

# INITIATIVES AND IMPROVEMENTS TO THE QUARTERLY SUMMARY OF STATE AND LOCAL GOVERNMENT TAX REVENUE\*

Marcus Graham and Brian Zamperini, U.S. Census Bureau<sup>1</sup>

## BACKGROUND

STATE AND LOCAL GOVERNMENTS PLAY A MAJOR role in the U.S. economy and many aspects of the way people live, conduct business, and interact on a daily basis. As of 2007, there were 89,476 state and local governments (states, counties, cities, townships, school districts, and special districts) in the United States. Governments differ widely in expenditure and revenue levels, revenue sources and collections, and expenditure programs (National Research Council, 2007). The U.S. Census Bureau's Governments Division provides information on the revenue, expenditures, cash and securities, debt, employment, and other key economic activities of the nation's federal, state, and local governments. The Division conducts a quinquennial Census of Governments (for years ending in "2" and "7") with annual and quarterly surveys between census years. The data serve two major user communities: users of aggregate statistics – e.g., federal agencies, such as the Bureau of Economic Analysis and the Federal Reserve Bank's Board of Governors, which produce economic time series such as Gross Domestic Products and the Flow of Funds respectively; and users of micro statistics – e.g., public and private sector public policy experts, public interest groups, and others who want information on state and local governments for research and analysis related to government functions.

The Governments Division conducts two surveys that specialize in tax collections: the Annual Survey of State Government Tax Collections (STC) and the Q-Tax. The STC is conducted on an annual basis, covers the fifty state governments only, and provides a summary of annual taxes collected for up to 25 tax categories. This survey is similar in purpose and detail to the Quarterly Survey of State Tax Collections (F-72). The main difference

between Q-Tax and the STC, other than the time frame for conduction of the survey, is the inclusion of local government data in the Q-Tax survey. Also, the Q-Tax Summary is conducted using calendar quarters, whereas the STC survey reflects each state fiscal year.

The National Academy of Sciences' Committee on National Statistics (CNStat) conducted a comprehensive assessment of the Census Bureau's Governments Division's surveys on the economic activity of state and local governments. In 2007, the CNStat committee issued a report, *State and Local Government Statistics at a Crossroads*, in which 21 recommendations on data quality and statistical methods, dissemination and analysis, user outreach, and challenges for the future were addressed. One recommendation focused entirely on the redesign of the Quarterly Summary of State and Local Government Tax Revenue. The CNStat committee recommended that Governments Division evaluate the quality of the sample frame, develop a probability sample of local governments for non-property tax measurement, and develop cost-effective variance estimation, editing, and imputation procedures that meet Census Bureau standards (National Research Council, 2007).

The universe for Q-Tax includes all state governments, all local government property tax collectors, and all local government non-property tax imposers. The results are compiled from three separate surveys: The Quarterly Survey of Property Tax Collections (F-71); the Quarterly Survey of State Tax Collections (F-72); and the Quarterly Survey of Non-Property Taxes (F-73). State governments report tax revenue by type of tax for 25 tax categories, while local governments report property tax and major non-property tax, such as income tax and sales tax. Data are reported for the tax collections during the preceding calendar quarter. The F-71 includes about 5,000 local property tax collectors; the F-73 is currently a panel of 111 local governments; and the F-72 surveys all fifty states and the District of Columbia. These three survey components have undergone an extensive

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redesign to ensure proper statistical methods are applied in all phases of the project. The redesign and improvement of all aspects of Q-Tax has been an important effort for the Census Bureau for the past three years. During that time, a new sample was selected and put in place for the F-71 survey; the F-73 survey was expanded from a panel to a probability sample and expanded from a three-question survey to a 25-question survey; and edit, imputation, estimation, and dissemination methods have been redesigned and updated. This paper discusses this initiative and provides a more thorough understanding of how the improvements initiated will create a higher quality and more valuable Q-Tax data product.

### QUARTERLY SURVEY OF PROPERTY TAX COLLECTIONS

The Quarterly Tax Survey has undergone a redesign of each survey component. The redesign of the Quarterly Survey of Property Tax Collections (F-71)<sup>2</sup> was completed with the release of the bridge study (Couzens et al., 2010), *Bridge Report for the Quarterly Tax Summary: A Study of the Methodological Changes to the Local Property Tax Component in 2008-2010*,<sup>3</sup> and national estimates from a new sample in September 2010. The redesign of the F-71 survey included an update of the sampling frame, new edit procedures to reduce unnecessary edit failures, new imputation procedures, and new estimation and variance estimation procedures.

The sample for the local property tax collection is a stratified sample of county-areas.<sup>4</sup> The questionnaire is mailed to all property tax collectors in the county-area. Prior to mailing, research was conducted on the number of property tax collectors in each county area. Each county in the country was stratified by a "cost" function based on the cost to survey the collectors in each county. Once these strata were defined, the counties were further stratified by population. There were 289 initial certainty county-area units and 320 non-certainty county areas selected for the sample. The result is a total sample size of 5,409 property tax collectors in the 609 county-areas selected.<sup>5</sup>

#### Editing<sup>6</sup>

Prior to the redesign, the editing process for the F-71 survey operations consisted of a single ratio edit of the current quarter to the same quarter in

the prior year, as well as bounds set to 0.80 and 1.20. This system resulted in large amounts of edit failures, which could not be reviewed with appropriate attention given the time constraints of a quarterly survey.

For the redesign of the editing process two ratio edits were selected: the ratio of the current quarter to the same quarter last year and the ratio of the change from current quarter to prior quarter this year to the same change in the prior year. For the bounds determination, the Hidiroglou-Berthelot (HB) method was used. This method allows larger changes in smaller units to be accepted, while restricting the acceptable amount of change allowed in larger reporting units (Hidiroglou and Berthelot, 1986).

In addition to the two ratio edits, edits that ensure internal consistency within the record were put in place. The goal of the new edits and bounds is to reduce the burden of the edits while increasing the quality. These changes have reduced the editing burden from 1,300 units to about 300 units per quarter, allowing for a more targeted review and analysis of the most influential changes in the data.

#### Imputation

Prior to the redesign of the imputation methodology, the process used to address non-responding governments in the F-71 survey was to "pull forward" the property tax amount from the same quarter of the prior year until a new response was received. A new imputation method was developed that did not assume that non-responding units never changed. When historical data are available, imputes are calculated using a median growth rate multiplied by the data from the same quarter in the prior year. In cases where no historical data are available, the missing data are imputed using an adjusted cell mean of the property tax amount.

#### Estimates of Variables

The coefficients of variation for the new property tax survey were calculated for the first time with the release of the second quarter 2010 survey results in September 2010.

A new sample was introduced for the F-71 survey for the fourth quarter 2008. For six quarters, beginning with the fourth quarter 2008 and continuing through the second quarter 2010, data were collected simultaneously for both the old sample

and the new sample. A bridge study was conducted comparing the differences in the local property tax estimates that resulted from the new survey methodologies. The bridge study (Couzens et al., 2010) can be found on the Census Bureau website: [http://www.census.gov/govs/pubs/research\\_reports.html](http://www.census.gov/govs/pubs/research_reports.html).

With the collection and release of the estimates from the new non-property tax portion of the survey (F-73), coefficients of variation will be calculated for the entire survey. Because all state governments are included in the sample, there is no sampling error for the F-72 part of the survey.

#### **QUARTERLY SURVEY OF NON-PROPERTY TAXES**

The Quarterly Survey of Non-property Taxes (F-73) provides estimates of local non-property government tax revenue. Data for this survey are collected from local governments ranging from small towns and municipalities to large cities and counties.<sup>7</sup> This survey also includes special districts (e.g., sewer and water districts) and school districts. Originally, this survey was a non-probability panel consisting of 111 local governments that have substantial non-property tax collection yields. However, to meet the Census Bureau's and the Office of Management and Budget's statistical quality standards<sup>8</sup> and to address the recommendations set forth by CNStat, this survey is moving to a probability sample selected from the 2007 Census of Governments. In addition to selecting a new sample, the questionnaire is being expanded from three tax categories (general sales tax, individual income tax, and all other taxes) to collecting information on an additional eight tax and license categories (motor fuels sales tax, public utilities sales tax, alcoholic beverages sales tax, tobacco products sales tax, other sales and use tax, motor vehicles licenses, motor vehicle operators licenses, and corporation net income tax).

To select a new survey sample, a frame consisting of tax imposers was constructed based on information from the 2007 Census of Governments.<sup>9</sup> This resulted in a sample of 3,688 tax imposers selected from the universe listing. The Census Bureau mailed the new sample in January 2011, collecting fourth quarter 2010 data. A dual sample, containing the old sample and the new sample, will be run for up to four quarters, during which a bridge study will be conducted comparing the two samples and processing procedures (imputation, editing, and estimation).

#### **QUARTERLY SURVEY OF STATE GOVERNMENT TAX COLLECTIONS**

The Quarterly Survey of State Government Tax Collections is a survey of tax and license fees at the state level of government. This survey is a census of the fifty states and the District of Columbia. The survey questionnaire (F-72)<sup>10</sup> requests information for 25 tax and license fee categories. Data for the F-72 survey can be received from a completed questionnaire or from a compilation of tax revenue from primary source material submitted by one or multiple state government agencies, depending on how the state government is organized.

The F-72 survey is a census of all state governments. There are no changes to the questionnaire or editing at this time. However, there are some aspects of the F-72 survey that are in the process of being modernized, namely the method of reporting revisions to the public and imputation methods.

The most notable change in the F-72 survey that the user will see will be the way the revisions are presented on Table 3 of the report found on the Census Bureau website (<http://www.census.gov/govs/ntax/>). The new revision practice for this survey will indicate which particular tax categories were revised in each state, rather than just indicating that the state had a revision.

The old imputation method is conducted at the state level for states that have not responded in a given quarter. Imputation is done by a system that computes a growth rate for the quarter from the responding states' current data, after removing any significant outliers. The growth rate is then applied to the non-responding states' prior data to get an estimate for the quarter. [There are various reasons that a state cannot respond in the time frame of a given quarter, the predominant reason is due to timing of their fiscal year end. Most states (90 percent) will respond with actual data within a quarter or two, at which time the imputed data are replaced with actual data and a revision is identified in the data tables.] Individual tax categories that are missing in a state are not imputed. These items are imputed by the analyst using other data sources or using a growth rate factor. New imputation methods for the F-72 survey are being researched and devised. Some of the key items that are being researched are item imputation as well as whole state non-response imputation. Progress is being made in this area, but no new imputation methods are ready at this time.

## FUTURE RESEARCH

With the completion of the redesigns of the F-71 and F-73 and the adjustments to the F-72, Governments Division will continue to build on the momentum of the past three years and strive toward a goal of continuous improvements to the Q-Tax. One aspect of the survey that can be implemented on an ongoing basis is updating the samples. Each of the survey samples will be selected on a regular basis, every five years, in conjunction with the Census of Governments.

Although a great deal of work has already been done on the F-71 property tax sample, there are still a number of potential options available for future research to further improve the survey. One option under consideration for the future of the survey is to expand the survey questionnaire to include, or allow respondents to separate out, the personal property tax from the real property tax.

Currently the F-71 utilizes a sample based on collectors of property taxes, whereas the new F-73 sample is conducted based on imposers of taxes. A new sampling methodology under consideration for the next iteration of the F-71 survey would be to select a sample based on the universe of governments that impose a property tax, rather than those responsible for collecting the tax. For property taxes, the imposer and collector of the property tax are typically the same government entity, and most government areas imposing a property tax have a property tax collector. This would necessitate the combination of the F-71 and F-73 surveys into one questionnaire. Combining the two local government surveys could potentially reduce respondent burden because one questionnaire, rather than two, can be sent to the government. Remembering that the purpose of the F-71 and F-73 surveys is to obtain a national aggregate of local taxes, and based on current sampling methodology, there would likely be a substantially reduced sample size, thus opening up the possibility of designing a sample that would yield regional estimates.

Selecting a regional sample for one or both (F-71 and F-73) of the samples is also a potential area for future research. By selecting a regional sample, a broader range of information about the public sector economy on a subnational basis would be available.

## CONCLUSION

This paper presented several ideas for the improvement of the Q-Tax. In the past three

years, the Census Bureau has made strides in the redesign of all three component Quarterly Tax Surveys: new statistical standards have been met; the recommendation of the CNSStat report has begun to be fulfilled; new editing, imputation, and dissemination methods have been implemented; new samples have been prepared; and a new and improved web site has been designed. Though we have made strides, the work is not done; the Governments Division will continue to be dedicated to the development of a high quality Quarterly Summary of State and Local Government Tax Revenue.

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## Notes

- <sup>1</sup> This report is released to inform interested parties of research and to encourage discussion of work in progress. The views expressed are those of the authors and not necessarily those of the U.S. Census Bureau.
- <sup>2</sup> For more information, please see: [http://www.census.gov/govs/qtax/get\\_forms.html](http://www.census.gov/govs/qtax/get_forms.html)
- <sup>3</sup> For more information on the bridge study, please see: <http://www.census.gov/govs/qtax/>
- <sup>4</sup> The term ‘county-area’ is used to distinguish between the county government entity and the geography of the county. The county-area is equivalent to the geography of the county and includes all governmental entities within that geographic area. This should not be confused with county government, as it may not be the only governmental unit in the county-area. There are several county-areas in which there are no county level governments (e.g., CT, RI) in the respective geographic areas.
- <sup>5</sup> For more information on the sample design, please see: [http://www.census.gov/govs/qtax/how\\_data\\_collected.html](http://www.census.gov/govs/qtax/how_data_collected.html)
- <sup>6</sup> For more information, please see: <http://www.census.gov/prod/2009pubs/govsrr2009-7.pdf> (Couzens et al., 2009)
- <sup>7</sup> County, municipal, and township governments are referred to as “general purpose” local governments in Census Bureau statistics on governments. Special district and school district governments are referred to as special purpose governments.
- <sup>8</sup> To view the form, please see: [http://www.census.gov/govs/qtax/get\\_forms.html](http://www.census.gov/govs/qtax/get_forms.html)

<sup>9</sup> For additional information on the nature of tax imposers and collectors in regards to the sample methodology, please see: <http://www2.census.gov/govs/pubs/2010pubs/govsrr2010-1.pdf> (Graham et al., 2010)

<sup>10</sup> To view the form, please see: [http://www.census.gov/govs/qtax/get\\_forms.html](http://www.census.gov/govs/qtax/get_forms.html)

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