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A Rational Theory of the Size of Government

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In a general equilibrium model of a labor economy, the size of government, measured by the share of income redistributed, is determined by majority rule. Voters rationally anticipate the disincentive effects of taxation on the labor-leisure choices of their fellow citizens and take the effect into account when voting. The share of earned income redistributed depends on the voting rule and on the distribution of productivity in the economy. Under majority rule, the equilibrium tax share balances the budget and pays for the voters' choices. The principal reasons for increased size of government implied by the model are extensions of the franchise that change the position of the decisive voter in the income distribution and changes in relative productivity. An increase in mean income relative to the income of the decisive voter increases the size of government.

I. Introduction

The share of income allocated by government differs from country to country, but the share has increased in all countries of western Europe and North America during the past 25 years (Nutter 1978). In the United States, in Britain, and perhaps elsewhere, the rise in tax payments relative to income has persisted for more than a century (Peacock and Wiseman 1961; Meltzer and Richard 1978). There is, as

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yet, no generally accepted explanation of the increase and no single accepted measure of the size of government.

In this paper, the budget is balanced.[1] We use the share of income redistributed by government, in cash and in services, as our measure of the relative size of government and develop a theory in which the government's share is set by the rational choices of utility-maximizing individuals who are fully informed about the state of the economy and the consequences of taxation and income redistribution.[2]

The issues we address have a long intellectual history. Wicksell (1958) joined the theory of taxation to the theory of individual choice. His conclusion, that individual maximization requires government spending and taxes to be set by unanimous consent, reflects the absence of a mechanism for grouping individual choices to reach a collective decision. Following Downs (1957), economists turned their attention to the determination of an equilibrium choice of public goods, redistribution, and other outcomes under voting rules that do not require unanimity.

Several recent surveys of the voluminous literature on the size or growth of government are now available (see Brunner 1978; Peacock 1979; Aranson and Ordeshook 1980; and Larkey, Stolp, and Winer 1980).[3] Many of the hypotheses advanced in this literature emphasize the incentives for bureaucrats, politicians, and interest groups to increase their incomes and power by increasing spending and the control of resources or rely on specific institutional details of the budget, taxing, and legislative processes. Although such studies contribute to an understanding of the processes by which particular programs are chosen, they often neglect general equilibrium aspects. Of particular importance is the frequent failure to close many of the models by balancing the budget in real terms and considering the effect on voters of the taxes that pay for spending and redistribution (see, e.g., Olson 1965; Niskanen 1971; and Hayek 1979). A recent empirical study by Cameron (1978) suggests that decisions about the size of the budget are not the result of "fiscal illusion," so the neglect of budget balance cannot be dismissed readily.

We differ from much of the recent literature in three main ways.

[1] All variables are real. There is no inflation. Budget balance means that redistribution uses real resources. Public goods are neglected.

[2] Ideally the size of government would be measured by the net burden imposed (or removed) by government programs.

[3] Larkey et al. (1980) include a survey of previous surveys. Recent surveys by Mueller (1976) and Sahota (1978) summarize recent contributions by Downs (1957), Musgrave (1959), Olson (1965), Niskanen (1971), Buchanan and Tullock (1972), Riker and Ordeshook (1973), and others to such related topics as the determination of equilibrium collective decisions and the effects of government policies on the distribution of income.

First, voters do not suffer from "fiscal illusion" and are not myopic. They know that the government must extract resources to pay for redistribution. Second, we concentrate on the demand for redistribution and neglect any "public goods" provided by government (see also Peltzman 1979). Third, we return to the earlier tradition of de Tocqueville ([1835] 1965) who associated the size of government, measured by taxes and spending, with two factors: the spread of the franchise and the distribution of wealth (property).[4]

Our hypothesis implies that the size of government depends on the relation of mean income to the income of the decisive voter. With universal suffrage and majority rule, the median voter is the decisive voter as shown by Roberts (1977) in an extension of the well-known work of Hotelling (1929) and Downs (1957). Studies of the distribution of income show that the distribution is skewed to the right, so the mean income lies above the median income. Any voting rule that concentrates votes below the mean provides an incentive for redistribution of income financed by (net) taxes on incomes that are (relatively) high. Extensions of the franchise to include more voters below mean income increase votes for redistribution and, thus, increase this measure of the size of government.

The problem with this version of the de Tocqueville hypothesis is that it explains too much. Nothing limits the amount of redistribution or prevents the decisive voter from equalizing incomes or, at a minimum, eliminating any difference between his disposable income and the disposable income of those who earn higher incomes. Incentives have been ignored. Higher taxes and redistribution reduce the incentive to work and thereby lower earned income. Once we take account of incentives, there is a limit to the size of government. To bring together the effect of incentives, the desire for redistribution, and the absence of fiscal illusion or myopia, we develop a general equilibrium model.

Section II sets out a static model. Individuals who differ in productivity, and therefore in earned income, choose their preferred combination of consumption and leisure. Not all individuals work, but those who do pay a portion of their income in taxes. The choice between labor and leisure, and the amount of earned income and taxes, depend on the tax rate and on the size of transfer payments.

The tax rate and the amount of income redistributed depend on the voting rule and the distribution of income. Section III shows how income redistribution, taxes, and the size of the government budget

[4] We are indebted to Larkey et al. (1980) for pointing out the similarity between de Tocqueville and the conclusion we reached in an earlier version and in Meltzer and Richard (1978). De Tocqueville's distribution of property finds an echo in the concerns about "mob rule" by the writers of the Constitution.

change with the voting rule and the distribution of productivity. A conclusion summarizes the findings and main implications.

II. The Economic Environment

The economy we consider has relatively standard features. There are a large number of individuals. Each treats prices, wages, and tax rates as givens, determined in the markets for goods and labor and by the political process, respectively. Differences in the choice of labor, leisure, and consumption and differences in wages arise solely because of differences in endowments which reflect differences in productivity. In this section, we extend this standard model to capture the salient features of the process by which individuals choose to work or subsist on welfare payments and show the conditions under which these choices are uniquely determined by the tax rate.

The utility function is assumed to be a strictly concave function, $u(c, l)$, for consumption, c, and leisure, l. Consumption and leisure are normal goods, and the marginal utility of consumption or leisure is infinite when the level of consumption or leisure is zero, respectively. There is no capital and no uncertainty.

The individual's endowment consists of ability to produce, or productivity, and a unit of time that he allocates to labor, n, or leisure, $l = 1 - n$. Individual incomes reflect the differences in individual productivity and the use of a common, constant-returns-to-scale technology to produce consumption goods. An individual with productivity x earns pretax income, y:

$$y(x) = xn(x). \tag{1}$$

Income is measured in units of consumption.

Tax revenues finance lump-sum redistribution of r units of consumption per capita. Individual productivity cannot be observed directly, so taxes are levied against earned income. The tax rate, t, is a constant fraction of earned income but a declining fraction of disposable income. The fraction of income paid in taxes net of transfers, however, rises with income.[5] There is no saving; consumption equals

[5] Reliance on a linear tax follows a well-established tradition. Romer (1975) analyzed problems of unimodality using a linear tax and predetermined government spending. Roberts (1977), using a linear tax and a predetermined budget, showed that the median voter dominates the solution if incomes are ordered by productivity. Linear tax functions are used also when the social welfare function is used to determine the optimal tax (see Sheshinski 1972). The degree to which actual taxes differ from linear taxes has generated a large literature. Pechman and Okner (1974) find that the tax rate is approximately constant. King (1980) writes that most redistribution in the United States and the United Kingdom comes from the transfer system, not from the tax system. Browning and Johnson (1979) show that conclusions about proportionality of the tax rate depend heavily on assumptions used to allocate the burden of indirect business taxes.

disposable income as shown in (2):

$$c(x) = (1 - t)nx + r, \qquad c \geqslant 0. \tag{2}$$

If there are individuals without any ability to produce, $x = 0$, their consumption is $r \geqslant 0$.

Each individual is a price taker in the labor market, takes t and r as givens, and chooses n to maximize utility. The maximization problem is:

$$\max_{n \in [0,1]} u(c, l) = \max_{n \in [0,1]} u[r + nx(1 - t), 1 - n]. \tag{3}$$

The first-order condition,

$$0 = \frac{\partial u}{\partial n} = u_c[r + nx(1 - t), 1 - n]x(1 - t) - u_l[r + nx(1 - t), 1 - n], \tag{4}$$

determines the optimal labor choice, $n[r, x(1 - t)]$, for those who choose to work. The choice depends only on the size of the welfare payment, r, and the after-tax wage, $x(1 - t)$.[6]

Some people subsist on welfare payments. From (4) we know that the productivity level at which $n = 0$ is the optimal choice is

$$x_0 = \frac{u_l(r, 1)}{u_c(r, 1)(1 - t)}. \tag{5}$$

Individuals with productivity below x_0 subsist on welfare payments and choose not to work; $n = 0$ for $x \leqslant x_0$.

Increases in redistribution increase consumption. For those who subsist on welfare, $c = r$, so $\partial c/\partial r = 1$. Those who work must consider not only the direct effect on consumption but also the effect of redistribution on their labor-leisure choice. The assumption that consumption is a normal good means that $\partial c/\partial r > 0$. Differentiating (4) and using the second-order condition, $D < 0$, in footnote 6 restricts u_{cl}:

$$\frac{\partial c}{\partial r} = \frac{u_{cl}x(1 - t) - u_{ll}}{-D} > 0. \tag{6}$$

Consumption increases with r for both workers and nonworkers provided consumption is a normal good.

The positive response of c to r takes one step toward establishing conditions under which we find a unique value of r that determines

[6] By assumption, u is strictly concave, so the second-order condition is negative and (4) defines a maximum. The second-order condition is $\partial^2 u/\partial n^2 = D = u_{cc}x^2(1 - t)^2 - 2u_{cl}x(1 - t) + u_{ll} < 0$.

the amount of earned income and amount of redistribution for each tax rate. The next step is to show that normality of consumption is sufficient to establish that earned income (income before taxes) increases with productivity.

Pretax income is

$$y(r, t, x) = xn[r, x(1 - t)]. \tag{7}$$

People who do not work, $x \leqslant x_0$, have $y = 0$ and $\partial y/\partial x = 0$. For all others,

$$\frac{\partial y}{\partial x} = n + x \frac{\partial n}{\partial x}. \tag{8}$$

The first-order condition (eq. [4]) yields

$$\frac{\partial n}{\partial x} = \frac{u_c(1 - t) + u_{cc}nx(1 - t)^2 - u_{cl}n(1 - t)}{-D}. \tag{9}$$

The sign of $\partial n/\partial x$ is indeterminate; as productivity increases, the supply of labor can be backward bending. Pretax income, $y = nx$, does not decline, however, even if n falls. Substituting (9) into (8) and rearranging terms shows that the bracketed term in (10) is the numerator of $\partial c/\partial r$ in (6). Hence, $\partial y/\partial x$ is positive for all $x > x_0$ provided that consumption is a normal good:

$$\frac{\partial y}{\partial x} = \frac{u_c(1 - t)x + n[u_{cl}x(1 - t) - u_{ll}]}{-D} > 0. \tag{10}$$

The final step in establishing that there is a unique equilibrium solution for any tax rate uses our assumption that leisure is a normal good. The government budget is balanced and all government spending is for redistribution of income. If per capita income is $\bar{y}$, then

$$t\bar{y} = r. \tag{11}$$

Let $F(\cdot)$ denote the distribution function for individual productivity, so that $F(x)$ is the fraction of the population with productivity less than x. Per capita income is obtained by integrating:

$$\bar{y} = \int_{x_0}^{\infty} xn[r, (1 - t)x]dF(x). \tag{12}$$

Equation (12) shows that per capita income, and therefore total earned income, is determined once we know x_0, t, and r. From (5), we know that x_0 depends only on t and r, and from (11) we know that, for any tax rate, there is at least one value of r that balances the budget.[7]

[7] The left side of (11) is nonnegative and is a continuous function of r that is bounded by $t\bar{x}$, where $\bar{x}$ is the average of x.

If leisure is a normal good, the value of r that satisfies (11) for each t is unique.[8]

Once r or t is chosen, the other is determined. The individual's choices of consumption and the distribution of his time between labor and leisure are determined also. The choice of r or t uniquely determines each individual's welfare and sets the size of government.

III. The Size of Government

The political process determines the share of national income taxed and redistributed. The many ways to make this choice range from dictatorship to unanimous consent, and each produces a different outcome. We call each political process that determines the tax rate a voting rule.

In this section, we consider any voting rule that allows a decisive individual to choose the tax rate. Two examples are dictatorship and universal suffrage with majority rule. A dictator is concerned about the effect of his decisions on the population's decisions to work and consume, but he alone makes the decision about the tax rate. Under majority rule, the voter with median income is decisive as we show below. We then show that changes in the voting rules and changes in productivity change the tax rate and the size of government.

The decisive voter chooses the tax rate that maximizes his utility. In making his choice, he is aware that his choice affects everyone's decision to work and consume. Increases in the tax rate have two effects. Each dollar of earned income raises more revenue but earned income declines; everyone chooses more leisure, and more people choose to subsist on redistribution. "High" and "low" tax rates have opposite effects on the choice of labor or leisure and, therefore, on earned income.

Formally, the individual is constrained to find a tax rate that balances the government budget, equation (11), and maximizes utility subject to his own budget constraint, equation (3). The first-order condition for the decisive voter is solved to find his preferred tax rate:

$$\bar{y} + t\frac{d\bar{y}}{dt} - y_d = 0, \tag{13}$$

where y_d is the income of the decisive voter.

[8] The normality of leisure means that $\partial l/\partial r > 0$ and, therefore, $\partial n/\partial r = -\partial l/\partial r < 0$. Since

$$\frac{\partial \bar{y}}{\partial r} = \int_{x_0}^{\infty} x\frac{\partial n}{\partial r}\,dF(x) < 0,$$

the left side of (11) is a strictly decreasing, continuous function of r. The right side of (11) strictly increases with r. This implies that there is a unique value of r that satisfies (11).

Roberts (1977) showed that if the ordering of individual incomes is independent of the choice of r and t, individual choice of the tax rate is inversely ordered by income. This implies that with universal suffrage the voter with median income is decisive, and the higher one's income, the lower the preferred tax rate. By making the additional assumption that consumption is a normal good, we have shown that incomes are ordered by productivity for all r and t. Combining Roberts's lemma 1 (1977, p. 334) with our results, we can order the choice of tax rate by the productivity of the decisive voter.[9] The higher an individual's productivity, the lower is his preferred tax rate.

Figure 1 illustrates the proposition and shows the effect on the tax rate of changing the voting rule. The negatively sloped line is the relation between individual productivity, x, and the individual's preferred tax rate. This line need not be linear.

The maximum tax rate, $t_{\max}$, is chosen if the decisive voter does not work. An example is $x = x_{d1}$. In this case, $x \leqslant x_0$; the decisive voter consumes only r, so he chooses the tax rate ($t_{\max}$) that maximizes r. Any higher tax rate reduces aggregate earned income, tax collections, and the amount available for redistribution. From equation (5), we see that the maximum tax rate must be less than $t = 1$.

As productivity rises from x_0 to $\bar{x}$, the tax rate declines from $t_{\max}$ to 0. At $x_d = \bar{x}$, the decisive voter is endowed with average productivity and cannot gain from lump-sum redistribution, so he votes for no redistribution by choosing $t = 0$.[10] From equation (5) and $u_c(0, \cdot) = \infty$, we see that everyone works when $r = 0$. If the decisive voter's productivity exceeds $\bar{x}$, t and r remain at zero and aggregate earned income remains at society's maximum.

Changes in the voting rule that spread the franchise up or down the productivity distribution change the decisive voter and raise or lower the tax rate. Our hypothesis implies that changing the position of the decisive voter in the distribution of productivity changes the size of government provided $x_0 < x_d < \bar{x}$. Major changes in x_d have occurred in two ways. Wealth and income requirements for voting were reduced or eliminated, gradually broadening the franchise and lowering the income of the decisive voter. Social security retirement systems grew in most countries after the franchise was extended. By increas-

[9] The formal statement of the result is: Consider any two pairs (r_1, t_1) and (r_2, t_2). If $t_2 > t_1$, then for all x: x is indifferent between (r_1, t_1) and (r_2, t_2) implies that x' weakly prefers (r_2, t_2) to (r_1, t_1) for all $x' < x$ and x'' weakly prefers (r_1, t_1) to (r_2, t_2) for all $x'' > x$; x strictly prefers (r_1, t_1) to (r_2, t_2) implies that x'' strictly prefers (r_1, t_1) to (r_2, t_2) for all $x'' > x$; x strictly prefers (r_2, t_2) to (r_1, t_1) implies that x' strictly prefers (r_2, t_2) to (r_1, t_1) for all $x' < x$. Note that this result does not require unimodality of voter preferences for tax rates.

[10] We have omitted public goods. In an earlier version we showed that under carefully specified conditions, public goods can be included without changing the result for redistribution.

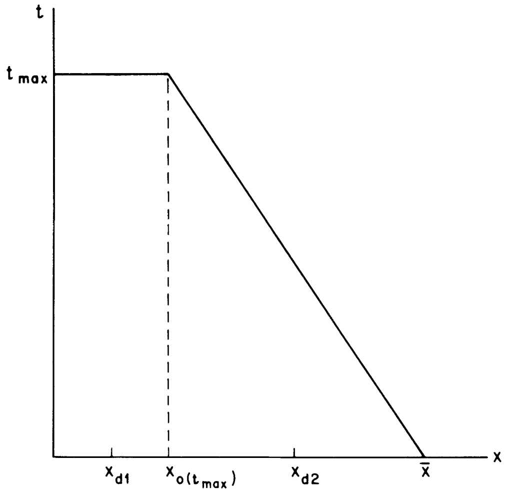

FIG. 1

ing the number of retired persons, social security systems increase the number of voters who favor increased redistribution financed by taxes on wages. Some of the retired who favor redistribution also favor low taxes on capital, property, and the income from capital.

The size of government changes also if there are changes in relative income, as shown by equation (13), or relative productivity. Conclusions about the precise effect of changes of this kind are difficult to draw. We cannot observe productivity directly and can only infer changes in the distribution of productivity, $F(\cdot)$, by observing changes in relative income. Recent literature makes clear that these effects are disputed (see Sahota 1978; King 1980; and others). Further, we cannot deduce the effect of changes in productivity on t directly from equation (13). The reason is that $\bar{y}$ depends on t, so finding the effect of changes in relative productivity requires the solution to a nonlinear equation in t. Instead, we rewrite (13) in a form which involves the (partial) elasticities of per capita income ($\bar{y}$) with respect to redistribution (r) and the wage rate ($x[1 - t]$).

Let $\tau = 1 - t$ be the fraction of earned income retained. From (12), $\bar{y}$ depends on r and τ only. The total derivative

$$\frac{d\bar{y}}{dt} = \frac{\bar{y}_r\bar{y} - \bar{y}_\tau}{1 - t\bar{y}_r}, \tag{14}$$

where $\bar{y}_r$ and $\bar{y}_\tau$ are the two partial derivatives. Substituting (14) into (13), we solve for t:

$$t = \frac{m - 1 + \eta(\bar{y}, r)}{m - 1 + \eta(\bar{y}, r) + m\eta(\bar{y}, \tau)}, \tag{15}$$

where m is the ratio of mean income to the income of the decisive voter, $\bar{y}/y_d$, and the η's are partial elasticities. Using the common economic assumption that the elasticities are constant, the tax rate rises as mean income rises relative to the income of the decisive voter, and taxes fall as m falls:

$$\frac{dt}{dm} = \frac{\eta(\bar{y}, \tau)[1 - \eta(\bar{y}, r)]}{[m - 1 + \eta(\bar{y}, r) + m\eta(\bar{y}, \tau)]^2} > 0. \tag{16}$$

Relaxing the assumption of constant elasticities weakens the conclusion, but we expect the sign of (16) to remain positive provided the change in the elasticities is small.

One of the oldest and most frequently tested explanations of the growth of government is known as Wagner's law. This law has been interpreted in two ways. The traditional interpretation is that government is a luxury good so that there is a positive relation between the relative size of government and the level of real income. Recently Alt (1980) has questioned this interpretation of Wagner's idea. Alt (1980, p. 4) notes that Wagner argued that there is "a proportion between public expenditure and national income which may not be permanently overstepped." This suggests an equilibrium relative size of government rather than an ever-growing government sector.

The traditional statement of Wagner's law—that government grows more rapidly than income—has been tested many times, but with mixed results. Peacock and Wiseman (1961), Cameron (1978), and Larkey et al. (1980) discuss these tests. Our hypothesis suggests that the results are ambiguous because Wagner's law is incomplete. The effect of absolute income on the size of government is conditional on relative income. Average or absolute income affects the elasticities in equation (15), and the relative income effect is given by m.

To make our hypothesis testable, we must identify the decisive voter. The applicable voting rule in the United States is universal franchise and majority rule. Under this rule, the voter with median income is decisive in single-issue elections, as we argued above. Hence the median voter is decisive in elections to choose the tax rate, so m is the ratio of mean to median income.[11]

[11] The many tests of the median-voter hypothesis using regression analyses are inconclusive. One reason is that many of the tests do not discriminate between the median and any other fractile of the income distribution (see Romer and Rosenthal 1979). Cooter and Helpman (1974) use income before and after taxes net of transfers to estimate the shape of the social welfare function implicit in U.S. data. They conclude that "the assumption that ability is distributed as wages per hour . . . —perhaps the best assumption on distribution of ability—vindicates the median voter rule."

IV. Conclusion

Government spending and taxes have grown relative to output in most countries with elected governments for the past 30 years or longer. Increased relative size of government appears to be independent of budget and tax systems, federal or national governments, the size of the bureaucracy, and other frequently mentioned institutional arrangements, although the relative rates of change in different countries may depend on these arrangements.

Our explanation of the size of government emphasizes voter demand for redistribution. Using a parsimonious, general equilibrium model in which the only government activities are redistribution and taxation, the real budget is balanced, and voters are fully informed, we show that the size of government is determined by the welfare-maximizing choice of a decisive individual. The decisive individual may be a dictator, absolute monarch, or marginal member of a junta.

With majority rule the voter with median income among the enfranchised citizens is decisive. Voters with income below the income of the decisive voter choose candidates who favor higher taxes and more redistribution; voters with income above the decisive voter desire lower taxes and less redistribution. The decisive voter chooses the tax share. When the mean income rises relative to the income of the decisive voter, taxes rise, and vice versa. The spread of the franchise in the nineteenth and twentieth centuries increased the number of voters with relatively low income. The position of the decisive voter shifted down the distribution of income, so tax rates rose. In recent years, the proportion of voters receiving social security has increased, raising the number of voters favoring taxes on wage and salary income to finance redistribution. A rational social security recipient with large property income supports taxes on labor income to finance redistribution but opposes taxes on income from property. In our analysis, there is neither capital nor taxes on property, so the increase in social security recipients has an effect similar to an extension of the franchise.

Our assumption that voters are fully informed about the size of government differs from much recent literature. There, taxpayers are portrayed as the prey sought by many predators who conspire to raise taxes relative to income by diffusing costs and concentrating benefits, or in other ways (Buchanan and Tullock 1962; Olson 1965; Niskanen 1971; Hayek 1979). We acknowledge that voters are ill informed about the costs of particular projects when, as is often the case, it is rational to avoid learning details. Knowledge of detail is not required to learn that the size of government has increased and that taxes have increased relative to output or income. Long ago it became rational for voters to anticipate this outcome of the political process.

Wagner's law, relating taxation to income, has generated a large literature and has been tested in various ways. Our analysis shows that Wagner's law should be amended to include the effect of relative income in addition to absolute income.

Kuznets (1955) observed that economic growth raises the incomes of skilled individuals relative to the incomes of the unskilled. In this way, economic growth can lead to rising inequality and, if our hypothesis is correct, to votes for redistribution. The rising relative size of government slows when the relative changes come to an end and reverses if the relative changes reverse in a mature stationary economy.

The distinctive feature of our analysis is not the voting rule but the relation between individual and collective choice. Each person chooses consumption and leisure by maximizing in the usual way. Anyone who works receives a wage equal to his marginal product. Taxes on labor income provide revenues for redistribution, however, so everyone benefits from decisions to work and incurs a cost when leisure increases.

The analysis explains why the size of government and the tax rate can remain constant yet be criticized by an overwhelming majority of citizens. The reason is that at the voting equilibrium nearly everyone prefers a different outcome. If unconstrained by the voting rule, everyone but the decisive voter would choose a different outcome. But only the decisive voter can assure a majority.

An extension of our argument may suggest why real government debt per capita, as measured in the budget, has increased more than 20-fold in this century. The decisive voter has as much incentive to tax the future rich as the current rich. An optimal distribution of the cost of redistribution would not tax only the current generation because, with economic growth, the future generation will be richer than the current generation. By shifting the burden of taxation toward the future, income is redistributed intertemporally.

To pursue these questions more fully and to analyze any effect of defense and public goods, it seems necessary to embed the analysis in a model with saving, capital accumulation, and public goods and to explore the effect of permitting relative shares to change as income changes. From an analysis of a growing economy, we can expect to develop a rational theory of the growth of government to complement our analysis of the government's size.

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