I. Review of Course Materials

II. Introduction to Public Finance and Public Economics

A. Public economics is the study of government policies.

i. Public economics analyzes the effects of all government policies on economic activities and the political processes by which those policies come to be in place.

ii. Tax revenues and public debt pay for essentially all of the operations of government: enforcement of laws and regulations, purchases of goods and services from market vendors, and paying for the inputs used for direct public provision of services.

iii. A wide variety of regulations also affect economic decisions by changing incentives at the margin through threats of fines or imprisonment.

iv. Still other polices determine what is owned, how what is owned can be used, and what political, economic, and private rights and duties one has.

B. Public Finance studies the subset of public policies that are fiscal in nature. These include government taxation, debt, and expenditures.

i. Because of time constraints, this course mostly focuses on the public finance subset of public economics.

ii. The US government takes about one third of gross national product to finance its enforcement, purchasing, transfer, and production activities.

- The central government's overall effect on the distribution of goods and services is larger than this, because its rules and regulations (and tax preferences) affect returns at the margin and thereby the allocation of a good deal more of the gross national product produced within its territories.
- A larger part of government spending within the U. S. takes place at the state, county, and town levels of government.

iii. The field of Public Finance studies the effects of alternative taxes and expenditures by all levels of government.

iv. Public Economics also attempts to explain why government policies are what they are.

- There are, for example, circumstances in which markets may fail to provide particular services, and thus why voters may ask the government to provide them to supplement those provided by markets.
- This partly explores why a majority of voters (and interest groups) support many government services.
- That is to say, part of the reason that governments in western Europe and North America are large is that governments provide desired public services, services that would otherwise by under-provided by the private sector.
- However, not all services are widely demanded, as with narrow tax loop holes. The effects and origins of such policies are also analyzed by public finance.

v. The main aim of this course is to show how microeconomic tools and concepts can be used to (1) understand the impacts of its tax, subsidy, and borrowing policies and (2) to account for their origins.

vi. To account for the origins of a government's fiscal policies, we will use models and concepts from microeconomics and public choice to analyze the political pressures that generates fiscal and tax-based regulatory policies.

- That part of the course will attempt to explain why some fiscal policies are adopted and not others.

C. Public Economics within Market Economies

i. Economics is often said to be the study of the allocation of scarce resources. And much of economics proceeds as if all resources were allocated by market forces.

a. A century ago, it might have been reasonable to ignore the resources directly and indirectly controlled by national governments because relatively little of a typical industrialized nation's national income was allocated by government decision making, perhaps 10%.

b. However, this is no longer the case. The typical national government of an industrialized nation now directly controls between 35 and 60 percent of national income.

c. On the other hand, those political decisions are constrained by a number of economic considerations, many of which are economic.

ii. Governments use taxes and debt to finance their services in part because governments have nearly always done so (at least at the margin) and in part because taxes and debt are often the least costly method of shifting resources from the private sector to the governmnet sector.

- Tax polices often reduce some economic activities while subsidies and tax preferences increase others.

iii. In spite of very significant taxes that are much higher than they were in 1950 or 1850, it is interesting to note that the industrialized democracies are the wealthiest on earth by essentially all physical measures of welfare: real income per capita, housing size, longevity.

- Thus, it would be wrong to conclude, at least in the short and medium term, that increases in the magnitude of government, necessarily leads to economic decline.
- To ignore public finance would be to ignore between a third and half of a modern democratic nation's economic activity.

iv. However, both taxes and expenditure policies have direct effects on the private sector, many of which tend to reduce the level and scope of private sector activities.

a. For example, as we will see in detail later in the course, there are both direct and indirect effects associated with the burden of taxation.

b. Most tax revenues are used to purchase goods and services in private markets and/or to subsidize various market activities. (That is to say, government revenues are not "kept" by the government, but spent in one way or another.)

v. Many of your own decisions today were affected by government fiscal policies.

a. For example: GMU is (still) a publicly financed university.

- (About a third of GMU's expenses are paid by Virginia tax payers, and much of the research conducted here is also supported by tax dollars.)

b. You are here, in part, because the cost of a college education at GMU is relatively less expensive than an equivalent private education.

- You probably used highways and/or public transit to make your way to class.

c. You probably paid sales tax on your lunch, and also paid a variety of state and federal excise taxes on the gasoline that you used to drive here.

- If you worked during the summer, you paid a variety of federal, state, and local income taxes.

d. If you think about retiring some day, your decision is influenced in part by the magnitude of Federal Social Security payments--and risks associated with their provision by the federal government (and, of course, future tax payers!).

III. Positive and Normative Public Economics

A. The *positive* strand of public economics analyzes very large fraction of the economic activity that we observe in modern industrial economies: how does it affect the economy, why are such policies in place?.

i. (DEF: A **positive statement** is a statement about what "is" "will be" or "has been." It is an attempt to describe the world.)

B. The *normative* strand of Public Finance is also important because it helps us to evaluate government tax and expenditure policies: are the polices that we observe the best that we can imagine, are there cases in which reforms or new policies would generally "improve" the existing situation? If so, in what sense?

i. (DEF: A **normative statement** attempt to evaluate alternative policies or alternative states of the world. Is one policy "better" than another? Is one state of the world "better" than some other. Most normative statements are based upon normative theories of some kind that attempt to determine what are "good" or "bad," "just" or "unjust," "fair" or "unfair" public policies.)

ii. Normative public finance addresses such questions as:

a. Are taxes too high or too low?

b. Can tax burdens be reduced without affecting the level of government services?

c. Are government services being efficiently provided or not?

d. And if not, how can services and service levels be improved?

e. Which services are best produced by government, and which levels of government can most effectively produce those services.

f. Moreover, it is difficult to vote sensibly without having some understanding of the economic effects of fiscal policies

iii. One does not have to believe that government expenditures should be large or small to study public finance, one simply has to appreciate that they **are**, in fact, large and important in modern industrialized nations.

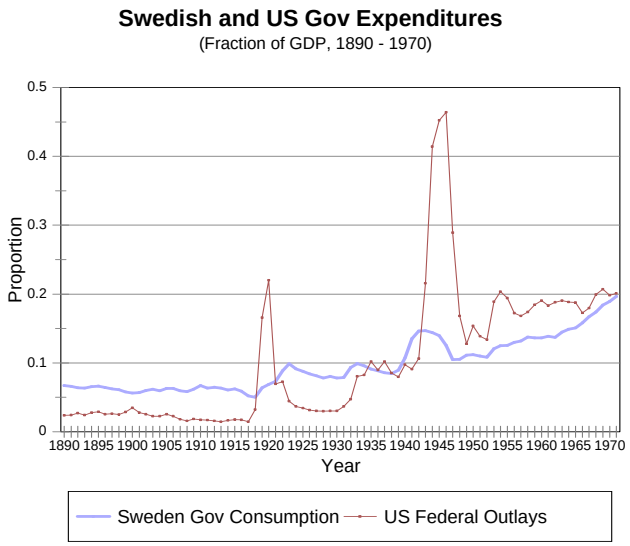
- (Your opinion of whether government services are too large or too small is in large part, as we will see, a matter of your tastes and fiscal circumstances, as with your demand for other services! However, it is also affected by your normative theories.)

IV. A Brief Overview of US and European Fiscal History

A. One striking feature of the past century of government finance is the extent to which more and more national resources **are directly** allocated by government decisions.

i. This increase took place for the most part in the 20th century particularly in the period between W.W.I and W.W.II and during the period between 1960 ad 1985.

Figure A2 (from Holcombe)



B. Some Recent Trends in Government Fiscal Policies

Table A3 (from Congleton, 2003)
Central Government
Consumption, Tax Receipts and Expenditures
As Percent of GDP (1960 -1996)

	Sweden (Central Government)			United States (Central Government)			Denmark		U. K.	
Year	Swd Gov Con	C. G. Tax Rev.	Cent. Gov Exp.	US Gov Con	C. G. Tax Rev.	Cent. Gov Exp.	D Gov Con	Cent Gov Exp.	C. Gov Con..	Cent. Gov Exp.
1960	16	..	..	17	..	..	13		16	
1961	16	..	..	17	..	..	14		17	
1962	17	..	..	18	..	..	15		17	
1963	17	..	..	17	..	..	15		17	
1964	17	..	..	17	..	..	16		17	
1965	18	..	..	16	..	..	17		17	
1966	19	..	..	17	..	..	17		17	
1967	20	..	..	19	..	..	18		18	
1968	21	..	..	19	..	..	19		18	
1969	21	..	..	18	..	..	19		17	
1970	22	26	25	18	..	..	20	32	18	32
1971	23	28	26	18	..	..	22	32	18	32
1972	23	28	28	18	17	19	22	32	19	32
1973	23	27	28	17	17	19	22	29	19	32
1974	24	27	29	18	18	19	24	33	20	36
1975	24	27	29	18	17	21	25	34	22	39
1976	25	31	32	18	16	21	25	33	22	39
1977	28	33	35	17	17	21	24	33	21	37
1978	28	32	37	17	17	21	25	34	20	37
1979	29	31	39	16	18	20	26	35	20	36
1980	29	30	39	17	18	22	27	39	22	38
1981	30	32	42	17	19	23	28	41	22	41
1982	30	32	43	18	19	24	29	43	22	41
1983	29	32	45	18	17	25	28	43	22	40
1984	28	33	44	17	17	23	26	42	22	40
1985	28	34	45	18	18	24	26	40	21	40
1986	27	34	43	18	17	24	24	37	21	38
1987	27	37	41	18	18	23	26	37	21	37
1988	26	37	40	18	18	23	26	39	20	35
1989	26	37	39	17	18	23	26	39	20	34
1990	27	38	41	18	18	23	26	39	21	38
1991	27	36	43	18	18	25	26	39	22	40
1992	28	35	46	17	18	24	26	41	22	43
1993	28	31	52	17	18	24	27	42	22	42
1994	27	29	49	16	18	23	26	43	22	42
1995	26	34	49	16	19	23	26	41	21	42
1996	26	37	46	16	19	22	26		21	

Source: World Development Indicators, 1999, (CD) World Bank, ISBN 0-8213-4375-0.
(Shaded cells indicate years where nonsocialists formed the Swedish government.)

(Notice the difference between tax receipts and government consumption. The difference largely "transfer payments" such as welfare and social security, which GNP accounts do not include as government consumption. In fact, central government expenditures including transfers is **generally a bit larger than tax revenues**, because most run significant deficits. Also remember that state and local taxes are ignored by these numbers.)

C. Government Growth and Some Indicators of Individual Welfare

Table A9 (From Congleton (2003))
Government Growth and National Performance
1960 and 1995 (Sorted by 1995 Central Gov Con)

	Government Consumption as % RGDP		Life Expectancy		Income Share Bottom 40%		Unemployment Rate	
	1960	1995	1960	1995	1960s	1980s	1960	1996
Sweden	16	25.8	74	79	15.1	21.2	1.4	8
UK	16.4	21.4	71	77	19.2	17.3	1.7	7.4
Norway	12.9	20.7	73	78	17.1	19	2.5	4.9
Canada	13.4	19.6	71	79	19.7	17.5	7	9.7
Germany	13.4	19.5	70	76	14.8	19.5	1.3	10.3
France	14.2	19.3	71	78	10	18.4	6.2*	12.4
Australia	13	18.8	69	77	19.7		3.5	6.2
Austria	11.2	17.5	71	77	20.1	15.5	2.4	8.5
Spain	8.3	16.6	70	77	16.5	19.4	11.5*	22.7
Italy	12	16.3	70	78	15.6	18.8	4.2	12.1
USA	19.4	16.2	70	77	15.9	15.7	5.5	5.4
Belgium	12.4	14.8	71	77		21.6	5.4	12.9
Ireland	12.5	14.7	70	77			6.7	11.3
New Zealand	10.5	14.3	71	76	20.9	15.9	2.5*	6.1
Netherlands	12.3	14.3	73	78	14.5	20.1	1.2	6.7
Switzerland	8.8	14	72	78		16.9	0.2*	4.7
Japan	8	9.7	69	80	15.3	21.9	1.1	3.3
Average	12.629	17.265	70.941	77.588	16.743	18.58	**4.8**	10.173

Source Table II.1 Table IV.8 Table IV.10 (*1980) Table IV.3

Assembled from Tanzi and Schuknecht (2000) various tables.
(Most of their data is from various OECD reports.)

(Notice that the rise of the welfare state has not materially increased longevity. The increase in longevity in Denmark and Sweden between 1960 and 1995 is actually less than occurred in the US during the same period. However, note that there appears to be an effect of the growth of welfare state expenditures on average unemployment rates.)

I. The Fundamental Geometry of Net Benefit Maximizing Choice

A. There are three widely used models of decision making by rational persons used in economics. (i) The utility maximizing model--which is usually introduced to students in intermediate micro--is the most widely used, partly because it lends itself to a variety of calculus tools. (ii) Since we do not use calculus in this class, we use a different model, the net-benefit maximizing model, which can be rigorously developed with geometry and which provides sharper predictions about behavior. (iii) In addition, there is a more advanced model that uses preference orderings, rather than continuous utility or net-benefit functions, which is rarely used outside of mathematical economics circles.

- It can be shown that the net-benefit maximizing model is a special case of the utility maximizing model, which is a special case of the preference ordering model.

B. This course relies uses the **net-benefit maximizing model** as the basis for nearly all of its analysis.

- The only exception is the material developed in a few weeks on the deadweight loss of taxes and subsidies that are targeted at particular activities or services, for which we'll use the utility maximizing model.

C. The net-benefit maximizing model simply assumes that individuals **maximize** their private **net benefits** in all choices.

There is always a benefit associated with an action or activity and always a cost (sometimes just an opportunity cost). The difference between the benefits and cost of an activity are its net benefits, $NB = B\text{-}C$.

D. The net benefits of consumers and firms are often given names such as consumer surplus and profits.

Consumers maximize consumer surplus: the difference between what a thing is worth to them and what they have to pay for it. CS(Q) = TB(Q) - TC(Q)

Firms maximize their profit:, the difference in what they receive in revenue from selling a product and its cost of production: Π = TR(Q) - TC(Q)

E. The change in benefits, costs, etc. with respect to quantity consumed or produced is generally called Marginal benefit, or Marginal cost.

DEF: **Marginal "X"** is the change in Total "X" caused by a one unit change in quantity. It is the slope of the Total "X" curve. "X" $\in$ {cost, benefit, profit, product, utility, revenue, etc.}

Important Geometric Property: Total "X" can be calculated from a Marginal "X" curve by finding the area under the Marginal l "X" curve over the range of interest (often from 0 to some quantity Q).

This property allows us to determine consumer surplus and/or profit from a diagram of marginal cost and marginal revenue curves.

It also will be used through out the course to calculate similar net beneftis for industries, consumers, or society as a whole, and helps to make the logic of (normative) welfare economics clear.

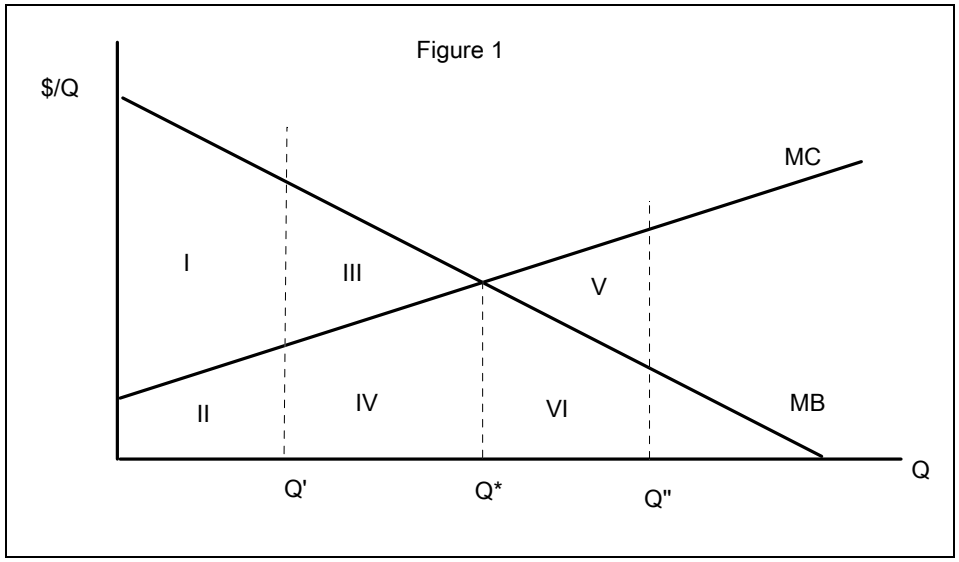
F. **Illustration.** Given the marginal cost and marginal benefit curves in Figure 1, it is possible to calculate the total cost of Q' and the total benefit of Q' .

The first step is normally to label the areas so that one can do some "area arithmetic." The relevant areas are those under the MB and MC curves in the range of interest.

In Figure 1, **total cost** is the area under the relevant actor's (consumer or firm) marginal cost curve, here TC(Q') = II. **Total benefit** is the area under the relevant actor's (consumer or firm) marginal benefit curve, here TB(Q') = I + II

Because **net benefits are total benefits minus (less) total costs,** one **can calculate the net benefits** by finding the actor's total benefit and total cost for the quantity or activity level of interest, and subtracting them.

Thus the net benefit of output Q' is TB(Q') - TC(Q') = [I + II] - [II] = I.



G. **Three Practice Exercises**. Use Figure 1 to determine the areas that correspond to the total benefit, cost and net benefit at outputs 0, Q*, and Q".

Answers:

- TB(0) = 0, TC(0) = 0 (ignoring any fixed costs that might exist), so NB(0) = 0.
- TB(Q*) = I + II + III + IV , TC(Q*) = II + IV , NB(Q*) = I + III
- TB(Q') = I + II + III + IV + VI , TC (Q") = II + IV + V + VI , NB(Q") = I + III - V

H. If one attempts to maximize net benefits, it turns out that generally he or she will want to consume or produce at the point where marginal cost equals marginal benefit (at least in cases where Q is very divisible).

There is a nice geometric proof of this.

In fact we have already shown this as an exercise for the case in which the MB curve crosses the MC curve one time from above, as in Figure 1.

Note that NB(Q*) > NB(Q') and NB(Q*) > NB(Q").

This is true for any Q' < Q* and for any Q" > Q*, where Q* is the quantity where MB(Q) = MC(Q).

I. **Thus, in the usual case, a net-benefit maximizing decision maker chooses consumption levels (Q) such that their own marginal costs equal their own marginal benefits.**

They do this not because they care about "margins" but because **this is how they maximizes net benefits** in most of the choice settings of interest to economists.

(An exception is the case in which the ideal consumption level is zero. Try to explain why. This will be covered in class.)

J. This characterization of net benefit maximizing decisions is quite general, and can be used to model the behavior of firms, consumers, and voters in a wide range of circumstances.

Moreover, the same geometry can be used to characterize ideal policies that maximize *Social Net Benefits*--which is just the sum of the net benefits realized by everyone in the society of interest.

K. That each person maximizes their own net benefits does not imply that every person will agree about what the ideal level or output of a particular good or service might be--nor does it imply that people are necessarily selfish.

Most individuals will have different marginal benefit or marginal cost curves, and so will differ about ideal service levels.

To the extent that these differences can be predicted, they can be used to model both private and political behavior:

A person's benefits and costs may take account of benefits and costs realized by others, as parents care about their children's welfare and friends care about each others welfare.

In cases in which people are more or less self-centered, it is often easy to predict in a general sense how they will behave in markets and in politics.

- What price will a typical firm charge?
- What quantity of gasoline will a typical consumer purchase?
- What types of persons will be most likely to lobby for subsidies for higher education?
- What types of persons will prefer progressive taxation to regressive taxation?
- What industries will prefer a carbon tax to a corporate income tax?)

L. Of course, the purpose of the net-benefit and utility maximizing models is not to provide some educated guesses about how individuals will behave--although this is enough to justify their use.

Economists generally believe that one can only understand social phenomena like markets and politics if one understands the individual behavior that generates the social outcomes.

M. Thus, the best way to understand markets and politics is to understand how price and policy incentives affect individual behavior, which in turn generates social outcomes.

A change in demand is generated when the "typical" or "average" consumer changes his or her behavior because of changes in income, prices, or technology.

A change in supply is generated when the "typical" or "average" firm changes its behavior in response to changes in prices, costs, or technology.

A change in policy is generated when changes in income, prices, technology, or ideology affects the behavior of "average" or "median" voters.

N. It turns out that one can **use the consumer-surplus maximizing model to derive a consumer's demand curve** for any good or service (given their marginal benefit curves) by: (i) choosing a price, (ii) finding the implied marginal cost curve for a consumer, (iii) use MC and MB to find the CS maximizing quantity of the good or service, (iv) plot the price and the CS maximizing Q*, and (v) repeat with other prices to trace out the individual's demand curve.

O. Similarly, one can use a profit maximizing model (another measure of net benefit) to derive a competitive firm's **short run** supply curve, given its marginal cost curve. Again, one (i) chooses a price (which is a price taking firm's MR curve), (ii) finds the profit maximizing output, (iii) plot P and Q*, (iv) repeat to trace out a supply curve.

II. Deriving Consumer's Demand Curve from MB curves using the Net Benefit Maximizing Model

A. If consumers are rational net benefit maximizers, it turns out that both individual and market demand curves are downward sloping.

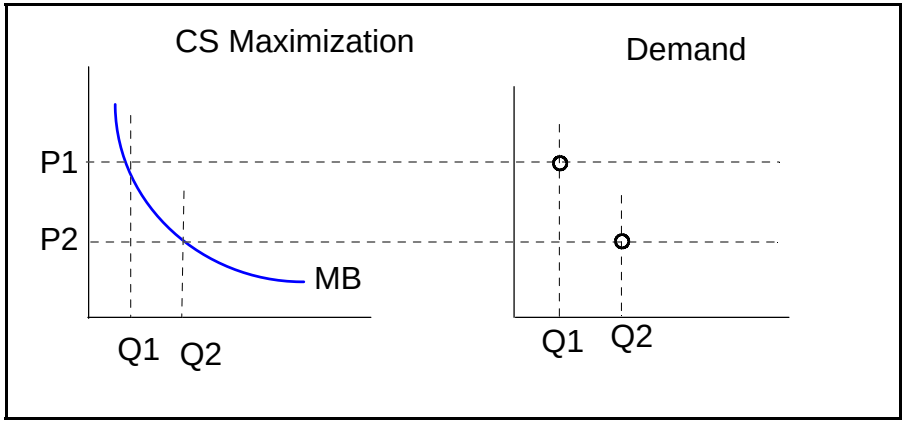
B. To demonstrate this, we will first determine what net benefit maximizing behavior implies about individual demand curves and then what individual demand curves imply about market demand curves.

To derive a demand curve from a consumer's MB curve:

- (i) Pick a price, P
- (ii) Find the associated MC curve. Normally this is a horizontal line equal to the price, because the extra cost associated with another unit of the good is simply its price.
- (iii) Find the NB maximizing quantity, Q (the amount bought by a rational consumer). Normally this is the quantity at which MB = MC, because it is this quantity that maximizes a consumer's net benefits or consumer surplus.
- (iv) Plot P and Q.
- (v) Repeat with another price.

C. The next figure illustrates the geometry of this process. It begins with a marginal benefit curve (MB) and uses two prices, P1 and P2, to find two points on this person's demand curve.

- Note that the **price**(s) characterizes a consumer's **marginal cost curve**(s), since he or she can has to pay that amount to get each successive unit of this good. The first MC curve is simply a horizontal line at P1.
- Given that MC curve, this person will chooses the quantity that maximizes his or her consumer surplus, which is labeled Q1.
- This price-quantity combination is plotted on the Demand diagram as the point P1, Q1. (At price P1, the consumer will buy quantity Q1.)
- Now we repeat this process with another price, P2. The implied new (second) MC curve is a horizontal line passing at P2.
- Given that MC curve, a net benefit maximizing (rational) consumer chooses the quantity that maximizes his or her consumer surplus, which is found at the quantity where MC=MB, and is labeled Q2.
- This price-quantity combination is plotted on the Demand diagram as the point P2, Q2. (At price P2, the consumer will buy quantity Q2.)
- In principle this process is continued forever, choosing prices, finding the associated CS-max quantities, and plotting the price and quantity.
- But in most cases three or four points are enough to get the basic geometry of a consumer's demand curve.



THE POINT HERE IS NOT TO MEMORIZE DIAGRAMS but to understand how to prices affect purchases by rational consumers.

- Prices do so by changing the marginal cost curves of every consumer.
- When prices rise, each person's marginal cost curve rises, which induces net-benefit maximizing consumers to purchase less of the good (other things being equal).

It is the logic that is general, rather than the particular diagrams.

- Thus, given a consumer's MB curve, we can deduce his or her demand curve!
- As long as the MB curves do not change, it is prices that determine the amounts purchased.
- And those purchases decrease as prices increase. Thus individual demand curves "slope downward."
- Market demand curves also slope downward because they are just the sum (horizontal sum) of individual demand curves.
- Marginal benefit curves are, of course, not always constant. For example, an individual's MB curve tends to increase as personal income rises or the prices of substitutes increase.

D. The same process can be used to derive a consumer's Demand curve from any sort of MB curve, although they are not always as easy as this one.

- [Several less straightforward derivations will be done in class and assigned as puzzles as homework.]
- Note that whenever the marginal benefit curve is downward sloping over its whole range, the consumer's demand curve goes through exactly the same points as the MB curve and is also downward sloping.
- In such cases, one can use estimates of individual demand curves as estimates of MB curves.

- Although they go through the same points, marginal benefits and demand are not the same function, because they **have different meanings** and the **functions go in "opposite" directions**.
- MB functions go from Q into $/units, whereas demand functions go from P into Q.
- They are inverse functions of each other.

IN CLASS, A VARIETY OF SIMILAR DERIVATIONS WILL BE DONE ON FOR VARIOUS MB CURVES, ONE OF WHICH WILL BE ASSIGNED AS A HOMEWORK PUZZLE. (So do show up for class!!!)

E. In cases in which a person's MB curve is not smoothly downward sloping (e.g. is not monotone decreasing), the associated demand curve includes only a subset of the point on an individual's MB curve. However, all the points that are on both the MB and demand curves are from the downward sloping portions of the MB curve.

- (Determining exactly which points are on both one normally has to work out geometrically.)
- Thus, when a demand curve is derived from MB curves--even when the MB curve is not itself always downward sloping--it turns out that **every** individual's demand curve slopes downward.
- [This is **not necessarily the case when a demand curve is derived from a utility** function, but since "upward" sloping demand curves have never been observed, this is a strength of the NB-maximizing model rather than a weakness.]

F. Notice that we **already have some predictions** about behavior that follows simply from the net-benefit maximizing model of consumer choice:

- Demand curves slope downward.
- As price rise, consumers tend to purchase fewer and firms tend to produce more (other things being equal).
- A change in MB will cause demand curves to shift up or down in the same direction as the shift in MB.
- Consumer net benefits tend to fall as prices rise, other things being equal.
- Firm profits tend to rise as prices rise, other things being equal.

III. Deriving a Firm's Supply Curve from MC Curves

A. In a similar fashion, one can use the **profit maximizing model** (another measure of net benefit) to derive a competitive firm's short run supply curve from its short run marginal cost (MC) curve.

B. The method used to derive a firm's supply curve is very similar to that used to derive a consumer's demand curve:

(i) Choose a price

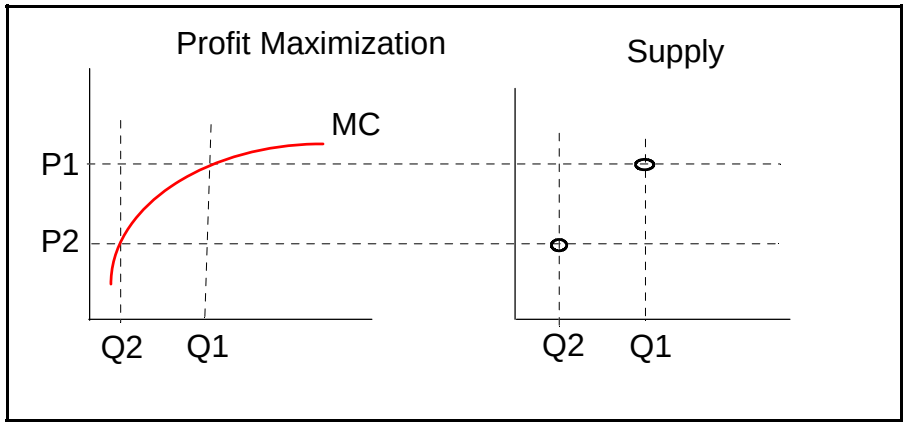
(ii) Find the associated marginal revenue curve (MR) Normally this is a horizontal line equal to the price, because the extra revenue generated by selling one more unit of the good is simply the price paid for it.

(iii) Find the profit maximizing quantity of the good or service, given that MC curve. Normally this is where MR equals MC, because this maximizes profits or net benefits for the firm or firm owner..

(iv) Plot the price and the profit-maximizing quantity on another diagram.

(v) Repeat with several other prices to trace out a supply curve.

(The supply curve of a firm tells one how many units it will produce and sell at a given price and this method characterizes that relationship for a profit maximizing firm.)



C. The figure above illustrates these steps for a given marginal cost curve (MC) and two prices, P1 and P2.

(i) In a competitive market, the market price is every firm's marginal revenue curve, because the firms gets "P" new dollars of revenue every time it sells an additional unit at that price.

- So the first MR curve is a horizontal line through P1.
- Given that MR curve, the firm will chooses the quantity that maximizes his or her profit (the firm's net benefit), which normally occurs at the quantity where MR=MC, and is labeled Q1.
- This price and output combination is plotted on the Supply diagram as the point P1, Q1. (At price P1, the firm will produce and sell quantity Q1.)

(ii) Next we try another price, P2. A horizontal line through P2 is the firm's marginal revenue curve, since its revenue now increases by that P2 dollars every time another unit of the good is sold.

- Given that new MR curve, this firm chooses the quantity that maximizes profits, which is again found where MC=MR and is labeled Q2.
- This price output combination is plotted on the Supply diagram as the point P2, Q2. (At price P2, the firm will produce and sell quantity Q2 if the price is P2.)

(iii) In principle this process continues forever, choosing prices, finding the associated profit-maximizing quantity, and plotting the price and quantity until the entire supply curve is traced out.

- However, in most cases three or four points are enough to get the basic geometry of a firm's supply curve.
- More points are needed when the MC curve has a complex shape.

(iv) Note that when the MC is upward sloping over the whole range (and MC>0), then a firm's supply curve goes through exactly the same points as its MC curve.

- This implies that one can use estimates of a firm's supply curve as estimates of its MC curve.
- (As in the case of demand curves, a firm's supply curve is the inverse of its MC curve. Supply goes from prices ($/unit) into quantities; whereas MC goes from quantity into $/unit measures of how costs increase as output increases.)
- However, if MC has a more complex shape, only the points on MC that can represent profit maximizing outputs are on both the MC and firm supply curve.
- It turns out that the points in common are all from the upward sloping parts of the firm's MC curve.
- Thus, a firm's supply curve always slopes upward (other things being equal).
- Since the market supply curve is just a sum (a horizontal sum) of the market supply curves, market supply curves are also upward sloping.

D. Again geometry and deduction allow us to make several predictions about a firm's behavior

- Firm supply curves tend to be upward sloping.
- As prices rise, other things being equal, firms produce and sell more units of their products.
- Any change in market conditions that affects a firm's marginal costs will shift the firm's supply curve.
- For example, an increase in input prices tends to cause the marginal cost of production to increase.
- If MC rises for a firm, its supply curve shifts back to the left.
- If MC rises for a , profits tend to fall for that firm, other things being equal.
- If market prices rise, MR shift upward, and profits tend to increase.

IV. Markets Demand and Supply

A. A market demand curve tells us how much of the product or service will be purchased by all consumers at a given price. Each consumer will be purchasing the quantities that he or she believes maximizes his or her net benefits in the above model. This implies that each person will be purchasing goods in the manner described by their individual demand curves.

B. As a consequence, Market Demand can be determined by varying price and adding up the amounts that consumers want to buy at each price.

The process is similar to that used to derive individual demand curves.

One picks a price, P',

Find the relevant quantities demanded by each consumer,

Add up those quantities. (Q' = sum of the individual consumer purchases at P'.)

Plot P' and Q'

Repeat with other prices to trace out the market demand curve.

[The geometry of this process was illustrated in class.]

C. **Market Demand** curves for ordinary private goods are thus "horizontal" sums of individual demand curves

Note that market demand can also be considered to be horizontal sums of individual MB curves, because all the points on individual demand curves are also points on the individual MB curves.

This allows us to use market demand curves as the MB curve for all consumers in the market.

This as, will be seen in later lectures, lets us understand how public policies like taxes affect consumer interests.

D. Similarly, **Market Supply** (for an industry with a fixed number of firms) can be derived by varying price and adding up the amounts that each firm in the industry is willing to sell at each price.

The process is similar to that used to derive individual supply curves.

One picks a price, P',

Find the relevant quantities supplied by each firm,

Add up those quantities. (Q' = sum of the individual firm production at P'.)

Plots P' and Q'

And repeats with other prices to trace out the market demand curve.

[The geometry of this process was illustrated in class., see your class notes for more details.]

E. **Market Supply** curves for ordinary private goods are "horizontal" sums of individual firm supply curves.

Note that market supply can also be regarded to be a horizontal sum of individual firm MC curves.

- A short run supply curve is the sum of short-run firm MC curves.
- A medium run supply curve is the sum of medium-run MC curves.
- A **long run supply curve is the sum long-run MC curves**.

[For the long run, we will always use this "Ricardian" long run supply, to simplify our geometry and because the Ricardian model is often the best one for real world markets, which is to say because individual firms often have somewhat different long run cost curves--especially in markets in which there are relatively few firms. See the discussion below.]

V. Competitive Market Equilibrium and the Gains to Trade

A. In competitive markets, prices tend to move to "market clearing levels," that is to prices that set the total quantity supplied by all firms equal to the total amount demanded by consumers.

In competitive markets, this occurs where the supply and demand curve cross.

At any other price, there will either be surpluses (which tend to cause prices to fall) or shortages (which tend to cause prices to rise).

Note that this is an entirely decentralized process requiring governments to do nothing more than enforce property rights and contracts.

The market clearing price is often denoted P* and the market clearing quantity as Q* where $Q^* = Q^D(P^*) = Q^S(P^*)$.

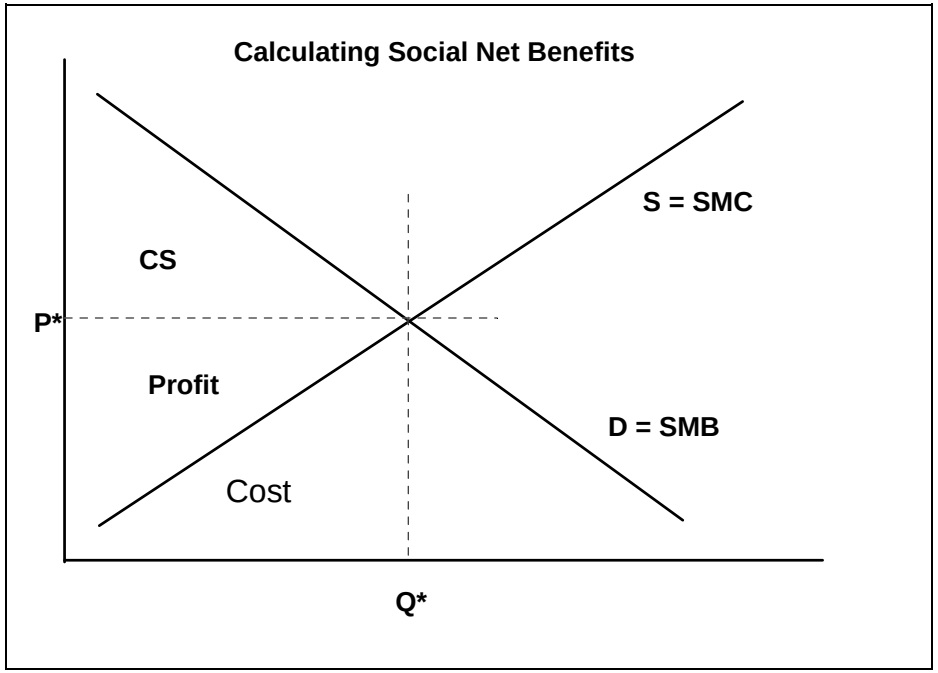
B. One can use our previous geometry to characterize the net benefits realized by consumers and firms at the market clearing prices

Finding Consumer Surplus using a market demand curve:

- The area under the demand curve from 0 to Q* is the total benefit realized by all consumers.
- The area under P* from 0 to Q* represents the total cost (amount paid) for the Q* units.
- Subtracting the TC from TB gives you consumer surplus.
- [The geometry was illustrated in class and is also illustrated below.]

Finding Industry Profit using a market supply cuve:

- The area under the supply curve from 0 to Q* is the total production cost for all firms in the industry.
- The area under P* from 0 to Q* represents the total revenue (or benefit, the amount received) for the Q* units.
- Subtracting the TC from TR gives you industry profit.
- [The geometry will be illustrated in class and is also illustrated below.]



C. **A digression on the difference between Ricardian and Marshallian long run supply.**

In the short and medium run, the number of firms in the industry can be taken as fixed.

- As a first approximation, this is also often true in the long run.

On this point, however, the Ricardian and Marshallian conceptions of long run supply are quite different and imply different things about the nature of the long run supply curve.

Long run supply in the "Marshallian" long run mostly reflects entry and exit of **identical** efficiently-sized firms into and out of the industry. This process takes

place until profits fall to zero. As long as input prices do not change, **Marshallian long run supply curves are always horizontal** and reflect the industries average cost (the minimum average cost for each identical firm).

In contrast, long run supply in the Ricardian framework reflects "entry and exit" of firms with different cost functions. So, the low cost producers enter first, other things being equal, and the high cost firms last.

Ricardian long run supply thus is always upward sloping and reflect the marginal production costs of firms in the industry.

- In general, relatively efficient firms (those with better technologies, locations, or natural resources) will continue to earn profits greater than zero in the long run, because they have lower costs than "marginal" firms.
- Note the derivation of long run supply in the Ricardian sense, is exactly like that used above for both short and medium run analysis. The number of potential suppliers is essentially fixed, although the individual firms will alter their production as prices vary.

It bears noting that the Marshallian model of long run supply works well for some industries (say auto repair shops), and the Ricardian model works well for markets in which firms tend to be large (oil, minerals, sports, farming, auto manufacturing, cell phone manufacturing, etc.).

We will use the Ricardian model of long run supply in this class, but it should be kept in mind that the Marshallian entry and exit may also be important in some cases.

VI. Summary: Markets, Net Benefits, and "Social Welfare"

A. Our derivations of demand and supply make it clear that:

Every market **demand curve is the sum of the marginal benefit** curves of the individual consumers, because each consumer's demand curve is essentially his or her MB curve.

Every short (or middle) run **market supply curve is the sum of the short (or middle) run marginal cost** curves of the individual firms in the market. Short and middle run supply curves can thus be used to represent an industry's short or middle run marginal cost of production.

Every Ricardian long run supply curve is the sum of the long run marginal cost curves of potential suppliers of the goods. Consequently, a Ricardian long run supply curve can be used as the industry's long run marginal cost curve.

B. In cases in which there are **no externalities** and little monopoly power, firms and consumers are the only ones affected by market transactions.

In such cases, the demand curve can be used as the Social Marginal Benefit Curve and the Supply curve as the Social Marginal Cost curve.

This allows **social net benefits** to be calculated for individual markets and for policies that affect markets--as demonstrated below and in subsequent lectures.

In the absence of externalities or market concentration, **markets tend to produce social net benefit maximizing** levels of goods and services!

C. From our earlier work, we know that given SMB and SMC curves, social net benefits are maximized at the quantity where SMB crosses SMC (assuming that it does so only once, and that SMB crosses SMC from above).

- Because D is approximately SMB (at least for all consumers) and S is approximately SMC (at least for firms in the industry), the quantity where demand and supply cross is exactly the output required to maximize social net benefits.

D. Consequently, the "market clearing" price, P*, causes markets to produce the **social net benefit maximizing** level of output (in cases where there are not externalities, e.g. relevant costs or benefits).

- The market clearing price, P*, causes social marginal benefit (the demand curve) equal to social marginal cost (the supply curve). Both are equal to price in this case!
- Social net benefits turn out to be the sum of profits and consumer surplus in this case. (Use diagrams like that above to prove this.)

E. Many economists use the **maximize social net benefit norm.**, and the above calculations allow them to rank states of the world and public policies.

- Note that competitive **market outcomes are very desirable** under this norm, because they tend to maximize social net benefits.
- This is one very widely used **normative** argument favoring markets as a method of social organization.
- [In cases where there are additional costs or benefits because of externalities, those additional marginal benefits or marginal costs will need to be taken account of.]

F. In cases where **external costs** exist, however, market outcomes will (often) fail to maximize social net benefits, because those costs will not be fully accounted for in the calculations of economic agents.

We will analyze markets with externalities later in the course.

- When there are external benefits or costs, demand and/or supply will not include all the relevant marginal benefits and/or all marginal costs.
-

It turns out that the existence of externality problems provides a **normative** basis for government policy (if one wants to maximize social net benefits).

- In cases where significant external costs exist at the margin (at Q*), markets will tend to **over produce** the output of interest relative to that which maximizes social net benefits.
- In cases where significant external benefits exist at the margin (at Q*), markets will **under produce** the service of interest relative to that which maximizes social net benefits.
- Governments might adopt policies to discourage production in the first case (perhaps with taxes) or encourage it (perhaps with subsidies) in the second case.

(Tools for analyzing externality and public goods problems will be developed just befor and just after the midterm.)

I. Introduction to Public Finance: Government Services Are Not Free

A. Governments provide a number of services. Resources for those services all have to be acquired.

B. Governments "govern," which is to say that the members of governing organizations pass and enforce laws. Making and enforcing rules is what distinguishes governments from other organizations. It is not that no other organizations have rules (they all do, this is what makes them organizations), but the ability to impose rules on others is far greater for governments than it is for other organizations.

- To do this, governments have procedures for "making laws," which usually involves "teams" of persons who write up new rules, other "teams" who interpret their meaning (in cases in which the rules are not clear), and still other "teams" who enforce the law and punish persons who violate the rules.
- The team members are normally government employees (civil servants or bureaucrats) and are paid to under take their duties.
- Examples of such rules include: civil law (protecting various ownership and contractual relationships), criminal law (protecting persons and their property from intentional harm), tax law (defining obligations to provide money to the government), regulatory law (defining other rules and regulations for producing and selling private services such as safety and environmental rules).

C. Another service of most governments is the defense of a nation's boundaries--sometimes called "defense" because it protects a nation from attack launched outside their territories.

- Defense services are also normally paid for, although in some cases a "draft" is used to assemble military teams at below market wages or resources may be "commandeered" by the government or its various agents.
- Money to pay for such services and all the equipment used also has to be raised in some way.

D. Other services are newer and vary more among governments.

- For example, governments often provide education or subsidize education.
- They may also provide or various forms of recreational services (as with parks of various kinds), subsidize or provide various insurance products such as unemployment insurance, retirement pensions, and health insurance, etc..

i. Governments need money to pay the persons who provide these services whether they are actually produced in the public sector or in the private sector.

ii. In democracies, the general pattern of services provided are at least roughly determined by competitive elections and promises/commitments made by persons trying to be elected to high office.

- In such cases, taxes and tax systems also are at least roughly determined by elections for high office (that is to say elections between candidates for positions that have the power to participate directly in the writing of laws).

E. It bears keeping in mind throughout this course that most "governments" have very few resources of its own.

- Very few governments pay for governmental services by selling them to willing customers as firms in the private sector do or by selling other services to winning customers.

  (In Medieval Europe, kings often owned and rented a good deal of land, which paid for many royal services. There were also taxes, but except in times of war, they were relatively unimportant. In today's world, there are royal families and governments that own national mineral rights and fund public services by selling products--for example oil--in world markets. Such systems are in a sense financed by profits, rather than taxes. Although no taxes are collected, the result is conceptually similar to that generated with land taxes and severance taxes.)

- Instead, most governments raise money through taxes of various kinds by through selling bonds on the international bond markets (e.g. borrowing money). They use the money generated through taxes and borrowing to pay for the services or inputs used to produce the "public" services they provide.
- Government services are never "free." They require scarce resources to produce. And most of these resources used to produce government services are obtained through market transactions.

Most of the resources used to produce government services are "pulled" from other uses, and this is normally done with money transactions--e.g. by paying for them.

- And most of that money in most places is paid for with tax revenues.

  (Exceptions tend to be oil rich areas, as in the middle east's oil rich kingdoms, and also oil rich democracies such as Norway and Alaska.)

F. Governments rely upon markets for the inputs used to produce services that are directly produced by governments (as with public education) and also to hire private firms to produce the services purchased from the private sector (as with highway construction, most military equipment, and health care (in the US)).

- Reliance on markets implies that the transactions through which services are provided are voluntary.
- The government act as a "buyer" and individuals and firms act as "sellers."
- As a relatively large buyer, they shift the demand curve out to the right when they expand purchases (as when new highways are built or office buildings constructed, etc.).
- In addition to direct purchases, governments of teen subsidize the production of some goods and services (such as agricultural products and higher education). Those receive subsidies also participate in voluntary transactions.
- The collection of taxes, in contrast, has elements of coercion and voluntariness, as developed below.

G. The **field of public finance** emerged from the efforts of high government officials to raise money for "the government's" purposes in a manner that advanced the interest of the top strata of government officials.

- As economics emerged as a separate field of study in the late 1800s, they began to use models to analyze how taxes and expenditures affect private markets.
- They used the results of their analysis to suggest various taxes which they believed would have a smaller negative effect on the private sector.

H. This course analyses and discusses the effects of taxes and expenditures using models form microeconomics. It also analyzes the processes through which tax laws and budget laws are adopted using models from public choice.

i. The course begins by examining taxation, because the micro-economic tools for taxation are easiest to develop, and because most of us are used to paying taxes and so less time has to be spent explaining what they are.

ii. The course then looks at expenditures and subsidies, followed by an analysis of why government services in a democracy tend to look the way they do.

- This is of course substantially because of voter demands, but why do they demand what they do? And, which voters really matter?
- In democracies, returning to high office by winning the next election is high on most office holder's list of interests. They thus try to please a sufficient number of voters to win the next election.
- In autocracies, tax revenues are also used to provide a lavish lifestyle and/or to garner support from necessary allies. The support that is necessary is generally from elite groups rather than from a majority of the citizenry.

II. Introduction to Taxation: Revenue, Incidence, and Burden

A. Taxation is the main method through which governments which pay for the inputs and services they provide.

i. Taxes transfer "potential control" over resources from the private to public sector.

- Government decision makers (both elected and unelected) choose how those resources will be allocated.
- In contemporary governance, expenditures are mostly distributed among services (defense, education, highways, parks, law and order, etc.), social insurance (unemployment insurance, social security, health insurance, and subsidies for similar products), and redistribution (welfare, food stamps, housing supports, farm subsidies, etc.).

ii. Relatively few persons would pay their taxes were it not for the punishments they would face if they did not turn over their income or other resources to the government's tax collectors.

a. In this sense, **all taxes are coercive at the point of collection.**

b. This contrasts with government bonds and fees for services such as road tolls, because such transactions are voluntary at the point of collection.

- Bond buyers and public service purchasers expect to be better off after the purchase, whereas tax payers normally feel worse off after paying the tax (although better off than had they not paid and been placed in jail).

iii. On the other hand, **insofar as taxes are used to fund desired public services, taxation as a method of government finance can be regarded as voluntary** in much the same sense that the amounts paid stores for their products can be regarded as voluntary.

- The extent to which taxes are truly voluntary depends on the services received in "exchange" for tax payments.
- If their overall benefits are higher than their costs, tax payments can be regarded as voluntary. If not, tax payments cannot be regarded as voluntary in this sense.
- That is to say, if the overall benefits from government servies are larger than their costs, voters prefer to "tax themselves" to pay for desired governmental services, rather than go without those services.
- (In contemporary society, there are a very broad range of services provided by governments, some of which could have been provided privately, which would be hard for most citizens to go without.)

B. Although direct and indirect taxation are the main sources of government revenue, there are other sources--some of which were more important in the past. than they are today.

a. One alternative to taxation is the sale or rent of government services or assets to the public.

- Governments own many things: land, building, facilities, and these could be sold off or rented to raise money, or persons could be charged substantial fees for using those assets.
- Highway tolls for example are often used to pay for the highways or bridges on which the tolls are collected.
- The U. S. central government (federal government) sometimes sells or rents assets that "it owns" to industry as with mineral, timber, grazing rights, and the electro-magnetic spectrum.
- National parks are partially financed by charging admission, as are toll bridges and roads.
- Grazing rights in national forests are often rented to nearby farmers.

b. However the sale of services and assets typically pay only a small fraction of the overall cost of government services.

- (Two or three hundred years ago, government often paid for most of their services through the sale of assets or fees for the use of their assets, such as land rents.)
- (An exception to this rule is highway tolls, which often more than pay for the maintenance of the highways provided.)

c. **Borrowing is a far more important** source of revenue in most cases--although normally less so than taxes.

- However, to the extent that **government borrowing (sales of bonds) are repaid, borrowing can be regarded as an implicit tax**, because the government promises bond buyers that they will collect tax revenue in the future to pay interest and principal on the bonds.
- Borrowing commits governments to raise taxes in the future (or default).

III. Taxation in the United States, A Few Numbers

A. In the United States, Total Federal (central government) Tax Revenue was 3.3 trillion dollars in 2017, Total State Revenue was 1.5 trillion, and Total Local Revenue was 1.3 trillion, for a total of 5.8 trillion dollars.

- **sources: CBO and Statistica, see below.**
- **GDP was 19.79 trillion in 2017, so Tax Revenues were about 30% of GNP.**
- **Expenditures were somewhat higher, and the difference was made up by selling bonds--that is to say borrowing from US citizens and banks (including the federal reserve). and also**

other governments, international banks and individual living in other countries.

B. The most important taxes for the federal government of the United States today are:

i. the income tax (1.587 trillion dollars in 2017)

ii. the payroll tax (used to finance social security and medicare) (1161.9 billion dollars in 2017) [These are also "income taxes" but are earmarked for old age pensions and health care.)

iii. corporate income taxes (297 billion dollars in 2017)

iv. excise taxes (83 billion dollars in 2017)

v. estate taxes accounted for 22.8 billion dollars in 2017.

vi. Total federal revenues were 3.316 trillion dollars and total federal outlays were 3.981 trillion dollars.

- https://www.cbo.gov/about/products/budget-economic-data#2
- **an excel file is available** from CBO, based on OMB numbers.

vii. At the state and local levels of taxation in the United States, the most important taxes in 2016 were: the income tax (370 billion), the sales tax (310 billion), excise taxes (160 billion), and the property tax (19 billion).

viii. (Source: statista..com).

IV. The Burden of Taxation

A. Obviously rasing tax revenue takes money from individuals and firms and transfers it to the government.

- This reduces expenditures by individuals and firms in order to increase expenditures by federal, state, and local governments.
- From the perspective of this section of the course, the **tax burden** can be though of as the reduced profits and consumer surplus generated by the tax system.
- These losses turn out to depend on market conditions.

B. The burden of particular taxes can be measured in two ways:

i. First, [the accounting method] it can be calculated as a cash payment--in much the same way that payments for ordinary goods are calculated.

- This method simply looks for the person who wrote the check and assumes that that person or organization bears the burden.

a. (This is the most widely used measure by macro-economists, accountants, and newspaper reporters.)

b. (It is also occasionally implicitly used by public finance economists.

- When data on the slopes of relevant demand and supply curves are unavailable.
- In such cases, its often convenient as a first approximation to assume that supply is horizontal--as in a Marshallian competitive long run equilibrium--and so tmhe full economic burden falls on consumers, as shown below.)
- In this very special case, the usual economic method of calculating burden and the accounting method yield the same result, as we will see below.
- In other cases, this accounting method miss-measures the effect of taxes on consumers and firms by ignoring market level effects.

ii. Second, [the economic method] the burden of taxation can be calculated by determining the **losses** imposed on consumers and firms as a consequence of the tax--that is to say the *opportunity cost of the tax*.

a. This method takes account of the effects of taxes on market equilibria and is the approach used by most economists (most of the time).

- It turns out that the market effects on incidence and burden are not affected by "who writes the check."

b. From an economic perspective, the burden of an excise or income tax is measured as the **reduction of consumer surplus and profits** induced by the tax.

- It measures burden by looking at the opportunity cost of the tax. What would profits and consumer surplus have been without the tax? What is it after a tax is imposed? The difference is the tax burden.
- All taxes have such burdens, and in most cases the burden is shared by firms and consumers.
- Moreover, in most cases the burden is larger than the amounts of money shifted to the government as tax revenue.
- (In an indifference curve or utility representation of tax burden, burden is the change in utility associated with the tax.)
-

c. The economic or opportunity cost measure of burden differs from the money paid to the government in several ways.

- First, the total burden of a tax is normally larger than the amount of money that taxpayers send into the treasury.
- Most taxes have a **deadweight loss**, which can be measured as the extent to which "social surplus" is reduced by the existence of a particular tax, which as we will see depends partly on how the taxes are spent.
- Second, the distribution of the tax burden varies with market conditions (the slopes of the relevant supply and demand curves) rather than with who signs the check sent to the treasury, or how the tax law says the burden should be divided up.

iii. In most cases, indirect tax payments are made by persons or firms who do not write checks to the treasury.

a. For example, sales taxes are paid by firms in the sense that firms (or firm owners) actually write the checks deposited in the government's treasury. Calculated as "who writes the check," one could say that the burden of a sales tax falls entirely on firms.

b. However, if firms simply increase their prices to pay for the tax, which is what they appear to do at the cash register, then the tax burden has really been "shifted" onto their customers, even though consumers do not write checks for sales taxes and send them into the treasury.

- (The same logic applies to value added taxes (VATs), which are widely used in other democracies around the world.)

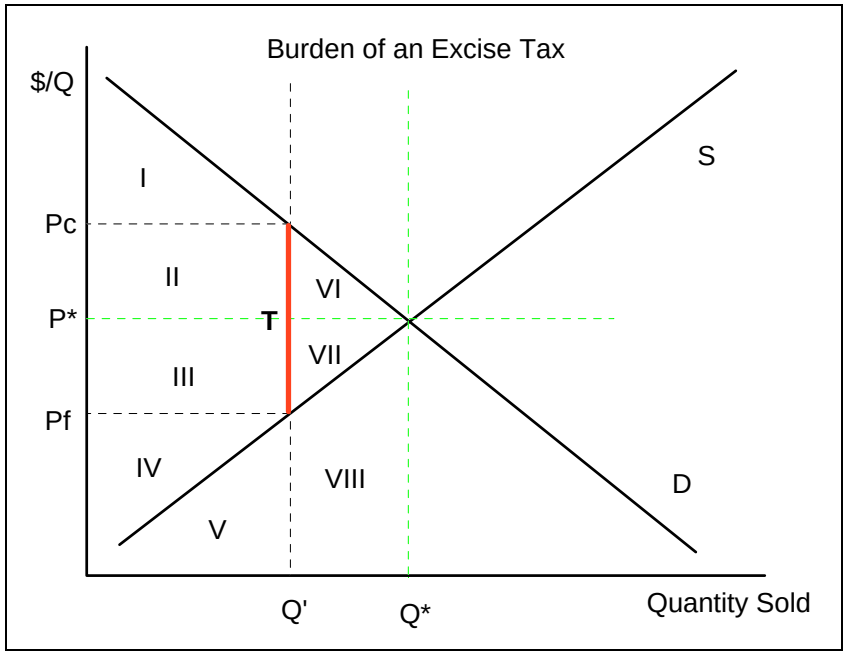
c. In many cases, the persons most affected by a tax are **not** the persons who "directly" pay the taxes by writing out a check to the treasury or IRS!

d. This implies that one can not simply create a law saying that tax burdens are to be shared equally by firms and consumers or by employees and employers.

- Ultimately, the distribution of tax burden depends on the slopes of the demand and supply curves in the markets of interest.
- (See the illustration below.)
- (Similar results hold for monopolists, although the diagrams are a bit different.)

V. The Geometry of Tax Burden

A. Illustration of the economic burden of an excise tax:



i. Suppose that a market is initially in an equilibrium without taxes, so that demand equal supply at P*. In this case, there is no "tax wedge" between the price paid by consumers, Pc, is the same as that received by firms, Pf; so Pf=Pc=P*.

a. Now, suppose that an excise tax of **T** is imposed on each unit of the good sold in this market, as for example is done with tire sales in the US.

b. After the tax is imposed, P* is no longer the market clearing price:

c. If **T** is simply added to P* by firms, consumers will purchase too little at their new price (Pc = P* + T) to match supply, which would remain at Q*.

d. On the other hand, if firms simply "ate" the tax, they would provide too little of the good to meet demand (at their after tax price of Pf = P* - T). Supply would fall and demand would remain at Q* if Pc = P* and Ps = P* - T.

e. **To clear the market**, thus, firms have to receive less than P* per item sold, and consumers have to pay more than P*.

f. At the new equilibrium output, the demand curve will be exactly T dollars above the supply curve, and Qd(Pf + T) = Qs(Pf).

ii. This equilibrium output is shown in the diagram.

- At Q', supply equals demand, if the price paid by consumers is exactly **T** dollars higher than the amount firms receive (Pf = Pc - T).
- Q' units of the good are sold, with Q'<Q*.
- At this equilibrium, there is a sense in which the tax has simply been passed onto consumers, because Pc = Pf + T.

iii. However, there is another sense in which the **burden of taxation is shared** by firms and consumers, because both consumer surplus and profits have been diminished by the tax!

- **Consumer Surplus falls** from area I + II + VI (before the tax at Q*) to just area I after the tax is imposed and output falls to Q'.
- Similarly, **Profit falls** from III + IV+ VII (before the tax at Q*) to area IV (after the tax at Q').

a. The burden on consumers is II + VI, and that on firms is III + VII.

b. Note that **this distribution of the loss of consumer and firm net benefits occurs regardless of who actually writes the check to the state or federal treasury.**

iv. **Price movements ultimately determine the actual division of burden between firms and consumers**.

- If firms send in the check, their effective "payment" is reduced by the increase in price paid by consumers.
- If consumers write out the checks, their effective "payment" is reduced by the price decrease absorbed by firms.

v. The amount of revenue raised by the tax is **T***Q'.

a. Q' units are sold and each pays a tax of **T** dollars.

b. The total tax revenue, **T**Q', can be represented in the diagram area II + III in the diagram.

- (Note that II + III is the area of a rectangle T tall and Q' wide.)

vi. Notice that the tax revenue is smaller than the "surplus" lost by taxpayers (firms and consumers in the affected market).

a. The reduced profit plus the reduced consumer surplus equals {II + VI} + {III + VII}.

b. The total burden of this tax is VI + VII larger than the tax revenue.

c. This area of "excess burden" is sometimes referred to as the **deadweight loss of an excise tax**.

B. Both the extent of the deadweight loss and the distribution of the tax burden vary with the slopes of the supply and demand curves.

i. Generally, more of the burden falls on the side of the market with the least price sensitive curves.

a. If the demand curve is less elastic than the supply curve, more of the burden falls on consumers than on firms.

- In the extreme case in which market demand is completely inelastic or the industry supply curve is completely elastic, all of the burden falls on consumers!

b. On the other hand if the demand curve is very elastic, because good substitutes exist, or the supply curve is relatively inelastic then more of the burden tends to fall on the firm.

- In the extreme case in which the market supply of the product of interest is completely inelastic or consumer demand is perfectly elastic, all of the burden falls on suppliers.

ii. The excess burden of a tax tends to increase with the price sensitivity (slope or elasticity) of the demand and supply curves.

iii. (As an exercise, draw the typical case and the division of burdens implied, then draw an extreme case in which the burden falls entirely on consumers and one where the burden falls entirely on firms. Label all areas and discuss briefly the logic of your analysis.)

C. Both supply and demand tend to be **more elastic in the long run than in the short run**, consequently, the excess burden of taxation tends to be larger in the long run than in the short run.

i. In cases in which long run and short run demand are the same, the fact that long run supply is relatively more price sensitive (elastic) than short run supply implies that the burden of a new tax or increase in tax tends to be gradually shifted from firms to consumer in the long run.

- Many competitive markets have perfectly elastic supply curves in the long run, which implies that narrow taxes on such products are shifted entirely to consumers in the long run.

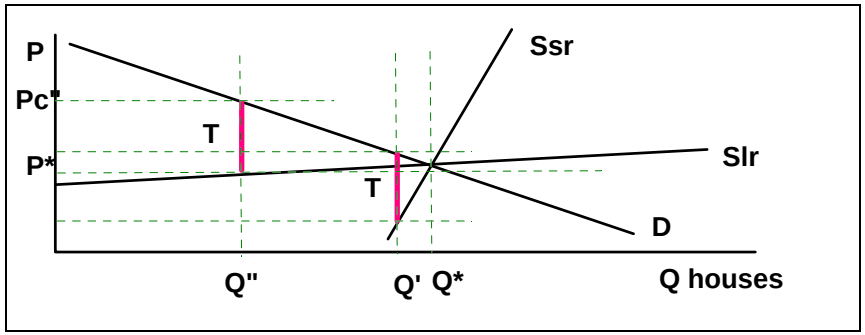
ii. There are, however, also cases in which consumer demand is more price elastic in the long run than in the short run (as when demand for a good is determined in part by consumer capital goods, like automobiles).

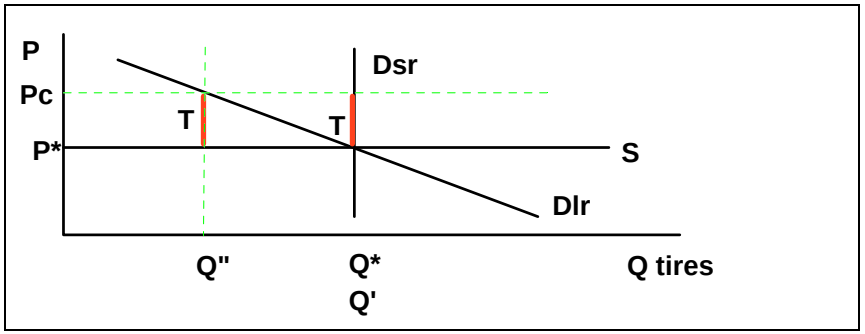
- ♦ In such cases, a tax such as a gasoline tax may be gradually shifted from consumers to firms (owners of capital and natural resources) in the long run.

iii. In cases where both sides of the market (firms and consumers) are more price elastic in the long run than in the short run, the shift of burden will reflect their relative ability to adjust.

iv. However, all such long run adjustments imply that **deadweight losses** to narrow taxes, such as an excise tax, are **larger in the long run than in the short run**.

v. Illustrations: effects of an excise tax in the short run and long run for different kinds of markets





vi.

a. Note that in the first case, supply is more elastic in the long run than in the short run, so the initial effect of the tax is largely on firms, but in the long run the burden is shifted mostly to consumers.

- ♦ The after tax price falls at first for firms, but rises back to P*.
- ♦ The price to consumers rises just a bit at first, but rises to P*+Pc in the long run.

b. The second case is an unusual case where demand is more price sensitive (elastic) in the long run than in the short run, but because supply is completely elastic in both the long and short run, the burden falls entirely on consumers in both the short and long run.

c. As an exercise, construct a case in which the burden falls entirely on firms in both the long and short run.

vii. In some cases, losses of consumer surplus may occur in other markets as a result of excise taxes.

- ♦ For example high gasoline taxes encourage bicycle purchases, which tend to increase the price paid for bicycles, at least in the short run.
- ♦ However, profits rise by nearly as much as the consumer surplus falls, so we will ignore these secondary effects in most of our analysis of tax burdens in this class.

VI. Normative Principles of Taxation

A. Different kinds of taxes have different effects on markets because they affect different markets. Some focus on consumer goods, others on income, others on different kinds of assets (such as real estate or housing), still others on inputs (such as oil or natural gas). Some have different patterns of taxation with different rates on different markets, persons, or types of income

- Normative tax theories attempt to determine whether one tax system can be said to be better than others.
- Generally, economists argue that one tax system is better than another if it has a lower overall burden.
- A minority of economists (chiefly those influenced by James Buchanan) argue that one cannot evaluate a tax system without knowing how the money is spent. A good tax and expenditure system benefits everyone in the country of interest.

B. Although the basic conclusions among normative tax theories are actually fairly similar, they approach taxation in different ways..

C. For example, one normative theory of taxation was proposed by Frank **Ramsay** in 1927. He argued that a system of excise taxes should attempt to **minimize the excess burden** of the tax system.

i. A **Ramsay tax** system imposes higher taxes on markets with relatively inelastic supply and demand curves, and relatively lower taxes on markets with relatively large price sensitivities.

ii. If markets with perfectly inelastic demand or supply curves exist, government services can be financed without any deadweight loss at all, if taxes on such goods can generate sufficient revenues.

a. (Remember that taxes on products with inelastic supply or demand curves generate no deadweight losses.)

b. A special case of such a tax is a tax on land--which is sometimes called a Georgist tax after Henry George who proposed financing government entirely with land taxes. The supply of land, after all, is perfectly inelastic (ignoring dikes and dumps).

c. (**Analyze the limitations**, if any, of a Georgist land tax. Where does the value of a piece of land come from? Would there be allocative affects across different types of land? Would a Georgist land tax be neutral even if it is a Ramsay tax?)

d. (Given the possibility of international emigration, can their actually be a tax that has no dead weight loss? Discuss.)

D. Another normative principle argues that a tax system should not directly affect *relative prices* across markets (see the indifference curve analysis in the appendix).

i. That is to say, a tax system should be **NEUTRAL**.

a. A perfectly neutral tax system would not affect private sector decisions across markets for private goods and services, because a neutral tax does not affect relative prices faced by firms or consumers (although it does, of course, produces revenues for the government).

b. A Neutral system of excise taxes would impose excise taxes so that prices increased by the same proportion in every market taxed.

c. Alternatively, the government could look for somewhat broader or narrower tax sources that do not have relative price effects, such as a general sales tax, or a **lump sum** tax **(head tax**).

ii. The geometry of lump sum taxes and other nearly neutral taxes can be illustrated a bit more easily using indifference curves and budget constraints, as is done in class and in the Appendix below.

- (Systems of excise taxes that generate a proportionate increase in all prices faced by consumers can be illustrated with the tools developed above using demand and supply curves for several markets.)

E. The benefit normative theory of taxation argues that one cannot determine the proper division of the tax burden without knowing the distribution of benefits from the services that are provided.

i. For example, Lindalh argues in favor of a **benefit tax**, that is a tax that imposes the greatest burden on those who receive the most valued services should pay the highest taxes.

ii. Under an ideal Lindalh tax system, each person's *marginal tax rate would be set equal to the marginal benefits* she or he receives from government services.

iii. James Buchanan (who won a Nobel Prize in economics while a professor at GMU, partly for his contributions to public finance) tends to agree with Lindalh.

a. Buchanan argues that proper accounts of tax burden--should focus on net tax burden--that is, they should take account of the services financed by taxes as well as the taxes paid.

b. For example, if a person receives an especially valuable service from the government, it is possible that his or her "true" net tax burden is negative. Others who receive no services of value, might have positive net tax burdens.

c. Ideally, all citizens would bear "negative" tax burdens in the sense that each person should receive services that are considered to be more valuable than the taxes paid.

d. (We will take up the demand and supply of government services later in the course.)

F. Some economists argue that a tax system should be designed to maximize economic growth--or at least to minimize its impact on economic growth. Such economists often favor tax systems that include tax preferences for saving, income from capital, and promote capital formation.

G. Other normative principles of taxation come are rooted in social norms or political philosophies of various kinds--often dealing with **fairness** (or equity).

i. For example, many argue that persons should pay based on their "ability to pay."

a. This notion of fairness tends to imply progressive income taxes.

b. For example, a "fair tax" might be one that caused all taxpayers should all sacrifice approximately the same "utility" (rather than net benefits) when they pay their taxes.

- (Since the marginal utility of money tends to be smaller for rich persons than poor persons, more money would be collected from rich persons than from poor persons.)
- (That is, taxes should be progressive rather than regressive)

ii. Others suggest that fairness requires all persons to pay be treated the same way under a tax system.

- (This notion of fairness tends to imply a flat tax--a proportional tax on income.)

H. [Think about these alternative normative principles and try to identify ones that are more or less compatible with each other and ones that conflict with each other.]

VII. Useful Measures for Thinking about Tax Schedules:

i. Equity based analysis of taxes often focus on the progressivity of a tax system. In those debates, progressivity is assessed relative to household wealth or income.

ii. However, progressivity or regressivity can be assessed relative to the tax system itself, which is the method used in this class.

a. A **progressive tax** is a tax whose average burden increases as the taxable base owned by an individual increases. [Such taxes often have marginal tax rates that increase with the base (increase with income), although not all progressive taxes have this property. Most income tax systems in industrialized countries are somewhat progressive.]

b. A **proportional tax** is a tax whose average tax burden does not change with income. (Such taxes normally have a constant marginal tax rate, as true of most sales taxes and some income taxes. A flat (proportional) tax on income has the form: $T = tY$.)

c. A **regressive tax** is a tax whose average tax burden falls with income. Such taxes often have declining marginal tax rates with ownership of the taxable base, however, not all regressive taxes have this property. An example of a regressive tax in the US is the social security tax--which has a cap on taxable income.

A. Definitions and Relationships:

a. The **tax base**, B, is that which is taxed. (taxable income, sales of final goods and services, profits, property, gasoline, etc.)

b. The **average tax rate** of a particular tax often varies with an individual's holding of the taxable base. If an individual pays tax Ti on a holding of Bi, his average tax rate is Bi/Ti. (If Ti = $50 and Bi = 200, the average tax rate for this tax is 50/200 = 0.25 or 25%.)

c. The **marginal tax rate** of a particular tax is the change in taxes owed for a one unit increase in holdings of the taxable base, $\Delta T/\Delta B$. (So, if a tax payer earning 50,000/year pays a tax of 10,000 and a taxpayer earning 50001 pays a tax of 10,000.50, his or marginal tax rate is 0.50/1 = 50%. Fifty percent of each additional dollar earned is taken from the "last" dollar of income earned by a taxpayer earning 50,000/year.)

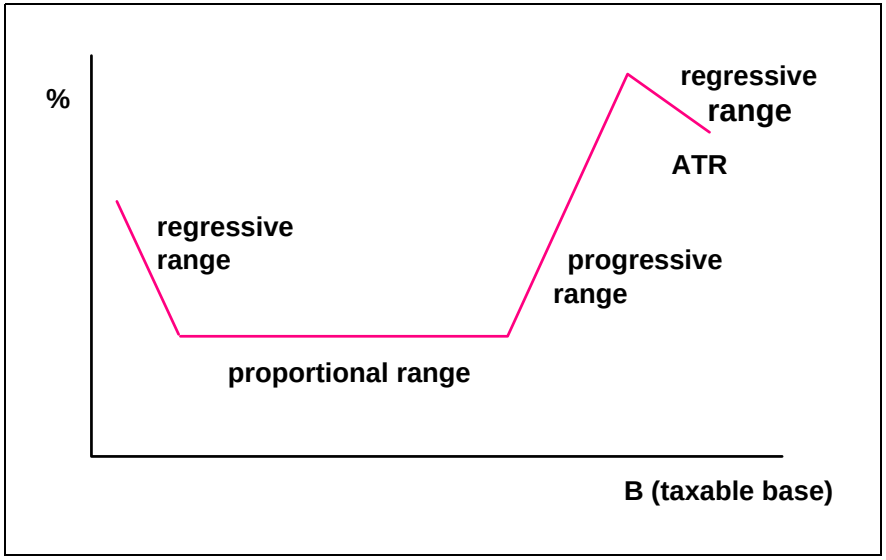
d. **Diagramming average and marginal tax** schedules:

- If MTR is above ATR, then that ATR curve will be rising (the marginal tax rate will be pulling the average up).

- ♦ If MTR is below ATR, then the ATR curve will be falling (the marginal tax rate will be pulling the average down).
- ♦ -If the MTR = ATR, the ATR will be neither rising nor falling.

e. Since individual decisions are determined by marginal cost and marginal benefits at various quantities, **it is the marginal tax rate rather than the average tax that directly affects tax payer behavior i**n most cases.

- ♦ (Thus, one argument in favor of proportional, or indeed, regressive taxes, is that they may have smaller effects on economic activities than a revenue equivalent progressive tax.)



B. (Peckman's estimates of the effective average and marginal tax rates faced by a typical American tax payer, often look a bit like this odd tax schedule.)

i. (As an exercise try to determine what the marginal tax schedule that corresponds to this average tax schedule looks like.)

ii. (Explain briefly why Peckman finds regressive ranges of taxation at both the highest and lowest ranges of income.)

C. Other normative tax theories are unconcerned with the fairness of the tax system and argue that a tax system should attempt to promote economic growth--or at least minimize the reduction in growth associated with raising a given amount of revenue.

i. Such persons often favor consumption taxes in order to encourage saving and investment.

ii. (The effects of a consumption tax on investment is easiest to illustrate with indifference curves and budget constraints, but the intuition behind the effect is simply based on supply and demand. If the price of saving falls relative to consumption, individuals will consume less and save more. And if savings increase, capital will be more rapidly accumulated, which leads to higher income levels and growth rates.)

VIII. Where we are so far

A. To this point in the course, we have used the assumption that people behave rationally in the sense that they attempt to maximize their net benefits to develop a number of insights about how markets operate and how taxes affect markets. We showed that:

i. Persons and organizations such as firms that maximize their net benefits tend to undertake activities at the point where marginal benefits equal marginal costs (when MB curves are initially above MC curves).

ii. That such "rational consumers" will purchase quantities of a good that set their marginal benefits equal to their marginal costs, which can be approximated with the prevailing market price of the good (P).

iii. This can be used to develop an individual demand curve. A similar method can be used to develop an individual firm's supply curve.

iv. These individual demand (and supply curves) pass through points on a consumer's MB curve (a firms MC curve). Thus estimates of individual demand can be used as estimates of their MB curves.

v. Adding the individual demand curves for all consumers in the market (adding up the Qs purchased at a each price) creates the market demand curve. Those demand curves slope downward and can be used to approximate the marginal benefits received by all persons in the market.

vi. Similar derivations of the supply curve show that a market supply curve can be used to estimate the marginal cost of production for an industry--which is to say for all firms in a market.

vii. That markets "clear" implies that prices move to set the quantity of market demand equal to the quantities of market supply.

viii. At this point, it can be said that markets maximize social net benefits because the MB of all consumers is being set equal to the MC of production for the industry. (This efficiency result is one of the

strongest defenses of markets--however it applies only in cases in which externalities are "insignificant" and markets "reasonably" competitive.)

ix. Taxes alter this equilibrium, by adding a third participant to every market transaction, namely the government.

B. Taxes are raised to generate the "money" used to purchase goods and services and to provide subsidies for services that governments (and hopefully voters) want to encourage. Although there is a sense in which taxes are voluntary (e.g. the voters want particular services and subsidies) there is another in which they are involuntary at the point of collection. So many people attempt to avoid paying taxes.

i. The new equilibrium is one where the demand for the good or servie at the price paid by consumers is equal to quantity supplied at the price received by firms (after taxes).

ii. In ordinary markets--those with downward sloping demand curves and upward sloping supply curves--both consumer surplus and profits fall--and the quantity sold falls as a consequence of a tax.

iii. In ordinary markets--those with downward sloping demand curves and upward sloping supply curves--tax burden is shared, which is to say it is borne by both consumers and firms.

iv. The division of the burden varies with the slopes of the supply and demand curve, with the larger burden falling on the side of the market with the most price sensitive (flat) curve.

C. A variety of tax system scan be used to generate tax revenue, and most governments use several tax systems simultaneously such as income taxes, profit taxes, excise taxes, sales taxes, property taxes, and so on.

i. Tax systems can be evaluated normatively in a variety of ways, and have been done so by economists for more than a century.

ii. Examples include: (i) minimize dead weight loss, (ii) try to have neutral taxes, (iii) try to minimize burden in terms of lost utility, (iv) try to make taxes reflect the benefits received from government services.

iii. In general, economists prefer relatively flat and uniform taxes on broad tax bases, because such tax systems advance all of these normative aims.

IX. Appendix A: Analysis of Tax Neutrality Using Indifference Curves: The Case for Broad Based Taxation

A. The behavior affects of alternative tax systems can also be analyzed with indifference curves and budget constraints.

i. The indifference curve approach is better able to characterize the problems associated with narrow tax bases and differential taxation of goods.

ii. It can also illustrate the effects of pure wealth taxes, as with a lump sum tax, more directly than can the net-benefit maximizing models, because consumer wealth is only indirectly represented in MB curves.

iii. (Wealth affects the height of a person's MB curve by affecting his or her willingness to pay for goods and services.

B. ILLUSTRATION. Suppose that there are two goods, Q and X, both of which the consumer normally uses.

i. Indifference curves represent combinations of goods for which a person is indifferent.

ii. They are analogous to the contour lines of a topographical map. But, rather than height above sea level, they represent utility levels.

iii. Consumers want to reach the highest indifference curve possible, given their opportunity (budget) set.

i.

iv. Our previous analysis implies that the effect of an excise tax on a typical consumer is to raise the price of the taxed good from P* to Pc.

v. This increase in price affects the location of each consumer's budget set.

vi. It rotates the budget constraint from the untaxed end of the budget constraint and generates a new budget constraint that lies inside the original one at all points where the consumer purchases positive quantities of the taxed good.

vii. Suppose that "A" is the original (pre tax) bundle consumed by this consumer.

a. In the figure below, the tax has increased price of good 1 from P1 to P1' (this price effect is taken from a supply and demand diagram)

- In the case drawn, the new higher price induces the consumer to purchase bundle **B** instead of **A**.
- (Indeed, A is no longer feasible.)

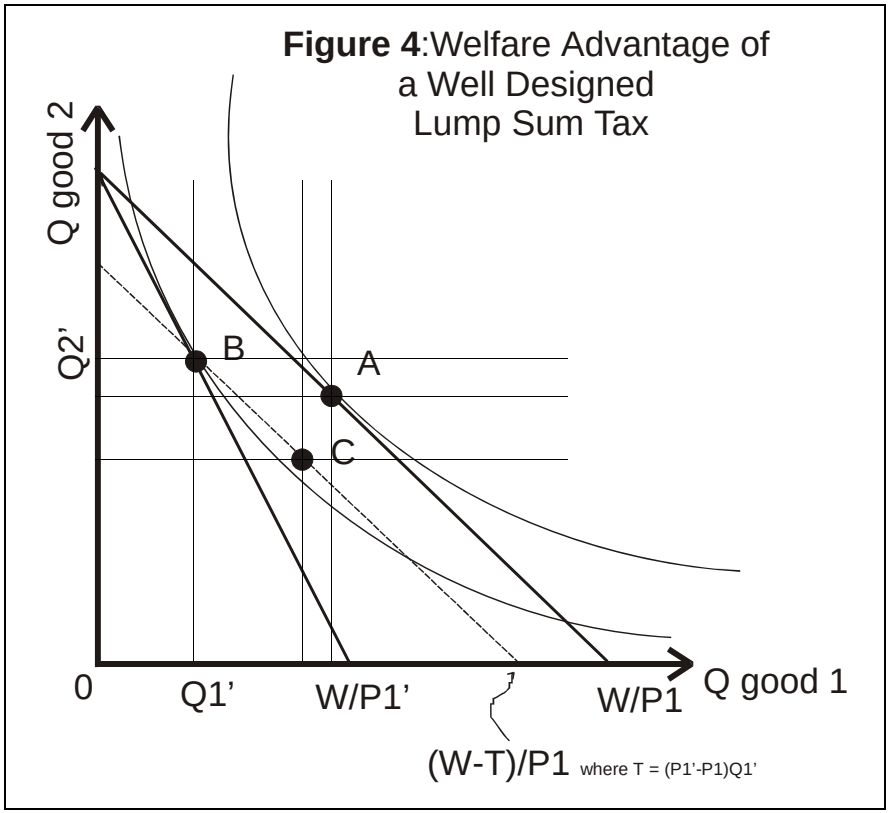


Figure 4:Welfare Advantage of a Well Designed Lump Sum Tax

y

b. It turns out that replacing an excise tax with a broad based or lump sum tax that produces exactly the same revenue from this individual would make him or her better off!

c. If instead of an excise tax on good 1 a lump sum tax (or wealth or sales tax) had been used, the budget constraint would have shifted toward the axis, but the new budget constraint would have the same slope as the original one.

- The "revenue equivalent" lump sum tax passes through point **B** and is parallel to the original (pre tax) budget constraint.

d. Note that a lump sum tax, would have allowed the individual to purchase a bundle like **C** which is on a higher indifference curve (not drawn) than bundle **B**.

- This loss in utility (from being on a lower indifference curve) is another measure of the excess burden of a non-neutral tax on consumers.

e. Much of the deadweight loss is a consequence of reduction in purchases of the taxed good, particularly that part which was generated by the "relative price" effect of the excise tax.

f. You learned in micro economics that every price increase has both a (relative price) substitution effect and a wealth effect on purchases of the good whose price has increased.

- An excise tax that affects consumer prices has both a (relative price) substitution effect and an income effect on purchases of the good whose price has increased because of a tax.
- A lump sum tax only has an income effect.

C. The burden (reduced utility) generated by a broad based tax or a lump sum tax tends to be smaller than that of an excise tax, because these taxes have only a wealth effect.

i. A revenue neutral lump sum tax, a (neutral) general sales tax, and an income tax all shift each consumer's budget constraint towards the origin, but **these taxes do not affect the slope** of the consumer's budget constraint.

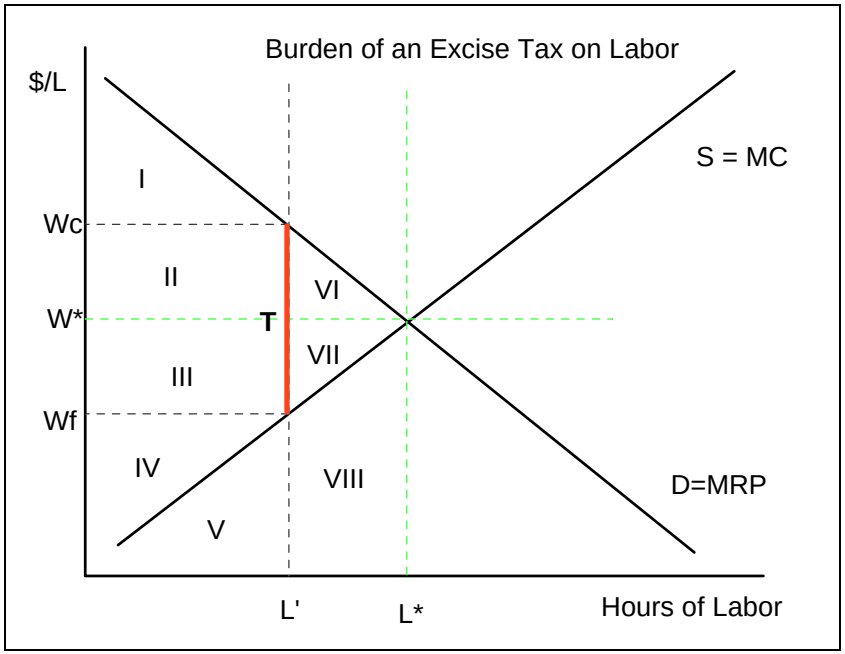
ii. Consequently, general taxes and lump sum taxes tend to have a smaller effect on behavior than excise taxes that raise the same amount of revenue. (There is no "substitution effect.")

X. Appendix B: The Taxation of Work and Labor Income

A. Excise taxes on alcohol and imports were once the largest revenue source for the central government of the United. After the 16th amendment was passed in 1913, income taxes of various kinds gradually became the most important tax revenue source for both then national and state governments.

B. All of the tools that we've developed to look at excise taxes can also be applied to income tax, if we choose the correct market (e.g. label the axes correctly).

C. For example, one can model the effect of a tax on labor income as an excise on the market for labor.



i. Note that this diagram looks the same as the first one in this handout except for the axis labels.

ii. There are, however some slight differences in interpretation.

iii. The tax burden areas are all the same. Changes in the net benefits of those purchasing labor are still II + VI; Changes in the net benefits of those selling labor are still III + VII; the tax revenue raised is still II+III, and so the deadweight loss is still VI + VII.

iv. However, the buyers are now firms rather than "ordinary persons," and the supplier are "ordinary people" rather than firms.

v. So the net benefits that the buyers of labor get should probably be called profits, instead of consumer surplus (area I after the tax), and the area that represent the net benefits of labor (area IV after the tax) could be thought of as labor net benefits or possibly as consumer surplus.

D. One can also use indifference curves and budget constrains to look at the effects of an income tax on patterns of consumption or labor leisure choices.

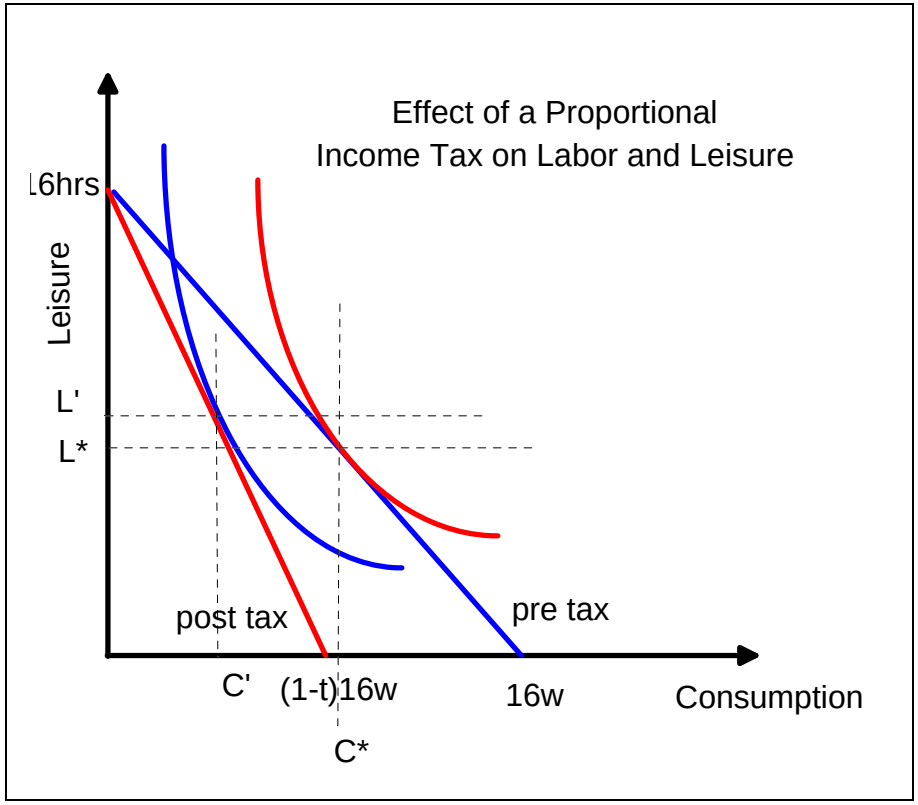
i. With respect to consumption choices, an income tax simply reduces the "W" at the ends of the budget constraints by the same proportion, shifting the original line back to the left in a manner parallel to the original (pre tax) budget line.

ii. Thus an income tax is neutral with respect to consumption choices.

iii. However, and income taxes (and many other taxes) is not neutral with respect to labor leisure choices, as indicated by the above supply and demand analysis of the effect of labor taxes. It tends to discourage labor and increase leisure.

E. To analyze the effect of an income tax on hours worked with indifference curves requires some fresh thinking about how to label the axes. The best labels for this purpose are hours of leisure and income (or consumption of other goods in dollars).

i. In this case the end points of the opportunity set (budget line) are hours available for leisure on the vertical axis and hours available for work times wage rates (dollars of potential consumption) on the horizontal axis.



ii. (I've assumed 8 hours of sleep and eating time is necessary each day, which leaves 16 for leisure or work.)

iii. Notice that an income tax changes the slope of the budget line in this case because it reduces one's after tax wage from w to (1-t)w. The slope of the post tax budget line (in red) is steeper than the pre tax budget line (in blue). After the tax is imposed one has to give up more leisure to obtain a given income or consumption level.

iv. Because of this effect the income tax is not neutral with respect to leisure (which is hard to tax at the same rate [why?]).

v. The person modeled cuts back on consumption, but slightly expands hours of leisure. This effect is consistent with the demand and supply analysis.

vi. [In such diagrams, it is quite possible that the person will choose to work longer hours, reducing his or her leisure as well as her consumption. Draw such a diagram.]

vii. Note that the logic of lump sum taxes would apply in this case as well, but the tax would have to be on available hours (reducing available time from 16 to 14 hours, for example) rather than on income alone. Simply reducing income by amount T, would also change the slope of the line.

viii. Progressivity of an income tax in this type of diagram shows up as changes in the slope of the after tax budget line. The budget line may become a curve (or series of line segments) that becomes steeper and steeper as the tax becomes more and more progressive.

XI. Appendix C: Some useful algebra for describing the effects of taxes on budget constraints

i. The slope of the budget lines can be calculated *for the lump sum, sales and income taxes.*

a. A budget line has the form $W = P_1Q_1 + P_2Q_2$

b. The place where the budget line intersects the Q_1 axis is that where $W = P_1Q_1$ or where $Q_1 = W/P_1$

c. The place where the budget line intersects the Q_2 axis is that where $W = P_2Q_2$ or where $Q_2 = W/P_2$

d. Recall that slope is "rise over run."

e. In the case without taxes, the slope of the budget line is $-(W/P_1) / (W/P_2)$, which simplifies to $- P_2/P_1$.

f. One can also fined the slop using a bit of algebra. Write the budget line as Q_2 as a function of Q_1 and W.

- One algebraic route is to subtract P_1Q_1 from both sides to obtain: $P_2Q_2 = W - P_1Q_1$,
- or $Q_2 = W/P_2 - (P_1/P_2)Q_1$
- Note that the budget line is now in the form Y = C + BX, where B is the slope of the line, here $- (P_1/P_2)$.

ii. Applications of slope to assess tax neutrality.

a. In the case of a lump sum tax, the endpoints of the new budget line become (W-T)/P2 and (W-T)/P1.

- The slope of the new budget constraint is $-[(W-T)/P_1]/[(W-T)/P_2]$ which equals $- P_2/P_1$.

b. In the case of a proportional income tax, where W is treated as income, the after tax income is (1-t)W, so the endpoints of the new budget line are $((1-t)W)/P_2$ and $((1-t)W)/P_1$.

- The slope of the new budget line is: $-[(1-t)W)/P_1]/[((1-t)W)/P_2] = - P_2/P_1$.
- A broad based income tax (e.g. one without deductions) is a neutral tax.

c. Similarly, in the case of a general sales tax the new after tax prices will be approximately $(1+t)P_1$ and $(1+t)P_2$. (What assumptions about supply and demand are sufficient for this to be exactly true?)

- The slope of the new budget line will be $-[(W)/(1+t)P_1]/[((1-t)W)/(1+t)P_2]$, which again can be shown to equal $-P_2/P_1$.
- So a broad based sales tax is neutral.

d. All three of these taxes are "neutral" with respect to the choice illustrated in our diagram.

- None of these taxes change the relative prices of goods 1 and 2. It remains $-P_2/P_1$ in each case.
- (Note however that sales taxes have an effect on a consumers decision to save, and income taxes have an effect on a consumer's decision to work.)

iii. In some cases that we will examine later in the course (Pigovian taxes), the purposes of a tax may be to change behavior.

- In such cases, excise taxes and other "marginal" taxes will be more effective at altering behavior than lump sum or general taxes.
- We will discuss the use of (Pigovian) taxes to "internalize" externalities after the midterm exam.

iv. **The algebra that shows how to calculate a lump sum tax that generates the same revenue as an excise** (narrow base) **tax**.

a. The pretax budget line is $W = P_1Q_1 + P_2Q_2$
   - The slope of this budget line is $-P_1/P_2$
   - See above

b. Suppose that a tax on good 1 raises its price to $(1+t)P_1>P_1$

c. The new budget line is: $W = (1+t)P_1Q_1 + P_2Q_2$
   - The slope of this budget line is $-(1+t)P_1/P_2$
   - See above

d. Suppose that (Q_1', Q_2') is the bundle chosen after the tax is imposed.

e. The amount collected from the individual from the tax is tP_1Q_1'.

f. The equivalent lump sum tax is thus $T = tP_1Q_1'$

g. Under that tax, the taxpayer's budget line would be:

$$W - tP_1Q_1' = P_1Q_1 + P_2Q_2$$

   - The slope of this budget line is $-P_1/P_2$
   - See above

h. Intuitively, this line should go through the point (Q_1', Q_2') because the consumer should still be able to afford that bundle. Let's see if we can prove that it does.

i. Note that with the original post tax budget line,
   $W = (1+t)P_1Q_1' + P_2Q_2'$ (the bundle bought was feasible)

j. This can be rewritten as: $W = P_1Q_1' + (t)P_1Q_1' + P_2Q_2'$

k. Subtracting yeilds: $W - tP_1Q_1' = P_1Q_1' + P_2Q_2'$

l. Notice that this expression simply describes a point on the lump sum budget constraint, under "g".

m. That is to say this particular point is common to both budget lines.

n. Thus the revenue-equivalent lump sum tax creates a new budget constraint that is parallel to the original budget line and passes through the bundle chosen under the excise tax.

o. QED

I. Government Expenditures

A. Most taxation and government borrowing is motivated by desires for services of one kind or another, from missiles to medicine, from social insurance to bicycle trails.

i. In democracies, the services provided reflect moderate voter interests for the most part. The majority of a community may want roads, police protection, and safe water supplies. It may also want public schools, unemployment insurance, festivals, and libraries. Nationally, it will want national security or defense.

ii. In addition, there are occasional emergencies that they want their governments to take care of. A sudden collective emergency may have to addressed with new social services (temporary emergency housing and food) or social insurance (flood insurance). A tornado may pass through town, an invading army may be on its way, or the Olympics may be hosted.

iii. In a monarchy or autocracy, the government is less responsible to its citizens, but many of the same services are also provided and have to be paid for in some way. Taxes are again commonplace.

B. There are exceptions to this general rule.

•Rather than services, voters may want to discourage certain activities and impose "sin" taxes on those activities to discourage them. Here the purpose is not taxation to fund services, but to change behavior.

•In addition to voter interests, the supply of government services may be influenced by interest groups, who may want particular activities subsidized from public funds, because they expect to profit by producing, rather than consuming, the government services.

•We'll take up the politics of elections and interest groups after the midterm.

C. However it is clear that **if you want to understand the magnitude of taxes you have to understand the political demand for government services (and transfers).**

II. Government as another "demander"

A. Most of a government's expenditures takes the form of direct payments for (i) goods and services, (ii) social insurance payments to individuals (as with social security, unemployment insurance, and welfare expenditures), and (iii) subsidies of various kinds (such as those for health care, education, and research and development).

B. In cases in which the government produces services, the government is a major input demander. Many services such as national defense, mass transit, law enforcement, and highway construction are paid for entirely with tax revenues.

C. Many others are "hybrids" that are partly paid for by the government and partly by individuals. The government's share in these cases are subsidies--they reduce the cost of the service for individuals and/or firms and so encourage the production and use of such services.

i. Public universities are a typical "hybrid" service and the the government's share can be analyzed as a subsidy.

- For example, education at WVU is organized by government agencies, which have buildings constructed, hire teachers, mow the grass, shovel the snow, etc.
- However, most of the cost is paid for with student tuition. , partly by state tax payers, and partly from grants and gifts of various kinds.
- State "subsidies" reduce the cost of education through direct payment and through its monosony power as a buyer of large buildings and other facilities. About 15% of WVU's operating costs are paid for by the state government.

D. This handout and the lectures associated with it in class analyze how expenditures, especially subsidies, affect market outcomes.

i. Government expenditures, like taxes, have direct affects on economic outcomes.

ii. When governments are major purchasers of goods and services or inputs they affect market prices.

- They may also affect market structure by contracting with single providers for most of services. This may transform a more or less competitive market into a concentrated industry or monopoly, as in various markets for defense products.

iii. When governments subsidize a good or service, it generates a price wedge between buyers and sellers. Prices move to clear markets, but with firms receiving more for their services and products than consumer pay for them. (Subsidies are like "negative" taxes in terms of their economic effects--as we will see later in this handout.).

E. The micro-economic effects of government expenditures can be modeled using the same tools that we used to analyze the effects of taxation.

i. In the case of purchases of goods and services, or of inputs to use to produce such goods and services, the effect is simply to increase the market demand for these goods, driving up their prices, and inducing greater supply.

ii. However, the new demand curve is no longer a sum of individual marginal benefit curves--since the government is not an individual.

iii. The effects of subsides are similar, but opposite, to those of taxes.

III. On Government Demands for Services

A. Many government services are directly produced by governments.

B. In such cases, governments demand inputs (labor, land, capital) and use those inputs to create public services.

i. Government in such cases is simply another "firm" or "consumer" of particular services or goods.

ii. It's demand for those services, although not grounded in an individual's net benefit calculations is otherwise just another demand curve in the market of interest.

iii. Such demands affect market prices by contributing to the overall demand for the inputs demanded.

iv. (For example, the production of education bids up price for teachers, buildings, and various supplies.)

C. An alternative to producing a service is to induce or pay other organization to produce and distribute services by paying for them.

i. Such cases include much of defense expenditures, which are largely produced by private firms, highway construction, which is largely built by private firms working for the government, and many other services.

ii. In such cases, the government is a major demander of final goods and services and again its demand--although not directly arising from net benefit maximizing choices--is simply one of many in the relevant market.

iii. Its effects on market prices and output arise are very similar to other increases in demand for goods and services.

D. In what might be regarded as hybrid cases, governments may attempt to induce some goods and services to be produced and purchased by subsidizing them rather than paying their full cost.

- **In this case, the price received by producers is usually greater than that paid by consumers, $P_f = P_c + S$, rather than less than it**.
- Many government programs are subsidies in that they indirectly reduce the price of a service for consumers and raise them for producers.
- Not all "subsidies" are call that by the government or newspapers.

IV. On the Microeconomics of Subsidies

A. The main focus of our analysis of government expenditures is on the effects of targeted government subsidies, because the effects of direct purchases and transfers are so easy to analyze

- In the case of direct purchases, the demand for the service of interest shifts out to the right when governments increase their purchases, causing prices to rise and output to rise in the market of interest.
- A transfer payment increases the income of the recipient, which increases his or her demand for normal and superior goods and reduces them for inferior goods.

B. As with taxes, the distributional effects of a **subsidy** can be measured in two ways:

i. First, it can be calculated as an accountant might, as a cash receipt similar to ordinary income is calculated.

- (This is the most widely used measure by macro-economists, accountants, and newspaper reporters.)
- This approach implicitly assumes that the entire benefit of a subsidy accrues to the persons or firms that receive the "check" from the treasury.

ii. Alternatively, the distribution of benefits can be calculated by determining the **net benefits** generated by the subsidy relative to the "no subsidy state."

- That is to say, the net benefit of a subsidy can be measured as the **increase in consumer surplus and profits** generated by the subsidy.
- (This measure of the effects of a subsidy program is the most widely used among microeconomists and public economists.)

iii. As in the case of taxes, there is a difference between the cost of the subsidy (amount paid out) and the amount of additional consumer surplus and profit generated.

- ♦ Subsidies tend to extends trades beyond the level at which trade produces marginal benefits greater than marginal costs.
- ♦ However, the net benefits of a subsidy tends to be less than the amounts spent and less than the cost of the taxes raised to finance them.
- ♦ The **deadweight loss of a subsidy** is the extent to which "social surplus" is increased by a particular subsidy relative to the cost of the subsidy.

- The dead weight loss of "targeted" or "cost sharing" subsidy is analogous to that associated with an excise tax.
  - ♦ The economic cost of a subsidy also includes the excess burden of the taxes used to finance it.
  - ♦ The diagrams developed below focus on the expenditures associated with a the subsidy, but the excess burden of the taxes used to pay for the subsidies should be kept in mind--even though they are not included in the diagrams. (A dollar of tax revenue costs more than a dollar to collect.)
  - ♦

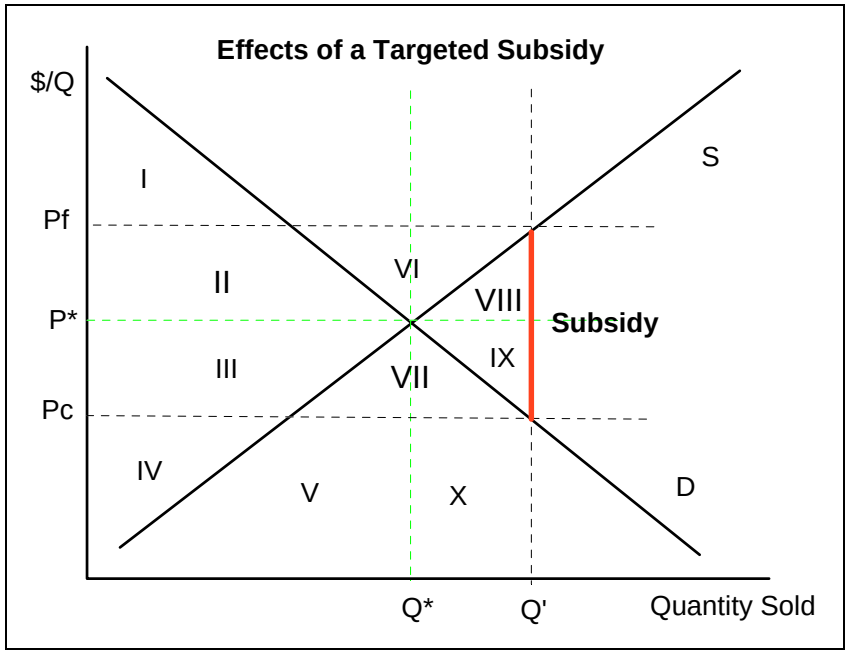
iv. At the level of individuals, both net benefit diagrams and indifference curve analysis can be used illustrate how different kinds of subsidies (marginal, lump sum, conditional and unconditional) affect rational decision makers.

- We will again focus on the net benefit or supply and demand approach, and spend less time on the utility approach.
- In this case, the utility-approach yields insights that can't be generated using the supply and demand approach. So we'll need to use that tool bag a bit to examine some of the more subtle effects of taxes and subsidies.

v. The market level effects can be analyzed using supply and demand curves, as we did in the previous lectures for excise taxes.

- ♦

C. The Essential Geometry of Subsidies:



i. Suppose that a market is initially in an equilibrium without subsidies or taxes, so that demand equals supply at P*. In this case, there is no "subsidy wedge" between the price paid by consumers, Pc, is the same as that received by firms, Pf; so Pf=Pc=P*.

- Now, suppose that a subsidy of **S** is imposed on each unit of the good sold in this market, perhaps a rent subsidy.
- After the subsidy is place, P* is no longer a market clearing price:
- If S is simply subtracted from P* by firms, consumers will want to purchase too much at their new price (Pc = P* - S) to match supply, which would remain at Q*.
- On the other hand, if firms simply "kept" the subsidy, they would want to provide more units than can be sold. The supply at Pf = P* + S is greater than the demand at P*, which would remain at Q* since in that case Pc = Q*.
- **To clear the market**, thus, consumers have to pay less than P* per item sold, and firms have to receive more than P*.
- **At the new equilibrium output**, the demand curve will be exactly B dollars below the supply curve, Qd(Pf - S) = Qs(Pf).

ii. At the new equilibrium output, as depicted above, supply equals demand, and the price paid by consumers is exactly **S** dollars lower than the amount firms receive (Pf = Pc + S). Note also that Q' units of the good are sold, with Q'>Q*.

- At this equilibrium, there is a sense in which the targeted subsidy has simply been *taken* by firms, because Pf = Pc + S.
- However, there is another sense in which **the benefit of the subsidy is shared by firms and consumers**, because both consumer surplus and profits have been increased by the subsidy!
- Consumer Surplus increases from area I + II (before the subsidy at Q*) to area I + II + III + VII after the subsidy is in place and output rises to Q'.
- Similarly, Profit increases from III + IV (before the subsidy at Q*) to area III + IV +II+VI (after the subsidy at Q').
- Thus, the benefit for consumers is III + VII , and for firms is II+VI.

D. Note that **the increase of consumer and firm net benefits exists regardless of who actually receives the check from the state or federal treasury as long as demand curves slope downward and supply curves slope upward.**

i. Price movements ultimately determine the division of benefits between firms and consumers.

- ♦ If firms receive the check, their effective "receipt" is reduced by the decrease in price paid by consumers.
- ♦ If consumers receive the checks, their effective "receipt" is reduced by the price increase of firms in the market subsidized.

ii. The money paid out by the treasury is **its fiscal cost, S***Q'.

- Q' units are sold and the "government" pays **S** dollars toward each unit sold.
- Consequently, the total expenditure, **S**Q', can be measured with area II + III +VI + VII + VIII + IX in the diagram. (The area of a rectangle Q' wide and S tall is Q'S.)
- Note that this "cash" measure of the cost of the subsidy is **larger** than the "net benefits" generated by it.
- The increase in industry profit plus the increase in consumer surplus equals (II + +VI) + (III + VII).
- The total benefit of this subsidy is VIII + IX smaller than the cost of the program.
- This area of "lost net benefits" is sometimes referred to as the **deadweight loss of a targeted** (or "marginal") **subsidy**.

iii. The **true economic cost** of a subsidy is larger than the direct fiscal cost of the subsidy, because of the DWL of the taxes used to finance the subsidy program and the administrative cost of both the subsidy program and tax collection.

E. Both the extent of the deadweight loss and the distribution of the benefits vary with the slopes of the supply and demand curves in the subsidized industry.

i. Generally, relatively more of the benefit is realized by the side of the market with the least price sensitive curves.

- That is to say, if the demand curve is less elastic than the supply curve more of the benefit is received by consumers than firms. (In the extreme case in which market demand is completely inelastic or the industry supply curve is completely elastic, all of the benefit falls on consumers!)
- On the other hand if the demand curve is very elastic, because good substitutes exist, or the supply curve is relatively inelastic then more of the benefit of a subsidy goes to firms in the subsidized industry. (In the extreme case in which the market supply of the product of interest is completely inelastic or consumer demand is perfectly elastic, all of the benefit goes to suppliers.)
- The excess benefit of a subsidy tends to increase with the price sensitivity (slope or elasticity) of the demand and supply curves.

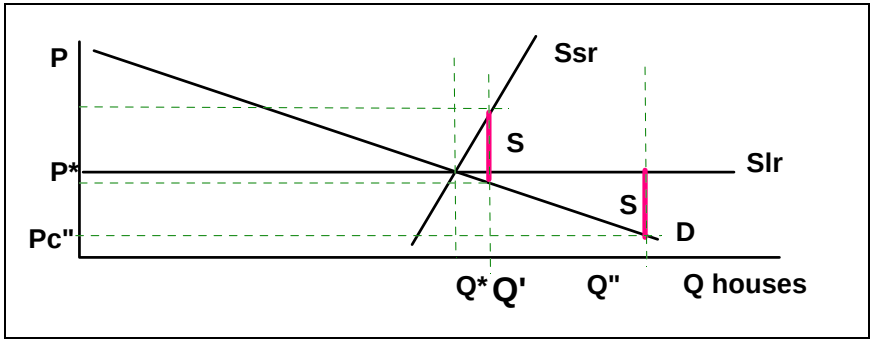
F. Supply and demand curves tend to be **more elastic in the long run than in the short run**, so the excess burden of a subsidy tends to be larger in the long run than in the short run.

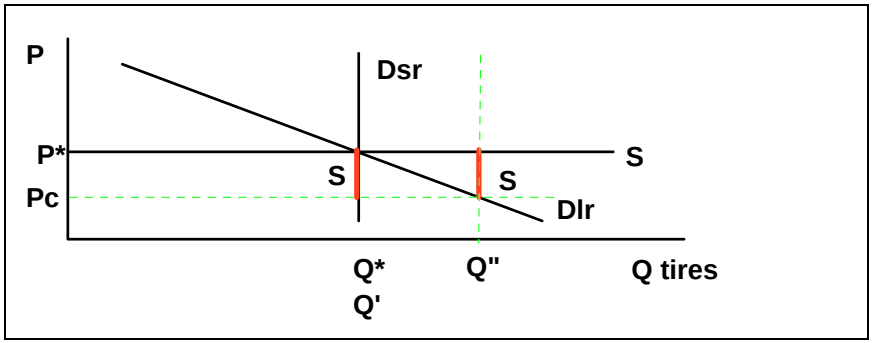
i. Insofar as long run supply is relatively more price sensitive (elastic) than demand in the long run, the benefit of a new subsidy or increase in subsidy tends to be *gradually shifted from firms to consumer* in the long run.

- For example, Marshallian competitive markets have perfectly elastic (horizontal) supply curves in the long run, which implies that narrow subsidies on Marshallian products are shifted entirely to consumers in the long run.

- In cases in which only consumer demand is more price elastic in the long run than in the short run (as when demand for a good is determined in part by consumer capital goods, like automobiles), a subsidy for gasoline or highway use tends to be gradually shifted from consumers to firms (owners of capital and natural resources) in the long run.
- In cases where both sides of the market (firms and consumers) are more price elastic in the long run than in the short run, the LR distribution of the benefit will reflect their relative abilities to adjust. However, all such long run adjustments imply that deadweight losses from targeted subsidies are larger in the long run than in the short run. (The height of the DWL triangle does not change but its length increases.)

ii. Illustrations: effects of an excise subsidy in the short run and long run for different kinds of markets--one with short and long run supply curves, the other with short and long run demand curves.





- Note that in the first case, supply is more elastic (flatter) in the long run than in the short run, so the initial benefit from the subsidy is largely for firms, but in the long run the benefit is shifted to consumers.
  - ♦ The after subsidy price falls at first for firms, but rises back to P*. The price to consumers falls just a bit at first, but falls to P*+Pc in the long run.
- The second case is an unusual case where demand is more price sensitive (elastic) in the long run than in the short run.
  - ♦ However, because supply is completely elastic in both the long and short run, the benefit falls entirely on consumers in both the short and long run.
- **As an exercise, construct a case in which the benefit goes entirely to firms in both the long and short run.**

G. One advantage of calculating the benefit of a subsidy as the change in profit and consumer surplus generated by that program rather than total government expenditures **is that allows one to calculate how the benefits of a subsidy are distributed within the markets subsidized.**

i. The benefits of a subsidy are often realized by persons or firms who are do not directly receive the subsidy payments.

ii. For example, a rent subsidy is normally paid to renters who are able to pay more for housing than they could before.

This bids up rents and the prices of rental housing, which benefits land lords and builders.

Calculated as cash payments, one could say that the benefit of a rent subsidy is realized entirely by renters.

However, if landlords increase their prices (rent), then the benefit of the subsidy has really been "shifted" forward from renters to land lords, even though landlords never actually receive a check from the government treasury.

iii. In many cases, the persons most affected by a subsidy are not the persons who "directly" receive the subsidy checks or coupons

iv. Thought question: why do farmers favor food stamps?!

V. Normative Principles of Subsidy Programs

A. Evaluating the normative merits of a subsidy program requires analysis of net benefits associated with a subsidy.

i. Based on the geometry above, it is clear that the net benefits of most subsidies are smaller than their costs, because the increase in social surplus is normally less than the money spent on the program.

ii. The diagram actually underestimates the deadweight loss because it neglects the cost of raising that money, which includes the deadweight loss of the tax used and other collection costs.

iii. In cases in which, equity or redistribution is the goal of a subsidy (as with **food stamps** and many rent subsidies), the distribution of net the subsidy benefits will also matter.

- Do the benefits mostly go to the poor, or to those selling services to the poor?
- In such cases, "distribution of burden" diagrams are necessary to analyze the relative merits of alternative subsidy programs (or, their equivalent mathematical representations).

iv. There are also cases in which social net benefits increase as a consequence of the subsidy (Pigovian subsidies), but these will be dealt with after the midterm.

- In all of these cases, distribution of burden diagrams can also be used to analyze political incentives that various groups have to lobby in favor or against particular subsidy or tax programs, as we will see in future lectures.)

B. It is also possible to utility-based geometric tools to determine the relative merits of alternative subsidy programs as we did with alternative taxes. (See the appendix of hand out 3.)

- Lump sum subsidies will generally have a smaller deadweight loss, as shown below, than marginal subsidies or matching grants.

C. The relative merits of lump sum and marginal subsidies (block and matching grants) can be assessed using the indifference curves and budget constraints in a manner very similar to that used at the end of hand out 3 to analyze the effects of lump sum and marginal taxes (uniform broad based and narrow based taxes).

D. Illustration of the inefficiency of matching grants (marginal subsidies).

i. Suppose that "Al" is purchase two goods and that one of these is subsidized in a manner that reduces its effective price (as in the demand and supply diagrams above).

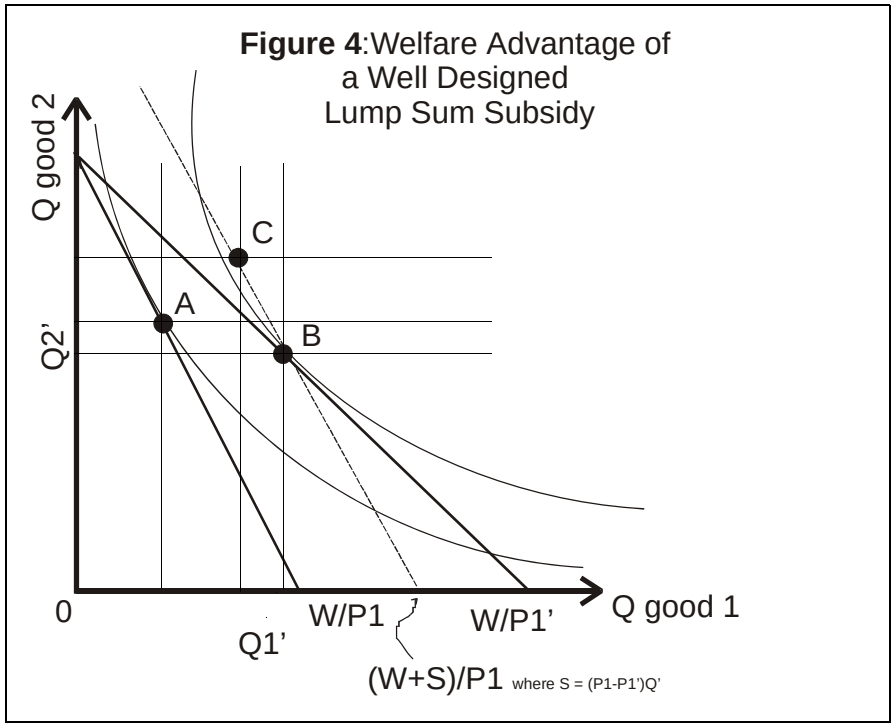


Figure 4:Welfare Advantage of a Well Designed Lump Sum Subsidy

- Suppose that "A" is the original (pre subsidy) bundle consumed by a consumer.
- The subsidy decreases the relative price of good 1 from P1 to P1'
  - ♦ This change in prices causes a new budget constraint and induces the consumer to purchase bundle B.
  - ♦ Note that the consumer has more utility at B than at A, because she is on a higher indifference curve.
  - ♦ However, the same amount of government money would have increased her utility by even more, if it were given as a lump sum grant or subsidy.

ii. The **cash-equivalent lump sum subsidy** produces a budget constraint parallel to the original one (with the same relative prices) passing through bundle B.

- Note that under the equivalent lump sum subsidy, Al could have purchased bundle C which is better than bundle B.

- C is on a higher indifference curve than B is, so it produces more utility for Al than B does.
  - The cash equivalent lump sum subsidy is equal to [(P1-P1')*Q1', the change in the consumer's price induced by the subsidy time the number of units purchased.
  - Notice that this is an intuitive result--most people would prefer cash to a discount coupon, because the cash can be spent on many things and the coupon only on the thing being discounted.

iii. The difference between the utility produced by a lump-sum subsidy and the marginal subsidy is a measure of the deadweight loss or inefficiency of a marginal subsidy.

- The lower utility of the targeted subsidy suggests that such subsidies (ones that directly change relative prices) tend to be less efficient than those which do not, as with a lump sum tax.
- That is to say "**neutral**" subsidies tend to be more efficient ways to increase recipient utility (welfare) than marginal or matching grants.

iv. Normatively, this diagram implies that a subsidy system "should be" **NEUTRAL** if it wants to maximize its effect on consumer welfare represented with utility.

- The above diagram demonstrates that a marginal subsidy yields a smaller increase in welfare than possible from an equally expensive lump sum or general subsidy--other things being equal
  - A perfectly neutral subsidy system does not directly affect private decisions across markets for private goods and services, because it does not affect relative prices faced by firms or consumers.
  - It does however, increase demand for normal goods and reduce demand for inferior goods, which will have some relative price effects.
  - And, of course, even neutral subsidies have to be paid for with taxes or loans.
- (In cases where the purpose of the subsidy is to **change behavior**, a marginal or targeted subsidy tends to be more effective than a lump sum subsidy, because they have a larger direct effect on behavior. We take up "Pigovian subsidies and taxes after the mid term exam.)

v. This effect is harder to analyze with supply and demand curves, although they can be represented with those curves as well.

  - A direct subsidy or marginal subsidy has the effect in the diagrams at the beginning of this section.
  - A lump-sum subsidy increases consumer income and increases his or her demand for all goods.
  - However, there is no way to determine which is better for consumers without knowing exactly how all the demand curves shift and measuring the associated net benefits.
  - This is, of course, why we use indifference curve analysis here. It is the only case in this course in which the conclusions of utility-based analysis are clearer and easier to represent than those grounded in the net-benefit maximizing model.

E. ALGEBRAIC APPENDIX FOR CASH EQUIVALENT SUBSIDIES

i. That the line passing through bundle B and parallel to the original budget constraint characterizes the consumer's budget constraint under the **equivalent** (equally costly) lump sum subsidy to the marginal (or matching) subsidy assumed can be demonstrated with a bit of **algebra**.

- The original budget constraint is $W = P_1Q_1 + P_2Q_2$, which includes all the combinations of Q_1 andQ_2 that can be purchased for W dollars at the (pre subsidy) market prices P1 and P2.
  - The budget constraint after the marginal subsidy on good 1 reduces the consumer's price for good 1 from P_1 to $Pd = P_1\text{-}S$ (which is shown as P1' in Figure 4).
  - So the budget constraint with the subsidy can be written as: $W = PdQ_1 + P_2Q_2$ or $W = P_1'Q_1 + P_2Q_2$.
- The specific combination of goods 1 and 2 selected by the consumer under the marginal or targetted subsidy is bundle B which is labeled as (Q1', Q2').
  - That point lies on the subsidized budget constraint so $W= PdQ_1' + P_2Q_2'$
- It is convenient to rewrite Pd as $P_1\text{-}S$ to get W= (P1-S)Q1' + P2Q2'
  - so $W= PdQ_1' + P_2Q_2'$ $W = (P_1\text{-}S)Q_1' + P_2Q_2'$ which implies that
  - $W = P_1Q_1' + P_2Q_2' - (SQ_1')$ (at point B)

ii. If the amount SQ_1' had been simply given to the consumer as a "lump sum," rather than the cost of good 1 subsidized, his or her new budget constraint would have been:

  - $W + (SQ_1') = P_1Q_1 + P_2Q_2$
  - Note that this **new budget line includes** the point (Q_1', Q_2'), point B on the diagram.

- The "lump sum equivalent" budget constraint, thus, passes through point B and is parallel to the original one (without a subsidy).
  - Both the pre-subsidy budget constraint and the budget constraint with a lump sum subsidy have the same slope, namely: -(P1/P2).

VI. More Complex Subsidies: Conditional Marginal and Lump-Sum Subsidies

A. The above examples are what might be called "unconditional" subsidies. The lump sum subsidies could be spent on anything that a person wants and the cost reducing subsidies applied to all units of the good purchased.

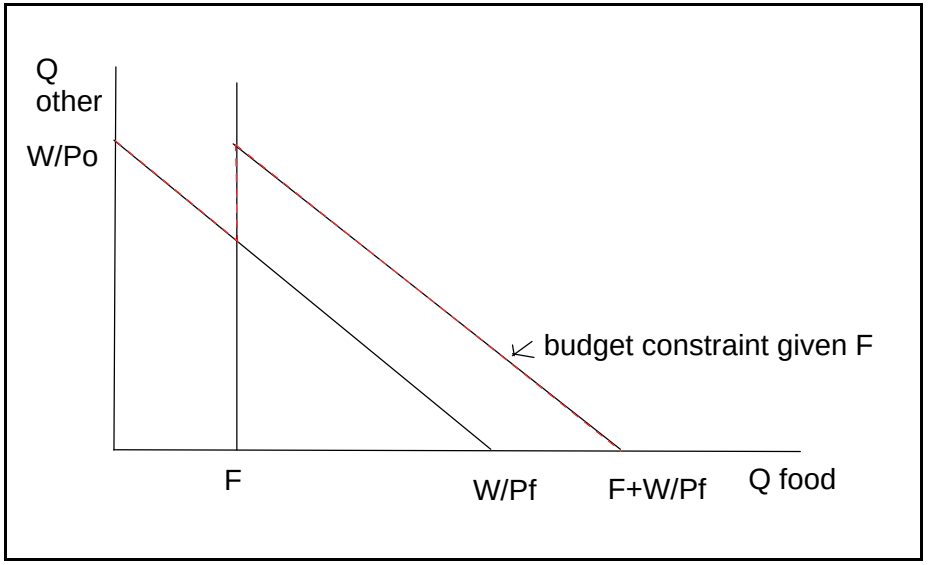
i. These are not the only kinds of subsidy programs that can be designed.

ii. Subsidy programs can also be conditional in the sense that the amount received under a lump sum subsidy might have to be spent on particular things (such as food) or a cost reducing subsidy might only be available for small purchases or for large purchases.

iii. Such conditional subsidies can also be analyzed with our geometric tool box, although the geometry (and mathematics) tends to be more complicated.

B. Illustrations of Conditional Subsidies

i. Consider a lump sum grant that has to be spent on food (as in the present food stamp program).
  - Note that if one simply spent all of the conditional lump sum subsidy on food one can purchase amount F of food and W/Po of the other goods.
  - However, if less than F units of food are purchased, one will not get the subsidy and be on his or her original budget line.
  - There is a kink in the budget constraint at F (assuming that the food cannot be resold on the black market).
  - Note that a person that finds this "corner" to the his or her utility maximizing combination of food and other goods will not necessarily be at a point where his or her indifference curve is tangent to his or her budget constraint. (Draw this case and explain why this happens.)



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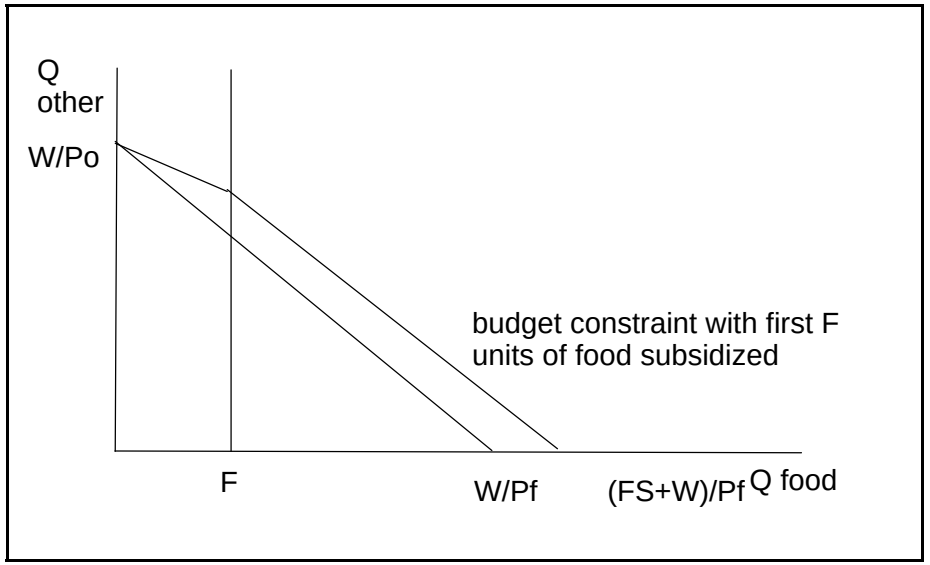
ii. Consider a similar targeted (cost reducing) subsidy that applies only to the first F units of food purchased.
  - The price of food falls by S dollars per unit for the first F units. After the subsidy is exhausted, the consumer has to pay the prevailing market price for additional food.
  - Note that there is again a kink in the budget constraint, but one that is less sharp.



•iii. Our earlier analysis suggests that it is possible to shift from a conditional targeted grant to a conditional lump sum grant and make (most) persons better off.

- Is this true in this case? Why or why not?
- As an exercise illustrate this point and explain its logic. Hint, a conditional lump sum grant for many people is equivalent to an unconditional lump sum grant.)

VII. Appendix: Tax Subsidies, Printing Money, and Borrowing

A. Most income tax systems include a variety of exemptions and deductions that define taxable income.

i. On the one hand, these simply define what the tax base is.

ii. In some cases, adjustments are necessary to determine economic income, itself, which is net receipts concept.

iii. On the other hand, many of the deductions are implicit subsidies of one kind or another, in the sense that one can think of a deduction or exclusion as a separate subsidy program.

- For example, suppose that there was a simple flat tax of 25% on all economic income and that interest on mortgages is deductable.
- That implies an implicit 25% subsidy for mortgages because a tax schedule of:
  - $T' = .25(Y - M)$ where Y is economic income and M is the mortgage payment is equivalent to a flat tax $T = .25Y$ plus a subsidy of $S = .25M$
  -
  - Note that the taxpayer's after tax income in this case is
  - $Y-T+S = .75Y + .25M$
  - which is the same as that under the first tax with a mortgage deduction
  - $Y-T' = Y-(.25(Y - M)) = Y-.25Y+.25M = .75Y + .25M$
- In this sense, many adjustments to an income tax can be thought of as "tax subsidies."

iv. The normative implications of such subsidies can be analyzed with either tax or subsidy normative theories, but some of the equity arguments are clearest when one applies the subsidy norms.

- Is it appropriate for other tax payers to subsidize housing purchase? Especially those of the relatively wealthy?

B. Digression-Long Footnote on debt and printing money.

i. It bears noting that a good deal of government finance involves borrowing and printing money rather than ordinary taxation.

- Indeed, many poorly run governments prefer to just "print money" to pay for their expenditures.
- Others would prefer to borrow all moneys spent,
- and would resort to taxation as a last resort, **were it not for the deadweight losses** generated by these other methods of government finance.

ii. In terms of the language used to discuss taxation, printing money may have a larger economic and political burden in the future than taxation, by both reducing the value of money held by private persons, producing inflation, and distorting relative prices throughout the economy.

- Inflation is an implicit tax on those who hold money.
- Discuss the extent to which it satisfies or conflicts with normative theories of taxation.

iii. Borrowing shifts the burden of tax payments from current taxpayers to future ones (or at least from those not generationally connected to individuals that are).

- Discuss the effects of posponing taxation (or shifting it to other generations) using our tax and/or subsidy normative theories.
- It also has macro-economic effects on the distribution of capital within a society that may affect long term growth rates.
- As a consequence, both printing money and debt-finance may be more difficult to use repeatedly than taxation. Explain Why?

VIII. Appendix: Progressive, Proportional and Regressive Subsidies

A. Normative theories that focus on "equity" often support subsidies that redistribute wealth or income from relatively rich persons to relatively poor persons.

i. For example, society A would be considered better than society B under most distributional theories, if **everyone** is richer in A than in B (Rawls).

ii. Other normative distributional theories might regard society A to be better than A if most persons are richer in A than in B, or if the average person is richer in society A than in society B.

- ♦ (In this last theory that attempts to maximize average income, only economic efficiency matters. why?)

B. The **Pareto principles**:

i. State A is better than (or *Pareto superior to*) state B if at least one person is better off at A than B and no one is worse off.

ii. A Pareto optimal state occurs when no Pareto superior moves are possible.

iii. The Pareto principle implies that inequality that increases total wealth or total social net (by for example creating incentives to work a bit harder or more productively) benefits tends to improve the state of the world as long as no one is harmed by the new wealth or new social net benefits.

C. In contrast, many mainstream normative theories imply that there are "efficiency-equity" tradeoffs.

i. That is to say, in some cases it is all right to sacrifice a bit of equity if efficiency increases enough.

ii. And conversely, in some cases it is all right to sacrifice a bit of efficiency if equality increases enough.

iii. What "enough" means varies according to the normative theory (or normative intuition) being applied.

D. Definitions and Relationships useful for characterizing positive characteristics of subsidy schedules that are relevant for distributional normative theories:

- The **subsidy base**, B, is the activity, good, or service that is subsidized. (food, rent, work, oil production, bus tickets, corn production, R&D, etc.)
- The **average subsidy rate** of a particular subsidy often varies with an individual's holding of the subsidy base. If an individual pays subsidy Ti on a holding of Bi, his average subsidy rate is Si/Bi. (If Si = $50 and Bi = 200, the average subsidy rate for this subsidy is 50/200 = 0.25 or 25%.)
- The **marginal subsidy rate** of a particular subsidy is the change in subsidies owed for a one unit increase in holdings of the taxable base, $\Delta S/\Delta B$. (So, if a subsidy payer earning 50,000/year pays a subsidy of 10,000 and a taxpayer earning 50001 pays a subsidy of 10,000.50, his or marginal subsidy rate is 0.50/1 = 50%. Fifty percent of each additional dollar earned is taken from the "last" dollar of income earned by a taxpayer earning 50,000/year.)
- In a **diagram of subsidy** schedules. If MSR is above ASR, then the ASR curve will be rising (the marginal subsidy rate will be pulling the average up). If MSR is below ASR, then the ASR curve will be falling (the marginal subsidy rate will be pulling the average down). If the MSR = ASR, the ASR will be neither rising nor falling.

i. Since **individual decisions are determined by marginal cost and marginal benefits at various quantities, it is the marginal subsidy rate rather than the average subsidy that affects subsidy receiver behavior**.

E. Calculating the Progressivity (etc) of subsidy schedules

i. Although the terms progressive, proportional, and regressive are used less frequently to describe subsidy programs than tax systems these terms can be applied, and are often important in policy discussions about the relative merits of a particular subsidy schedule or program.

ii. In principle, the reference point for calculating "progressivity" can be either the subsidy "base," or personal income.

- ♦ For most positive analyses, the "base" tends to be used.
- ♦ For most normative analyses personal income tends to be used.

- Calculated relative to its base, a progressive subsidy schedule has an average subsidy rate that falls with purchases of the subsidized good, etc..
- Calculated relative to income, a progressive subsidy program's has an average subsidy rate that falls with income.
  - ♦ Such progressive subsidies are said to promote "equity."

iii. When a subsidy program is designed, its positive characteristics have to be determined, and so its progressivity, proportionality, or regressivity is normally judged relative to the "thing" subsidized (that is with respect to its base).

- ♦ For example, the average subsidy rate of an agricultural subsidy can be designed to decline (on average) as farm size increases (progressive).
- ♦ The average subsidy rate of an agricultural subsidy can also be designed to be the same for all sizes of farms (proportional).
- ♦ Or, the average subsidy rate can be designed to increase as farm size increases (regressive).

iv. In public policy debates, the discussion of subsidies and other transfer programs often centers on a subsidy's relationship to personal income. (Do poor people get more than rich people, or vice versa?)

- Using income as the reference point, a **progressive subsidy** is a subsidy whose average benefit falls as the income of an individual increases.
  - ♦ [Such subsidies often have marginal subsidy rates that decrease with the "base," although not all progressive subsidies have this property. This tends to be true, for example, of social security benefits.]
- A **proportional subsidy** is a subsidy whose average subsidy benefit does not change with income. (Such subsidies normally have a constant marginal subsidy rate, as true of most sales subsidies and some income subsidies. A flat (proportional) subsidy on income has the form: $S = aY$.) [farm subsidies and unemployment insurance]
- *Using income as the reference*, a **regressive subsidy** is a subsidy whose average subsidy benefit increases with income. Such subsidies often have declining marginal subsidy rates with ownership of the item or activity subsidized, however, not all regressive subsidies have this property. [state subsidized higher education]

F. Some Geometric Puzzles:

i. Economic efficiency-based normative theories are sometime said to oppose consumption and borrowing subsidies, but to favor subsidies that encourage saving and investment, because these are argued to increase long run economic growth.

- The intuition behind the effect is based on supply and demand.
- If the price of saving increases relative to consumption, individuals will consume more and save less.
- As capital is accumulated, the productivity of labor increases and so does national income.

ii. However, you can use an indifference curve diagram to show that a **permanent saving's subsidy does not** have any relative price effect on savings versus consumption decisions.

- As an exercise draw the effect of an investment-savings subsidy in a two period intertemporal choice diagram.
- Note that a subsidy that proportionately reduced the absolute price of consumption in both periods , would **not change relative prices** of consumption now and in the future, and so would operate like a lump sum tax.
- Does a permanent savings subsidy really increase saving? Why or why not?
  - ♦

I. Introduction to Externality and Public Goods Problems

A. The previous part of the course addressed how a governments efforts to raise its revenues and its general pattern of expenditures affect "private" or "ordinary" market equilibria. It did so without explaining why governments might want to raise revenues or spend money in specific ways. The **next two parts** of the course addresses why democratic governments "need" revenue and why its spent in particular ways.

i. The analysis of the course thus far tend to call in to question why we have more than a minimal government, since subsidies and taxes both create dead weight losses, that is, they reduce social net benefits.

ii. In the cases of externalities and public goods, governments can adopt polices that increase rather than reduce social net benefits.

a. These "problems" are often called "market failures," because in both cases market outccomes will fail to maximize social net benefits, as shown below in these lecture notes.

b. The existence of such market failures may also induce voters (or benevolent governments) to demand that particular public services be provided or particular activities be regulated or taxes.

c. We take up the politics of public policy in the next lecture block.

d. One can think of this handout, the externality and public goods block, as exploring "market failures."

e. The next handout explores "government failures," failures by governments to properly address public goods and externality problems or to use inefficient tax instruments.

B. The first of these "problems" to be analyzed is the case of externalities.

C. DEF: An *externality* occurs whenever a decision made by an individual or group has effects on others not involved in the decision. That is to say, an externality exists whenever some activity imposes spillover costs or benefits on other persons not directly involved in the activity being analyzed.

i. In most cases, an activity that imposes external losses (costs) on third parties at "the margin" will be carried out at levels greater than those which maximizes the social net advantage from the activity. This follows because the people who decide the level of the activity that gets carried out tend to focus only on their own costs and benefits.

ii. Note that this (normative) conclusion is partly based on a positive prediction about behavior--that spill over costs and benefits will be ignored by those controlling the activity.

iii. [For example, within environmental economics, producers ignore spillover costs generated by their waste products, while government officials ignore spill-over costs generated by forcing firms to clean up.]

D. The existence of externalities is a positive claim. Either there are spillove costs or benefits or their are not.

E. The existence of externality "problems" is a normative claim and follows from normative theories used by economists. These normative theories are sometimes called "welfare economics."

i. The problem from the point of view of mainstream welfare economics is not externalities exist, but rather that **the wrong level (too much or too little) of the externality generating activity gets produced to maximize social net benefits**.

a. Consider, for example water pollution.

b. Water pollution imposes costs on other users of a river or lake, and tends to be over produced, as we will (see diagrams below).

c. The optimal amount of pollution is not generally zero, but the amount produced tends to be too large.

- The "optimal" amount of water pollution sets the marginal cost of cleaning up the pollution equal to the social marginal benefits of engaging in the polluting activity. (See the diagrams below.)
- In nearly every case in which an *environmental problem* is claimed to exist-- the underlying "economic problem" is an externality problem.

d. There are a very wide range of externalities, only a few of which are environmental and not all of which are "problems."

ii. Generally, activities that produce negative externalities (external costs) tend to be over provided relative to levels that maximize social net benefits, as demonstrated below.

iii. In addition to negative externalities, there are also activitie that produce spillover benefits (positive externalities).

a. Consider, for example, the activity of planting flowers along sidewalks and highways.

b. Nearly everyone passing by enjoys them, but the "gardeners" will take account of only their own marginal benefits and costs when deciding how many flowers to plant. there are other activities that may also produce spillover benefits.

c. When a driver turns on his or her "blinker" to indicate which direction he or she is planning to turn, most people around that driver are better off because they are now better informed about that driver's intended path.

iv. Activities that generate positive externalities tend to be under provided in equilibrium.

a. Those involved in activities that produce positive externalities neglect their spillover benefits.

b. Thus, they tend to be undertaken at levels below the optimal ones. as illustrated below.

v. One way of thinking about "**public goods**" is that the are goods and services that generate positive externalities.

a. This implies that public goods tend to be under produced in markets, relative to the outputs that maximizes social net benefits (or which is Pareto efficient).

b. However, not all problems associated with positive externalities are public goods problems.

II. The Geometry of Externality Problems

A. The geometry of externalities and externality problems is fairly straight forward.

i. Several illustrations are developed below, but their logic is always the same.

ii. In a supply and demand (market) diagram, we introduce a new curve that represents the external marginal costs or external marginal benefits for the activity or product of interest.

- These are benefit or costs that fall on persons not directly involved in the market of interest.
- (These other costs or benefits fall on persons who are neither consumers nor producers of the goods sold in the market of interest)

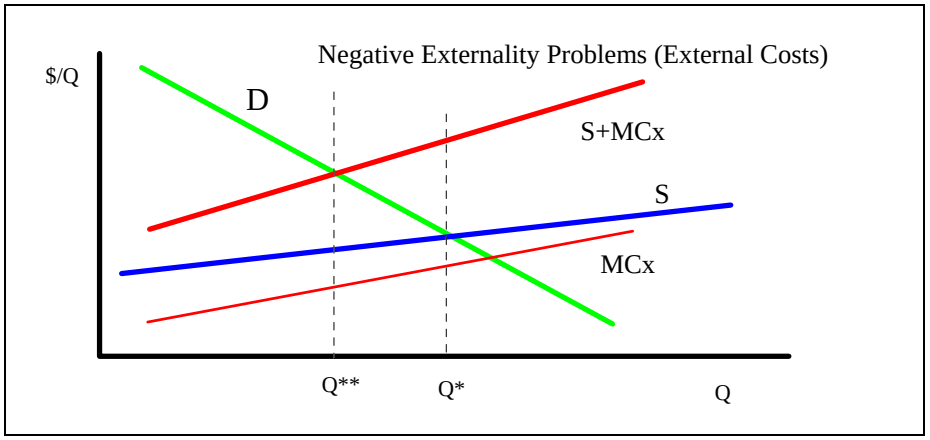
iii. The predicted market outcome (Q*) is not affected by the existence of the new marginal external cost curve, because firms and consumers are assumed to focus on their own costs and benefits, and so ignore the externality generated.

- (This is actually a positive behavioral assumption or prediction, as noted above. Why?)

B. To find out whether an externality generating activity or output is over or under supplied, **find the social marginal benefit and social marginal cost curves**, and use them to characterize the social net benefit maximizing activity level (output, Q**).

i. **To find the SMB and SMC curves**, recall that the Demand curve is approximately the same as the marginal benefits received by consumers and the supply curve is approximately the industry's marginal cost curve.

ii. To these market MB and/or MC cost curves, we **add the external marginal benefits and/or external marginal cost curves, which generates** the social marginal benefit and social marginal costs curves--which fully account for spillovers.



C. Geometrically, there is a recipe or algorithm for adding up the marginal cost curves and a similar one for adding up the marginal benefit curves.

i. To find a **social marginal cost curve** (SMC) in a setting with external costs,

a. First pick a quantity, q'.

b. Find the marginal cost that market participants are taking account of (normally from the supply curve) at the output level chosen (q') and add the spillover marginal costs at that quantity (q') to it.

- Geometrically, this involves adding the **vertical distances** from the Q axis to the respective curves.
- SMC(q') = MCind(q') + MCext(q')

c. Repeat the above with another quantity.

d. Continue until the SMC curve is traced out.

ii. To find a **social marginal benefit curve** (SMB),

a. First pick a quantity, q.

b. Find the marginal benefit that market participants are receiving at the output level (q) [normally from the demand curve] and add the spillover marginal benefits at that output level (q) to it.

- Geometrically, this involves adding the **vertical distances** from the Q axis to values on the respective curves.
- SMB(q) = MBcon(q) + MBext(q)

c. Repeat with another quantity,

d. Continue until the SMB curve is traced out.

iii. If all the "curves" are straight lines, SMB or SMC can be calculated with just 2 or 3 quantities, but more are necessary for more complicated shapes.

D. The level of the activity (Q**) that **maximizes social net benefits** is generally found where the social marginal benefit of the activity equals its social marginal cost curve.

- If Q* does not equal Q**, there is an externality problem.
- (Explain why.)
- Notice that this conclusion, the existence of a problem, relies on the "maxmize social net benefit" norm.

E. An Illustration of the Case of External Benefits

i. The problem of positive externalities is similar to that of external costs. Again there is a spillover that is not accounted for by market participants. Again there is are social net benefits that can potentially be realized that are not. The figure below illustrates the geometry of the problem.

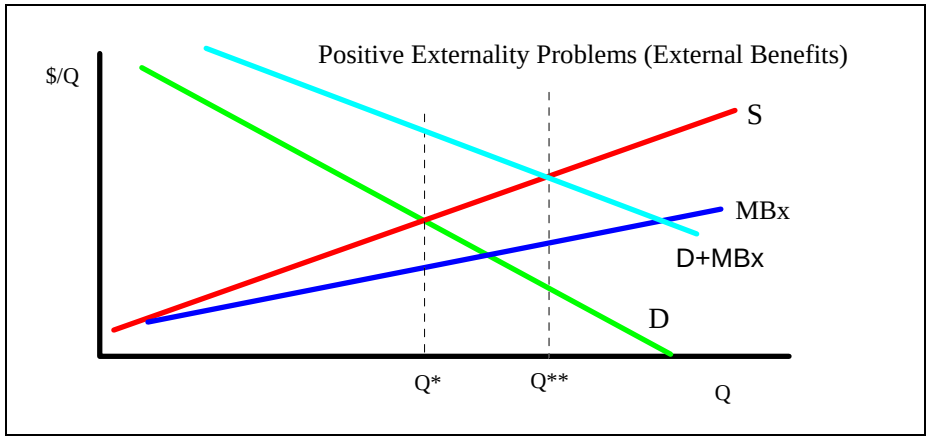
ii. There is an external benefit (MBx) in the case illustrated, rather than an external cost.

iii. The market supply and demand cross at Q*.

iv. The social marginal benefit curve is found by adding the MBx and D curves (because the demand curve can be used as the MB curve for consumers).

v. There is no external cost, so SMC(Q) = MCind(Q) + 0 which is represented with the supply curve.

- Note that the SMC and SMB curves [S and D+MBx] cross at Q**.
- This is the quantity that maximizes social net benefits.
- Since the observed market clearing output, Q*, is not equal to Q** there is an **externality problem**.
- As in the external cost case, the market outcome no longer maximizes social net benefits. However, in this case too little, rather than too much of the externality generating activity is provided.
-



- **[As an exercise, determine the increase in social net benefits obtained at Q** relative to those obtained at Q*]**

F. **Externality analysis can also be undertaken at the level of small groups of individuals**.

i. This can be done using marginal benefit and marginal cost curves for the individuals affected by an externality generating activity, rather than market demand curves and aggregate external marginal cost and/or marginal benefit curves.

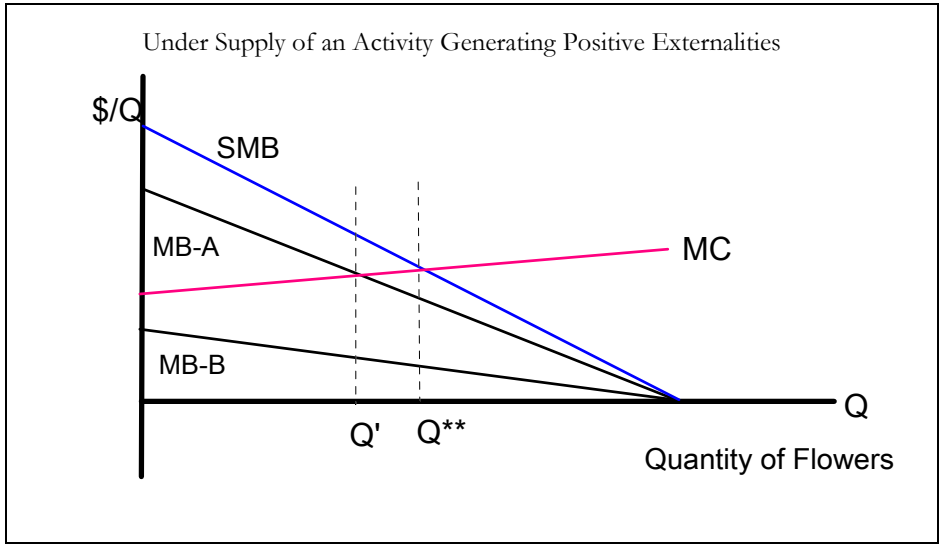
ii. To find the private supply, we either assume that someone initially has the right to control the activity in question, or that the "**high demander**" provides the quantity that maximizes his or her own consumer surplus.

iii. The controlling individual is assumed to maximize his or her own net benefits.

iv. The social marginal benefit curve is the (vertical) sum of the individual MB curves.

v. If the level privately chosen differs from that which maximizes social net benefits, then there is an externality (or public good) problem from the perspective of the SNB maximizing norm (and also the Pareto norm as we shall see later).

G. An external benefit case is illustrated below for Al (A) and Bob (B).



i. Note that in the figure above, Al's preferred output level, Q', (the one that maximizes her own net benefits) and there are spill over **benefits** at the margin at Q'. (Mbx > 0 at Q')
   - Al's purchase and use of this good makes Bob better off-

ii. To find the SMB curve add Bob's MB curve to Al's MB curve (vertically), as described in the "recipe" above.

iii. Note that the social net benefit maximizing level of the activity is higher than that provided (Q**>Q').

- [This is the typical case for activities that generate positive externalities and for the private supply of pure public goods.]
- **Since Q' and Q** are different, there is an externality problem**.
- Social net benefits are not being maximized at Q', the private choice.

H. The same general method can be used to illustrate the effect of a negative externality among small groups of individuals.

i. An negative externality problem among individuals is illustrated in figure 2.

ii. In Figure 2, Al's activity generates spillover costs, rather than benefits, at the margins.

- For example, Bob may be Al's neighbor and negatively affected by smoke from her barbecue or loud music.

iii. The spillover costs can be represented as a negative marginal benefit.

a. Again the Social Marginal Benefit curve is the vertical sum of all the individuals affected by the externality generating activity.

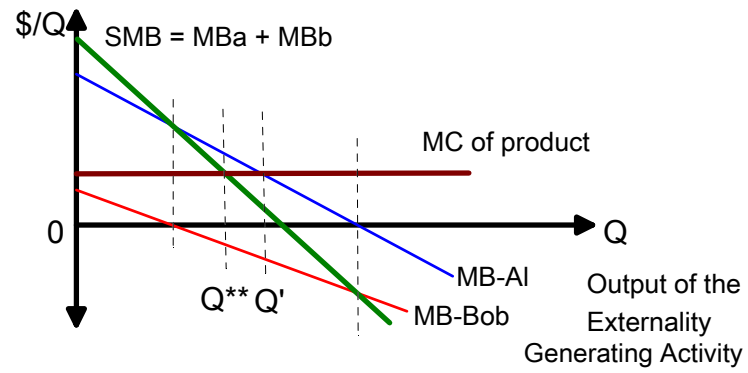
b. Adding up the curves is, however, a bit different than in the previous case, because we are adding one or more negative numbers, rather than just positive numbers.

- Note that the addition is always done with MB curves in the small numbers case.
- (Hint: the easiest place(s) to add the MB's occurs where one of the MB curves cross the horizontal axis and so have the value of zero.)
-

c. As in the positive externality case, the private "high demander provides" equilibrium is different from the activity level (output) that would maximize social net benefits.

- Thus, there is an externality problem from the perspective of the "maximize social net benefit" norm.
- However, in the negative externality case, the problem is over supply rather than under supply of the externality generating activity.

Over Supply of a Negative Externality Generating Activity



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(It would be much more complicate to do so, but one could use the negative of the negative range of the MB curve(s) and add the resulting positive numbers (MCx) to the original MC curve to generate a social marginal cost curve.)

iv. Such negative externalities are typical for pollution, congestion, and commons problems.

III. On the Pure Logic and Normal Cases of Externalities

A. The existence of externalities normally implies that social net benefits are not maximized at the market equilibrium, because some relevant marginal costs or marginal benefits is being neglected.

i. In most cases, the existence of an **external cost implies that an activity is over provided** relative to that which maximize social net benefits.

ii. In most cases, the existence of an external benefit implies that an activity is **under provided** relative to that which maximizes social net benefits.

- In many, but not all, of those cases, some form of collective or government action can potentially "solve" the externality problem.
- Externality problems are one of the areas of life in which economics implies that governments can improve the result over markets.

B. However, there are exceptions--that is to say special cases that do not conform to these rules of thumb.

C. **The mere existence of an externality does not always imply that there is an externality problem**.

i. There are, for example, cases in which externalities exist (infra-marginally) but there are **no external benefits or costs at the margin** (e.g. at Q').

a. If the marginal external benefits and marginal external costs are both zero at Q' then it turns out that Q' = Q**, and there is no problem.

- As a practice exercise, draw such a case.)

b. Pareto optimal (and social net benefit maximizing outcomes) may also occur in cases in which spillover marginal costs exactly equal spillover marginal costs at Q'.

- As an practice exercise, draw such a case.
- Try to think of examples of such externalities

ii. Of course, such geometry is pretty demanding.

- (See your lecture notes. One of these cases is usually covered in the class lecture.)
-
- The "no problem" cases are more likely if there are costs associated with solving externality problems.
- The marginal cost of reducing the problem may be greater than the marginal unrealized gains from addressing particular externality problems.
- (For example, consider the problem of sidewalk congestion.)

IV. Pure Public Goods

A. The problems associated with **pure public goods** are similar to those associated with activities that generate **spillover benefits**.

B. However, they occupy a special place in public finance and public economics, because in many cases not only are public goods undersupplied in private markets, **they may not be supplied at all**.

- Some public goods are too expensive for even "high demanders" to provide.
- Such complete failures may **justify government production** of pure public goods, rather than regulatory solutions.
- Tax revenues in such cases will be at least partly used to pay for the cost of producing public goods.

C. DEF: A **pure public good** is a good that is perfectly shareable.

- A pure public good can be simultaneously consumed by "as many people as want" simultaneously, without diminishing anyone's net benefits.
- Examples include gravity, national defense, the air (breathing outside), and gravity.
- [Other professors and textbooks may stress the fact that persons can not be **excluded** from using a pure public good, but I stress the sharability property of the good, for several reasons developed in class.]

i. DEF A **pure private good** is a good that cannot be shared without proportionately reducing everyone's consumption of the good.

- Essentially, a pure private good can only be consumed by just one person at a time.
- Examples include a jelly bean, a pair of shoes, a shirt, a hat, or a nap.
- (**Most micro-economic analyses and models assume that all the goods and services being analyzed are pure private goods**.)

ii. In between pure private and pure public goods are other goods, most of which can be considered "club goods," goods which are somewhat shareable, but not completely so.

iii. DEF A **club good** is a good that is shareable within limits. A club good can be shared by several people, but the "quality" of the consumption experience falls with the number of people sharing the good, although less than proportionately.

- Club goods are "congestible."
- Examples include this lecture, the highways, swimming pools, parking lots, parks, etc.
- Congestibility implies that there is an ideal number of people who can share a good or service, which is greater than one but less than everyone.

D. Together the existence of pure public, club, and pure private goods implies the existence of **a spectrum of types of goods** that vary according to their "shareability."

- The more shareable the good is, the closer to the pure public good end of the distribution it is. (See your class notes.)
- (As an exercise, draw a "spectrum of good types" and provide examples of goods along the spectrum. We'll also do this in class..)

E. Because pure public goods are shareable and are "goods," **the private provision of pure public goods tends to generate positive externalities**.

- The private production of pure public goods tend to generate **spillover benefits** for those sharing in the services or goods.
- As a consequence, **pure public goods tend to be under-provided** in the absence of some kind of collective action (as with a club or governmental action).
- [Note that excluding persons from potentially shareable benefits also causes social net benefits to be lower than they could be. Draw and explain why.]

F. The problem of under providing public goods is sometimes called the **"free rider problem"** and can be illustrated using diagrams similar to those used in the positive externality cases above.

- [See also your in-class notes.]

G. The **free rider problem can also be illustrated using a bit of elementary game theory.**

i. Assume that there are two people each of which can contribute to producing a public good or free ride.

ii. Assume further that the good is "freely available" if the other person pays for it, or if both share the cost of providing it, and that the public good is produces benefits for both persons that are greater than its total cost.

- [All we really need assume here that if there are N people, each person's benefits are greater than 1/Nth of the cost of providing the good.]

iii. In the two person case, the net benefits for each person can be represented in a "2x2 game matrix" that characterizes each persons "payoffs" (net benefits) given different combinations of free riding and contributing to the public good.

The Free Rider Problem

Contributions to Providing a Pure Public Good

	Bob: Contributes	Bob: Free Rides
Al: Contributes	A, B 3, 3	A, B 1, 4
Al: Free Rides	4, 1	2, 2

(Payoffs are utility levels or net benefits for Al (A) and Bob (B). Only "rank order" is important. (why?))

iv. Both Bob and Al are better off if the public good is produced (3>2) and 4>1, yet each prefers that the other person provide it (4>3).

a. The result of these payoffs is a game that has a "prisoner's dilemma" format.

b. If each person independently chooses his benefit maximizing strategy, each will choose to free ride.

- If Bob contributes, Al gets 3 if he/she also contributes, but gets 4 if he/she free rides.
- If Bob free rides, Al gets 1 if he/she contributes, but gets 2 he/she free rides.

c. Thus, **regardless of what Bob does, Al is best off if he/she free rides**

- The same logic applies to Bob's choice of strategy.
- In this game, both Al's and Bob's dominant strategy is to free ride.
- DEF: strategy X is a dominant strategy for player I, if and only if it generates the highest payoff for I, regardless of what the other players in the game or contest choose to do.

v. Thus in this simple 2x2 game, each person will tend to free ride if their strategy choices are made independently of one another.

- Essentially the same logic applies to public goods settings in which there are many persons who must contribute in order to produce the service.
- The predicted result in such "all or nothing"cases that all persons in the game free ride.

H. Free riding is the Nash Equilibrium of the free rider game.

i. DEF: a strategy combination is a **Nash equilibrium**, if no player in the game can alter his or her strategy and achieve a higher payoff.

a. Note that neither person acting alone in the above can make him or herself better off by switching from free riding to contributing, given what the other person is doing!

b. This is true in spite of the fact that there is a Pareto superior move that is possible.

c. DEF: A **Pareto Superior** move makes at least one person better off without making any other worse off.

- **Note that each person would be better off if the public good is produced. There is a Pareto Superior move (3>2)**

I. The Nash equilibrium is a consequence of individual rational choice.

i. However in this case, unlike that in normal markets for private goods without externalities, those choices do not produce the social net benefit maximizing outcome.

ii. Privately optimal behavior in this setting, leads to an outcome that is agreed by each to be worse than the case in which they both contribute to providing the public good.

iii. DEF: Outcome A is **Pareto efficient** (or Pareto Optimal), if an only if, there are no feasible Pareto Superior moves from A.

iv. The free rider equilibrium is not Pareto optimal, because there is a Pareto superior move.

V. Solutions to Externality and Public Goods Problems

A. For persons interested in maximizing net benefits, both externality and public goods problems provide a good reason to undertake collective activities in a club or by government.

i. A variety of solutions to these problems are possible if we use governments coercive authority to address them.

ii. In some cases, the improvemente is simply an increase in social net benefits (with some winners and some losers).

iii. In other cases, the use of coercive threats can produce Pareto superior moves.

iv. (Of course, as we will see later in the course, it is not necessarily the case the governments will attempt to maximize social net benefits.

v. We now analyze both private and public solutions to these problems.

VI. Private Solutions to Externality and Public Goods Problems

A. Do nothing.

i. In some cases, the existence of an externality or pure public good may be compatible with Pareto efficiency or maximizing the net advantage from the activities in question.

ii. That is to say, there may not be a "Pareto relevant" externality at the margin even ignoring transactions costs.

iii. In other cases, nothing may be done, because transactions costs are too great. In such cases, it may cost more to solve the problem than is gained in social net benefits.

B. Privatization

i. In some cases, the reason for the externality is simply an improper specification of property rights.

ii. For example, commons problems involving non-circulating or readily identifiable resources such as land, can be addressed by granting a person, firm, or club exclusive rights to control the usage of the resource in question.

a. (Privatization may solve such commons problem even if the "user rights" are not tradable, because *owners have no incentive to overuse their own resources.*)

C. **Coasian Contracts** (Private Agreements That Solve Externality Problems)

i. In other settings, privatization may not be sufficient by itself, but it may make it possible for the affected parties to contract with one another to solve the problem.

a. For example those affected by pollution may pay the polluter not to pollute.

b. Alternatively, those wishing to engage in a negative externality producing activity (pollution) may pay those who will be affected by that pollution for the privilege.

ii. **The Coase theorem says that if (a) property rights are well defined (or contracts enforced) and (b) transactions costs are negligible, then voluntary exchange can solve essentially all externality problems.**

iii. **More over if (c) there are no significant income (original endowment) effects, then the final result tends to be the same regardless of the original assignment of property rights**

a. "a through c" are sometimes called the Coase theorem.

b. (It bears noting that part "c" of the "Coase theorem" requires the Pareto set to be composed of a single point, which is often the case in our diagrams, where there is a unique output level that maximizes social net benefits.)

c. Explain why will not be true in more general circumstances?)

iv. An Intuitive Example.

a. Suppose that a factory, Acme, uses a production process that produces smoke along with its marketable output. The wind mostly comes out of the West so that the smoke fall mostly on homeowners who live East of the factory .

a. The **weak form of the Coase theorem** (a and b) suggests that voluntary exchange can be used to solve the externality problem. The home owners can band together and pay the firm to reduce its emissions either by reducing output or by using pollution control devices.

a. Gains to trade exist because at the margin, the firm realizes no profits from the last unit sold, but the home owners association is willing to pay a positive sum to get the firm to produce less.

b. Notice that very similar gains to trade would exist if the home owners initially had veto power over the firm's output. In this case, the firm would be willing to pay the home owner association for the privilege of producing its output and smoke.

c. Whenever transactions costs are small, contracts can be developed (trade can take place) that completely solve the externality problem in the sense that after the "Coasian contract" all gains from trade are realized, and net benefits are maximized.

v. The **strong form of the Coase theorem** holds if transactions costs are low and there are no important income effects that arise from the assignment of control over the resource or activity of interest.

a. In such cases, Coasian contracts will always reach the same output level, insofar as there is a unique output that maximizes social net benefits--as it often is in our diagrams.

b. In this case, the **final outcome is the same no matter who controls the resources** after all gains from trade are realized!

c. (In other words, the gains to trade are exhausted at the same output level regardless of the initial assignment of control (property rights). For this and one other important insight about the nature of firms Ronald Coase won the Nobel Prize in economics.)

vi. The Coasian approach to externalities implies that essentially all externalities are reciprocal in the sense that who "creates" the externality depends on the original assignment of control.

a. In the case where the home owners association control the resource, their decision imposed large costs on Acme!

b. And vice versa. If Acme controls the output or activity level, then the home owners are made worse off.

c. However, the process of exchange always makes both parties better off, given their original circumstances.

d. The original property rights assignment affects the direction of payments, although not the final output level in a Coasian world.

vii. An Illustration of the geometry of the Coase Theorem

a. Suppose that the firm, Acme, initially controls the output or emissions. In this case, in the absence of a Coasian Contract, the outcome will be an output that maximizes profits such as Q*.

b. Note that unrealized gains to trade exist at Q*. The home owners are willing to pay more for reductions in output than the firm earns as profits.

c. The last unit that the homeowners can afford to compensate the firm for "not to producing" is Q** where the marginal compensation required by the firm (the marginal profit labeled x) equals the willingness of the home owner association to pay for it (the marginal external cost labeled x).

d. Note that the result is not changed by a reassignment of property rights. Had the homeowner association initially had veto power over the firm's activity, they will set output at 0 in the absence of a Coasian contract. ("0" minimizes cost imposed on them by the firm.)

e. Clearly, gains to trade also exist in this case. The distance from the MR curve to the firm's MC curve is much larger than the size of the marginal external cost borne by home owners at 0.

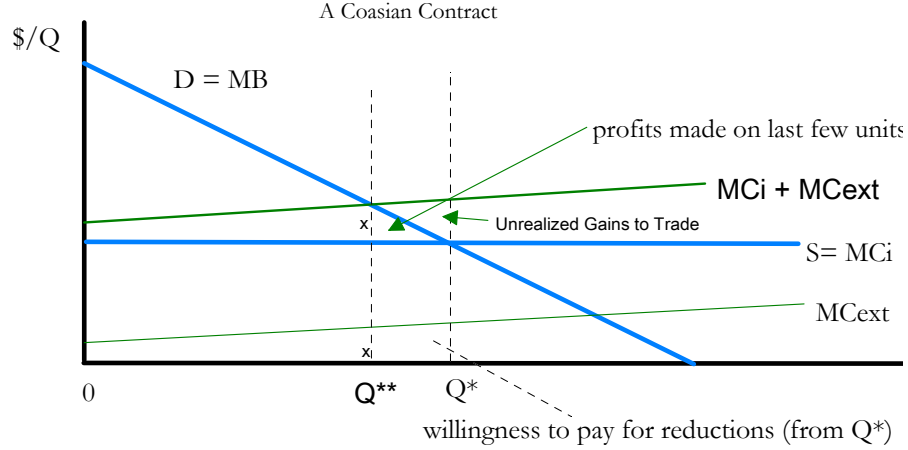
f. The firm can, thus, compensate the homeowners for the costs imposed on them by its smoke on all units of output up to the point where Acme's willingness to pay for the privilege of producing more output exactly equals the amount required to compensate home owners at Q**.

g. In the case depicted, the strong form of the Coase theorem holds. The same output level occurs regardless whether the firm or the home owners initially control the emission or output level. (This counter intuitive result is why Ronald Coase won the Nobel prize in economics in 1991.)

- Of course, the flow of payments clearly differs!
- Acme prefer the first setting, and the homeowner's association prefer the second.

Figure 3

A Coasian Contract



D. Not all externality problems can be solved with Coasian contracts or with a change in the assignment of property rights.

a. *Transactions costs may be very large, because* many people are involved.

b. The resources of interest might not be easily divided up and assigned to specific users.

c. It may be less expensive to use a preexisting institution (government) to solve the problem.

VII. Collective Management of Externality Problems: Pigovian Taxes and Subsidies

A. There are several possible collective management solutions to externality problems.

i. Elinor Ostrom won the Nobel prize in 2009 for her analysis of the great variety of such solutions (and related commons problems).

ii. We examine just a few of the classic economic solutions in this class--namely the ones most studied by economists.

B. **Pigovian Taxes**: Excise taxes as a means of "internalizing" negative externalities

i. A Pigovian tax attempts to change incentives at the margin by imposing a tax (or subsidy) on the activity that generates the externality.

a. Notice that if the externality producer is subject to a tax equal to the marginal external cost (benefit) at the Pareto efficient level, the externality producer will now choose to produce the Pareto efficient output/effluent levels.

b. Such a tax (or subsidy) is said to **internalize** the externality, because it makes the externality producer bear the full cost of his actions (at Q**).

ii. In principle, Pigovian tax schedules can have a variety of shapes, but for the purposes of this class we will assume that they are all "flat excise taxes" that impose the same tax on every unit of the product (or emission) produced.

iii. Pigovian taxes may yield substantial revenues although this is not their main purpose.

a. *Unlike a neutral tax, the main purpose of a Pigovian tax is to change behavior.*

b. Unlike an ordinary excise tax, a Pigovian excise tax generates no excess burden (as developed below and in class.)

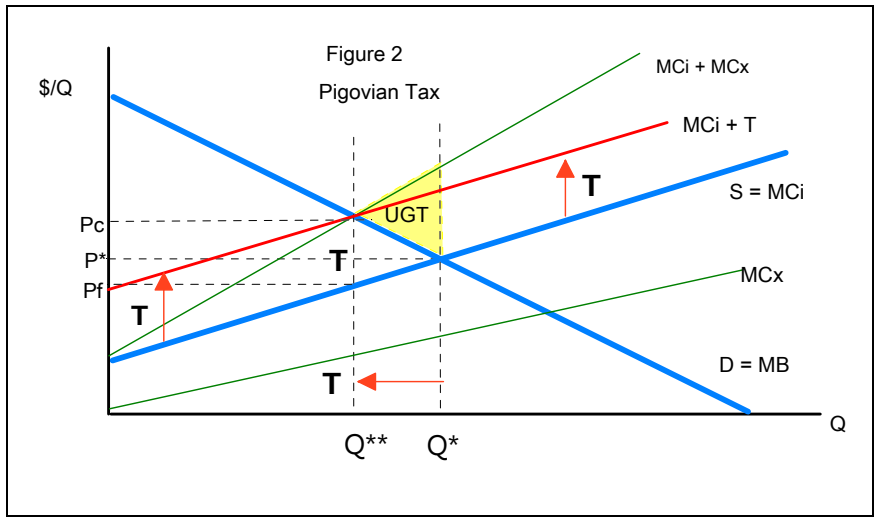
iv. **Illustration of the Pigovian Tax**

a. From our analysis of externalities, we know that market equilibria may not maximize social net benefits or necessarily realize all potential gains to trade.

a. These unrealized social net benefits (or **g**ains to **t**rade) are the triangle labelled UGT at Q* in the diagram.

a. A Coasian bargain might be able to realize those social net benefits if transactions costs are low enough, but they can also be realized by adopting a tax that internalizes the externality.

b. Such a tax induces market participants to take account of the external marginal costs.



b. The external cost at Q** is the vertical distance from MC to the MC + MCx curve.

c. This distance is the level of an ideal **Pigovian tax**. If it is placed on production or sales of this product, it will internalize the externality.

d. This ideal tax is labeled "T" in the diagram above.

e. If a tax of T dollars per unit is imposed on the firm's output (or emissions) the firm will now face a marginal cost for production equal to MC + T.

f. Given this new MC curve (which includes the tax that "internalizes" the externality) the firm will produce an output of Q**, the Pareto Efficient level.

v. Pigovian taxes can be a low cost method of solving an externality problem, because firms and consumers can all independently adjust to the tax.

a. However, the tax burden required to achieve the desired level of the externality generating activity can be very large, which can make both consumers and firms in the taxed industry worse off.

b. This tends to make Pigovian taxes politically unpopular (explain why).

c. (This cost can be reduced by using the revenues for desired public services or by rebating the revenues as lump sum subsidies to people in the market being taxed.)

vi. Imposing a Pigovian tax requires that the marginal external damages be estimated.

a. This may be possible at Q* , the output actually produced in the unregulated setting.

b. However this will be more difficult to do at Q** because Q** is not observed and has to be estimated using estimates of SMC and SMB.

C. **Pigovian Subsidies** are essentially similar to that of the Pigovian tax, except in this case the externality generating activity is under produced, and the subsidy attempts to encourage additional production.

- (Internalizing the externality in this case requires producers to take account of unnoticed benefits falling on others outside the decision of interest.)
- A Pigovian subsidy is set equal to Mbx at Q** and will cause the market to produce Q** units of the good after it is imposed.
- A Pigovian subsidy increases social net benefits (beyond the cost of the subsidy) and so has no DWL.
- (As a practice exercise draw such a case.)

VIII. Collective Provision of Pure Public Goods

A. In some cases, it will be easier for a group to take over production of a public good rather than to provide the proper Pigovian subsidies to encourage Pareto efficient private production. This may be done privately through clubs, or publicly through governments of one kind or another.

i. Within democracies, many government services can be understood as attempts to solve free rider problems.

ii. In these cases, a democratic government can be thought of as a special kind of club with the power to tax.

- (This tends to be more true of local governments than national governments, insofar as membership (residence) in a local government's jurisdiction tend to be "more" voluntary than those in national jurisdictions.)

B. In 1954, Paul Samuelson wrote a very influential paper in which he characterized the ideal solution to a pure public goods problem.

- His solution requires Q** to be produced, as in our diagrams above.
- And, it also characterizes Pareto efficient tax systems for paying for the pure public goods.

C. Samuelson's ideal way to finance the "collective" production of pure public goods requires:

i. Taxes that do not impose a deadweight loss. (Broad-based or lump sum taxes)

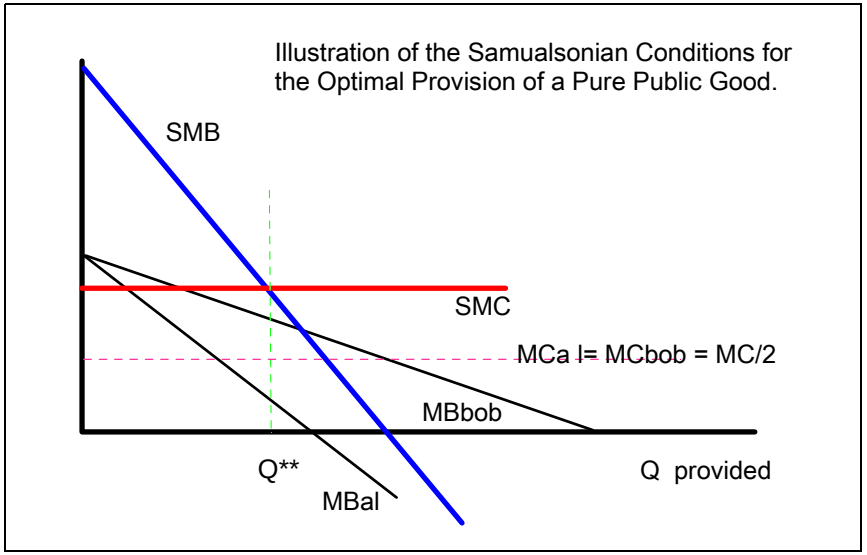
ii. Taxes that generate just sufficient revenue to cover the cost of the public services.

iii. Taxes for which the sum of the marginal costs imposed on users of the public good equals the marginal cost of producing them.

iv. (These conditions, optimal production of government services financed by an efficient tax system just sufficient to cover the costs of the services, are sometimes called the **Samuelsonian conditions for the optimal provision of a pure public good**.)

v.

vi. (The figure below provides a simple illustration.)



D. There are several important features of Samuelsonian solutions to public goods problems.

i. First, it is an attempt to take account of both sides of the fiscal equation: both expenditures and taxes are simultaneously optimized.

ii. Second, it shows that even when people disagree, there is a Pareto efficient outcome--which in our diagrams is often unique.

iii. Third, it shows that there are a lot of Pareto Efficient methods of financing a pure public good--once Q** is determined, more or less any division of the cost of Q** units will be Pareto efficient.

iv. (However, not every shift from a free rider solution to a Samuelsonian solution will be a Pareto superior move. Explain why and provide an illustration.)

E. One problems with most "Samuelsonian Solutions" to public good problems, is that the individual tax payers are often "unhappy" with the amount of the public service provided, given their tax cost.

F. A special case of the Samualsonian Solution that avoids this problem is the **Lindahl tax system**. (Erik Lindahl, a Swedish economist, figured out his solution decades before Paul Samuelson figured out his more general solution.)

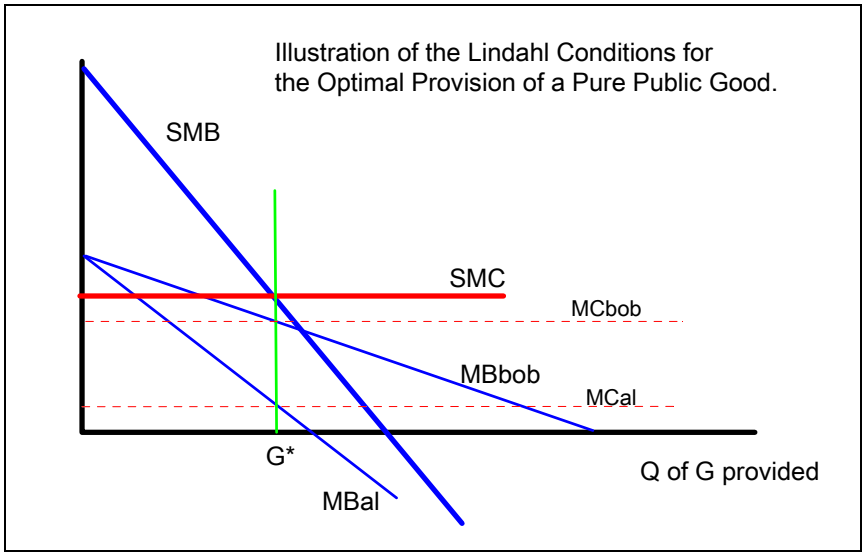
G. To the Samuelsonian conditions, **Lindahl** suggests that the *taxes should equate marginal benefits and marginal costs for individuals at the desired output* of government services.

i. **Lindahl taxes** are, thus, said to be idealized **benefit taxes**.

a. Lindahl taxes are a special case of a Samuelsonian solution for the efficient government (or club) provision of a pure public good.

b. Note, however, that the Lindahl solution is an important special case, because in this case, everyone in the society of interest is completely satisfied with the level of public goods provided.

c. (In the usual Samuelsonian case, it is possible that essentially all people will be quite dissatisfied with the services levels provided by government! Those whose marginal tax cost are below their marginal benefits from the service will demand more, whereas those whose marginal tax cost is above their marginal benefits will want less!)



ii. Lindahl is important because is shows that even in cases in which people disagree about the value of a public service, there are tax systems that can increase consensus.

a. Indeed in the Lindahl case, it is possible to produce a tax system under which there is unanimous agreement about the ideal service level (given the tax shares).

iii. Lindahl taxes are also of interest, because it turns out that every shift from a "pure" free rider outcome, an outcome in which Q'=0, to a Lindahl solution will be a Pareto superior move.

a. Everyone will be made better off (consumer increases from 0 to Q** when it is paid for with Lindahl taxes.

b. (As and exercise, illustrate why this is true.)

iv. It bears noting, however, that shifts from "high demander supplies" equilibria with significant services under private supply to a Lindahl solution (with uniform tax rates) will not necessarily be a Pareto superior move.

a. (Explain why a high demander outcome might be preferred by a free rider to a Lindahl tax solution.)

b. Although it is always possible to devise a Lindahl tax scheme that will generate a Pareto Superior move.)

IX. Appendix: Pareto Superior Moves and Pareto Efficiency

A. DEF: Outcome A is **Pareto superior** to Outcome B, if and only if at least one person is better off at A than at B and no one is worse at B than at A.

B. DEF: Outcome A is **Pareto efficient** (or Pareto Optimal), if an only if, there are no feasible Pareto Superior moves from A.

i. Outcomes that maximize social net benefits are normally Pareto efficient.

ii. However, outcomes that do not maximize social net benefits may also be Pareto efficient.

- (Such cases often occur in game matrices, although not market-based diagrams. Coasian bargains are both Pareto efficient and maximize social net benefits.)

C. Consider the Diagram below and explain why:

i. Z is Pareto superior to X

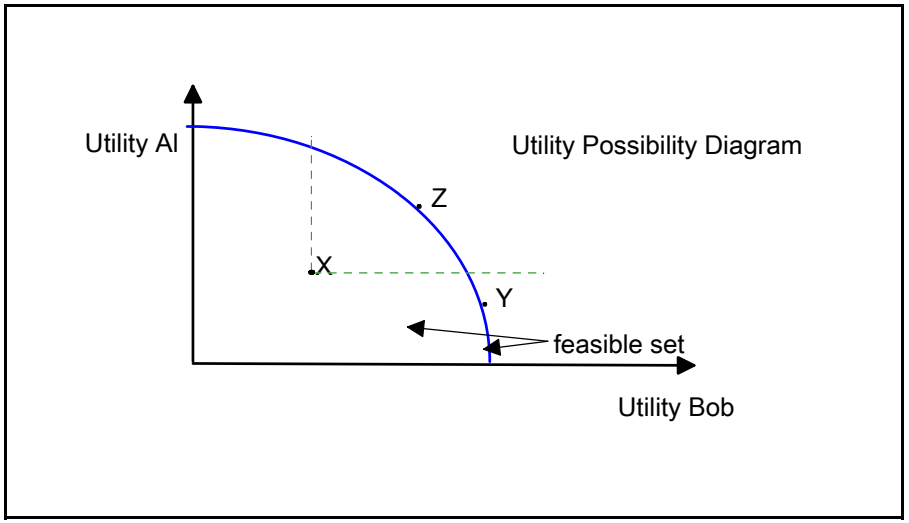
ii. Z and Y are Pareto Efficient

iii. Y is not Pareto superior to X

iv. The outer edge of the feasibility set, is often called the "Pareto frontier" because it includes all the Pareto optimal points. (Explain why this is often true. Draw an exception to this rule.)

v. Shade in all the possibilities that are Pareto superior to X.

vi. Explain the implicit economic assumptions behind the "utility possibility set."



I. Introduction to Public Choice: Voting for Public Services and Taxes

A. Up to this point in the course, we have treated public policies as "exogenous" to our analysis, as something determined by factors outside the models that we have examined.

i. Taxes or subsidies were imposed, there were consequences on market prices, outputs, and the distribution of net benefits between consumers and firms.

ii. Those same taxes could be judged using various normative tools, including the extent of deadweight losses, equity or fairness, and whether persons were made better off or not by the fiscal packages adopted.

iii. The policies themselves, in effect, came from outer space.

iv. This handout shows how one can use rational choice models to analyze the sorts of policies we should anticipate in democracies.

B. To do so, we'll extend our net-benefit maximizing model of rational choice to democratic politics.

i. We'll first think about how rational voters would decide between policies using both "spatial" and net-benefit models of voter preferences over policies.

ii. We'll use those results to characterize the nature of equilibrium outcomes under direct democracy.

iii. We'll then think about representative democracy.

iv. We'll use rational choice models to characterize how candidates will position themselves if they want to be elected by a majority of such voters.

v. Finally, we'll use this model of elections to analyze how policies are chosen in a democracies and problems that might be associated with them.

- It turns out that democratic governments too may fail to maximize social net benefits and so may be said to "fail."
- The models developed are from the public choice research program worked out after World War II. (See Congleton 2018a or 2018b for overviews.)

C. In democracies, both public service levels and taxes are determined jointly by votes case by voters, by elected representatives, and the implementing decisions of government employees (bureaucrats).

i. From the public choice perspective, voters, elected representatives and bureaucrats are assumed to be **self-interested** in the same sense that consumers and firms are in the private sector. That is to say, they all try to maximize their personal net benefits given the opportunities they have.

- That is to say, if one wishes to understand the pattern of tax and expenditure policies that are adopted by democratic governments, one has to take account of the interests and incentives faced by voters,.
- candidates for elective office, and government employees (bureaucrats).

ii. However, elected officials cannot simply choose any combination of expenditures and taxes that they wish if the wish to be reelected.

- They have to choose policies that please a majority of voters.
- Just as firm owners cannot sell any product that they might want to at any price they desire--because their products have to satisfy consumer wants at a reasonable price to sell--politicians have to take "reasonable" positions on public policies if they wish to attract enough votes from voters to be elected.

iii. Elections and electoral competition, thus, have important effects on fiscal policies within democracies.

iv. (That voters, representatives and bureaucrats are self-interested implies that one can not simply assume that tax and expenditure policies are made by some net-benefit maximizing all knowing "government," as sometimes seems to be suggested in many public economic text books, newspapers, websites, and blogs.)

D. Although a wide variety of decision making rules can are used within democratic governments, we will focus most of our attention on the implication of majority rule. (For a more complete treatment, you should take a course in public choice.)

i. Examples of **other voting rules** include:

ii. Unanimity (100% approval is required to pass new laws. Anyone can veto a new law.)

iii. Super Majority (More than 50% approval is required to pass new laws.)

- For example, a 2/3 vote by the Senate is required for constitutional amendments and impeachment under the US constitution.

iv. Plurality Rule (The policy/rule/candidate with the most votes is adopted.)

v. Committee rule (A relatively small elite makes decisions, possibly by majority rule within the committee.)

vi. One person rule (Commander in Chief, King, Executive Mandates)

vii. King and council template based governments.

- The first analytical examination of which voting rules work best for a given circumstance : *The Calculus of Consent*, in 1962 by James M. Buchanan and Gordon Tullock..

viii. Initially, we will focus all our attention on the majority because it is the most widely used voting rule inside democratic governments. If we have time, we'll also analyze how rational ignorance and interest groups affect policy choices.

II. Majority Rule and the Median Voter Theorems

A. The most widely used model of majority-rule politics is the median voter model. In a variety of electoral settings, self interested behavior implies that the "median voter" will get his or her way.

B. We begin with a simple model of direct democracy.

i. Suppose that three individuals: Al, Bob and Cathy are to make a decision about where to eat lunch using majority rule.

ii. Al prefers a restaurant where lunch can be had for $5.00, Bob wants one where lunch costs around $10.00 and Cathy, a gourmet, prefers one costing around $20.00.

iii. For convenience assume that, given any two options, each will prefer the restaurants whose price for lunch that is closest to their preferred one.

- This "spatial voting" can be shown to be the result when their marginal benefit and marginal cost curves are straight lines.
- Price is used as proxy for the quality of the restaurant and/or its service and ambiance.

iv. Consider some votes on various alternative restaurants:

Options	Votes Cast			Outcome
a. $10 vs. 20$	A: 10	B: 10	C: 20	10 MP 20
b. $5 vs. $20	A: 5	B: 5	C: 20	5 MP 20
c. $5 vs. $16	A: 5	B: 5	C: 16	5 MP 16
d. $10 vs. $5	A: 5	B: 10	C: 10	10 MP 5
e. $12 vs. 10	A: 10	B:10	C: 12	10 MP 12

C. *Note that Bob always votes in favor of the outcome that wins the election.* (The B column of Votes Cast and the Outcome column are EXACTLY the same.)

D. Note also that exactly the same number of individuals prefer a more expensive dinner as prefer a less expensive dinner than Bob.

i. *So, Bob is the median voter.* (He is the voter with the *median* ideal point.)

ii. The definition of a median ideal point or "preference." is that the same number of persons want more of this good or service as want less. It the "ideal point" that is the median of the distribution of voter ideal points for the electorate of interest.

iii. Note that the median voter's ideal point can beat every other possible alternative in pair-wise voting.

E. The **Weak Form** of the *median voter theorem* says that the median voter always casts his vote for the policy that is adopted. [In the example above, Bob always votes for the alternative that wins.]

F. The **Strong Form** of the *median voter theorem* say the median voter always gets his most preferred policy. [In the example above, Bob's preferred expenditure level, $10, will defeat any other policy. It thus tends to emerge as an equilibrium in a series of votes over alternatives.]

III. Electoral Competition and The Median Voter

A. The previous illustration shows that the median voter determines the electoral outcome in direct democracies. He or she always votes for the policy that is adopted. We next show that the median voter is also very important--pivotal--in representative democracy.

B. To make our analysis of elections more straight forward, we will assume that Voters all vote for the candidate (or policy) that is "closest" to them in the policy dimension.

C. This assumption allows competition between candidates for government office can be analyzed with a diagram that shows any distribution of voter ideal points.

i. Voters may have a wide variety of ideal points, and one can either construct a bar chart with different ideal points along the bottom and numbers of voters represented as the height of the bars, or if there are enough voters and positions, one can represent the distribution with a diagram analogous to a frequency distribution in statistics.

ii. In this "frequency distribution" representation, areas under the curve between two values, say G1 and G2, represents the number of voters whose ideal points are between G1 and G2 (including G1 and G2).

iii. The frequency distribution of voter ideal points can be used to create diagrams with policy alternatives along the bottom (X) axis and with number of voters with a specific ideal point along the vertical axis. .

iv. The assumption of spatial voting allows us to determine how all these voters will vote when there are two candidates or two policy options being voted on

- (Every voter will vote in favor of the candidate whose position is closed to their own.)
- (Voters who are exactly half way between the two "alternatives" will be indifferent between them., and are assumed either not to vote or to vote by flipping a coin.)

v. Voters to the left of the "indifferent voters" will vote for the policy on the left, and those to the right of the "indifferent voters" will vote for the policy on the right.)

D. The illustration below assumes that candidates 1 and 2 have taken policy positions C1 and C2, and that voters vote for the candidate closest to their ideal point.

i. The distribution of voter ideal points is assumed to be a "uniform" distribution--although essentially the same results would arise for other distributions, as shown in class.

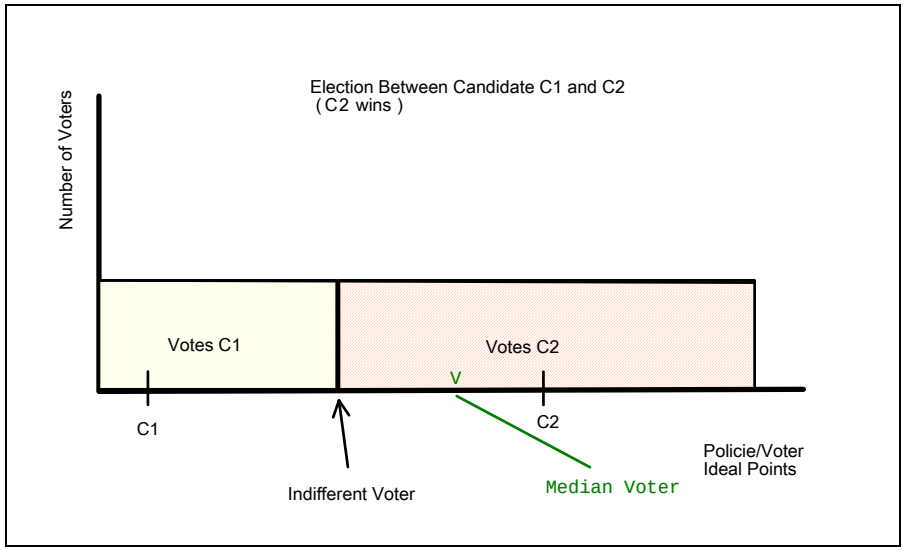
- The uniform distribution is adopted here to make drawing the diagram a bit simpler.

ii. It turns out Candidate C1 loses this election.

- He or she gets fewer than half of the votes cast. (This is implied by the fact that the area labeled C1 is much smaller than the area labeled C2.)

iii. How could Candidate C1 have done better?

- Clearly he or she should have chosen a policy position further to the right.
- That is to say, he or she should have chosen a position closer to the median voter.



iv.

E. It turns out that **the candidate who is closest to the median voter's ideal point will always win the election,** because that voter will always receive AT LEAST HALF OF THE VOTES.

i. Thus, if candidates are free to adjust their policy position to attract votes, they will each try to be closer to the Median Voter's ideal point than the other candidate.

ii. This tends to make the candidates take more similar positions on the issue(s) of interest to voters, which is to say less extreme policy positions.

F. In **equilibrium**, this kind of competition for votes implies that both candidates will take essentially the same position, namely that of the median voter.

i. At this equilibrium, the candidates take essentially the same position, so they receive approximately the same number of voters.

ii. Note that the predicted outcome is a tie, when both candidates take the exactly same position.

iii. At this equilibrium, **the median voter gets exactly what he or she wants.** *That is to say the strong from of the median voter theorem holds!.*

- This is not because the median voter is "special" or "admirable" but simply because of competition for votes.

- The median voter outcome is simply the Nash equilibrium of pragmatic competition by candidates or parties for votes along a single ideological or policy dimension.

IV. The Median Voter and Public Policy

A. One important insight that follows from the median voter model is that to understand the scale of government programs, one has to look at **both** the benefit and cost sides of programs from the point of view of the median voter.

B. In most cases, the median voter is approximately the VOTER with MEDIAN characteristics.

i. That is to say he or she is a voter of median age with median income, median education, median family size, median political ideas and so forth.

ii. This allows this model to be used to predict public policies using estimates of median voter demands for public services.

iii. This turns out to vary with both his or her marginal benefits from the service and from his or her tax price.

C. The median voter will not ordinarily be the same as the median member of the community because not all persons are equally likely to vote!

i. In the US it turns out that the median voter is a bit older, richer, and better educated than the median member of the group of persons eligible to vote.

ii. Poor, young, and less educated person vote less frequently than older, richer, and more educated persons.

D. To the extent that the Median Voter gets what he or she wants, anything that changes the median voter's preferred policy will affect government policy.

i. [This neglects possible "agency problems."

ii. Candidates may say one thing to get elected and do something else once in office.

iii. Moreover, elected representatives may not be able to fully control the bureaucracy.

iv. However, candidates that are known to have cheated and done poorly at overseeing the bureaucracy will be more likely to lose the next election than those that have not since the median voter will not have gotten what he or she wants. So this is not a crazy assumption.]

E. To the extent that government services are normal goods, Government services will tend to increase as the median voter becomes wealthier, as their tax-cost relative to private services decreases, and as their perceived value increases.

V. The Electoral Demand for Government Services

A. The next step is to see how our net-benefit maximizing model can be used along with the median voter model to predict the size of government programs. We'll start off with a "simple" example, based on the equal sharing form of the Samuelsonian tax system. However, we'll now assume that voting determines the quantity provided rather than some abstract effort to maximize social net benefits (as at Q** in our diagrams)

B. Suppose that there are three voters, each with a somewhat different marginal benefit curve for the government service of interest (G).

i. For purposes of illustration assume that the tax system in place is an "equal share" system.

a. (Recall, that this will satisfy the Samuelsonian conditions for the Pareto efficient supply of a public services if the "right" service level is produced (Q**).)

b. Given this tax system, these there voters will all **disagree** about the optimal level of the government services.

c. (See the diagram below.)

ii. If a referenda is held to determine the service level, we know from our previous analysis that the median voter's ideal point will determine the outcome.

a. Recall that the median voter is the voter whose ideal point is exactly in the middle in the sense that there are exactly the same **number** of voters with ideal points to the left as to the right of his or her ideal point.

b. In this case, **Bob is the median voter**. (Why?)

iii. Thus the predicted result of democratic politics is policy Q^*_b.

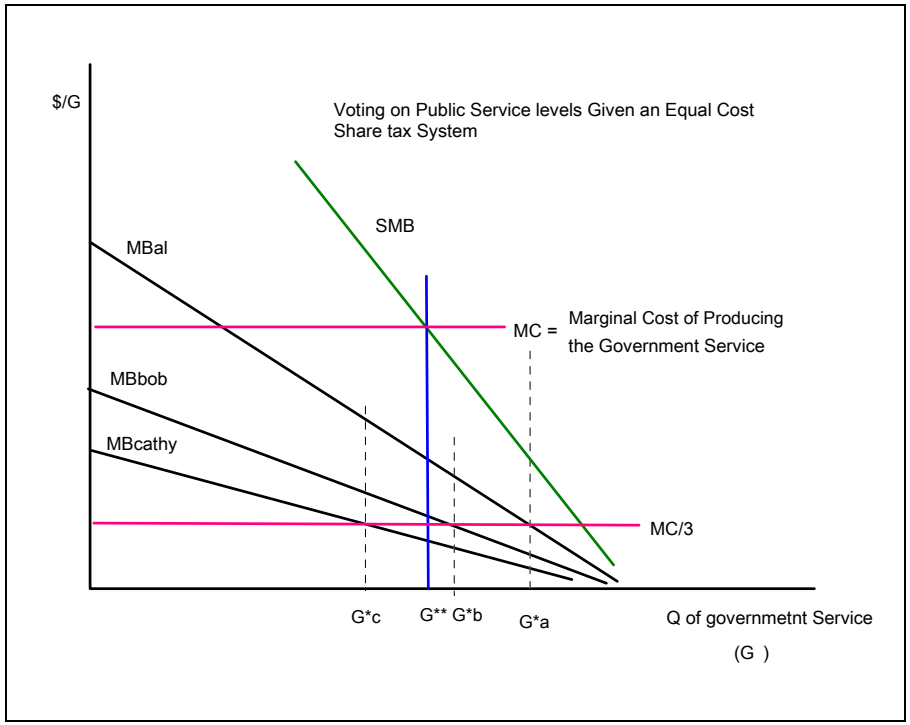
iv. Note that this is not usually the same as the social net benefit maximizing level of the public service!

a. Bob has no reason to take account of the benefits and costs imposed on other voters by his vote.

b. (Remember we assuming self-interested voting, so Bob maximizes his own consumer surplus rather than social net benefits.)

c. In the case illustrated Q** is somewhat below Q^*_b.

d. As drawn below, the supply of public services will be somewhat higher than the net-benefit maximizing level of services.



e. The government may be said to "fail" in such cases just as markets failed when we were analyzing public goods and externality problems.

v. (It is also possible for Q** to be greater Q*b.

- As and exercise draw such a case, and label all details.

C. Note that the median voter's demand for services depends on his tax price for the service(s) that government provides.

- It is his or her marginal benefits from the service in combination with his or her marginal cost for the service that determines his or her ideal point.
- A variety of tax systems satisfy the Samuelsonian rules, but not all of them will generate G** as the outcome in a democracy.

D. Notice that this illustration implies that taxes not only affect market outcomes, they also affect political outcomes.

i. The tax system affects what QUANTITY of services each voter wants to purchase.

ii. The tax system thus affects the demand of every voter.

iii. It is the middle voter that is pivotal--which is to say the median voter.

iv. By determining the demand of the median voter, a tax system can essentially determine the level of the service that emerges from competitive elections.

E. Most public services are normal goods, ordinarily a wealth person will demand higher services than a poor person.

i. That is to say, a wealthy person's MB curve for a normal good tends to be higher than that of poorer persons.

ii. However, wealthy voters are willing to pay a higher price to have one more unit of a public service than a poor person (just as they are for ordinary private goods).

iii. The "price effect" of a progressive income tax system can cause wealthy persons to demand less of a service than a poorer person because they pay a much higher price for it.

F. It is the quantities demanded by each voter that determines the distribution of voter ideal points and thus who the median voter is.

i. For example, if one uses a flat tax to fund all services, the rank order of service demands will reflect differences in tastes and incomes of voters.

ii. Generally a small increase in the marginal tax rate faced by individuals for services (an increase in the tax rate) will reduce demands for services without affecting their "rank order" -- that is to say, without changing the median voter.

iii. Other things being equal, such a change in tax law would tend to reduce the demand for public services.

- However, if income is rising at the same time, the demand for public services may nonetheless increase..
- (Explain why.)

VI. Voting on the "Governmentization" of Private Services

A. To this point, we have applied the electoral model to the provision of public goods as within a Samuelsonian fiscal package. We found that median voters will not necessarily favor the service level that maxiimizes social net benefits

and so governments may be said to fail in the same sense that markets fail in the provision of pure public goods.

B. In cases in which the initial supply of a pure public good is zero, government supply of that good at median voter ideal levels will tend to increase social net benefits if not necessarily to maximize them. (Draw a few diagrams to see how this operates.) However, when positive amounts are provided by the private sector, voters may prefer to free ride rather than pay for somewhat larger amounts of the services. (Again, draw a few examples to see how this operates. Perhaps surprisingly, this is also true of Lindahl tax based provision of public goods. (Again draw a few diagrams to see that free riding is often preferred to paying a positive price for all units of a pure public good.

C. The next cases of interest are ones in which a pure private good may be provided by government. Such cases are actually fairly common. For example, the two of the three largest areas of government expenditure today are public pensions (social security) and health care (medicare and medicaid) are cases in which a pure private good (income and insurance) are provided by government..

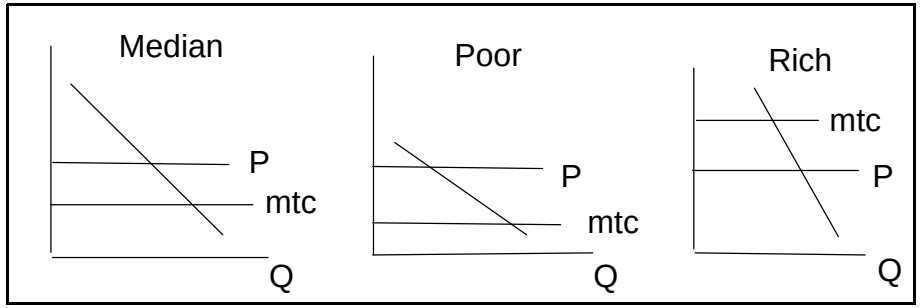
i. There is, of course, no simple net benefit maximizing justification for providing priave goods through public means if the products of interest can be provided through competitive markets. Competitive markets as shown early in the course tend to maximize social net benefits. (An exception might be made for products for which there are large economies of scale or problems with monopoly that cannot be solved through regulation--but these are not straight forward to develop.

ii. Nonetheless, it can be in a voter's interest to have the government take over the production of such services because their own tax price for the service is lower than that of the market price. because of the way the tax system works. For example, the more progressive is the tax system, the more likely it is that the median voter will be able to save money by having the government provide a pure public good--assuming that the quality of the service does not fall or at least does not fall much.

iii. The median voter is choosing between getting the service that he or she wants at his or her tax price versus paying the market price. Obviously a cost minimizing median voter will favor the delivery system with the lowest price.

iv. Other voters are choosing between the median voter's preferred level of the private good at their tax price and their own ideal level at the market price. many will also benefit from a lower price even though they cannot control the amounts received. (Indeed, these may not differ very much from that provided by markets--although without some competition, quality is likely to fall.) Among those voters, low income and richer voters with high health needs may both favor government supply of the serive--ignoring quality differences and the effects of ideology.

v. The figures below illustrate the median voter's choice, a relatively poor voter's choice, and a relatively rich voter's choice under the assumption that the private good is provided at a uniform level and is paid for with a progressive income tax.



i. **P** is the market price for insurance or health care, **mtc** (marginal tax cost) is the price under a tax financed supply of the same service.

ii. Note that both the median voter and poor voter pay a below market price under government provision, because of the progressivity of the income tax system used to pay for the service.

iii. This is not always the case, but is often the case and is assumed here to illustrate why the median voter may prefer to have some private services provided by the government.. (There may also be ideological reasons, but these are not necessary to explain such policy preferences as demonstrated here.)

iv. The relatively rich voter pays a higher than market price under government provision, because he or she has relatively higher income than the median or poor voter. The more progressive the income tax system is, the larger the range of marginal tax prices is.

v. Notice that as drawn, the median voter's demand for this service is in the middle of the three voters or types of voters.

vi. The result is a vote is a program in which the rich voters may be said to "subsidize" the middle income and poor voters.

vii. (The amounts of the goods preferred by the three voters is left to the student to identify under personal and tax-financed provision.)

viii. Note that "governmentization" is a predictable result for some sorts of goods--even if we ignore voter ideology--when they are funded through a. progressive tax system.

ix. The diagrams above have the following implications:

a. As progressivity is reduced, this effect tends to diminish, but does not disappear.

b. If expected quality is expected to be lower after governmentization--for example, because of reduced rates of innovation associated with government provision and reductions in choices associated with reduced competition--interest in governmentization diminishes--other things being equal. (In effect the MB curve after governmentization is below that of MB before privatization.).

c. Ideological interests may reinforce or reduce this tendency, as interests i in equality tend to increase it and interest in personal property rights tends to reduce it. (These also affect relative position of the before and after governmentization MB curves.)

VII. Rational Ignorance and Fiscal Illusion

A. An implication of the strong form of the median voter theorem(s) is that the median voter gets what she/he wants. However, the median voter's ability to pick the policy that is most in her (or his) interest is limited by the information, theories, and time that she (he) has available for analyzing the alternatives.

B. Analyzing the relative merits of alternative public policies is costly.

i. As with other costly activities, it is engaged in only up to the point that maximizes expected net benefits.

ii. In most cases this occurs at the point where the expected marginal benefits of more information and more analysis equals its expected marginal cost.

iii. An implication of the rational pursuit of polity information (one stressed by Downs and Tullock) is that voters will **rationally remain ignorant** of much useful information.

- Indeed they may remain completely ignorant on most policy issues. (A point stressed in some of my own work on rational ignorance.)

iv. They will use smaller than possible samples of data and ignore types and dimensions of information that are relatively costly to acquire and/or to analyze.

v. [Draw a diagram that illustrates the collection of information by an expected net benefit maximizing individual. Show that less than perfect or complete information is often optimal.]

C. A bit of rational ignorance is not a problem for democracy as long as it does not induce "biased expectations" about the benefits and/or costs of public policy for the median voter.

i. For example, if the sampling of information done by voters is reasonably complete they will tend to have unbiased estimates of their costs and benefits--although not perfect ones--and the result will *on average* advance the interests of the median voter--if not perfectly so.

ii. As long as voter expectations are unbiased, the Condorcet jury theorem implies that the outcomes of majority rule in effect "aggregate" the information in the minds of voters (by using the median of their estimates when assessing candidates or policies), and so help assure that median voter interests are actually advanced by public policies.

iii. However, if the information included in the sample falls to zero for some policy issues, voter expectations will be biased, and the results of elections will not necessarily advance all the interest of the median voter.

iv. (See Congleton 2007 and 2001 for more on this. These are available on my website under "recent publications.")

D. When voters have biased expectations about the benefits and/or cost of public programs the are said to exhibit **Fiscal Illusion**.

i. In cases in which the median voter's expected marginal benefit from a public policy is greater than the actual benefit or her (or his) expected marginal cost is lower than the actual cost, the result will be an OVER demand for public services, relative to that which actually maximizes net benefits for the median voter.

ii. In cases in which the median voter's expected marginal benefit from a public policy is less than the actual benefit or her (or his) expected marginal cost is higher than the actual cost, the result will be an UNDER demand for public services, relative to that which actually maximizes net benefits for the median voter.

iii. It bears noting that both governments and interest groups may attempt to induce biased expectations by "subsidizing" (freely providing) information

about the benefits of programs and/or "taxing" (withholding) information about the costs of programs.

E. [Draw a diagram of the policy preferences of voters with "biased" assessments of their marginal benefits or costs, and contrast the results with their actual interests.]

VIII. Extensions and alternatives to the median voter model: Interest Groups, Agency Costs, and Representative Governance

A. The median voter model represents a pure electoral model of policy formation in democratic governments. Although a very useful and powerful model of policy formation in well-functioning democracies, the median voter model neglects the effects of interest groups and the bureaucracy on public policy.

B. Incorporating the effects of these groups into the model is more properly the subject of Public Choice than public finance, but some brief discussion of their effects is presented below and in the next handout.

i. Both interest groups and the bureaucracy can influence public policy by lobbying elected officials for particular policies.

ii. By doing so, such groups take advantage of the rational ignorance of voters.

a. When these groups are successful, the policies that we observe will depart from those preferred by the median voter toward those preferred by these "special interest groups."

b. Voters tend to punish politicians for adopting policies that are different from those announced during campaigns.

- This will reduce the extent to which elected officials will listen to lobbyists and bureaucracy.
- But rational ignorance implies that there are many policies about which voters know little or nothing.

iii. **William Niskanen** argued that **bureaucrats** sometimes operate as an interest group and have incentives to try to **maximize their budgets** for many private reasons.

a. Larger budgets often create new opportunities for advancement, more pleasant office environments, more staff support, and, perhaps, even opportunities for travel.

b. Note that even "public spirited" bureaucrats who want to advance their agency's "mission" will also lobby for larger budgets.

c. Thus, Niskanen argues that lobbying by bureaucrats creates systematic increases in government budgets to the extent that they are successful.

- (Draw a diagram that illustrates this form of bureaucratic bargaining with the legislature using all or nothing offers. Note that government services tend to be larger than optimal when it succeeds.)
- [This will be covered in class if we have time..]

C. The effects of other interest groups are less systematic. Some government services may increase and other fall.

i. In general one anticipates that interest groups will be most common in policy areas in which benefits are substantial and concentrated so that the interest group can over come its own "free riding problem."

ii. **Mancur Olson's** *Logic of Collective Action* is the classic work in this area and the point of departure for most interest group models.

a. If we have time, we'll undertake a short overview of this literature, some of which is covered in the next handout..

b. That overview will include the theory of rent seeking.

IX. Some Other Extensions to the Median Voter Model

A. There is a link between the rational ignorance idea and the ability of interest groups to influence public policies.

B. A good deal of what **interests groups** do is informational in nature.

i. They sponsor research and testimony of researchers in Congress and before regulatory commissions.

ii. They sponsor political advertising of various kinds.

iii. All of this information is intended to persuade voters, legislators, and bureaucrats that the "public interest" is advanced by policies that just hapen to be the ones that the lobbying groups want.

iv. To the extent that these informational strategies affect voter expectations about their costs or benefits, they **may induce fiscal illusion**.

C. Voter ignorance also allows candidates for office to trade favors to interest groups in exchange for campaign resources.

i. If voters knew everything, campaign resources would not matter.

a. However, voters typically know relatively little about the details of candidate positions on "minor issues."

b. This allows such deals to be made without voters knowing they occur.

ii. Most campaigns for higher office benefit from campaign resources, so it turns out that a candidate that can bargain for such resources from interest

groups (without being noticed) increases his or her probability of winning the election.

iii. Candidates thus often move away from the median voter's position along dimensions of policies in which voters are ignorant of (or disinterested in) in order to secure campaign resources.

iv. This allows interest groups to have direct effects on policy that is disproportional to the number of votes that they cast in an election.

v. (It is also one reason why **campaign reform law** tends to be discussed and adopted.)

D. Other topics in voter theory beyond the scope of this course:

i. Majority cycles: there is not always a median voter

ii. Turnout: why do people vote if they have so little direct effect on electoral outcomes?

iii. The role of morality, ideology, and "expressive voting" in voter behavior.

I. Where we are at this point.

A. The median voter model serves the public choice literature in much the same way that the model of perfect competition serves the economics literature.

B. The median voter model demonstrates central tendencies in democratic decision making.

i. It predicts what democratic public policies tend to be in policy areas in which voters are reasonably well informed and electoral competition is open and fairly intense.

ii. The median voter works very well as a "first approximation" for broad policies (which are likely to be known to voters) and it provides an explanation for the relatively narrow range of policy positions taken by candidates (parties) from the dominant political parties (coalitions).

C. However, there are policy areas in which median voter interests do not seem to be advanced by public policy.

i. For example, food subsidies tend to raise the cost of food for the median voter, making her (him) worse off rather than better off than other policies that can be imagined.

ii. In many cases, farm programs advance the median voter's interest less than "no" policy would.

iii. Many of the details of tax law and regulatory law appear to benefit particular industries and occupations, rather than advance median voter interests.

D. To explain these exceptions to the median voter model, a more or less separate public choice literature on the politics of interest groups emerged during the 1960s and 1970s.

- It explored how special interest groups can affect public policy choices and move them away from the median voter's ideal.

II. The systematic part of the interest group literature begins with Mancur Olson's book, the *Logic of Collective Action* (1965).

A. Olson's book explores the implication of public goods and free rider problems for politically active groups.

i. He notes that free-rider problems exist for all interest group activities, but especially for those that benefit large groups.

ii. Smaller groups have smaller free rider problems and so are more likely to organize and lobby for policies that advance their interests than are large groups.

iii. Most of the subsequent literature was influenced by Olson's book work--although not all of it.

- Most of the subsequent research on interest groups is more narrowly focused than Olson's quite general analysis of collective action--and not all of it took account of the free rider problems associated with such activities.

B. The political economy of interest groups as applied to economic regulation was developed by University of Chicago economists with an interest in industrial organization. The first contributions to this literature took Olson's argument very seriously.

i. Stigler's theory of regulation (1971) is sometimes called the "capture" theory of regulation, because he argues that regulated industries get exactly the regulations that they want.

- Individual firms have relatively large and clear interests and tend to lobby for regulations that favor themselves. Individual consumers in contrast have relatively small net benefits at stake (individually) and so tend not to organize to resist such regulations.
- The regulations that firm's lobby for often create entry barriers that reduce competition and long run supply, increasing the profits of firms already in the industry and, in some cases, reducing the number of firms in an industry.

ii. Even uniform regulations tend to raise production costs for small and medium sized firms more than they do for large firms, because of economies of scale in reporting and keeping records.

- These ideas and empirical work supporting them led to Stigler being awarded a Nobel prize in 1982.

C. Another normative and game theoretic strand of interest group research emerged at about the same time that Olson's book was published.

i. Gordon **Tullock**'s (1967, *Ec. Inq.*) argued that the efforts of most interest groups should be considered a deadweight loss, because their efforts reduce rather than increase social net benefits.

ii. These losses are in addition to the "dead weight triangle" types of losses focused on in public finance and monopoly theory.

- (These "triangles" are sometimes referred to as Harberger DWL triangles after the USCA economist that estimated the magnitude of those losses for the U. S.)

iii. The losses associated with expenditures to obtain special privileges came be to be called "**rent-seeking losses**" (a term coined by Anne Krueger [1974]).

iv. The activities that generate such losses have come to be referred to as **rent seeking activities**.

a. The basic idea is that competition to be beneficiaries of policies that produce rent (economic profits) often reduce social net benefits rather than increase them, and so those resources should be regarded as a waste or dead weight loss.

- In the limit all the profits to be gained through such policies may be consumed in the contest to win the political contest of influence necessary to obtain them.
- In effect the profits from rent seeking are competed away, not by lowering prices, but by spending more effort seeking rents.

b. Mueller and Cowling (1978) undertook an empirical analysis of the dead weight loss of rent-seeking by would-be monopolists in the U. S. and U. K.. They estimated that the rent-seeking losses were many times greater than the static losses, about 5% of GDP.

D. Another strand of interest group theory treats the bureaucracy (government employees) as an interest group that attempts to maximize their net advantage at the expense of voter-taxpayers.

III. Olson's *Logic of Collective Action* (1965)

A. Olson argues that interest group efforts to influence policy via coordinated voting, lobbying, campaign contributions, etc. are all public goods for the group's members.

i. When a policy is influenced it, all members of the group benefit, whether they have contributed to the collective effort or not.

- Thus, there tend to be free-rider problems associated with most collective action and with the efforts of most interest groups.

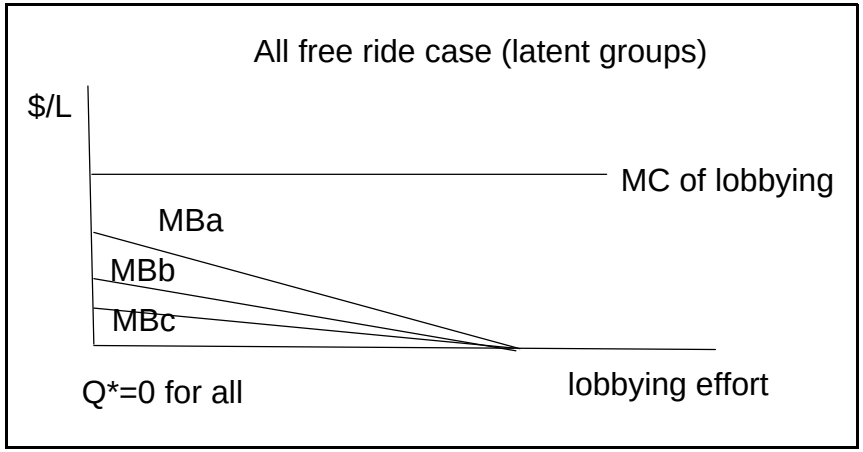
ii. Olson's theory can be used to predict the types of groups that are most likely to engage in lobbying.

iii. It also provides insights about how groups may over come the free rider problem by organization themselves.

B. Olson argues that this public good or free rider problem is the most important impediment to collective action.

C. Olson argues **that n the absence of an organization, large groups will not lobby to advance their interests.**

i. **Such groups remain "latent" and so do not, for example, lobby for particular policies or make conditional campaign contributions, etc.**



- **It should be noted, however, that many of the general interests of large groups tend to be advanced by electoral politics.**
- **The median voters most basic economic interests are his or her interests as a consumer.**

ii. **Small groups are also easier to organize, because there are fewer people or firms to incentivise and monitoring costs tend to be smaller. Small groups with intense interests are the easiest to organize of all.**

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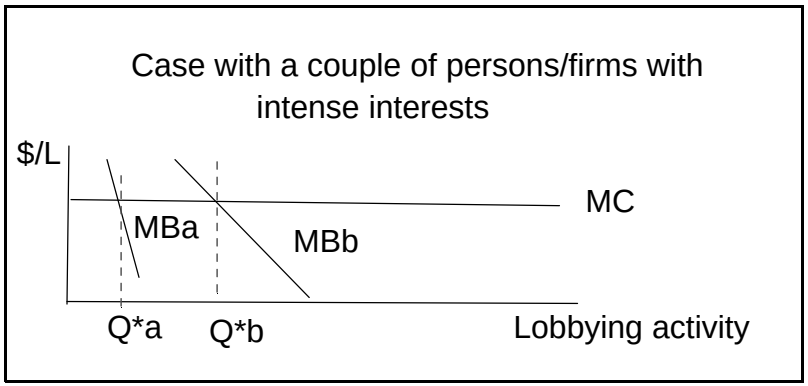


iii. **These choice settings can also be represented with game matrices that illustrate incentives to participate in activities that may affect the kinds of policies adopted by governments.**

a. **The first game matrix illustrates the behavior of members of a "latent" group--groups with large memberships and relatively small individual stakes in the laws under consideration by the legislature. Note that just as in a pure public goods problem, free riding is the dominant strategy for each and neither contributes to their group's lobbying activities. The Nash equilibrium is thus in the upper lefthand cell.**

Free Riding in a Lobbying Group

		Bob	
Al		**Free Ride**	**Contribute**
	Free Ride	**2, 2**	**4, 1**
	Contribute	**1, 4**	**3, 3**

b. **The second case illustrated with a game matrix is one for a "privileged" group. In this case, the groups are smaller and their individual interests are much greater than in the former case. Thus, each member has a sufficient reason to contribute to their group's activities, but may still benefit from free riding. There are two Nash equilibria to this game (in the absence of a formal organization) and significant lobbying takes place.**

Contributions of or Lobbying by a Privilege Group

		Apex	
Acme		**Free Ride**	**Contribute**
	Free Ride	**1, 1**	**4, 2**
	Contribute	**2, 4**	**3, 3**

c. **The last case illustrated with a game matrix is one in which a latent group and a privileged group are rivals--which is to say groups with quite different interests in the policy of interest. For reasons indicated in the first and second diagrams and first and second game matrices of this section of the notes, the latent group (in the absence of a formal organization) will devote fewer resources to lobbying than the privileged group and so "lose" if resources determine the outcome.**

Lobbying Group by Opposing Latent and Privileged Groups

		Bob	
Acme		**Free Ride**	**Contribute**
	Free Ride	**2, 2**	**2, 3**
	Contribute	**3, 4**	**4, 1**

d. **In this last case, the payoffs change a bit more than in the previous cases. Generally, the latent group is best off free riding**

if the privileged group lobbies but is better off lobbying if the privileged group doesn't. Thus there is a single equilibrium to the game in this case, in which only the privileged group lobbies for change.

iv. **Small groups with intense interests are thus often able to have their way on legislation (at the margin). And the rules that are adopted often make members of latent groups worse off by rasing prices for privately sold goods or increasing their tax burdens. This effect is most likely in areas in which a rationally or naturally ignorant voter remains uninformed, because this reduces the incentives of elected officials to take account of voter interests.**

a. **For example, firms may get protection in a form that generates profits for themselves but higher prices for consumers.**

- **The tariff protection provided US sugar growers is one such case.** It raises the price of sugar and sugar products in the US for consumers.
- Of course, this requires rational ignorance on the part of voters in the policy areas of interest. (Explain why.)
- Small ideologically energized groups may have similar effects.

b. Small politically active groups are often able to get preferential government policies adopted which benefit themselves at the expense of other larger groups.

v. **Large groups require some sort of organization** to be able to lobby.

a. Such groups are often organized for other purposes, as with farm cooperatives and labor unions.

b. However, once organized, they can be used to raise money for lobbying on behalf of their members.

- Groups that lack other reasons to organize tend to remain unorganized and thus "latent" in Olson's terms.
- Lobbying will rarely be the primary aim of organizations with large numbers (thousands or millions) of members.

D. This asymmetry in the ability of small and large groups to organize and lobby for or against policies implies that the benefits received by small groups are often less than the costs imposed on the large unorganized or poorly organized group.

- It is such cases that regulatory policies generate dead-weight losses.
- Many entry barriers, for example, increase an industry's profits but reduce social net benefits by reducing supply and increasing market prices.
- Many tax privileges increase tax burdens for others in society, and through effects on tax rates (they increase) increase dead weight losses from taxation.

E. Olson also analyzed various methods that groups might use to help overcome their free-rider problems.

i. He noted that organized groups generally provide benefits that are directly related to active membership.

- To get such benefits, they have to pay their dues, participate in lobbying and rallies, etc..

ii. Such conditional benefits provide incentives to join the organization and pay their dues.

a. These conditional benefits are normally pure private goods, often produced with economies of scale, but perfectly excludable.

- Providing such services reduce incentives free ride on the groups l activities.

b. Olson calls such conditional benefits **selective incentives**.

- For example, farm coops provide many services to farmers in addition to lobbying for preferential farm policies.
- Environmental and senior citizen groups often sponsor trips, newsletters, and so forth.

iii. Keep in mind that interest group activities are only part of the process that generate public policies in democracies.

a. Electoral competition still matters--especially on broad policy issues understood by voters.

b. The "dark side" of interest group politics affects policies only at the margin in well functioning democracies like those of the US, Canada, and Western Europe.

IV. How Do Interest Groups Affect Public Policy?

A. There are a variety of perfectly legal methods by which interest groups can affect public policy.

B. First, and probably most important, is persuasion.

i. Interest groups may attempt to persuade the public (voters), their representatives, or regulations that the "best" policy just happens to be the policy that generates large transfers to the groups of interest.

ii. To persuade voters and politicians, they can sponsor TV and internet advertisements, blogs, books, and reports on the projects that they favor.

iii. In effect such campaigns selectively reduce information costs to induce voters and government officials to become more familiar with data or arguments that support their preferred policies.

C. Second, in a democracy or dictatorship, such groups may provide direct and indirect support for those in power in exchange for preferential public policies, subsidies, and/or tax breaks.

i. In democracies electoral can be done with "single issue" voting, public protests/support, and with campaign contributions.

ii. In dictatorships, support may be provided with "gifts" to persons in authority, organized public demonstrations of support, and by helping out with censorship and the discovery and repression of political opponents.

D. Third, there are also many illegal methods of influence: bribery, threats of violence, extortion, blackmail, etc. of relevant policy makers.

- [All these methods are routinely used, although not to the same degree in every country.]

E. Thought questions:

i. Name several groups that appear to be effective at influencing public policy.

ii. What methods do they seem to use?

iii. Does the general flow of direct and indirect transfers look like Olson's analysis suggests?

iv. What is the optimal size of an interest group?

v. Is free-riding necessarily a social problem in this case from the point of view of the Pareto criteria?

vi. Draw an Olsonian lobbying diagram in which one of the interested members of a group is a billionaire.. Show the "high demander provides" equilibrium, and discuss the relevance of this model for contemporary US politics.

V. Elections, Interest Groups, and Campaign Contributions

A. During electoral contests, interest groups often provide campaign contributions of various kinds: money, labor, assistance with travel arrangements, etc.

B. The tradeoffs faced by a candidate who can use campaign resources to influence his probability of being elected is within the following diagram.

i. The diagram uses "iso-probility" lines.

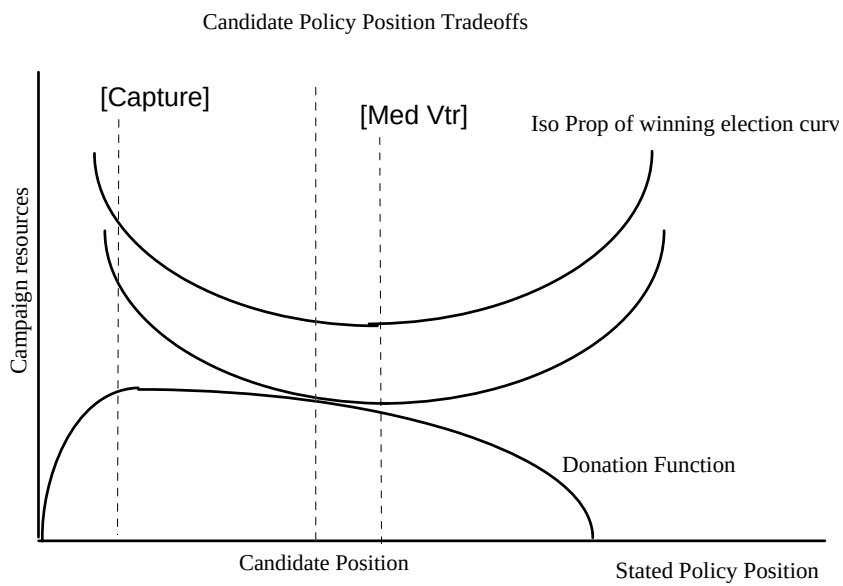
- Iso-probability curves characterize combinations of policy positions and campaign resources that generate the same probability of being elected.
- They are thus analogous to indifference curves for politicians running for office.

ii. The shape of the iso-probability lines is one way to characterize the importance of campaign resources.

- The lines may be horizontal, in which case only campaign spending matters. In such cases voters can be easily persuaded to accept the arguments of candidates and interest groups.
- They may be u-shaped, in which case both policy positions and campaign resources matter.
- They may be vertical in which case only campaign positions matter and campaign resources are irrelevant. (This takes us back to the

median voter model. The highest iso-probability line in this case is the one passing therough the median voter's ideal point.)

iii. When they are u-shaped as drawn below, candidates face a tradeoff between satisfying the median voter and securing sufficient resources to run a creditable campaign.



iv. A broad array of intermediate type "ii" shapes are possible--as in the case drawn--with various tradeoffs between policy positions and campaign resources as illustrated.

- As they become flatter, campaign resourses become more important.
- As they become steeper (narrower and more vertical) campaign resourses become less important.
- The equilibria of all such intermediate cases are between the median voter and capture equilibria, as in the above diagram.

v. If only campaign resources matter, then the iso-probability lines are horizontal, and candidates will attempt to maximize campaign resources.

- In that case, the equilibrium policy position will be the one labeled "capture."

vi. If only policy positions matter, then the iso-probability lines are vertical, and the median voter model in its pure form obtains.

- In that case, the equilibrium candidate position will resemble that labeled "Med Vtr."

vii. Perhaps, surprisingly, there is quite a bit of statistical evidence that near vertical or tightly u-shaped iso-probability curves are the most common in the U.S. and that candidate positions are more important than campaign resources "at the margin."

- (Note that successful candidates may still have more money to spend than losers, but this reflects the donor's interest in gain favor from the persons holding high office.)

C. Footnote/Appendix for interested students--Difficulty of moving beyond the one-sided case illustrated

i. The illustration can be used to determine a Nash-type reaction function insofar as the donation function and the probability of being elected functions are both determined (as drawn) by specific positions on the part of the other candidate(s).

ii. Unfortunately somewhat ad hoc assumptions have to be introduced to demonstrate the existence of an equilibrium.

iii. In the Stochastic voting models it is assumed that voters have an exogenous bias favoring one of the candidates. This generates an equilibrium where the favored candidate departs furthest from the median voter position , secures the most resources, and wins the election. (The other candidate in such models often locates at the median voter position, but loses none the less.)

iv. In models that do not assume such a bias, an equilibrium only exists when donors are symmetrically distributed about the median voter. That equilibrium was a median voter equilibrium.

v. (In other cases, the one most likely to lose can always gain a 50% chance of winning by taking the same position as the other candidate, yet once this happens the other generally can find a better position, thus there is no equilibrium, but a range of possible positions (as in musical chairs) that candidates might take in a given election. This result surprised me.)

VI. Normative Aspects of Interest Group Politics: Rent-Seeking Losses

A. Gordon Tullock (1967, 1980) pointed out that many of interest group activities are costly and socially unproductive.

i. To the extent that the policies lobbied for are transfers programs, or programs with a positive dead weight loss, **it may be said that all the resources used to get those programs adopted are wasted**.

ii. These resources could have been used to produce new goods and services or efficiently enhancing services, rather than to produce new or increased dead weight losses.

iii. Instead, the resources are consumed in conflict that tends to reduce the size of the "social pie."

B. To an economist, a "rent" means "compensation above one's opportunity cost" or expressed a bit differently: rewards greater than necessary to attract resources to their current uses.

- Rents in this sense tend to be just another word for profits.
- Many rules that prevent competition in one way or another may be said to generate rents or profits for the persons receiving preferential treatment.

C. Tullock argued that not only are resources wasted in the pursuit of monopoly privileges, protective tariffs, and tax preferences, but that **the waste may be very large**.

i. He argues that in a perfectly competitive market for political influence, the rate of return on rent-seeking activities should fall to that of other possible uses of a person or firm's resources.

ii. In this case, all the "profits" from rent seeking tend to be consumed by the process of competing for them.

iii. Winners still profit, but the overall rent-seeking contest consumes resources that are approximately equal to the profits won.

- For example, in a standard monopoly diagram, there is a rectangle of profits obtained by controlling output to keep prices up.
- That profit will be competed away as would-be monopolists all attempt to secure such privileges for themselves from government.
- [Draw the classic figure illustrate rent-seeking costs involved in Monopoly and Tariff policy. Label both the Harberger DWL triangle and the Tullock rent-seeking losses rectangle.]

iv. Not all rent-seeking contests have this property (which came to be called "exact dissipation," but many do.

D. The game matrix below illustrates how a contest between two persons can escalate toward the "exact dissipation" result.

i. In the contest characterized in the game matrix, the "rents" are simply taken from the other player, but at a cost.

- The efforts of both players are consume resources.

A Rent Seeking Contest between Groups A and B (The strategies are effort levels)

	B = 0	B=1	B=2
A = 0	4, 4	2.5, 4.5	1, 5
A= 1	4.5, 1.5	3, 3	1, 4
A=2	5, 1	4, 1	2, 2

ii. The equilibrium effort levels are fairly high (2 each), although not all of the game's "GNP" is consumed by the contest.

- Notice, however, that the total net benefits of the equilibrium outcome is below that of the upper left-hand cell, where no effort in rent-seeking is made.

a. There is a dead weight loss of 4 from this game.

- 4+4 = 8 which is greater than 2+2=4, the difference in net benefits between the upper left-hand and lower right-hand cells is 4.

b. Note also, that there are two Pareto superior moves at the equilibrium: from E=2, E=2 to E=1, E=1 and from E=2, E=2 to E=0, E=0. (3,3) > (2,2) and (4,4)>(2,2).

iii. Unfortunately, under the rules of the game--as implicitly summarized by the game payoffs, the Pareto efficient outcome (E=0, E=0) is not stable--each person privately benefits by engaging in some rent-seeking effort.

E. In many cases, the efforts of interest groups largely offset each other, and so most of their efforts are "wasted."

i. Rent-seeking losses occur because of both the competitive nature of rent-seeking contests and because of the methods used to win.

ii. The losses are larger for some contests than others, because their are more players and/or the method of competition consumers more or less (net) resources.

iii. The game matrix below adds a third payoff that represents losses to those outside the rent-seeking contest. The game characterized is one where those outside benefit as rent-seeking falls. Their ideal is that with no rent seeking. However, that outcome is not stable because rent-seeking is potentially profitable.

A Rent Seeking Contest
between Groups A and B
The strategies are effort levels (or investments)
The payoffs are net benefits (A, B, C)
(C represents net benefits for others outside the game.)

	B = 0	B=1	B=2
A = 0	1, 1, 8	0, 2, 7	-1, 3, 6
A= 1	2, 0, 7	1.5, 1.5, 5	2, 1, 4
A=2	3, -1, 6	2, 1, 4	2.5, 2.5, 1

iv. In the above game matrix, the Nash equilibrium is, as in the first example, in the lower right-hand cell.

- This contest "escalates toward relatively large rent-seeking expenditures.
- The rent comes from "transfers" from others outside the game.
- (It bears noting that not all rent-seeking contests tend to escalate, but other cases are beyond the scope of this short overview.)

v. In the case illustrated, there are no (simple) Pareto superior moves at the Nash equilibrium, because the interests of the rent seekers and those being exploited differ.

- This follows even though social net benefits are not maximized for the society as a whole.

a. For and overview of this literature, see Congleton and Hillman (2015).

F. Footnote/Appendix, Optional: the mathematics of a Tullock rent seeking contest:

i. Let the contest success function be $R_j^e = R\,[E_j/(E_i + E_j)] - E_j$

ii. R is the prize, Ej is the effort of the jth group or individual., the probability of winning the prize is $[E_j/(E_i + E_j)]$, and the expected net prize is R_j^e.

iii. To find Group j's optimal investment, differentiate R_j^e with respect to Ej, set the result equal to zero, and solve for Ej as a function of Ei and R.

iv. Repeat for group I.

v. The result for "ii" is the "best reply function" for group ii and the result for "iii" is the best reply function for group iii.

vi. The Nash equilibrium occurs when both ii and iii are satisfied simultaneously.

a. This can be solved for with a bit of algebra.

b. However, **a convenient shortcut** is to note that the game is symmetric and assume that a symmetric equilibrium exist (as in the game matrices).

c. In this case, one can simply substitute Ej for Ei in either (or both) of the reaction functions.

d. If you do so, the result will be: Ej=Ei=R/4.

e. The resources wasted at the Nash equilibrium equals the sum of the effort in this case, which is R/4+R/4 = R/2.

f. In equilibrium, rent-seeking contestants "waste" (dissipate) half of the prize in their efforts to win.

vii. Thought questions:

a. To what kinds of activities other than politics might the logic of the rent seeking contests apply?

b. How does rent-seeking differ from ordinary auctions?

c. Is the rent-seeking industry as large as you might expect based on Gordon Tullock's argument? Why or why not?

d. How might one reduce the extent of rent-seeking losses?

VII. Bureaucracy as a Special Interest Group

A. In the median voter model, we treated the process of "government production" as if it took place mechanically and automatically.

i. That is to say, if the electorate votes for a referendum or candidate and that proposal or candidate wins, the promised policy is adopted and the bureaucracy simply implements the policy as promised.

ii. This is similar to the way that we look at production in most economic model of the "firm."

iii. However, the real world is not so simple.

iv. There can be "principal agent" problems in both political and economic settings.

B. Were bureaucrats entirely disinterested in policy and were the "decisions" reached by political decision makers always crystal clear, the bureaucracy might well simply implement what ever policy it is told to--as if it were bureaucrats were ideal programed "robots" or ideally incentivized workers.

i. They would have no interest or ability to do otherwise in such cases.

ii. However, when the "best" policies are not obvious to voters or legislators, bureaucrats may have considerable influence over both the design and implementation of policy.

C. In such cases, analysis of bureaucratic decision making will be required to understand many policy decisions.

i. Bureaucrats may, for example, lobby to influence the policy choice made by legislatures and voters.

ii. A variety of other principle-agent problems may also occur within the public bureaucracy: shirking, etc.

D. Niskanen (1971, 1975) proposes a **Budget Maximizing model of bureaucratic behavior with respect to the legislature.**

- He argues that essentially all bureaus and bureaucrats attempt to increase their budgets.

i. Why would bureaucrats try to maximize their budgets?

ii. Niskanen argues that bureaucrats have a direct personal interest in the size of their organization's budget because:

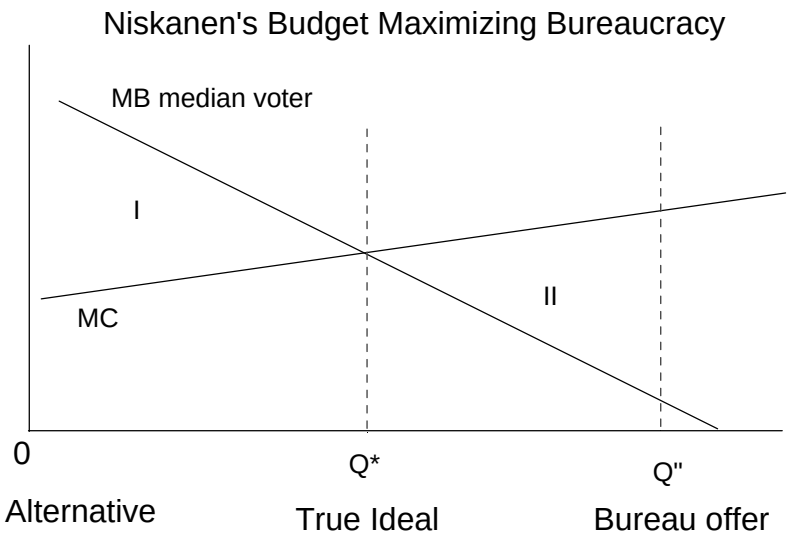
a. Opportunities for promotion tend to increase, and thereby expected salaries, as budgets increase

b. Working conditions tend to improve--computers, office furniture, secretarial support, etc.-- as budgets increase.

c. Non-pecuniary compensation tends to increase as resources become available for travel, dinners, or projects of particular interest to a given bureaucrat.

iii. Moreover, to the extent that public employees are interested in the mission of their agency or bureau, they will gain additional satisfaction by being better able to advance the agency's mission as their budget increase.

- (Even very public spirited bureaucrats generally have an interest in



larger budgets.)

E. The bureaucratic interest in larger budgets would not be significant, if they had no methods by which they might achieve higher budgets.

i. However, Niskanen argues that the bureaucrat's superior knowledge of production methods, policy alternatives, and public demand for specific services, provides them the ability to influence legislative decisions.

ii. They are often regarded as experts. (In many cases they actually are experts, they just happen to be interested in larger budgets).

- It also bears noting that most budgetary requests originate with the bureaucracy.

iii. In extreme cases, bureaucrats can maximize their budgets by making **all or nothing offers** to their sponsors (or oversight committees).

iv. The illustration below characterizes the largest budget that can be acquired by making all or nothing offers.

.

a. If the bureaucrat argues that the "real" choice is between Q" and nothing, an (uninformed) legislator will accept the proposal (Q") as long as area I is larger than area II.

b. **In the limit, the bureau can obtain a budget to produce output Q where area I is approximately equal to area II, and output is twice as large as maximizes the net benefits for the "sponsor" (congressional committee or median voter)**

c. In the case where marginal cost and the demand for the public service under their agency's power are linear, **the maximum budget is twice as large** as the service level that would have maximized net benefits.

F. Implications.

i. To the extent that bureaucrats can use "all or nothing" offers to obtain budget increases, bureaus will tend to have budgets that are larger than those which maximize net benefits for the legislature (ultimately voters or interest groups).

a. This provides a partial explanation for defense spending being "too high."

b. It provides a partial explanation for heathcare support (etc) being "too high."

c. It provides a partial explanation for why environmental regulation tends to be too rigorous.

- (Of course, all these are also affected by interest group lobbying.)

d. [Whether the Niskanen theory is the correct explanation, depends on the actual bargaining that we observe. Are bureaucrats always much better informed than Congress? Or does this vary by policy area? Why?

e. (Can you think of examples of budget maximizing behavior in the public and/or private sectors?)

VIII. Footnote/Appendix Optional: Other Agency Costs

A. Bureaucrats may influence how policies are influenced even if they cannot influence their budgets, because bureaus and bureaucrats normally have some discretion over the implementation of policies for several reasons.

i. First, monitoring can never be perfect.

a. As a consequence, some laws may go unenforced, at least on occasion, because law enforcing agent have only weak incentives to enforce such laws.

b. Similarly, it is often difficult to determine whether a road, cost estimate, or satellite launch is well done (or done as well as possible), without a very careful review of of the bureau's analysis.

ii. Second, discretion over policy might be explicitly delegated to the bureaucracy.

a. The bureaucracy often has expertise--at the very least knowledge of time, place and circumstance--which policy makers lack.

b. Because of this bureaus are often granted some discretion to *interpret and implement* "the policy" in the manner that seems appropriate.

c. In many cases, the actual writing of laws (deciding targets for pesticides and food additives) are delegated to the agencies.

d. Politicians may also delegate decisions to the bureaucracy, not because of the bureaucracy's expertise or comparative advantage, but rather to avoid making public commitments on controversial regulations.

B. In the end, almost all agencies have at least some discretion over the implementation of their assigned duties.

i. In cases where the aims of bureaucrats differ from those of the legislature or electorate, an *agency problem* over the implementation of policy is likely to exist.

ii. That is to say, bureaucrats may implement policies in ways that do not maximize the net advantage of their "sponsors" (the legislators or electorate).

a. For example, public agencies might engage in "Predatory Pricing" (Lott, 1990, J.Pub.E.): That is to say, bureaus may under price their services to drive out private (or public) competition. They can do so, because their production is paid for (or subsidized) by tax payers, rather than their customers.

b. [Illustrate this with a simple diagram.]

c. In cases in which public bureaus have monopoly power, they may be able to manipulating the demand for their services in a manner analogous to interest groups and/or by threatening to close the most valuable services whenever their budgets are under review.

d. [Illustrate this with a simple diagram.]

C. The modern literature on contracts (which emerged well after the literature on bureaucracy began) suggests that there are a wide range of contractual means by which agency problems may be addressed.

i. For example, bureaucrats could be required to post a performance bond which they may redeem upon successful completion of an assigned task.

ii. Wages and salaries could be based on measured output (bridges built, cases handled, money's dispensed appropriately), rather than the quantity of an input (time spent on the job).

D. But, beyond prospects for promotions, such incentives are rarely used within government bureaucracies.

i. Most bureaucrats are paid a straight salary which is largely independent of day to day performance.

ii. [In fact, you might argue that, given the method of compensation, agency problems in the US and Western Europe are surprisingly small. Why?]

I. Introduction to Fiscal Federalism

A. Thus far in the course, we have analyzed:

i. the positive properties of a single tax or expenditure program in isolation

ii. the normative properties of such taxes and expenditures

iii. the normative or "economic" case for government services and regulation: externalities and public goods problems

iv. the politics the underlie the main (large and well known) tax and expenditure programs selected by elected governments.

v. the effects of interest groups in well-functioning democracies

vi. All these analyses were grounded in relatively simple and general models of rational decision making that we developed in the first few lectures of this course.

B. Next we'll use the same models to analyze settings in which governments are not monolithic unitary organizations, but rather decentralized, federal, or confederal governments.

i. Decentralized policy making structures are common features of most national governments.

a. Most governments have regional and local governments, as well as central (national or federal) governments.

b. However, the extent of policy making authority accorded to state and local governments varies widely.

c. Some countries have local and regional governments that have little control over taxation and expenditures, while others have local and regional governments that exercise considerable control over taxes, expenditures, and regulations.

- For example, the state and local governments of Spain and France tend to have relatively little authority over public policies.
- Whereas, the states governments of the United States, Switzerland, Australia, and Canada have a good deal of authority over budgets and regulations.
- In between are the state and local governments of Germany, the United Kingdom and Sweden.

ii. In cases in which the various state and local governments are independently elected--rather than appointed by the central government--policy making at the various levels of government are substantially independent of one another--and thus our model of governments operating alone remains useful for thinking about state and local governments as well as national ones.

iii. However, there are important features of federal systems of government that need to be taken into account.

a. First, state governments compete with each other in a variety of ways. Local governments compete with each other for residents, business, and for grants from state and national governments.

b. These competitive aspects affect the kinds of policies that local and state governments "can" adopt.

c. For example, grants from higher level governments to lower levels of government often affect the relative cost of government services--much as subsidies do for individuals--and so affect local public policies.

d. Competition for residents implies that a state has to please its residents to "keep them," or attract new residents.

iv. All these effects can be analyzed using rational choice models. Examples include taxes, public services, local fiscal and regulatory policy.

v. The result of a decentralized, "polycentric" system of governance is a patchwork of policies that vary among state and local governments, but which generally pleases a majority of their residents.

C. In federal systems of governance, the central government is formally sovereign, rather than the "member" states, but the states often have independent formal legal (constitutional) status.

i. Federal states include a hierarchy of governments with more or less overlapping jurisdictions, but more or less independent policy making procedures.

ii. Some federal systems are more decentralized than others, because their local governments are less independent and/or have less authority than in others.

a. In some cases a subset of local officials are appointed by higher levels of government.

b. In some countries, local governments have relatively little ability to make tax, expenditure, or regulatory decisions.

iii. The parliaments of constitutionally federal governments include a chamber that represents state (provincial, lander, etc.) interests.

- Some political scientists insist that a truly federal government always have a chamber in the national legislature that represents state interests.

- However, such a structure is not necessary for what economists refer to as "fiscal federalism."
- What is required for fiscal federalism is simply some local independence and some authority to make fiscal (tax and/or spending) decisions.

II. Advantages of Federal and Polycentric Systems of Government

A. Most large governments are "polycentric" in the sense that they include many agencies that can make more or less independent policy decisions that are binding on the nation as a whole, regions of a nation, or other parts of the government. In many cases, this is simply a matter of bureaucratic organization that attempts to take account of advantages of specialization and local management of particular areas of policy. Local circumstances and problems are often best assessed "on the ground," meaning by persons in the area to be regulated or in which services are to be produced and distributed.

B. In many cases, the sub-units of government are products of historical agreements as when several smaller governments band together to create a larger governing agency. These include both confederal and federal governments. In such cases the member states or provinces are older than the central government and, one way or another, created it.

C. In federal governments, the central government is supreme in a subset of policy areas and the state or provincial governments are supreme in others. And, there may be a few policy areas in which both levels of government share responsibilities.

D. In confederal governments, the states have greater authority than in federal systems, which in many cases, include significant veto power over the central governments policies. (Policy making of the European Union resembles that of a confederation, and in the EU, unanimous agreement among the member states is necessary for major policy decisions.)

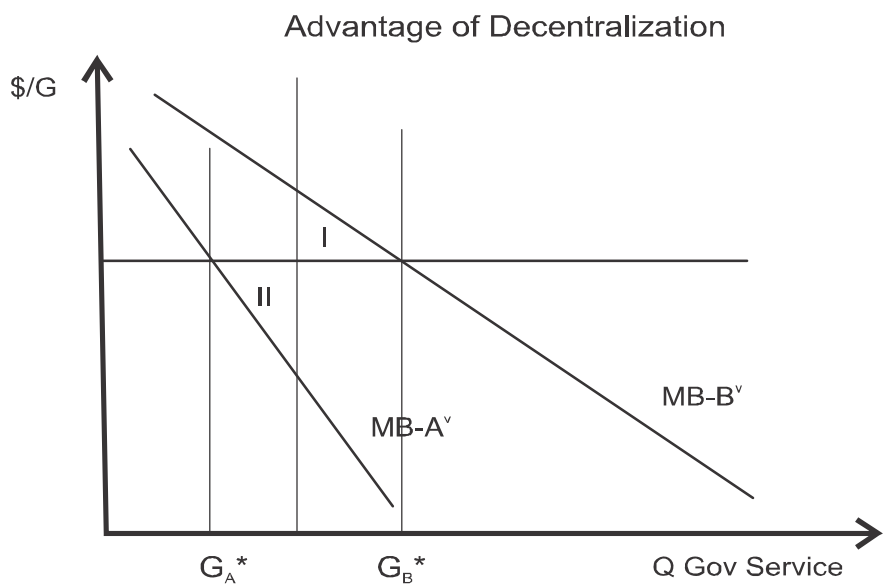
E. In areas of policy in which the states can make independent policy decisions, those decisions tend to reflect state level rather than national politics.

i. Insofar as the state governments are elected, their policies can be modeled as the policies preferred by state level median voters.

ii. If state level median voters have different interests, have different incomes, or face different prices for government services, they will tend to have different "ideal" points with respect to public policy.

iii. A a consequence, state or provincial level policies tend to vary and do so in a manner that tends to advance state level median voter interests, which will, of course, be favored by majorities of a state's voters for reasons that we developed a few lectures back.

F. Illustration of the Oates' Decentralization Theorem



i. In the figure above, the marginal benefits of the median voters of two different states or communities are depicted. (To simplify the comparison, it is assumed that the marginal costs curves in each state or community are the same, as would be the case if they purchased the service from a company that provided it in both states. However, the conclusions do not depend on that.)

ii. Note, that the median voters of the two communities disagree about the ideal level of this service.

iii. Note also that these service levels (G_A and G_B) would be preferred by a majority of the voters in their respective states--although not all voters.

iv. Note as well that a single uniform output between the ideal service levels of the two states imposes losses on each median voter. The

median voter of community A loses area II and the median voter of community B loses area I.

v. Thus, the service levels chosen by each state (or local government) provides larger net benefits than any single service level provided by the national government can.

vi. This is the essential geometry of what Wallace Oates called the decentralization theorem.

G. In general, the decentralization theorem implies that services should be provided at the lowest level of government able to realize all (or most) economies of scale involved in producing the service. Variety, in this case, makes a super majority of voters better off over any uniform level of service.

H. Unless there are substantial economies of scale that cannot be realized by local or state governments or significant inter-state externalities exist, the pattern of state policies associated with federal governments tends to advance broader voter interests than any single centralized policy can.

III. Intergovernmental Competition: the Tiebout Model

A. Another normatively attractive feature of federalism is that states tend to compete with each other for residents which encourages them to provide their services at least cost.

B. The analysis of "perfect" competition between state or local governments was pioneered by an economist named Charles Tiebout (pronounced Tee boo).

C. Charles **Tiebout** (1954) pointed out that competition between local governments can have properties that are similar to those of perfect competition between firms in competitive markets if voters are mobile.

- Instead of competing for consumer dollars, local governments can be thought of as competing for residents and tax base.
- To attract new residents they have to provide services at a "reasonable" tax cost or else people would move to other communities where the "tax prices" were more reasonable.
- When competition among governments for residents and tax bases are "perfect," competition can generate patterns of local public services and taxes that are economically efficient in the same sense that competitive markets can.
- (However, as we will see, the assumptions required for this ideal limiting case to occur are even more demanding (less likely) than those required for competitive markets. Nonetheless, competition should move local policies in the direction described by Tiebout.)

i. Tiebout uses migration and changes in local tax bases to characterize a **perfectly competitive** environment for local and state governments.

a. He assumes that **moving** from one community to another is **costless** and motivated entirely by differences in local public services and taxes.

b. He also assumes that competition for residents produces a wide range of fiscal packages to choose from.

c. Potential residents "vote with their feet" and locate in the jurisdiction that has the best combination of taxes and services, given their tastes and income.

d. Residents, thus, locate in communities where they get the services they want at least cost.

ii. In the limit, "voting with one's feet" produces a competitive equilibrium among communities in which:

a. Each community provides its bundle of public services at least cost.

b. Every community is ideally sized to produce its bundle of services.

c. Each community's residents are "homogeneous" in their demand for local public services.

d. Each voter-resident pays the marginal cost of his or her services.

iii. Such tax and service combinations meet the Lindalh conditions for efficient provision of public services (as well as the Samuelsonian ones).

iv. Note that **this process does not require an effective political system** to achieve Pareto efficient results, only very mobile tax payers who can take their part of the tax base with them.

- ♦ In order to tax mobile resources, communities (towns, states, and countries) have to provide services commensurate with their tax costs.
- ♦ Otherwise "public consumers" will **vote with their feet** and move to other places that provide better value for their tax dollars (taking "their tax bases" with them).

D. Tiebout's analysis provides one of the strongest arguments in favor of decentralized governance. It induces the efficient provision of government services and also encourage governments to innovate.

i. Decentralizing the provision of local services potentially allows voters to get just what they want from goverment--no more and no less.

ii. The tax system in place tends to resemble a Lindahl tax system and thus (in the limit) every resident is content with the services provided given their own tax cost..

iii. All services are provided efficiently, at least cost.

E. Intergovernmental competition does not always work as well as Tiebout suggests, but this idea has informed a good deal of discussion about the desirability of decentralizing the provision of services.

i. For example, it along with Oate's decentralization theorem provide the main justifications for the "subsidiarity principle," the rule that responsibility for a government service or regulation should be assigned to the lowest level of government capable of providing the service.

F. Although Tiebout's idealized equilibrium may be a reasonable first approximation for competition between local governments (and condo associations) within a metropolitan area, **there are limits to its applicability**--just as there are limits to the applicability of his theory of perfect competition in ordinary markets.

i. For example, the cost of moving between governments is not trivial, and tends to vary with the level of government.

ii. There also tend to be more local governments to choose from than state of national governments.

iii. Both these factors imply that "Tiebout competition" is likely to be more intense at local than at state or national levels.

iv. Just as the "law of one price" for markets varies with information and transactions costs, Tiebout's "homogeneous demand for services" result varies with the cost of moving. The lower this cost is--other things being equal--the more uniform will be the demands for services within a community or jurisdiction.

- This partially explains why rural demands for services tend to systematically differ from urban demands for services.
- People move toward or away from cities according to their demands for and willingness to pay for services.
- (Note that this effect shows up on US post-election maps in that republicans tend to demand low services and tend to live in rural areas.)

v. **Another theoretical (and practical) problem is that economies of scale** in producing important government services may reduce the number of competing "town-firms" that can be sustained in a "Tiebout world" in a manner that economies of scale can reduce the range of choice available to consumers in markets..

- ♦ Economies of scale imply that menu of government services that voter-taxpayer-consumers can choose from may be more limited than the Tiebout model implies.
- ♦ In such cases, residency choice is still partly determined by the net benefits associated with the fiscal package available.
- ♦ However, local politics be a more important determinant of services and citizen welfare than implied by the Tiebout model. and residents no longer get exactly what they want from their governments.

vi. The existence of intergovernmental **externalities** may also imply that some services are under provided locally and others are over provided relative to the levels that maximize social net benefits.

a. The logic closely parallels our earlier analysis of externalities between individuals and/or firms.

- ♦ NIMBY problems may also emerge.
- ♦ Transfer programs may be underprovided.

b. Solving externality and public goods problems may require "treaties-Coasian contracts" or "interventions" by higher levels of government.

G. The existence of economies of scale and externalities provide **an economic rationale for federal systems** with several "levels" of government with responsibilities for providing services in different sized jurisdictions.

- ♦ If Tiebout worked perfectly, it would imply that an efficient federal government would be composed largely of local governments with a very small central government with the sole task of guaranteeing citizen mobility among communities.
- ♦ (Explain why)
- ♦ Economies of scale and externality problems imply that other levels of government are necessary to provide government services efficiently (and/or to maximize social net benefits).
- ♦ (Explain why)
- ♦ However, overall, the Oates and Tiebout arguments suggest that decentralization and intergovernmental competition tend to systematically generate benefits for their citizens even in cases in which Tiebout's perfect competition is absent.

IV. Decentralization varies among federal governments

A. In cases in which several of the "levels" of government have independent taxing and/or spending authority, a country or nation state can be said to exhibit **fiscal federalism** (Oates 1972, 1977, 1999; see also Mueller in Congleton and Swedenborg 2006).

i. Fiscal federalism does not require political federalism, but it does require "polycentric" governance (Ostrom 1972, McGinnis 1999, Hooghe and Marks 2003).

a. Within the US, individual state, county and town governments (local voters) can usually control local taxes and expenditures.

b. Similar decentralized control over taxes and expenditures also exist in Canada, Australia and Switzerland which are **federal nation states** and within Scandinavian nation states, **which are not**.

B. The greater is the independence of local governments and the broader is their fiscal and regulatory authority, **the more decentralized** is a federal (or other polycentric) government.

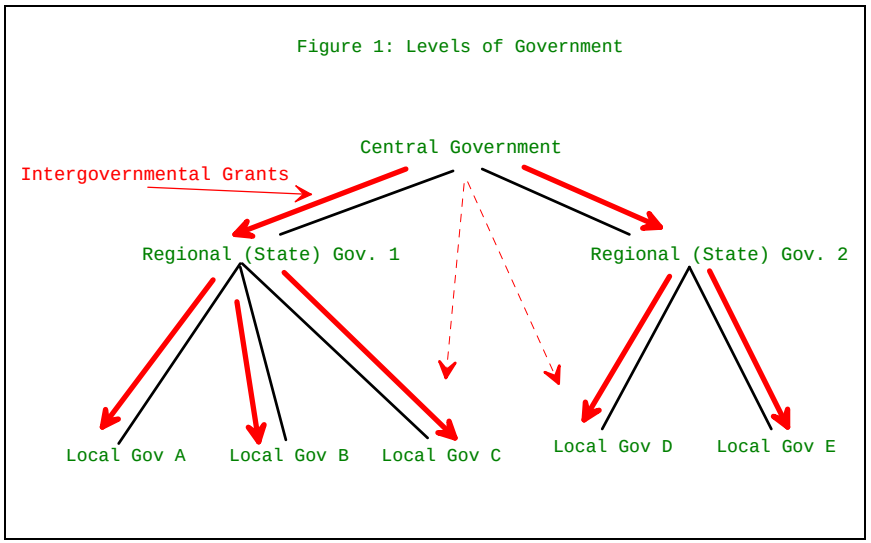
i. In other less decentralized federal systems, control over many local taxes and expenditures is exercised by higher levels of governments.

a. Independent state and local governments exist, but they are not able to set many (or any) local tax rates or may have very limited control over local expenditures.

b. Fiscal federalism exists in such countries as well, if local governments can make some independent fiscal decisions.

ii. Within "unified" governments, local governments may also be more or less independent and more or less free to determine taxes, expenditures, borrowing, and regulations.

- Such states may be considered to be "federal" in the fiscal sense because taxing and/or spending authority is distributed between national, state, and local governments.)



C. Federal systems of governance have both "vertical" and "horizontal" relationships among governments.

i. With respect to "vertical" relationships: some state and local services and taxes may simply be mandated by higher levels of government.

a. Local governments are constrained in what they can do by state laws.

b. State governments are constrained in what the can do by national laws.

ii. In addition to mandates and prohibitions from higher levels of government, there are often subsidies from "upper" levels of governments to "lower" levels of governments that create new opportunities for local governments to provide services without having to raise local taxes.

iii. In the diagram above, the red arrows can be thought of as "mandates" placed on local governments or as grants (subsidies) paid to local governments.

D. The vertical relationships given most attention by economists are intergovernmental grants and political feedback(s).

i. The existence of intergovernmental grants and targeted grants tend to induce local and state governments to lobby in favor of such programs.

ii. One possible result is "Pork barrel politics" a.k.a. the "fiscal commons problem" (discussed below).

iii. Another type of political feedback concerns how bargaining between levels of government affect the extent of centralization observed (Congleton, Bacaarria, and Kyriacou 2003).

iv. In addition to the vertical relationships, there are "horizontal" relationships that are of interest to economists. The most important of which were examined above.

a. For example, to the extent that "tax base" is mobile across local governmental jurisdictions, **intergovernmental competition** over taxes, expenditures, and regulation tends to emerge.

- If community A has higher taxes than Community C, people from community A will tend to move to community C--unless the services in community B are noticeably better than those in community C.
- (The effects of competition between government are discussed below.)

b. There are also regulatory externalities that may be associated with local governments.

E. Analyzing the economics and politics of fiscal relationships within federal systems allow us to understand federal governments operate and also provides some insights about how federal systems should be designed.

V. The Effects of Intergovernmental Grants

A. Modeling the effects of intergovernmental grants requires a model of local governmental decision making. We'll continue to use the median voter model for this purpose.

i. The median voter model (or median legislator model and governor models) allows the decisions of government to be modeled as if they were made by a single person.

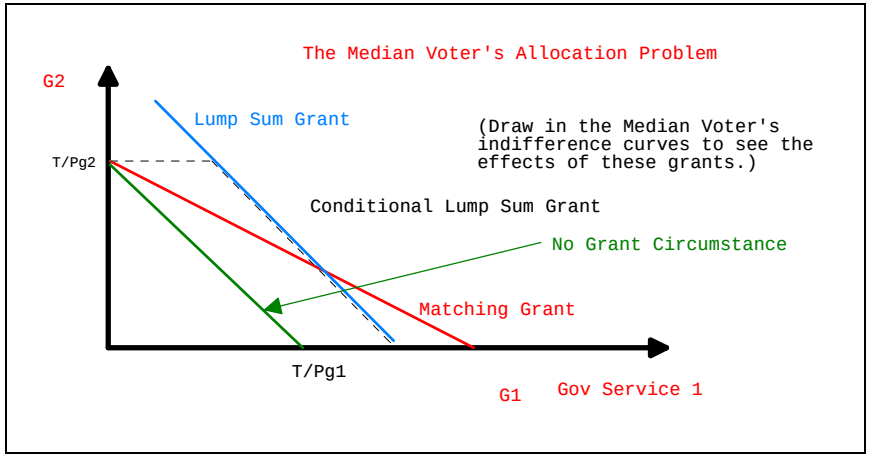
ii. This, in turn, allows us to use diagrams from microeconomics and from the first part of the course on the effects of taxes and subsidies to represent the effects of conditional and unconditional grants on local governments and local governmental policies.

B. The median voter and intergovernmental grants.

i. As is the case for ordinary subsidies to individuals and firms, intergovernmental grants can be "lump sum" or "marginal" (block grants or matching grants).

ii. As true of ordinary subsidies, grants may also be conditional or not.

iii. Both conditional and unconditional matching grants affect relative prices of alternative government services faced by voters.



iv. How intergovernmental grants change the public budget constraint is illustrated above.

v. How such grants affect public policy require adding the indifference curves of the median voter or "pivotal policy maker."

a. For most of our purposes, the relevant indifference curves are those of the median voter (or directly elected city planner).

b. (Add indifference curves to diagrams like that above, and analyze how different kinds of grants tend to affect the level and distribution of government services within a community.)

vi. For the most part, the empirical evidence on the effects of grants is consistent with the median voter model of government decision making.

vii. There is however one puzzle, often termed the "**fly paper effect**" (Hamilton 1983, Bailey and Connolly 1998, Jacoby 2002).

a. Block grants, which resemble lump sum grants, increase government services by more than one would expect based on standard consumer models.

b. The grants "stick" to the programs they are aimed at, rather than inducing tax reductions that the median voter model seems to predict.

- That is to say, in a community that spends 10% of its income on government services why aren't 90% of block grants used to reduce taxes?

- (There are several theories that can be used to explain this, but all require more complex models of governance than our simple median voter model, and not all are very convincing.)

VI. Lobbying Higher Levels of Government: the Fiscal Commons Problem (aka the Pork Barrel Dilemma)

A. The existence of intergovernmental grants creates incentives for state and local governments (and state representatives and senators) to lobby for grants and other targeted programs that benefit their own states--even if they do not benefit the nation as a whole.

i. A higher level of government may fund specific highway and water projects that benefit only a particular city or metropolitan area, but which are paid for by taxes imposed on everyone in the state or country.

a. Other programs that have regional rather than national benefits include: flood insurance, hurricane relief, ports and harbor spending, railroad and airport subsidies. (These provide benefits mainly for persons living next to oceans, rivers, or major transportation hubs.)

b. Many national parks, libraries, monuments, and museums also mainly produce local benefits.

ii. *Lower levels of government will lobby higher levels of government for targeted projects that generate benefits for them, but which they would not favor if they had to pay for them with local taxes, because their costs in that case would be greater than their benefits.*

a. *In such cases, the national funding of local projects induces a good deal more lobbying than would occur if the projects were funded at local levels, because local benefits are more likely to exceed local tax costs if taxpayers from other cities and states are paying most of the cost for local projects.*

b. The end result can be a quite inefficient distribution of grants and local projects--projects that overall generate negative net benefits.

c. This is the so-called fiscal commons problem or pork barrel dilemma.

B. Illustration of the Pork Barrel Dilemma

i. Consider two programs with negative social net benefits, but majority support from two narrow coalitions.

a. Each project has total costs that exceed its total benefits, but that regional benefits are greater than regional costs under central government financing, because of the use of general taxes.

b. For the purposes of illustration, assume:

- that a regional **highway costs** 10 billion dollars and provides 1 billion dollars of benefits to region A and 6 billion dollars of benefits to region B.
- Assume also that a regional **water project costs** 12 billion dollars and generates 8 billion dollars of benefits for region A, but only 2 billion dollars of benefits for region B.

ii. The following game matrix can be used to illustrate this pork barrel dilemma.

the Pork Barrel Dilemma		
Region B	Build Road	Don't Build Road
Region A Build W	A, B (-2, -3)	A, B (+2, -4)
Don't build W	(-4, +1)	(0, 0)

a. The payoffs to the region B and region A coalitions consist of their own narrow benefits from their projects less half of the total cost of the projects adopted.

- If neither project is built, no benefits and no costs are realized.
- If just the road is built, then region A gets (1 - 10/5) = -4 in net benefits. Region B, on the other hand pays its share of the costs and receives only very small benefits (6 - 10/2) = +1.
- If just the water project is built, then region A gets most of the benefits but pays only half the costs, (8 - 12/2) = +2. Region B gets its small benefit at the cost of half of the water project, (2 - 12/2) = -4.
- If both projects are built, Region A gets (1-4) = -3 and region B gets (2 - 4) = -2 in net benefits.

b. Each coalition has incentives to press for passage of their project, regardless of what the other coalition does.

- Notice that the payoffs in this case resemble those of a Prisoner's dilemma game.
- Each group has a dominant strategy

c. **As a consequence, each project is adopted at the Nash equilibrium of this game.**

- **However, both coalitions would be better off if neither of the projects were actually built!**

iii. The fiscal commons problem arises because of fiscal externalities. One region's centrally funded programs impose costs on other regions, who have to pay for those projects even though they receive little if any benefit from those projects.

iv. This problem can be avoided by (i) making the regions fund their own projects, (ii) by rigorously using cost benefit analysis, or (iii) by adopting a generality rule (see Buchanan and Congleton 1998).

v. (Explain why these three solutions would all solve the dilemma.)

vi. (Are there other solutions that would also avoid the PD outcome while allowing projects with positive net benefits to be built? For example, how might user fees or benefit taxes be applied?)

VII. Externalities between Governments:

A. There are cases in which a government cannot adopt Pareto efficient regulations or service levels--even if it wants to--because part of the problem is generated by persons or companies outside their jurisdiction.

i. In such cases, regulation itself can be an externality generating activity.

a. For example, a town's regulations on water pollution may impose externalities on towns further down stream.

b. Similarly, the environmental and trade regulations in one nation state may impose benefits or costs on resident of other adjacent countries.

ii. Consequently, there may be unrealized gains to trade between governments regarding appropriate regulation.

B. There are two general methods for dealing with such **governmental externality problems.**

i. First, the affected parties may attempt to negotiate a "Coasian" contract that "internalizes" the externality.

a. In a median voter model, the existence of externalities would provide the median voters of the communities of interest with an economic reason to coordinate their policy choices.

b. That is to say, it is possible that Coasian contracts (regional alliances or treaties) may be used to address interjurisdictional externality problems.

- State and local governments may negotiate with each other and sign agreements to coordinate policies or to create a "special use district" of the same "size" as the externality.
- (Examples include airport and transit authorities, as with those between NY, NJ and CN, or between VA, MD, and DC.

ii. Note that this same logic applies to international settings, insofar as governments may negotiate a treaty where the countries "trade regulations" with one another.

a. For example, in the various international environmental treaties, countries agree to strengthen various environmental regulations to deal with an international externality.

b. Examples include international water commissions (US and Canada, Sweden and Denmark) and international environmental treaties.

iii. Second, local governments may "ask" higher levels of government to regulate the matter of concern.

a. Adjacent counties may ask states to regulate "county externalities," states may ask the federal government to regulate "inter state externalities."

- ♦ In Europe the regulation of many international externalities is coordinated by the European Community.

b. Note that this solution is of limited value for international regulation and public good problems because there are no world or continental governments.

- ♦ The results of Coasian contracts can be highly imperfect (relative to Pareto optimality) in international settings. Discuss some of these.
- ♦ [We will analyze the demand for treaties and their effectiveness later in the course.]

VIII. Additional Analysis of the Optimal Assignment of Fiscal and Regulatory Responsibilities to Different Levels of Government

A. The Oates and Tiebout cases for decentralization implies that services should be provide by government's with the smallest jurisdictions (territories) sufficient to realize all economies of scale for the service of interest.

a. Oates (1972) develops this point more formally with his decentralization theorem.

b. The EU adopts this idea with its "subsidiarity principle."

c. This last section of the material on federalism analyzes the normataive case for decentralization in a bit more detail.

B. The Oates approach implies that the optimal level of governmental for providing particular services depends on the economies of scale in producing the services of interest..

i. Services with nation-level economies of scale should be provided by the national government (national defense, macroeconomic policy, redistribution)

ii. Services with that require relatively large service areas or numbers of customers should be produced by state or regional governments. (regional highways, higher education, etc.)

iii. And services that can be effectively provided in relatively small service areas or for relatively small customer bases should be provided by local governments. (police and fire protection, elementary education, local roads, sanitation services etc.)

iv. Some "services" will be produced by several different levels of governments because the "services" are actually different goods produced through different processes (production funtions).

a. Some forms of education, police services, and environmental regulation have only local effects--on their students or local residents.

b. However, other forms of the same general type of service may have greater economies of scale.

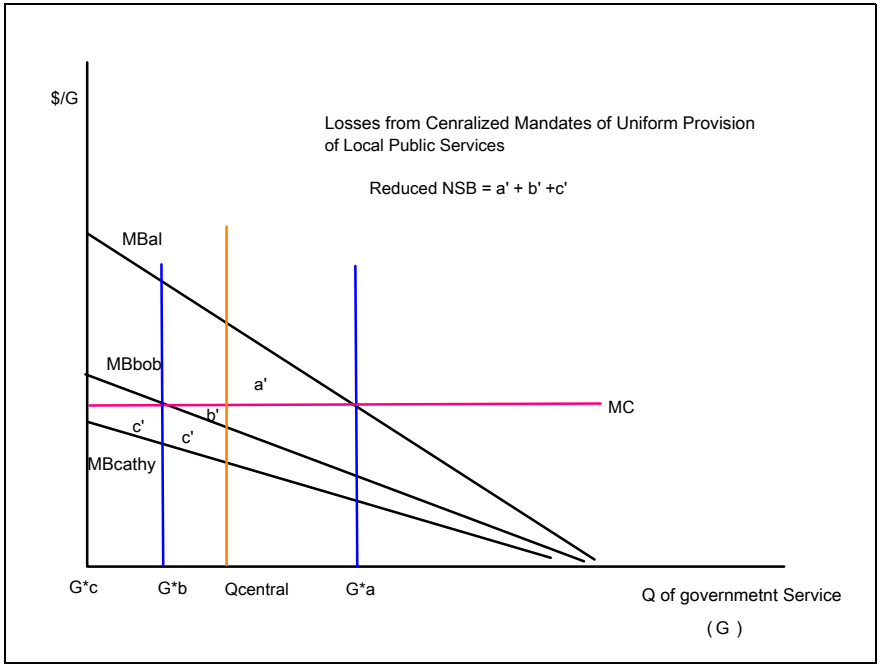
c. For example, grammar schools, high schools, and colleges all provide educational services, but the services provided are quite different from one anther and have different production functions and economies of scale.

d. In such cases, the optimal district changes as the various services are provided.

e. Ideal school district sizes increase as one moves from elementary school to high school and from high school to college.

v. Similarly, he argues that services that have regional effects as with commuter networks, some forms of air and water pollution, and some forms of police authority, should be provided regionally rather than locally, by states, or at national levels.

vi. In general, Oates' simple production-based arguments imply that particular services should be provided by only a single level of government. (Federalism should be a layer cake.)



C. The same can be applied to externality problems, both ordinary economic externalities and ones between governments--although other possible solutions exist for such problems as was demonstrated in the lectures on externalities as with Pigovian taxes and subsidies and Coasian agreements among the affected individuals and communities.

i. The federalism solution to an inter-community or interstate externality problems is to shift responsibility for regulating such problems to the lowest level of government in which all the affected persons are voters for that level of government.

ii. In such cases, voters may have an interest in fully addressing the problem--which for the purposes of this course is the level whose median voter would tend to "internalize" the externality in his or her policy analysis.

iii. However, as shown in the public choice section of the course, such a voter would not necessarily adopt policies that maximize social net benefits.

iv. In cases in which no level of government has a large enough jurisdiction to fully encompass the externality problem--as with international

externality problems--the only solution possible is through Coasian contracts or treaties of one kind or another.

v. Oates reasoning also implies that large--but not national--externality problems, such as lake or river water pollution can be best addressed by state government or regional consortiums of states.

vi. In a few cases, there are nationwide economies of scale, in which case, services should be provided nationally.

a. These include national defense and broad environmental problems.

b. Similarly, insofar as the advantages of free trade zones increase with size, so the national government should have responsibility for maintaining free trade within the nation.

D. Transfers among states or locality in the interest of fairness or equity

i. In addition to the purely economic based assignment of problems to levels of government, there are also political and normative rationales that may be used.

ii. For example, Tiebout competition implies that innovation may be greater if a service is provided at a lower level of government than a higher level of government. This suggests that Oates' analysis somewhat understates the case for decentralization.

iii. Similarly, voters may regard decentralization to be a "good" in itself and favor it even when the costs of local services are somewhat higher than they would be with less decentralization.

iv. Voters that have internalized "fairness" or "equity" norms may also favor redistributive grants (block grants) that provide additional resources to the governments of relatively poor regions so that services though to be "important" are adequately provided in that region, such as education and social insurance.

E. The economic production and externality-based economic arguments developed above neglect the advantages of variation in the services provided and also the **political costs** associated with larger regional governments with greater monopoly power.

i. There are political costs associated with merging quite different areas into a single metropolitan area.

a. The community becomes more heterogeneous.

b. Monitoring costs tend to increase.

c. Each voter has a smaller effect on service levels through his locational choice and voting behavior.

d. Competition tends to fall as the number of government service packages diminishes.

- (Indeed, come "community mergers" may be just cartelizing behavior by local politicians who attempt to escape from competitive pressures.)

ii. Thus, it is often the case that greater decentralization is "optimal" than the level argued by Oates.

iii. The best (utilitarian or contractarian) assignment of authority for providing services to specific levels of government (should) take account of both economic and political costs.

IX. Optional Material Appears Below for Interested Students

X. Endogenous Decentralization and Asymmetric Forms of Federalism

A. The above analysis assumes that the degree of centralization is fixed or decided by policy makers of higher levels of government. It also assumes that the authority of governments at a given level within a federal or confederal system of government is uniform.

B. Neither assumption is necessarily true. In the long run, the degree of decentralization in place tends to emerge from bargaining between higher and lower levels of government. And, that bargaining often generates patterns of decentralization in which some governments (large states and large cities) have greater authority than other governments at the same level in the federal system (smaller states and cities).

C. The degree of decentralization is normally not determined by the central government alone. It is partly determined by constitutional law and through negotiations within a federal system. In some cases, local governments will lobby for (and trade for) additional authority. In others, they will lobby higher levels of government to take over policy areas that currently are local or state matters rather than state or national matters.

D. The result of such negotiations can be asymmetric forms of federalism in which the state and local governments vary in their authority over taxation and public policy.

E. Most economic models of federalism implicitly assume that each government at a given level has the same authority to make fiscal and regulatory decisions.

i. However, the assumption of uniform jurisdictional size and authority is rarely completely accurate.

ii. For example, we observe significant differences in physical size, population, income, and political representation for state and local governments.

a. In the United States, California is physically the third largest state with 11% of the citizens, whereas Wyoming, the sixth largest state includes less than 1% of the U. S. population.

b. Requejo (1996) notes that New South Wales includes 35% of the population of Australia, whereas Tasmania includes less than 3%. North Rhine Westfalia includes some 21% of the population of Germany, whereas Bremen includes less than 1% of the population.

c. Uttar Pradesh includes 16% of the population of India, whereas Sikkim includes less than a twentieth of one percent.

iii. That population and population densities vary so widely implies that demands for local services also tend to vary widely among these regional governments and, moreover, implies that political power within their respective democratic central governments is also likely to vary widely by state, lander, and province.

F. That regional interests and bargaining power vary has important effects on the degree of centralization of decentralization found in federal and other polycentric forms of government (in the long run).

i. National constitutions do not fully specify the degree of decentralization within a nation at any single point in time or through time.

ii. Rather, the degree of decentralization is determined by a series of political bargains within and between national and regional legislatures in which both the details of policy and the powers to make policies are negotiated and renegotiated through time.

iii. Differences in the bargaining power and interests among participating governments affect the distribution of fiscal and regulatory authority adopted.

G. As a consequence, a good deal of asymmetry is observed within most federal and confederal systems.

i. For example, in Spain, Navarra and the Basque communities have formal tax and expenditure powers beyond those of the other "autonomous communities."

- Galicia and Catalonia have special authority over education, language, and culture.
- In Canada, Quebec has special powers to encourage the use of the French language and protect the French-Canadian culture.
- In the United Kingdom, the Scottish Parliament has significantly more policy-making authority than the Welsh Parliament.
- In the United States, Indian reservations have their own specific taxing and regulatory authority that differ from those of ordinary state governments.

- California, the most populous state, has unique powers of environmental regulation.
- In China, Hong Kong has been granted unique legal and political institutions: "one country, two systems."

ii. Large cities in many countries often have powers of taxation and regulation that smaller cities lack or rarely use.

- New York City and Washington D. C. have their own income and sales taxes.

iii. Asymmetries are also common among the members of large international organizations.

- In the European Union, some members retain more autonomy than others inasmuch as they have opted out of or delayed membership in the menu of treaties that define the responsibilities of affiliated countries.
- The responsibilities of members of the United Nations with respect to military armaments, human rights, and environmental regulations are similarly defined through a series of treaties with quite different signatories.
- Different nations formally retain different degrees of autonomy both within and without these very decentralized confederations.

H. As a consequence, service differences across communities may emerge in both decentralized and unified states, for other reasons than those analyzed above. That is to say, they may emerge because communities may have unequal authority to make particular kinds of policy decisions or different abilities to influence higher levels of government.

i. For example, equal representation by population often implies unequal representation by regions or economic interests, and vice versa.

- In the US, some states have far more influence in the House than in the Senate, and these differences have been shown to influence the pattern of intergovernmental grants

ii. Unequal influence within the central government implies that central government policies will often favor some regions or communities over others.

- Analysis of variation voting power has a long and distinguished history in the public choice literature. (See for example: Mueller, 1989.)
- However, this form of asymmetry is not the same as that analyzed here in which regional governments acquire different degrees of local policy-making authority.

I. Asymmetric federalism exists whenever governments at the same level of geographic responsibility—towns, counties, cities, or states—have different regulatory and fiscal powers.

- Such differences in policy authorities create a "supply-side" source of variation in government services, regulations, and taxes in addition to the standard demand-side variation in local demand stressed in models of local fiscal competition.

J. Differences in authority can influence both the variation in services among regions and the path of economic development among regions.

K. For example, consider the case in which only a single city is granted authority to use eminent domain to produce "right of ways" for light rail transport services.

i. Suppose that the favored city sells or rents the right of ways to private railroad companies.

a. This provides the city with a unique source of revenue and also a unique economic advantage.

b. Both effects allow the more autonomous government to provide a more attractive fiscal and economic environment for its residents than possible for otherwise similar governments.

ii. Light rail has the effect of reducing transport costs to city apartments, shops, and factories that operate in an otherwise competitive market.

a. Individuals prefer to work for firms that are close to the rail lines, and consumers prefer to live and shop at stores near the rail lines—other things being equal—because the net of transport real wages are higher and net of transport prices are lower along the rail lines.

b. This increases net benefits and profits for consumers and firms located near the rail lines.

c. Moreover, rental revenue from the right of ways allows the favored city to reduce other tax rates within the city.

iii. Given these economic advantages, persons and firms from within the favored city and throughout the country of interest will attempt to relocate near to the rail lines of the favored city.

- In principle, the favored city continues expanding its rail network and attracting tax base up to the point where the marginal increase in revenue and tax base generated by an extra kilometer of new right of way equals the marginal cost of the right of way less any loss in tax base generated by investor fears concerning the use of eminent domain—or until no private

firm is willing to expand its rail network because traffic densities are too low to recover its costs. The latter, of course, expands outward from the city center as immigration of capital and labor occurs.

iv. Although there is a limit to the urban growth encouraged by this city's unique power of eminent domain, the favored city is likely to becomes an important commercial and cultural center well before this limit is reached. Its internal market and population expands.

- Specialization increases; and wages and profits increase as productivity rise.
- Other cities that have to rely entirely upon private provision of rail services falter, because holdout problems make assembling long right of ways very difficult—indeed intractable—for private firms acting alone.
- The more autonomous city grows and prospers—while other similar cities that would have copied the strategy of the favored city are legally unable to do so.

v. Other local fiscal and regulatory "privileges" can have similar effects, insofar as the additional authority allows favored governments to provide a more attractive fiscal package than legally possible for other similar governments.

L. Asymmetric federalism may take a variety of institutional forms.

i. Specific asymmetries may be created by a nation's constitution by assigning different areas of competency to various regions of the country.

ii. Alternatively, the constitution may allow the possibility of alternative internal arrangements that allow the formation of many levels and combinations of fiscal authority.

a. For example, a national constitution may simply allow states to organize themselves into various subnational organizations of states, cities, or counties.

b. An international treaty organization may allow a subset of member states to pursue their own interests within the terms of the treaty.

iii. This possibility allows a range of federal structures that is more complex than normally analyzed by economists. However, it is clear that that many internal organizational structures tend to produce asymmetric forms of fiscal federalism.

a. The figure below illustrates one such internal structure.

b. If we interpret the inter-regional government as another level of centralized control, it is clear that local government 1 retains more autonomy than local governments 2 and 3, because it is not bound by the decisions of the regional government, if the regional government is not granted exclusive areas of competency.

M. Surprisingly little research has been done asymmetric forms of federalism. Additional reading is provided in various articles published in economic journals.

i. Tiebout, 1956, and Oates, 1972, pioneered the economic analysis of fiscal federalism and intergovernmental relationships.

a. Inman and Rubinfeld (1997) provide a survey of issues in subsequent literature.

b. Molander (2004) provide an international review of fiscal federalism in unitary states.

c. Qian and Weingast (1997) elaborate the role that federalism can play in solving various commitment and information problems.

ii. None of these papers or books includes any reference or comments on asymmetric forms of federalism.

a. Requejo (1996) analyses some general features of existing asymmetries within modern states.

b. Congleton, Bacarria, and Kyriacou (2003) analyze the political foundations of asymmetric distribution of authority within nation states and international organizations and the manner in which they tend to change through time..

c. Several handbooks of fiscal federalism now include chapters on asymmetric forms of federalism.

I. An Overview of Taxation by the U. S. Central Government

A. The two main tax sources for governments around the world are the income tax and the VAT or Sales tax.

i. Instead governments were funded by a combination of income and excise taxes, augmented by government businesses and sales of land and monopoly privilege.

ii. Both the VAT and income tax are relatively recent inventions.

iii. The income tax was not used until the mid-nineteenth century

a. The British first implemented an income tax in 1842

- (This was partly to offset revenues lost from tariffs as the Corn Laws were repealed.)

b. The Netherlands adopted one in 1893

c. Sweden adopted one in 1902

d. Germany adopted one in 1920

e. (Source Aidt event4 data set, 2007)

iv. This is not to say that taxes similar to income taxes were never used before the 19th century.

- Land taxes and "in-kind" labor taxes resemble income taxes in their effects, and were widely used throughout history.
- Part of the reason that income taxes were a relatively new form of taxation is that market-based income became a relatively large tax base only after the industrial revolution.

B. Until 1914, most of the revenues of the U. S. federal government came from excise taxes, tariffs, and land sales in the West.

i. There was a temporary use of an income tax during the Civil War, but the Constitution ruled out direct taxation of citizens unless it was proportional to population--as would be the case for a "head tax" or pole tax.

ii. Partly as a consequence of this restriction on revenues and partly as a consequence of other interpretations of the constitution which restricted the domain of federal government, most government revenues were collected by state governments and most government services were provided by state and local governments prior to 1914.

C. A federal income tax was allowed by the **XVI constitutional amendment**, which was **ratified in 1913**.

i. The 16th amendment had major effects on the balance of power between the states and federal government, and in the potential fiscal impact of the federal government.

- Indeed, apart from a few of the early amendments included in the bill of rights and the t13th amendment (that eliminated slavery), the 16th amendment probably had one of the largest effect on the political culture in the US of any of the 27 amendments.

ii. Initially, the federal income tax applied only to about 1% of the population, and rates were very low.

- (The method of selecting senators was also changed by the 17th amendment, which was also ratified in 1913. Prior to 1914 senators had been **appointed** by state legislatures.)
- (The last of the four "Progressive" amendments was the 19th amendment that assured Woman's suffrage. It was rataified in 1919.

iii. Tax rates were increased during W.W.I, but were reduced during the post war years.

a. (The marginal tax rate on incomes greater than a million dollars per year rose to 77%!)

b. (Greater use of the income tax became necessary after W. W. I, because prohibition (the 18th amendment) was ratified in 1919, which reduced revenues from excise taxes on alcoholic beverages!))

- (The 18th amendment was repealed by the 21st amendment, which was ratified during the Great Depression in 1833. The repeal of "prohibition" increased national tax revenue, reduced crime, and facilitated a bit of economic growth.)
- Use diagrams to show the effects of prohibition and its repeal on the market for alcohol, clubs, and restaurants.

iv. During the 1930s the income tax was extended to include more people and the income tax became the largest single source of government revenue.

a. Although the income tax base included most persons, relatively few person paid an income tax prior to W.W.II--other than a small tax to support the new social security program.

b. President Roosevelt also extended the role of the federal government in regulation and providing social services, and created new income-based taxes.

c. For example, the social security system was enacted in 1935.

v. Government spending on national defense increased rapidly during W.W.II, and spending on other social services increased after the war--especially those associated with social security.

a. It was during this period that the income tax took the basic form that it has today.

b. For example, withholding of employee taxes by employers and the standard deduction were introduced during W. W. II (partly at the

recommendation of Milton Friedman, who was working in the US treasury at the time.)

vi. (For more detailed histories, see the history links on the class website.)

II. Public Finance and General Ideas for Tax Reform

A. There are a wide variety of normative theories of taxation used in Public Finance, and these norms suggest that the current tax system can be "improved" through tax reforms of one kind or another.

- (at least if one ignores political considerations)
- We covered this in some detail before the midterm.
- We now revisit those ideas with the idea of making general recommendations for tax reform of existing tax laws in the US and elsewhere.

i. For example, Neutrality can be increased.

a. Neutrality is generally increased by broadening the tax base, and reducing loopholes and exemptions.

b. (Increases in neutrality are sometimes described as reducing tax "distortions" or as "**tax simplification**.")

c. The US personal income tax includes a variety of "loopholes" (also called tax preferences) relative to the payroll tax used to finance social security.

d. Although much of the complexity of the US tax code has to do with properly defining income, definitions of income could be brought more in line with economic theory--which would also increase neutrality across income sources.

e. (Tax preferences are usually adopted as a consequence of lobbying by the groups that benefit most directly from the loop hole of tax preference.)

- However, in some cases Pigovian tax preferences are introduced as a method of advancing policies desired by moderate voters (the median voter).
- In a few cases, both are true--that is to say a tax preference may advance mainstream voter interests in environmental quality, social insurance, capital formation ..., but use policy tools (taxes, subsidies, etc.) preferred by particular groups that have lobbied for those tools.

ii. Deadweight losses can be reduced by broadening the base (as indicated with the indifference curves diagrams.

a. (Recall our diagrams of lump sum taxes and excise taxes from the first part of the course.)

b. However, an effort to minimize the overall dead weight loss from a system of commodity taxation through **Ramsay taxes** will not be neutral because it requires different tax rates on different goods.

- Deadweight losses from commodity taxation are reduced by attempting to target markets with relatively inelastic demand or supply curves with relatively higher tax rates
- Indeed, the Ramsay tax method implies that taxes should be different for nearly every product.
- (Imagine, however, the contentious politics of creating such a tax system!)

iii. Consensus about many government policies can be increase by linking marginal **benefits** from government services to marginal tax rates. (**Lindalh** taxes.)

iv. Externalities can be addressed with taxes rather than regulatory mandates. (Pigovian taxes)

v. Economic growth can be encouraged rather than discouraged by the tax system. (consumption taxes)

a. For example, saving rather than borrowing can be encouraged in order to increase the accumulation of human and physical capital.

b. Tariffs can be reduced to promote trade and specialization.

c. Investments in public infrastructure can be made to reduce transactions costs and increase the effective size of markets.

d. Tax preferences and subsidies for scientific and technical research can be created.

vi. Fairness (horizontal and vertical equity) can be increased through tax rate reform and base broadening.

a. Horizontal equity suggests that people with similar incomes should be taxed at similar rates.

- (On this point, there is fairly broad agreement within the Public Finance community.)

b. Theories of vertical equity, however, vary more widely than theories of horizontal equity.

- Some argue that fairness is increased if everyone is taxed in the same way, as with a flat income tax, VAT, or head tax.
- Others argue that people with higher incomes should be taxed at higher rates because they have a greater ability to pay the taxes.

vii. The **political efficiency** of democratic governance can be increased by broadening the base and applying uniform tax rates (Buchanan and Congleton 1998)

a. Application of a generality rule to the tax system would greatly reduce incentives for "rent seeking" in pursuit of preferential tax treatment.
b. It would also reduce political deadweight losses and some forms of corporate and government corruption.

B. Based on this list of tax norms, several US tax systems turn out to be quite good systems for collecting revenue.

i. For example, the payroll tax used to pay for the social security system is broad based and taxes an activity that tends to be quite inelastic although not perfectly inelastic (labor supply curves slope upward).

a. The payroll tax system has very few loopholes.
- Essentially all labor income below the maximal taxable labor income is taxed at the same rate.

b. n the other hand, the payroll is regressive in its upper ranges and, as true of all income taxes, it somewhat distorts choices between work an leisure.
- (The maximum labor income taxed was 94,200 in 2007)

c. (The associated **benefit program has a far larger effect on labor-leisure** choices. Most people retire soon after being eligible for program benefits.)

ii. The gasoline tax resembles a benefit tax, because revenues are (largely) earmarked for highway expenditures.
- The tax is roughly proportional to the marginal benefits obtained from using the highways, because those who drive most pay the most in taxes.
- Those who drive the most--other things being equal--also produce more wear and tear on the highways.
- Moreover, heavy vehicles cause more wear and tear, but also tend to consume more gasoline and so pay more taxes.
- Gasoline consumption is also a relatively inelastic, externality-generating activity.

iii. State sales taxes are generally broad based and flat
- Like essentially all taxes, however, they somewhat "distort" decisions between savings and consumption and between work and leisure-
- Show and explain why

iv. Local property taxes **on land** tend to have relatively little dead weight losses associated with them.T
- The supply of land is almost perfectly inelastic, so taxing it produces almost no dead weight loss.
- (See Henry George)
- However, taxing improvements as well as land--as normally done with local property taxes--tends to discourage capital formation.

C. Many other tax systems in the U. S. have significant problems according to the normative tax theories outlined above.
- These imperfect tax systems account for more than half of the revenues collected

i. For example, the personal income, corporate profit, excise, and tariff tax systems all have a number of problems.

a. Most of these tax systems include large and varied tax rates and loopholes (tax preferences) that favor or punish particular industries, types of expenditures, and sources of income.
b. These loopholes often violate horizontal equity, because they tax essentially similar tax payers at quite different rates..
- Examples include preferences for particular kinds of investments (computers, oil wells, farming, drugs, housing),
- special treatment of income from capital gains, tax exemption of income from government bonds,
- excise taxes on restaurant meals, tires, differential tax rates on commercial and residential property, etc.

c. They are often regressive in that marginal and average tax rates decline over part of their range (relative to taxpayer income)

ii. (Illustrate how unequal taxes and tax preferences distort economic decisions and tend to generate larger dead weight losses than more general taxes.)

a. How many of these "tax breaks" make sense from the perspective of the median voter?
b. from the perspective of internalizing externalities?
c. from the perspective of interest group politics--who wins and who loses?)

D. As a consequence of such concerns (as well as rent-seeking) a number of major reforms are always being discussed by policy makers and policy advocates in the US.

i. Typical proposals include:

a. Keep the present system, but reduce loopholes and tax preferences.
b. Broaden the base and adopt a (very) flat income tax.
c. Replace the income tax with a flat consumption tax (VAT).
d. Replace the corporate income tax with a carbon tax.
e. (Discuss how these taxes advance or conflict with the tax norms listed above.)

ii. See the class website for links to tax reforms currently under discussion.

III. Some Specific Conclusions about Tax Reform in the US from the Work of this Class

A. Tax systems should have broad bases and few loopholes.

- Neutral broad based taxes tend to have a lower deadweight loss.

B. Lower marginal rates are better than higher marginal rates other things being equal.

- [Use a supply and demand of labor curve to illustrate how higher marginal tax rates affect market equilibria in labor markets. The higher is the progressivity of the tax, the higher marginal rates have to be and the lower employment and national output tend to be.]
-
- [Both A and B tend to reduce the excess burden of taxation.]

C. In the US, there is a structural deficit that appears to be increasing from about 3% (22-18) of GDP to 6% of GDP (24-18), rather than decreasing through time, because of there retirement of the baby boomers and the socialization of health care and pension plans through the social security, medicare, and medicaid systems. This is unsustainable. Thus, average tax rates should be increased to close the gap. (It is unlikely that the entire gap will be closed by reducing expenditures.)

- GAO forecasts suggest that under current law debt will grow rapidly to unsustainable levels.
- Debt payments themselves will consume more and more of tax revenue, become one of the largest expenditure categories.
- It is not clear that world bond markets will be able to absorb all the debt that will need to be sold as this takes place.

D. The Lindalh tax diagrams suggest that some degree of progressivity is desirable (eg. one linked to marginal benefits), but beyond this point the tax system itself may induce political outcomes that tend to increase future deficits. The political economy of taxation suggests that low marginal rates (0) for low income persons tend to increase the median voter's demand for services by reducing the tax price of public services.

- [Draw a three persons diagram to illustrate this political economy effect of taxation through effects on median demand for servives.]
- Recall that differences in marginal benefits are at least partly driven by differences in income.
- Differences in ideal service levels, however, are driven by **both** marginal benefits and marginal tax costs for the services.
-
- Another side benefit of Lindalh taxe systems (in addition to their assumed provision of the service levels that maximize social net benefits) is that they tend to reduce conflict over public service levels.
- [These may also apply to social insurance programs but not transfer programs, explain why.]

IV. A review of effect of tax preferences (loop holes) within an income tax system.

A. Many existing income tax and VAT tax systems include "tax preferences" (loop holes) of various kinds.

- These preferences (and/or loop holes) have the effect of making an otherwise neutral tax systems less neutral.
- The demonstration below used some algebra to illustrate this point. Undergraduates can skip the math and rely on the diagrams instead.

B. The effects of privileged areas of life on excess burden can be modelled with a bit of algebra.

i. Suppose that a consumer's (Al's) pretax budget constraint is

- $Y = PaA + PbB$
- where Y is the consumer's income A and B are quantities of goods A and B that might be purchased and Pa and Pb are the prices of those goods.
- Recall that the ratio $-Pb/Pa$ is the slope of the consumer's budget line.

ii. After a flat income tax, Al's budget constraint becomes:

- $(1-t)Y = PaA + PbB$
- The after tax budget constraint can also be written as $Y - tY$, pretax income Y less the tax paid tY. $Y-tY = (1-t)Y$
- The new after-tax budget line is parallel to the pretax budget line, but inside (below) the pretax budget line.
- The slope of the budget line is **not affected** by a flat broad-based income tax.

iii. Now suppose that tax preferences for activity or product A are introduced.

a. A tax preference allows the tax payer to reduce his or her tax burden by purchasing the preferred good.

b. Suppose that good A is given a tax preference of Z dollars per unit.

- The new budget line can be written as $Y- tY + ZA = PaA + PbB$
- Note that after just a bit of algebra this can be written as:

- $Y - tY = PaA - TA + PbB = (Pa - Z)\,A + PbB$
- or: $(1-t)Y = (Pa - Z)\,A + PbB$

c. Note that the relative has changed from -Pb/Pa to -(Pb-T)/Pa

C. The effect of a tax preference or loop hole is to "narrow" the tax base, particularly in cases in which the preferred good or activity is subject to no tax.

i. Tax preferences usually create excess burdens that would not be present under a neutral tax.

ii. This can be shown using geometry similar to that which we studied earlier in the course.

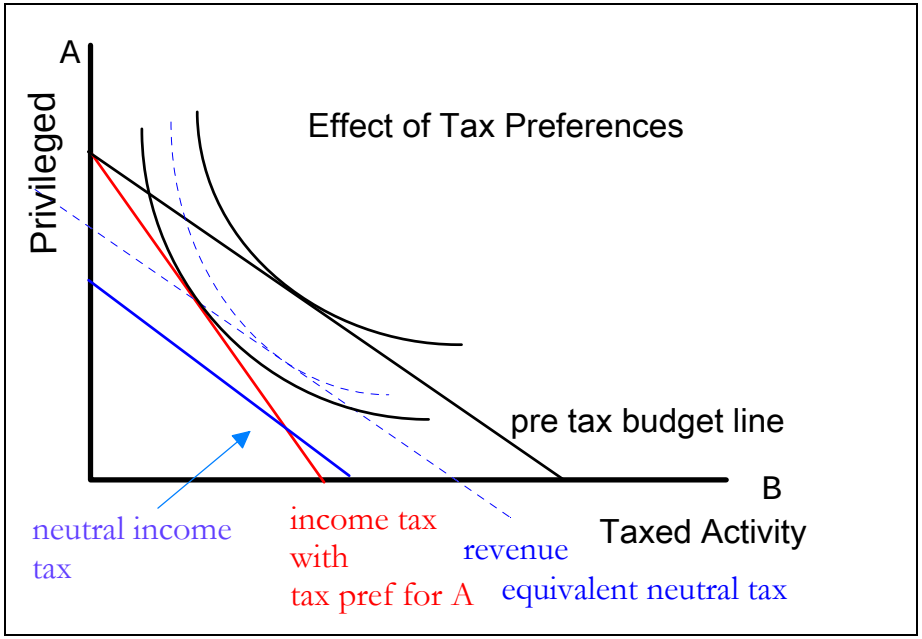
a. (See the diagram below.)

b. A flat tax rate of "t" reduces the consumer income, which shifts A's budget line back toward the origin (from the black to the blue line).

c. A tax preference for A makes consumers better off by increasing the size of the budget set, but also affects relative prices (shift from the blue to the red line)

d. Note that this tax has an excess burden. The consumer would be better off with a neutral tax with a lower overall tax rate than with a tax preference. The blue dashed line allows Al to reach a higher indifference curve while paying the same total amount of taxes.

e. (For the algebra of the advantage of neutral tax see the appendix to the notes from the earlier lecture on tax burdens.)



D. Effects of Loopholes on Product Markets

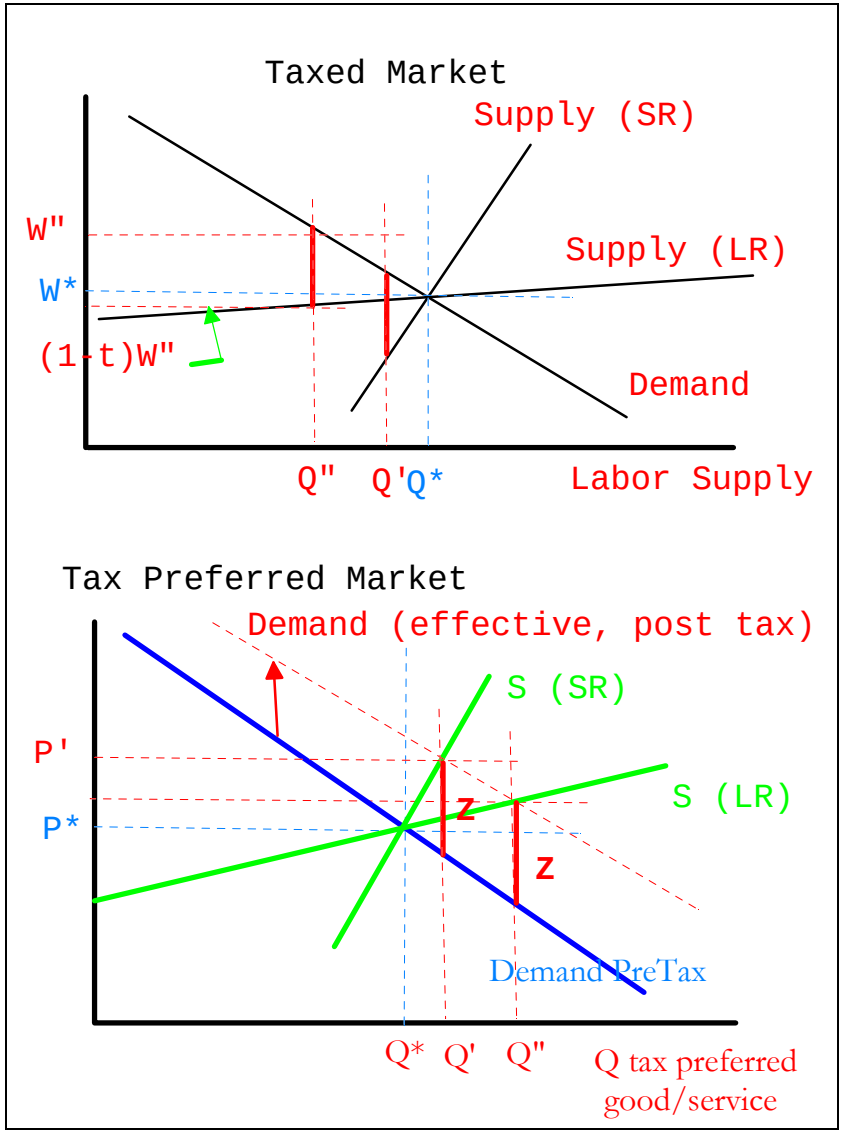
i. The after-tax reduction in the price of "privileged" activities and products has an effect similar to a subsidy.

- Consequently, the tax preference Z above can be thought of as a subsidy for the purposes of analysis, although the tax payer does not receive any payments from the government.
- Alternatively, the relative price change induced by the preference can be modeled as increasing the "effective" demand for the "preferred" activity
- (The subsidy treatment is more consistent with the geometric tools used previously in class, but a bit less faithful to "cash flow" definitions of subsidies and taxes.)

ii. The effects of a tax preferences are greater in the long run than in the short run. because long run supply (and demand) tends to be more price sensitive in the long run (after all possible adjustments are made) than in the short run (after quantity adjustments are made, holding capital and technology constant).

iii. In the figures below, the effects of tax preference Z on the market for a preferred and non-preferred activity are illustrated.

- Insofar as the tax preference is modeled as an implicit subsidy for the preferred activity, the geometry of subsidies applies.
- This is indicated with the dark red lines of length Z in the diagram.
-
- The subsidy effect occurs because of the change in the relative price of the preferred good relative to the other taxed goods and services or sources of income, etc.
-
- (Note that in some cases, a tax preference may be implemented with a tax rebates, which clearly resemble a subsidy.)
-
- (A change in the demand for the privileged good occurs because the increased price of any taxed good that is a substitute for the privileged good.)



E.

i. As an exercise,

- label the areas that represent deadweight loss, and changes in consumer surplus and profit
- Note that the deadweight losses in crease in the long run
- Recall that the effect of a Pigovian tax such as a Carbon Tax may be similar but not produce a dead weight loss. (explain why)

I. Structural and Temporary Deficits

A. A deficit occurs whenever tax revenues are less than expenditures.

B. Some deficits are temporary.

i. For example, there may be a new emergency program funded through borrowing, rather than taxes--because borrowing is faster to implement. Keynesian macroeconomic theory often recommends that temporary deficits be run during times of recessions.

ii. Other deficits are "structural" in the sense that stable durable policies such as social security or Medicare may promise more in benefits than their supporting tax systems can deliver.

iii. Both sorts of deficits are simple matters of arithmetic--expenditures greater than revenues. Temporary deficits are "self-curing" in that they disappear after a crisis or recession is over. A structural deficit requires political action to solve. Either spending has to be systematically reduced, taxes systematically increased, or some combination of the two adopted by the government.

C. Both sorts of deficits increase the amount of debt that exists, and, other things being equal, tend to increase the extent to which future tax revenues have to be used to pay interest on that debt and/or to retire the amount owed.

i. A bit of temporary debt is commonplace for most governments, although in some cases even temporary debts can get out of hand and produce bankruptcy for governments. (Examples include Iceland and Ireland during the financial crisis of 2008.)

ii. Large structural deficits such as we have in the United States can generate such problems in the long run, which is one reason that so many economists and voters are concerned about the debt and deficits.

D. In the US, the largest federal government expenditures are associated with National Defense, Social Security, Medicare and Medicaid, and interest on the National Debt.

i. See the spreadsheet links from lecture 1 to see which is largest now and in the past.

ii. Making interest payments on the national debt will be among the largest expenditures when interest rates return to historical norms unless deficits are reduced to the point where surpluses are generated..

E. The economics and politics of debt are not always straight forward, but we can use straightforward models to try to understand some of the key relationships and variables that determine how and why governments use debt finance to pay for services.

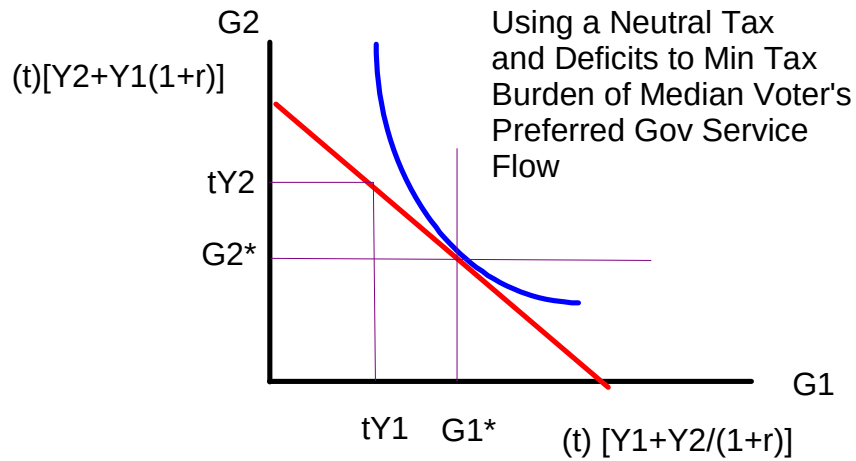
II. Debt and Taxes

A. Governments methods for obtaining control over resources includes four methods: taxes, debt, printing money, and regulation.

- Public finance deals with two of these: debt and taxes.

B. In cases in which debts will eventually be paid off, debt finance is simply a method of altering the timing of taxation.

- This "equivalence" between debt and taxes is sometimes referred to "Ricardian equivalence," after David Ricardo.
- How one divides up the tax between the two periods does not affect the location of the intertemporal budget constraint.



tY1-G1* = deficit t(Y2)-G2* = surplus

- It bears noting, however, that the persons paying the taxes and the amounts paid may be affected by the timing, which may affect the politics of tax-debt policies as will be discuused below.

-

C. From a Ramsay taxation perspective, it makes sense to smooth out the path of taxation through time, because dead weight losses from taxation tend to increase with the square of marginal tax rates.

i. In the diagram above, it was possible to use the same tax rate to finance the services in period 1 and 2 desired by the median voter.

ii. Without the use of debt the tax rate would have had to be much higher in period one which would have increased the DWL of the tax system--even though they could have been lower in period 2.

a. (This follows because DWL rises with the square of the marginal tax rate.)

b. $(T_1+T_2/2)^2 < (T_1^2+T_2^2)$ where T_1 is the relatively high tax needed in period 1 and T_2 is the relatively low tax needed in period 2. The tax rate in the diagram, t, is approximately the average of the two rates.

iii. Borrowing during emergencies, allows marginal tax rates to fluctuate less, which tends to reduce the (present value of) deadweight loss from a series of taxes that generates the same (present value of) revenues.

- Temporary deficits are thus desirable under a Ramsay tax norm.

D. In addition to potential "tax smoothing," government borrowing (tax-timing) normally has a variety of distributional effects.

i. Some of the distributional effects are analogous to those previously examined for taxation.

ii. Many of these distributional effects are "intergenerational," because the pool of taxpayers will change between the time that the debt is issued and the time at which it taxes will be collected to paid it off.

- New taxpayers are born, while existing ones age and eventually die.
- The income of some groups rise and others fall between the time that a bond is issue and sold, and the time that it is redeemed.
- These changes can affect the progressivity of taxation and/or the fiscal package as a whole (including government services such as schools).
- Distributional effects are also likely to affect the politics of debt finance.
- (Whether a net fiscal transfer actually takes place or not depends in part on what the borrowed money is spent on. If it is spent on schools, for example, the benefits of the borrowing are also shifted to future generations.)

iii. Not all tax payers will be alive when the taxes are collected to pay off the bonds issued, and not all future are connected via inheritance to bond holders in the borrowing generation of tax payers (Buchanan and Roback, 1987) .

- Long term debt financing, consequently, tends to affect inter-generational distribution of taxation. It shifts taxes and excess burden to future tax payers and resources to the generation of taxpayers borrowing the money.
- Of course, the resources are not literally shifted from adults to children, rather the resources come from person who buy the government bonds.
- At the micro-economic level of analysis, **the children of persons who do not hold government bonds equal to their future tax burden, will bear a relatively greater "inherited" tax burden than those who do not.**

E. Other controversies with respect to debt finance are centered on the extent to which such "buy now pay later" arrangements tend to bias **government finance in favor of debt** or tend to bias individual tax payers away from saving and capital intensive services.

i. In the simplest models, government borrowing bids up interest rates which "crowds out" private borrowing for consumption and capital goods.

ii. The latter is the rationale for effects of debt on capital formation.

iii. The intergenerational effects and fiscal illusion are rationales for a political bias in favor of debt finance.

iv. The latter implies that democracies are inclined to **overuse** debt finance relative to the ideal levels of Ramsay taxation and borrowing and/or relevant to idealized Keynesian macroeconomics?

III. The Median Voter and Debt Finance

A. The lecture notes below are based on Congleton's 1992 survey of issues regarding the political economy of debt, which still provide a good overview of issues associated with the politics of debt finance.

B. For this class, only the next two sections covered. The other material in the appendices are included for students with a strong interest in public finance and especially theories of debt finance.

C. In a competitive democracy, political outcomes reflect the perspective of the median voter.1

- The median voter is the voter whose ideal fiscal package lies exactly in the middle of all voter ideal points.
- (The median voter model and related public choice models were covered in handout 6.)

i. If we accept the median voter model as a first approximation of political decision making in democracies, the current deficit reflects the fiscal circumstances and discount rate of the median voter at a given moment, and the cumulative debt is a consequence of the series of median voter preferences, circumstances, and political incentives in previous periods.

ii. We can, thus, use "single decision-maker" models to characterize a variety of debt-taxation choices.

iii. The next few sections provide overviews of reasons why the median voter might prefer debt finance to tax finance (at the margin).

IV. Barro: Richardian Equivalence and the Median Voter

A. The modern analysis of debt is often associated with two papers by Robert Barro (1974, 1979) in which he updated the **Richardian Equivalence** principle by using contemporary models of voters and taxation.

i. Barro's models assume that the population of voters is homogeneous, and consequently all voters make identical decisions about the optimal debt level.

- This lack of dissension is not the principal focus of Barro's analysis.
- The homogeneity of voters is used to facilitate analysis of other problems, but it turns out to be an important assumption nonetheless..

ii. Within an electoral context, every voter in the Barro model agrees with the every other voter (including the median voter), and thus the policy result is Pareto optimal.

B. The principal insight of Barro's original piece (1974) public debt was to note that **even finite lived individuals might have an infinite planning horizon if they care about the welfare of their descendants**.

i. An implication of the infinite planning horizon result is that for purposes of analysis one can neglect intergenerational aspects of the politics of government finance.

ii. Each person acts as if they will live forever.

iii. This assumption tends to make the Ricardian Equivalence idea clear (although Barro's treatment of it was not).

C. The following two-period model of the median voter's choice captures essential features of the Barro model, and is used for illustrative purposes throughout the paper.

i. For the purposes of this paper, assume that individuals have infinite planning horizon, which in the context of a two period model implies that voters in period 1 act as if they will be alive in period 2.

ii. The median voter faces both private and public budget constraints. He faces a private budget constraint that requires the present discounted value of disposable income to equal the present value of personal consumption.

a. Draw a two period intertemporal choice setting, note private savings and debt on the diagram.

b. Now impose a lump sum tax on the consumer.

- Note that lump sum taxes can be imposed in the first period, in the second period, or a bit in each period in a manner that generates the same effect on the consumer.

c. This tends to be true as long as the present value of the tax is the same.

1 In the stochastic voting literature, candidates are assumed to be only imperfectly informed of voting behavior. In such models, vote maximizing candidates converge to the average voter's ideal point rather than the median voter's position.

iii. Because of the implicitly assumed neutrality of debt, the timing of taxes does not affect utility as long as the budget constraints are satisfied.

iv. This is the Ricardian Equivalence theorem within the context of an electoral model.

a. Individuals are indifferent between debt and taxes as fiscal instruments.

- Not only are the politics of debt formation in this model marked by unanimity, but also by indifference.

b. A model where individuals are fiscally homogeneous and debt is neutral has no direct implications regarding debt formation in equilibrium.

v. When individuals are not fiscally homogeneous, as in the Buchanan and Roback paper, the politics of debt are quite different because tax burdens will vary among families in a manner that can generate additional support for debt finance as discussed above.

V. Buchanan and the Median Voter

A. The Buchanan and Buchanan and Roback approaches drop the assumed homogeneity of tax payer-voters.

i. Buchanan allows for individual diversity, not only in incomes and tastes, but also in future tax obligations.

- In the Buchanan model, Ricardian equivalence may hold for the average tax payer but not for the entire distribution of tax payers.
- Buchanan demonstrates that such individual differences tend to affect the level of current deficits and thereby the level public debt amassed through time.

ii. Consider the following modified Barro model which is a variation of the Buchanan and Roback (1987) model.

a. Assume that the distribution of income has a positive skew so that the median voter pays less than the average tax in both the present and future periods.

- The lower price of government services tends to increase the quantities of public services demanded relative to the original Barro setting.
- However, this sort of voter heterogeneity does not affect the choice of fiscal tools as long as the ratio of the median voter's tax obligation to the total tax burden is the same in each period.

b. In addition, suppose that the median voter's relative cost share differs substantially in the two periods.

- This would be the case for a median voter who expects to retire in period two.
- It would also be the case in an explict intergenerational context for voter-taxpayers whose children have *relatively* poor prospects for future income or, indeed voters without children at all.
- In such cases the median voter has a clear incentive to borrow in the period of high taxes and repay the loans in period where "his" expected tax is relatively small.

VI. Finite Planning Horizons and Rational Ignorance

A. Several other informational problems exist which also tend to increase incentives for debt finance beyond that implied in the certainty models of debt formation.

i. For example, (1) planning horizons may be shorter than the duration of a particular government, which allows the possibility that budgets may not be balanced in the "long run."

ii. The fact that forecasting errors rise rapidly as values further and further into the future are estimated implies that there comes a point where additional forecasts and planning are essentially without value.

iii. If this occurs before all debt is expected to be retired, long term borrowing becomes effectively a "costless" method of funding current government services.

iv. Given debt neutrality (as discussed in the Barro section above), a planning horizon shorter than the anticipated debt repayment schedule clearly encourages debt finance.

B. Given positive information costs, individuals may not uniformly gather information about government services, and moreover may remain ignorant of whole areas of fiscal policy.

i. In many cases the expected benefits associated with being informed on an issue are below the costs of obtaining the information.

ii. Moreover, the same residual uncertainty that diminishes the benefits of becoming "informed" about future programs also tends to increase the cost of becoming "informed" about such programs.
   a. Consequently, fiscal ignorance about future programs tends to exceed that of fiscal ignorance about current programs.
   b. The extent to which any consequent biases affect the timing of taxation and expenditures is a matter of the extent and direction of the biases engendered.

iii. If fiscal ignorance merely increases uncertainty about the costs of future programs, it would still affect the timing of public service levels and thereby debt levels.
   a. Moreover, if future benefits of government programs or future tax burdens are systematically underestimated, the result would be an increase in debt levels.
   b. A decline in the benefits of future services makes current service relatively more attractive, while a decline in the anticipated future tax burden tends to cause the median voter to shift tax burdens into the future.2

VII. Interest Groups, Voter Ignorance, and Government Finance

A. In the this section of the lecture, the possible influence of debt-oriented interest groups on fiscal policies is analyzed.

B. In a pure voting model of government finance, the median voter (if one exists) indirectly determines the distribution of government services and the financial means used to attract economic resources into the public sector.3

C. In a model augmented with the effects of politically active special interest groups, policies open to the influence of interest groups are determined at the margin by the relative power of alternative interest groups.

D. The Buchanan model indicates that the median voter may himself have a special interest in the timing and composition of government finance.4

i. The analysis of this section demonstrates that interest groups will tend to find debt finance an attractive fiscal means to advance their ends.

ii. There are many interest groups who are directly affected by government decisions concerning the level and timing of taxation and who therefore have an active interest in fiscal policies.
   a. For example, Alesina (1988) argues that the history of West European debt defaults (monetization) and repayment reflects changes in the relative power of three coalitions: rentiers, entrepreneurs and workers.
   b. Many other politically active groups also have an interest in the timing of taxation and government services.
   c. For example, pro-service interest groups often appear to believe (or at least argue) that their particular area of interest is at a "crisis point" and therefore require *immediate* increases in government services.
   d. Here, the environmental, and education lobbies come to mind.5

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2 Such an effect, as seen above in the Buchanan model, causes debt finance to increase as tax burdens are shifted to periods in which anticipated burdens are reduced. Such biased assessments of tax burdens are easy to imagine. For example, individuals (an the Congress) may easily underestimate the extent to which current policies increase future unfunded fiscal liabilities. This might be argued of various government sponsored insurance programs in the U. S., which causes future tax burdens to be underestimated. In the case of insurance to the Banking industry, or social insurance, future tax obligations can not be known with certainty until the actual insurance liability arises in the future.

3 In cases where a combination of voting rules and party discipline gives particular parties control of government, than the rather than the median voter, the median party member may be decisive. In such cases, changes in parties will cause substantial policy shifts, since the median party member's ideal point may be substantially distant from the median voter's ideal point. This modification does not significantly change the above analysis, which is cast in terms of the decisive voter. Moreover, in coalition governments, the decisive coalition member is often a centrist party.

4 Cukierman and Meltzer (1989) demonstrate this point in a somewhat richer over-lapping generations model. However, their model of debt finance is not neutral in the sense of Barro or Alesina and Tabellini. In the Cukierman and Meltzer (1989) model, government debt issues bid up interest rates and crowd out private investment rates which reduces growth rates and future income levels.

5 It bears noting that the degree of intergenerational altruism or foresight is not a decisive variable in this context. Many of the groups that favor speeding up the

E. If voters are perfectly informed, and a stable institutionally determined voting equilibrium exists, then special interest group influence is essentially ruled out.

   i. In such cases, voter preferences directly determine fiscal policies as weighted by the collective decision making arrangements.
   ii. On the other hand, if voters are only partially informed about fiscal issues or remain completely ignorant of fiscally relevant policy details, several perfectly legal non-voting opportunities arise by which interest groups may strategically manipulate information costs to affect policy decisions.
   iii. Illegal means also arise as a consequence of the imperfect knowledge of voters, but for the purposes of this paper it is assumed that bribery and other such efforts have only minor effects on general fiscal policy decisions.
   iv. Interest groups are assumed to sponsor messages which affect voter expectations rather than encourage representatives to sacrifice general constituent interests for personal profit.6

F. Interest Group Influence

   i. The above analysis suggests that interest groups who are able to persuade the median voter that current government services are relatively more valuable than future government services, and/or that future taxes will be less burdensome than current taxes will thereby increase the stock of debt generated in the current period.
      a. Casual observation suggests that the messages of groups favoring immediate service levels and tax postponement are more commonly heard than those espousing policies that encourage government account surpluses.
      b. If this assessment is true, the balance of interest group power tends to increase the level of current deficits at the margin.

G. The extent to which such groups have affects on political outcomes beyond their votes, is a matter of their ability to invest resources to persuade voters or their representatives of the relative merits of their positions.

   i. The extent to which a given array of interest groups is able to influence public policy is partly a matter of local institutional arrangements, partly a matter of the resources invested by other groups, and partly a matter of the persuadability of voters and/or their representatives.7
   ii. Incentives to organize and become politically active are a matter each respective interest group's expected relative gains net of organizational costs, see Olson (1965).

H. The same uncertainty, and imperfect information that tends to encourage median voters to use deficit finance, tends to make groups favoring immediate public services paid with future taxes larger and more effective groups than those groups favoring surpluses and postponement of government services.

   i. Such groups tend to have both greater interests at stake and lower organization costs than anti-deficit groups.
   ii. (1) Future tax payers are clearly not personally active current policy debates.
      a. Their interests are represented only to the extent that current tax payers have a direct interest in reduced deficit spending or believe that their children will be relatively better off than they themselves are. In an environment where median income is rising at a substantially slower rate than average income, the interests of future taxpayers be under represented.

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delivery of public services are, at least in public, motivated by concern about effects on future generations. For example, environmentalists argue that argue that reducing current emissions of "green house" gases will benefit future generations and reduce the long run cost of achieving a desirable distribution of global temperatures.

6 Under some institutional arrangements, direct monetary incentives are legal and provide a more direct method by which interest groups may affect the votes of elected representatives. For example, a firm might hire a representative as a consultant, or director on its board of directors; or purchase services from firms in which a representative has an indirect economic interest. These indirect "purchases" of votes are neglected here in order to focus on informational aspects of vote-determined political processes. Analysis of the purely economic methods by which votes may be influenced is beyond the scope of this paper. See Buchanan Tollison and Tullock (1980) for an overview the rent-seeking approach to such political "markets."

7 It is clear that if individuals were entirely unpersuadable, because they were perfectly informed or ideological zealots, resources would not be invested in information based lobbying activities, since such efforts would be ineffective. See Congleton (1991).

b. Groups favoring debt finance will have a greater interest in debt increasing programs than those advocating fiscal restraint and thus potentially will command greater resources.

iii. (2) The same relatively ease with which current program benefits and taxes can be assessed, implies that the **organizational costs of groups favoring debt finance are lower than for groups supporting delayed services or increases in current taxes.**

iv. Potential supporters are, as discussed above, less inclined to remain ignorant of policies affecting current benefits and taxes than of policies which provide only future benefits and costs.

VIII. Appendix: Tabellini and Alesina

A. The Tabellini and Alesina (1990) model adds electoral uncertainty to the median voter's policy decision.

i. They assume that the current median voter can not commit future governments (median voters) to specific fiscal policies.

ii. That is to say, the current median voter directly controls only the current tax and service levels.

iii. However, to the extent that current tax and borrowing policies constrain future political decisions, current tax/debt decisions become an instrument by which the current policy makers can influence, indeed even control, future public policy decisions.

B. The Tabellini and Alesina analysis can also be captured with a minor extension of the simplified Barro model developed above.8

i. Setting the marginal influence of current taxes on next period taxes equal to zero implies that period 1 tax rates are set to maximize the tax receipts in period 2.

a. By maximizing tax receipts, the current median voter indirectly maximizes his control over expenditure levels.

ii. Whether strategic elements of government finance implies deficit finance is a matter of the specific geometry of the reaction (best reply) function of the anticipated alternative median voter in period 2.

a. In general, there is no particular implication regarding debt levels.9

b. Deficit finance arises if the desired expenditure level is above the revenue generated by the optimal rate in period 1.10

IX. Appendix: Uncertainty and Fiscal Choice

A. The above analysis of the level and causes of government debt indicates that under complete certainty there are a number of factors which can generate significant use of debt finance as a method of shifting the burden of public programs to other tax payers (and their heirs) or as a means of constraining the choices of successive governments.

B. The third part of the lecture examines whether various kinds of uncertainty may have similar effects on the timing of taxation or expenditures.

C. The Buchanan and Tabellini and Alesina models characterized above suggest that changes in the original Barro model which affect expected future tax burdens or service levels may thereby affect debt levels.

i. Imperfect information may similarly affect expected tax burdens and service levels.

ii. For example, note that if the Barro model is modified to reflect uncertainty about whether the current median-voter-taxpayer (or his children) will survive to be taxpayers in period 2, anticipated future tax burdens are clearly reduced relative to the original model.

a. This transforms the Barro model to one resembling the Buchanan model previously analyzed.

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8 Vaughn and Wagner (1992) argue that all the various approaches to debt can be combined into single unified theory. This could easily be done here by adding electoral uncertainty to the Buchanan model. However, such a combined model would not serve the purpose of this paper which is to demonstrate that various forms of imperfect information and consequent fiscal uncertainty has clear effects in all three models.

9 Tabellini and Alesina (1990) analyze a less general model in which individuals consume only two government services. Because voters have a zero discount rate, and debt is completely neutral, any debt level is possible in period 1. Consequently, ambiguity over debt levels also occurs in the Tabellini and Alesina model. However, the absence of private consumption alternatives in their model, makes debt a perfect method of controlling government expenditure levels in period 2.

10 Note that corner solutions are not ruled out by equation 8. If period 2 tax rates tend to rise as period 1 tax rates fall over the entire range, then the same corner solution as in the Buchanan analysis is implied, as current taxes are reduced to zero and the entire period 1 government service level is debt financed.

b. Consequently, uncertain survival of the median voter and his progeny causes taxes to be prosposed in order to minimize the expected tax burden for the current median voter and his heirs.

D. Uncertain Costs and the Timing of Government Services

i. A similar effect can arise if voters are uncertain about the costs of future services.

a. Fiscal uncertainty can also affect the *timing of public services as well as taxes* in a manner which increases debt levels.

b. Uncertain future service levels or future costs tend to encourage substitution of the more certain current services for future services relative to the original complete certainty model.

ii. Future cost uncertainty leads to the substitution of current for future government services.

iii. The constraints under this probabilistic choice are equivalent to those of the original complete certainty case in an expected value sense.11

a. Since tax burdens are again assessed to minimize the median voter's tax share, cost uncertainty has no direct effect on the median voter's preferred timing of tax receipts.

b. Consequently, while total tax revenues may decline somewhat under future government service cost uncertainty as planned future service levels decline, there is no particular reason for changing the timing of taxation.

- Debt is still neutral.

c. However, for any given tax rate in period 1, the size of the deficit implied under service cost uncertainty is larger than it would have been under the initial Barro assumptions.

- Similar conclusions hold for the Buchanan, and Alesina and Tabellini models.
- The debt effects of their extensions of the Barro model arise because of changes in the fiscal constraints that affect the timing of taxation.
- In this example, government debt increases because government cost uncertainty affects the timing of government services.

X. Appendix: Persuasion and Fiscal Uncertainty

A. It bears noting that, even if a policy debate is balanced in the sense that equally persuasive messages are sponsored by pro and anti debt interest groups, to the extent that policy debate *increases uncertainty*, the lobbying process will, itself, tend to increase the size of deficits.

B. To see how such a process might operate, consider the following model of persuasion, based on Congleton (1986), in which two groups attempt to influence the decisive voter's expectation about the cost of a future government service.

i. Suppose that campaign and other messages have at least a minor affect on his assessment of the likely consequences of the policies of interest.

a. In particular, suppose that the median voter (or his representative) has Bayesian priors on the range of possible costs that might occur, and updates these priors based on messages sent by the lobbying groups.

b. In such a setting, it is easy to find cases where the process of public debate increases rather than decreases variance.

ii. For purposes of illustration assume that initially the average cost of future services can only be any one of three levels, 1-k, 1, and 1+k.

a. The median voter's uninformed prior is that each of these prices is equally likely, $P(1+k) = P(1) = P(1-k) = 0.333$.

b. Consequently, the expected average cost of future services before any persuasive efforts are undertaken by the lobbying groups is 1.

iii. Interest groups who favor increased current government services have an incentive to send messages that future prices will be higher than expected, since as demonstrated above, higher expected future costs tends to cause substitution away from future programs toward current programs.

a. Similarly, interest groups who favor postponement of government services (or regulations) would send messages that the average cost of future services will be lower than expected.

11 The mathematical equivalence occurs because of the assumed average (expected) price being equal to the original uncertainty value of 1. Here, $G_2((1-k) + 1 + (1+k))/3 = G_2$.

b. Given the assumed range of costs, the former can plausibly argue that actual costs will be 1+k; while the latter would argue that future service costs will be only 1-k.

iv. The median voter is naturally skeptical of messages sent by special interest groups, but believes that each message is slightly more likely to be true than false.

a. For purposes of illustration, let the probability that a particular message is heard be .4 if the stated value it is true and .3 if one of the other values actually obtains.

b. For example, the probability that a message that the future costs equals 1+k is heard is $P(M^+|1+k) = .4$ if 1+k is the true value and is $P(M^+|1) = .3$ if 1 is the actual value, and is $P(M^+|1-k) = .3$ if 1-k is the actual value.

c. (Superscripted "-", "o", and "+" are used to denote messages regarding the cost of future government services.)

v. The probability of hearing a particular message is the probability that it would be heard under one of these three circumstances.

a. Either it is true or false and one of the other cost levels obtains.

b. For messages M_j : j = 1, 2, 3 and average cost levels C_i , i = 1, 2, 3; the probability of hearing message M_j is $P(M_j)=\Sigma P(C_i)P(M_j|C_i)$, which given the assumed values of $P(M_j|C_i)$ is (.33)(.4) + (.33)(.3) + (.33)(.3) = .33 for all three messages.

vi. The voter updates his priors after hearing the various messages using Bayes Law.12

a. The posterior probability assigned to 1+k is the following after a M^+ message is:

$$P(1+k|M^+) = [P(1+k)(P(M^+|1+k)]/P(M^+) \quad (12)$$

or substituting:

$$P(1+k|M^+) = (.33)(.4)/(.33) = 0.4$$

b. The M^+ message is persuasive in the sense that it causes the individual to revise his assessment of the probability that service costs equals 1+k, from 0.33 to 0.4.

vii. In this quasi Bayesian model of learning and persuasion, messages modestly influence an individual's probability assessment of alternative cost levels and thereby affect his expections about the costs of future programs.

viii. Table 1 reports successive posteriors for an alternating sequence of M+ and M- messages, and the mean and variance of each prior/posterior distribution.

Table 1

Average Cost of Government Services	Original prior	M^+ message (1)	M^- message (2)	M^+ message (3)	M^- message (4)
1-k	0.33	0.3	0.36	0.32	0.41
1	0.33	0.3	0.27	0.24	0.17
1+k	0.33	0.4	0.36	0.43	0.41
Expected Cost	1	1+0.1k	1	1 + 0.108k	1
Variance	$.66(k)^2$	$.7(k)^2$	$.728(k)^2$	$.756(k)^2$	$.826(k)^2$

ix. Note that each successive message has a small effect on both the expected cost of the government service and the variance of the estimate.

12 Any process of updating which has qualitatively the same effects would yield similar conclusions. That is to say, as long as $dP(M^+)/dM^+ > 0$, messages will be persuasive at the margin.

a. Each successive message is somewhat persuasive, and consequently the expected cost moves in the direction of the the message heard.

b. The final assessment reflects the values of the original priors and the cumulative effect of all the messages heard. In the case represented in the table, the same number of M^+ and M^- messages were heard with generally offsetting effects on expected costs.

c. However, although the expected cost of services was not affected, the message series did *increase* the variance of the estimated future cost of government services.

d. **A series of "extreme" messages tends to increase the variance of the distribution of posteriors.**

x. A series of extreme messages. thus, may effect policies even if they do not expect expected (mean) costs.13

a. The effect of such policy debates are the same as those associated with the move from a certain future cost environment to an uncertain future cost environment analyzed above.

b. Except in cases where extreme complementarity exists between future and current government expenditures, the end result of the competitive persuasion will be an increase in current (period 1) government expenditures and thereby, caeterus paribus, an increase in current deficits (or a reduction in current surpluses).

c. The proponents of increased current government service levels do not have to win the public debate to at least partially achieve their policy goals.

d. It is sufficient to increase the uncertainty of future alternatives.

XI. Conclusion

A. Tabellini and Alesina (1990) argue that many of the neutrality results of the Barro type approach are the consequence of an assumed permanence in the polity's ability to make decisions.

i. They show that if decisive power in government changes from time to time, that each successive "polity" has an incentive to attempt to manipulate the choices of their successors through the choice of fiscal policy.

a. While such strategic interdependence between current and future decisions makers is doubtless important, their results can be reinterpreted in fiscal uncertainty and insurance terms.

b. Uncertainty about future service levels can be reduced in their model by substituting debt financed current services for tax financed future services.

c. This lecture has argued that other sorts of fiscal uncertainty may have similar effects on the level of debt issue.

ii. Even in cases where voters (or at least the median voter) have unbiased expectations about the costs of future government programs, uncertainty itself may cause current programs to be substituted for future expenditures.

a. Risk averse political decision makers will prefer the relatively greater certain benefits of present programs to the increasingly unpredictable benefits of future programs.

b. Similarly, voters prefer the uncertain taxes of future periods to certain ones in the present.

c. In this manner, uncertainty itself tends to increase deficit spending.

B. The existence of costly and imperfect information creates an opportunity for interest groups to invest in the strategic dissemination of policy relevant information.

i. This is generally what lobbying, per se, entails.

ii. The analysis above demonstrates that imperfect information may thereby increase the tendency for governments to engage in deficit finance if the future - tax current - expenditure lobby is able to generate greater influence than their pro-surplus oriented opponents.

iii. Moreover, even in cases where interest groups are not able to materially change the expectations of pivotal decision makers, it is still possible that the debate will *increase* perceived uncertainty, and thereby encourage government programs to be implemented sooner rather than later.

iv. **Imperfect information, itself, often has non-neutral implications about the level of debt in a society.**

13 See Husted, T. A., Kenny, L. W. and Morton, R. B. (1991) for general empirical support for this Bayesian approach to messages. They find that voters often have expectations with greater error variances associated with them after U. S. Senate elections. See table 2.

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