CHAPTER

4

DEMAND FOR STATE AND LOCAL GOODS AND SERVICES

Utility . . . maximization has already played a fundamental role in the development of such basic economic concepts as consumer demand functions. . . . It takes only a few extensions . . . to construct a theory of state and local behavior.

Edward M. Gramlich[1]

Headlines

State–Local Spending and Income, 1991

Top 10 Spending States			*Bottom 10 Spending States*		
State	*Per Capita Spending Rank*	*Per Capita Income Rank*	*State*	*Per Capita Spending Rank*	*Per Capita Income Rank*
AK	1	7	KY	41	40
NY	2	4	AL	42	42
WY	3	38	OK	43	41
HI	4	8	TX	44	32
CT	5	1	WV	45	49
MN	6	18	IN	46	33
MA	7	3	TN	47	35
NJ	8	2	MS	48	50
DE	9	9	MO	49	23
CA	10	10	AR	50	48

[1] "Alternative Federal Policies for Stimulating State and Local Expenditures: A Comparison of Their Effects," *National Tax Journal* 21 (June 1968) p. 119.

The demand for the goods and services provided by state–local governments is the relationship between the amount of those goods and services desired by consumers and the tax prices, incomes, and social characteristics of those consumers. The task in this chapter is to consider how prices, income, and various characteristics influence demand for state and local goods and services. After reviewing the basic relationship between consumer budgets and demand, the sources of data and statistical methods used by economists to measure demand are discussed. The results of those studies are then presented, showing, perhaps surprisingly, that the desired amount of state–local government goods generally *rises* with income.

Understanding and Measuring Demand

The standard measures of how price and income influence demand are the *price and income elasticities of demand*—that is, the percentage change in quantity demanded that results from a given percentage change in those variables. Demand reflects how consumers behave, and the elasticities are simply measurements of that behavior. Although most readers of this book undoubtedly have been introduced to the concept of demand elasticities previously, they are reviewed in the appendix to this chapter, which you should review now if you are not comfortable with these concepts.

To use demand in policy analysis, it is necessary to estimate the price and income elasticities of demand for the specific goods and services provided by state–local governments. Those computations can be made using statistical techniques if data on the amount of services consumed, prices, incomes, and other personal characteristics are available. Those data may come from census measurements of individual governments, such as the amount of government spending, personal income, population, and tax structure for each state; they may come from the observed voting behavior in individual precincts; or they may be collected by surveying individual consumers. Variations in the selected amount of government service in the data can be related to the variations in price and income, providing estimates of the elasticities.

Suppose, for instance, that the actual selected amounts of expenditures for different categories of services are available for a group of subnational governments (perhaps for all states, cities with a population of more than 100,000, or all school districts in a given state). But many different individuals or voters comprised each of those jurisdictions. Each individual's demand for government service is influenced by that individual's budget. The budget is:

$$Y_i = C_i + t_i(T)$$

where

Y_i = The income of person i
C_i = Private consumption spending by person i
t_i = The state or local tax share of person i
T = Total tax collected by person i's state or local government

The budget for the state or local government is:

$$E = T + G$$

where

E = Total spending by the state or local government
G = Lump-sum grants received by the government

Solving for the jurisdiction's taxes T and substituting into the individual's budget yields:

$$Y_i = C_i + t_i\,(E) - t_i(G).$$

The tax share for person i depends on the jurisdiction's tax structure. If the only tax is a property tax, then person i's tax share is:

$$t_i = \frac{V_i}{V}(1 - S)$$

where

V_i = Taxable property value of person i
V = Total taxable property value in the jurisdiction
S = The portion of person i's tax which is offset by tax deductions and credits

If that tax share is substituted into the equation for the individual's budget, the result is

$$Y_i - C_i - \frac{V_i}{V}(1 - S)E + \frac{V_i}{V}(1 - S)G = 0$$

Given income, property values, and tax credits and deductions, the individual desires to consume whatever quantities of C_i and E give the highest happiness or utility from those that can be afforded. The demand for government spending E by this person depends, therefore, on this person's income, tax price (which is determined by the person's property value with a property tax), credits or deductions that reduce this person's tax cost, and the intergovernmental grants to the government.

For each jurisdiction, which individual's tax price and income should be used to characterize that jurisdiction in estimating the price and income elasticities? The answer depends on how the expenditure choice was made in that community. Given the choice or voting system, the issue is which voter in each jurisdiction is decisive in the choice; that is, which voter best represents that jurisdiction.

Median-voter Models of Demand

It was shown in Chapter 3 that if the choice of the amount of government expenditure is made through majority voting, the selected amount will be the median (middle) of the desired amounts of all the voters. Moreover, the demand by any other voter is irrelevant because only the median position can generate majority support. It is as if the median voter's demand *is* the demand of the entire community. If the individual who desires that median expenditure can be identified, then that individual's characteristics—tax price, income, social characteristics—can be used to represent the community in estimating the elasticities of demand. So the issue is finding a way to identify the median, or decisive, voter, assuming that the conditions required by the median-voter model apply in that community.

Will the median voter have median income? One solution to this issue has been offered by two economists, Theodore Bergstrom and Robert Goodman, who show that under certain conditions the voter who has the median desired-expenditure amount in a community is the voter with median income. Because data for median income and other median social characteristics generally are available for individual subnational governments, this result allows easy computation of demand elasticities, assuming that those conditions exist.[2]

The intuition behind the Bergstrom–Goodman analysis can be demonstrated in Figures 4–1 and 4–2. Suppose, for example, that subnational goods are normal (demand rises with income, so the income elasticity is positive) and that tax prices also increase with income. This is different than traditional demand analysis in which different individuals face the same price. The price of a shirt at Your Favorite Store is usually the same for both low-income and high-income customers. But because the prices for government goods are determined by the taxes one pays and because taxes are not the same for individuals with different incomes, tax prices for subnational government goods and services also will vary by income.[3] Given that $Y_C > Y_B > Y_A$, demand rises as income rises in both cases in Figure 4–1, and tax prices rise with

---

[2]Bergstrom and Goodman (1973) show that the following conditions are sufficient to ensure that the median voter will be the individual with median income:

1. Individuals' (or family) tax prices, h, are constant elasticity functions of income ($h = wY^c$), where Y = income, w is a constant > 0, and c is the elasticity of tax price with respect to income, also assumed > 0.
2. All individuals (or families) have the same form of demand for public services, which depends only on that individual's tax price and income and which has constant price and income elasticities ($E = wY^a h^b$) where a is the income elasticity and b is the price elasticity.)
3. Given the elasticities a, b, and c, $(a + bc)$ must not equal zero.
4. All individuals vote in a majority vote based on their actual demand (no strategic voting).
5. The distribution of income for all population subgroups in any one community is proportional to the distribution of income for those subgroups in all other communities.

[3]This is true regardless of whether the jurisdiction uses an income tax. For instance, a tax on consumption or one on property value also is expected to vary with income because total consumption and the values of houses chosen by different consumers vary by income.

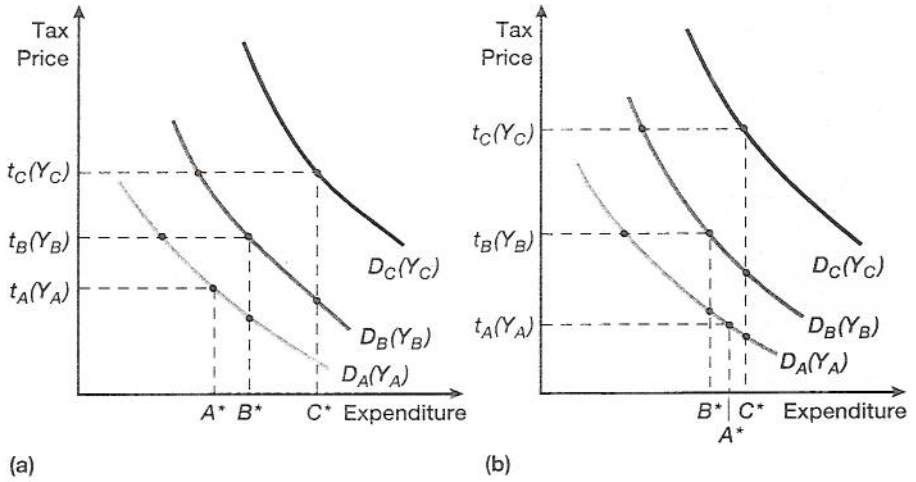


FIGURE 4–1
Desired government expenditure is determined by demand and tax prices

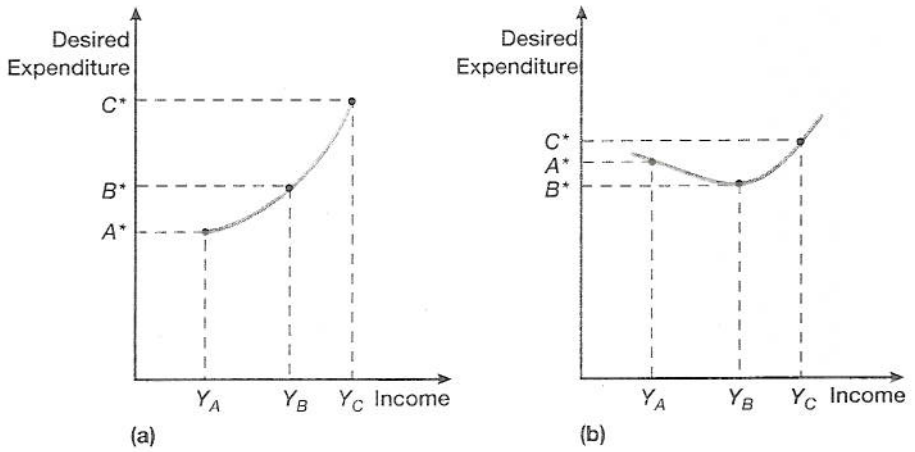


FIGURE 4–2
The relationship between desired expenditure and income

income, although differently, in both cases. Given the demand and tax price for each individual in each case, the desired expenditure amounts for each individual are labeled A^*, B^*, and C^*.

In Figure 4–1a, although prices increase with income, demand increases more, so that desired expenditures rise as income rises. The lowest-income individual wants the least amount of government expenditure, the middle-income individual wants the middle amount of expenditure, and the highest-income individual wants the most expenditure. This is exactly the possibility envisioned by Bergstrom and Goodman. With a majority vote among the three, B^* would win, and individual B has middle or median income. As shown in Figure 4–2a, desired expenditure rises as income rises.

But this outcome is not guaranteed, as shown by the situation in Figures 4–1b and 4–2b. In that case, the individual with the median desired expenditure is A, the lowest-income individual. In a majority vote among the three desired amounts of expenditure, A^* is selected, so that the median voter is the low-income individual. In this case, Bergstrom and Goodman's conditions are not satisfied. As shown in Figure 4–2b, desired public expenditure is a U-shaped function of income—the high- and low-income voters join together to select a higher level of expenditure than desired by the middle-income voter.

The Bergstrom–Goodman result depends, then, on the relationship between desired expenditure and income. If desired expenditure rises with income as depicted in Figure 4–2a or if desired expenditure falls continuously with income, the median desired expenditure is held by the median-income voter. If desired expenditure initially falls with income and then rises with income (the U-shaped relationship) or if desired expenditure initially rises with income and then falls (an inverted U-shaped relationship), the median voter may not be the individual with median income.[4]

Therefore, if one is willing to assume that desired expenditure is either a continually increasing *or* decreasing function of income—that is, if one believes the Bergstrom–Goodman conditions are satisfied for the jurisdictions being considered—then the demand elasticities for the jurisdictions can be found by estimating demand for the median-income individuals. This assumption and method has, in fact, been the most used method in recent years for estimating the price and income elasticities of demand for subnational government goods and services.

But is the method appropriate? Is the relationship between income and desired expenditure always a continuously increasing one? There is some evidence that the answer to both questions is no. Byron Brown and Daniel Saks (1983) examined the spending behavior of Michigan school districts for 1970–71, partly to test whether there was a continually increasing or U-shaped relationship between desired school spending and income. If the relationship is, in fact, U-shaped, then spending in a school district should depend on the variance, or *spread*, of the income distribution as well as on median income because it is the voters at each end of the income distribution who form a coalition to select spending. Brown and Saks reported that school spending in these districts did depend on the variance of the income distribution in each district and concluded that "the correctly specified . . . curve . . . is U-shaped with a minimum at a family income of about $8300" [in 1970 dollars]."[5]

[4]The result depends on the elasticities a, b, and c from footnote 6. Substituting the equation for tax price into that for demand gives $E = Ww^bY^{a+bc}$. If $(a + bc) > 0$, then E rises as income rises. If $(a + bc) < 0$, E falls with income.

[5]Brown and Saks (1983, 37). Similar results for other cases have been reported by Jorge Martinez-Vazquez (1981) and John Beck (1984).

Which view of the world is correct? At this point, no one can be completely sure; it remains an unresolved issue in state–local government finance. In fact, it may be possible for *both* views to be correct. For the U-shaped function in Figure 4–2b, desired expenditure decreases with income for incomes less than Y_B and increases with income for incomes above Y_B. Thus, in communities whose residents (mostly) have incomes either below or above Y_B, the relationship in that community is always rising or falling and the Bergstrom–Goodman conditions are satisfied. In communities where residents' incomes substantially fall across Y_B, the function is U-shaped. It also may be that the minimum occurs at a different income—that is, at a different Y_B—in different communities. Even in those cases, all is not lost because Brown and Saks and others have developed methods to estimate demand for government goods and services in those instances. The difference is that a single number cannot characterize the entire relationship between income and desired quantity in those cases; one must estimate how income and desired quantity are related at all income levels.

Demand and Voter Participation

Another potential difficulty in using voting models to analyze demand is that typically only a small fraction of eligible voters actually participates in state–local elections. This is particularly true of special fiscal elections or referenda such as those to select government spending or the property tax rate; voter turnout of only 10 to 20 percent is common in those cases. It is the characteristics of *voters* that determine local fiscal decisions, then, not the characteristics of the whole community. Moreover, the choice to vote is not random but influenced by the individual's stake in the outcome. Families with children in public schools, for instance, might be more likely to vote on the local school district budget than others, and they might also desire higher spending than other residents. Similarly, a larger percentage of higher- as compared to lower-income residents tends to vote in local elections; if desired spending increases with income, then the voter participation patterns leads to a higher level of government spending than desired by the entire community.

The importance of voter participation patterns for measuring demand was illustrated in Chapter 3 by Robert Inman's study of school-spending decisions in 58 Long Island districts. On average, about 20 percent of the voters in these districts participated in the school-budget election, and increased voter participation led to lower selected spending levels. Consistent with that result, Inman also reported that income apparently affects both the demand for service and the choice to vote. He concluded that "the poor, who are low demanders but nonvoters, appear to be underrepresented in the public choice process" (p. 56).

Alternative Models of Demand

Of course, not all estimates of the demand for state and local government services have been based on the majority-voting/median-voter theory. One alternative theory assumes that spending decisions are made not by voting but by a government official acting on behalf of residents of a jurisdiction. This so-called dominant party model is intended to represent a situation where there is no credible political threat to the existing officials or party. The decision-making official is assumed to care about the per capita (or average) taxes and expenditures in that community. In essence, studies of demand based on this theory statistically relate per capita spending on government services to per capita income of the residents, to some measure of per capita tax burden (as a measure of price), and to other average characteristics of the community. (The study by Gramlich and Galper reported on later in this chapter is an example of this type.)

Monopoly bureaucrat theories, previously discussed in Chapter 3, also are used as the foundation for studies of demand. In these theories, spending decisions are made by majority voting, but the bureaucrat controls the choices from which the voters may choose. As a result, some voter is decisive, but the selection will not be that voter's most preferred amount of spending. Instead, the selection will be that voter's preferred amount *among those offered* by the bureaucrat. Using this theory, per capita or median spending is related to per capita or median fiscal variables *plus* some political variables representing the limited choices voters face.

Evidence on Demand

Despite these alternative theories on which demand studies are based and very different data sources, two fundamental conclusions have emerged consistently: consumption of most state–local government services is relatively insensitive to price, and demand for state–local services generally rises with income (holding price constant). The typical ranges for estimated income and price elasticities for various categories of state–local government services are listed in Table 4–1. For comparison, the demand elasticities for selected privately provided goods and services also are listed.

Price Elasticity

When all services are aggregated, the price elasticity tends to fall in the range from $-.25$ to $-.50$, indicating very price inelastic demand. It further appears that among local government services, demand for education is relatively more price inelastic than demand for other traditional local government services. The demand for state–local services has similar price elasticities to that for such goods as coffee, tobacco, and (at least in the short run) electricity and alcohol.

These services traditionally provided by state and local governments are viewed by consumers therefore as basic commodities, similar in character to

TABLE 4–1 Representative Estimated Price and Income Elasticities

Good or Service	*Price Elasticity*	*Income Elasticity*
For Government Expenditures		
Total local	−.25 to −.50	.60 to .80
Education	−.15 to −.50	.40 to .65
Police and fire	−.20 to −.70	.50 to .70
Parks and recreation	−.20 to −.90	.90 to 1.30
Public works	−.40 to −.90	.40 to .80
For Selected Private Goods		
Coffee	−.25	0
Electricity (residential)	−.13 (− 1.9LR)[a]	.20
Tobacco	−.51	.64
Alcohol	−.92 (−3.6LR)[a]	1.54
Gambling (horse races)	−1.59	.86
Restaurant meals	−1.63	1.40
Automobiles	−1.35	2.46

[a]Long run

Sources: For government expenditures: Inman (1979, Table 9.1, pp. 286–88). For private goods: Kohler (1982, Tables 4.2–4.4, pp. 101–102); Suits (1979, Table II, p. 160).

basic foodstuffs and maintenance services. Public safety and quality education are, after all, two of the most sought-after characteristics of local communities. One should emphasize that it is the characteristics of these services that make demand price inelastic, not the fact that they tend to be provided by government. If these estimates are correct, demand for education would be very price inelastic even if education were entirely provided by private schools, just as the demand for coffee would still be price inelastic if suddenly all coffee sales were monopolized by governments.

The fact that demand for state–local government services tends to be price inelastic has many important policy implications. Because consumption is not very sensitive to price, attempts to alter the amount or type of government expenditure by reducing prices—with intergovernmental grants, for example—will be only moderately successful. And if the prices of state–local services rise, perhaps because of increases in the costs of providing them, consumers are not expected to reduce consumption much, requiring that increasing funds be allocated to those types of consumption. These implications are examined in Chapters 7 and 9.

Income Elasticity

State–local government services are normal goods. That is, increases in income (holding prices constant) tend to cause demand to increase, although for most of these services, demand is income inelastic—demand changes less than proportionally to the income change. Demand appears to be income elastic for parks and recreation services—that is, demand increases more than proportionally to an increase in income. That parks and recreation services are

superior goods seems reasonable, given the evidence that the demand for vacations and restaurant meals is also income elastic. These commodities are demanded in greater proportion by higher-income consumers.

Although the income elasticity of demand is a measure of the percentage change in government expenditure due to a percentage change in income, it is sometimes more useful to use elasticity to calculate the dollar change in expenditure due to a $1 change in income. Given the actual magnitude of expenditures and incomes, the range of elasticities reported in Table 4–1 are consistent with a $.01 to $.10 increase in state–local government expenditures for each $1 increase in consumers' incomes.[6]

As with price elasticity, these income elasticity estimates have important implications for the expected effects of intergovernmental grants on subnational government expenditures (see Chapter 9) and for the prospects of controlling the growth of the state–local government sector through the use of tax and expenditure limits (see Chapter 11).

Introduction to Statistical Analysis

In various sections of this book, the results of specific empirical studies of public finance issues are reported. Before reading those results, some discussion of the statistical concepts underlying these types of studies might be helpful in interpreting the results. Statistical analysis of data to clarify economic issues is called **econometrics.**

The first step in doing econometrics is to postulate some relationship between the variables of interest. This relationship is one based upon economic theory or some specific economic model. For instance, one might think of the demand for government services that arises from the median-voter model. Government spending is influenced by median income, the tax price for the median voter, production costs, and the median voter's tastes. A simple mathematical statement of the relationship might be

$$E = a + (b \cdot Y) + (c \cdot P) + (d \cdot N) + (e \cdot D) + u$$

where

E = Spending
Y = Income
P = Tax price
N = Population
D = Population density
u = Random error, representing other potential effects on spending not captured by the included variables.

Parameters a, b, c, d, and e are to be estimated and represent the effect of a change in each of the variables on government spending. For instance, if

[6]The income elasticity can be written as

$$E_D^Y = (\Delta E/\Delta Y)(Y/E)$$

where E = expenditure, Y = income, and Δ means *change in.* Given values for the elasticity, expenditure, and income, $\Delta E/\Delta Y$ can be computed.

TABLE 4–2 Spending and Income in the Southeastern States, 1991

State	*Per Capita Expenditure*	*Per Capita Income*
Alabama	$2941	$15,526
Arkansas	2440	14,636
Florida	3415	18,985
Georgia	3213	17,447
Kentucky	2949	15,626
Louisiana	3349	15,054
Mississippi	2691	13,318
North Carolina	3036	16,848
South Carolina	3138	15,391
Tennessee	2757	16,478
Virginia	3322	20,246
West Virginia	2862	14,315

$b = .10$, then spending increases by $.10 for each $1 increase in median income, assuming constant values for all the other variables.

Once data are available, various statistical techniques can be used to make these estimates. The most common technique used by economists is multiple regression analysis, which finds the set of estimates for all parameters that best characterizes the observed relationship among the variables.[7] While it is beyond the scope of this book to explain how or why multiple regression analysis works, the basic idea underlying regression analysis can be easily illustrated.

Economic theory suggests that there should be a relationship between the level of spending by a jurisdiction and the incomes of that jurisdiction's residents. Data showing per capita state–local expenditure and per capita income for the Southeastern states in 1991 are reported in Table 4–2. Based on economic analysis, one might expect the following relationship:

$$E = C + aY + u$$

where

E = Per capita expenditure
C = Constant
Y = Per capita income
a = Marginal effect of a $1 increase in Y on E
u = Error term

Using the data for E and Y, regression analysis can be used to derive estimates of the variables C and a. The data points are shown in panel a of Figure 4–3. The regression technique in this case determines what linear function (line) is

[7]For more information about econometrics, see Harry Kelejian and Wallace Oates (1981).

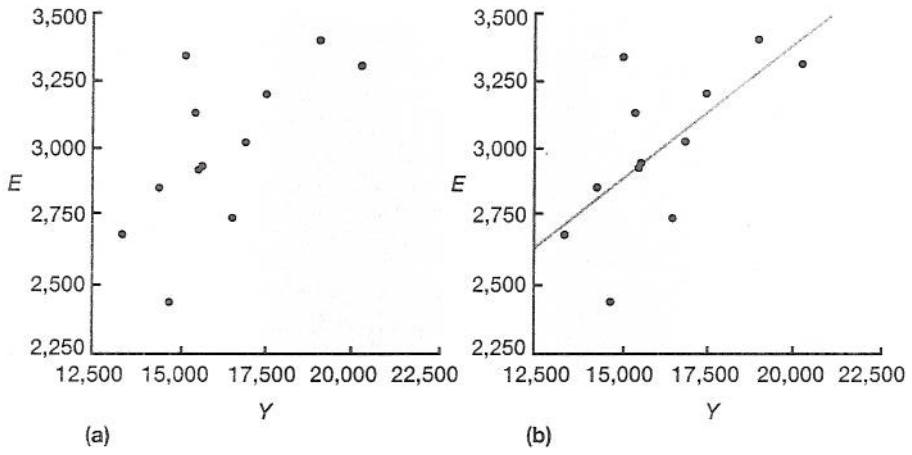


FIGURE 4–3
Estimated relationship between income (Y) and per capita state–local expenditure (E) among the southeastern states, 1991

most consistent with these data points by finding the line for which the sum of squared differences between the actual data points and those on the line is smallest. That is, the computer program calculates the difference between each data point and the point on a line, squares that difference, adds all those squared differences, and finds which line makes that sum smallest. As a result, the line selected has smallest average error between the estimated data points (those on the line) and the actual points.

It is important to emphasize that this technique provides estimates of the variables in the model but cannot determine those values exactly. In the equation of the model, the error term, u, represents the effects of other factors that influence the relationship between E and Y and that are not included in this analysis. Such other factors might include intergovernmental grants received by the state and localities, the state tax structure, and social characteristics of the residents. The technique also yields only estimates because the data usually represent only a sample of all the cases to be described by this model.

The results of the estimation for this example are shown in panel b of Figure 4–3 and below:

$$E = 1413.38 + .0988\text{Y}$$

The line described by this equation best fits the data and is shown in the Figure. Variable C is estimated by the Y-intercept of that line (1413.38) and variable a is estimated by the slope of that line (.0988). The economic interpretation of the result is that among the Southeastern states, each $1 change in state per capita income is associated with about a $.10 change (in the same direction) in state–local per capita spending. Because a is positive, state–local services are normal goods.

The fitted regression line in panel b of the figure shows clearly that the model does not fit each state's case equally well. Two states with spending of about $2,950, Alabama and Kentucky, are essentially exactly on the fitted line, and three others, Mississippi, West Virginia, and North Carolina, are extremely close. But the model predicts spending relatively poorly for Arkansas,

where actual spending is much lower than estimated, and Louisiana, which has actual spending well above that suggested by the model.

These regression results also can be used to predict or forecast values for data points that do not exist currently. For instance, the estimated regression line in panel b implies that a Southeastern state with per capita income of $16,000 is predicted to have per capita spending of $2,994 [1413.38 + .0988(16,000)]. Thus, the results can be used to extend the analysis to cases not in the sample or to future periods of time.

The basic idea of regression captured by this example can be extended in many ways. Multiple regression differs from this one-variable case in that the separate, but related influences of a number of variables are estimated simultaneously. The technique is still to find the relationship (or set of variables) that minimizes the sum of squared errors, but that relationship is not characterized by a single line. Each estimated variable shows the marginal effect of a change in that factor, holding all others constant. The underlying relationship need not be a linear one either. For instance, if one believes the correct model is

$$E = C + aY + bY^2 + u$$

then the variables a, b, and C can be estimated, and the fitted relationship is not a line, but a curve.

Every empirical or econometric study, then, has three main components. One is the relationship one expects between the variables based on economic, historical, or political analysis, what one calls the model. Second are the data to be used to estimate or test the model. And the third is the statistical techniques used to do the estimation. As there are many different statistical issues that can arise, different statistical techniques may be necessary depending on the nature of the data or model.

Two Classic Studies

Although it is intended that the general discussion in this chapter explain how economists go about measuring the demand for state–local government services, a better understanding may be obtained by examining exactly how specific analysts have proceeded. What follows is a review of two now classic studies of the expenditure behavior of state and local governments, one based on a majority-voting model of choice and the other on a theory of decision-making by government officials.

Bergstrom–Goodman Study. Theodore Bergstrom and Robert Goodman (1973) examined the expenditure behavior of 826 municipalities located in 10 states based on 1962 data for three different expenditure categories: total expenditures (excluding education and welfare because not all municipalities in the sample had responsibility for those functions), police expenditures, and parks and recreation expenditures. The analysis was based on the standard

TABLE 4–3 Bergstrom–Goodman Results
Determinants of Municipal Expenditures, 1962, All Observations Pooled[a]

	General Expenditures	*Police Expenditures*	*Parks and Recreation*
Income elasticity ε	0.64[b]	0.71[b]	1.32[b]
	0.07	*0.13*	*0.22*
Tax share elasticity δ	−0.23[b]	−0.25[b]	−0.19[b]
	0.03	*0.05*	*0.08*
Population elasticity α	0.84[b]	0.80[b]	1.17[b]
	0.03	*0.06*	*0.11*
Crowding parameter $\gamma = [\alpha/(1 + \delta)]$	1.09[c]	1.07	1.44[c]
Percent population change (1950–60)	−0.04[b]	−0.04[b]	−0.08[b]
	0.01	*0.01*	*0.02*
Employment residential ratio	0.12[b]	0.01	0.24[b]
	0.02	*0.04*	*0.06*
Percent owner occupied	−0.77[b]	−1.12[b]	−0.78
	0.13	*0.25*	*0.42*
Percent nonwhites	0.84[b]	0.90[b]	−0.20
	0.19	*0.36*	*0.60*
Density	−0.07[b]	0.01	−0.02
	0.02	*0.04*	*0.06*
Percent population 65+	1.75[b]	1.27	4.94[b]
	0.45	*0.85*	*1.43*
Percent living in same house (1955–60)	−0.65[b]	−0.77[b]	−1.99[b]
	0.17	*0.32*	*0.53*

[a]Values in italics are the standard errors of the coefficients.
[b]Indicates a coefficient that is significant at the 95 percent confidence level.
[c]Indicates a value of γ that is significantly different from 1 at the 95 percent level.
Source: Bergstrom and Goodman, 1973, Table 4, p. 290, reprinted with permission.

median-voter theory, so they assumed that selected expenditures were the desired expenditures of the median-income consumer in each municipality.

Accordingly, actual expenditures for each category in each municipality were related statistically to median income in that municipality, the share of property tax paid by the median voter, the population of the municipality, and a set of social characteristic variables designed to capture differences in costs (density, percentage of population change 1950–60, employment-resident ratio) or differences in demand not related to income (percentage of population 65 years and over, percentage of nonwhites, percentage of homes that are owner-occupied). Separate estimates were made for each state and with the full sample combined. Their results for that combined sample are reprinted in Table 4–3.

Consistent with other studies, Bergstrom and Goodman reported that price elasticities (with price measured by tax shares) are negative and inelastic. Consumption of these services in these cities in 1962 was not very sensitive to changes in the share of taxes paid by middle-income consumers. The income elasticities are all positive, with the demand for parks and recreation being income elastic ($E_D^Y = 1.32$) while the demand for all other services in aggregate is income inelastic ($E_D^Y = .64$). Moreover, by the usual statistical tests, they could conclude that these estimates were significantly different from zero.

Among the other taste/cost variables, population is positively related to expenditures, but the percentage change in population over the previous decade is negatively related, suggesting perhaps that expenditures respond to a growing population only gradually. A larger percentage of the population over the age of 65 seems related to higher expenditures, suggesting that older consumers demand more services than younger consumers with the same income and tax share. In contrast, a larger percentage of consumers who live in their own house seems related to lower expenditures, perhaps because owner-occupiers are more sensitive to property taxes than are renters.

Gramlich–Galper Study. Edward Gramlich and Harvey Galper (1973) actually undertook two analyses based on a budgetary model of behavior. A subnational government official had four objectives: to increase expenditures for current services, to increase private disposable incomes, to increase the stock of government capital, and to increase the amount of financial assets (or saving) held by the government. Obviously, all these objectives are competing, and the official is constrained in achieving them by the available resources, including the resources provided by intergovernmental grants.

Gramlich and Galper used this basic model to analyze both the aggregate annual expenditures for all state–local governments from 1954–72 and the expenditures of 10 large cities over the period 1962–70. In the case of the cities, expenditures for education, public safety, social services, urban support, and general government were separated. Gramlich and Galper's analysis differed from Bergstrom and Goodman's, then, both in theory and data. Gramlich and Galper did not have a voting model, but assumed that all decisions were made by some dictator, and used data over a time period (what is called a time-series) rather than comparing different jurisdictions at a definite time (what is called a cross-section).

Although the primary focus of Gramlich and Galper's results was on the effects of different types of intergovernmental grants (see Chapter 9), the analysis also provided measures of price and income elasticities. From the time-series analysis of total state–local expenditures, the price elasticity is −.04, and the income elasticity is 1.08. Here it appears that state–local expenditures *together* increase slightly more than proportionately with income—that state–local expenditures are superior. Of course, as previously noted, the state–local sector grew substantially during the period used for this study,

1954–72. Even so, this elasticity implies that state–local expenditures grow only by $.095 for each $1 increase in income. The results from the analysis of city expenditures are more similar to those of Bergstrom and Goodman. Here the price elasticities vary from −.71 to −.92, and the income elasticity is .86; demand is price and income inelastic.

Subsequent Research

During the past 25 years, there have been many such analyses of the expenditure behavior of state–local governments, a good number using the same theoretical approach as the two studies reviewed. But research involving both alternative theories and improved statistical methods gives the same fundamental results: the demand for state–local government services is, in most cases, price and income inelastic.

Application 4–1

Business Demand for Government Service

Although individuals ultimately benefit from and pay for state–local government services, the business sector often plays a role in the public-choice process about taxes and government spending. Taxes are a cost of doing business that may arise from the sale of a product (sales or excise tax) or from the use of a productive input such as labor (unemployment insurance tax) or capital (property taxes). On the other hand, many of the services provided by state–local government become inputs into the production of goods and services by private firms. For instance, businesses make use of highways and other transportation facilities, are protected from loss by government public-safety services, employ workers who have been educated or trained in public schools and colleges, and use public sanitation and utility services. To the extent that these services or facilities are provided by government, private firms do not have to provide them separately; in that way, government services reduce private business costs.

Voting models really do not characterize how business influences these fiscal decisions. Individuals vote in elections, not businesses. But businesses try to influence the outcomes of specific elections as well as the decisions of elected representatives by influencing public opinion and lobbying public officials. As with individuals, businesses are expected to work to achieve fiscal-policy objectives that are in their self-interest.

But the self-interest of business concerning state–local government fiscal policy is not always clear because businesses benefit from services and pay taxes. Certainly, businesses can be expected to and often do argue for lower business taxes, but businesses can also be concerned about the level and quality of government services. *The Wall Street Journal* (1987b) reported about a survey of the factors chief executives said are "absolutely essential" in considering new office locations. The factor cited most often was "good public schools" (by 23 percent of the CEOs), followed by "a low crime rate," and "an efficient highway system" (both by 20 percent). "Reasonable state and local taxes" was also mentioned (by 17 percent).

(Application 4–1 continued)

The common perception that business groups always oppose taxes may be wrong, therefore. Interest in good state and local services can lead business groups to support higher taxes sometimes. One such case occurred in Colorado. David Shribman (1986) reported that 20 local chambers of commerce in Colorado had launched a campaign to *raise* state taxes to maintain and improve public facilities and services. Shribman quoted the chambers' position as the following: "Without additional revenues, Colorado will be left little choice but to woefully underfund areas such as higher education, elementary and secondary education, our state highways, water resources and vital capital construction and maintenance projects." The chambers took this position because an increase in the number of state residents had reduced the quality of services and because these services were seen as important for attracting and retaining businesses.

Indeed, Colorado did increase state taxes in 1986 and 1987. The gasoline tax, diesel fuel tax, cigarette tax, and corporate income tax were all increased in 1986, and personal income tax indexing also was suspended, effectively increasing personal income taxes in the future. In 1987, Colorado changed its personal income tax and retained a portion of the increase in revenue resulting from the federal income tax changes (see Chapter 16). In this case, business was an explicit and successful demander of more or better quality government service.

Summary

The price elasticity of demand is a measure of the responsiveness of consumption to changes in price.

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity}}{\text{Percentage change in price}}$$

If the absolute value of the price elasticity is greater than 1.0, demand is said to be price elastic, and consumption is very responsive to changes in price. If the price elasticity is less than 1.0, demand is said to be price inelastic, and consumption is not very responsive to changes in price.

The income elasticity of demand is a measure of the responsiveness of consumption to changes in income.

$$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity}}{\text{Percentage change in income}}$$

If the income elasticity of demand is negative, then quantity demanded falls as income increases, and the good is said to be inferior. If the income elasticity is positive but less than 1.0, reflecting a smaller percentage increase in consumption than income, demand is said to be income inelastic. If the income elasticity is greater than 1.0, then quantity rises by a larger percentage than

Disc

income rises. In that case, the commodity is said to be superior and demand is income elastic.

Despite the alternative theories on which demand studies are based and very different data sources, two fundamental conclusions have emerged consistently: Consumption of most state–local government services is relatively insensitive to price, and demand for state–local services generally rises with income (holding price constant). When all services are aggregated, the price elasticity tends to fall in the range from −.25 to −.50, indicating very price inelastic demand.

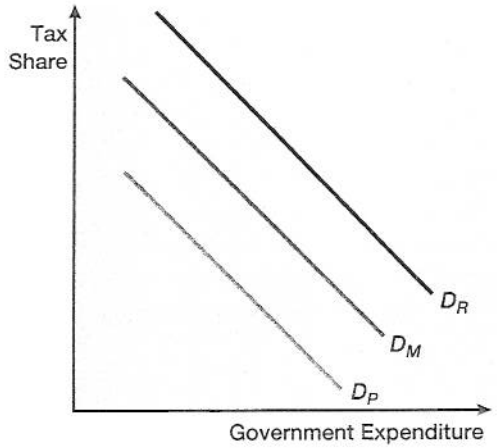
Most state–local government services are normal goods. Increases in income (holding prices constant) tend to cause demand to increase, although for most services demand changes less than proportionally to the income change. The range of elasticities reported suggests between a $.01 to $.10 increase in state and local government expenditures for each $1 increase in consumers' incomes.

There is some evidence that the relationship between income and desired expenditure is not always a continuously increasing one: Brown and Saks reported that school spending depended on the variance of the income distribution in each district in addition to median income and concluded that "the correctly specified . . . curve . . . is U-shaped with a minimum at a family income of about $8,300 [in 1970 dollars]."

Discussion Questions

1. Suppose you believe that the income elasticity of demand for state government services (measured by expenditures) is on the order of 0.80. If state per capita income is expected to increase by 20 percent over the next three years, what is the expected effect on desired state spending? If the increase in income were the only economic change expected in these years (no inflation, population growth, or change in consumer preferences), what might be expected to happen to state spending as a percentage of state personal income?
2. Suppose that in one community there are three groups of voters that differ by income, with P denoting the lowest, M the middle, and R the highest. The demand for local government services by these groups is shown below. Under what conditions would the desired amount of service be the same for all three groups? Is it clear whether the tax structure that generates such a result would be regressive, proportional, or progressive? Is it possible under other conditions that the low-income group would desire the most service, followed by the M group and then the R group?

(See figure on next page.)



3. There is some evidence that the relationship between desired local government services (spending) and income is U-shaped—that is, lower- and higher-income voters may form a coalition to support higher amounts of local spending than desired by middle-income voters. Using two services for illustration, police protection and education, discuss why this might be the case. Remember that, in general, demand depends on price, income, and tastes.

Selected Readings

Inman, Robert P. "The Fiscal Performance of Local Governments: An Interpretative Review." In *Current Issues in Urban Economics*, ed. P. Mieszkowski and M. Straszheim (Baltimore: Johns Hopkins University Press, 1979).

Appendix
Characterizing Demand

Price Elasticity. The price elasticity of demand is a measure of the responsiveness of consumption to changes in price, or the percentage change in quantity demanded due to a 1-percent change in price, assuming that *only* the price changes—incomes, tastes, and other characteristics are held constant. The definition is

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity}}{\text{Percentage change in price}}$$

If demand curves are negatively sloped, as is usually the case, then the price elasticity will be negative because price and quantity move in opposite directions; an increase in price will cause a decrease in quantity, and vice versa. For example, if the price elasticity of demand is −2.0 and price rises by 5 percent (the percentage change in

TABLE 4A–1 Price Elasticity Values and Terminology

Elasticity	*Name*	*Effect*
$E_D^P > 1$	Price elastic	P × Q falls as price increases P × Q rises as price decreases
$E_D^P < 1$	Price inelastic	P × Q rises as price increases P × Q falls as price decreases
$E_D^P = 1$	Unit elastic	P × Q constant as price increases and as price decreases
$E_D^P = 0$	Perfectly inelastic	Demand curve vertical Quantity constant
$E_D^P = \infty$	Perfectly elastic	Demand curve horizontal Price constant

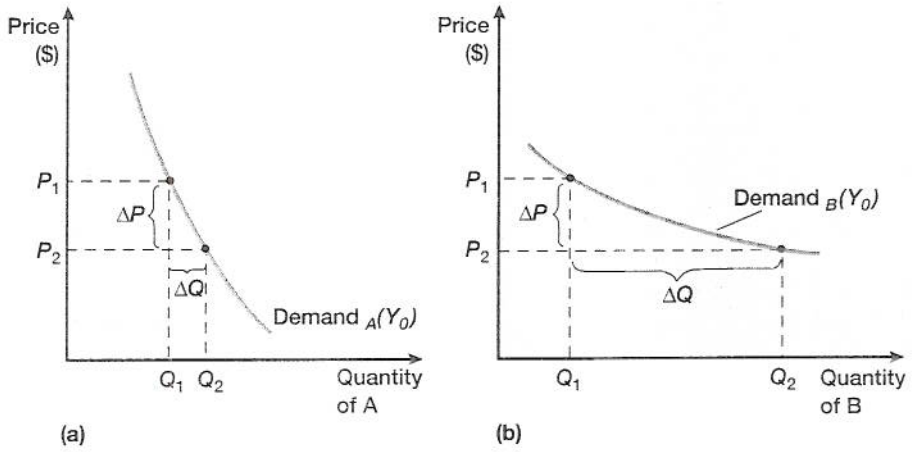
price is +5), then the quantity demanded decreases by 10 percent (the percentage change in quantity is −10).[8]

In evaluating the price elasticity of demand, distinction is made as to whether the absolute value of the elasticity is greater or less than one, as outlined in Table 4A–1. If the price elasticity is *greater than 1.0,* demand is said to be **price elastic,** and consumption is relatively responsive to changes in price. For a good that is price elastic, a 1-percent decrease in price would lead to a more-than-1-percent increase in consumption, perhaps 3 percent. If the price elasticity is *less than 1.0,* demand is said to be **price inelastic.** Consumption is not very responsive to changes in price because a 1-percent decrease in price would cause a less than 1-percent increase in quantity, perhaps only .5 percent. If the demand curve is vertical, implying that consumers demand the same quantity regardless of price, then the price elasticity of demand equals 0 and demand is said to be **perfectly inelastic.** This represents a situation where consumers will pay any price for a product, a commodity that is truly priceless. At the other extreme, if the demand curve is horizontal, implying that any amount will be demanded at a given price but that none is demanded at a higher price, the price elasticity is undefined and demand is said to be **perfectly elastic.**

As shown in Table 4A–1, whether demand is price elastic or inelastic has implications for what happens to total expenditure ($P \times Q$) as price changes. If demand is price elastic, then an increase in price causes a relatively larger decrease in quantity purchased so that total expenditure on the product falls. In contrast, if demand is price inelastic, that same increase in price causes a relatively smaller decrease in quantity

[8]For convenience, the price elasticity is often presented as the absolute value of the percentage change in quantity divided by the percentage change in price, so the number is positive.

FIGURE 4A–1
Demand and price elasticity



so that total expenditure rises. Whether total expenditure rises or falls from a given price change depends, then, on how much consumers react to the price change.

In some cases, the relative magnitude of the price elasticity in different markets is more important than the actual magnitude of those elasticities. For example, the price elasticity might be .5 in one market and .8 in another. While demand is price inelastic in both cases, it can be said to be relatively more inelastic in the first market or relatively more elastic in the second. This is represented in Figure 4A–1, with demand curve A being more inelastic than demand curve B, because for the same decrease in price, quantity rises more in market B than in A. For the same reason, it could be said that demand in B is relatively more elastic than demand in A.[9]

Remember that price elasticities are simply measurements of how consumers behave. If demand is price inelastic, then consumers are unwilling or unable to alter their behavior much in response to price changes. Perhaps there simply are no good substitutes for a commodity or perhaps consumers require some time to switch to substitute commodities or to change their behavior. For instance, consumers might substitute insulation for heating fuel when heating fuel prices rise, but the substitution will not occur until consumers are convinced that the price change is likely to last for a while, and then the change will take some time. In that case, the price elasticity in the long run will be greater than in the short run. Finally, the degree to which consumers alter consumption in the face of price changes depends on how important the price change is to them and how much they value the product. A given price change has more impact the more one spends on a commodity and the lower one's income. Thus, demand may be more price inelastic for higher-income consumers and for products that occupy a small fraction of consumers' budgets.

[9]To compute an approximation of the price elasticity of demand, one can use the formula:

$$E_D^P = [\Delta Q/(Q_1 + Q_2)]/[\Delta P/(P_1 + P_2)]$$

where ΔQ equals $Q_1 - Q_2$ and ΔP equals $P_1 - P_2$. This formula calculates the *arc elasticity*, which is the average effect over that arc of the demand curve.

TABLE 4A–2 Income Elasticity Values and Terminology

Elasticity	*Name*	*Effects*
$E_D^Y < 0$	Inferior good	Q falls as income increase Q rises as income decreases
$E_D^Y = 0$	No income effect	Q constant as income changes
$0 < E_D^Y < 1$	Normal good income inelastic	Q rises as income increases Q falls as income decreases
$E_D^Y = 1$	Normal good unit elastic	Q rises as income increases Q falls as income decreases $(P \times Q)/Y$ falls as income increases
$E_D^Y > 1$	Superior good income elastic	Q rises as income increases Q falls as income decreases $(P \times Q)/Y$ rises as income increases

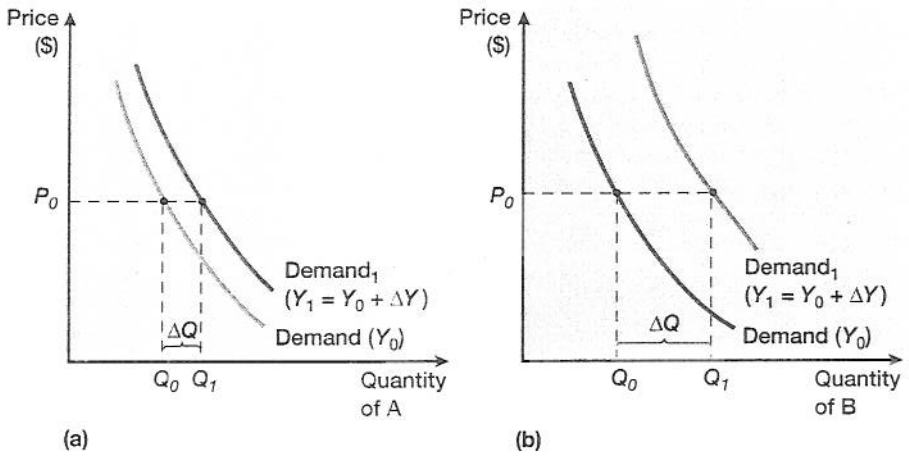
Income Elasticity. The income elasticity of demand is a measure of the responsiveness of consumption to changes in income, or the percentage change in quantity demanded due to a 1-percent change in income, assuming that *only* income changes. The definition is

$$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity}}{\text{Percentage change in income}}$$

For example, if the income elasticity of demand is 2.0 and income rises by 5 percent (the percentage change in income is +5), then the quantity demanded increases by 10 percent (the percentage change in quantity is +10).

Possible values for the income elasticity of demand and some effects of those values are shown in Table 4A–2. If the income elasticity of demand is negative, then quantity demanded falls as income increases, and the good is said to be an *inferior* good. As consumers become richer, they consume less of this commodity and presumably substitute some others. In contrast, the income elasticity is positive if consumers demand more of a commodity as income increases. These commodities are said to be *normal* goods. If the income elasticity is positive but less than 1.0, reflecting a smaller percentage increase in consumption than income, demand is said to be **income inelastic.** Because an increase in income causes a relatively smaller increase in quantity, expenditure rises by a smaller percentage than income, and consumption of the commodity takes a smaller share of the consumer's income than before the income increase. If the income elasticity is greater than 1.0, then quantity rises by a larger percentage than income rises. In that case, the commodity is said to be *superior* and demand is **income**

FIGURE 4A–2
Demand and income elasticity



elastic.[10] Total expenditure on the product rises by a larger percentage than income so that consumption of this commodity takes a larger share of the consumer's income.

Two possibilities are shown in Figure 4A–2. In both markets *A* and *B* demand rises as income increases; *A* and *B* are normal goods. In both the increase in income from Y_0 to Y_1 causes an increase in consumption from Q_0 to Q_1, assuming a constant price of P_0. But the increase in consumption is greater in market *B* than in market *A*. Although the income elasticity is positive in both markets, it is larger in *B*. Demand is relatively more income elastic in market *B*, or demand is more inelastic in market *A*. If the income elasticity for *A* is .5 while the income elasticity for *B* is 1.2, for instance, spending on A becomes a smaller fraction of this consumer's income whereas spending on B takes a larger share of the consumer's budget.[11]

Again, remember that the income elasticity is a measure of how consumers behave. It is usually argued that demand for basic commodities or necessities such as food will be income inelastic because all consumers choose a basic amount of those commodities regardless of income. Of course, even if the demand for food in aggregate is income inelastic, the demand for any one food, say caviar, can be income elastic. Commodities for which demand is income elastic often are referred to as *luxuries* simply because they tend to be consumed in relatively larger quantities by higher-income consumers.

[10]Neither of the terms *inferior* or *superior* carry any pejorative connotations about quality. They merely describe consumer behavior.

[11]To compute the income elasticity of demand, one can use the following formula:

$$E_D^Y = [\Delta Q/(Q_0 + Q_1)]/[\Delta Y/(Y_0 + Y_1)]$$

where $\Delta Q = Q_0 - Q_1$ and $\Delta Y = Y_0 - Y_1$