

FEATURES

Understand Your Expenditure Efficiency

by **Richard Grove**

Wouldn't it be nice to know the exact expenditure level that would maximize community harmony? Think of the benefits as government finance advanced in efficiency. The budget process would be improved as rational decisions dethroned emotion. Job-changing managers would know what lay ahead. Such publications as Places Rated Almanac could sum up spending efficiency in a single paragraph. Finance directors could foresee and correct problems before the public spotted them. And researchers could better observe the causes and effects of service-level imbalance.

A new study by the author aspires to bring this knowledge within the grasp of every professional staff member simply by applying Excel spreadsheet functions to easily obtained data. This article defines expenditure efficiency, uncovers the causes of expenditures, and describes how an optimal expenditure level can be predicted.

What Is Expenditure Efficiency?

Common practice has relegated expenditure-level ideals to an externality. These ideals have been assumed to be undeterminable and ever-changing. Accordingly, financial science has moved along without it; budgeting has matched costs to services, accounting has matched costs to revenues, and so forth. Nothing, it has commonly been thought, could empirically match spending levels to community harmony.

This mindset began to change in 1956, when Charles Tiebout published what still stands as the classic theory of expenditure efficiency. He was looking for the most effectual way to balance tax burden with service delivery.

This efficiency, Tiebout's theory proposes, will be reached when there are enough competing jurisdictions within an area so that each family resides where its preferences for public service are provided (assuming that all families are mobile and knowledgeable enough to locate accordingly). With each jurisdiction consisting of households exerting homogeneous service demands, he says, each locality will provide the exact package of services and taxes needed to just satisfy all of its residents.

Although Tiebout's theory is generally accepted by the academic community, it is difficult to test, and aspects of it are still debated. The research described in this

article tested a similar but more practical definition, namely, that municipal expenditure efficiency is a natural occurrence of community harmony relating to service and taxation levels where the expenditure level that achieves this harmony is consistent and predictable because similar groups behave in similar ways.

This definition still relies upon the assumption that the partitioning of groups will be based upon each group's demand for public services, but Tiebout's structured intermunicipal competition is dismissed in favor of a concept of naturally occurring separation. Surveys show that local government service levels are not the main location determinants for groups, but numerous studies indicate that people end up sorting themselves into internally similar socioeconomic groups anyway.¹

What Causes Expenditures?

People are the root of all expenditures. Several studies, including this one, have found a strong correlation between the number of people placing demands upon a locality and its total expenditures. Virtually every new resident and employer adds to this cost.

This also means that local officials have limited control over expenditure levels in the long run. The most oft-cited reason for this is that communities provide essential services that are not subject to arbitrary adjustments.

If this explanation were the entire story, there should be little difference in the expenditure levels of like-sized communities. The study described here used the number of residents and the number of employees reporting to work within community borders as variables with which to make expenditure-level predictions. Results were accurate when applied generally, but there was no way to fine-tune them to become reliable indicators for individual cities. (Author's note: counties were not part of the study). Numbers of people alone could not explain all differences.

The definition of expenditure efficiency tested in this study implies that there are service-demand differences between any two groups. More than 100 variables were meticulously researched. Three variables were found to be highly reliable for predicting expenditure levels for healthy local governments: household income, population density, and the ratio of taxable residential property value to total taxable property value.

Numbers of people and naturally occurring group differences are the forces that shape public service demand. The ideal expenditure level will just meet these demands. Unfortunately, a third force also adds to cost. Call it error, sin, dialectic, or whatever, but it always detracts from efficiency. Because the study found a way to measure the first two forces, the third should also be determinable.

How Can Ideal Expenditure Levels Be Calculated?

Ideal expenditure levels are best measured by looking at the forest rather than the trees. A lifetime of dissection will not isolate an ideal. As suggested by our

definition of expenditure efficiency, the ideal will be a judgmental condition that exists within an affected group. If groups are assumed to work naturally toward this ideal, it should be measurable by analyzing the actions of many groups. This principle, which is the core of the Delphi Technique, is crudely exemplified by the fact that polling the audience is the most accurate lifeline available on the television show "Who Wants to Be a Millionaire."

The present study randomly selected groups of like localities and used the three variables already mentioned to derive formulas to predict levels of expenditure per household (EPH). The sum of the differences between the EPH predictions and actuals-technically called the mean absolute percentage error (MAPE)-for all groups was only 2 percent. The study went on to discover that the further a locality's actual EPH was from the predicted value, the more likely the locality was to show signs of taxation or service-level disharmony.

Evaluating an individual locality begins by collecting data from five to seven communities similar in the three aforementioned variables to the government under study. They must also be a healthy sample that is free from potentially troubled communities, technically known as outliers. It may seem surprising that other variables are irrelevant, but the list may display vast differences in total population, budget size, tax burdens, and so forth.

Using an imaginary community-Hypothetical, Massachusetts-as an example, data was collected for similar communities and the five most suitable were selected. Because median household income is the most influential variable, prospective localities were arranged and considered in that order.

Population density is the next most important, followed by the percent of taxable residential property to total taxable property. Most of this data can be obtained from U.S. Census and state government sources. Local governments that best matched Hypothetical, Massachusetts, are shown in Figure 1.

Figure 1. Ideal Expenditure Levels for Hypothetical Localities

	Median Household Income	Population Density	% Residential Assessment	Expenditure Per Household (EPH)
Hypothetical, MA	\$59,371	1,425	75.3%	\$5,356
Abington	57,100	1,465	88.0%	5,296
Draycut	57,676	1,371	92.9%	4,595
Holbrook	54,419	1,477	92.0%	5,431
Hudson	58,549	1,553	1,553	5,988
Shrewsbury	64,237	1,523	85.6%	4,920

Applying the variables for the five similar communities to Excel's Regression function-and checking the Residuals box-produced a table with the excerpt that is shown in Figure 2.

Figure 2. Applying Variables for Five Hypothetical Localities

SUMMARY OUTPUT		
<i>Coefficients</i>		
Intercept	10,282	
Median Household income	-0.1073	
Population Density	4.132	
Percent Residuals Assessment	-5,567.42	
RESIDUAL OUTPUT		
<i>Observation</i>	<i>Predicted Expenditure per Household</i>	<i>Residuals</i>
Abington	5,311	(15)
Draycut	4,589	5
Holbrook	5,427	4
Hudson	5,983	5
Shrewsbury	4,920	0

Next, the sum of the absolute-value Residuals (29) was divided by the sum of the Predicted EPH values (26,230) to reach the MAPE of 0.1 percent. (The lower the MAPE, the better, but it is acceptable to have a MAPE as high as 7 percent or 8 percent. If it exceeds this, outlier localities should be removed and more suitable replacements found.) An arbitrary 4.0 percent was added to the MAPE to arrive at the threshold value of 4.1 percent. This 4.0 percent is a constant value used in the evaluation of every community.

A predicted EPH was found for Hypothetical, Massachusetts, as follows by applying the coefficients given by Excel to Hypothetical's three variables:

$$\text{Predicted EPH} = 10,282 + 59,371 * -0.1073 + 1,425 * 4.132 + 75.3\% * -5,567.42 = \$5,607.$$

The actual EPH value (\$5,356) was divided by the predicted EPH (\$5,607), which gave an absolute-value difference of 4.5 percent. This percent was compared to the threshold value: 4.1 percent is close to 4.5 percent

Hypothetical, Massachusetts, was slightly over the threshold in the year measured. The probability of public pressure over tax or service levels is low. In the overall study, public pressure to reduce taxes or improved service levels was not found in local governments that were at or below their threshold.

In general, the ubiquity and viciousness of public pressure rose as the distance above the threshold increased. There is a good chance of at least some pressure at twice the threshold, and unmistakable public pressure is the norm at three times the threshold. It is estimated that between 9 and 14 percent of the 147 governments in the study had reached or exceeded their thresholds.

Applicability Guidelines

The resulting indicator of expenditure efficiency is an extremely reliable and precise one. It can be employed with confidence as long as its meaning and limitations are understood.

This is a lagging indicator. The most relevant EPH available will always be the prior year. To foretell the danger of rising public discontent, however, multiyear trends must be observed.

About the Study

This study, *Forecasting Municipal Expenditures*, conducted in 2004 and 2005 by the author, used financial data from 147 Massachusetts local governments ranging in size from 10,433 to 589,141 population. Each locality provides a full range of services, including education from kindergarten through grade 12. More than 100 statistics were collected for each place, covering periods ranging from 1989 through 2002. Statistical analyses and case studies were conducted.

The local government financial data used in this study were pre-GASB 34, and they exclude capital outlays, debt-service expenditures, and business-type operations. This leaves only financial activity related to the direct delivery of traditional public services, less depreciation and financing cost. It is anticipated that unmodified GASB 34 statements will enhance results when available.

This is not a financial indicator. Financial stress was the most commonly observed coincidental event linked to high scores, but other coincidences were observed. Likewise, the indicator does not measure any source of public disharmony that is not directly related to service or taxation levels.

It also provides no action-plan guidance. The study devoted much effort to finding links between the score and local components, but none were found. No useful links, for example, were found between the mix of services or the level of tax burden and the scores. It appears that the ideal service mix and tax burden will vary by community in ways that cannot be statistically predicted.

A one-size-fits-all indicator cannot be developed that will accurately evaluate individual local governments. Each locality must develop its own formula, using data from similar places that have been carefully chosen.

The indicator cannot be applied to state or national governments and probably not even to counties. It should also be applied cautiously to larger localities. The definition of expenditure efficiency predicts its own unraveling, as large populations are influenced by a blend of diverse and competing groups, rather than by a single, homogeneous group.

In defense of the indicator in this regard, it does show exactly what Tiebout's theory implies. The larger the population, the lower the likelihood of homogeneous service demands; hence, the lower the probability of expenditure efficiency. The percent of outliers in low-population localities in the study was small. There was a sharp increase in outliers at population levels above 29,999 and an even greater percentage at 50,000 and above.

Finally, expenditure efficiency should not always be assumed to be the highest achievement. A considerable number of people, for example, obviously prefer to live in cities, even though public disharmony over service and taxation levels is more likely to be found there.

Conclusion

Total local government expenditure levels can be accurately predicted. They are caused by the presence of people within a community. Demand for public services is subtly tweaked in predictable ways by three variables: median household income, population density, and the ratio of taxable residential-property value to total taxable property value.

People in all urban areas naturally segregate themselves into internally similar groups. Local expenditure efficiency is, therefore, a naturally occurring event that is consistent and predictable because similar groups behave in similar ways. This event occurs when a level of services is provided that just satisfies the group in question.

Local expenditure efficiency, as it relates to community harmony, can be measured by comparing the predicted value of expenditures per household with the actual value. This method has useful applications, but it also has some limitations.

In summary, the following management-oriented observations can be derived from this study:

- Only a single, narrow spending-range will provide for community harmony. This range is determined by group dynamics that coincide with demographic variables. These cannot be easily changed; hence community leaders cannot readily influence where the ideal spending level will fall.
- The farther a community is from its ideal spending range, the greater the

public discord is likely to be. A community and its leaders are best served when spending levels are kept within this range.

- Knowledge of the ideal spending level is an important part of the financial challenge that all leaders face. Although this is not all that needs to be known about public harmony, like a jigsaw puzzle, solving the first major section makes the rest a lot easier.

¹ See U.S. Census Bureau, American Housing Surveys, Metropolitan Area Surveys, www.census.gov/hhes/www/housing/ahs/metropolitaindata.html. This site has dozens of available surveys conducted from 1973 to date. All contain a table titled "2-11 Reasons for Move and Choice of Current Residence-Occupied Units." This table lists reasons why movers selected a particular community. In virtually all surveys, such personal reasons as proximity to employment and family were given more frequently than reasons relating to public service provision such as good schools.

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