I. The Demand for Government Services and the Positive Theory of Taxation

Thus, from an economic or rational choice politics perspective, one should model taxation and services simultaneously as we did in the last lecture. A rational voter will simultaneously take account of both the benefits and costs of a public service, with the latter being mostly a matter of the additional taxes that will have to be paid to finance the service(s) of interest.

A candidate running for office is in effect asking voters to let him or her to direct the production of the services wanted by voters and to collect the revenues necessary to pay for the inputs used to produce and distribute the services. This includes cases in which rather than producing goods, they simply purchase the goods from private vendors and distribute them to voters and cases in which the money collected via taxes and debt are themselves distributed to citizens in the form of subsidies, social insurance, or transfers. Although voters do not make these decisions directly, through competitive elections they provide incentives for those elected to high office to conduct public policy as "advised" by voters.

Similarly—although not identically—an authoritarian that seeks to profit from rule will also take account of both expenditures and tax revenues simultaneously, although in that case with an eye to net revenues rather than reelection. In such cases, the tax system arguably justifies the services rather than vice versa, because the services provided are ones that either reduce the cost of maintaining authority or increase revenues by expanding the tax base in various ways—as through civil law, national defense, and public education. Again, both taxation and services are determined simultaneously.

A positive theory of taxation—which is to say, an systematic explanation of the types and rates of taxation that we observe in a particular country at a particular time—is impossible if it does not also simultaneously account for the services provided by the same governments at the same time. One can analyze the effects of a tax system on individuals or on an economy, but not explain their existence without taking into consideration the type of government and the aims of its principle decision makers—re-election or rent extraction or some combination of the two.

The public choice models developed in the previous handout showed that it is fairly easy to model the general interdependency between a preexisting service and a preexisting tax system. The same logic applies to complex service and tax systems as long as there is a pivotal (median) voter or authoritarian. In such cases, the logic of maximizing utility (or any other goal) can be used to characterize the ideal fiscal package of services and tax rates. One can model the simulataneous provision of thousands of services financed by dozens of different taxes. Most models (and model builders) focus on settings with one or two government services and/or taxes, simply because most of the insights of the more general analysis can be seen from simpler models, rather than because more general models are impossible.

Models of authoritarian regimes are in a sense easier than models of democratic regimes when one can identify a "ruler" who is in most cases the pivotal persons in a coalition rather than a completely independent actor. The problem with democratic regimes is that a median voter does not always exist in settings in which there are multiple services and taxes that can be used. In such cases, either the median voter model cannot be used, or requires supplemental assumptions such as a dominant ideology or a symmetric distribution of voter preferences. An alternative to the median voter model that has occasionally been used is the stochastic voter model in which voters are more or less rational in that the usually vote for the best candidate, but do not always do so. Such models have, for example, be used by Hettich and Winer (1984, 2005) to analyze complex tax systems. The outcomes of stochastic voter models tend to be weighted averages of voter preferences rather than determined by a single individual—where the weights vary with each voter's propensity to change his or her votes in response to small changes in public policy (See Coughlin 1992, Nitzan and Coughlin 1981), These models do not require as many assumptions or as many unrealistic ones as deterministic choice models to generate sharp predictions, although cycling problems are not entirely avoided by that methodology (see Kirshgassner 2000).

In either case (ideological voting or stochastic voting), the results are quite similar to those generated by just assuming that a median voter exists, focusing on one or two taxes and services, and proceeding from those assumptions. The tradeoffs among taxes are similar and the tradeoff among private and public services are also similar.

The main problems in those models arise because changes in the tax system may alter

the identity of the median voter. However, if in the first round of elections, the preexisting system has a median voter, the median voter will tend to continue that system to preserve his or her influence and modify it only insofar as the changes will not materially affect the median preference over the fiscal package. Thus, if one begins with a median voter and he or she has sufficient information to understand how fiscal policies affect the distribution of voter preferences over services and/or taxes, there will be a tendency to favor systems that reinforce the status quo. Reforms would tend to be modest, because these are the easiest to understand.

Innovations may occasionally be adopted, but only insofar as the pivotal voter believes will preserve the preexisting center of gravity in politics—including its stability. In such cases, the stability of the fiscal package would be generated by intent, rather than accident, and be disturbed only through unanticipated fiscal shocks or mistakes on the part of the median voter. The fiscal package would be designed to maximize the median voter's net benefits from the fiscal package while preserving his or her role as the pivotal voter.

This implies that taxes would not be zero for the median voter as might be expected, but in the middle range, and the desired services would be near ideal for the median voter. With this combination, about half of the persons in the electorate would want more of the services provided and about half less than that favored by the median voter. The median voter's interests would also reflect his or her ideology and other internalized norms. (A sketch of how this might be done can be found in Usher [1981]). This complete model of the political economy of public finance is still to be worked out—although the general direction of the theory is clear.

However, empirical work based on median voter models with preexisting tax systems and products are commonplace. I have, for example, worked on several aspects of the U.S. fiscal package and of the services provided by OECD member states. See for example Congleton and Shughart (1990) [on US social security and medicare], Congleton and Bennett (1995) [on US highway expenditures], Congleton (2001) [growth of US government], Congleton and Bose (2010) [emergence of Western welfare states], or Congleton, Batinti, Pietrantonio (2017) [Western healthcare systems], etc..

II. Normative Theories of Taxation

Although theories of how to rank societies or public policies are in a sense a subject for philosophers and theologians rather than economists, economic analysis is often motivatred by efforts to improve a society or public policy. With respect to taxes, the ethical, moral, or normative question is how should we acquire the resources required to produce government services and/or to allow kings to live like kings? In principle, a government could simply take what it wanted from its citizens since it has the coercive power to do so—its police force and army. However, for reasons doubtless similar to those described in Olson's model of stationary bandits, rule-based confiscation (taxes) rather than willy-nilly taking is employed by most governments. Such rule-based systems of "takings" tend to reduce the tax base by less than simply taking the assets of persons within the territory governed. Few people would bother to acquire "surpluses" or "assets" if they expected them to be simply taken by the most powerful organizations in their neighborhood.

If confiscations are to be rule based (e.g. tax law), the question of which rules are best naturally arises. If the aim is simple "extraction" as in the Olson model, then maximizing the present value of tax receipts is the aim of a "good" tax law. If, on the other hand, the aim is simply to pay for services that a citizenry believes it would be useful for a rule-making organization to provide—as in a "productive" or "social contract" based government—the tax laws adopted should be acceptable to all citizens within the territory of interest. These are likely to combine both pragmatic interests (minimizing the burden induced by the tax, being easy to collect, and so forth) and also other normative aims (consistent with community theories of just desserts, good policies, and fairness). The models sketched out in the previous section stressed the pragmatic interests of voters and rulers. The models sketched out below stress the ethical, moral, or normative dimension of taxation.

Most secular normative theories are "consequentialist." According to such theories, the consequences of an individual or government's actions determine whether it is "good" or not, "efficient" or not, "optimal" or not, "fair" or not, where various normative ideas are used to define "good", "efficient," "optimal," or "fair."

For example, the Pareto criteria evaluates the merits of fiscal systems by determining

whether a particular system can be improved on or not, where "improve" means to make at least one person better off without making anyone worse off. If that is possible, then the present system is not "optimal" or "ideal." If such changes are not possible, then it is Pareto optimal or Pareto efficient. Whether a policy is ideal or not in this sense depends on its consequences of the individual affected. If it makes at least one person better off and no one worse off, it is an improvement—a Pareto superior move. A policy or outcome is Pareto optimal if no Pareto superior moves are possible, which is to say if no policies can generate outcomes that make at least one person better off and no one worse off.

Alternatively, a policy may be judge optimal from the point of view of some single dimensioned "optimand" such as social welfare, aggregate Utility, or per capita RGNP. A policy that maximizes one of these optimands is optimal or good from the perspective of the associated norm and normative theory. Utilitarians of the late eighteenth century believed that good policies required taking account of the effects of every policy on everyone within a country. And, because everyone was ultimately interested in happiness or utility, that maximizing the sum of everyone's happiness or utility should be the goal of every government and every government policy.

Interpreted with economic ideas worked out a century later, this implies that in a setting in which a single-dimensioned public service (G) is financed by a proportional tax on income, the ideal level of G would maximize the sum of everyone's utility function, given $tY=c(G)$, where Y is national income, t is the proportional tax rate, and c(G) is the cost of the government service. The ideal tax rate under that system would be that required to fund the service, $t^* = c(g^*)/Y$.

Conditions for characterizing the ideal utilitarian outcome can be calculated using some calculus—a tool that few eighteenth and nineteenth century Utilitarians had at their disposal. If each person in the community or territory of interest has a utility function of the form $Ui= u(Ci, G)$ where $Ci = (1-t)Yi$, then aggregate utility, $W = \sum Ui$, can be written as:

$$W = \sum Ui(1-C(G)/Y)Yi, G) \qquad (1)$$

The conditions for maximizing aggregate utility can be found by differentiating equation 1 with respect to G and setting the result equal to zero (assuming that W is strictly con-

cave). Thus, maximizing W requires service level G to satisfy:

$$W_G = \sum\{Ui_C(-C_G/Y)Yi + Ui_G\} = 0 \qquad (2)$$

Equation 2 can be interpreted as finding the G that sets the sum of the marginal benefits from the government services being equal to the sum of the marginal opportunity cost of financing that service (and therefore reducing personal consumption). Notice that the first term in the sum is individual i's marginal opportunity cost of the government service in terms of lost utility from private consumption and the second is his or her marginal benefit from the service. Note that the marginal opportunity cost terms all combine subjective utility and objective terms, which implies that this calculation is not entirely subjective.

Note the consequences captured in this simple model include all the effects of the service on individual welfare—although as written it assumes that the tax has no incentive effect on the extent of national or personal income. Such effects could have been taken into account by making Y and Yi functions of the tax rate, t=c(G)/Y, although it would have somewhat complicated the math in equation 2.

Most of the normative ideas used by economists can be traced back through Alfred Pigou to the Utilitarians of the nineteenth century such as John Stuart Mill and Herbert Spencer and from them back to Jeremy Bentham. The social welfare functions used in post WWII papers and texts are generalizations of the Bentham characterization of aggregate utility (as a sum) used above. They allow for different functional forms such as multiplicative ones (sometimes called a Paretian social welfare function) and also for weighting individuals differently (treating heros and villains or nobles and commoners differently—a rather nasty generalization if you ask me).[1] Many papers in contemporary normative public economics rely upon the myth of the "benevolent social planner" who uses a social welfare function to choose public policies.[2]

Exceptions to mainstream reliance on utilitarian ideas and social welfare functions in-

[1] For background on social welfare functions, see Arrow (1950), Bergson (1954), Harsanyi (1975), Samuelson (1977), Bergstrom (1993), and/or Florio (2014).

[2] This is evidently an extension of Plato's idea of the philosopher king being the best form of government, but it is of course actually a form of dictatorship unless all the persons in the community agree about the exact nature of the best social welfare function.

clude the Pareto criteria (although Pareto himself was a utilitarian) and the contractarian norm theories of John Rawls (1971) and James Buchanan (1962 with Tullock, 1988, with Brennan). Contemporary **contractarians** such as John Rawls and James Buchanan regard consensus to be the best indication of whether a policy change is an improvement or not. If everyone agrees that G' is better than G", then it is—at least as far as contractarians are concerned. Agreement is considered a better indicator than aggregate utility, because aggregate utility cannot be reliably measured and because good policies should—according to this approach—make everyone better off, rather than simply assure that the "winners" gain more than the "losers" lose as in utilitarian analysis.

Consensus requires each individual to assess his or her expected net benefits from the consequences of policy G' and G" and then to vote in favor if his or her expected net benefits (adjusted for risk) are greater than zero. The problem confronted by contractarians is that both honest (non strategic) voting and unanimous agreement are rarely forthcoming in normal "real world" circumstances for reasons similar to those used above in the median voter illustrations. Individuals often have different interests and so disagree about the best policies.

To be fair to the contractarians, they do not generally favor consensus based politics on every issue, but tend to argue that citizens might agree to procedures for selecting policies (Buchanan) or principles for ranking policies (Rawls). They believe this to be the case because it is more difficult for individuals to assess their own narrow benefits from long-term procedures and principles than it is on day-to-day policies.

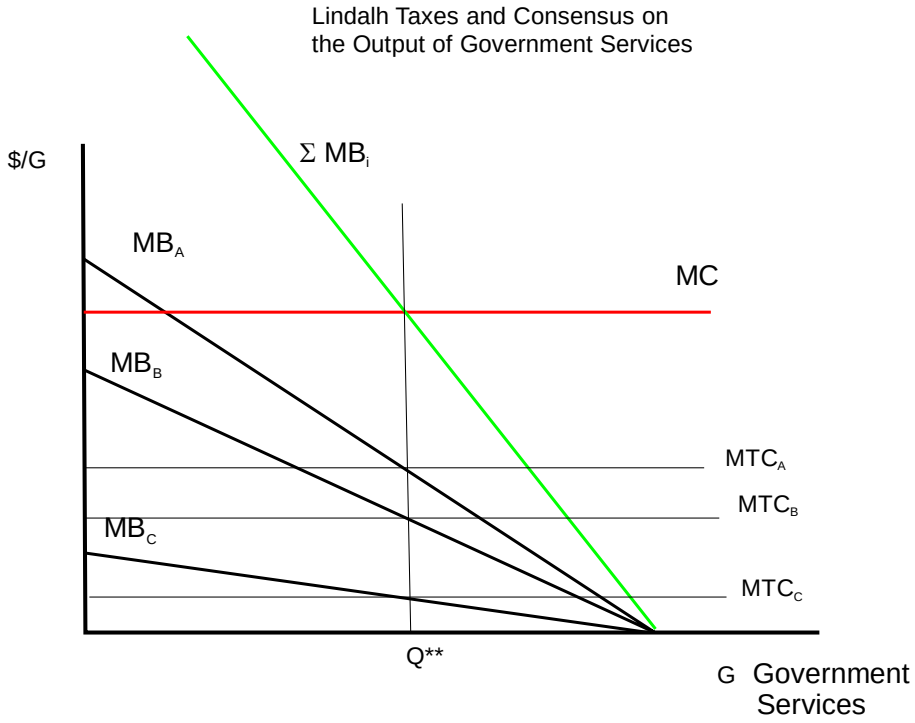
This uncertainty is sometimes referred to as "the veil." For Buchanan, it is the real uncertainly associated with standing procedures that tends to generate agreement (the veil of uncertainty). Would you prefer to use majority rule for every choice, or super majority or unanimity, or perhaps some combination of all three: unanimity for the most important, super majorities for other important issues, and majority rule for routine decisions, etc.. For Rawls, the "veil" is a method of thinking about policies that he suggests tends to produce consensus about principles, the "veil of ignorance." From behind the veil, Rawls assume that one disassociate one's real self from the decision and instead imagines what would be best if he or she did not know what role or position he or she would occupy in the society chosen via a principle of justice. This allows alternative principles of justice to be assessed. Each individual imagines

what it would be like to be in all the various positions in society and think about what principles (or what institutions) they would like public policies to reflect in that situation.

For example, if you didn't know which person you would be in the following 4 societies of 3 people, which society would you prefer (5, 5, 5), or (8, 8, 5), or (12, 7, 4), or (18, 5, 2) if there was an equal chance that you could/would be each of the individuals?

It turns out that there is a special case of the Samuelsonian social welfare maximizing provision of a pure public good that tends to generate unanimous agreement. It was developed somewhat before Samuelson's famous paper by Erik Lindahl, who was interested in tax systems that would tend toward unanimous approval and/or minimize resistance. Recall that in its geometric form, the Samuelson Conditions required (i) producing the service at the point (G**)where the sum of the marginal benefits realized by all individuals equals the marginal production cost of the good, (ii) the sum of the individual tax payments to add up to the cost of producing G** units of the pure public good, and (iii) that the sum of the marginal tax payments equal the marginal cost of producing the service. To that list, the Lindahl tax system adds the provision that each person's marginal tax cost equal's his or her marginal benefit at output G**. It is for this reason that Lindahl taxes are sometime called benefit taxes.

The figure below illustrates such a tax system for three persons or three homogeneous groups of taxpayer citizens. Al, Bob, and Cathy each have different marginal benefit curves, which as drawn may be simply because of differences in income, although their tastes for the service may also differ. The Pareto optimal level of the public service is G** is where the sum of those marginal benefit curves (the social marginal benefit curve) crosses the marginal cost of producing the service line (MC). The Lindalh taxes shown are one of many possibilities for which the individual marginal tax costs (MTC) equal their marginal benefits at G**. Notice that, given their tax costs, each person prefers G** to every other level of service. Thus, a Lindahl tax system can generate unanimous agreement about government service levels.



That unanimity is even conceptually possible is a bit surprising given the differences in interests indicated by their marginal benefit curves. In practice, the challenge would be estimating each person's marginal benefit curve.[3]

These three approaches—the utilitarian, the contractarian, and the Paretian are the most widely used normative foundations for economic analysis, with the utilititarian one as interpreted by Pigou being by far the most common one. However, familiarity with these approaches are also useful for economists as individuals—which do you find most plausible as a method for identifying good policies?

The remainder of this handout focuses on the social-net benefit maximizing norm sketched out by Pigou and now routinely used in benefit-cost analysis and in geometric analysis within public economics. A deeper study of normative theories for choosing among public policies is, of course, of interest, but beyond the scope of this course.

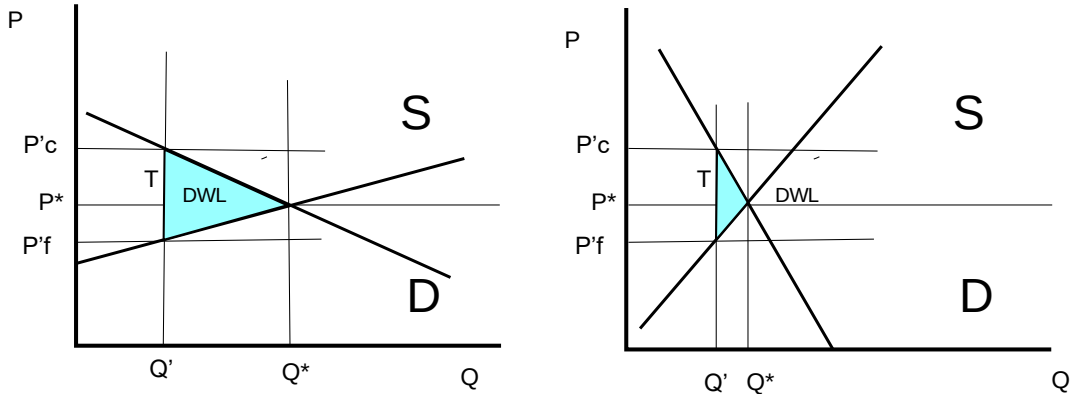
[3] A method for eliciting honest revelations of voter marginal benefit curves was worked out by Clarke (1971) and discussed in a simplified form by Tideman and Tullock (1977). See Kawagoe and Mori (2001) for an experimental test of the Clarke tax mechanism.

III. The Geometry and Implications of Tax Burden for Normative Theories of Taxation

The geometric approach and their calculus-based counter parts tend to assume that expenditures are fixed and that the issue is how best to raise the money required to fund those expenditures. We have already seen that this assumption is inconsistent with the positive theory of taxation in that both voters and dictators take simultaneously account of expenditures and taxes. Neither can choose an expenditure independently of the tax system that will be used to fund them, nor a tax rate without considering the benefits that will be associated with the expenditures to be funded.

Nonetheless, it is sometimes a useful simplification to imagine that expenditures are chosen before taxes—but only if it truly simplifies one's analysis of taxation in a manner that makes some conclusions sharper than they would otherwise have been—without obviously conflicting with the positive theory of taxation. For example, the choice of a tax system may be separate from the choice of tax rates and it may be possible to "easily" rank tax systems in a manner that would be consistent with voter or authoritarian goals. For example, some taxes may be "obviously" inferior to others because they have a larger burden. An excise tax on a market with relatively price sensitive (price elastic) demand and supply curves will have a larger excess burden than the same tax on a market with relatively price insensitive (price inelastic) demand and supply curves. The greater the excess burden associated with a tax system, the lower net benefits from non-governmental services tend to be after revenues are raised, other things being equal. This is the rationale for Ramsey (1927) tax systems—that minimize the excess burden of every level of revenue that might be sought.

Different DWLs for identical tax revenues and rates

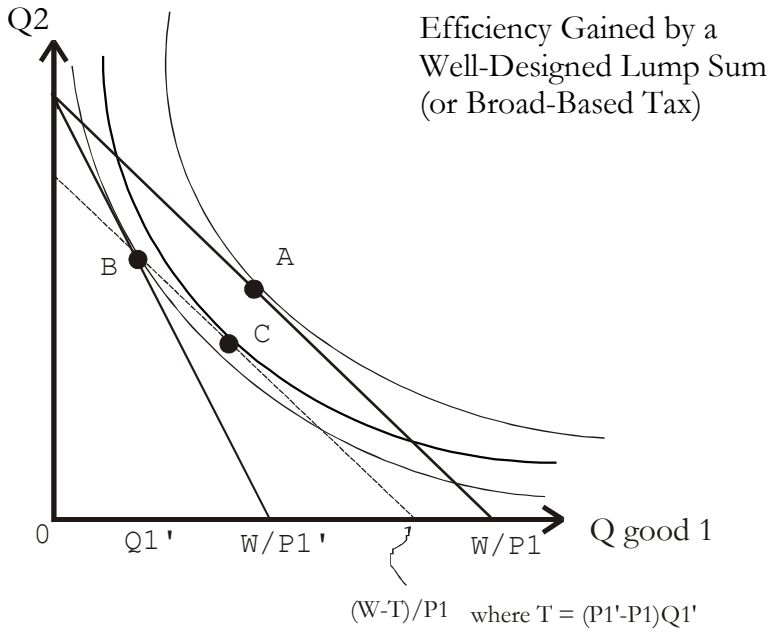


The same argument applies to subsidies. That is to say, if one is interested in minimizing deadweight losses, one should focus subsidies on markets with relatively little price sensitivity. Moreover when earmarking a excise tax for use as a subsidy, both markets should be ones with relatively little price sensitivity (steep slopes).

Notice, however, that these deadweight-loss arguments do not address the question of why one has a tax or undertakes a subsidy. These evidently are based on something other than minimizing deadweight losses or neither excise taxes nor targeted subsidies would every be adopted. The positive theory of taxation simply says that taxes and subsidies are targeted because moderate voters prefer them to be that way, and their excess burden(s) is fully taken into account by voters, except insofar as voters suffer from fiscal illusion(s) associated with their rational ignorance. In the latter cases, economists might usefully point out that voters would be better off with different tax and/or subsidy systems—or simply note that they prefer other tax and subsidy systems themselves. The issue for positive tax theory is what "drives" voter preferences over policies rather than normatively assessing voter preferences or public policies.

In general economists tend to favor "neutral" general taxes over targeted taxes because such taxes tend to have lower excess burdens than other tax systems. That is to say their total burdens associated with any given level of revenue (revenue raised plus excess burden) tends to be smaller than that of targeted taxes (with one exception, that we'll discuss later).

The indifference curve diagram below illustrates the geometric case for broad-based neutral taxes and/or lump sum taxes. It assumes that there are two goods that consumers are interested in and that initially only one of them is taxed, as with an excise tax. In the pre-tax setting the individual of interest, "Al", purchases bundle "A". The effect of an excise tax on good 1 is to increase the price of the taxed good from P* to Pc . This increase in price affects the shape of each consumer's budget set. 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. In the case drawn, the new higher price causes the consumer to purchase bundle B instead of A. (Indeed, A is no longer feasible.)



The lump sum or general tax that raises the same revenue is characterized by the budget line parallel to the original pre-tax budget line and passing through point B. Note that under that tax scheme, the consumer can reach a higher indifference curve and chooses bundle C rather than bundle B. The difference between the utility realized with bundle C over that of bundle B the excess burden of a non-neutral tax on consumers.[4]

As in the demand and supply diagrams, much of the excess burden (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. A neutral tax has no direct effect on relative prices and so has a smaller effect on sales of goods, one that operates through the income effect alone rather than through both an income effect and substitution effect. [However, it bears noting that It also bears noting, however, that no tax can be completely neutral, because all taxes that are "widely known" to exist will affect locational choices of firms and consumers.]

[4] This can be demonstrated by showing that a lump sum tax equal in amount to the amount this consumer pays under the excise tax, generates a budget line parallel to the first passing through bundle B. This algebraic exercise is left to students to work through.

IV. Pigovian Taxation, and the Double Dividend

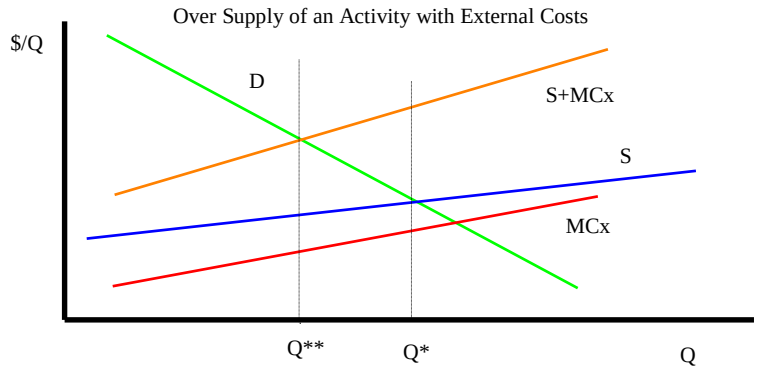
Another tax system that is consistent with the Ramsay norm of minimizing the excess burden of taxation is the Pigovian tax. A Pigovian tax is designed to solve externality problems and thus Pigovian taxes increase social net benefits rather than reducing them (assuming that the tax revenue generates at least an equal amount of benefits dollar per dollar). A Pigovian tax is designed to change behavior, in contrast to most excise taxes which are adopted simply to generate tax revenue. Pigovian taxes are sometimes argued to have a "double dividend" they solve externality problems and produce revenue in an efficient manner.

The geometry of externalities and externality problems is straight forward. In a supply and demand (market) diagram, we introduce a new curve that represents the **external** marginal costs (or marginal benefits) of the activity of interest. The predicted market outcome—Q* where the Demand and Supply curve cross—is is not affected by the existence of the new marginal external cost curve, because both firms and consumers are assumed to ignore the externality generated. (Note that this positive prediction plays an important role in the entire exercise and is an assumption that can be tested.)

To find out whether an externality generating activity or output is over or under supplied, we find the social marginal benefit and marginal cost curves, and use them to characterize the social net benefit maximizing activity level (output, Q**). 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. To these we add the external marginal benefits and/or external marginal costs to find the social marginal benefit and social marginal costs curves--now taking account of the spillovers.

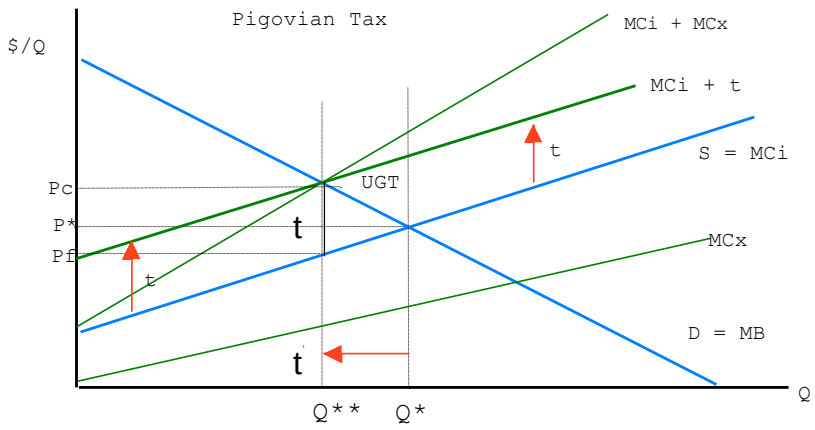
Because an externality generating activity generates benefits or costs for a wide range of people simultaneously, the social marginal benefit and marginal cost curves for such activities are "vertical" sums of the relevant consumer, firm, and spillover MB and MC curves. The level of the activity that 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.**

Illustration: In the figure below, the market supply and demand cross at Q*, but the SMB and SMC curves (here D and S+MCx) cross at Q**. Since Q* is not equal to Q** there is an externality problem.



The inefficiency (market failure) conclusion of this diagram can be reached using several normative theories. For example, (i) the activity level chosen fails to maximizes social net benefits, then there is an externality (or public good) problem. (ii) The activity fails to realize all potential gains to trade and so there are Pareto superior moves possible. (iii) From behind a veil of ignorance, the community would (or may) agree to implement an institution that generates Q** rather than Q*.

A Pigovian tax attempts to change incentives at the margin by imposing a tax (or subsidy) on the activity that generates the externality. The ideal Pigovian tax equals the marginal external cost of the externality generating activity at Q**. 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**). The figure below illustrates the effect of a Pigovian tax on an externality problem similar to that above. Without a Pigovian tax, there are unrealized gains to trade (see triangle UGT) at Q*, between the firm and those affected by the externality. The external cost at Q** is also the vertical distance from supply curve (MCi) to the demand curve at Q**. Thus, a tax equal to the marginal spillover cost at Q** induces the market equilibrium to shift from Q* to Q**.



The extent of the revenues generated vary with the size of the externality and markets of interest. Pigovian taxes, such as an optimal carbon tax, may yield substantial revenues although this is not their main purpose. Their main purpose is to change behavior.

Notice that Pigovians do not have a deadweight loss because social net benefits increase, rather than decrease, when a Pigovian tax is imposed, because an externality problem is solved. However, any tax higher than equal to the marginal external cost at Q** will generate an excess burden. (See Goulder (1995) for a useful overview of the literature on the double dividend. See also Blovenberg (1999), and Parry and Bento (2000).)

The most important of Pigovian taxes under discussion during the past decade or two is the **carbon tax**, which would generate levels of revenue similar or greater than that of the Corporate Income tax.

v. Appendix: Additional notes on normative tax theories

A. 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 Lindahl.

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.

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.

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.

Buchanan points out that most Western governments are very productive in the sense that a good deal of the wealth produced in a given nation state is affected by property rights, civil law, and public services--as well the taxes used to finance them. These alone have benefits that exceed most person's tax costs.

B. Other normative principles of taxation come are rooted in shared cultural norms--often dealing with **fairness** (or equity).

i. Some argue that fairness requires all persons to pay be treated the same way under a tax system.

This notion of fairness tends to imply an equal cost sharing rule or a flat tax. Examples include a proportional tax on income which can be considered a flat "work hour" tax, where differences in marginal productivity are accounted for, as developed in Buchanan and Congleton (1998, ch. 8).

ii. Others argue that taxation of persons should be based on their "ability to pay" or equal utility burdens from taxation.

This notion of fairness tends to imply progressive income taxes. 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 diminishing marginal utility implies that 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. (This assumes that the MU of money curves are more or less the same. If some persons are better able to increase their utility using dollars than others, then they would bear lower burdens under this logic.)

This notion of fairness often plays an important role in policy debates over taxation in the US.

"Progressivity" if often argued to be desirable, while "regressivity" is often argued to be undesirable--although these ideas are not universally accepted among normative tax theorists.

iii. Perhaps the most extreme of the rational choice-based fairness analyses is that of John Rawls (1971, *A Theory of Justice*), who argues that fiscal packages should be designed so that the welfare of the least well off person in society is maximized.

C. Some Useful definitions for characterizing and discussing tax schedules and also for discussion tax equity and/or the equity of fiscal systems from a utilitarian perspective:

i. 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.]

ii. 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: $T = tY$.)

iii. 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.

iv. [Instead of tax base, many analysts use income, which allows them to think in terms of "ability to pay" and apply utilitarian "fairness" norms to tax systems.]

D. A Few Useful Definitions and Relationships:

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

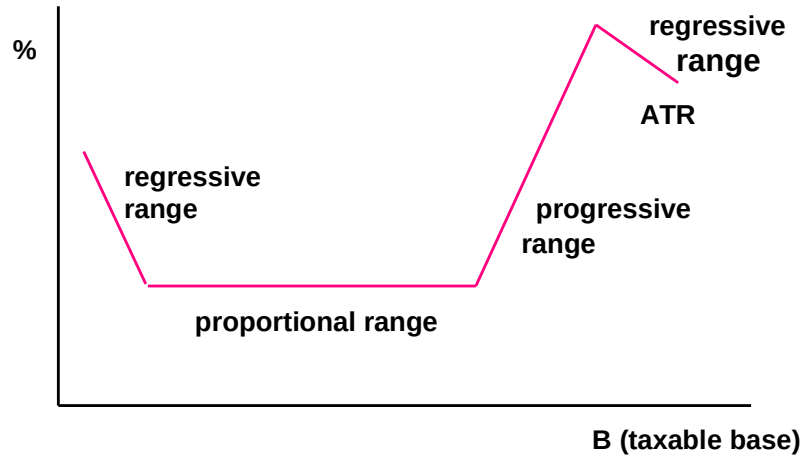
The **average tax rate** of a particular tax often varies with an individual's holding of the taxable base. If an individual pays tax Ti on a holding of Bi, his average tax rate is Ti/Bi. (If Ti = \$50 and Bi = 200, the average tax rate for this tax is 50/200 = 0.25 or 25%.)

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.)

In a **diagram of 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.

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 affects tax payer behavior**.

(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.)



vi. (Peckman's estimates of the effective average and marginal tax rates faced by typical American tax payers looks a bit like this odd tax schedule.)

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

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

E. The Importance of Marginal Tax Rates

The supply and demand diagrams of lecture 2 provide very useful ways to illustrate the burden of an excise tax, tariff, or other tax that can be represented in more or less "flat" per unit terms. However, they are less useful for examining the impact of more complex taxes such as a progressive income tax.

i. The taxes examined in the diagrams all had a constant tax rate, which implied that their average and marginal tax rates were essentially the same.

ii. In many cases, however, the marginal and average tax rates will differ, in which case it is the marginal tax rate rather than the average tax rate that is most important for predicting the impact of the tax on persons and markets.

iii. In such cases, one gains more insight into the effects of a tax by using indifference curve analysis or a bit of mathematics.

Consider the following decision setting in which Al can work to earn money for goods available only in markets or engage in leisure.

i. To simplify, assume that their H hours a day that can be worked and that Al is free to work as much or as little as he or she wants to.

ii. Also assume that work produces neither pleasure nor pain, but is s imply a means of obtaining the desired market basket of consumption goods, C.

iii. Leisure, L, is assumed to be a good subject to diminishing marginal returns as usual..

Hours worked are denoted W and the wage rate is w.

So, income is Y=wW.

The income tax schedule is T = t(wW) or T =t(w(H-L)) with $T_Y > 0$.

(Assume for convenience, that the entire burden of the tax is borne by Al.)

Given all this, we can write down the optimization problem that characterizes Al's labor-leisure choice:

$U = u(L, C)$

with $C = wW - T$ or $C = w(H-L) - t(w(H-L))$

Both leisure and consumption are ordinary goods subject to diminishing marginal utility and have positive or zero cross-partials.

$U_L > 0$, $U_C > 0$, $U_{LL} < 0$ and $U_{CC} < 0$ with $U_{CL} > 0$

To simplify the math a bit, note that one can substitute the budget constraint for C into the utility function.

This allows Al's utility can be written either entirely in terms of leisure (L)

or entirely in terms of hours worked W, if we also substitute for L = H - W.

In the latter case: U = u(H-W), wW - t(wW))

Differentiating with respect to W (the only control variable available to Al in this representation), we obtain the first order condition that characterizes Al's optimal work day:

W* satisfies: $U_L (-1) + U_C (w - T_Y w) = 0$

or $w(1- T_Y) U_C = U_L + w(1- T_Y)$

U_C is the marginal benefit of an hour worked (in utility terms) net of taxes, U_L is the marginal opportunity cost of working (also in utility terms). A utility maximizing person will work at the point where his marginal increase in income [$w(1- T_Y)$] times the marginal utility of income equals the marginal utility of leisure.

Note that it is the marginal tax rate, T_Y, rather than the average or total tax rate, that affects Al's decision.

(In cases in which Al bears less than the full burden of the tax, it will be his or her effective marginal tax rate that affects behavior.)