

Testing Theories of Real Government Size: U.S. Experience, 1959–89*

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I. Introduction

In a recent article, West [17] argued that the existence of so many strands of analysis attempting to explain the growth of government calls ultimately for one consolidated or generalized theory. Accordingly he produced a model that integrated four such theories, two on the cost side and two on the demand side. The purpose of the present paper is to derive empirical measures of all four theories, using U.S. data for the period 1959–1989. The presumption is that each one separately might contribute in its own way to a composite explanation of government growth, and that what is currently most needed is a set of jointly determined empirical estimates showing *relative* importance.

While all our measures of government size consolidate federal, state and local government expenditures, two other measurement issues should be emphasized since they distinguish our work from other contributions to this literature. The government component of our main dependent variable, the real size of government, is measured in two different ways: the first uses the National Accounts definition of government purchases which excludes transfer payments from the measure of size; whereas the second includes final purchases plus net government transfer payments.¹ Since we are interested in the effects of changes in the productivity of supplying government services, the first of these definitions is expected to be more relevant and is so used as the basis of our empirical work. However, since there is a sense in which changes in the productivity of government may affect the “output” of transfers, we also use the second definition to produce a more complete empirical exercise.

The other distinguishing feature of our analysis is that both definitions of government size are analyzed in *real* as distinct from the more usual *nominal* share of government in Gross Domestic Product (GDP). This distinction becomes immediately more striking when it is pointed out that, while most authors hitherto have attempted to explain the phenomenon of *positive* growth in the ratio of nominals over the past half century, the ratio of reals has actually *fallen* for most of our

*We would like to thank Keith Acheson, Dennis Mueller, Soo Bin Park, Larry Schembri, Stan Winer and a referee from this *Journal* for comments that have altered and improved the real size of this paper. None are responsible for any remaining errors. Finally we wish to acknowledge support from a G6 grant from Carleton University.

1. The first and second measures correspond, to the Citibase series GAGGE and GAGEX.

time period, when that real share is exclusive of transfer payments.² The distinction between the real and nominal share is illustrated in Figure 1.³ Note that the coming together of the two series reflects the rise in the relative price of government services that is characteristic of this time period.⁴

Section II of our paper briefly restates the theory in West [17] in a form amenable to testing. Section III sets out the empirical predictions and section IV outlines the data sources and variable names used in the tests. Section V then presents the three-stage least squares estimates of the demand and supply curves used to determine real government size and discusses their meaning. Section VI offers our main conclusions.

II. Theory

The equilibrium real share of output produced by government is modelled as the outcome of a competition among different factors to influence government size and is organized in terms of demand and supply analysis [17]. In addition to traditional variables influencing product demand, our integrated model focuses both on Wagner's [16] proposition that, at least in the early stages of growth, there is a "high" elasticity of demand for government services, and on public choice hypotheses in which special interest groups are hypothesized to influence real government size. The particular interest groups are drawn from the public choice literature, with particular emphasis on the "bureau voting power hypothesis" of Brennan and Buchanan [7]. On the supply side, we test the Baumol [2] and Beck [3] postulate that the relative cost of providing government services rises over time, as well as Kau and Rubin's hypothesis [10] that government tax collection costs fall as factors of production transfer to occupations with more visible rewards.

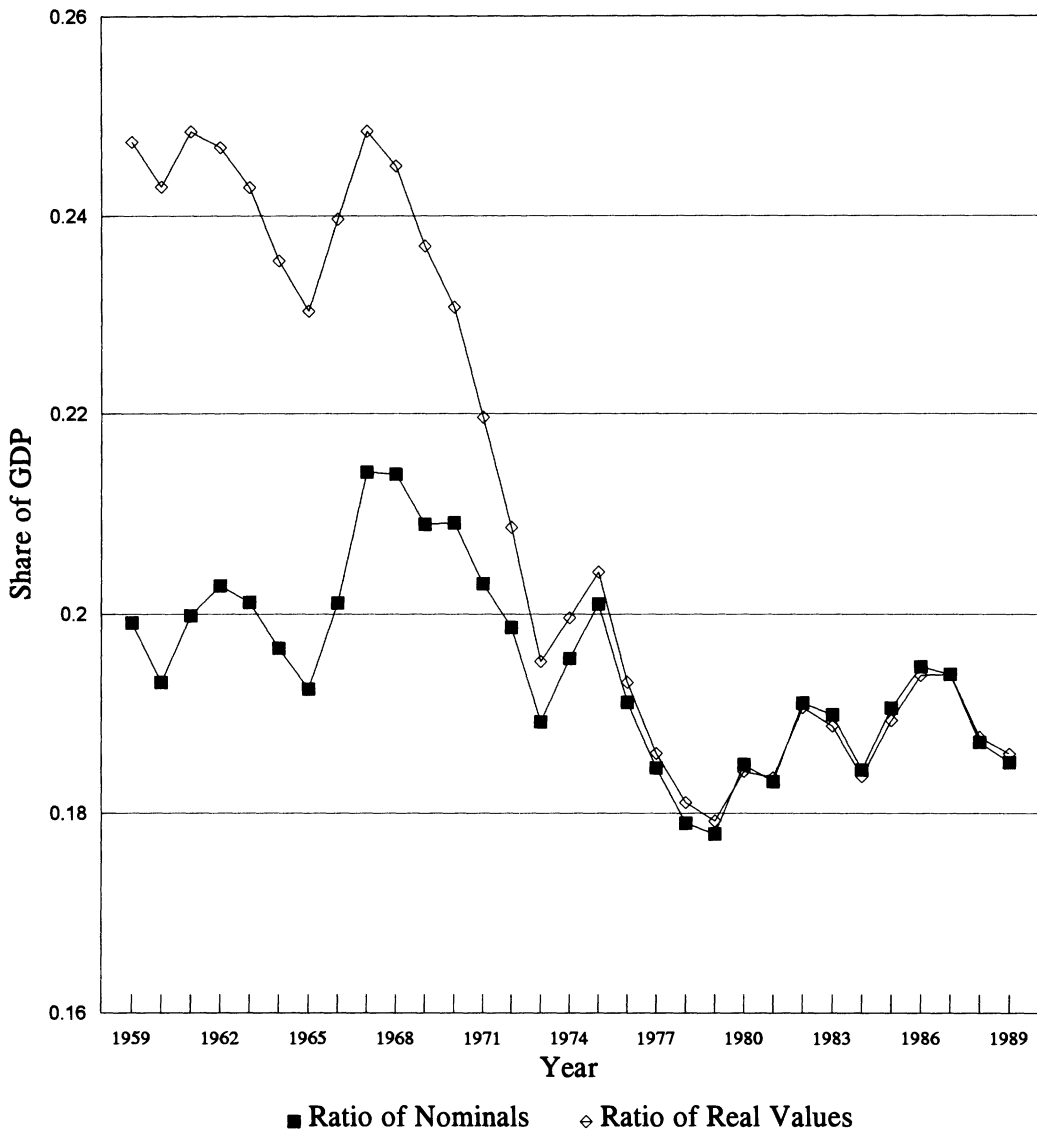
The equilibrium determining the real size of government is illustrated by the intersection of dashed full demand and supply curves in Figure 2. The full demand price, p^d , represents the marginal willingness of the community to pay for increases in the real share of government services (fully delivered), while the full supply price, p^s , represents the complete marginal cost of providing these services, i.e., the sum of the conventional costs of producing government services plus the deadweight costs of raising necessary funds through taxation. These deadweight costs, a function of the distortion produced by taxing real activities with "imperfect" taxes, are assumed to increase with the real size of government [15].

Because not all the costs of tax collection are observable, the full demand and supply curves in Figure 2 are purely conceptual. For empirical purposes, observable prices and quantities are

2. The transfer inclusive measure of real government services has stayed relatively constant at about thirty five percent of real GDP since the early fifties.

3. Berry and Lowery [5, 734–35] note that "any valid assessment of change in the size of the public sector must reflect a recognition of the differential rates of change in the prices of goods and services between the public and private sectors . . ." so that "when the numerator and denominator in the ratio of US governmental expenditure to total national output are adjusted with price deflators . . . the apparent rate of government growth in the post war era falls substantially."

4. While we highlight the choice over which quantity should be used to measure real government size, there also arises a choice over which price index to use to deflate the different nominal magnitudes. Because we focus on the benefits and costs of producing government "output," we deflate nominal government measures by the government services price index from the GDP accounts. However some authors argue that a more appropriate price index would be one that values government expenditure in terms of the private consumption foregone to finance these services. In this case, it would be argued, the CPI would be a more appropriate measure and that our measure of size would be biased against theories that relate directly to willingness to pay. While this does not appear empirically to be a substantive concern in our time period, its potential significance is discussed and assessed in relation to our empirical findings in section V below.



Sources: Citibase (see Appendix)
Government size -- net of transfers

Figure 1. Real versus Nominal Government Share of GDP

needed and to generate these we rearrange the factors affecting demand and supply to write the equilibrium condition in terms of net demand and supply. A net demand for real government services is constructed by subtracting the unobserved tax collection and deadweight costs of financing the government's share from the full willingness to pay. Net demand measures the community's willingness to pay after recognizing that additional deadweight costs will arise from funding these services through taxation. By including this cost in the demand side of the problem, the cost equation now includes only the production costs of government services. Because a measure of the direct cost of providing these services is observable (from the National Accounts), our

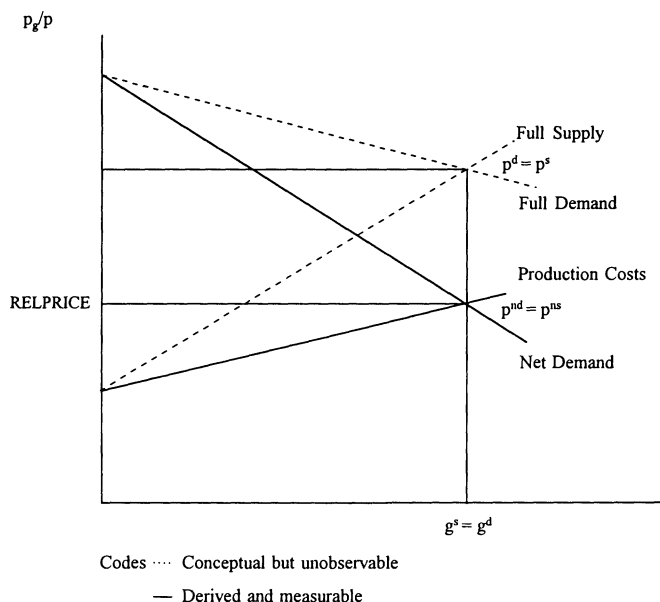


Figure 2. Demand and Supply of Government Goods and Services

equilibrium is now formulated in terms of the equality of measurable demand and supply prices. This is the intersection of the solid lines in Figure 2. In equilibrium, $p^{ns} = p^{nd}$, where p^{ns} is the marginal production cost of producing government services (*RELPRICE*) and is measured in our empirical work as the ratio of the government services deflator in GDP, p_g , to the aggregate GDP price deflator, p . The corresponding measure of quantity is the real share of the National Accounts measure of government, G , in GDP and is measured as $RSHARE \equiv (G/p_g)/(GDP/p)$.

III. The Basic Model

Beginning with the demand side, the net demand for government services can be written as

$$g^d(TDV, PCV, DCC) = g^d(p^{nd}, YPC, POVRATE, PCV, DCC), \tag{1}$$

where *TDV* represents a set of traditional demand side expenditure determinants, price (p), income per capita (*YPC*) and a measure of perceived need, the poverty rate (*POVRATE*); *PCV* represents a set of public choice or “Leviathan” variables; and *DCC* represents the factors influencing deadweight tax collection costs.

From the set of traditional variables that would affect the median voter, we begin with the first law of demand and predict a negative coefficient on net demand price (*RELPRICE*). Note that because the demand for government services is determined by the unobserved full price, p^d , (rather than the observed net price, p^{nd}), the measured quantity response to the observed price is expected to be smaller than for the (underlying) full price. This follows from the observation that because deadweight collection costs increase at an increasing rate, their subtraction from the full demand curve results in a net demand curve that is steeper in relation to price. Thus while

the regression coefficient on *RELPRICE* is predicted to be negative, it would not be surprising to find that that coefficient is small.⁵

Theory places no a priori restriction on the sign of the income effect. However, if Wagner's Law is interpreted as predicting an income elasticity on government services greater than one, then that prediction when applied to the *share* of government in output would correspond to a positive coefficient on per capita income, *YPC*. Unitary income elasticity implies constancy in the real share and hence a share coefficient of zero. In testing for the presence of Wagner's Law, Peltzman [13] has argued convincingly that the use of actual rather than permanent income will result in an income coefficient that is downward biased (because it includes transitory income) and hence biased against finding Wagner's Law. For this reason our analysis uses permanent, *PERMY*, rather than actual income.⁶

To reflect the demand by the median voter for redistribution, we use a direct measure of the size of the target group to which substantial portions of real government services (and additional government transfers) are directed. Our measure of the desire for redistribution is the prevalence of poverty or the poverty rate, *POVRATE*.⁷ An increase in *POVRATE* is then predicted to increase the demand for government services either because the community itself wishes greater government involvement in improving the lot of the poor or because the poor, or their representatives, are politically effective in obtaining increased transfers. The latter consideration raises public choice issues and perhaps the most important reason for including *POVRATE* in the regression. The presence of *POVRATE* controls for the potential spurious correlation that could arise because other (particularly public choice) variables are often correlated with both government size and poverty. This increases our confidence in the economic importance of those variables found to be statistically significant.

Consider next the proposition that the demand for government services is driven by the relative strength of special interest groups. Two groups that have often been the subject of much public choice speculation are: government employment (bureaucrats), *GOVEMP*; and farmers, *FARMPop*. The prediction is that as the share of these groups in the voting age population increases, the real share of government will also increase. Next, we expand the public choice variables to include two additional special interest groups that have received more recent critical attention: unions, *UNION*; and the fraction of the population over sixty five, *OLDPOP*. The *UNION* variable is of interest because of a conflict that has arisen between the more traditional public choice view that unions favor stronger and larger governments, and a more recent labor hypothesis that workers view government as a substitute for unions (so that declining union membership is associated with the absorption of union-like functions within government [12]). The latter argument gains plausibility from the observation that many of today's major social programs, such as unemployment insurance, social security, workers' compensation, and health and safety laws,

5. This expectation is suggested by earlier findings of price inelasticity in such studies as Perkins [14] and Gramlich [9].

6. Our measure of permanent income is the best fit of income per capita, *YPC*, regressed against past values of itself (where the best fit was for three lags). Experimentation with actual and permanent income confirmed Peltzman's conjecture.

7. The inclusion of the poverty series restricts our time period to the years after 1959. However, because the presence of *POVRATE* on the demand side serves to counter more objections than it raises (by decreasing the degrees of freedom), we present the results for the shorter period. For the results of our tests over the longer 1948 to 1989 time period (but excluding *POVRATE*), see Ferris and West, [8]. The results are basically unchanged and complement the ones presented in the text.

were originally of union origin. A more recent strengthening of this substitution can be seen in the “employment at will” doctrine, initiated by both the judiciary and some legislatures. Such changes establish implicit but binding contracts that require just cause before an employee can be discharged.

The second variable, *OLDPOP*, is of growing interest because the over sixty five year old age group is the fastest growing and most conservative segment of the population. Having the highest level of disposable income, the lowest rate of poverty, and owning one-third of all household assets and forty percent of all financial assets, senior citizens tend to have less than average demands for government expenditures and higher than average demands for lower taxes. In this sense, their growth would act as a brake on government expansion. Countering this, however, is the consideration that an older population may have a proportionally larger demand for the newer services and transfers that governments supply, e.g., Medicaid and social security. There then is no strong a priori case for believing that the coefficients on either of these two variables must have one specific sign.

The final set of demand side variables are a set of tax collection cost variables associated with the Kau and Rubin (K/R) hypothesis that governments grow when people transfer to jobs with more visible and therefore taxable earnings. K/R argue that growth in the proportion of the labor force that is self-employed, *SE*, leads to less visible earnings and therefore more tax avoidance. The consequence is higher real costs of financing government services. In our framework, an increase in *SE* reduces the demand for government services. Next urbanization (*URBAN*), is used by K/R as a measure of the larger set of opportunities available to closely located taxpayers to avoid formal markets (through such activities as barter). This, it is argued, will increase the cost to government of detecting economic activity and allow individuals some escape from taxation. For both these variables, the predicted sign of the regression coefficient is negative. A third K/R variable is the female participation rate (*FPART*). K/R argue that as women relocate from areas of employment that are hard to tax (i.e., the home) and into market employment where earnings have greater visibility, the real cost of collecting taxes by government will fall. To this consideration we add a variable measuring the production output ratio of business equipment to consumer goods, *BERATIO*. With this fourth variable we argue, in the spirit of K/R, that as the accounts of the economy become more mechanized, the cost of keeping track of taxpayers and realizing tax payments will be lower. For these reasons, positive coefficients are expected for both *FPART* and *BERATIO*. Finally, we add the ratio of foreign transactions to national income (*BPRATIO*) as a measure of the degree to which the domestic economy is interconnected with the rest of the world.⁸ The prediction is that market openness constrains real government size so that the coefficient on *BPRATIO* is predicted to be negative.

The estimating equation that comes from these demand side considerations is:

$$\begin{aligned} RSHARE^d = & \alpha_1 + \alpha_2 RELPRICE + \alpha_3 YPC + \alpha_4 GOVEMP + \alpha_5 FARMPOP \\ & + \alpha_6 UNION + \alpha_7 OLDPOP + \alpha_8 SE + \alpha_9 URBAN + \alpha_{10} FPART \\ & + \alpha_{11} BERATIO + \alpha_{12} BPRATIO + \epsilon_1. \end{aligned} \quad (2)$$

To recapitulate the predictions of the analysis: α_2 , α_8 , α_9 , and α_{12} are expected to be negative; the sign of α_3 is viewed as a test of Wagner’s Law; and α_4 , α_5 , α_{10} , and α_{11} are all predicted

8. Alternatively, *BPRATIO* may stand as a measure of the constraint on government size imposed by the growth of the internationalization on economic activity where the ability of any particular government to tax is lower.

to be positive. In addition, the negative coefficient on the observed price, α_2 , is expected to be small, while α_6 and α_7 have no expected sign.

It is now time to turn to the supply side. When Baumol's production cost theory is added to the more traditional supply side considerations, a supply relationship of the following sort results:

$$g^{ns} = S(p^{ns}, \text{Relative Factor Costs, Population, Relative Productivity Changes}). \quad (3)$$

Beginning with the traditional cost considerations, the supply price of government services, *RELPRICE*, is predicted to be positively associated with real government size, *RSHARE*, reflecting a movement upward along the supply curve. Similarly an increase in relative labor input costs should increase the relative cost of government services, shifting upwards the supply curve and decreasing quantity. This is measured as the ratio of income received by government workers relative to that received by workers in the private sector and denoted as *PAYRATIO*. Another variable is suggested by the Samuelsonian hypothesis that governments provide public goods. To the extent that government services are more public than those provided by the private sector, the relative cost of providing a fixed share of real government services should fall with an increase in population size. To test this prediction we included the two variables, population, *POP* and population squared, *POPSQ*. The public good hypothesis predicts that the coefficient on *POP* will be positive. The presence of *POPSQ* allows this relationship to be nonlinear.⁹

Finally, Baumol's cost disease hypothesis states that because government services are relatively labor intensive, the government sector should lag behind the rest of the economy in productivity growth. This implies that government services become increasingly costly over time, reducing the relative size of government. One measure of the disadvantage facing government is captured in *BERATIO*. As organizations become more business machine and computer intensive, labor intensive sectors should fall further behind. Manufacturing output per hour (*MPROD*) and time (*YEAR*) are two more direct measures of the relative rate of productivity change in manufacturing. Baumol's cost disease theory predicts that all three coefficients will be negative.

Summarizing, the estimating equation that comes from these considerations is:

$$\begin{aligned} RSHARE = & \beta_1 + \beta_2 RELPRICE + \beta_3 PAYRATIO + \beta_4 POP + \beta_5 POPSQ \\ & + \beta_6 MPROD + \beta_7 YEAR + \beta_8 BERATIO + \epsilon_2 \end{aligned} \quad (4)$$

where the predictions are that β_2 will be positive, and β_3 , β_6 , β_7 and β_8 all negative. The sign of β_4 indicates whether economies or diseconomies of scale exist in the relative provision of real government services and β_5 tests for nonlinearity in the relationship.

Because of the mutual dependence of price and quantity in equations (2) and (4), the demand and supply relationships should be estimated simultaneously using a technique such as three-stage least squares. To interpret the resulting coefficients as tests of the proposed hypotheses, however, the remaining right hand side variables must be strictly exogenous. On a priori grounds, however, it seems likely that while government employees may form an important special interest group demanding greater government services, more government services also require more employees, if only for purely technological reasons. There is then a two way relationship running between *GOVEMP* and *RSHARE*, and a model that does not separate out the aspects of

9. Borchering [6] places *POP* on the demand side as a tax share price effect, i.e., reduces individual tax shares as population increases.

their mutual interdependence may attribute the strength of a particular correlation to the wrong theoretical reason.¹⁰

This consideration suggests that a three rather than a two equation system should be estimated to determine the share of government employment (*GOVEMP*) along with *RSHARE* and *RELPRICE*. Moreover, the output basis for suspecting a positive bias in the demand side *GOVEMP* variable suggests that the additional equation should be the derived demand for employees, derived from the conditions for cost minimization. From cost minimization, then, the government's share of employment is determined when the relative value of the marginal product of labor within the government sector equals its relative wage cost. Similarly, a focus on input proportions suggests that the government sector should become more labor intensive with increases in the rental rate on capital. Finally, the use of a separate employment equation also allows us to test for *UNION* as a determinant of the government's employment share as distinct from its role in determining the government's share of real output. Union power may be focussed more effectively on the immediate and direct benefit of a larger employment share rather than on the indirect benefits derived from a larger government output share.

These considerations suggest that a third equation of the following form be added to the analysis:

$$\begin{aligned} GOVEMP = & \delta_1 + \delta_2 RELPRICE + \delta_3 RSHARE + \delta_4 RWAGEG + \delta_5 RWAGEPS \\ & + \delta_6 UNION + \delta_7 TBR + \epsilon_3, \end{aligned} \quad (5)$$

where *RWAGEG* represents real earnings by government employees, *RWAGEPS* represents real earnings within the private sector and *TBR* represents the treasury bill rate (3 month).

As predictions from the theory of derived factor demand, the coefficients on both *RELPRICE*, δ_2 , and *RSHARE*, δ_3 , should be positive. The desire to economize on relative labor costs means that the coefficient on own wages, δ_4 , is predicted to be negative and the coefficient on private sector wages, δ_5 , positive. The δ_7 coefficient on the treasury bill rate, *TBR*, is used to measure the degree to which capital and labor substitute within the government sector and this is predicted to be positive. Finally, δ_6 measures the effect of union strength on government employment which is expected to be positive.

IV. Data

With the exception of the variables *URBAN*, *UNION* and *POVRATE*, all the data in this study are taken from Citicorp Economic Database, *Citibase*, for 1992. The variable names were chosen to briefly describe the measure of the variable and to correspond to those used by Berry and Lowery [5]. A complete description of the data and the manipulations made to the raw data is available in the Appendix and a brief description of some of the more difficult variable names is attached to the table of results. The 1992 Citibase database includes both quarterly and annual data, running between 1947 and 1991. However, because the longest time series we could find for the poverty rate began only in 1959, our time series was restricted to the years following 1959.

10. A Hausman specification test on *GOVEMP* allows maintenance of the null hypothesis that *GOVEMP* is uncorrelated with the error term in the demand equation, although not with a great degree of confidence. The coefficient of 1.58 on the reduced form predicted value of *GOVEMP* is significantly different from zero at twenty per cent.

In addition, some of our variables were available only through 1989. The result is that our study is limited to the thirty one observations that arise between 1959 and 1989.¹¹

To assist in reading the following table of results, we collect together in a list the empirical counterparts of the theoretical variables described in section III. They are:

- RSHARE* = Real government services divided by real GDP. Columns (a) and (b) of Table I (below) use a National Accounts measure of real government size, while Column (c) uses a larger, transfer inclusive measure of size.
- RELPRICE* = Price deflator for government services in GDP divided by the GDP deflator.
- PERMY* = Per capita permanent income = permanent real GDP divided by population (total).
- GOVEMP* = Ratio of total government employment to population aged 20 and over.
- FARMPPOP* = Ratio of farm population to total population 20+.
- OLDPOP* = Ratio of population 65 or older to population 20+.
- UNION* = Ratio of total union membership to population 20+.
- SE* = Ratio of self-employed workers to population 20+.
- URBAN* = Ratio of urban passenger vehicle miles to total passenger vehicle miles.
- FPART* = Female participation rate.
- BERATIO* = Production output of business equipment relative to consumer goods.
- BPRATIO* = Ratio of balance of payments receipts from foreigners to national income.
- POP* = Population (in thousands); *POPSQ* = Population squared.
- RWAGEG* = Real earnings per government employee.
- RWAGEPS* = Real earnings per private sector employee.
- PAYRATIO* = Ratio of government to private sector earnings = *RWAGEG*/*RWAGEPS*.
- RWAGEM* = Real earnings per manufacturing employee.
- MPROD* = Manufacturing output per hour.
- TBR* = Three month treasury bill rate.

V. Results

The equation estimates are presented in Table I using the data names described above (and defined in the Appendix). The coefficient estimates of the three-stage least squares demand and supply system where government employment is treated as exogenous are presented first and labelled as the set of (a) column equations (appearing as columns 1 and 4 in Table I). For direct comparison with the results when the government's share of employment becomes endogenous, the three-stage least squares estimates of the three equation system (*RSHARE^D*, *RSHARE^S*, and *GOVEMP*) are labelled as (b)'s and are placed directly to the right of the (a) columns (as columns 2, 5, and 7). By locating any variable of interest and moving to the right along that row, the changes in the coefficient produced by accounting for the endogeneity of government employment can readily be identified. Finally, Table I also includes the three equation system estimation for the transfer inclusive measure of real government size (again when the government's share of employment is

11. Results for a longer time period (1948/1989, excluding the poverty rate) can be found in the working paper version of this paper [8]. The transfer inclusive measure of real government size is available only for the period between 1952 and 1989.

Table I. Three-Stage Least Squares Estimates of Real Government Size: 1959–1989

REAL SHARE DEMAND	1. (a)	2. (b)	3. (c)	REAL SHARE SUPPLY	4. (a)	5. (b)	6. (c)	GOVEMP (Endog)	7. (b)	8. (c)
1. Constant	-.363 (1.75)	-.494* (2.65)	-.138 (.525)	Constant	30.19* (2.76)	24.57* (2.47)	-25.35 (1.89)	Constant	-.150* (14.09)	-.165* (11.84)
2. RELPRICE	.022 (0.632)	.059 (1.68)	.122* (2.53)	RELPRICE	.641* (5.11)	.691* (6.00)	.511* (3.43)	RELPRICE	.158* (3.69)	.190* (3.32)
3. PERMY	.0035 (1.25)	-.0029 (1.12)	-.007 (1.97)	PAYRATIO	-.728* (4.80)	-.801* (5.74)	-.561* (3.12)	RSHARE	.183* (7.22)	.394* (12.94)
4. POVRATE	.771* (5.62)	.781* (6.02)	.836* (4.70)	POP	-.007* (2.45)	-.010* (3.60)	-.008* (2.07)	RWAGEG	-.008* (4.08)	-.012* (4.77)
5. GOVEMP	3.23* (6.98)	3.69* (6.17)	4.18* (5.21)	POPSQ	.0003* (6.54)	.0004* (7.28)	.0001 (1.70)	RWAGEPS	.010* (10.43)	.013* (11.86)
6. FARMPOP	.531* (4.60)	.739* (6.09)	.476* (3.25)	YEAR	-.022* (3.94)	-.012* (2.23)	-.014 (1.92)	UNION	.394* (16.40)	.394* (12.94)
7. UNION	-.454 (1.59)	-.490 (1.94)	-.765* (2.15)	MPROD	-.003* (4.38)	-.002* (4.08)	-.003* (4.72)	TBR	.0005* (3.15)	.0002 (.292)
8. OLDPOP	0.900 (.911)	1.47 (1.45)	-1.95 (1.43)	BERATIO	-.058* (2.49)	-.052* (2.47)	-.113* (3.90)			
9. SE	-.764 (1.03)	-1.13 (1.28)	-1.13 (1.01)							
10. URBAN	-.193 (1.37)	-.418* (2.32)	.118 (.578)							
11. FPART	.026 (.254)	.327* (2.55)	.387* (2.87)							
12. BERATIO	.034 (1.56)	.051* (2.36)	.007 (.266)							
13. BPRATIO	-.442* (6.37)	-.472* (6.17)	-.014 (.150)							
S.E.	.003	.0037	.0049		.007	.0069	.008		.0014	.0016
F-stat	160.3	120.1	10.2		59.3	56.0	3.26		118.2	192.4
D.W.	1.69	1.85	1.72		1.32	1.37	1.35		1.70	1.41

Column (a) Two equation estimate with GOVEMP exogenous

(b) Three equation estimate with GOVEMP endogenous

(c) Three equation estimate with transfer inclusive measure of government size

t-statistics in parentheses; * significantly different from zero at 5%; Variable names and definitions in Appendix

endogenous). The coefficients for these equations appear as the set of (c) columns (or columns 3, 6, and 8) in the same table.

We begin our discussion of the results by first reviewing the combined findings represented by the set of equations as a whole. At this the most comprehensive level, the combined set of public finance hypotheses used to predict the real share of government output in GDP perform well in all forms of the test, even when using the broader transfer inclusive measure of real government size (the set of equations appearing in (c)). For the size specification most appropriate to our analysis (i.e., the service output or net of transfer income measure of real government size in columns 2, 5, and 7), all three F-statistics allow rejection of the null hypothesis that the set of

variables in each equation has no explanatory power, while the Durbin-Watson statistics suggest that serial correlation is not a significant concern.¹² Similarly as a general statement about the individual hypotheses—that is, their conformity to the sign predictions of the analysis—almost all of the coefficients with specific sign predictions are found to have their expected sign and most of these are significantly different from zero. The exceptions are the demand price coefficients (in row 4, columns 1–3). This finding of general conformity to predicted values is repeated in all formulations of the model (although, as expected, the findings are less significant for transfer inclusive form of the model). Overall, then, the group of findings are consistent with all of the major hypothesis groupings and do not suggest the particular importance of one set of hypotheses relative to the others.

Demand Side Variables

To structure our discussion of the individual findings, we begin by discussing the hypotheses associated with the traditional choice variables (income and price) and then continue down the set of demand side variables in order of their appearance in the first column of Table I. Beginning then with permanent income (*PERMY*) and the hypothesis associated with Wagner's Law, support for Wagner's Law of an income elasticity of real government spending greater than one requires the regression coefficients in row 3 (columns 1–3) to be significantly positive. This is because a rise in the share of government in income is required for real government spending to have an elasticity greater than one. None of the coefficients of *PERMY* (row 3 columns 1–3), however, are found to be significantly different from zero when the traditional five per cent confidence interval is used. If the confidence interval is increased to seven per cent, however, the transfer inclusive measure of real government size is found to decrease with increases in permanent income (implying a less than in proportion increase in demand for increases in permanent income).

When we turn to look at the own-price coefficients (on *RELPRICE*) in row two of the table, we see that the findings are somewhat mixed. On the one hand, all three supply price coefficients

12. Although spurious correlation does not seem a significant concern, the system was also estimated in difference form. While some variables lose their significance in this form, the general pattern of result remains. We report the three equation (transfer excluded) estimates:

$$\begin{aligned} \Delta RSHARE^D &= -.038\Delta RELPRICE + .002\Delta PERMY + 3.42\Delta GOVEMP + .791\Delta FARMPOP \\ &\quad (.317) \quad (.560) \quad (2.59) \quad (1.99) \\ &\quad -.072\Delta UNION - 2.36\Delta OLDPOP - .084\Delta SE - .073\Delta URBAN - .235\Delta FPART \\ &\quad (.115) \quad (.978) \quad (.061) \quad (.240) \quad (.598) \\ &\quad -.367\Delta BPRATIO + .013\Delta BERATIO + .697\Delta POVRATE \quad D.W. = 1.86 \\ &\quad (1.67) \quad (.308) \quad (2.44) \\ \Delta RSHARE^S &= -.012 + .024\Delta RELPRICE - .097\Delta PAYRATIO - .005\Delta POP \\ &\quad (.400) (.055) \quad (.204) \quad (.333) \\ &\quad + .00001\Delta POPSQ - .002\Delta MPROD - .049\Delta BERATIO \quad D.W. = 1.20 \\ &\quad (.044) \quad (.851) \quad (.738) \\ \Delta GOVEMP &= .073\Delta RELPRICE + .232\Delta RSHARE - .003\Delta RWAGEG + .006\Delta RWAGEPS \\ &\quad (.752) \quad (2.39) \quad (.599) \quad (1.95) \\ &\quad + .255\Delta UNION + .0005\Delta TBR \quad D.W. = 1.69. \\ &\quad (1.88) \quad (1.59) \end{aligned}$$

(row 2, columns 4–6) conform to the prediction that price increases will result in movements up or along an upward sloping supply curve. Moreover, all of these positive coefficient estimates are significantly different from zero. Evaluated at their mean, the coefficients suggest that the supply curve for government services is highly elastic. In contrast, the estimates of the own-price effect on demand equations (row 2, columns 1–3) contradict the expected sign in all three cases, although only in the transfer inclusive measure of government size is the coefficient found to be significantly different from zero. The set of demand curve estimates in row 2 suggest essentially no responsiveness to price and imply that the net demand curve is virtually inelastic.¹³

The demand side variable used to meter the intensity of the public's wish to provide government services to the disadvantaged, *POVRATE* (in row 4 columns 1–3), does have a significant positive effect on the real size of government in all system specifications.¹⁴ The real scale of government activity increases with increases in the poverty rate. It is worth repeating, however, that in addition to having its own significance as a direct indicator of demand, an important reason for including *POVRATE* is to separate its influence on size from the effect on size produced by such public choice variables as *GOVEMP* and *OLDPOP*. The presence of *POVRATE* in the regression equation and the consistent finding that its coefficient is significantly positive increases our confidence that the regression coefficients on the other public choice variables will not simply reflect a spurious correlation with size through poverty. Over the whole of our time period, the effect of the change in the poverty rate has been to decrease government size. Beginning at twenty two per cent in 1959, the poverty rate fell at first dramatically and then more slowly through the early seventies where it bottomed (at 11.2%). Since then the poverty rate has risen marginally.

After controlling for the desire to use government to ameliorate poverty and/or effect redistribution, we turn to assess the significance of the set of public choice variables as determinants of size. Here there are two sets of variables. First for the two public choice variables for which there are specific sign predictions, the relative size of government employees (*GOVEMP*) and the size of the farm population (*FARMPOP*), the coefficient findings in rows 5 and 6 (columns 1–3) suggest that both have significant power in explaining variations in *RSHARE*. All six coefficients are significantly positive and hence conform to the hypothesis that increases in the relative strength of these special interest groups will increase government size. Because the coefficient values are not independent of the units chosen to measure size, the coefficients were converted into elasticities so that the relative size of different effects could be compared. Evaluated at the means, the coefficient estimates imply government employment share elasticities that are all significantly larger than one (the smallest in row 5 column 1 being 1.8), while the *FARMPOP* elasticities are found to be positive but smaller than one (at about .3 for the entry in row 6 column 3). It was the power of the government employee variable to "explain" government size that first led us to consider the possible endogeneity of employment. However, as can be seen by looking at the two coefficients when *GOVEMP* is endogenized (i.e., row 5, columns 2 and 3), the employment coefficients retain both their size and significance. Government employment then helps to explain changes in government's share of real output both in the sense that more employment is required

13. Previous studies suggest that the full demand for public goods is inelastic (see footnote 6). Hence given that our net demand curve requires the further subtraction of an increasing marginal cost curve, the slope of net demand should appear steeper and the estimated coefficient would be expected to be smaller.

14. As might be expected, the point estimate for the effect of *POVRATE* on the transfer inclusive measure of government size is found to be larger than the point estimate of the narrower measure. The difference, however, is not statistically significant.

to fulfil the functions of a larger government and also in the sense that a larger bureaucracy will itself increase political and group pressure for larger government.

The values of the coefficients on the second set of public choice variables (*OLDPOP* and *UNION*) help to resolve the quantitative strength of opposing factors seen to be at play within these groups. In the case of the fraction of the population that is sixty five or older, the coefficient findings for the narrower service definition of government size (in row 8, columns 1 and 2) suggest that increases in *OLDPOP* increase the real size of government. However, while both coefficients are positive, neither is significantly different from zero. For the transfer inclusive measure of real size, on the other hand, the coefficient is negative (row 8 column 3), but again insignificantly different from zero. Thus while our results hint at the conflicting incentives facing the older proportion of the population, the data cannot resolve this issue and are consistent only with the hypothesis that the “grey panthers” are not yet an effective lobby group. For *UNION*, however, the coefficient estimates are negative in all three forms of the test (row 7 columns 1–3) and become significantly negative as we move to the transfer inclusive measure in column 3.¹⁵ These results are more consistent with the hypothesis that government services have substituted for traditional union activities than they are with the hypothesis that the enhancement of union power will increase the provision of real government services.

The final set of demand side predictions (see rows 9–13, columns 1–3) involve the five hypotheses associated with the K/R collection cost hypothesis that changes in the structure of economic organization making it easier for governments to monitor economic activity will lower the cost of raising taxes and hence increase the real size of government. For the K/R variables, virtually all coefficients had their expected sign and, in the preferred specification (in column 2) where government spending excludes transfer payments, not only do all coefficients have their expected sign but only the SE coefficient (in row 9 column 2) is insignificantly different from zero. This suggests that increases in the rate of female participation in the work force, the increases in the mechanization of business activities and its accounts, and increases in the internationalization of market activity have all worked towards decreasing tax avoidance, while increases in urbanization and to some degree self-employment have tended to work in the opposite direction. What is also of interest is that as we broaden the measure of real size to include transfer activities (rows 9–13, column 3), all the K/R coefficients except that for the female participation rate lose their significance. Overall, the data is strongly supportive of the K/R hypothesis when the measure of size is centered on the provision of real services, but is only mildly supportive when transfers are added to the measure.

Supply Side Variables

On the supply side of the problem (i.e., the *RSHARES* equations in columns 4–6), the findings are broadly consistent with the hypotheses that changes in the real size of government will respond to traditional cost considerations (including input costs), scale variables (population size) as well as the set of Baumol/Beck variables indicating relative productivity change. As mentioned earlier, the positive price coefficients (in row 2) confirm the prediction that increases in quantities supplied can be achieved only at higher cost. In addition, the coefficients in row 3 columns 4–6 suggest that a rise in the real input cost of government employees, *PAYRATIO*, will reduce

15. If the confidence interval is expanded to ten per cent, *UNION* is significantly negative.

significantly the real size of government (all coefficients are significantly negative). The data, however, contradict the hypothesis of significant publicness in the provision of real government services. The *POP* coefficients in row 4, columns 4–6 indicate that population is inversely associated with real size, suggesting diseconomies rather than economies of scale in the provision of real services.¹⁶ Finally, the data provide broad support for Baumol’s “cost disease” hypothesis. For example, in rows 7 and 8 (columns 4–6) the coefficients on both *BERATIO* and *MPROD* are consistently and significantly negative as predicted. Thus to the extent that increases in the ratio of business machine production relative to consumer goods capture indirectly the degree to which labor intensive sectors such as government fall behind more innovative capital intensive sectors and manufacturing output per labor hour captures this directly, the findings for both *BERATIO* and *MPROD* are consistent with Baumol’s “cost disease” hypothesis. Similarly, because the relative productivity disadvantage held by government is predicted to be an increasing function of time, the significantly negative coefficients found for *YEAR* (in row 6 columns 4 and 5) are consistent with the predicted decline in the relative efficiency of providing government services over time.¹⁷

Government Employment Equation

As expected, the coefficients of the third equation (the *GOVEMP* equations in last two columns, 7 and 8, of the table) added to endogenize government employment and so account for the supply side interaction of employment and output conform closely to the predictions of cost minimization theory. All coefficients have their predicted signs and almost all are significantly different from zero at five per cent. The coefficients on both real government size (*RSHARE* in row 3, columns 7 and 8) and the relative price of government services (*RELPRICE* in row 2, columns 7 and 8) conform to the predictions that expansions in real government output will increase its relative use of labor (as a factor of production) and that an increase in the relative sector price will similarly attract labor and so increase government’s share of employment. Along the same lines, the positive coefficient found for the interest rate variable (*TBR* in row 7, columns 7 and 8) suggests a significant degree of substitutability between capital and labor within the production activities of the government sector (although this disappears, as might be expected, in the more transfer inclusive measure of real government size). Finally, the *UNION* coefficient (in row 6, columns 7 and 8) is consistently and significantly positive in its effect on *GOVEMP*. This suggests that although we found earlier that government growth may be substituted for union-like services on the demand side of the problem, union power has been more successful on the supply side in promoting employment.

Focusing specifically on the changes that arise once government employment is endogenized (in equation sets (b) and (c)), the most general comment is that the concern expressed earlier over the potential loss in significance of *GOVEMP* as a demand side variable (because of reverse causation from *RSHARE* to *GOVEMP*) is not realized.¹⁸ The coefficient on *GOVEMP* rises slightly despite finding a significant positive relation between *RSHARE* and *GOVEMP* in the employment equation. The relative employment size of government, then, remains a large and significantly

16. The point estimates of *POP* and *POPSQ* in the transfer excluded measure of government size suggest that the negative effect of *POP* on *RSHARE* will disappear at a population size of around 244 million. This would then reconcile our results with those usually found [6, 367].

17. The coefficient on *MPROD* for the transfer inclusive measure of real government size (row 6 column 6) would be significantly different from zero only if the significance interval were extended to seven per cent.

18. These results confirm the outcome of the Hausmann specification test of footnote 11.

positive determinant of *RSHARE* (i.e., the elasticities represented by the coefficients in row 5, columns 2 and 3 remain greater than one). The three equation system results then allow us to retain the public choice hypothesis linking the size of government employment with the real size of the government sector. In terms of the other hypotheses, the endogenization of *GOVEMP* appears to produce a cleaner separation of the demand and supply hypotheses, marginally improving the significance of most coefficients relative to their predicted value. This is most strongly the case for the K/R predictions (e.g., *URBAN*, *FPART*, and *BERATIO* all become significantly different from zero) in the product (transfer excluded) measure of real government size. The K/R variables, however, are also the variables that do most poorly when the more comprehensive, transfer inclusive measure of real size is used.

While much of the literature on the size of government is designed to explain the growth in the share of government through time, it is worth reiterating that the real share of government in GDP has declined. The real size of government peaked during the Korean War just before the beginning of our time period and declined continuously to reach twenty per cent by 1978. Over the period of the eighties, *RSHARE* remained roughly constant. While the size of government measured in real terms has fallen, the ratio of nominal has tended to remain constant at about twenty per cent.¹⁹ The difference between the two is the trend in the real cost of providing government services and the implied continuous rise in the relative cost of government services throughout this period was the focus of an influential 1984 article by Berry and Lowery [5] (hereafter BL).

In that work BL tested the comparative explanatory power of “Baumol/Beck’s cost disease” versus “Buchanan and Tullock’s bureau voting power” hypothesis as an explanation of the continuing rise in the cost of government services through 1970. In relative terms, their findings “clearly lend support to the Beck/Baumol interpretation” [5, 745]. In contrast, our results for a more recent time period suggest that both hypotheses are equally well supported by the data. It may be significant, however, that our testing procedure allows the two hypotheses to be separated across the estimation of separate demand and supply equations, one in the demand, the other in the supply equation, rather than having the two combined together in one reduced form.

In comparative terms, then, our findings do not reduce the explanatory power of the Buchanan/Tullock bureaucratic-voting hypothesis relative to the Baumol/Beck production cost hypothesis even after *GOVEMP* is endogenized. As such, our results contradict the general tenor of BL’s findings in this more general setting. In addition, we confirm the significance of the general set of hypotheses advanced by K/R [10]. On the other side of the market, our findings suggest that there remains a substantive role to be played by the conventional production cost variables (real wages and scale variables) along with the Baumol/Beck considerations in explaining the relative cost of supplying real government services. Finally, and as expected, the hypotheses as a group work less well at explaining the transfer inclusive measure of government size (in column (c))

19. The ratio of the nominal values could also be interpreted as a ratio of real outputs when both nominal expenditure categories are deflated by the CPI index. This interpretation of the appropriate real ratio would be preferred by theories focusing less on the quantity of real services provided by government and more on consumers’ willingness to pay and hence on the foregone value of the funds needed to finance government activity. If the ratio of nominals is used as the dependent variable in our test (with transfers excluded), the results do change slightly (these findings are available upon request). As a general statement, all coefficients signs are unchanged, however, on the demand side three of the K/R variables (*URBAN*, *FPART* and *BERATIO*) lose their significance. On the supply side equation, only *YEAR* lost significance. In relative terms, then, the definition of real output used in this analysis is somewhat more favorable to the K/R hypothesis than is the more traditional measure. On the other hand, the public choice and the Baumol/Beck hypotheses appear to perform equally well in either form of the test.

than they do the size measure that excludes transfer payments. The K/R variables receive least support in terms of the more comprehensive measure.

VI. Conclusion

Our purpose in this paper has been to present a simplified demand and supply system approach to explain the determination of the real share of government in GDP and suggest reasons and instances when the neglect of a more general setting may bias single equation results. The conclusion that arises from our empirics is that over the later postwar period the evidence is consistent with three of the four major theories used to explain government size, the exception being the theory associated with Wagner's Law of a propensity to spend greater than one. Depending on the particular set of regressions chosen one can find evidence that is more or less favorable to one's favorite approach. However, when viewed as a whole, there seems no strong reason for preferring any of the three to a more comprehensive approach that nests these theories within a traditional demand and supply setting. What may be more surprising is that even after accounting for the endogeneity of *GOVEMP*, the data remain consistent with a significant demand side role for *GOVEMP* in government's real size, whether measured as exclusive of transfers or not. Finally, while there is strong evidence for the presence and significance of "unobservable" tax collection costs in determining real government size when the service measure of size is used, the weakening of this effect when transfer payments are included (combined with a similar weakening of demand price effect) is consistent with some degree of fiscal illusion. In view of the significance of transfers as an ever increasing proportion of government spending, this becomes discouraging news for economists who wish politicians and voters to both recognize and internalize deadweight tax collection costs when making allocative political decisions. As such, our findings echo and support the recent call by Baumol [1] for greater informed communication to overcome the illusions held by the public of the real costs of providing government services.

Appendix

Variable Definitions and Sources from CITIBASE

RSHARE (Columns (a) and (b)) = $GGE/GDPQ$ (both converted from quarterly data);
RSHARE (Column (c)) = $GGEX/GDPQ$ (from quarterly data);
GDPDEF = $GDP/GDPQ$ (from quarterly data);
GOVDEF = $GGE/GGEQ$ (from quarterly data);
RELPRICE = $GOVDEF/GDPDEF$; *POP* = *PAN*;
POPSQ = $PAN \times PAN$; *YPC* = $GY/(PAN \times GDPDEF)$;
PERMY = $.261 + 1.22YPC(-1) - .524YPC(-2) + .304YPC(-3)$;
GOVEMP = $GATG/PAMF20$; *FARMPOP* = $GATAF1/PAMF20$;
OLDPOP = $PAN19/PAMF20$; *SE* = $LHNASE/LF$;
FPART = $LHFPI6$; *WAGEMAN* = $GAPM/GAFM$;
RWAGEM = $WAGEMAN/GDPDEF$; *GOVWAGE* = $GAPG/GAFG$;
RWAGE = $GOVWAGE/GDPDEF$; *WAGEPRIV* = $(GAP - GAPG)/(GAF - GAFG)$;
RWAGEPS = $WAGEPRIV/GDPDEF$; *PAYRATIO* = $GOVWAGE/WAGEPRIV$;
BERATIO = IFE/IPC ;
BPRATIO = $GEXF/GY$ (converted from quarterly data);
MPROD = $LOUTM$.

Variable Names and Definitions from Non-Citibase Sources

URBAN: 1947–1965—Urban streets to total travel;
 1966–1985—Urban interstate + other urban to total Urban and Rural;
 1986–1990—All Urban to Total Urban and Rural

Source: Office of Highway Information Management, U.S. Department of Transportation, Federal Highway Administration. Tables entitled Annual Vehicle-Miles of Travel and Related Data (by Highway Category and Vehicle Type) 1936–1985 and by year through 1990.

UNION: Total Membership of National and International Unions (exclusive of Canadian Membership)
 —1947–1978, U.S. Department of Labor, *Handbook of Labor Statistics*, 1975 (Table 164) and 1979 (Table 165).
 —1983–1990, U.S. Department of Labor, *Employment and Earnings*, January issues, 1985, 7, 9 and 1991.
 —1979–1982, interpolated.

POVRATE: Poverty Rate for Individuals in Selected Demographic Groups (Overall) Bureau of the Census, Technical Paper 56, Table 1; Current Population Reports series P-60.

References

1. Baumol, William J., "Health Care, Education and the Cost Disease: A Looming Crisis for Public Choice." *Public Choice*, September 1993, 17–28.
2. ———, "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis." *American Economic Review*, June 1967, 415–26.
3. Beck, Morris, "The Expanding Public Sector: Some Contrary Evidence." *National Tax Journal*, March 1976, 15–21.
4. ———, "Public Sector Growth: A Real Perspective." *Public Finance*, 34 (3) 1979, 313–56.
5. Berry, William D. and David Lowery, "The Growing Cost of Government: A Test of Two Explanations." *Social Science Quarterly*, 65 1984, 735–49.
6. Borchering, Thomas E., "The Causes of Government Expenditure Growth: A Survey of the U.S. Evidence." *Journal of Public Economics*, December 1985, 359–82.
7. Brennan, Geoffrey and James Buchanan. *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. Cambridge: Cambridge University Press, 1980.
8. Ferris, J. Stephen and Edwin G. West. "Changes in the Real Size of Government: US Experience 1947–1989." *Carleton University Working Papers*, 93-01, 1993.
9. Gramlich, Edward M. "Excessive Government Spending in the U.S.: Facts and Theories," in *Control of Local Government*, edited by E. M. Gramlich and B. C. Ysander. Stockholm: Almqvist and Wicksell, 1985.
10. Kau, James B. and Paul H. Rubin, "The Size of Government." *Public Choice*, 37 1981, 261–74.
11. Mueller, Dennis C. *Public Choice II*. Cambridge: Cambridge University Press, 1989.
12. Neumann, George R. and Ellen R. Rissman, "Where Have All the Union Members Gone?" *Journal of Labor Economics*, April 1984, 175–91.
13. Peltzman, Sam, "The Growth of Government." *Journal of Law and Economics*, October 1980, 209–88.
14. Perkins, George M., "The Demand for Local Public Goods: Elasticities of Demand for Own Price, Cross Price and Income." *National Tax Journal*, December 1977, 411–22.
15. Usher, Dan, "Tax Evasion and the Marginal Cost of Public Funds." *Economic Inquiry*, October 1986, 563–86.
16. Wagner, Adolf. *Gründlegung der Politischen Ökonomie*, 3rd ed. Leipzig: 1893.
17. West, Edwin G., "Secular Cost Changes and the Size of Government." *Journal of Public Economics*, August 1991, 363–81.