

Expansion and Improvement of the U.S. Census Bureau's Retail and Wholesale Programs¹

Ruth E. Detlefsen, U.S. Census Bureau, SSSD, Rm. 2641-3, Washington, DC 20233-6500

Key words: Sample Selection, Time Series, Data Collection Integration

1. Introduction

The U.S. Census Bureau has conducted censuses and sample surveys of the retail and wholesale trades for many years. In keeping with the Bureau's longstanding commitment to produce quality data that is relevant, responsive to customer needs, and attentive to minimizing respondent burden, several projects are underway which will further expand and improve these programs.

After a brief synopsis of the retail and wholesale programs, this paper will discuss motivation, research, and implementation for: 1) expansion of the Wholesale Annual Trade Survey (ATS), 2) methodological and procedural improvements for the 2006 Business Sample Revision (BSR-06), 3) restatement of historical time series to reflect the 2002 North American Industry Classification System (NAICS), and 4) expansion of data collection integration for the 2007 Economic Census.

2. Retail and Wholesale Programs

2.1. Monthly and Annual Surveys

The U.S. Census Bureau conducts monthly and annual probability-based sample surveys of the retail and wholesale sectors as defined by NAICS. Sector coverage is complete for retail, but not for wholesale. However, the annual wholesale survey coverage will expand as discussed in section 3. These surveys provide national estimates of level and change for various industries. Estimates of annual and monthly sales, annual purchases, end-of-year and end-of-month inventories, and annual electronic-commerce sales are computed for both the retail and wholesale sectors. For retail, we also compute estimates of end-of-year accounts receivables and quarterly electronic-commerce sales.

These surveys provide the only continuing official measures of retail and wholesale sector statistics for the period between the economic censuses. The monthly surveys are essential in preparing the Bureau

of Economic Analysis' (BEA) National Income and Product Accounts (NIPA). The annual surveys are used to benchmark the estimates from the monthly surveys and provide critical inputs to BEA's annual input-output tables and their annual benchmark of national accounts. These surveys provide information to trade and professional organizations to analyze industry trends, benchmark their own data, and develop forecasts. Private businesses use data from these surveys to measure market share, analyze business potential, and plan investment decisions.

2.2. Economic Census

Once every five years the Census Bureau conducts an economic census that includes, among others, the retail and wholesale sectors. The 2002 census will provide information about sales, payroll, employment, electronic-commerce sales, wholesale inventories, class of customer, supply chain items, product line sales, and many other industry specific data items for detailed industries, geographic levels, and size categories for all retailers and wholesalers in the U.S.

The economic census is the chief source of data about the structure and functioning of the Nation's economy. It provides the foundation and framework for a host of other statistical endeavors by both public and private organizations. The census data is used for benchmarking the Federal Reserve Board's productivity estimates, the BEA's NIPA, and the Census Bureau's annual retail and wholesale survey estimates.

3. Expansion of the Wholesale Annual Trade Survey

3.1. Motivation

The Census Bureau has conducted an Annual Trade Survey (ATS) since 1936 to provide measures of annual sales and purchases and end-of-year inventories for U.S. wholesalers that buy goods and then resell them to other businesses (distributors). ATS has excluded wholesalers selling their own U.S. manufactured or mined goods or arranging for the sale of goods owned by others. Thus, manufacturers'

¹*This report is released to inform interested parties of ongoing research and to encourage discussion of work in progress. The views expressed on statistical, methodological, technical, or operational issues are those of the author and not necessarily those of the U.S. Census Bureau.*

sales branches and offices (MSBOs), except for ferrous metals services centers with inventories, and agents and brokers (both electronic and traditional) have been excluded from ATS. The wholesalers excluded from ATS are covered only once every five years in the economic census.

The Census Bureau began receiving funds in fiscal year 2003 to expand the ATS to include these missing components. We will begin producing estimates for the MSBOs for reference years 2002 and 2003 and for the agents and brokers for reference years 2004 and 2005. These estimates will fill an important data gap for the Bureau of Economic Analysis (BEA). The BEA uses input from the wholesale programs to produce the Gross Domestic Product (GDP) estimates. Absent annual measures for the MSBOs and the agents and brokers, the BEA estimates the values for these components for the National Accounts except in census years. In recent years, the value of inventories for these wholesale components has grown rapidly, amounting to more than \$50 billion. More accurate inventory estimates for these components between censuses will facilitate significant improvement in the accuracy of the inventory investment portion of GDP.

3.2. Research

Most research conducted up to now has focused on the MSBOs since data collection for them began in early 2004, while data collection for agents and brokers will not begin until 2006. Research includes the following:

3.2.1. As part of the 2000 Business Sample Revision (BSR-2K), research was done to develop selection parameters for the MSBOs. We subsequently selected a sample of MSBOs in 1999 and have continued to update the sample to reflect changes in the universe since that time. Sampling units were defined in a way similar to ATS, i.e., the units consisted either of MSBO establishments (physical locations) aggregated by company or by the Employer Identification Number (EIN) used to report social security payments for employees. Samples were selected for each 4-digit wholesale industry defined by the 1997 NAICS.

3.2.2. Questions later arose concerning the choice of sampling unit. Work for another project indicated that we should examine using establishment units. Additional research and our previous experience with the MSBOs for the ferrous metal service centers confirmed our earlier choice of company and EIN sampling units.

3.2.3. Research was conducted that led to the establishment of appropriate reporting arrangements. The research consisted of 1) investigating those wholesalers having units selected in both the ATS and the MSBO samples, 2) updating the certainty units to reflect the latest size and company organization information available to the Census Bureau, and 3) company visits and telephone interviews.

3.2.4. Cognitive research was conducted to inform questionnaire format and to develop question wording for each of the ATS and the MSBO report forms. Among the issues addressed were how to more clearly convey our definition of MSBO so that data is reported for the particular establishments of interest to us. For firms selected to report in both surveys, we developed a set of screening questions to help the firm decide which set of its establishments should be reported on which form. The screening questions were incorporated into each of the forms.

3.2.5. The separate construction of the ATS and MSBO sampling units and the unique characteristics of the MSBOs necessitated the development of rather complex rules for maintaining the sampling units. Research was undertaken to ensure the proper simultaneous maintenance of units that were selected as “company” units in one of the samples and as EINs in the other sample.

3.3. Implementation

MSBO estimates for reference years 2002 and 2003 will be released in Spring 2005. This release will provide data at the 4-digit 1997 NAICS levels.

The new samples selected during the 2006 Business Sample Revision Census (section 4) will use the 2002 NAICS. Under the 2002 NAICS the MSBOs and the distributors are classified together as merchant wholesalers. With the introduction of the new samples, we will publish annual merchant wholesale estimates and continue to produce separate estimates of the MSBO portion of the merchant wholesalers. At that time, we will also select a sample of agents and brokers (both electronic and traditional) which will be called “wholesale electronic markets and agents and brokers” under the 2002 NAICS. Effective with the BSR-06 sample, the Census Bureau will provide annual coverage of the entire wholesale trade sector.

4. Methodological and Implementation Improvements for the 2006 Business Sample Revision

4.1. Motivation

The Census Bureau selects new samples for its retail and wholesale monthly and annual surveys approximately once every five years.² Samples for our 2006 Business Sample Revision (BSR-06) will be selected in May 2005 with initial mailings in the fall. These new samples will be selected based on classification information and size data obtained from the most recent economic census (2002) and subsequent administrative updates. Samples are reselected to ensure that they remain representative of the retail and wholesale populations, to redistribute response burden, to ensure that new survey requirements are met, and to introduce technological and methodological improvements and efficiencies.

4.2. Research

4.2.1. Sample selection work begins with extraction of establishment records from the Business Register. Historically we have edited data extracted for the establishment, but have not edited data aggregated to the sampling unit level. Sampling units consist of one or more establishments. Research was conducted to develop extraction edits to be applied at both the establishment and the sampling unit levels. An interactive review and correction system is being developed to give priority to the review of sampling unit failures and the capability to drill down into the establishments of the failing sampling unit records. An evaluation of the BSR-06 sampling unit edits is planned.

4.2.2. Bounds for extraction edits of two types of relationships are being developed in a more rigorous manner than for past sample revisions. We are tailoring the bounds by industry sampling level for edits that test relationships between administrative sales (receipts) and payroll and between census sales and measures of size for sampling (MOS). In addition, bounds are being separately developed for sampling units that consist of one establishment and those that consist of more than one. Research confirmed that we can better identify units with problems and cut down on the total number of edit failures by implementing a data analysis method called resistant fences (Thompson). This method identifies a ratio as an outlier when it is k interquartile ranges outside the first or third quartiles (k constant). We modified software developed for use in the 2002 Economic Census to conduct the research and will

make use of it as we develop the bounds for BSR-06. We plan to evaluate the BSR-06 edit parameters.

4.2.3. Research is underway to determine the best method for estimating the MOS for wholesale agents and brokers whose revenue is primarily derived from commissions. For units whose revenue is primarily derived from sales, we will develop a MOS using administrative sales, economic census sales, or administrative payroll. These may not be appropriate for units operating on a commission basis.

4.2.4. During the last sample selection we developed a procedure to identify sampling units that were inflating sample sizes beyond our initial expectations. We were able to keep the final sample size in line with our initial expectations by moving those units from noncertainty to certainty strata. For BSR-06, this procedure is being refined to identify these units as part of the selection process. In addition, a mechanism is being developed to allow only those units contributing the most to the increase to be moved to certainty strata.

4.2.5. A spreadsheet has been developed that allows easy gathering and updating of sampling requirements. Using the spreadsheet will eliminate omission and typographical errors and clerical redundancies. Using the spreadsheet entries, a separate program combines NAICS industries to define the sampling levels and assign sampling recodes. The sampling levels may be either hierarchical or not. The program also determines which recodes require coefficient of variation constraints.

4.2.6. For the wholesale trade area, we will design samples that allow us to estimate sales and inventories on a 2002 NAICS basis. Annual estimates are required for total wholesale, merchant wholesale, distributors, MSBOs, and electronic markets and agents and brokers. Monthly estimates are required only for distributors. Units included in the monthly survey are a subsample of those selected for the annual survey. Experience with the expanded 2003 ATS has pointed out that for wholesalers having establishments in both the traditional ATS universe and in the MSBO universe, it will be advantageous to collect data for both simultaneously. Our previous sample did not accommodate that. Research is underway to develop sample designs that account for these publication and collection requirements.

²Note that a new sample for the Monthly Advance Retail Survey is also selected mid-way between this 5 year period.

4.2.7. As a part of BSR-06, we will reselect the MSBO and ATS samples and will select a sample for the electronic markets and agents and brokers. We will research the simultaneous selection of a sample of these three components. Some of the factors to consider in developing methods to simultaneously select samples for the expanded annual survey are: 1) for sampling units with activity in multiple components, measures of size must be developed to avoid assigning large weights to units with large sales in one of the samples, 2) the sample used for the Monthly Wholesale Trade Survey (MWTS) has traditionally been a subsample of the ATS, 3) the coverage of the MWTS will not be expanded, and 4) MWTS results are benchmarked to the ATS results.

4.2.8. For the retail trade area, we will design samples that allow us to estimate annual and monthly sales and inventories. Two monthly surveys are conducted – the Monthly Advance Retail Trade Survey (MARTS) and the Monthly Retail Trade Survey (MRTS). The MARTS provides the earliest indication of retail sales. The later MRTS provides sales estimates at detailed industry levels and includes estimates for inventories. MARTS sales estimates and MRTS inventory estimates are primarily at the subsector levels. Units included in the MRTS are a subsample of those selected for the annual survey. Since the industry detail required for MARTS sales and MRTS inventory estimates is less than that required for MRTS sales, subsamples of the MRTS are selected for both MARTS and MRTS inventory. Research is underway to devise ways to minimize the number of units in the MARTS and inventory subsamples that must be taken with conditional certainty, to determine whether the inventory subsample can be improved by using inventory in lieu of payroll for allocation purposes, and to determine the most effective industry stratification for the MARTS subsample.

4.3. Implementation

We will begin using the new samples for the monthly retail and wholesale surveys starting with estimates to be released in November 2006. At that time, October 2006 estimates from the MARTS and September 2006 estimates from the MRTS and the MWTS will be published. We begin using the new sample for the annual surveys starting with estimates for 2004 and 2005 to be released in Spring 2007. Concurrent with the new samples we will adopt the 2002 NAICS.

5. Restatement of Historical Time Series

5.1. Motivation

The Census Bureau restates its historical retail and wholesale time series annually through a benchmarking process. Benchmarking revises the annual survey level estimates to be consistent with the latest available census results. Monthly survey level estimates are subsequently benchmarked to the revised annual results. Except for those resulting from data corrections and other real changes, the benchmarking process minimizes differences between revised and previously published current-to-prior month and current-to-prior year estimates. The time span of the restatement and the methods we use vary depending on several factors. These include such things as the availability of new census results, changes to the industry classification system, the introduction of new samples for the annual and monthly surveys, or significant data corrections. Each of these will affect how we restate historic series over the next several years.

5.2. Research

Most of our time series research will center on how best to deal with changes related to the industry classification system. The 1997 NAICS was adopted, but not fully implemented, for the 1997 Economic Census and for the annual and monthly survey data released since April 2001. The 2002 census has implemented the 2002 NAICS which includes changes to the prior implementation of the 1997 NAICS. Benchmarking methodology decisions regarding industry classification issues will be based on results from the following evaluations and research:

5.2.1. We have evaluated the expected impact of full 1997 NAICS implementation on published annual sales estimates. Evaluation results indicate which industry series are likely to present the most challenges as we restate the historical estimates.

5.2.2. Research will be conducted to determine how to restate both the 1992 and 1997 census results to reflect the 2002 NAICS and full implementation of the 1997 NAICS. We will start by investigating extensions and modifications to the methods used during the prior sample revision to restate the 1992 census results (Detlefsen). Restated 1992 and 1997 census results will be used as constraints in the benchmarking process to restate historical annual estimates. These will also be used to create factors for adjusting monthly and annual survey estimates for input to the benchmarking procedure.

5.2.3. The benchmarking process used to restate the time series requires both historic annual and monthly

period-to-period ratios. For industries for which NAICS was identically implemented in the 1997 and 2002 censuses, we will use ratios estimated from the existing historical series as input. For the other industries, research will be conducted to determine the appropriate ratios. We will first investigate the feasibility of reclassifying sampling units to a 2002 (full 1997) NAICS basis to provide input ratios. If reclassification introduces unacceptable biases, we will consider collecting data from a small supplemental sample that targets the industries of particular concern.

5.2.4. Historically we have not benchmarked annual inventory and purchases estimates to the census - either because the census and annual surveys treated auxiliary locations differently or because the census did not collect the data. In the past we derived restated estimates by adjusting historical inventory and purchases estimates to ensure consistency with the inventory-to-sales and purchases-to-sales ratios estimated from the most recent sample. For industries that were not implemented identically in the 2002 and 1997 censuses, we will need to conduct research similar to that noted in 5.2.3.

Other research to be conducted includes the following:

5.2.5. Since we do collect wholesale inventory and purchases in the census, we will evaluate whether it is now feasible to benchmark the annual wholesale inventory and purchases estimates to the census results. If this proves to be a viable method, we will use this method for benchmarking the annual wholesale inventory and purchases rather than the method noted in 5.2.4.

5.2.6. We will evaluate whether it is now advisable to benchmark the annual estimates for the Wholesale Farm Products industry group to the census results. This was not previously done because of differences between census and annual survey treatment of them.

5.3. Implementation

The Spring 2005 benchmarking operations will be the first to make use of the 2002 Economic Census results. Those results will reflect the implementation of the 2002 NAICS and will incorporate changes to the Census Bureau's prior implementation of the 1997 NAICS. The Spring 2006 benchmarking operations will incorporate any revisions made to the 2002 census. In Fall 2006, concurrent with the introduction of the new samples for the monthly surveys, we will link the results from the old and new

samples. The Spring 2007 benchmarking will reflect the availability of annual survey results from the new samples.

6. Data Collection Integration

6.1. Motivation

In Economic Census years, we traditionally mail both census questionnaires and annual survey questionnaires to collect data from retailers and wholesalers. There is considerable overlap in the data requested for the census and the annual surveys, so integrating the collection of data for the census reference year may be a reasonable way to reduce respondent burden and costs. We began investigating the feasibility of integrating the census and annual survey data collection with the 2002 Economic Census. The following section discusses this unfolding study.

6.2. Research

Research plans for this study were developed recognizing two general differences between the census and the annual surveys: 1) questionnaire content and 2) collection units. While there is considerable overlap in questionnaire content there is not perfect agreement. For the census, data are collected from each establishment of a company. For the annual surveys the collection unit is either an aggregate of several establishments from a multi-establishment company or one establishment from a single-establishment company. Our plan consists of:

- Integrating data collection during the 2002 census for single-establishment companies in industries for which census questionnaires include all items required for the annual survey.
- Evaluating the 2002 single-establishment company data collection integration.
- Expanding single-establishment company integration in the 2007 census in light of evaluation findings and recommendations.
- Laying the groundwork for a multi-establishment company integration feasibility test with the 2007 census.

There are several parts to this evaluation that are in various stages of progress:

6.2.1. Prior to mailing the 2002 census questionnaires, a study was conducted to evaluate for

which industries collection could be integrated because the census questionnaires included all the annual survey data items. Based on the study, we integrated collection for single-establishment companies in the wholesale sector. Retailers were not integrated since the census did not collect items, such as inventories and purchases, that were required for the Annual Retail Trade Survey (ARTS).

6.2.2. An evaluation of census response receipt timing was conducted for both the retail and wholesale single-establishment companies. This was done to assess whether the census data were received soon enough for use in the annual surveys. If census response timing lagged what was needed for the annual surveys, analysis and publication of annual survey results could be delayed. This study showed return patterns to be nearly identical for the census and the annual surveys. (While retail data collection was not integrated for 2002, we are using census and annual survey results to evaluate the likely impact of integrating retail in the future.)

6.2.3. Evaluations are underway to compare response rates of retail single-establishment companies to basic data items that are collected by both the census and the annual surveys. When both a census and annual survey response are received for an item, the reported values are being compared and potential sources of difference are being investigated. Administrative and reported prior year annual survey data will be used to evaluate the two responses.

6.2.4. We will compare the 2002 ARTS industry estimates to those derived by substituting census data for retail single-establishment companies. Census data will be subjected to ARTS editing, imputation, and estimation procedures.

6.2.5. We will evaluate the procedures used for the 2002 integration to determine whether any modifications should be made to them prior to the 2007 Economic Census.

6.2.6. We will also compare the responses of multi-establishment companies in the 2002 annual surveys and the census. The comparisons and ensuing analysis will be more complex than for the single-units due to the differences between annual survey and census collection units. This analysis will help to shape a multi-establishment company integration feasibility study for the 2007 census.

6.3. Implementation

The results of this evaluation will be used to help

determine whether to expand single-establishment company integration in 2007. If a decision is made to expand the single-establishment company integration, modifications may be needed to the processes used for the 2002 integration. Greater coordination in the development of census and annual surveys, including the development of questionnaires, will be required to maximize the amount of integration possible. Processes may need to be modified to accommodate the multi-establishment company feasibility study to be conducted in 2007. Planning must start soon enough to implement required modifications.

7. Summary

The projects described in this paper contribute to the Census Bureau's commitment to produce quality retail and wholesale data that is relevant, responsive to customer needs, and attentive to minimizing respondent burden.

Data from the expanded Wholesale Annual Trade Survey will be used by the Bureau of Economic Analysis to improve its GDP estimates, particularly the inventory investment portion. The 2006 Business Sample Revision will be the venue for keeping samples up-to-date and representative of the retail and wholesale sectors, redistributing response burden, introducing the 2002 NAICS, accommodating new survey requirements, and introducing improvements and efficiencies. Historical retail and wholesale data will be restated to a 2002 NAICS basis and benchmarked to the 2002 Economic Census results to ensure comparability to the census and continuity of the historical time series. Expanding census and annual survey data collection integration for the retail and wholesale sectors for the 2007 Economic Census will reduce respondent burden and cost.

8. References

Anderson, A., Tuttle, D., and Stettler, K. (2003), "Annual Trade Survey – Manufacturers' Sales Branches and Offices Results and Recommendations from Cognitive Testing, Round 2," Economic Statistical Methods and Programming Division, U.S. Census Bureau Internal Document.

Briscoe, M. (2003), "Testing Plain Vanilla (PV) Bounds Development Software for Deriving BSR Edit Bounds," Service Sector Statistics Division, U.S. Census Bureau Internal Document.

Detlefsen, R.E., Shimberg, M.Z., and Davie, Jr., W.C. (2002), "Methods Used to Develop Retail and Wholesale Time Series Under the North American

Industry Classification System,” *ASA Proceedings of the Joint Statistical Meetings*, pp. 752-757.

Executive Office of the President (1998), *North American Industry Classification System, United States 1997*, Washington, D.C.: U.S. Office of Management and Budget.

Executive Office of the President (2002), *North American Industry Classification System, United States 2002*, Washington, D.C.: U.S. Office of Management and Budget.

Kinyon, D., Glassbrenner, D., Black, J., and Detlefsen, R. (2000), “Improving the Design of the

Sample Used for Business Surveys Conducted by the United States Bureau of the Census,” *Proceedings of the 2000 American Statistical Association, Section on Survey Research Methods*, pp. 388-393.

Thompson, K.J., “Ratio Edit Tolerance Development Using Variations of Exploratory Data Analysis (EDA) Resistant Fences Methods,” *Statistical Policy Working Paper 29*, available from the Federal Committee on Statistical Methodology (www.fcsm.gov/99papers/Thompson.pdf)

Thompson, K.J. and Sigman, R.S. (1999), “Statistical Methods for Developing Ratio Edit Tolerances for Economic Data,” *Journal of Official Statistics*. **15**, pp. 517-535.