I. Debt finance

A. Most governments have funded themselves and their various expenditures with various combinations of debt and taxes, with taxes generally be larger than debt, except for during short periods of emergencies.

i. That borrowing is less important than taxes as a source of revenue is most likely a consequence of domestic and international bond markets.

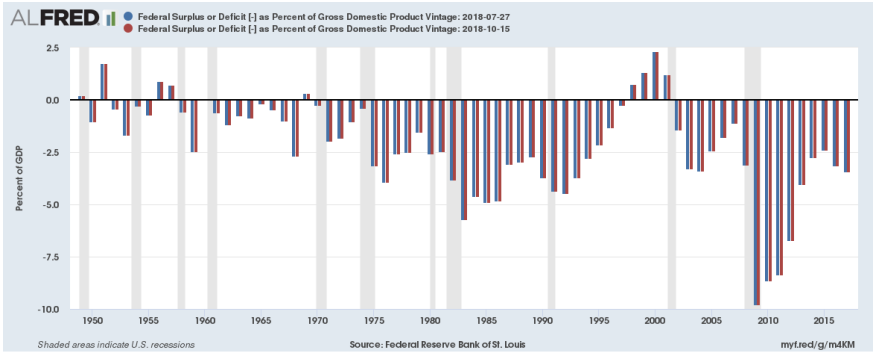
ii. These markets are sensitive to the risk(s) of default associated with various governments.

iii. If a government's tax revenue is not sufficient to pay for essential services and interest on the debt, bond purchasers will tend to shift from the bonds of such governments (selling them) and toward ones with more prudent fiscal policies (buying them).

iv. Bond buyers know that a government that lets its debt get too large relative to revenues is likely to default (stop paying interest and/or the face value of its bonds).

v. So debt is a common method of paying for services, but it is rarely the main way that such services are paid for.

B. In the United States, prior to about 1960, there was a general pattern of selling bonds (borrowing) to finance wars and paying off the debt after the war (emergency) was over. This ended in the 1960s in part because of Keynesian macroeconomic theory which made an economic case for running debts during recessions.



C. The graph below plots US deficits (down) and surpluses (up) since 1950. It is clear that deficits as a fraction of gnp have increased substantially after the 1960s and "exploded" after the financial crisis as Keynesian remedies were tried.

D. This lecture explores the microeconomics and politics of deficits and the accumulation of national debt.

II. 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 rough borrowing (usually war expenditures), rather than taxes--because borrowing is faster to implement.

ii. Keynesian macroeconomic theory recommends that temporary deficits be run during times of recessions.

C. Other deficits are "**structural**." This may be simply a standing method of finance. Tax revenues may be routinely a bit smaller than government expenditures.

i. Or, it may be that stable durable policies such as social security or Medicare have promised more in benefits than their supporting tax systems can deliver. Both programs ran surpluses and the past

but will run large deficits in the future unless funding for the programs (their ear marked taxes) is significantly increased.

ii. 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.

D. Both sorts of deficits increase the amount of debt that exists, and thus they increase the extent to which future tax revenues have to be used to pay future interest on that debt and/or to retire the amount owed.

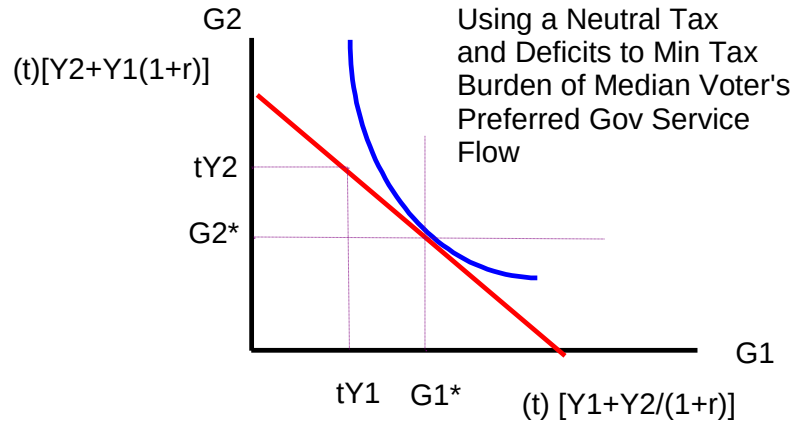
i. A bit of temporary debt is commonplace for most governments, although in some cases even temporary debts can get out of hand and produce bankruptcy for governments. (Examples include Iceland and Ireland during the financial crisis of 2008.)

ii. 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.

E. In the US, the fourth largest area of expenditure is interest on the national debt.

- The largest federal government expenditures are associated with National Defense, Social Security, Medicare and Medicaid, and interest on the National Debt.
- See the spreadsheet links from lecture 1 to see which is largest now and in the past.
- 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..

F. 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.



tY1-G1* = deficit t(Y2)-G2* = surplus

III. Deficits for Tax Smoothing

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.
- 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, as shown below.
- 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 discussed below.

B. The intertemporal budget constraint faced by the median voter reflects the tax system and his or her present and future income (in present value terms).

- It is not affected by the timing of the taxes as long as the present value of revenue collected is the same.

- This is the sense in which the Ricardian/Barro equivalence between taxes and debt holds. (See the appendix for more on their models.)

C. The diagram can also be used to think about temporary deficits from a Ramsay taxation perspective.

i. From this 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.

ii. In the diagram above, it is possible to use the same tax rate to finance the services in period 1 and 2 desired by the median voter.

iii. Note that without the use of debt, the tax rate would have had to be much higher in period 1 which would have increased the DWL of the tax system--even though they could have been lower in period 2.

- That a constant average tax has a lower DWL than the two taxes averaged is a property of squares.
- *(The optional math developed below shows why this tends to be true.)*

iv. DWL rises with the square of the marginal tax rate..

v. Suppose that the tax rate in period 1 under a strong balanced budget rule would be T1 in period 1 which is higher than the tax required in period 2, T2. (If this were not the case, no deficit in period 1 would be useful).

- Suppose that the average of these taxes would be sufficient to generate the same revenue, $t = (T_1+T_2)/2$
- To see that DWL is reduced by having a constant "average" tax rate, we need to show that $2([T_1+T_2]/2)^2 < (T_1^2+T_2^2)$.
- multiplying both sides by 4 yields
- $(T_1^2+ 2\ T_1T_2 + T_2^2) < 2\ \ (T_1^2+T_2^2)$
- subtracting yields: $2\ T_1T_2 < (T_1^2+T_2^2)$
- which can be written as $0 < \ \ (T_1^2- 2\ T_1T_2+T_2^2)$
- which can be factored and rewritten as $0 < (T_1 - T_2)^2$
- Since $T_1 > T_2$ the square of $(T_1 - T_2)$ is greater than zero. QED

vi. iv. The tax rate in the diagram, t, is approximately the average of the two rates.)

vii. Borrowing during emergencies, thus 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.

D. Temporary deficits are thus desirable under a Ramsay tax norm.

IV. Distributional Effects of Tax Finance

A. 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.

- Reducing current taxes will improve the welfare of some groups more than others in the short run.
- Raising them in the future--over what they would have had to be without the deficit--decreases the welfare of some taxpayers more than others.

ii. Note that some of these distributional effects are "intertemporal" and likely to be "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 die before taxes come due.
- However, keep in mind that the bonds sold to borrow the money associated with the deficit are owned by someone, and these are also left to future generations.
- Those who do not inherit bonds will face new higher tax burdens and those who inherent bonds will also do so, but have the means (the bonds) to pay for their higher taxes.
- The income of some groups rise, and others fall between the time that a bond is issued and sold, and the time that it is redeemed.

iii. Distributional effects are likely to affect the politics of debt finance.

- Some families benefit from debt issue, and some lose..
- The winners will vote in favor of debt finance and the losers against

(ignoring fiscal illusion).

- Whether a net fiscal transfer from the current generation to the next 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.)

iv. Not all taxpayers 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 taxpayers (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 relatively poor taxpayers (those who do not inherit bonds).
- Of course, the resources are not literally shifted from adults to children, rather the resources come from person who buy the government bonds.

v. 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.

B. Other controversies with respect to debt finance are centered on the extent to which such "buy now pay later" arrangements tend to reduce capital formation by shifting savings from capital formation to government bonds (which typically pay lower average returns but with much less risk).

i. In the simplest models, government borrowing bids up "risk free" interest rates which "crowds out" private lending to firms who would have invested in capital goods.

ii. The latter is one rationale for effects of national debt on capital formation and long run economic growth.

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?

v. See Buchanan and Wagner (1977) for a nice book length discussion of the political biases in favor of debt over tax finance.

V. Intergenerational Burden Shifting and the Median Voter

A. The Buchanan and Buchanan and Roback approaches drop the assumed homogeneity of taxpayer-voters.

i. Buchanan allows for individual diversity, not only in incomes and tastes, but also in future tax obligations.

ii. In the Buchanan model, Ricardian equivalence may hold for the average taxpayer but not for the entire distribution of taxpayers.

- Buchanan demonstrates that such individual differences tend to affect the level of current deficits and thereby the level public debt amassed through time.

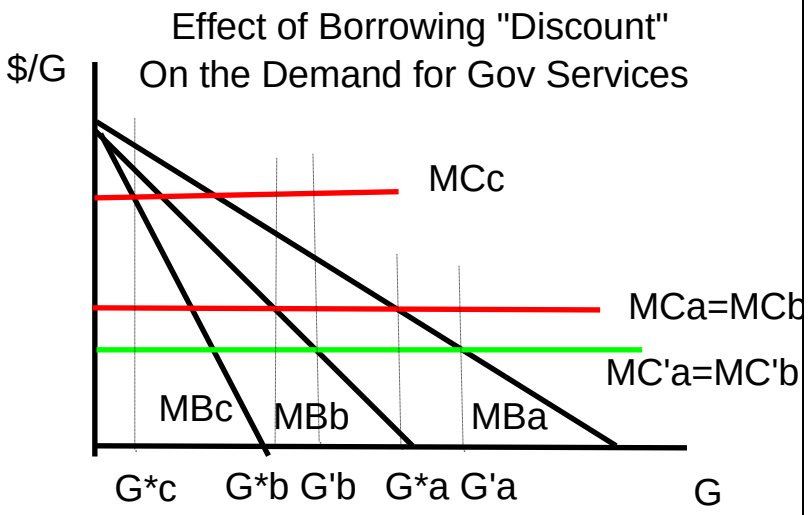
iii. Consider the following modified Barro model which is a variation of the Buchanan and Roback (1987) model.

- 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.
- 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 explicit intergenerational context for voter-taxpayers whose children have *relatively* poor prospects for future income or, indeed voters without children at all.

iv. 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.

- Note also that this "discount" on the cost of government services

tends to increase the demand for those services.



- v. The diagram above assumes that a and b are older than c and so they get a discount on their tax price (the green line is below the red line their MC' < MC)
  - This causes them to demand more, and since this group includes the median voter (here B), this determines both the output level (G'b) and the method of financing used.

VI. Debt biases introduced by fiscal illusion and Finite Planning Horizons

A. The same rational ignorance that can generates fiscal illusion can also increase incentives for debt finance beyond that implied in the full information models of debt formation.

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 such as the long-term effect of current borrowing on future taxes or financial problems (e.g. access to world bond markets) are below the costs of obtaining the information.

ii. The complexity of the issues--at least if one attempts to go beyond the common sense of household budgeting--tends to make the marginal cost of being informed relatively high.

- Consequently, fiscal ignorance about debt finance tends to exceed that of fiscal ignorance about current programs.
- 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 will still affect the timing of public service levels and thereby debt levels.

- Uncertainty by itself would tend to discourage debt finance by risk averse taxpayers.
- However, if future benefits of future government programs or future tax burdens are systematically underestimated, the result could be an increase in debt levels. (See the diagram in the previous subsection to see roughly what happens.)

iv. An expected decline in the benefits of future services makes current service relatively more attractive, while a decrease in the anticipated future tax burden tends to cause the median voter to shift tax burdens into the future.1

C. Voters or Government officials may also simply plan for the short term, because of information costs (or impossibilities) associated

1 Such an effect, as seen above in the Buchanan-Roback 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 (and 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.

with long run planning. As Keynes once wrote "In the long run we are all dead."

- 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."
- . 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.
- If this occurs before all debt is expected to be retired, long term borrowing becomes effectively a "costless" method of funding current government services.
- . Given debt neutrality (as discussed in the Barro section above), a planning horizon shorter than the anticipated debt repayment schedule clearly encourages debt finance since it lowers each taxpayer's cost for government services.

VII. The Limits of Debt Finance.

A. All the above assumes that the government doing the borrowing will pay interest on its bonds (on its debt) and that there is no risk that the bonds will not be fully paid off.

i. As the level of debt increases relative to a government tax revenues or potential tax revenues, the risk of default (that neither interest nor principal will be paid).

ii. As that occurs, potential bond buyers regard the bonds for sale (the loans to the government) to be riskier and demand a risk premium, which increases the interest rate on the debt, which makes debt finance more expensive for the borrowing government than it would have been had their overall debt been smaller relative to their tax revenues or potential tax revenues.

iii. At some point, the bonds become sufficiently risky that no one will purchase them because a default is widely believed to be likely in the near future.

B. At that point **the economic limit of debt finance has been reached**, and the government of interest may be said to be bankrupt—unable to borrow in the world's financial markets.

C. This is partly based on the size of a government tax base—which is to say on the size of "its" economy.

- It is for this reason that concerns are often raised about a nation's debt as a fraction of GNP.
- When that ratio becomes high, borrowing risk tend to increase, the interest rates tend to rise, and the probability of "bankruptcy" in the sense of not being able to borrow on the worlds finance markets. .

Appendices on Debt Finance Theories

A. The appendices 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.

- **For this class, only those covered in lecture are relevant.** The other material is included in the appendices for students with a strong interest in public economics and especially for students who might be heading to graduate school in economics.
- (Some years, there will be more time for covering the appendices than others, but they have rarely been covered at WVU.)

B. In a competitive democracy, political outcomes reflect the perspective of the median voter.

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.

- 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.
- The median voter model allows us to use "single decision-maker" models to characterize a variety of debt-taxation choices.

ii. The next few sections provide overviews of reasons why the median voter might prefer debt finance to tax finance (at the margin).

Appendix I: Ricardian-Barro 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 **Ricardian 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 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.

- Draw a two-period intertemporal choice setting, note private savings and debt on the diagram.
- 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.
- This tends to be true as long as the present value of the tax is the same.

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.

- 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.
- 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.

Appendix II: Interest Groups, Voter Ignorance, and Government Finance

A. In this appendix, 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.2

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.3

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.

- 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.

iii. Many other politically active groups also have an interest in the timing of taxation and government services.

- 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.
- Here, the environmental, and education lobbies come to mind.4

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.

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2 In cases where a combination of voting rules and party discipline gives particular parties control of government, rather than the median voter in Congress, 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.

3 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.

4 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 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 "greenhouse" gases will benefit future generations and reduce the long run cost of achieving a desirable distribution of global temperatures.

iv. Interest groups are assumed to sponsor messages which affect voter expectations rather than encourage representatives to sacrifice general constituent interests for personal profit.5

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.

- 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.
- 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 effects 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 persuadably of voters and/or their representatives.6

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 taxpayers are clearly not personally active current policy debates.

- Their interests are represented only to the extent that current taxpayers 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.
- 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.

5Under 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."

6 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).

Appendix III: 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 cannot 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.[7]

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.

- By maximizing tax receipts, the current median voter indirectly maximizes his control over expenditure levels.

iv. Whether strategic elements of government finance imply deficit finance is a matter of the specific geometry of the reaction (best reply) function of the anticipated alternative median voter in period 2.

- In general, there is no particular implication regarding debt levels.[8]
- Deficit finance arises if the desired expenditure level is above the revenue generated by the optimal rate in period 1. [9]

Appendix IV: 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 taxpayers (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.

- This transforms the Barro model to one resembling the Buchanan

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7 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.

8 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.

9 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.

model previously analyzed.

- Consequently, uncertain survival of the median voter and his progeny causes taxes to be proposed 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.

- Fiscal uncertainty can also affect the timing of public services as well as taxes in a manner which increases debt levels.
- 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.10

- 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.
- 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.

E. Debt is still neutral.

- 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.

Appendix V: 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 effect on his assessment of the likely consequences of the policies of interest.

- 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.
- 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.

- The median voter's uninformed prior is that each of these prices is equally likely, $P(1+k) = P(1) = P(1-k) = 0.333$.
- Consequently, the expected average cost of future services before any

10The mathematical equivalence occurs because of the assumed average (expected) price being equal to the original uncertainty value of 1. Here, $G2((1-k) + 1 + (1+k))/3 = G2$.

persuasive efforts are undertaken by the lobbying groups is 1.

- 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 tend to cause substitution away from future programs toward current programs.
- 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.
- 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.

iii. 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.

- 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.
- 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.
- (Superscripted "-", "o", and "+" are used to denote messages regarding the cost of future government services.)
- The probability of hearing a particular message is the probability that it would be heard under one of these three circumstances.
- Either it is true or false and one of the other cost levels obtains.
- . 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.

iv. The voter updates his priors after hearing the various messages using Bayes Law.11

a. The posterior probability assigned to 1+k is the following after a M^+ message is:

$$P(1+k|M^+) = [P(1+k)(P(M^+|1+k)]/P(M^+) \qquad (12)$$

or substituting:

$$P(1+k|M^+) = (.33)(.4)/(.33) = 0.4$$

- 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.

v. 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 expectations about the costs of future programs.

vi. 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	$.66(k)^2$	$.7(k)^2$	$.728(k)^2$	$.756(k)^2$	$.826(k)^2$

11Any 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.

vii. Note that each successive message has a small effect on both the expected cost of the government service and the variance of the estimate.

- Each successive message is somewhat persuasive, and consequently the expected cost moves in the direction of 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.
- 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.
- A series of "extreme" messages tends to increase the variance of the distribution of posteriors.

viii. A series of extreme messages. thus, may affect policies even if they do not expect expected (mean) costs.12

- The effect of such policy debates is the same as those associated with the move from a certain future cost environment to an uncertain future cost environment analyzed above.
- 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).
- The proponents of increased current government service levels do not have to win the public debate to at least partially achieve their policy goals.
- It is sufficient to increase the uncertainty of future alternatives.
-

VIII. Some Conclusions about Debt Finance

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.

- While such strategic interdependence between current and future decisions makers is doubtless important, their results can be reinterpreted in fiscal uncertainty and insurance terms.
- Uncertainty about future service levels can be reduced in their model by substituting debt financed current services for tax financed future services.
- 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.

- Risk averse political decision makers will prefer the relatively greater certain benefits of present programs to the increasingly unpredictable benefits of future programs.
- Similarly, voters prefer the uncertain taxes of future periods to certain ones in the present.
- 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.

12See 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.

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.

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