definition, attainable. Similar to a budget constraint. Could postulate a social welfare function, which embodies society’s views on the relative well-being of Adam and Eve:

\[ W = F(U_{Adam}, U_{Ef}) \]

Could then maximize society’s preferences, or demonstrate that some Pareto-inefficient bundles are preferred to some Pareto-efficient ones.

Adjustments to prices. Issues of efficiency and distributional fairness can be separated.

Market Failure

Theorems will be violated when there are market failures
- Market power (monopoly)
- Nonexistence of markets
  1. Information failures (asymmetric information)
  2. Externalities
  3. Public goods

Evaluating Policy

Will the policy have desirable distributional consequences?
Will it enhance efficiency?
Can it be done at a reasonable cost?

Recap of Tools of Normative Analysis

What is welfare economics
- Pure exchange economy
- Production economy
- First and second fundamental welfare theorems

CHAPTER 4

PUBLIC GOODS

Public Goods Defined

Pure public goods share two characteristics
- Nonrival—Cost of another person consuming the good is zero
- Nonexcludable—Very expensive to prevent others from consuming the good

Examples of Public and Private Goods

Public Goods
- National defense
- House cleaning in an apartment with many roommates
- Fireworks display
- Music file sharing
- Uncongested freeway

Private goods
- Pizza
- Health care
- Congested freeway
- Public housing

Valuation of Public Goods

Everyone consumes same quantity of public good Marginal benefit of public good varies by person. In the housecleaning example, different roommates value the clean apartment differently.

Impure Public Goods

Most goods that are thought of as public goods may not strictly satisfy the nonrival or nonexcludable assumption. A scenic view is a public good without congestion, but the quality diminishes as more the number of sightseers increases. Thus, a scenic view becomes rival.

Private Goods can Be Provided by the Public Sector

These are called “publicly provided private goods.” Key criteria: is the good rival and excludable? Public housing is rival (one family consumes one apartment) and excludable (easy to prevent consumption).

Efficient Provision of Private Goods

Derivation of aggregate demand. Each person’s demand curve represents the willingness-to-pay for an additional unit of a good. Private good: holding P0 constant, add together individual quantities to get Q. Horizontal summation

Equilibrium in Private Goods Market

Equilibrium where supply curve intersects aggregate demand curve. Everyone pays the same price, P. Individuals consume different quantities, Q. Pareto efficient.
Efficient Provision of Public Goods
Consider a fireworks display as a public good—it is nonrival and nonexcludable. Bigger displays give higher benefit. Public good: holding Q constant, add together individual willingness-to-pay to get P. Vertical summation.

Efficiency in Public Goods Market
Everyone consumes the same quantity, Q. Individual’s marginal benefit varies. Efficiency requires that the sum of individual marginal benefits equals the marginal cost.

Numerical Example
Consider 2 individuals, Adam and Eve, who have the following inverse demand curves and face a marginal cost curve below.

\[ P_A = 100 - \frac{1}{2} Q_A \]
\[ P_E = 200 - Q_E \]
\[ MC = \frac{2}{3} Q \]

If the good was a private good, then the aggregate demand curve is:

\[ Q = Q_A + Q_E = (200 - 2P_A) + (200 - P_E) \]

With a private good, everyone pays the same price.

\[ P = P_A = P_E \]
\[ Q = 400 - 3P \]

In a competitive market, P=MC

\[ P = MC \Rightarrow \frac{400}{3} - \frac{Q}{3} = \frac{2}{3} Q \]
\[ Q = \frac{400}{3} \approx 133, P = \frac{800}{9} \approx 88 \]

Approximately 133 units of the private good are provided at a price of $88. Adam consumes around 22 units, and Eve consumes around 111 units.

Suppose instead that the good is a public good. The aggregate demand curve is:

\[ P = P_A + P_E = (100 - \frac{1}{2} Q_A) + (200 - Q_E) \]

With a public good, everyone consumes the same quantity.

\[ Q = \frac{Q_A + Q_E}{2} \]
\[ P = \frac{300}{3} - \frac{3}{2} Q \]

Efficient provision would require: P=MC

\[ P = MC \Rightarrow \frac{400}{3} - \frac{Q}{3} = \frac{2}{3} Q \]
\[ Q = 138.46, P = 92.30 \]

Efficient provision would imply that Adam & Eve consume 138.46 units of the public good. Private market may not arrive at this allocation, however.

Efficient Allocations of Public Goods: Problems
Although a competitive market will provide private goods efficiently, will the same be true for public goods? People may have incentives to hide their true preferences for a public good. If Adam can get Eve to pay for the public good, he can use his income for other purposes and still enjoy the public good. This incentive to let others pay for the public good while still enjoying the benefits is known as the “free rider problem.” The private market may therefore fall short of providing the efficient amount of the public good. This incentive to free ride occurs because the public good is nonrival and nonexcludable. A person gets to consume the good even if he does not pay for it.

Return to the public goods numerical example. Suppose Adam chooses to free ride, and Eve therefore provides her optimal amount.

Eve chooses:

\[ P_E = MC \Rightarrow Q_E = Q = 120 \]

Ather Eve contributes 120 units of the public good, Adam does not provide any additional contributions, because the marginal benefit to Adam of the 120th unit is less than the marginal cost.

Solutions to the Free Rider Problem
Government intervention can potentially lead to a more efficient outcome. Government can use coercive power to force people to pay for public goods, through taxation. Free riding is not a fact, however. There are instances when individuals do act collectively without coercion. Laboratory experiments on college students contradict the notion that free riding will lead to zero contributions for the public good. Some suggest the results derive from a “warm glow” of giving.

Privatization Debate
Privatization means taking services that are supplied by the government and turning them over to the private sector for provision and/or production. Examples with competing public/private provision include policing, parks, and even the judicial system.

Private Provision
Mix of private and public provision depends on:
1. Relative wage and materials costs: Which sector is less expensive?
2. Administrative costs: Can these fixed costs be spread over a large group of people?
3. Diversity of tastes. Private provision is more efficient with diverse tastes because people can tailor their consumption to their own tastes.
4. Distributional issues. Notions of fairness may require that some commodities are available to everyone—such as education or health care.

Private Production
Even if there is agreement that the public sector should provide a good, it is not clear whether the public sector should produce it. Airport security workers are a timely example. Public sector managers may not have a strong incentive to control costs because of the lack of profit motive or fears of takeovers or bankruptcy. Quality of public services may be higher, however. This is more relevant when contracts are incomplete.

Education Provision
Government spends approximately $400 billion on education annually. Why such extensive intervention?
1. –Education primarily a private good.
2. –Some efficiency concerns—socialization, political stability.
3. –Equity concerns—access to education increases social mobility.

Elementary and secondary education is subsidized, compulsory, and produced by the government. This cannot be rationalized on efficiency grounds alone.

What Do Expenditures for Public Education Accomplish?
Educational inputs include teacher/pupil ratio, teacher education, experience, and salary, and expenditures per pupil. Educational outputs include test scores, attendance records, dropout rates, and labor market outcomes. Hanushek (2002) finds virtually no correspondence between inputs and outputs, though this conclusion is controversial. One especially
noteworthy result is that, over wide ranges, class size does not affect educational outcomes.

CHAPTER 5
EXTERNALITIES

Externality Defined
An externality is present when the activity of one entity (person or firm) directly affects the welfare of another entity in a way that is outside the market mechanism.

Negative externality: These activities impose damages on others.

Positive externality: These activities benefit others.

Examples of Externalities
Negative Externalities

- Pollution
- Cell phones in a movie theater
- Congestion on the internet
- Drinking and driving
- Student cheating that changes the grade curve
- The “Club” anti-theft device for automobiles

Positive Externalities

- Research & development
- Vaccinations
- A neighbor’s nice landscape
- Students asking good questions in class
- The “LoJack” anti-theft device for automobiles

Not Considered Externalities

- Land prices rising in urban area
- Known as “pecuniary” externalities

Nature of Externalities

Arise because there is no market price attached to the activity. Can be produced by people or firms. Can be positive or negative. Public goods are special case. Positive externality’s full effects are felt by everyone in the economy

Graphical Analysis: Negative Externalities

For simplicity, assume that a steel firm dumps pollution into a river that harms a fishery downstream. Competitive markets, firms maximize profits. Note that steel firm only cares about its own profits, not the fishery’s. Fishery only cares about its profits, not the steel firm’s profits.

**MB** = marginal benefit to steel firm

**MPC** = marginal private cost to steel firm

**MD** = marginal damage to fishery

**MSC** = **MPC** + **MD** = marginal social cost

**Figure 5.1**

From Figure 5.1, as usual, the steel firm maximizes profits at MB=MPC. This quantity is denoted as Q1 in the figure. Social welfare is maximized at MB=MSC, which is denoted as Q* in the figure.

Graphical Analysis, Implications

Result 1: Q1 > Q*

Steel firm privately produces “too much” steel, because it does not account for the damages to the fishery.

Result 2: Fishery’s preferred amount is 0.

Fishery’s damages are minimized at MD=0.

Figure 5.2

The steel firm therefore chooses Q1:

**MB** = **MPC**: 300 - **Q** = 20 + **Q** ⇒ Q1 = 140

The socially efficient amount is instead Q*:

**MB** = **MSC** = **MPC** + **MD**

= 300 - **Q** = (20 - **Q**) - (40 - 2**Q**) ⇒ Q* = 60

The deadweight loss of steel firm choosing Q1=140 is calculated as the triangle between the MB and MSC curves from Q1 to Q*.

$$DWL = \frac{1}{2} (Q_1 - Q_*) (MSC_{Q_1} - MB_{Q_1})$$

$$DWL = \frac{1}{2} (140 - 60)(480 - 160) = $12800$$

In Figure 5.2, this corresponds to area dhg. By moving to Q* the steel firm loses profits equal to the triangle between the MB and MPC curve from Q1 to Q*.

$$GAIN = \frac{1}{2} (Q_1 - Q_*) (MD_{Q_1} + MD_{Q_*})$$

$$GAIN = \frac{1}{2} (140 - 60)(160 + 320) = 19200$$

By moving to Q* the fishery reduces its damages by an amount equal to the trapezoid under the MD curve from Q1 to Q*.

Calculating Gains & Losses Raises Practical Questions

What activities produce pollutants?
–With acid rain it is not known how much is associated with factory production versus natural activities like plant decay.

–Which pollutants do harm?
–Pinpointing a pollutant’s effect is difficult. Some studies show very limited damage from acid rain.

What is the value of the damage done?
–Difficult to value because pollution not bought/sold in market. Housing values may capitalize in pollution’s effect.

Private Responses
1. Coase Theorem
2. Mergers
3. Social conventions

Coase Theorem
Insight: root of the inefficiencies from externalities is the absence of property rights. The Coase Theorem states that once property rights are established and transaction costs are small, then one of the parties will bribe the other to attain the socially efficient quantity. The socially efficient quantity is attained regardless of to whom the property rights were initially assigned.

Illustration of the Coase Theorem
Recall the steel firm/fishery example. If the steel firm were assigned property rights, it would initially produce Q1, which maximizes its profits. If the fishery were assigned property rights, it would initially mandate zero production, which minimizes its damages.

Coase Theorem: Assign Property Rights to Steel Firm
Consider the effects of the steel firm reducing production in the direction of the socially efficient level, Q*. This entails a cost to the steel firm and a benefit to the fishery:
- The steel firm (and its customers) would lose surplus between the MB and MPC curves between Q1 and Q1-1, while the fishery’s damages are reduced by the area under the MD curve between Q1 and Q1-1.
- Note that the marginal loss in profits is extremely small, because the steel firm was profit maximizing, while the reduction in damages to the fishery is substantial.
- A bribe from the fishery to the steel firm could therefore make all parties better off.

When would the process of bribes (and pollution reduction) stop?
- When the parties no longer find it beneficial to bribe.
- The fishery will not offer a bribe larger than its MD for a given quantity, and the steel firm will not accept a bribe smaller than its loss in profits (MB-MPC) for a given quantity.
- Thus, the quantity where MD=(MB-MPC) will be where the parties stop bribing and reducing output.
- Rearranging, MB=MPC+MD, or MSC=MB, which is equal at Q*, the socially efficient level.

Similar reasoning follows when the fishery has property rights, and initially allows zero production.
- The fishery’s damages are increased by the area under the MD curve by moving from 0 to Q. On the other hand, the steel firm’s surplus is increased.
- The increase in damages to the fishery is initially very small, while the gain in surplus to the steel firm is large.
- A bribe from the steel firm to the fishery could therefore make all parties better off.

When would the process of bribes now stop?
- Again, when the parties no longer find it beneficial to bribe.
- The fishery will not accept a bribe smaller than its MD for a given quantity, and the steel firm will not offer a bribe larger than its gain in profits (MB-MPC) for a given quantity.

Again, the quantity where MD=(MB-MPC) will be where the parties stop bribing and reducing output. This still occurs at Q*.

When Is the Coase Theorem Relevant?
1. Low transaction costs, Few parties involved
2. Source of externality well defined
3. Not relevant with high transaction costs or ill-defined externality
Example: Air pollution

Mergers
Mergers between firms “internalize” the externality. A firm that consisted of both the steel firm and fishery would only care about maximizing the jointprofits of the two firms, not either’s profits individually. Thus, it would take into account the effects of increased steel production on the fishery.

Social Conventions
Certain social conventions can be viewed as attempts to force people to account for the externalities they generate. Examples include conventions about not littering, not talking in a movie theater, etc.

Public Responses
1. Taxes
2. Subsidies
3. Creating a market
4. Regulation

Taxes
Again, return to the steel firm/fishery example. Steel firm produces inefficiently because the prices for inputs incorrectly signal social costs. Input prices are too low. Natural solution is to levy a tax on a polluter. A Pigouvian tax levied on each unit of a polluter’s output in an amount just equal to the marginal damage it inflicts at the efficient level of output.

Numerical Example: Pigouvian Taxes
Returning to the numerical example:

MB = 300 - Q
MPC = 20 + Q
MD = 40 + 2Q

Recall that Q1=140 and Q*≈60.

Setting t=MD(60) gives t=160. The firm now sets MB=MPC+t, which then yields Q*.

MB = MPC + t = 300 - Q = 20 + Q + t
300 - Q = 20 + Q + 160
120 = 2Q
Q = 60

Public Responses
1. Subsidies
2. Creating a market
3. Regulation

Subsidies
Another solution is paying the polluter to not pollute. Assume this subsidy was again equal to the marginal damage at the socially efficient level. Steel firm would cut back production until the loss in profit was equal to the subsidy; this again occurs at \( Q^* \). Subsidy could induce new firms to enter the market, however.

Creating a Market
Sell producers permits to pollute. Creates market that would not have emerged.

Process:
- Government sells permits to pollute in the quantity \( Z^* \).
- Firms bid for the right to own these permits, fee charged clears the market.

In effect, supply of permits is inelastic.

Figure 5.6

Process would also work if the government initially assigned permits to firms, and then allowed firms to sell permits. Distributional consequences are different – firms that are assigned permits initially now benefit. One advantage over Pigouvian taxes: permit scheme reduces uncertainty over ultimate level of pollution when costs of MB, MPC, and MD are unknown.

Regulation
Each polluter must reduce pollution by a certain amount or face legal sanctions. Inefficient when there are multiple firms with different costs to pollution reduction. Efficiency does not require equal reductions in pollution emissions; rather, it depends on the shapes of the MB and MPC curves.

Figure 5.7

The U.S. Response
1970s: Regulation. Congress set national air quality standards that were to be met independent of the costs of doing so.
1990s: Market oriented approaches have somewhat more influence, but not dominant. 1990 Clean Air Act created a market to control emissions of sulfur dioxide with permits.

Graphical Analysis: Positive Externalities
For simplicity, assume that a university conducts research that has spillovers to a private firm. Competitive markets, firms maximize profits.
Figure 6.1 shows the relationship between each person’s tax share and quantity of fireworks demanded. Each person demands more fireworks as the share of costs paid falls. Shares add up to one: SA+SE=1. Lindahl prices: Each person faces a “personalized price” per unit of the public good, which depends on the tax share. Equilibrium set of Lindahl prices such that each person votes for the same quantity of the public good. In Figure 6.1, this occurs at quantity \( r^\ast \), and each person’s share is measured on the x-axis.

Direct Democracy: Feasibility of Lindahl’s Procedure

Could imagine an auctioneer announces initial set of tax schedules, then Adam and Eve vote on quantity of fireworks. If they agree on quantity, stop. Otherwise, continue process with new tax shares. Would converge to \( r^\ast \), which is Pareto efficient.

Problems:

- Assumes people vote sincerely. Strategic behavior (e.g., misrepresenting one’s preferences) may prevent Lindahl equilibrium. Finding tax shares may take a lot of time. Imagine many parties, not just two.

Direct Democracy: Majority Voting Rules

Majority Voting Rules: one more than half of the votes must favor a measure to gain approval. Although the rules are familiar, potential problems with them.

Three people have to choose among three levels of missile provision:

- A is small amount of provision
- B is moderate amount of provision
- C is large amount of provision

People are Cosmo, Elaine, and George. Preferences are shown in Table 6.1

Table 6.1

<table>
<thead>
<tr>
<th>Choice</th>
<th>Cosmo</th>
<th>Elaine</th>
<th>George</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>A</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>Second</td>
<td>B</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>Third</td>
<td>C</td>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

Direct Democracy: Majority Voting Rule Example

In Table 6.1, the quantity B would win in an election of B versus A(by a vote of 2-1, with Elaine and George voting for B). B would also win in an election of B versus C(by a vote of 2-1, with Cosmo and George voting for B). Selection of B in this case is independent of the order in which the votes are taken. Now consider the preferences that are shown in Table 6.2

Table 6.2

<table>
<thead>
<tr>
<th>Choice</th>
<th>Cosmo</th>
<th>Elaine</th>
<th>George</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>A</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>Second</td>
<td>B</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>Third</td>
<td>C</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

In Table 6.2, imagine a series of paired elections to determine the most preferred level. Elaine’s preferences are the only ones that have changed.

The quantity A would win in an election of A versus B(by a vote of 2-1, with Cosmo and Elaine voting for A).

The quantity B would win in an election of B versus C(by a vote of 2-1, with Cosmo and George voting for B).

The quantity C would win in an election of A versus C(by a vote of 2-1, with Elaine and George voting for B).

Thus, the ultimate outcome depends crucially on the order in which the votes are taken. It is clear in this example that whichever quantity was not considered in the first round would ultimately win. Agenda manipulation is the process of organizing the order of votes to assure a favorable outcome. Another problem is cycling: paired voting can go on forever without reaching a decision.

Direct Democracy: Why Difficulties with Majority Voting Rule?

A peak in individual’s preferences is a point at which all neighboring points are lower.

1. Single-peaked preferences: utility falls as person moves away from most preferred outcome in any and all directions.
2. Double-peaked preferences: utility initially falls as person moves away from most preferred outcome, but then rises.

In Figure 6.2, Elaine has double-peaked preferences as quantity increases. This means she prefers either very large or very small missile expenditures to a quantity in the middle.

Figure 6.2

Direct Democracy: Median Voter Theorem Illustrated

Consider the five voters in Table 6.3, each with single-peaked preferences. Each voter’s individually preferred expenditure is given in the table.

Table 6.3

<table>
<thead>
<tr>
<th>Voter</th>
<th>Preferred level of party expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donal</td>
<td>$5</td>
</tr>
<tr>
<td>Daisy</td>
<td>100</td>
</tr>
<tr>
<td>Huey</td>
<td>150</td>
</tr>
<tr>
<td>Dewey</td>
<td>160</td>
</tr>
<tr>
<td>Louie</td>
<td>700</td>
</tr>
</tbody>
</table>

A movement from $0 to $5 would be by all five voters. A movement from $0 to $100 would be approved by Daisy, Huey, Dewey, and Louie. A movement from $100 to $150 would be approved by Huey, Dewey, and Louie. Any increase above $150 would be blocked by a majority of voters. Hence, the majority votes for $150, which is the preferred amount of the median voter, Huey.
Direct Democracy: Logrolling
Logrolling systems allow people to trade votes and, hence, register how strongly they feel about various issues. Vote trading is controversial, but may lead to more efficient provision of public goods.

Direct Democracy: Logrolling Example
Consider the benefits from three different projects for three people. Negative values mean a net loss.

Table 6.4 Logrolling can improve welfare

<table>
<thead>
<tr>
<th>Project</th>
<th>Melanie</th>
<th>Rhett</th>
<th>Scarlet</th>
<th>Total Net Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>200</td>
<td>30</td>
<td>-55</td>
<td>95</td>
</tr>
<tr>
<td>Library</td>
<td>-40</td>
<td>150</td>
<td>-30</td>
<td>80</td>
</tr>
<tr>
<td>Pool</td>
<td>-120</td>
<td>-60</td>
<td>90</td>
<td>-220</td>
</tr>
</tbody>
</table>

Direct Democracy: Logrolling Example
Table 6.4 shows the net benefit for each project is positive, but under a simple majority rule scheme, none gets approved. Net benefit is negative for two of the voters in each case (but small) and positive for one.

In the second example, a majority of votes form a coalition to vote for projects that serve their interests, but whose costs are borne mainly by the minority of voters.

Direct Democracy: Problems
Can anyethically acceptable method for translating individual preferences into collective preferences be free of difficulties discussed so far?

Criteria for decision making rule
1. Rule must be responsive to individual preferences.
2. Rule must be consistent (e.g., transitivity).
3. Rule must be able to rank two policies independent of irrelevant alternatives.
4. No dictatorship. Social preferences must not reflect preferences of only one individual.

Arrow’s Impossibility Theorem: states that it is impossible to find a decision rule that satisfies all of these criteria. These six criteria, taken together, seem reasonable. But theorems cast doubt on the ability of democracies to function. If any one of the six criteria is dropped, it is possible to find a collective decision making rule. It is sometimes possible, but not guaranteed, to find a decision making rule e.g., if everyone has same preferences. Theorem casts doubt on the use of social welfare functions.

Representative Democracy
In reality, government doesn’t simply aggregate people’s preferences; rather, the governing is done by politicians, judges, bureaucrats, and so on. These players have their own objective functions.

Representative Democracy: Politicians
Elected Politicians: If voters have single-peaked preferences, the vote-maximizing politician adopts the preferred program of the median voter. See Figure 6.3. Candidates move to middle of spectrum, because voters support candidate with view closest to own, and only one wins.

In previous figure, bureaucrat doesn’t choose the efficient amount for the project, Q*, where MB=MC, but rather chooses a larger project, Qbc, where TB>Tc. Project doesn’t suffer losses, but is inefficient. Bureaucrats have incentive to promote activities that increase the sponsor’s perceptions of the project’s benefits. Analogous to shifting the V curve upward. Bureaucrats have informational advantage, to present the alternatives “take Qbc or none at all.”

Figure 6.5

In Figure 6.5, the competitive output would be at Qc. The peanut industry could try to form an illegal cartel to restrict output to Qcartel, but each firm has an individual incentive to cheat. If producers can lobby for quotas, they can enforce this output level. Standard deadweight loss from reduced output is equal to triangle cde. To the extent that the economic rents, abcd, are spent on socially wasteful lobbying (rather than being a transfer to producers), this is also considered deadweight loss.

Explaining Government Growth
Various reasons to explain growth in government expenditure

- Citizen preferences
- Marxist view
- Chance events
- Changes in social attitudes

Figure 6.4
CHAPTER 7

INCOME REDISTRIBUTION: CONCEPTUAL ISSUES

Some question whether economists should be concerned with distributional issues.

--Value judgments embodied in the "right" income distribution.
--No scientific basis for the "right" distribution.

Focus on efficiency alone has problems.
--That focus, too, is a value judgment.
--Multiple equilibria.
--Decision makers do care about the income distribution; economic analysis ineffective if it doesn't consider this policy-maker constraint.

Distribution of Income
Can analyze household income, and see how equally or unequally the "pie" is distributed. Table 7.1 shows the percentage of money income among households for more than 30 years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Lowest Fifth</th>
<th>Second Fifth</th>
<th>Middle Fifth</th>
<th>Fourth Fifth</th>
<th>Highest Fifth</th>
<th>Top 5 Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>4.0</td>
<td>10.8</td>
<td>17.3</td>
<td>24.2</td>
<td>43.8</td>
<td>17.5</td>
</tr>
<tr>
<td>1978</td>
<td>4.4</td>
<td>10.3</td>
<td>17.0</td>
<td>24.8</td>
<td>43.6</td>
<td>16.1</td>
</tr>
<tr>
<td>1982</td>
<td>4.1</td>
<td>10.1</td>
<td>16.6</td>
<td>24.7</td>
<td>44.5</td>
<td>16.2</td>
</tr>
<tr>
<td>1987</td>
<td>3.8</td>
<td>9.6</td>
<td>16.1</td>
<td>24.3</td>
<td>46.2</td>
<td>18.2</td>
</tr>
<tr>
<td>1992</td>
<td>3.8</td>
<td>9.4</td>
<td>15.8</td>
<td>24.2</td>
<td>46.9</td>
<td>18.6</td>
</tr>
<tr>
<td>1997</td>
<td>3.8</td>
<td>8.9</td>
<td>15.0</td>
<td>23.2</td>
<td>49.4</td>
<td>21.7</td>
</tr>
<tr>
<td>2001</td>
<td>3.9</td>
<td>8.7</td>
<td>14.6</td>
<td>23.0</td>
<td>49.1</td>
<td>20.4</td>
</tr>
</tbody>
</table>

Distribution of Income
Richest 20% receives about 50% of total income. Poorest 20% receives about 4% of total income. Inequality has increased over time.

Distribution of Income: Poverty
The poverty line is a fixed level of real income which is considered enough to provide a minimally adequate standard of living. Inherently arbitrary, but still a useful benchmark.
--Trends over time
--Differences across groups

Poverty line for a family of four was $18,244 in 2001. Median household income more than double that, $42,228. Table 7.2 shows poverty rates for selected groups in 2001.

<table>
<thead>
<tr>
<th>Group</th>
<th>Poverty Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All persons</td>
<td>11.7%</td>
</tr>
<tr>
<td>White</td>
<td>7.4</td>
</tr>
<tr>
<td>Black</td>
<td>20.7</td>
</tr>
<tr>
<td>Hispanic origin</td>
<td>19.4</td>
</tr>
<tr>
<td>Under 18 years</td>
<td>16.3%</td>
</tr>
<tr>
<td>65 years and older</td>
<td>10.1</td>
</tr>
<tr>
<td>Female households</td>
<td>13.3</td>
</tr>
<tr>
<td>No husband present</td>
<td>26.4</td>
</tr>
</tbody>
</table>

Distribution of Income: Poverty
Poverty rates in U.S. in 2001 might be considered surprisingly high --11.7% for population as whole. Concentrated among certain groups, such as female headed households, children, and minorities. Elderly have lower poverty rates than the U.S. average. Can also look at trends over time. See Table 7.3. Poverty considerably lower than in 1960s, but not much progress since 1970.

Rationales for Income Redistribution
--Different kinds of social welfare functions
--Utilitarian
--Maximin criterion (Rawlsian)
--Pareto efficient
--Nonindividualistic

Simple Utilitarianism
The utilitarian social welfare function is:

\[ W = F(U_1, U_2, \ldots, U_n) \]

Which depends on all n members of society. One specific function form is:

\[ W = U_1 + U_2 + \ldots + U_n \]

With the additive SWF that was given, also assume:
--Identical utility functions that depend only on income.
--Diminishing marginal utility of income.
--Society's total income is fixed.

Implication: government should redistribute to obtain complete equality.

This can be illustrated with two people. See Figure 7.1. Any income level other than I* does not maximize the SWF. I* entails equal incomes.

Table 7.1    Table 7.2

Table 7.3 Poverty Rate

<table>
<thead>
<tr>
<th>Year</th>
<th>Poverty Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959</td>
<td>22.4%</td>
</tr>
<tr>
<td>1960</td>
<td>22.2%</td>
</tr>
<tr>
<td>1965</td>
<td>17.3%</td>
</tr>
<tr>
<td>1970</td>
<td>12.6%</td>
</tr>
<tr>
<td>1975</td>
<td>12.3%</td>
</tr>
</tbody>
</table>

Interpretation Problems
Poverty line (and poverty rate) is subject to a number of criticisms. When interpreting the numbers, it is useful to know the conventions and limitations.

Interpretation Problem #1
"Income" consists only of cash receipts. Excludes in-kind transfers like health insurance, food stamps, and housing. Would reduce poverty rate by more than 20%. Excludes non-market work such as childcare or housework. Ignores income flow from durable goods.

Interpretation Problem #2
Income is before tax. Ignores cash refunds from the Earned Income Tax Credit, which has grown dramatically in the last decade, and now amounts to more than $31 billion annually. Ignoring this overstates poverty rates and also affects the trends over time.

Interpretation Problem #3
Income is measured annually. Not obvious what the correct time frame should be. Income does fluctuate from year to year. Lifetime income considerations seem relevant. Consider a "starving" college student, for example. Not really "poor" in a lifetime sense.

Interpretation Problem #4
Unit of observation
--Person, family, household?
--People often make decisions as an economic unit, and there are economies of scale in household production.

Classifications can matter for poverty numbers
--Bauman (1997) calculates that including the income of nonfamily members (such as nonmarried cohabitators) would reclassify 55% of people who are poor out of official definition.

Marginal Utility of Income
Marginal utility increases as income increases, but at a decreasing rate. As income increases, the utility gained from an additional unit of income decreases.

Figure 7.1

---

Muhammad Firman (University of Indonesia - Accounting)
Simple Utilitarianism
Striking result is that full income equality should be pursued, but some scrutiny required. Assumes identical utilities. Assumes decreasing marginal utility. Assumes total income fixed e.g., no disincentives from this kind of redistributive policy.

The Maximin Criterion
The Rawlsian social welfare function is:

\[ W = \min(U_1, U_2, \ldots, U_n) \]

Social welfare in this case depends only on the utility of the person who has the lowest utility. Rawls (1971) asserts it has ethical validity because of the notion of original position. Notion that ex-ante individuals do not know where in the income distribution they will be.

These ethical claims are controversial:
– Still selfish view in original position
– Individuals extremely risk averse here
– All that is relevant is the welfare of the worst-off person, even if a policy is extremely detrimental to everyone else.

Pareto Efficient Income Redistribution
Suppose that utility of richer person does depend on poorer person’s utility. That is:

\[ U_{PETER} = U(I_{PETER}, U(I_{PAUL})) \]

Government redistribution in this case could improve efficiency. It may be difficult for the private market to do this, if, for example, the rich lack information on just who really is poor. Simply an externality problem. Altruism plays a role in this example, but private market could contain it by give charity. But not just altruism. Self-interest could play a role. Suppose there is a possibility that, for circumstances beyond your control, you become poor.
– When well off, pay “premiums.” When bad times hit, collect “payoff.”
– Motivation of some social insurance programs.

Nonindividualistic views
In previous cases, social welfare derived from individual’s utilities. Some specify what the income distribution should look like independent of individual preferences. One example: commodity egalitarianism. Right to vote, food, shelter, education, perhaps health insurance.

Processes versus Outcomes
Some argue that a just distribution of income is defined by the processes that generated it. For example, “equal opportunity” in U.S. Ensuing outcome would be considered fair, regardless of the income distribution it happened to entail. Fair bit of income mobility (Gottschalk, 1997). Does raise problem of how to evaluate social processes.

Expenditure Incidence
– Relative Price Effects
– Public Goods
– Valuing In-Kind Transfers

Relative Price Effects
Government provides many benefits to the poor in-kind—that is, direct provision of goods rather than cash.
– Food stamps
– Medicaid
– Public Housing

Estimating value is difficult. Not always valued dollar-for-dollar (if resale is difficult). Consider how the provision of an in-kind benefit changes the budget constraint in Figure 7.2. In this case, giving an in-kind benefit lowers utility relative to an equally costly cash transfer. Although the person is better off by having the in-kind transfer than not having it, she would be even happier with the cash transfer.

In this example, giving the transfer in-kind is not binding.

Numerical Example: Baseline
Assume that Jones has the following utility function:

\[ U = u(C, O) = C^\frac{1}{3}O^\frac{2}{3} \]

Where \( C \) indicates the quantity of cheese consumed, and \( O \) indicates the quantity of other goods. Jones faces prices \( P_C=2 \) and \( P_O=1 \) for cheese and other goods, respectively.

What allocation of would Jones choose with \( I=300 \)? In this Cobb-Douglas utility function, Jones’ demand curve for cheese is:

\[ C^* = \frac{\alpha}{\alpha + \beta} \frac{I}{P_C} = \frac{1}{1 + \frac{1}{4}} \left( \frac{300}{2} \right) = 37.5 \]

In addition, Jones’ demand curve for other goods is:

\[ O^* = \frac{\beta}{\alpha + \beta} \frac{I}{P_O} = \frac{1}{1 + \frac{1}{4}} \left( \frac{300}{1} \right) = 225 \]

Jones’ utility is therefore equal to:

\[ U = \left( 37.5 \right) \frac{1}{3} \left( 225 \right)^{2/3} = 143.76 \]

Numerical Example: Cash Transfer
In addition to Jones’ initial income, assume the government gives a cash transfer of $120. What consumption bundle does Jones now choose, and what is her utility?
Table 8.1 shows that welfare spending is a shared expense between the federal and state/local governments. Subsidized medical care (mainly Medicaid) exceeded $215 billion in 2000. Cash assistance (including the Earned Income Tax Credit) exceeded $91 billion in 2000.

**TANF**
  - Aid to Families with Dependent Children
- 1996–present: TANF
  - Temporary Assistance for Needy Families

Programs are largely targeted toward single parent households with children under 18.

**AFDC/TANF differences**
- AFDC
  - Open-ended entitlement – anyone who qualifies gets AFDC
  - No time limits – could be on program indefinitely
  - No work requirements
  - Cost sharing by federal and state governments – open ended costs
- State determines benefit levels subject to broad federal guidelines
- High tax rates on earned income

**TANF**
- No "entitlement" – limited funding
- Time limited for at most 5 years
- Work requirements
- Block grant to states – costs to federal government are not open ended
- States have even more control of the design of the program
- States have option to lower tax rates on earned income

**Income Maintenance and Work Incentives**
- Analyzing welfare programs is simply utility maximization subject to a budget constraint. The government’s welfare program design changes the budget constraint, and the economic agent then maximizes utility.

**CHAPTER 8**

**EXPENDITURE PROGRAMS FOR THE POOR**

Quick Look at Welfare Spending

"Welfare" in the United States is a patchwork of dozens of different programs. All welfare programs are means-tested—only individuals with sufficiently low income are eligible. Programs often have other requirements related to family structure and assets. Spending on welfare programs, as a fraction of GDP, has more than doubled in the past 30 years. The role of direct cash assistance has diminished, however. Subsidized health care has grown enormously.
income eligibility limit is $1,200. With a much higher tax rate of 100%, the income eligibility limit is $300. Fewer people qualify with the 100% tax rate, but such a high tax could discourage work among welfare recipients.

Analysis of Work Incentives

Typical utility maximization problem includes a utility function (U), prices of goods (p), and income (I). The key change in an analysis of labor supply and welfare programs is that rather than being “endowed” with income, the person is endowed with time, T. This is known as the time endowment—which can be used for either labor or leisure. The utility function consists of two goods, leisure and “all other consumption goods” (which will simply be measured as income in the examples below).

\[ U = u(L, C) \] or equivalently \[ U = u(L, I) \] where

- \( L = \text{Leisure} \)
- \( C = \text{Consumption goods} \)
- \( I = \text{Income} \)

This utility function shows that leisure is a “good” —all else equal, people prefer more to less. The reason why people work is to buy consumption goods. If we denote \( H = \text{hours of work} \), then:

- \( L + H = T \)

The amount of leisure and hours of work equals the time endowment.

In Figure 8.1, the x-axis therefore simultaneously represents leisure (moving away from the origin), and hours of work (moving toward the origin). \( O \) represents hours of leisure, and \( T \) represents hours of work. The y-axis represents consumption goods or income (they are interchangeable). In Figure 8.1, if the person does not work at all, then \( L = T \) (\( H = 0 \)). Smith earns no money, and therefore has zero income (consumption goods). Thus, one point on her budget constraint is \( (T, 0) \). If she gives up one hour of leisure, she works one hour and earns a wage rate of \( w \). Thus, another point on her budget constraint is \( (T-1, w) \), which is labeled as point b. If she gives up two hours of leisure, she works two hours and earns a wage rate of \( 2w \). Thus, another point on her budget constraint is \( (T-2, 2w) \), which is labeled as point c.

The most leisure she could give up is \( T \) hours (her time endowment), which leads to y-intercept on her budget constraint: \( (0, Tw) \). This exercise traces out all the leisure/income combinations along the line \( TD \). The price of an additional hour of leisure is its opportunity cost—the income forgone by not working that hour—which is the wage rate, \( w \). Given this budget constraint, the person maximizes utility by choosing the indifference curve tangent to the budget constraint.

This is illustrated in Figure 8.2.

- The amount of leisure consumed is \( OF \).
- The amount of income is \( OG \).

### Numerical Example

Assume that Smith has the following preferences over leisure and consumption goods:

Further, assume that the price of leisure is \$5, price of consumption goods is \$2, and the time endowment is 100 hours.

The “full” budget constraint is therefore:

\[ wL + pC = wT \rightarrow 5L + 2C = 500 \]

This translates easily into leisure demand:

She therefore consumes 25 hours of leisure (provides 75 hours of work), earns \$375 (=75x$5), and purchases 187.5 units of consumption goods (=375/2).

### Introducing the Welfare System into the Analysis

In the previous figures, the person would literally starve if she did not work at all. The welfare system provides additional income for those with low earnings (low hours of work). Figure 8.3 illustrates the budget constraint with grant of \$100 and a tax rate of 25%.

In Figure 8.3, the budget constraint has changed with the introduction of the welfare system. If the person does not work, she now collects \$G\ from the welfare system. Thus, point Q represents the leisure/income combination \((T, G)\). As she begins to work, she still receives \( w \) from her employer, but her grant is reduced by \( tw \), or \( 0.25w \). Her income therefore increases by 0.75w, not \( w \), from an additional hour of work. The (absolute value) of the slope is flatter than before. Where does she lose welfare benefits? Answer: when her benefits fall to zero, which occurs at the “breakeven level.” The earnings where welfare eligibility is lost is equal to:

\[ E = \frac{G}{w} \]

The hours of work where welfare eligibility is therefore:

\[ H = E = \frac{G}{w} = \frac{G}{tw} \]

It follows that the leisure where welfare eligibility ends is:
In Figure 8.3, this expression for leisure corresponds to OV. After earning this amount, Smith earns no additional benefits, and garbage further to keep the entire hourly wage. Thus, the new budget constraint is given by the kinked line QSD. How will Smith react to the new budget constraint QSD? Rather than T7, it will depend on her indifference curve. Given the indifference curves in Figure 8.4, Smith reduces her hours of work from FT to KT. Her leisure increases from OF to OK.

Figure 8.4

Note that Smith is clearly better off in Figure 8.4 after the welfare system is introduced—her utility is higher than before. In the previous case, we assumed the tax rate was t=25%. The next case considers a higher tax rate, t=100%. Note that 100% tax rates are not unheard of in the welfare system. Nine states and the District of Columbia impose this tax rate. Assume that G=$338 per month. Now, when a welfare recipient works another hour and earns w, her welfare benefit is reduced by exactly w. Her net wage is therefore 0! She moves from (7,338) to (7-1,338).

This is illustrated as P1 in Figure 8.5. Regardless of her preferences, she would never choose point P1 because it violates the nonsatiation assumption.

Figure 8.5

The breakeven level of earnings is G/t=(338/1.0)=338. Ather Smith earns $338, her welfare benefit has fallen to zero, and she then keeps all of her additional earnings. The absolute value of the slope of the budget constraint becomes w. The budget constraint is therefore PRD. Given the 100% tax rate and Smith’s indifference curves in Figure 8.6, she rationally chooses to leave the labor force and consume (7,338). Figure 8.6. It is never rational in Figure 8.6 to work between 0 and PR hours. This special case does not explicitly depend on a person’s indifference curves, because the tax rate is 100%. It is not true, however, that all people leave the labor force when the tax rate on welfare benefits is 100%. Figure 8.7 illustrates a person with a high level of work effort, who attains higher utility at E2 than at P.

Figure 8.7

This person’s indifference curve is everyone above the welfare part of the budget constraint. If the welfare grant, G, increased sufficiently, at some point this person would respond by leaving the labor force (assuming t=100%). But the current grant level in Figure 8.7 does not induce this person to leave. 6 Why impose such high tax rates if these tax rates create work disincentives? Holding the grant constant, lowering the tax rate increases welfare eligibility. For example, lowering tin the previous figure (Figure 8.7) would eventually induce this person to enter welfare. Do high tax rates really matter for work behavior of welfare recipients?

– Moffitt (2002) concluded that AFDC led to a 10–50% labor supply reduction among welfare recipients.

– When TANF was introduced and tax rates were lowered, the proportion of welfare recipients who had any earnings increased from 6.7% in 1990 to 28.1% in 1999.

Other factors, like work requirements and an improving economy, clearly matter, too.

Work Requirements

Workfare is a welfare arrangement where able-bodied individuals receive transfer payments only if they agree to participate in a work-related activity and accept employment. Returning to Figure 8.6, take away segment SP from the budget constraint. The budget constraint “jumps up” once the welfare recipient works at least SP hours.

Figure 8.6

Time Limited Benefits

TANF limits individuals to five years of receipt over their lifetimes. Witnessed a drop of 50% in welfare caseloads from 1994 to 2000. Other factors, like the economy, would help explain caseload reduction too. Grogger (2001) found that time limits did affect welfare participation, as families with younger children “bank” their benefits.

National versus State Administration

States have much more choice over the structure of their welfare programs. Would more generous states face influx of welfare-induced migration? Would potential migration, in turn, lead to a “race to the bottom” in terms of generosity? Although some studies have found welfare-induced migration, there has not been “race to the bottom.”

EITC

The earned income tax credit (EITC) is the largest cash transfer to low-income individuals, and is administered through the tax system, not the welfare system. Comes in form of tax credit, which is a reduction in a person’s tax liability. It is possible to have a net-negative liability—meaning the government owes the person money rather than the other way around.

EITC has grown dramatically over time, with an annual cost now exceeding $31 billion. Subsidy depends on:
Figure 8.8A summarizes the size of the credit as income increases for a family with two children.

Figure 8.8B shows how the tax rates for the EITC vary with income.

Medicaid
Medicaid is the largest spending program for the poor. Initially established in 1965, provided health insurance to recipients of cash welfare (AFDC and SSI). Has expanded over time; now covers many children and pregnant women who have no other attachment to the welfare system. By 2002, 40.1 million Medicaid recipients. Program costs exceed $219 billion. A number of policy issues arise in the provision of Medicaid.

Medicaid Crowd-out
Providing Medicaid affects both the uninsured and low income people with private (employer) health insurance. To the extent that families give up costly private insurance for the free Medicaid coverage, Medicaid "crowd-out" private coverage. The most credible estimates of private insurance crowd-out suggest that it is extremely important. As many as half of Medicaid recipients who were covered by recent expansions were previously privately insured. The "taxation" of Medicaid is quite different from the taxation of cash benefits or food stamps. Cash benefits are smoothly taken away, albeit at high tax rates. Medicaid is retained in its entirety, as long as a person is eligible for cash assistance, and taken away in its entirety if a person is ineligible for cash assistance.

Medicaid Notch
This structure creates implicit tax rates far greater than 100% for becoming ineligible for TANF/AFDC. Although a person might typically lose, say $0.80 of cash benefits for earning an extra $1.00 in the labor market, at the "Medicaid notch" she would also lose health insurance that could be valued at several thousand dollars. Consider Figure 8.8, which abstracts from the cash welfare benefits. Smith receives Medicaid valued at $1,000, as long as hours of work is less than XT (or earnings are less than Z = w x XT). She loses Medicaid for working any more than that.

Medicaid and Health
The main reason for providing (and expanding) Medicaid is to improve the health of vulnerable groups. Recent evidence suggests small but important improvements in birthweight and infant mortality.

Food Stamps
Virtually all poor people can receive food stamps (unlike cash assistance and Medicaid). In 2001, around 17.3 million food stamp participants each month, at an annual cost of $16 billion. Food stamps are an in-kind benefit and, as shown in the previous chapter, may be valued as less than their face value. Evidence suggests people buy more food when they have food stamps rather than the cash equivalent transfer. Takeup rate for food stamps is only around 70% of eligible households. Possibly some "welfare stigma" associated with participation.

Housing Assistance
Several forms of subsidized housing:
- Public housing "projects"
- Section 8 "vouchers" and certificates

Projects are developed, owned, and run by local government housing authorities. Vouchers are provided to tenants to find apartments in private market. Projects save gained a reputation as a breeding ground for crime and other social pathologies. As a consequence, little new project construction since the 1970s. Currie and Yelowitz (2000) find that these negative outcomes are largely illusory. Those who lived in projects would have fared poorly even if they had lived elsewhere. One recent focus in housing policy is increasing self-sufficiency. Perhaps poor neighborhoods or long distances from employment harm recipients. Recent evidence does not find that moving project households into better neighborhoods helps their job prospects.

Programs to Enhance Earnings
Education,
- Head Start for preschool children
Training
- Improve job skills
- Heckman (1999) finds, perhaps surprisingly, that training programs are not very effective at increasing earnings.

Social Insurance Programs
Generally share four characteristics:
- Participation is mandatory
- Benefits and benefits depend on prior contributions
- Benefits begin with an identifiable occurrence
- Programs are not means-tested

Why Have Social Insurance?
Recall that the First Welfare Theorem concluded that private markets generally work well. One critical difference in insurance markets is asymmetric information—one party has information that is not available to the other party. If a private firm offers insurance and cannot observe the high risks from the low risks, likely to get a group of buyers that is adverse to its interests. Adverse selection—Individual who knows he is especially likely to collect benefits will have an especially high demand for insurance. In a perfectly competitive insurance market, expected profits will be driven down to 0. Adverse selection could lead to insurance plans losing money, and raising the premiums only exacerbates the adverse selection problem.

**How can government intervention improve efficiency?**

Social insurance programs are compulsory. The adverse selection problem is avoided because the low risks are forced to purchase the insurance policy as well. In the private market, the low risks would be less likely than the high risks to purchase the insurance policy.

**Other justifications**

– Lack of foresight/paternalism. For example, some individuals do a poor job of planning for their retirement.
– Moral Hazard, “Gaming the system”
– Economize on decision-making costs
– Income distribution

**Structure of Social Security**

Many details of Social Security laid out in the following slides. One motivation for presenting these details is that virtually all college students are affected by Social Security, thus, it is important to understand the details.

**Structure of Social Security: Basic Components**

– Pay-as-you-go Financing
– Explicit transfers
– Benefit structure
– Age at which benefits are withdrawn
– Recipient’s family status
– Financing

**Pay-as-you-go Financing**

– Benefits for current retirees come from payments made by current workers.
– Early recipients received very high returns on their contributions.

**Explicit transfers**

– Supplemental Security Income (SSI) was enacted in 1972 and is administered by the Social Security Administration.

**Benefit Structure**

– Average Indexed Monthly Earnings—are an individual’s average wages throughout his or her working life.
  1. Adjusted for inflation
  2. Wages up to a ceiling
  3. Only highest 35 years of earnings

Only highest 35 years of earnings count toward AIME. Consider a person with a typical “age-earnings” profile, who starts work at age 22 and retires at 67, and therefore has 45 years of full-time work. Likely that the Social Security taxes paid from ages 22-32 will not matter for AIME. Convert AIME into Primary Insurance Amount (PIA)—basic benefit payable to a worker who retires at the “normal retirement age.” Benefit schedule is progressive, where lower-earners receive a higher proportion of previous earnings.

**Example of Benefit Calculation (Using 2004 Rules)**

<table>
<thead>
<tr>
<th>Average AIME</th>
<th>Maximum AIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2,774</td>
<td>$5,092</td>
</tr>
</tbody>
</table>

AIME formulas:

90 percent of the first $912 of AIME
32 percent of AIME over $912 and through $3,688
15 percent of AIME over $3,688

Total 1,242.64 1,865.64

PIA 1,242.64 1,865.64

Typical low-earner who retired in 2003 received 64% of AIME. Average earner received 48%. High earner received 40%.

Age at which benefits are withdrawn

– The normal retirement age is the age at which an individual qualifies for full Social Security benefits.
– Can retire as early as age 62, but benefits are scaled down.
– Benefits are scaled up for retirement after the normal age.

Normal retirement age is being ratcheted up from 65 to 67 for younger generations. Implicitly a benefit cut. Retirement Age is Increasing

<table>
<thead>
<tr>
<th>Year of birth</th>
<th>Normal retirement age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1937 and prior</td>
<td>65</td>
</tr>
<tr>
<td>1938</td>
<td>65 and 2 months</td>
</tr>
<tr>
<td>1939</td>
<td>65 and 4 months</td>
</tr>
<tr>
<td>1940</td>
<td>65 and 6 months</td>
</tr>
<tr>
<td>1941</td>
<td>65 and 8 months</td>
</tr>
<tr>
<td>1942</td>
<td>65 and 10 months</td>
</tr>
<tr>
<td>1943-54</td>
<td>66</td>
</tr>
<tr>
<td>1955</td>
<td>66 and 2 months</td>
</tr>
<tr>
<td>1956-59</td>
<td>66 and 4 months</td>
</tr>
<tr>
<td>1960-64</td>
<td>66 and 6 months</td>
</tr>
<tr>
<td>1965-69</td>
<td>66 and 8 months</td>
</tr>
<tr>
<td>1970-74</td>
<td>66 and 10 months</td>
</tr>
<tr>
<td>1975 and later</td>
<td>67</td>
</tr>
</tbody>
</table>

Recipient’s family status

For a single worker who retires at the normal retirement age, the monthly benefit equals PIA. A worker with a dependent spouse (or child) may receive an additional 50% of the PIA.

**Other details**

Up to 85% of the benefits can be taxed for individuals whose income exceeds certain thresholds. Benefits are indexed for inflation. Very few financial assets offer this kind of protection against inflation. Earnings test for retirees who have not reached the normal retirement age.

**Financing**

Payroll tax is a flat percentage of an employee’s annual gross wages up to a cap. Currently, the Social Security part of the payroll tax is split equally between employer and employee, with each paying 6.2% of gross wages. Likely that much of the employer tax is shifted to employees in the form of lower wages. Payroll tax and the cap have increased dramatically over time. In addition to the cumulative Social Security payroll tax of 12.4%, there is also an uncapped Medicare tax of 2.9%, resulting in a cumulative tax of 15.3%.

**Social Security Taxes Are Capped**

<table>
<thead>
<tr>
<th>Maximum Earnings Taxable</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Security (OASDI) only</td>
<td>$84,900</td>
<td>$87,000</td>
<td>$87,900</td>
</tr>
<tr>
<td>Maximum Tax Withheld</td>
<td>$5,263.86</td>
<td>$5,394</td>
<td>$5,449.80</td>
</tr>
<tr>
<td>Medicare (HI only) No Limit No Limit No Limit</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Structure of Social Security: Distributional Issues**

Some people benefit more than others from Social Security. Given the complexity of the program, how do economists figure out who wins and who loses?

Simulate lifetime net benefits for different representative individuals. Social Security Wealth: Lifetime value of Social Security benefits, discounted to present lifetime costs of being in the system—payroll taxes. See Table 9.3.

**Table 9.3**

<table>
<thead>
<tr>
<th>Year of Retirement</th>
<th>Low Earnings</th>
<th>Average Earnings</th>
<th>High Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>Social Security benefit $ 4,010</td>
<td>$11,422</td>
<td>$29,196</td>
</tr>
<tr>
<td>1995</td>
<td>Social Security benefit $ 5,180</td>
<td>$12,000</td>
<td>$38,000</td>
</tr>
<tr>
<td>2015</td>
<td>Social Security benefit $ 6,350</td>
<td>$12,600</td>
<td>$46,800</td>
</tr>
</tbody>
</table>

**Table 9.5**

<table>
<thead>
<tr>
<th>Estimator benefits and costs of Social Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings Level</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>1980</td>
</tr>
<tr>
<td>1995</td>
</tr>
<tr>
<td>2015</td>
</tr>
</tbody>
</table>
Conclusions from Table 9.3:

- Social Security redistributes across income groups
- Social Security redistributes across generations

Social Security redistributes in other ways as well, many of which may be unintended. Social Security redistributes to groups with higher life expectancies. Life expectancy varies by: Race, gender, smoking status. Social Security also redistributes by living arrangements due to the 50% PIA adjustment.

Consider benefits for three households:

- Single individual
  \[ BEN = PIA_1 \]
- Married, 1 earner
  \[ BEN = 1.5PIA_1 \]
- Married, 2 earners
  \[ BEN = \max \{1.5PIA_1, 1.5PIA_2, PIA_1 - PIA_2 \} \]

Married couples with uncovered spouses gain relative to single people because of the 50% PIA adjustment. Married couples with uncovered spouses gain, relative to married couples with two earners. If the secondary earner would have a sufficiently low PIA (e.g., PIA2 is small relative to PIA1), then the higher PIA (PIA1) entirely determines the benefit. All of the payroll contributions for PIA in this case are taxed away.

Economic Status of the Aged

- Elderly used to be a relatively disadvantaged group
- Elderly now have lower poverty rates than the average household

Effects on Economic Behavior

1. Saving behavior
2. Retirement decisions

Effects on Economic Behavior: Saving Behavior

Life-cycle theory of savings states that consumption and savings decisions are based on lifetime considerations. Generally want to “consumption-smooth.” Thus, should save during working years when income is high, and dissipate during retirement years when income is low. Social Security affects these incentives.

1. Wealth substitution effect: Households view the government as doing some of this saving for them (↓S)
2. Retirement effect: Social Security may induce people to retire earlier, thus, more periods of retirement to finance (↑T S)
3. Bequest effect: Social Security redistributes from the young to the old, and parents may offset this with larger bequests (↑T S)

Net effect of Social Security on personal savings decisions is ambiguous. Empirical work finds that Social Security increases consumption and reduces savings (e.g., the wealth substitution effect dominates). Calculations suggest Social Security reduced personal savings from $744 to $296 billion. Huge negative impact.

Effects on Economic Behavior: Retirement Decisions

Dramatic fall in labor force participation among men over 65.
- In 1930, 54% in labor force.
- In 2001, 18% in labor force

Many factors may have contributed to this, including Social Security.

1. Social Security’s adjustments to benefits create incentives to retire at 65.
2. Although the benefits are adjusted upward after that, the adjustments are actuarially unfair.
3. Age at which benefits are first available has an important effect on likelihood of retirement.

Long-Term Stresses on Social Security

Given its current pay-as-you-go structure, Social Security is financially unstable. In stable system, benefits received equals payments collected. We can decompose these two parts.

Benefits received:

\[ N_b B \]

Payments collected:

\[ tN_w w \]

Where \( N_b \) = number of retirees, \( B \) = average benefit per retiree, \( t \) = tax rate, \( N_w \) = number of workers, and \( w \) = average wage per worker.

For solvency, we must have:

\[ N_b B = tN_w w \]

Or rearranging:

\[ t = \left( \frac{N_b}{N_w} \right) \left( \frac{B}{w} \right) \]

The first term on the right hand side is the dependency ratio, and the second term is the replacement ratio. Dependency ratio has been going down because of an aging population.

- Currently, three workers per retiree
- By 2030, 0.5 workers per retiree

Only way to keep system stable would be to increase taxes or lower benefits.

Social Security Reform

Tweak the current system. Raise payroll tax, increase retirement age. Privatize the system. Contributions earmarked for account where the person could invest in various assets. Potentially higher returns (but more variance). Has distributional consequences

Unemployment Insurance

Protects against income losses due to unemployment. Weekly benefit was $258 in 2002. Private markets may fail to provide this insurance because of adverse selection. Government provision eliminates the adverse selection problem, but not moral hazard. Gross replacement rate—proportion of pretax earnings replaced by UI. About 50%. Financed through payroll tax, entirely paid by employer (on paper, at least). Tax is experience rated—firms that lay off more workers face higher tax rate.

Concerns that UI increases the unemployment rate. Moral hazard on the part of employees / job searchers because of high replacement rates. Moral hazard on part of firm because of imperfect experience rating. Studies suggest that higher benefits do increase durations of unemployment.

CHAPTER 10

SOCIAL INSURANCE II: HEALTHCARE

What’s Special About Health Care?

Health care costs are large and growing fast. Number of reasons why First Welfare Theorem may be violated:

1. Poor information (physician induced demand)
2. Adverse selection and moral hazard
3. Disease externalities

In the context of health care, moral hazard can be analyzed in a conventional supply-and-demand framework. Health insurance changes the price of health care and creates deadweight loss.

Without insurance, consume M0 of health care services. Insurance in this example lowers the price of services to 20% of actual price. With insurance, consume M1 of health care services. Deadweight loss equals abh.

Assumes that demand for health care downward sloping (e.g., health care use is elastic with respect to the price). Assumed coinsurance rate of 20% — the amount the insured person pays out of pocket. Social experiments find that the elasticity of demand for health care is -0.20.

The U.S. Health Care Market

Patchwork of public and private insurance. 13.2% of GDP. Spending on hospitals is 32% of costs. Spending on physician services is 22%.
The U.S. Health Care Market: Private Insurance

Virtually all (93%) of private insurance for the non-elderly is provided through the employer.

– By-product of wage and price controls during World War II

– Tax provisions subsidize employer contributions

– Group market is less expensive than individual market

Link to employment potentially leads to “job lock”

– When you leave your job, you also lose your health insurance

– May be difficult to get new insurance if you have a “pre-existing” condition

– Kennedy-Kassenbaum Act mandated that employers must include a new employee who previously had health insurance, even if he or she has pre-existing condition.

Group market

Possible that workers within a firm are fairly heterogeneous, so adverse selection is less of a concern.

– On the other hand, employees may shift-compensation toward wages, or shift employee’s onto spouse’s plan by offering a less generous package of benefits. More problematic at smaller firms.

Cost-based reimbursement/Fee-for-service

– Insurance policies that provide payments to health care providers based on actual costs of treating patient

– Little incentive to economize on methods for delivering health care since fully reimbursed

Managed Care

– Focus on supply-side (health care provider-side) of market rather than on the demand size.

– Often patients face very little cost sharing (prices close to zero).

– Quantity constraints (such as seeing a “gatekeeper” primary care physician before seeing a specialist).

– Capitation based reimbursement–providers received fixed, lump sum per patient, regardless of actual utilization.

– Health Maintenance Organizations (HMOs)–a group of physicians work only for a particular plan and patients can only see doctors within that plan.

– Preferred Provider Organizations (PPOs)–a group of physicians accept lower fees for access to patient network; patients can go out of the network at greater cost.

The Role of Government: Medicare

Medicare

– Implicit subsidy for employer health insurance

Medicaid

The Role of Government: Medicaid

Enacted in 1965, provides health insurance coverage to virtually all elderly individuals and some disabled. $254 billion in 2002. Adverse selection problems likely to be greatest for the elderly. Approximately 40 million enrollees. Not means-tested

Program divided into three parts:

– Part A: Hospital insurance (HI)

– Part B: Supplementary medical insurance (SMI)–optional, but 99% of elderly take it up

– Part C: Medicare+Choice–optional, a managed care arrangement where elderly get certain additional benefits like prescription drug coverage and have restricted choice of providers

Medicare does not cover:

– Long-term institutional services like nursing homes

– Prescription drugs, though new legislation was passed in 2003 that will phase-in coverage. Medicare beneficiaries spent $87 billion on outpatient prescription drugs in 2002.

Medicare financing paid for by payroll tax on current workers. Uncapped, totals 2.9% split evenly between employer and employee. Medicare financing paid for by payroll tax on current workers. Uncapped, totals 2.9% split evenly between employer and employee. Medicare outlays have grown dramatically over time – raises concerns about its solvency.

Table 10.1

<table>
<thead>
<tr>
<th>Table 10.1 Federal government outlays for Medicare (selected years)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td>1967</td>
</tr>
<tr>
<td>1970</td>
</tr>
<tr>
<td>1975</td>
</tr>
<tr>
<td>1980</td>
</tr>
<tr>
<td>1985</td>
</tr>
<tr>
<td>1990</td>
</tr>
<tr>
<td>1995</td>
</tr>
</tbody>
</table>

| **Outlays as Percent of GDP** |
| 0.4% |
| 0.7 |
| 0.9 |
| 1.2 |
| 1.7 |
| 1.9 |
| 2.4 |
| 2.2 |

The Role of Government: Controlling the Costs of Medicare

Increasing burden on current beneficiaries

Price controls

– Complicated to administer

– May lead to access problems

– Ather Medicare reduced reimbursement by 5.4% in 2002, a substantial number of medical practices stopped taking Medicare patients

Managed care

– Only 15% of Medicare elderly choose managed care arrangements.

– A number of HMOs have backed out of providing service.

Hospice and home health care

– End-of-life expenditures are 27% of Medicare costs. May be less expensive to provide home health care rather than expensive in-patient procedures.

– Has not slowed the growth in Medicare costs.

Medical Savings Accounts (MSAs)

– Consumers have very weak incentives to control costs, the moral hazard issue.

– MSAs are in effect a catastrophic insurance policy – provides payments for very expensive illnesses, but not the day-to-day health care needs.

– Money in MSAs that is not used can be used for non-medical purposes.

– Leads to adverse selection, where the low-risks opt into MSAs.

The Role of Government: Implicit Subsidy for Health Insurance

Employer contributions for health care plans are not subject to taxation. If employer increases wages by $2,000, employee only keeps (1-t)x$2,000, where t=marginal tax rate. If employer provides health insurance worth $2,000, tax bill does not increase. Provides incentive to substitute away from wages and towards fringe benefits like health insurance.

Because of subsidy:

– More firms provide employer-provided health insurance

– Firms provide more generous health insurance

The Twin Issues: Access and Cost

Access to health care

– 83% of non-elderly have some form of health care

– 17% of non-elderly (41 million people) are uninsured

– Uninsured are diverse group

– Most are employed

– Less than half are poor

Absence of health insurance different from absence of health care

Costs

– Table 10.2 shows the rapid growth in health care over time

– Table 10.3 and Figure 10.2 show that the U.S. has much higher levels of health care expenditure than other developed countries, but the rate of growth is not out of line

Table 10.2 National health expenditures (selected years)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Expenditures (in billions of dollars)</th>
<th>Percent of GDP</th>
<th>Public Share as Percent of Total Health Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>$73</td>
<td>7.0%</td>
<td>37.8%</td>
</tr>
<tr>
<td>1980</td>
<td>246</td>
<td>8.8</td>
<td>42.7</td>
</tr>
<tr>
<td>1990</td>
<td>466</td>
<td>12.0</td>
<td>40.5</td>
</tr>
<tr>
<td>1997</td>
<td>1,051</td>
<td>13.1</td>
<td>46.0</td>
</tr>
<tr>
<td>2000</td>
<td>1,360</td>
<td>13.2</td>
<td>45.2</td>
</tr>
<tr>
<td>2011*</td>
<td>2,800*</td>
<td>17.0*</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 10.3 Real health expenditures per capita in selected countries

<table>
<thead>
<tr>
<th>Country</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>$2,535</td>
</tr>
<tr>
<td>Germany</td>
<td>2,748</td>
</tr>
<tr>
<td>Japan</td>
<td>2,012</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1,763</td>
</tr>
<tr>
<td>United States</td>
<td>4,651</td>
</tr>
</tbody>
</table>

Muhammad Firman (University of Indonesia - Accounting)
The Twin Issues: Access and Cost
Why are costs growing?
– The “graying” of America – older populations require more health care
– Income growth – health care is a normal good
– Third party payments – insurance coverage may have changed
– Improvements in quality – treatments are very different (better and more expensive) than in previous decade

New Directions for Government’s Role in Health Care
Individual mandates
States force their residents to purchase automobile insurance, so why not health insurance? Heritage Foundation’s plan would have an individual mandate, replace the implicit tax subsidy to employer-provided health insurance with vouchers, and keep Medicare and Medicaid intact.

Analogy with automobile insurance is tenuous. Automobile accidents clearly cause fiscal externalities – damages to other vehicles, passengers, and property. The consequences of getting sick are largely internalized. States remove the highest risks (e.g., those who have drunk driving convictions and those under age 16, etc.) from the insurance pool by restricting their ability to drive. The high health risks are not removed in any way.

– Enforcement of mandate is unclear
– What happens if someone did not purchase insurance?
– If someone chooses not to drive or own an automobile, there is no mandate that they buy insurance.

Single Payer
– One provider of health insurance, funded by tax collections.
– Eliminates adverse selection problem, and is used in many developed countries.
– Analog in U.S. would be to extend Medicare.
– Prices are not used in this case to ration health care, and other rationing is done by imposed constraints on the supply side (e.g., waiting lists for health care).
– Also, denial of treatments for some patients
– In United Kingdom, patients over age 65 are generally not permitted kidney dialysis
– Health care costs are growing at about the same rate in these countries as in the U.S.

Incremental changes to current system
Medicare prescription drug benefit
– How generous should the program be?
– Should the program be means-tested?
– How important is adverse selection?
– How expensive will it be?
– Would greater use of prescription drugs lead to substitution away from physicians and hospitals, and lower overall costs?

CHAPTER 11
COST BENEFIT ANALYSIS

Cost-benefit analysis is a set of practical procedures for guiding public expenditure decisions.

Present Value
Project evaluation usually requires comparing costs and benefits from different time periods. Dollars across time periods are not immediately comparable, because of inflation and returns in the market.

Suppose you invest $100 today in the bank . . .
– At the end of year 1, it is worth (1+.05)x$100, or $105
– At the end of year 2, it is worth (1+.05)x$105, or $110.25
– The interest compounds over time, that is, the interest is also earning interest.

Define
– R = initial investment amount
– r = rate of return on investment
– T = years of investment

The future value (FV) of the investment is:

\[ FV = R (1+r)^T \]

Present Value: Future Dollars into the Present
Suppose someone promises to pay you $100 one year from now. What is the maximum amount you should be willing to pay today for such a promise? You are forgoing the interest that you could earn on the money that is being loaned. The present value of a future amount of money is the maximum amount you would be willing to pay today for the right to receive the money in the future.

Define
– R = amount to be received in future
– r = rate of return on investment
– T = years of investment

The present value (PV) of the investment is:

\[ PV = \frac{R}{(1+r)^T} \]

In previous equation, R is referred to as the discount rate, and (1+r)^T is the discount factor. Finally, consider a promise to pay a stream of money, $R_0$ today, $R_1$ one year from now, and so on, for T years.

\[ PV = R_0 + \frac{R_1}{(1+r)^1} + \frac{R_2}{(1+r)^2} + \ldots + \frac{R_T}{(1+r)^T} \]

Present value is an enormously important concept A $1,000,000 payment 20 years from now is only worth today:
– $376,889 if r=.05
– $148,644 if r=.10

Present Value: Inflation
– Nominal amounts are valued according to the level of prices in the year the return occurs.
– Real amounts are valued according to the level of prices in one particular year.
– Inflation affects both the payout stream and the discount factor, and these two cancel each other out.

Private Sector Project Evaluation
Suppose there are two projects, X and Y. Each entails certain benefits and costs, denoted as BX, CX, BY, and CY.

Need to ask:
– Is the project admissible?
– Is the project preferable?
– Admissible: Are the benefits greater than the costs?
– Preferable: Are the net benefits the highest?
– Most projects involve a stream of benefits and costs over time.

Define:

\[ B_i^t = \text{Benefits from project } i \text{ at time } t \]
\[ C_i^t = \text{Costs from project } i \text{ at time } t \]

Then the present value of project i is:

\[ PV_i = \frac{(B_i^t - C_i^t)}{(1+r)^t} + \frac{(B_{i+1}^t - C_{i+1}^t)}{(1+r)^{t+1}} + \ldots + \frac{(B_T^t - C_T^t)}{(1+r)^T} \]

The present value criteria for project evaluation are that:
– A project is admissible only if its present value is positive.
– When two projects are mutually exclusive, the preferred project is the one with the highest present value.
Table 11.2 shows two different projects (R&D or Advertising). The discount rate plays a key role in deciding what project to choose, because the cash inflows occur at different times. The lower the discount rate, the more valuable the back-loaded project.

<table>
<thead>
<tr>
<th>Year</th>
<th>R&amp;D</th>
<th>Advertising</th>
<th>( \tau )</th>
<th>R&amp;D</th>
<th>Advertising</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-1000</td>
<td>-1000</td>
<td>0</td>
<td>1500</td>
<td>2000</td>
</tr>
<tr>
<td>1</td>
<td>500</td>
<td>0</td>
<td>0.1</td>
<td>128</td>
<td>165</td>
</tr>
<tr>
<td>2</td>
<td>-200</td>
<td>0</td>
<td>0.03</td>
<td>86</td>
<td>98</td>
</tr>
<tr>
<td>3</td>
<td>550</td>
<td>1200</td>
<td>0.05</td>
<td>46</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.07</td>
<td>10</td>
<td>-21</td>
</tr>
</tbody>
</table>

Several other criteria are often used for project evaluation, but can give misleading answers:

- Internal rate of return
- Benefit-cost ratio

The internal rate of return, \( \rho \), is defined as the \( \rho \) that solves the equation:

\[
0 = \left( B_0 - C_0 \right) \frac{(1 + \rho)^T}{(1 +\rho)} + \frac{(B_t - C_t)}{(1 +\rho)^T}
\]

The IRR is the discount rate that would make the present value of the project equal to zero.

- Admissible if \( \rho > r \).
- The flawed analysis would choose an admissible project with the higher internal rate of return, ignoring scale.

The benefit-cost ratio divides the discounted stream of benefits by the discounted stream of costs. In this case:

\[
\frac{B}{C} = \frac{B_0 + \frac{B_t}{(1 +\rho)^T}}{C_0 + \frac{C_t}{(1 +\rho)^T}}
\]

Admissibility using the benefit-cost ratio requires:

\[
\frac{B}{C} > 1
\]

This ratio is virtually useless for comparing across admissible projects, however. Ratio can be manipulated by counting benefits as “negative costs” and vice-versa.

Discount Rate for Government Projects

Government decision making involves present value calculations. Costs, benefits, and discount rates are somewhat different from private sector. Less consensus on appropriate discount rate in public sector. One possibility are rates based on returns in private sector. Assumes all of the money that is raised would have been invested in a private sector project. In reality, funding comes from a variety of sources – investment and consumption. Funding that come from consumption should be discounted at the after-tax discount rate. Hard in reality to determine what proportions of funding come from consumption or investment.

Another possibility is the social rate of discount—which measures the valuation society place on consumption that is sacrificed in the present.

Discounts from market returns because it:

- Accounts for concern about future generations
- Involves paternalism
- May solve some market inefficiencies such as positive externalities

In reality, federal agencies are required to use a real rate of return of 7%, on the assumption that this measures the before-tax rate of return in the private sector. Some use 2% real return instead, thought to measure the after-tax rate of return. When a new tax or expenditure is introduced, its effects over a 5-year or 10-year period are analyzed to see whether it will put the budget out of balance.

Costs (or benefits) outside of the window are not counted toward deficit (or surplus).

Valuing Public Benefits and Costs

Recall that the discount rate, benefits, and costs are needed to compute the present value of a project.

For private company:

- Benefits = revenues received
- Costs = firm’s payments for inputs

For public sector, market prices may not reflect social benefits and costs.

- Externalities, for example

Several ways of measuring benefits and costs

- Market prices
- Adjusted market prices
- Consumer surplus
- Inferences from economic behavior
- Valuing intangibles

Market prices

- In a properly functioning competitive economy, the price of a good simultaneously reflects its marginal social cost of production and its marginal value to consumers.
- Ignores market imperfections
- Easy to gather

Adjusted market prices

If markets are imperfect, prices generally do not reflect true marginal social cost. Shadow prices or commodity is its true, underlying marginal social cost, which can sometimes be estimated. Examples where insights can be gleaned include monopoly price, taxes, and unemployment.

Consumer surplus

Public sector projects can be large and change market prices. Figure 11.1 measures the change in consumer surplus from a government irrigation project that lowers the cost of agricultural production.

\[
\text{Figure 11.1}
\]

In this figure, the change in consumer surplus is area bcgd. Provided the government planner can accurately measure the demand curve, the project’s benefit can be measured with this change inferences from Economic Behavior. Many times a good in question is not explicitly traded, so no market price exists.

Examples:

- Value of time
- Value of life

Value of time

In cost-benefit analysis, need to estimate the value of time to take advantage of theory of leisure-income choice. Ather-tax wage is often used.

- But hours of work not always a “choice,” and not all uses of time away from job equivalent. Researchers have examined value of time by travel commuting choices. Trains are more expensive, but less time-consuming, than buses. The same is true about non-stop airline flights versus those with a layover. Estimates are that value of time approximately half of the before-tax wage.

Value of life

The mindset that “life is priceless” presents obvious difficulties for cost-benefit analysis. If the benefits of a saved life are infinite, any project that leads to a single life saved has an infinitely high present value. Economists use two methods to assign finite values to human life:

1. Lost earnings: Net present value of individual’s other-tax earnings over lifetime. Taken literally, no loss for aged, infirm, or severely handicapped
2. Probability of death: Most projects affect probability of death (e.g., cancer research). People are willing to accept increases in the probability of death for a finite amount of money.
Examples:
Purchasing a more expensive, safer car with a lower probability of death versus a less expensive, less safe car. Occupational choice: Riskier jobs have higher wages, all else equal Willingness to pay for safety devices like smoke alarms.

Estimates suggest value of a life between $4,000,000-$9,000,000. Can contrast this versus the cost per life saved:

- Emergency floor lights on airplanes cost about $900,000 per life saved
- Asbestos removal rules cost $100,000,000 per life saved

Valuing intangibles:
National prestige, others. Can be used to subvert entire cost-benefit analysis. Could use difference between costs and benefits to make an argument on how large intangibles would have to be to make the project admissible.

Cost-Benefit “Games”:
Chain-Reaction game: Include secondary benefits to make a proposal appear more favorable, without also including the secondary costs
Labor game: Wages are viewed as benefits rather than costs of the project
Double counting game: Benefits are erroneously counted twice

Distributional Considerations:
The Hicks-Kaldor criterion bases project selection on whether there is a potential Pareto improvement. May imposes costs on some if benefits on others are larger. Others view some groups in population as “more deserving” and argue this should be taken into account in project selection.

Uncertainty:
The results of many projects are uncertain (e.g., AIDS vaccine research or defense research). In risky projects, benefits or costs must be converted into certainty equivalents—the amount of certain income the individual would trade for a set of uncertain outcomes generated by project. Requires information on distribution of returns and risk aversion.

Figure 11.2 shows a risky project \((E, E+y)\) and a certain project \((C)\) that give the same expected utility.

![Figure 11.2](image)

The results are uncertain (e.g., AIDS vaccine research or defense research). In risky projects, benefits or costs must be converted into certainty equivalents—the amount of certain income the individual would trade for a set of uncertain outcomes generated by project. Requires information on distribution of returns and risk aversion.

Figure 11.2 shows a risky project \((E, E+y)\) and a certain project \((C)\) that give the same expected utility.

CHAPTER 12
TAXATION AND INCOME DISTRIBUTION

Many policies center around whether the tax burden is distributed fairly. Not as simple as analyzing how much in taxes each person actually paid, because of tax-induced changes to price.

Two main concepts of how a tax is distributed:
1. Statutory incidence—who is legally responsible for tax
2. Economic incidence—the true change in the distribution of income induced by tax

These two concepts differ because of tax shifting.

Tax Incidence: General Remarks
Only people can bear taxes.
Business paying their fair share simply shifts the tax burden to different people. Can study people whose total income consists of different proportions of labor earnings, capital income, and so on. Sometimes appropriate to study incidence of a tax across regions. Both Sources and Uses of Income should be considered. Tax affects consumers, workers in industry, and owners. Economists often ignore the sources side. Incidence depends on how prices are determined:

- Industry structure matters
- Short-versus long-run responses

Incidence depends on disposition of tax revenue.
Balanced budget incidence computes the combined effects of levying taxes and government spending financed by those taxes. Differential tax incidence compares the incidence of one tax to another, ignoring how the money is spent. Often the comparison tax is a lump sum tax—a tax that does not depend on a person’s behavior.

Tax progressiveness can be measured in a number of ways. A tax is often classified:
1. Progressive
2. Regressive
3. Proportional

Proportional taxes are straightforward: ratio of taxes to income is constant regardless of income level. Can define progressive (and regressive) taxes in a number of ways. Can compute in terms of:
- Average tax rate (ratio of total taxes total income)
- Marginal tax rate (tax rate on last dollar of income)

Measuring how progressive a tax system is present additional difficulties. Consider two simple definitions. The first one says that the greater the increase in average tax rates as income rises, the more progressive the system:

\[ V_1 = \frac{T_1 - T_0}{I_1 - I_0} \]

The second one says a tax system is more progressive if its elasticity of tax revenues with respect to income is higher. Recall that an elasticity is defined in terms of percent change in one variable with respect to percent change in another one:

\[ V_2 = \frac{\frac{\partial T}{\partial I}}{\frac{\partial I}{\partial I}} \]

These two measures, both of which make intuitive sense, may lead to different answers. Example: increasing all taxpayers’ liability by 20%.

Partial Equilibrium Models
Partial equilibrium models only examine the market in which the tax is imposed and ignores other markets. Most appropriate when the taxed commodity is small relative to the economy as a whole.

Partial Equilibrium Models: Per-unit Taxes
Unit taxes are levied as a fixed amount per unit of commodity sold. Federal tax on cigarettes, for example, is 39 cents per pack. Assume perfect competition. Then the initial equilibrium is determined as \((Q_0, P_0)\) in

![Figure 12.1](image)

Partial Equilibrium Models: Per-unit Taxes
Next, impose a per-unit tax of $u in this market. Key insight: In the presence of a tax, the price paid by consumers and price received by producers differ. Before, the supply-and-demand system was used to determine a single price; now, there is a separate price for each. How does the tax affect the demand schedule? Consider point a in Figure 12.1. The maximum price consumers would pay for $a is that suppliers perceive that the demand curve shifts downward to point b in Figure 12.1. Performing this thought experiment for all quantities leads to a new, perceived demand curve shown in Figure 12.2. This new demand curve, $b$, is relevant for suppliers because it shows how much they receive for each unit sold.

Equilibrium now consists of a new quantity and two prices (one paid by demanders, and the other received by suppliers). The supplier’s price ($P_s$) is determined by the new demand curve and the old supply curve. The demander’s price ($P_d$) is $P_d=P_n+u$. Quantity $Q_a$ obtained by either $D(P_n)$ or $S(P_n)$. Tax revenue is equal to $uQ_a$, or area $kfhn$ in Figure 12.2. The economic incidence of the tax is split between the demanders and suppliers. Price demanders face goes up from $P_0$ to $P_n$, which (in this case) is less than the statutory tax, $u$.

**Numerical Example**
Suppose the market for champagne is characterized by the following supply and demand curves:

$$Q_S = 20 + 2P_S$$
$$Q_D = 100 - 2P_D$$

If the government imposes a per-unit tax on demanders of $8 per unit, the tax creates a wedge between what demanders pay and suppliers get. Before the tax, we can rewrite the system as:

$$Q_S = 20 + 2P_S$$
$$Q_D = 100 - 2P_D$$
$$P_S = P_D - 8$$

After the tax, suppliers receive $8 less per pack than demanders pay. Therefore:

$$P_S = P_D - 8$$
$$P_n = P_D - 8$$

Solving the initial system (before the tax) gives a price of $P=20$ and $Q=60$. Solving the system after the tax gives:

$$Q_S = 20 + 2P_D - 8 = 20 + 2P_D - 8 = 100 - 2P_D$$
$$P_D = 24, P_n = 16, Q = 52$$

In this case, the statutory incidence falls 100% on the demanders, but the economic incidence is 50% on demanders and 50% on suppliers.
An ad-valorem tax is a tax with a rate given in proportion to the price. A good example is the sales tax. Graphical analysis is fairly similar to the case we had before. Instead of moving the demand curve down by the same absolute amount for each quantity, move it down by the same proportion. Figure 12.7 shows an ad-valorem tax levied on demanders. As with the per-unit tax, the demand curve as perceived by suppliers has changed, and the same analysis is used to find equilibrium quantity and prices.

**Numerical Example**

Returning to our previous example, with a per-unit tax on demanders the system was written as:

\[
\begin{align*}
Q_d &= 20 + 2P_s \\
Q_s &= 100 - 2P_d \\
P_s &= P_d - \tau_d
\end{align*}
\]

Now, with an ad-valorem tax (\(\tau_D\)), the system is written as:

\[
\begin{align*}
Q_d &= 20 + 2P_s \\
Q_s &= 100 - 2P_D \\
P_s &= (1 - \tau_D)P_D
\end{align*}
\]

If the ad-valorem tax on demanders was 10%, then relationship between prices is:

\[
P_s = 0.9P_d \Rightarrow Q_d = Q_s \Rightarrow 20 + 2(0.9P_d) = 100 - 2P_D
\]

\[
P_d = 210.5, P_s = 18.95, Q = 57.89
\]

**Partial Equilibrium Models: Ad-valorem Tax**

The payroll tax, which pays for Social Security and Medicare, is an ad-valorem tax on a factor of production – labor. Statutory incidence is split evenly with a total of 15.3%. The statutory distinction is irrelevant – the incidence is determined by the underlying elasticities of supply and demand. Figure 12.8 shows the likely outcome on wages.

We can also loosen the assumption of perfect competition. Figure 12.9 shows a monopolist before a per-unit tax is imposed.

After a per-unit tax is imposed in Figure 12.10, the “effective” demand curve shifts down, as does the “effective” marginal revenue curve. Monopolists’ profits fall after the tax, even though it has market power.

**Partial Equilibrium Models: Profits taxes**

Firms can be taxed on economic profits, defined as the return to the owners of the firm in excess of the opportunity costs of the factors used in production. For profit-maximizing firms, proportional profit taxes cannot be shifted. Intuition: the same price-quantity combination that initially maximized profits initially still does. Output does not change.

**Partial Equilibrium Models: Capitalization**

Special issues arise when lands is taxed.

- Fixed supply, immobile, durable
- Assume annual rental rate is \(S_R t\) at time \(t\).
- If market for land is competitive, its value is simply equal to the present discounted value of rental payments:

\[
P_L = \frac{S_R}{(1 + r)} + \frac{S_R}{(1 + r)^2} + \cdots = \frac{S_R}{(1 + r)^n}
\]

Assume a tax of \(S_t\) is then imposed in each period \(t\). The returns on owning land therefore fall, and purchasers take this into account. Thus, the price falls to:

\[
P'_L = S_L (R_0 - u_t) + \frac{(S_R - u_t)}{1 + r} + \frac{(S_R - u_t)}{(1 + r)^2} + \cdots = \frac{(S_R - u_t)}{1 + r} + \frac{(S_R - u_t)}{(1 + r)^2} + \cdots
\]

The difference in these prices is simply the present discounted value of tax payments:

\[
P_L - P'_L = S_L u_t + \frac{u_1}{1 + r} + \frac{u_2}{(1 + r)^2} + \cdots = \frac{u_t}{1 + r} + \frac{u_t}{(1 + r)^2} + \cdots
\]

At the time the tax is imposed (not collected), the price of the land falls by the present value of all future tax payments, a process known as capitalization. The person who bears the full burden of the tax forever is the landlord at the time the tax is levied. Future landlords write the checks to the tax authority, but these payments are not a “burden” because they paid a lower price for the land from the current landlord. Also works the other way, when a new benefit is announced (e.g., better schools).

**General Equilibrium Models**

Looking at one particular market may be insufficient when a sector is large enough relative to the economy as a whole. General equilibrium analysis takes into account the ways in which various markets are interrelated. Accounts for both inputs and output, and related commodities

In a GE model, usually assume:

- Two commodities (\(F=food, M=manufactures\))
- Two factors of production (\(L=labor, K=capital\))
- No savings

**General Equilibrium Models: Tax Equivalence**

Nine possible ad-valorem taxes in such a model:

Four partial factor taxes

- \(t_FK\) = tax on capital used in production of food
- \(t_FM\) = tax on capital used in production of manufacturers
- \(t_LF\) = tax on labor used in production of food
- \(t_LM\) = tax on labor used in production of manufacturers

Five other possible ad-valorem taxes:
Two consumption taxes (on food and manufacturers)
- \( t_F \)= tax on consumption of food
- \( t_M \)= tax on consumption of manufacturers

Two factor taxes
- \( t_K \)= tax on capital in both sectors
- \( t_L \)= tax on labor in both sectors

Income tax

Certain combinations of these nine taxes are equivalent to others.
- Equal consumption taxes equivalent to an income tax.
- Equal factor taxes equivalent to an income tax.
- Equal partial factor taxes equivalent to a consumption tax on that commodity.

Apply GE models to tax incidence. Principal assumptions include:
1. Technology: Constant returns to scale, production may differ with respect to elasticity of substitution (either capital intensive or labor intensive)
2. Behavior of factor suppliers: Labor and capital perfectly mobile (net return equalized across sectors)
3. Market structure: Perfectly competitive
4. Total factor supplies: Fixed (but mobile across sector)
5. Consumer preferences: Identical
6. Tax incidence framework: Differential tax incidence

Commodity tax: A tax on food leads to:
- Relative price of food increasing
- Consumers substitute away from food and toward manufacturers
- Less food produced, more manufactured goods produced
- As food production falls, labor and capital relocate toward manufacturing
- Because labor-capital ratios differ across sectors, relative prices of inputs have to change for manufacturing to be willing to absorb unemployed factors.

General Equilibrium Models : Harberger Model

Commodity tax: A tax on food leads to ... 
- If food production is relatively capital intensive, relatively large amounts of capital must be absorbed by manufacturing.
- Relative price of capital falls (including capital already used in manufacturing)
- All capital is relatively worse off, not just capital used in the food sector.
- In general, tax on the output of a particular sector induces a decline in the relative price of the input that is used intensively in that sector.

Conclusion : food tax tends to hurt people who receive a relatively large proportion of income from capital. Would also hurt those who consume a large proportion of food (if dropped identical preferences).

1. Income tax: Since it is equivalent to set of taxes on labor and capital at same rate, and factors are fixed, income tax cannot be shifted.
2. Labor tax: No incentive to switch use between sectors, labor bears full burden.
3. Partial factor tax: Two initial effects --
   - Output effect
   - Factor substitution effect

Figure 12.11

At each consumption level of barley, the vertical distance between AD and AF shows tax payments in terms of forgone corn. Normalize \( P_c = 5 \), so that vertical distance can be measured in either quantity of corn or dollars. Figure 13.2 shows new optimizing choice with the higher prices along budget constraint AF. Utility maximized at bundle \( E_2 \). Vertical distance between old and new budget constraints is \( GE_2 \), the “tax bill.” Any tax will lower utility, but is there an alternative tax that raises the same revenue, \( GE_2 \), but entails a smaller utility loss? Or greater revenue with the same utility loss? If so, the tax on barley leads to excess burden.

Equivalent variation is the amount of income we would have to take away (before any tax was imposed) to induce a move to the lower indifference curve. Taking away income is equivalent to a parallel movement inward on the budget constraint. Budget constraint HIm Figure 13.3 shows this.
Note that ME3=GN>GE2, but both give the consumer the same utility. Thus, the difference E2Ni is the excess burden of the barley tax. The barley tax makes the person worse off by an amount that exceeds the revenue it generates.

Lump sum tax is a tax that must be paid regardless of the taxpayer’s behavior. Budget constraint Hsatisfies this. Revenue yield exactly equals the equivalent variation. Conclusion: Lump sum tax has no excess burden.

Questions and Answers

Why aren’t lump sum taxes widely used?
- Construed as unfair because people’s abilities to pay vary

How do lump sum taxes relate to welfare economics?
- The equilibrium conditions become:

\[ MRS_{bc} = \frac{(1 + t_b)P_b}{P_c} > MRT_{bc} = \frac{P_b}{P_c} \]

Intuitively, when \( MRS > MRT \) the marginal utility of substituting barley consumption for corn consumption exceeds the change in production costs from doing so. In the presence of the tax, there is no financial incentive to do so.

Does an income tax entail excess burden?
- It usually does entail excess burden, if a third commodity, leisure, exists.

If demand for a commodity is perfectly inelastic, is there excess burden?
- Yes, see Figure 13.4.

In Figure 13.4, the ordinary (uncompensated) demand curve is inelastic – B1=B2 when the price increases. But this is because the income effect offsets the substitution effect. The substitution effect is the part necessary to compute excess burden. The compensated demand curve (which holds utility constant as prices change) is the relevant one, and the elasticity for it is non-zero.

Excess Burden Measurement with Demand Curves

Consider a compensated demand curve, such as the one in Figure 13.5. Impose an ad-valorem tax on barley, so that its price increases to \((1 + tb)P_0\). Equivalent to the supply curve shifting upward.

Excess burden equal to triangle fid. Through some mathematical manipulation, this can be expressed as:

\[ LB = \frac{1}{2} \rho (d_1 - d_2) \]

Implications of formula:
- Higher (compensated) elasticities lead to larger excess burden.
- Excess burden increases with the square of the tax rate.
- The greater the initial expenditure on the taxed commodity, the larger the excess burden.

Differential Taxation of Inputs

Some inputs are taxed differently depending on where they are used:
- Capital used in the corporate sector is subject to a higher tax rate than capital used in the noncorporate sector.
- Labor used in the household is untaxed

Figure 13.8 measures the efficiency cost

Differential Taxation of Inputs

In this figure, total amount of labor is fixed at OO’. Moving along the x-axis simply shifts labor from the labor market to the household sector. MPis the value of marginal product, or the dollar value of the additional input produced from an hour of work. VMPdeclines with hours worked in a sector. Optimal allocation of hours equates margins, such that OH* is spent in household production, and O’H* is spent in the market. If a tax is levied on market work, but not household production, then the “effective” VMP curve for market work rotates downward.

Figure 13.9 shows the effects.
CHAPTER 14
EFFICIENT AND EQUITABLE TAXATION

Optimal Commodity Taxation
Assume that the goal is to finance expenditures with a minimum of excess burden. Assume lump sum taxes are infeasible. Three commodities:
– Good X, Y, and leisure
– Prices PX, PY, and w.

Time endowment is fixed at T. The full budget constraint can be written as:
\[ wT = P_X X + P_Y Y + wL \]

Optimal Commodity Taxation: Case 1 – All Goods Can Be Taxed
If all commodities can be taxed, imposing equal ad-valorem tax rates yields:
\[ \frac{wT}{(1 + t)} = P_X X + P_Y Y + wL \]

In this case, the inability to impose a lump sum tax is irrelevant. The government can effectively take away a lump sum amount through equal taxes on all commodities (including leisure). No excess burden.

Optimal Commodity Taxation: Case 2 – Not All Goods Can Be Taxed
May be impossible to tax nonmarket work. Assume only taxes can be applied to goods X and Y. In general, some excess burden is inevitable. Key question is how to select rates on X and Y to minimize excess burden subject to the revenue constraint.

Optimal Commodity Taxation: Ramsey Rule
Consider the idea of marginal excess burden. The additional inefficiency from incrementally raising a tax by a small amount. Figure 14.1 shows the initial excess burden as a triangle (abc) and the marginal excess burden as a trapezoid (fbae).

The marginal excess burden of taxing good X is approximately: \( \Delta X \). The marginal tax revenue raised is approximately: \( X_1 \). Therefore the marginal excess burden per dollar of tax revenue is:
\[ \frac{\Delta X}{X_1} \]

Similar reasoning is used for good Y. Optimization therefore leads to:
\[ \frac{\Delta Y}{X_1} = \frac{\Delta Y}{Y_1} \]

Ramsey Rule says that to minimize total excess burden, tax rates should be set so the percentage reduction in the quantity of each good demanded is the same. Recall the formula for excess burden for good X:
\[ EB_X = \frac{1}{2} \left| \eta P_X X_1^2 \right| \]

Planter’s optimization problem is to minimize total excess burden by choosing taxes on goods X and Y, subject to a revenue constraint.

Optimal Commodity Taxation: Ramsey Rule Reinterpreted
Setting up the LaGrangian:
\[ \min L = \frac{1}{2} \left| \eta P_X X_1^2 + \frac{1}{2} \left| \eta P_Y Y_1^2 + \lambda (R - P_X X_1 - P_Y Y_1) \right| \]

Solving leads to a relationship between tax rates and elasticities:
\[ \frac{\eta_X}{\eta_Y} \]

Or rearranging, we have the inverse elasticity rule:
\[ \frac{\eta_X}{\eta_Y} = \frac{P_X}{P_Y} \]

Implication of the Inverse Elasticity Rule: As long as goods are unrelated in consumption (neither complements nor substitutes), tax rates should be inversely proportional to elasticities. When good Y is relatively inelastic, tax it more.

Optimal Commodity Taxation: Equity Considerations
Is it “fair” to tax inelastic goods like food and medicine? Clearly, it is not. Another criterion for a tax system is vertical equity: It should distribute burdens fairly across people with different abilities to pay. Ramsey Rule has been modified to account for the distributional issues. Degree of departure from original rule depends on:
– How much society cares about equity
– Extent to which consumption patterns of rich and poor differ

Optimal User Fees
If government produces a good or service, must directly choose a user fee.
– A user fees price paid by users of the good or service to the government.
– For example, natural monopoly.

Consider the natural monopoly in Figure 14.2.
– Continually decreasing average costs
– Marginal cost lies everywhere below average cost

Figure 14.2
A private firm would set MR=MC, and choose Zm. This output level leads to inefficiency. See Figure 14.3
Efficiency would require \( P = MC \), or output at \( Z^* \). Key problem is that at this quantity, price is less than average cost, so the operation suffers losses.

Policy solutions:
- Average cost pricing: Zero profits, but \( Z_A < Z^* \).
- Marginal cost pricing with Lump Sum Taxes: Set \( P = MC \), provide \( Z^* \) at a loss, and finance it with a lump sum tax. Assumes such a tax is available. Equity considerations—who uses the good?

Second principle is called the benefits-received principle—consumers of a publicly provided service pay for it.

A Ramsey Solution
If government is running several enterprises, choose markup over marginal costs subject to a breakeven constraint.

Optimal Income Taxation
Edgeworth’s model implies a radically progressive tax structure: marginal tax rates on high income individuals are 100%. Key problem is work disincentives.

Optimal Income Taxation: Modern Studies
Account for work disincentives. Tax schedule is characterized by:

\[
\text{revenue} = -\alpha + t \times \text{Income}
\]

Figure 14.4 shows this equation.

This schedule is referred to as a linear income tax schedule (or a flat income tax). Higher values of \( t \) mean more progressive tax but larger excess burdens. Optimal income tax finds right combination of \( \alpha \) and \( t \). Typical findings of optimal income tax problems: Allowing for modest amount of substitution between leisure and income leads to income tax rates considerably less than 100%.

Other Criteria for Tax Design
Horizontal equity: People in equal positions should be treated equally. Measures represent outcomes of people’s decisions, so it is difficult to figure out whether they were initially in equal position.

Costs of running a tax system
- Tax evasion
- Tax avoidance

Tax Evasion
Tax evasion is failing to pay legally due taxes. Tax cheating difficult to measure and probably manifests itself in a number of ways:
- Keeping two sets of books
- Moonlighting for cash

Suppose person cares only about maximizing expected income. Goal is to choose \( R \), the amount that is hidden from authorities. Marginal benefit of hiding income is the tax rate. Assume authorities randomly audit with probability, \( p \), and increasing penalty for greater amounts hidden. Figure 14.5 shows that optimal underreporting occurs when the expected marginal benefit from doing so exceeds the marginal cost. Implications: Cheating increases with tax rates and decreases with enforcement.

(Continued...)

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**CHAPTER 15**

THE PERSONAL INCOME TAX

Basic Structure
Figure 15.1 shows the series of steps used to compute a person’s tax liability.
- Step 1: Compute Adjusted Gross Income (AGI).
- Step 2: Convert AGI into taxable income by subtracting exemptions and deductions.
- Step 3: Compute tax due by applying a rate schedule and subtracting tax credits.

Later in this lesson, will discuss extensively the “real-life” aspects of the U.S. tax code. Before doing that, useful to think about what the tax code “should” look like.
Defining Income
Which forms of income could be taxed?
−Wages and salaries, rents, dividends, and so on...

Haig-Simons definition of income: Income is the money value of the net increase in an individual's power to consume during a period.

H-S criterion:
−Includes net additions to wealth
−All sources of potential increases in consumption (regardless of whether consumption took place)
−Subtracts losses

Defining Income: Items Included in H-S Income
H-S definition encompasses:
−Items ordinarily thought of as income include wages, salaries, business profits, rents, royalties, dividends, and interest
−Employer pension contributions and insurance premiums
−Transfer payments like Social Security, Unemployment
−Insurances, and Welfare
−Capital Gains (whether they are realized or unrealized)
−Imputed rental income from durable goods

Defining Income: Problems
Business expenses are often difficult to parse out into "consumption" and "costs of obtaining income." Unrealized capital gains and losses difficult to measure. Imputed rental income from durable goods difficult to value.

Defining Income: Evaluating the H-SCriterion
Clearly, arbitrary decisions need to be made on how to define income from a practical point of view.

H-S criterion appeals to:
−Horizontal equity—people with equal incomes should pay equal taxes
−Neutrality—it treats all forms of income the same and does not distort economic activity.

Excludable Forms of Income: Interest on State and Local Bonds
Interest earned on bond issued by state or locality is untaxed (while interest earned on the bond of a private company is taxed). Investors are therefore willing to accept a lower before-tax rate of return on these bonds. For example, if the return in the private market is r, then investors will purchase state bonds as long as the return is higher than (1-t)r, where t is the marginal tax rate on investment income. The state saves money (by paying a lower interest rate), while the federal government loses (by collecting less tax revenue). It is not usually the case that the states' gains exactly offset the federal government's losses—it will usually be the case that the federal government's loss is greater.

Illustration:
Suppose the private market return is r=20%
Progressive tax system
1. Low income: t=0%
2. Moderate income: t=15%
3. High income: t=28%

With this information, the return necessary to induce a person to invest in the state bond is:
−(1-Low) = 20% for low income group
−(1-MOD) = 17% for moderate income group
−(1-HIG) = 14.4% for high income group

Thus, people in higher tax brackets are more likely to benefit from buying state bonds.

Illustration: Equal gains and losses
−If the state government needs to raise $100,000, what rate of return should it offer? It should offer a return r=14.4%, because it can induce the high income people to supply enough capital.

−How much does the state government save? Instead of paying r=20% on $100,000, it instead pays r=14.4%, saving 5.6%*$100,000 or $5,600.

−How much does the federal government lose? The federal government would have collected taxes on interest of $20,000 (20%*$100,000). It therefore loses $28,800-$5,600=$23,200.

Illustration: Unequal gains and losses
−If the state government needs to raise $325,000, what rate of return should it offer? It should raise the return to r=17%, because it must also induce the moderate income group to provide capital. The high income group (which provides $250,000 of capital) receives some economic rents because it would have provided the capital for r=14.4%.

−How much does the state government save? Instead of paying r=20% on $100,000, it instead pays r=17%, saving 3%*$325,000 or $9,750.

−How much does the federal government lose?
Once AGI is determined, subtract certain exemptions and deductions to arrive at taxable income.

Exemptions
Family allowed an exemption for each member. Exemption in 2003 was $3,050 per family member, so a husband and wife with three dependent children could claim five exemptions and subtract $15,250 from AGI. Exemptions phased out for households with high AGIs.

Why have exemptions?
–Adjust ability to pay in the presence of children. Relative to deductions, not much room for affecting the exemptions claimed.

Deductions
The other subtraction from AGI is a deduction. There are two types:
–Standard deduction—a fixed amount that requires no documentation
–Itemized deduction—subtractions for specific items cited in the law, must list each item separately, and be able to prove the expenditures were made

Taxpayers would choose whichever one minimized their tax liabilities. Standard deduction in 2003 was $4,750 for single individuals and $7,950 for joint filers. Around 67% of tax returns take the standard deduction. As long as a household is itemizing, deductibility changes relative prices. If the price of Z is P2 and the household’s marginal tax rate is t, then the “effective price” is lowered from P2 to P2(1-tp). This would likely affect the quantity demanded. The higher the rate tax, the lower the effective price.

Deductions: Some Specific Items
Unreimbursed medical expenses that exceed 7.5% of AGI
–Only medical expenses above the threshold are deductible.
–creates incentives to “stack” medical procedures in one calendar year and potentially time these procedures for years when AGI is low.

State and local income and property taxes
–In 2000, these deductions amounted to $290 billion.
–Sales taxes are not deductible.
–For those who itemize, lowers the effective costs of paying these taxes.

Certain interest expenses
–Interest on home mortgages
1. Conventional mortgages
2. Home equity loans
3. Lowers the effective price of home ownership

–Student loans
–Not interest paid on consumer debt like credit cards

Charitable contributions
Charitable deductions cannot exceed 50% of AGI. In 2000, $134 billion in deductions for charitable contributions. Tax deductibility lowers the effective “price” of giving. Elasticity estimates around 0.5, which mean that lowering the effective price from $1 to $0.7 increases giving by 15%

Credits
A tax credit is a subtraction from tax liability (not taxable income). Unlike deductions, the value of the credit is independent of the tax rate. Number of credits in the tax system, including the “kiddie tax credit”, which is $1,000 per child, and credits for college expenses.

Tax expenditures
Tax expenditures are the revenues forgone due to preferential tax treatment. The revenue loss for 2004 will exceed $600 billion.

Rate Structure
The taxable income scale is divided into segments, and the law specifies the marginal tax rate that applies to income from each segment.

Four different schedules
–Single
–Married, filing jointly
–Married, filing separately
–Heads of household

–In 1913, bracket rates ranged between 1%-7%
–In 1945, rates ranges between 23%-94%
–In mid-1980s, rates ranges between 11%-50%, with 14 brackets
–1986: Two brackets, 15% and 28%
–Rates crept up in 1990s:
–Trend was reversed in 2001

Table 15.1 shows the official statutory tax rate schedule for 2003. Rates vary between 10% and 38.6%.

Table 15.2: Alternative Minimum Tax Income

<table>
<thead>
<tr>
<th>Individual Income</th>
<th>Individual Tax</th>
<th>Taxable Income</th>
<th>Marginal Tax Rate</th>
</tr>
</thead>
<tbody>
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<td>Individual Income</td>
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<td>Marginal Tax Rate</td>
</tr>
<tr>
<td>$1,000</td>
<td>$800</td>
<td>$2,800</td>
<td>33.3%</td>
</tr>
<tr>
<td>$8,000</td>
<td>$6,400</td>
<td>$28,000</td>
<td>23.8%</td>
</tr>
<tr>
<td>$60,000</td>
<td>$48,000</td>
<td>$160,000</td>
<td>28.2%</td>
</tr>
<tr>
<td>$70,000</td>
<td>$56,000</td>
<td>$170,000</td>
<td>35.1%</td>
</tr>
<tr>
<td>$100,000</td>
<td>$80,000</td>
<td>$200,000</td>
<td>35.6%</td>
</tr>
</tbody>
</table>

Official statutory marginal tax rates may not correspond well to actual marginal tax rates because of various deductions and credits. Figure 15.2

Alternative Minimum Tax
Because of various deductions and tax treatment of certain forms of income, it is possible that some high-income households have little or no tax liability. In 1969, Secretary of Treasury announced that 155 individuals with incomes above $200,000 had no federal income tax liability. The alternative minimum tax (AMT) was then enacted and is an attempt to ensure that rich people who benefited from various tax shelters paid at least some tax. AMT is essentially a shadow tax system, with its own rules for computing the tax base and rate schedule.

Step 1: Add taxable income and AMT preferences
–Personal exemptions, standard deduction, and itemized deductions for state income taxes

Step 2: Subtract AMT exemption
–Currently $49,000 for married couples and $35,750 for single individuals

Step 3: Compute Alternative Minimum Tax Income (AMTI)
–Tax rate is 26% on first $175,000
–Tax rate is 28% on remaining
–Neither exemption nor brackets indexed for inflation

Tax liability is the tentative AMT. If this is greater than the regular income tax liability, difference between them is the AMT, which must be added on top of the regular income tax. Initially targeted to catch high-income people. Under current law, however, by 2010 about 35 million taxpayers will be on the AMT. Anything that tends to reduce the tax liability under the regular tax relative to the AMT tends to increase the number of AMT taxpayers. 2001 tax reform reduced tax rates in regular income tax code but not AMT.

AMT policy of concern because:
–Will target those with moderate incomes
–Higher tax rates lead to efficiency losses
–Complicated

U.S. tax code, along its current path, is headed for some serious problems.

Choice of Unit and the Marriage Tax
Suppose that the following three characteristics of a tax system are considered desirable:
–Progressivity
–Families with equal incomes should pay equal taxes
–Marriage neutrality

No tax system can adhere to all three of these simultaneously.

Consider Table 15.2

Table 15.2: Tax liabilities under a hypothetical tax system

<table>
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<td>$80,000</td>
<td>$200,000</td>
<td>35.6%</td>
</tr>
</tbody>
</table>

In this example, the tax rate is 10% for income up to $6,000 and 50% thereafter. Families with equal total incomes pay unequal taxes.
CHAPTER 16
PERSONAL TAXATION AND BEHAVIOUR

A key policy question is how do households respond to the incentives presented in the U.S. tax code?

We will examine:
-- Labor supply
-- Saving
-- Housing
-- Portfolio Composition

Labor Supply: Theoretical Considerations

Recall, from previous discussions of the welfare system, that a labor supply problem has the following elements:

-- Time Endowment (T)
-- Budget constraint, with a price of leisure of $w
-- Preferences

Figure 16.1 shows a typical labor supply framework. Person chooses \( F_T \) of work in this example and attains utility on indifference curve \( ii \).

How do taxes affect the work decision? In Figure 16.2, tax reduces wage rate from \( w \) to \( (1-t)w \), because person only cares about part of wage he gets to keep. Tax reduces the opportunity cost of another hour of leisure. Budget constraint rotates from \( T_D \) to \( TH \).

Based on the specific indifference curves in Figure 16.2, we can conclude the following:
-- The person is worse off ather the tax, that is, utility is lower
-- In this case, the person reduces hours of work from \( F_T \) to \( J_T \).

Is it always the case that the person will reduce hours of work when a tax is imposed (or increased)? No. Figure 16.3 shows a case where hours of work increases from \( F_T \) to \( J_T \) (and the person is still worse off relative to no taxes).

Increasing (or decreasing) taxes changes the ather-tax wage rate. Changing the wage rate has two effects:

1. Substitution effect–leisure is relatively less costly ather the effective wage is cut, so a person substitutes toward leisure and away from work (↑ leisure).
2. Income effect–The person feels poorer ather the effective wage cut and, if leisure is a normal good, the person consumes less of it (↓ leisure).

Progressive taxes

Consider three tax rates
-- \( t_1 \) for income under \( L \)
-- \( t_2 \) for income between \( L \) and \( M \)
-- \( t_3 \) for income greater than \( M \)

The effective wage rate (and the slope of the budget constraint) changes as hours of work increase.

Figure 16.4 depicts this situation. Budget constraint is now \( TLMN \). In this figure, person maximizes utility at \( E_4 \). One common theoretical prediction that arises from kinked budget constraints is that many people should locate at the kink points.

Labor Supply: Empirical Findings

Theory suggests labor supply should depend on:
-- Ather-tax wage
-- Preferences (factors like age, gender, marital status, and children)

Econometricians have estimated regression equations relating hours of work to these variables. For "prime-age" males (ages 20 to 60), effect of changes in the net wage on hours of work is small. Elasticity of 0.05, meaning that a 10% increase in the wage increase hours of work by 0.5%. Elasticities for women vary widely, but married women seem quite sensitive to changes in the net wage.

Labor Supply: Some Caveats

Demand-side considerations.
-- Large influx of workers could lower equilibrium wage or change consumption patterns.
Individual versus group effects
– Effects of tax policy could have ambiguous effects; some may increase work, and others may decrease work.

Other dimensions of labor supply
– Hours of work the usual metric
– Human capital investment

Proportional income tax could lead to no change in investment because both the benefits (increased wages) and costs (forgone current earnings) are taxed.

Compensation package
– Fringe benefits not taxed

Expenditure side
– How tax revenue is spent (e.g., national parks versus child care facilities) could affect work effort

Labor Supply: Labor Supply and Tax Revenues
How do tax collections vary with the tax rate? Consider the supply curve, SL, in Figure 16.5. Shows optimal work effort for each ather-tax wage—in this case, the substitution effect dominates.

Figure 16.5  
Labor Supply: Labor Supply and Tax Revenues
At wage w, work L0, and no tax revenue is collected. At wage (1-t1)w, work L1, and collect t1L1in tax revenue. At wage (1-t2)w, work L2, and collect t2L2in tax revenue. As tax rate gets very high, total tax revenue will eventually fall (to zero). Figure 16.6 maps out the relationship between tax rates and tax revenue. The contentions that tax rates exceeded tAwere popularly known as being on the wrong side of the Laffer curve and were an important tenet in supply-side economics.

Figure 16.6  
Several points deserve mention:
Shape of Laffer curve depends on elasticity of hours with respect to ather-tax wage. Although not likely in practice, Figure 16.6 suggests lower tax rates can lead to higher collections. Empirical question, Not only hours of work, but taxable income

Saving
Life-cycle model says that individuals’ consumption and saving decisions during a year are the result of a process that considers their lifetime economic circumstances.

Consider a model with the following features:
– Two income flows (I0 and I1).
– Earnings and pension income
– Preferences over consumption (C0 and C1)

Consumption in present and future

Figure 16.7 incorporates this detail into an intertemporal budget constraint. Endowment points the point where person’s per-period consumption matches their per-period income. With perfect capital markets, can save or borrow at interest rate r.Gives budget constraint MN.

Figure 16.7  
How would taxes affect saving?
We consider two cases:
1. Case I: Interest earnings are taxable, and interest payments are deductible
2. Case II: Interest earnings are taxable, and interest payments are not deductible

Case I: Interest earnings are taxable, and interest payments are deductible
With a proportional tax t, the rate of return falls from r to (1-t)r. With any change in r, can always consume endowment point (I0, I1). Budget constraint rotates around this point, with the absolute value of the slope decreasing. In Figure 16.8, new budget constraint is PQ. As illustrated, cannot choose point E3, but instead choose point E1. In this example, saving decreases.
Muhammad Firman  (University of Indonesia - Accounting )

This is not the only possibility, however. In Figure 16.10, new budget constraint is still PQ. In this case, saving increases. Ambiguity arises because, on the one hand, taxing interest reduces the opportunity cost of present consumption (substitution effect). On the other hand, taxing interest makes it more difficult to achieve any future consumption goal (income effect).

Figure 16.10

Case III: Interest earnings are taxable, and interest payments are not deductible
– Can still consume endowment point (I0, I1).
– Saving is still penalized (as in the previous two figures), but borrowing is not rewarded.
– Kinked budget constraint PAM.

Figure 16.11

Housing Decisions
Tax code favors housing consumption in several ways. Suppose a homeowner decides to rent out his house:

– Receives net rental payments of R (net of operating expenses)
– Mortgage interest payments MI (business expense)
– House may increase in value ΔV

Net income as a landlord is therefore:

\[ \text{Net Income} = R - MI + ΔV \]

An owner-occupier receives an imputed rent R (the benefit of living in the house), still pays maintenance expenses and mortgage interest, and receives capital gains. Thus, the owner-occupier receives the same income flow as the landlord and, under the Haig-Simons principle, should pay the same tax. Under U.S. tax law, the implicit rent R is untaxed for homeowners, and the capital gain ΔV is usually untaxed, too. Implicit subsidy increases demand for housing, with elasticities around -1.0.

Portfolio Composition
Taxes not only affect the decision to save, but asset allocation. Do high taxes discourage investors from taking risks? Why take a chance on a risky investment if your gains are going to be grabbed by the tax collector?

Tobin (1958) models individuals as making investments based on two characteristics:
– Expected return
– Risk

Investors like higher returns and lower risk.

Two assets:
– One is perfectly safe, but zero rate of return.
– Other is risky, on average has positive return.

– Can hold any combination of two assets.

Levy a proportional tax, and assume full loss offset—individuals can deduct all losses from taxable income. Risky investment now has a lower return (makes asset less attractive), but also less risk (makes asset more attractive). Result is therefore ambiguous.

CHAPTER 17

THE CORPORATION TAX

Introduction
A corporation is a form of business organization in which ownership is usually represented by transferable stock certificates.
– Stockholders have limited liability
– Corporations are independent legal entities.

Corporation tax is simply a user fee.

Why Tax Corporations?
Only real people can pay a tax, so why not just tax incomes of corporation owners via the personal income tax?
1. Justification #1: Corporations are distinct entities, and ownership and control are separated.
2. Justification #2: Corporations receive a number of special privileges, such as limited liability. Corporation tax is simply a user fee.
3. Justification #3: Corporation tax protects the integrity of the personal income tax. Cannot simply accumulate income within the corporation to defer tax payments.

Structure
Tax system can safely be presented as a flat rate of 35%. Statutory rate gives relatively little information about the effective burden, because we must know what deductions are allowed.

Structure: Deductions
– Employee compensation
– Interest payments, not dividends
– Depreciation
– No Investment Tax Credit
– Treatment of Dividends versus Retained Earnings

Employee compensation
Wages and benefits are excluded from taxable income.

Interest payments, not dividends
When corporations borrow, interest payments to lenders are excluded from taxable income. When corporations finance activities by issuing stock, dividends are not deductable.

How should durable goods be treated in determining taxable income?
Buying a drill press (that lasts for 10 years) is initially just an exchange of assets, not an economic cost. As it is used, it is subject to wear and tear, which decreases its value. This decrease in value, called economic depreciation, is an economic cost to the firm. Each year’s worth of depreciation should be deductible from that year’s gross income. Difficult to measure true depreciation, or even the useful life of durable goods. Instead, the tax law specifies a tax life. For each asset, what proportion of

Masterbook of Business and Industry (MBI)
its acquisition value can be depreciated each year, and over how many years. To calculate the value of the depreciation allowances in the tax code, compute the present value of the stream of depreciation allowances. Generally, the present value of these allowances for a $1 asset would be:

$$\psi = \theta \times \frac{D(L)}{(1+r)} + \theta \times \frac{D(T)}{(1+r)^2} + \ldots = \theta \times \frac{D(T)}{(1+r)^2}$$

Thus, the presence of depreciation allowances lowers the effective price of acquiring durable assets from $S_0$ to $S(1-\psi)$. Tax savings depend on value of Tand the function D(n). Tax benefits are more valuable the lower the T is and the more front-loaded that D(n) is. Accelerated depreciation scheme to write off assets faster than true economic depreciation. Expensing allows a firm to deduct from current taxable income the asset's full cost at the time of acquisition.

Under current law, T varies from 3 to 39 years.
- Racehorses are depreciated over 3 years
- Computers are depreciated over 5 years
- Nonresidential structures are depreciated over 31.5 years

Generally, tax laws are shorter than actual useful lives.

Intangible assets
Some spending, such as an advertising campaign, may increase sales over a number of years. Computed appropriate depreciation is difficult.

No Investment Tax Credit (ITC)
Prior to 1986, ITC permitted a firm to subtract some portion of the purchase price of an asset from its tax liability at the time the asset was acquired. ITC did not depend on corporate tax rate and was unrelated to depreciation allowances. Subtracted directly from tax liability, not taxable income.

Discussion so far has focused on taxed directly paid by corporation. Another issue is the total tax rate on income generated by corporations. Corporate profits may either be retained by the firm (retained earnings) or paid to stockholders (dividends). Dividends not deductible expense from corporations viewpoint and taxed in the personal income tax code, too. Recent legislation has moved toward eliminating this double taxation of dividends. Maximum tax rate on dividends received is now 35% at the individual level.

Retained earnings increase the value of the corporation, and this increase should be valued into the stock price. These increased capital gains are not taxed until those gains are realized. Thus, tax system creates incentives for firms to retain earnings rather than pay them out in dividends.

Incidence and Excess Burden
Economic consequences of the corporation tax are very controversial. Not a consensus on just what kind of tax it is.

- Tax on Corporate Capital
- Tax on Economic Profits

Incidence and Excess Burden: Tax on Corporate Capital
Firm is not allowed to deduct from taxable income the opportunity cost of capital supplied to shareholders. Therefore, the corporation tax is a partial factor tax. Tax leads to migration of capital from the corporate sector until the after-tax rates of return are equalized. As capital moves to the non-corporate sector, the rate of return on capital to all owners of capital is depressed. Reallocation also affects return to labor. Ultimate incidence depends on production technology and structure of consumers' demands.

Incidence and Excess Burden: Tax on Economic Profits
Alternative view is that corporation tax is tax on economic profits.

Tax base = gross corporate income – costs
Incidence of profits tax is straightforward, no shifting of tax. Tax is borne by owners of firm, no misallocation of resources.

Problems:
Base of pure profits tax is computed by subtracting from gross earnings the value of all inputs, including the opportunity cost of the inputs supplied by the owners. Not the case here. Under certain circumstances, corporate tax is equivalent to profits tax (when corporation can deduct interest payments to creditors).

Effects on Behavior
1. Total Physical Investment
2. Types of Asset
3. Corporate Finance

Effects on Behavior: Total Physical Investment
Total Physical Investment
Do features like accelerated depreciation and the investment tax credit stimulate investment demand?

Will discuss three types of models:
1. Accelerator model
2. Neoclassical model
3. Cash flow model

Accelerator model
Main determinant of the amount of investment is changes in the level of output demanded. Depreciation allowances and investment tax credits basically irrelevant.

Neoclassical model
Key variable is user cost of capital—the cost the firm incurs as a consequence of owning an asset. Includes direct costs like depreciation and taxes. Includes opportunity costs of forgone other investments. An investment will only be undertaken if its return exceeds the user cost of capital.

Define:
$$r = return \ in \ capital \ market$$
$$\delta = depreciation$$
$$\theta = corporate \ tax \ rate$$
$$t = personal \ tax \ rate$$

The user cost of capital is then defined as:

$$C = \frac{(r + \delta)}{(1-t)}$$

Thus, a company would only undertake a project if the return where greater than C. Previous equation did not account for depreciation allowances ($\psi$) or investment tax credits (k). User cost of capital becomes:

By taxing corporate income, tax makes capital investment more expensive, but depreciation allowances and ITCs lower the user cost. How do user costs affect investment? If the neoclassical model is correct, investment does respond to depreciation allowances and ITCs. Econometrically, role of policy expectations in the investment process is critical. Current investment depends on future values of the user cost of capital. Elasticity around 0.4 seems reasonable.

Cash Flow Model
Cash flows the difference between revenues and expenditures for inputs. The more money on hand, the greater the capacity for investment. In neoclassical model, internal funds and borrowed money had the same opportunity cost. In cash flow model, cost of internal funds is lower than external funds. For example, lenders may view a project as being more uncertain than the management.

Effects on Behavior: Types of Asset
Tax system encourages the purchase of certain types of assets, for example, those with generous depreciation allowances. Table 17.1 shows that the Tax Reform Act of 1986 reduced the gap between tax rates on equipment and structures.

Table 17.1 Effective marginal tax rates by asset type

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Before TRA 86</th>
<th>Current Law</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structures</td>
<td>14.7%</td>
<td>32.3%</td>
</tr>
<tr>
<td>32.3%</td>
<td>40.5%</td>
<td></td>
</tr>
</tbody>
</table>

Effects on Behavior: Corporate Finance
Owners must decide how to finance a firm’s operations and whether to distribute or retain profits.

Why do firms pay dividends?
If outcomes of all investments are known in advance and there are no taxes, then the owners of a firm are indifferent between a dollar of dividends or retained earnings. In reality, the tax system is not neutral—dividends are more highly taxed. Surprisingly, in a typical year, almost 79% of after-tax corporate profits are paid out as dividends.

Several explanations:
Signal of firm's financial strength. Marginal tax rates of investors vary—some firms “specialize” in attracting low marginal tax rate investors, known as the clientele effect. Several econometric studies have found that when the opportunity cost of retained earnings decreases, dividend payments go down. Thus, tax system increases amount of retained earnings. In raising money, firm can either borrow money and pay interest (interest debt), or it can issues shares of stock and pay dividends (issue equity), U.S. tax system allows deductibility of interest payments, but not dividend payments. Thus, built in bias toward debt financing. In one econometric study, Gordon and Lee (2001) find that lowering the corporate rate by 10 percentage points lowers the percentage of the firm’s assets financed by debt by 4 percent. Recent corporate scandals.
Number of firms, most notably Enron, used deceptive and fraudulent practices to inflate earnings and increase stock value. Is the tax system to blame? Dividend payments send a strong signal about the profitability of a firm. Tax code discourages firms from paying dividends.

State Corporation Taxes
Almost all states levy their own corporation income taxes. Differ substantially with respect to the rate structures and rules for defining taxable income. Variation leads to many questions: If a state levies a corporation tax, how much of the burden is exported to citizens of other states? In mobile firms more likely to bear incidence of tax if capital is more mobile than labor, incidence tends to fall on labor.

Taxation of Multinational Corporations
The value of assets invested in foreign countries by U.S. firms was $6 trillion in 2001. U.S. multinational corporations are allowed tax credits for taxes paid to foreign governments.

Complications arise due to:
Tax deferral using foreign subsidiaries. A foreign subsidiary is a company owned by a U.S. corporation, but incorporated abroad. Tax avoidance via transfer pricing. Price that one part of the company uses for transferring resources to another part of the company.

CHAPTER 18
DEFICIT TAX

How Big Is the Debt?
Definitions:
The deficit during a time period is the excess of spending over revenues.
The surplus during a time period is the excess of revenues over spending.

Some items are off-budget, like the revenues and expenditures associated with Social Security. Thus, one could modify the terms to:
On-budget deficit (surplus)
Off-budget deficit (surplus)

In 2002, the on-budget deficit was $317.5 billion, while the off-budget surplus was $159.6 billion. This gives a total deficit of $157.8 billion. Table 18.1 shows the total federal budget deficits (including off-budget items) for a number of years.

Both in absolute size
Relative to GDP

Table 18.1 Federal government deficits, 1970–2005

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Total Deficit or Surplus (in billions)</th>
<th>Total Deficit or Surplus as a percent of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>7.8</td>
<td>0.2%</td>
</tr>
<tr>
<td>1979</td>
<td>71.8</td>
<td>2.4%</td>
</tr>
<tr>
<td>1980</td>
<td>241.2</td>
<td>4.4%</td>
</tr>
<tr>
<td>1989</td>
<td>155.9</td>
<td>3.6%</td>
</tr>
<tr>
<td>1990</td>
<td>233.4</td>
<td>4.9%</td>
</tr>
<tr>
<td>2001</td>
<td>355.7</td>
<td>5.2%</td>
</tr>
<tr>
<td>2002</td>
<td>157.8</td>
<td>2.6%</td>
</tr>
<tr>
<td>2003</td>
<td>220.3</td>
<td>3.8%</td>
</tr>
</tbody>
</table>

Deficits have generally been the rule (although there was a surplus from 1998 to 2001). Deficit (as fraction of GDP) was highest in mid-1980s. The debt at a given time is the sum of all past budget deficits. Cumulative excess of past spending over past receipts. When there is a deficit, debt goes up; when there is a surplus, debt goes down. Debt is stock variable, while deficit and surplus are flow variables.

Federal debt at end of 2002 was: $3,500,000,000,000. That is, 3.5 trillion dollars.

Putting the debt in perspective
The $3.5 trillion debt was about 34% of GDP in 2002.
It has always been a large share of current GDP. See Table 18.2.

Table 18.2 Federal government debt held by the public, 1970–2005

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Debt Held by the Public (in billions)</th>
<th>Debt Held as a Percent of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>283</td>
<td>29.4%</td>
</tr>
<tr>
<td>1980</td>
<td>704</td>
<td>27.8%</td>
</tr>
<tr>
<td>1990</td>
<td>1,499</td>
<td>18.4%</td>
</tr>
<tr>
<td>2001</td>
<td>2,410</td>
<td>45.1%</td>
</tr>
<tr>
<td>2002</td>
<td>3,340</td>
<td>35.1%</td>
</tr>
<tr>
<td>2003</td>
<td>3,320</td>
<td>34.1%</td>
</tr>
</tbody>
</table>

Interpreting the Numbers

The numbers above are clearly politically important. A key problem is that the numbers above are probably not economically meaningful. Government Debt Held by the Federal Reserve Bank. FRB held $604 billion in government securities in 2002. This is counted as debt. State and Local Government Debt. State and local debt was $1.37 trillion in 1999.

Inflation
When prices change, so does the real value of the debt. In 2002, the debt was $3.5 trillion, and inflation was 1.4%. Thus, inflation reduced the real value of the federal debt by $49 billion ($3.5 trillion x 0.014). This should be considered a receipt, as a tax would. The measured total deficit would therefore fall from $158 billion to $109 billion, but government accounting rules do not allow the inclusion of gains due to inflationary erosion.

Capital versus current accounting
Current spending refers to expenditures that are consumed during the year. Capital spending refers to expenditures for durable items such as dams, radar stations, and aircraft carriers. $2.1 trillion stock of capital. All items are lumped together in budget. Standard accounting procedure for many businesses and state/local governments is to keep separate budgets. In absence of capital budgeting, some unusual government decisions, like selling government assets to the private sector and claiming deficit is falling.

Tangible Assets
Are omitted and paints a misleading picture of the government’s financial position. Government owns:
1. Residential and nonresidential buildings
2. Equipment
3. Gold
4. Mineral rights

Implicit obligations
Future Social Security and Medicare promises that must be paid out of future tax revenue. Social Security’s unfunded future liability is $9 trillion, and Medicare’s is $6 trillion, Federal pensions. These could potentially be reduced by legislative action in future (unlikely). Thus, the debt depends on which assets and liabilities are included in the calculation and how they are valued.

The Burden of Debt
Why should we care about whether the national debt is increasing or decreasing? Future generations have to retire the debt or refinance it. Theory of incidence tells us that statutory incidence may not match the economic incidence. Answer depends on assumptions about economic behavior.

Old school view
Internal debts when the government borrows from its own citizens. Lerner (1948) argues that internal debt creates no burden for the future generation. External debt is when the government borrows from abroad. In this case, future generations do bear a burden.

The Burden of Debt: OLG
More modern view. Overlapping generations model—several generations exist simultaneously. Used to show how burden of debt can be transferred across generations.

Three equal sized generations
Young, middle-aged, and old
Each person has fixed income of $12,000
20-year horizon

Table 18.3 Overlapping generations model

<table>
<thead>
<tr>
<th>The Period 2004–2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>(1) Income</td>
</tr>
<tr>
<td>(2) Government borrowing</td>
</tr>
<tr>
<td>(3) Government provided consumption</td>
</tr>
<tr>
<td>The Year 2024</td>
</tr>
<tr>
<td>Young</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>(4) Government rates taxes to pay back the debt</td>
</tr>
<tr>
<td>(5) Government pays back the debt</td>
</tr>
</tbody>
</table>

The Burden of Debt: OLG Example
Government borrows $12,000 to finance public consumption in 2004. Loan repaid in 2024—only young and middle-aged willing to lend to government because old will not be alive to get repaid. Half of lending done by young group, half by middle-aged group (row 2).
Each group benefits from the government consumption $4,000 (row 3). By 2024, the old have died, the middle-aged are now old, and the young are now middle-aged. There is also a new young generation. Government...
must raise $12,000 to pay off debt. Levy $4,000 tax per group (row 4). With these tax receipts in 2024, government pays off its debt-holders, the current middle-aged and old (line 5). Thus, we can now compute the incidence for different groups. In Table 18.3, if only in 2004 had lifetime consumption that was $4,000 higher than it otherwise would have. Middle-aged and young in 2004 are no better off (or worse off). Young in 2024 have a lifetime consumption that was $4,000 lower than it otherwise would have.

Implicitly, transfer from the young of 2024 to the old of 2004. Young in 2024 are at the short end of the transfer because they have to contribute to repaying a debt from which they never benefited. Even though all the debt was internal, it creates a burden for the future generation. Generational accounting is a framework for comparing the effects of fiscal policies across generations. Take representative person in each generation, compute present value of all taxes paid. Compute present value of transfers received from Social Security, Medicare, etc. Difference is the “net tax.”

**The Burden of Debt : Neoclassical Model**

Models so far do not allow for economic decisions to be affected by government debt policy. For example, policies neither affect work, saving, nor capital formation. Neoclassical models of the debt stresses that government borrowing crowds out investment in the private sector. As a consequence, debt finance leaves future generations with a smaller capital stock. Its members are therefore less productive and have smaller real incomes. Assumption that government borrowing reduces private investment is referred to as the crowding hypothesis.

**The Burden of Debt : Ricardian Model**

All of the previous discussion ignores individual’s intentional transfers across generations. Barro (1974) argued that when the government borrows, members of the “old” generation realize their heirs will be made worse off. If the “old” increase their bequests by the tax burden on the “young,” they can undo the government transfer. In Figure 18.3, the old generation of 2004 saves $4,000 to give to the young of 2024. The conclusion of this model is that tax and debt finance are essentially equivalent; form of government finance is irrelevant.

**To Tax or Borrow?**

Benefits-received principle states that the beneficiaries of a particular spending program should have to pay for it. Intergeneration equity states that, if younger generations will be richer because of technological progress, should transfer from them. Efficiency considerations states that the decision to tax or borrow should be based on excess burden calculations. Taxing versus borrowing is simply a question about the timing of taxes: one large payment (current tax) versus numerous smaller payments (borrowing). – Excess burden formula says that excess burden increases with the square of the tax rate, so many smaller tax payments are preferred.

**CHAPTER 19**

**TAXES ON CONSUMPTION AND WEALTH**

There is substantial dissatisfaction with the federal personal and corporate income tax systems. One possibility is to adopt a consumption tax, whose base is actual consumption. Another possibility is a tax on wealth, whose base is accumulated saving.

**Retail Sales Tax**

Several types of sales taxes levied on a wide variety of commodities: General sales tax impose the same tax rate on the purchase of all commodities. Selective sales taxes levied at different rates on the purchase of different commodities. Also known as excise tax or differential commodity tax.

Table 19.1 shows tax revenue collected from various sales taxes. Federal government levies no general sales tax, but does tax motor fuel, alcoholic beverages, tobacco, and some other commodities. Large majority of states have sales tax, with rates between 2.9% and 7.25%.

<table>
<thead>
<tr>
<th>Source</th>
<th>State</th>
<th>Local</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>General sales tax</td>
<td>$16.2</td>
<td>$20.7</td>
<td></td>
</tr>
<tr>
<td>Motor fuel</td>
<td>92.9</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Alcoholic beverages</td>
<td>3.9</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Tobacco</td>
<td>8.4</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Petrol fuel</td>
<td>8.9</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Percent of consumption revenue from sales taxes</td>
<td>30.7%</td>
<td>10.5%</td>
<td></td>
</tr>
</tbody>
</table>

Sales taxes generally take one of two forms:
1. A unit tax a given amount for each unit purchased (e.g., motor fuel tax that is a certain number of cents per gallon of gasoline).
2. An ad-valorem taxis computed as a percentage of the value of the purchase.

**Rationalizations for a sales tax**

**Administrative Considerations**
1. Collected at retail level, have to monitor fewer units. Nonetheless, still difficult, and defining the tax base somewhat arbitrary.
2. Underground markets/smuggling.

**Optimal Tax Considerations**
1. It can be shown that the income tax is not optimal, differential commodity taxes can improve welfare.
2. Inverse elasticity rule could guide the rate setting.

**Other considerations**
1. Sin taxes
2. Merit goods

**Efficiency and Distributional Implications**

- Would the pattern of sales tax rates minimize excess burden? Overall excess burden depends on both the elasticities of each good and the degree of substitutability or complementarity with other goods.
- Equal tax rates is almost certainly not efficient.
- When viewed in a lifetime perspective (rather than an annual perspective), general sales taxes are somewhat progressive.
- More generally, however, statutory incidence of sales tax is not the same as the economic incidence.
- Exempting goods that are consumed intensively by the poor (such as food) can make the after-tax distribution more equal, but achieving equality this way is difficult.
1. Many upper-income families still benefit
2. Administrative complexity

Some proposals for replacing income tax with a national retail sales tax. Advantages include simplicity and compliance. Rates would have to increase from the current 3-7% range to about 35%. Benefits from cheating would increase greatly. National sales tax creates transitional issues. Those who had accumulated wealth under the existing income tax structure would suffer. Accumulated wealth was taxed through the personal income tax. Saved for future consumption, which is now more expensive. Viewed in this light, such a tax is essentially a one-time tax on wealth.

**Value-Added Tax**

Goods are produces in several stages before becoming final goods. The value added at each stage of production is the difference between the firm’s sales and the purchased material inputs used in production. Table 19.2 gives an illustration.

**Table 19.2 Implementation of a value-added tax (VAT)**

<table>
<thead>
<tr>
<th>Producer</th>
<th>Purchases</th>
<th>Sales</th>
<th>Value Added</th>
<th>VAT at 19% Percent Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>70</td>
<td>400</td>
<td>330</td>
<td>80</td>
</tr>
<tr>
<td>Miller</td>
<td>400</td>
<td>70</td>
<td>90</td>
<td>60</td>
</tr>
<tr>
<td>Baker</td>
<td>700</td>
<td>950</td>
<td>250</td>
<td>50</td>
</tr>
<tr>
<td>Grocer</td>
<td>950</td>
<td>1,000</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>$3,150</td>
<td>$3,150</td>
<td>$1,000</td>
<td>$280</td>
</tr>
</tbody>
</table>

A value-added tax (VAT) is a percentage tax on value added applied at each stage of production. VAT is just an alternative method for collecting a retail sales tax.

**Implementation issues**

How are durable investment assets treated? In Europe, consumption-type VAT excludes the investment from the tax base.
Wealth Taxes
All the taxes discussed so far (such as income taxes and consumption taxes) are flow variables—and are associated with a time dimension (such as one calendar year). A stock variable has no time dimension. Wealth is one such variable. The property tax on housing is an example of a wealth tax.

What are the justifications for a wealth tax?
- May correct problems that arise with the administration of an income tax.
- The higher an individual’s wealth, the greater his ability to pay. Ignores human capital, however.
- Reduces concentration of wealth, which may be desirable socially and politically.
- Wealth taxes are payments for benefits that wealth holders receive from government (e.g., defense).

Gift and Estate Taxes
Federal government (and some state governments) levy gift taxes and estate taxes. Small source of federal tax revenue. In principle, the “death tax” will be phased out over the next six years.

Rationales for estate taxes
- Payment for services
- Reversion of property to society
- Incentives
- Relation to the Personal Income Tax
- Income Distribution

Provisions of the estate tax and gift tax. Two taxes are linked; otherwise could avoid tax by transferring resources inter vivos. Officially referred to as the unified transfer tax.

Taxable base: The gross estate consists of all property, including real property, stocks, bonds, and insurance policies. Also includes gifts made during the decedent’s lifetime.

The taxable estate has the following provisions:
- Gifts to charity are deductible without limit.
- Lifetime exemption of $1.5 million in 2004.
- Qualified transfers to spouse are deductible from the taxable base.
- Annual gift exclusion of $11,000 per recipient. Married couple with three kids could transfer $66,000 per year out of their estate.

Rate structure: maximal rate in 2004 is 48%, and is being phased down to 45% in 2009, then to 0% in 2010. Legislation will revert back in 2011 to the pre-2001 rules unless Congress makes the repeal permanent.

Problems with the estate tax
- Jointly held property
- Under current law, half of the value of jointly held property is now included in the gross estate of the first spouse to die.
- Closely held businesses
- Heirs may have to sell business to pay estate tax. Law allows estate taxes to be paid off over 14 years at favorable interest rates.
- Avoidance strategies
- Trusts are arrangements whereby a person or institution known as a trustee holds legal title to assets with the obligation to use them for the benefit of another party. Allows a household to get funds out of their estate. In general, many methods are available for making intergenerational transfers of wealth without bearing any taxes and without losing effective control of the property during one’s life.

A federal system consists of different levels of government that provide public goods and services and have some scope for making decisions. Fiscal federalism explores roles of different levels of government and how they relate to one another. The centralization ratio measures the proportion of total direct government expenditures made by the central government. Incorrectly measures power if state and local governments are mandated to spend money on certain programs.

A number of activities are run primarily at the state and local levels.
- Education
- Public safety
- Highways
- Public welfare
Community Formation

Think of communities as a club—a voluntary association of people who band together to share some kind of benefit.

Public park example

—Members of the club have identical tastes
—Can costlessly exclude nonmembers
—Will share equally the use and costs of park within the club

For a park of a given size, the larger the club, the smaller the costs per person. As more people join the club, congestion costs rise. Community should expand membership until Marginal decrease in membership fee equals the marginal increase in congestion costs. For a community of a given size, how large should the park be? Larger park yields greater benefits, but at a diminishing rate. Community should expand park size until Each member’s marginal benefit just equals the per-member marginal cost.

Putting these two together:
The optimal community is one in which the number of members and level of services simultaneously satisfy the condition that the marginal cost equals the corresponding marginal benefit.

The Tiebout Model

Tiebout (1956) argued that the ability of individuals to move across jurisdictions produces a market-like solution to the local public goods problem. People distribute themselves across communities based on their demands for public services (and pay taxes for these services). Equilibrium is Pareto efficient.

The Tiebout Model: Some Key Assumptions

Government activities generate no externalities. Individuals are completely mobile and have perfect information with respect to each community’s public services and taxes. There are enough communities so that each individual can find one with services meeting his or her demands. Constant returns to scale technology. Public services financed by a proportional property tax. Communities can enact exclusionary zoning laws—statutes that prohibit certain uses of land.

Optimal Federalism

What is the optimal allocation of economic responsibilities among levels of government in a federal system? Will discuss the advantages and disadvantages of a decentralized system.

Disadvantages of a Decentralized System

Several reasons why decentralization may not lead to an efficient allocation of resources. Externalities—commodities may produce negative or positive externalities for other communities. Scale economies; increasing returns to scale would suggest larger community could provide good at lower average cost. Communities could jointly run some activities. Inefficient tax systems, capital may be very immobile across countries but very mobile across jurisdictions within a country. Leads to tax rates that are “too low.” Scale economies in tax collection, it is likely that larger agencies are more efficient at collecting taxes. Equity Issues, Migration of the poor puts extra demands on a community’s tax base and makes it difficult to redistribute.

Advantages of a Decentralized System

Tailoring Outputs to Local Tastes—under a decentralized system, individuals with similar tastes for public goods group together. Related to this is the notion that a local government’s proximity to the people makes it more responsive to citizens’ preferences. Fostering Intergovernmental Competition—citizens can choose among communities, then substantial mismanagement of government resources may cause out-migration. This may create incentive for government managers to produce more efficiently. Experimentation and Innovation, For many policies, not known what the “right” answer is (if there is one). Diverse governments increases the likelihood that new solutions to problems will be sought.

Public Education in a Federal System

Total government spending in 1999 was $566 billion, most of which was spent at the local level. —Parents have strong, diverse views about their children’s education. Makes sense in this case for local communities to take the lead in education. Financing could come from higher level of government, but leads to additional regulations. —Money for education raised largely through local property tax. Wide variations in property tax base (and funding) across school districts. Intergovernmental grants play an important role in educational finance.

The Property Tax

In 1999, $240 billion collected in property taxes, almost all at the local level. Plays key role in local public finance. Property tax liability is the product of the tax rate and the property’s assessed value. Value the jurisdiction assigns to property. In many cases, assessed values correspond to market values, but more difficult if a property has not been sold recently. The assessment ratios the ratio of assessed to market value. If assessment ratios differ, then so does the effective tax rate. Table 20.2 shows that effective tax rates on residential property vary widely.

Table 20.2 Residential property tax rates in selected cities

<table>
<thead>
<tr>
<th>City</th>
<th>Effective Tax Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newark</td>
<td>3.34%</td>
</tr>
<tr>
<td>Atlanta</td>
<td>1.87</td>
</tr>
<tr>
<td>Detroit</td>
<td>1.84</td>
</tr>
<tr>
<td>New Orleans</td>
<td>1.70</td>
</tr>
<tr>
<td>Chicago</td>
<td>1.39</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>1.97</td>
</tr>
<tr>
<td>Chicago</td>
<td>1.80</td>
</tr>
</tbody>
</table>

Incidence and Efficiency Effects

Who ultimately bears the burden of the property tax? Three views:

—Property tax as an excise tax
—Property tax as a capital tax
—Property tax as a user fee

Property tax as an excise tax

Migration of capital may be very immobile across countries but very mobile across jurisdictions within a country. Leads to tax rates that are “too low.” Scale economies in tax collection, it is likely that larger agencies are more efficient at collecting taxes. Equity Issues, Migration of the poor puts extra demands on a community’s tax base and makes it difficult to redistribute.

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Federal money devoted to two areas of education:

1. At elementary and secondary level, disadvantaged and disabled children.
2. In higher education, federal spending for research.

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<td>Chicago</td>
<td>1.80</td>
</tr>
</tbody>
</table>

Incidence and Efficiency Effects

Who ultimately bears the burden of the property tax? Three views:

—Property tax as an excise tax
—Property tax as a capital tax
—Property tax as a user fee

Property tax as an excise tax

Migration of capital may be very immobile across countries but very mobile across jurisdictions within a country. Leads to tax rates that are “too low.” Scale economies in tax collection, it is likely that larger agencies are more efficient at collecting taxes. Equity Issues, Migration of the poor puts extra demands on a community’s tax base and makes it difficult to redistribute.

Public Education in a Federal System

Total government spending in 1999 was $566 billion, most of which was spent at the local level. —Parents have strong, diverse views about their children’s education. Makes sense in this case for local communities to take the lead in education. Financing could come from higher level of government, but leads to additional regulations. —Money for education raised largely through local property tax. Wide variations in property tax base (and funding) across school districts. Intergovernmental grants play an important role in educational finance.

Federal money devoted to two areas of education:

1. At elementary and secondary level, disadvantaged and disabled children.
2. In higher education, federal spending for research.

The Property Tax

In 1999, $240 billion collected in property taxes, almost all at the local level. Plays key role in local public finance. Property tax liability is the product of the tax rate and the property’s assessed value. Value the jurisdiction assigns to property. In many cases, assessed values correspond to market values, but more difficult if a property has not been sold recently. The assessment ratios the ratio of assessed to market value. If assessment ratios differ, then so does the effective tax rate. Table 20.2 shows that effective tax rates on residential property vary widely.

Table 20.2 Residential property tax rates in selected cities

<table>
<thead>
<tr>
<th>City</th>
<th>Effective Tax Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newark</td>
<td>3.34%</td>
</tr>
<tr>
<td>Atlanta</td>
<td>1.87</td>
</tr>
<tr>
<td>Detroit</td>
<td>1.84</td>
</tr>
<tr>
<td>New Orleans</td>
<td>1.70</td>
</tr>
<tr>
<td>Chicago</td>
<td>1.39</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>1.97</td>
</tr>
<tr>
<td>Chicago</td>
<td>1.80</td>
</tr>
</tbody>
</table>
Property tax as a capital tax
Takes general equilibrium perspective. General wealth tax, with some assets taxed at a below average rate and others taxed at an above average rate. General tax effect viewed as a general factor tax on capital. Excise tax effects capital migrates to low tax areas. Incidence depends on how production is organized, structure of consumer demand, and mobility of factors.

Property tax as a user fee
Communities use property taxes to purchase public services like education. Thus, not really a tax at all.

Implications:
– Incidence is meaningless
– No excess burden
– Deductibility of property taxes subsidizes consumption of local public services.

Intergovernmental Grants
Federal grants important source of revenue to states and localities. Grants from federal and state government are about 34% of total local general revenues. Essentially two types of grants: conditional and unconditional.

Conditional grants
Also known as categorical grants. Donor specifies the purposes for which the recipient may use the money. Usually earmarked. Several types of conditional grants:
1. Matching grant
2. Matching closed-ended grant
3. Nonmatching grant

Matching grant
For every dollar given by the donor to support a particular activity, a certain sum must be expended by the recipient. Changes relative price of the public good, $G$. Figure 20.3 illustrates the potential effects.

Matching closed-ended grant
For every dollar given by the donor to support a particular activity, a certain sum must be expended by the recipient. Donor specifies ceiling, that is, a maximum contribution. Changes relative price of the public good, $G$, on part of the budget constraint. Budget constraint is non-linear. Figure 20.4 illustrates the potential effects.

Nonmatching grant
Donor gives fixed sum of money with the stipulation that it is spent on public good. Does not change the relative price of the public good, $G$. Budget constraint is nonlinear.

Unconditional grants
Sometimes referred to as revenue sharing. Money is unrestricted. Similar to budget constraint in Figure 20.5, except that the budget line is now JM rather than AHM.

Flypaper effect
The budget constraint analysis shows that much of the money that was intended to be spent on the local public good may actually be spent on other consumption. Surprisingly, virtually all studies conclude that a dollar received by the community in the form of a grant results in greater public spending than a dollar increase in community income. “Money seems to stick where it initially hits.”