

## Miscellanea

Under the heading Miscellanea, essays will be published dealing with topics considered to be of general interest to the readers. All contributions will be refereed for their compatibility with this criterion.

### Evaluation of the 1977 Economic Censuses of the United States<sup>1</sup>

#### 0. Introduction

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Every five years the Bureau of the Census undertakes censuses covering most of the establishments conducting economic activity in the United States. These establishments span many Standard Industrial Classifications (SICs). The 1977 Economic Censuses in fact include the following individual censuses: Construction Industries, Mineral Industries, Manufactures, Transportation, Retail Trade, Wholesale Trade, and Service Industries. The Census of Governments covers local governments and the Census of Agriculture covers farming. Other areas of economic activity, especially those heavily regulated by government such as financial institutions and insurance companies, have not been covered by censuses.

In the past there have been few formal evaluations of the censuses. For the 1977 Economic Censuses, the Bureau of the Census decided to undertake a broad, formal program of evaluation. Bailar and Kallek (1980) describe the role of this evaluation. Because of monetary and personnel constraints, only a few different studies could be undertaken. These could not possibly

cover all aspects of each individual census; however, ideas for evaluating many areas of the censuses were considered. The final selection of the areas to be evaluated by studies depended on a number of considerations including feasibility of the study (likeness of successful conclusion), informal cost-benefit analysis, availability of personnel, suspicion of problems in the specific area, and degree of criticalness of the area to final data products.

In the following sections summaries of each of the evaluation studies are given. These studies are:

1. Survey of Sole Proprietors for the 1977 Censuses Evaluation,
2. Evaluation of Coverage of the Administrative Records Frame for the 1977 Economic Censuses—Employer Segment,
3. Evaluation of Coverage of the Administrative Records Frame for the 1977 Economic Censuses—Nonemployer Segment,
4. Evaluation of Employer Nonresponse Processing in the 1977 Census of Construction Industries,
5. Evaluation of the Use of Administrative Record Data for Nonemployers in the 1977 Census of Construction Industries,
6. The Evaluation of the Use of Administrative Record Data for Below Cutoff Estab-

<sup>1</sup> The summaries presented in this article have been written by employees at the U.S. Bureau of the Census, Washington D.C. 20233, U.S.A.

- lishments in the 1977 Censuses of Retail Trade and Service Industries,
7. Evaluation of the Use of Administrative Record Data for Nonemployers in the 1977 Censuses of Retail Trade and Service Industries,
  8. The Evaluation of the Use of Administrative Record Data for Establishments which Were Nonrespondents to the 1977 Censuses of Wholesale Trade, Retail Trade or Service Industries,
  9. Content Evaluation of the 1977 Economic Censuses, and
  10. Evaluation of the Geographic Coding for the 1977 Economic Censuses.

The first three studies involved coverage evaluation of the censuses. The next five studies evaluate the use of administrative data for nonrespondents and smaller establishments. The ninth study, a content evaluation, measured the accuracy of the reported data for establishments that responded to the 1977 censuses. The last study evaluated the geographic coding of the establishments in the censuses. In total these studies showed that in areas of importance the 1977 censuses produced statistically sound data products, but that there were areas where improvements could be made.

## 1. Survey of Sole Proprietors for the 1977 Censuses Evaluation

*Kirk M. Wolter*

The Survey of Sole Proprietorships was part of the general evaluation program for the 1977 Economic Censuses. The economic censuses cover organizations of various legal forms of which the main ones are sole proprietorships, partnerships, and corporations. This study's main purpose was to estimate undercoverage of sole proprietorships in the censuses. A unique feature of the project was that a post-enumerative sample of households was the vehicle for measuring undercoverage. This sample was independent of the censuses themselves, which were based exclusively on establishment reports. A detailed report of this survey is in Wolter (1983).

The study was motivated by the concern that the economic censuses may miss large numbers of small sole proprietorships. In general, a proprietorship was included in the 1977 Economic Censuses if and only if the proprietor filed either a Schedule C with the Form 1040 Federal Tax Return for 1977 or a Form 941 for at least one quarter of 1977. If

the proprietor failed to report on the Schedule C and reported no wages on the Form 941, then the proprietor's sales (or receipts) were missed by the censuses. This survey was conducted to measure the extent of such misses. Because of prominent skewness in the economic censuses populations, however, the impact of the missed sole proprietorships as a percent of published census totals was expected to be small.

The approach for measuring undercoverage consisted of the following essential features:

- (i) The Current Population Survey (CPS) was used as a sample of households in the United States. CPS normally gathers labor force information each month from a probability sample of households. In the March 1978 CPS, supplementary questions were asked of the household residents as to whether there was a business from which they derived self-employment income during the calendar year 1977.

- (ii) A list of businesses was then prepared from the responses in step (i). Each of these businesses was mailed a questionnaire, the NC-X5, to obtain information on Standard Industrial Classification, receipts, and identification numbers. The businesses were then matched to the economic censuses, and each business was determined to have been included or missed.
- (iii) Estimates of Census undercoverage were prepared from the survey data for businesses that were determined to have been missed in step (ii). In theory, the estimators of undercoverage should be unbiased for the sole proprietorship component, because the household frame was complete and every sole proprietorship in scope to the 1977 Economic Censuses was linked to a household.

The study produced some interesting results that must be interpreted with a degree of caution. We issue this warning because of potential nonsampling errors in the survey results and small survey sample sizes. Little could be done about either of these problems. In the first case there were little or no external data available for editing the survey responses. Editing was confined to checks for reasonableness and internal consistency. Consequently, reporting or keying errors may exist in our data to some unknown degree, and these would lead to either matching errors in step (ii) or estimation errors in step (iii). Whenever possible, however, potential nonsampling error was dealt with by forcing the estimators to be as conservative as possible, i.e., estimators of total census misses are as downward biased as possible.

The second problem, small survey sample sizes, affects the variance of our survey statistics. Estimates of variability are presented to assist the reader in the interpretation of the results. But in some cases, sample sizes

are just so small that neither the estimated undercounts nor the corresponding variance estimates should be ascribed much importance.

Regardless of these limitations, much was learned about undercoverage in the 1977 Economic Censuses. First, the populations of businesses missed by the censuses are among the most highly skewed that we have encountered. Of course, the populations of businesses included in the censuses are also highly skewed, but not to the degree shown by the missed businesses. Most of the census misses are small, say on the order of \$50 000 sales/receipts or less. In all trade areas, however, there were a few extremely large outlying values. The problem of large variance, earlier attributed to small sample sizes, is worsened by the presence of extremely large outliers.

To alleviate the outlier problem, four estimates of missed sales/receipts were produced for each trade area. The estimators implemented four of the standard statistical methods for treating large observations. In this summary we shall describe results for the fourth estimator, which operates by truncating large observations at the value of a cutoff (\$500 000 in this analysis). The undercount estimates produced by this estimator fall between those produced by the other estimators.

In construction industries we estimate that 1.7 percent (.3)<sup>2</sup> of receipts and 13.4 percent (1.1) of businesses were missed by the census. We conclude that completeness of the census was reasonably good, at least as regards receipts. The number of businesses missed was relatively large, but such businesses tend to be quite small in size. Among nonemployers, however, census coverage was troublesome. We estimate miss rates of 14.4 percent (2.0) and 19.5 percent (1.5) for

<sup>2</sup> After each estimate, the estimated standard error appears in parenthesis.

receipts and number, respectively. The coverage of employers was very good.

In retail trade, we estimate that 1.1 percent (.2) of sales and 4.4 percent (.5) of businesses were missed by the census. As was the case for construction, census completeness was good. Furthermore, completeness was very good among retail employers. Retail nonemployers were missed at the rates of 15.8 percent (3.4) and 10.3 percent (1.4) for sales and number, respectively. Again, coverage in this component of the census is troublesome.

In service industries, the patterns of undercoverage are similar to those observed for construction and retail. Overall coverage is good, coverage of employers very good, and coverage of nonemployers troublesome. The specific statistics are

Standard Industrial Classification Codes	Receipts	Number
70–79	3.0 % (.5)	13.7 % (1.0)
80–81	4.8 % (.9)	12.9 % (1.3)
82–85, 87, 89	5.4 % (1.2)	20.1 % (1.8)

for overall (i.e., employers and nonemployers combined), and

70–79	24.8 % (3.6)	19.2 % (1.3)
80–81	38.3 % (5.0)	26.1 % (2.6)
82–85, 87, 89	22.3 % (4.0)	23.4 % (2.1)

for nonemployers. While the pattern of undercoverage observed here is the same as for construction and retail, the reader will note that the magnitude of the undercoverage is now higher.

The census coverage in wholesale, manufacturing, and mining is probably very good. In each of these trade areas the number of observed census misses was so small that it was not worth computing formal estimates of undercoverage. To a large degree, coverage is successful in these censuses because problems have been defined away. The nonemployers, so troublesome in the other censuses, are defined out-of-scope of these censuses.

2. Evaluation of Coverage of the Administrative Records Frame for the 1977 Economic Censuses – Employer Segment

Paul S. Hanczaryk and John M. Sullivan

In assembling the mailing and control lists for the 1977 Economic Censuses, the Bureau of the Census relied on a variety of administrative record information from the Internal Revenue Service (IRS) and Social Security Administration. Through their use, along with regularly maintained Census Bureau lists of multiestablishment firms, the population of

active businesses to be included in the economic censuses was defined.

The primary purpose of this evaluation was to assess the quality of the assumption that the group of establishments classified as out-of-scope, and therefore not given a chance for coverage in the censuses, were indeed out-of-scope. Results from the evaluation showed

the reliability of administrative records in determining census coverage. The details of the study can be found in Hanczaryk and Sullivan (1979).

The 1977 out-of-scope universe was comprised of the following 11 exclusion categories:

Category	Number of Estab- lishments
A – Government organizations that elect social security coverage.	55 188
B – Establishments located in American Samoa.	154
C – Establishments involved in international operations.	1 008
D – Establishments that are foreign subsidiaries of domestic corporations.	281
E – Federal Government establishments not covered by social security.	1 235
F – State or local government establishments not covered by social security.	64 999
G – Establishments located in foreign areas.	56
H – Establishments that are out-of-scope of the economic censuses but contain in-scope Standard Industrial Classification (SIC) codes. (For example, establishments in the transportation industry that are regulated by the Interstate Commerce Commission (ICC).)	8 865
I – Establishments with no name and address on the record.	0
J – Establishments in Puerto Rico, Virgin Islands, or Guam that are out-of-scope of the economic censuses for those areas.	5 932
K – Establishments with out-of-scope SIC codes. These include agricultural production and services; forestry, fishing, and trapping; certain industries in transportation; public utilities; finance, insurance, and real estate; religious organizations; private households; and public administration.	420 166
Total	557 884

The objectives of the evaluation were to document any existing misclassification<sup>3</sup> in the out-of-scope universe, to show the corresponding census undercoverage rate, and to identify areas of concentrated misclassification. In order to meet these objectives, we examined sample cases from the above exclusion categories to verify administrative

record information. This was accomplished primarily through a mailout of the 1977 Economic Censuses General Schedule. Because most out-of-scope establishments originated from Category K (establishments with out-of-scope SIC codes), and the majority of misclassification resulted from establishments in Category K, the results of the study emphasized this area.

<sup>3</sup> Throughout this article, “misclassification” refers to establishments and corresponding data that should have been covered in the 1977 Economic Censuses.

Misclassification of the sample cases occurred in only three of the 11 exclusion categories: Category C (international

operations), Category H (out-of-scope establishments that contain in-scope SIC codes), and Category K. As can be seen in the following table, the overall misclassification in the out-of-scope universe was estimated to be 17 203 establishments:

Exclusion Category	Misclassification	
	Number of Establishments	Percent of Category
Category C	79	7.9
Category H	1 463	16.5
Category K	15 661	3.7
All Other Categories	0	.0
Total	17 203	3.1

The overall undercoverage for census data was approximately 17 203 or .5 percent for establishments, 124 169 or .2 percent for employees, and \$1 033 462 or .2 percent for annual payroll. The three in-scope divisions that contained the highest undercoverage rates were construction, transportation, and services. Of the 3 603 establishments that should have been covered in construction 2 854 originated from Standard Industrial Classification (SIC) major group 65, which represents real estate establishments. Often, the misclassified establishments contained

both construction and real estate activities, and, as is the practice, were coded to the industry with the highest percentage of total receipts (i.e., construction). At the time the SIC was originally assigned, the percentage distribution of receipts could have been different and probably was.

We attempted throughout the evaluation to identify specific areas of misclassification, in order that they may be corrected in future economic censuses. Each establishment has an associated record that contains control file information, including a Principal Industrial Activity (PIA) code, which is the classification code received from the IRS and which is converted to an SIC code. We determined that considerable misclassification occurred for out-of-scope establishments that contained in-scope PIA codes. Additionally, establishments that were excluded because they were thought to be regulated by the Interstate Commerce Commission (ICC) caused substantial misclassification. Specifically, a type-of-operation (T/O) code of 55 is used primarily to indicate ICC regulation of establishments. We found that records with a T/O code of 55 assigned during the 1971 or 1972 processing produced significant misclassification. The following table details the number of establishments in these two specific areas of misclassification and summarizes the estimated effect on total misclassification if these areas were refiled:

Areas of Misclassification	Impact if Refiled		
	Requiring Mailing	Expected Corrections	Change in Overall Misclassification Percent
In-scope PIA Code	24 578	4 968	3.08 to 2.19
T/O 55 Assigned in 1971 or 1972	5 748	1 463	3.08 to 2.82
Total	30 326	6 431	3.08 to 1.93

3. Evaluation of Coverage of the Administrative Records Frame for the 1977 Economic Censuses – Nonemployer Segment

Deborah Diehl Penrod and John M. Sullivan

This study evaluated the accuracy with which certain types of nonemployer businesses were excluded from coverage in the 1977 Economic Censuses. The details of this evaluation study can be found in Diehl and Sullivan (1981).

Nonemployers, i.e., active revenue-reporting businesses without paid employees, were identified from the Internal Revenue Service (IRS) universe of tax returns for 1977. Corporation, partnership and sole proprietorship tax return extracts received from IRS were matched on Employer Identification (EI) Number to the Census Bureau's Standard Statistical Establishment List, which contains the universe of payroll reporting, or employer, businesses. Tax return extracts

with EI numbers not matched to the payroll universe, as well as all return extracts without EI numbers (most sole proprietors use their Social Security Number for tax reporting) formed the preliminary universe of 6 920 000 nonfarm nonemployers.

The preliminary file was then edited to yield two distinct segments: nonemployers within the scope of the censuses (nonemployer statistics are published for retail trade and the service and construction industries) and nonemployers excluded from the censuses.

This evaluation focused on the 3 064 000 nonemployers excluded from the censuses, according to the following criteria:

Reason for Exclusion	Number of Returns
1. Administrative record Principal Industrial Activity (PIA) code missing (unclassified).	327 000
2. Administrative record PIA code other than Construction, Retail or Services.	1 472 000
3. Administrative record business receipts less than \$1 000 if Services or \$2 500 if Retail (this edit excludes businesses with occasional or hobby activity).	806 000
4. Administrative record address insufficient for geographic coding.	7 000
5. Administrative record business receipts greater than \$250 000 if Services, or \$500 000 if Retail or Construction (this edit excludes businesses presumed to have paid employees reported under a separate EI number not entered on the tax return, they are excluded to avoid potential duplication).	32 000
6. Administrative record cost of labor/salaries and wages entries greater than \$4 000 if Construction, or \$1 000 if Retail or Service (also an indication of paid employment).	420 000
Total	3 064 000

Evaluation report forms were mailed to a sample of excluded businesses, and the information collected was used to verify administrative record activity codes and data. The survey also tested the assumptions that businesses with receipts, or cost of labor/salaries and wages, over the pre-determined maximums are employers.

The study concluded that an estimated 417 000 nonemployer businesses, with esti-

mated receipts of \$15.8 billion, would have been included in the censuses if not for incorrect administrative record information (exclusion categories 1, 2, 3 and 4) or incorrect assumptions made in the exclusion process (exclusion categories 5 and 6). Survey findings for each exclusion category are shown in the following table:

Exclusion Category	Nonemployers Determined to be Within the Scope of the Censuses	
	Estimated Number	% of Category
1 – PIA unclassified	149 000	46
2 – PIA out-of-scope	106 000	7
3 – under minimum receipts	25 000	3
4 – inadequate address	6 000	86
5 – over maximum receipts	9 000	28
6 – over maximum cost of labor/salaries and wages	122 000	29
All categories	417 000	14

The table shows that missing or incorrect tax return Principal Industrial Activity (PIA) codes (categories 1 and 2) are responsible for much of the problem. This is not easily resolved, as significant costs would be incurred to canvass these businesses for Standard Industrial Classification (SIC) information. Further, computerized name coding systems used by the Bureau would not be applicable, as the tax return contains the individual taxpayer's name and not the business name. In category 3, the errors in exclusion were virtually never caused by incorrect administrative receipts, but again were due to incorrect PIA codes (had the correct PIA been assigned to the return, it would have fallen into a trade area with a lower receipts criterion for exclusion and would not, in fact,

have been excluded). Category 4 simply reflects the inherent problems in transcribing and keying millions of addresses. The evaluation results for categories 5 and 6 showed that it is not always correct to assume that high receipts or the presence of cost of labor/salaries and wages are indicative of businesses with employees. It was found that automobile dealers, fuel oil dealers, doctors, and theatrical producers, for example, frequently had receipts over the maximum criteria but did not have employees. Also, for gas station proprietors, general contractors, engineers and others it was found that cost of labor/salaries and wages entries on the tax return often represent contract labor, and not actual employees. The study determined that the error rate in categories 5 and 6 could be



reduced substantially by using additional return information (i.e., the answer to the tax return question “was a Form 941 payroll report filed for this business?”) in conjunction with receipts and cost of labor/salaries and wage data. This will not be possible for 1982, though, as IRS omitted the question from 1982 tax returns.

Including the wrongly excluded 417 000 businesses in the censuses would have increased the number of nonemployers about 12 percent, and receipts values (for non-employers) about 20 percent. Mitigating the apparent significance of the results is the extent to which census published nonemployer statistics contain overcoverage (for example, tax returns erroneously PIA coded in-scope of the censuses), and the fact that nonemployer receipts pale in comparison to all receipts. The time and expense required to reduce the error

rates would be substantial with the exception of the proposed change in the edit to identify probable employers (exclusion categories 5 and 6).

The evaluation also revealed discrepancies between reported and administrative receipts. Significant discrepancies were examined through telephone follow-up of a subsample, and were resolved in favor of administrative records in almost all cases. Respondents, or their accountants, gave a variety of reasons for survey misreporting, including: reporting for the wrong year; incorrect approximations due to the time lag between the survey and reference period; including personal wages as part of receipts; and reporting for a different business. Respondent explanations may have been biased by their knowledge that discrepancies were identified using IRS data.

#### 4. Evaluation of Employer Nonresponse Processing in the 1977 Census of Construction Industries

*Edward K. Ricketts*

In the 1977 Census of Construction Industries, there was considerable nonresponse. The table below demonstrates the importance of imputing for establishments which do not respond to the Census. The imputation procedure used was to first match each nonrespondent to a respondent with the same 4-digit Standard Industrial Classification (SIC) code, in the same state, and with approximately the same size administrative payroll. Then the ratio of the response item to the

corresponding administrative item for the respondent was multiplied by the same administrative item for the nonrespondent. The administrative items including payroll, number of employees, and receipts are received from the Internal Revenue Service. When a suitable match could not be found, ratios using all respondent establishments at the 4-digit SIC level were used in a similar fashion.

## 1977 Census of Construction Industries (Employers Only)

	Number of Establishments (Thousands)	Number of Employees (Thousands)	Payroll (Millions \$)	Receipts (Millions \$)
All Establishments	475	4 234	54 566	221 622
Nonrespondents	133	716	8 846	36 358
Percent of Nonresponse	28	17	16	16

The objective of the evaluation study was to assess the effectiveness of the imputation procedure with respect to the four statistics given in the above table. A sample of 1 486 nonrespondent establishments was selected for special telephone follow-up, phone numbers were obtained through the information operators, and up to five tries were made to contact each of these establishments. There were a large number of cases for which a telephone number could not be obtained, and a large number that could not be contacted even with five tries. The results are based on 712 responses.

An estimated 17 000 establishments were found to be misclassified, at the 2-digit SIC level. This is 13 percent of the nonrespondents, or 4 percent of all establishments. 13 000 cases were reclassified into other construction industries, and 4 000 cases were found not to be in construction. A large proportion of the latter were construction supply firms of one type or another. The imputation procedure underestimated the total employment, the second statistic, for nonrespondent cases by 11 000 employees (about 1.5 percent). This was .26 percent of the total employment for all employer establishments. The procedure had underestimated payroll by \$22 million or .25 percent of the payroll for nonrespondent cases. This was .04 percent of all payroll. The procedure had underestimated total receipts, the fourth statistic, by \$325 million. This was .65 percent of the receipts for nonrespondents, and .11

percent of the total receipts for all employer establishments.

The combined effect of all the errors studied, on each of the four statistics was downward, but in no case greater than 1 percent at the all construction industries level. At the 2-digit level, SIC Group 16 (General Contractors, other than Buildings) decreased by 6 percent in number of establishments and by approximately 2 percent in the other three statistics. SIC Group 15 (General Contractors, Buildings) decreased by 4 percent in the number of establishments and by approximately 2 percent in the other three characteristics. SIC Group 17 (Special Trades Contractors) increased in number of establishments (1 percent) and employment (.4 percent) and decreased in payroll and receipts (.2 percent each). The downward shifts are due to the reclassification of cases out of construction SIC's. Due to programming limitations, standard errors of the estimates were not calculated, and thus the statistical significance of the results cannot be assessed.

Given the limitations of the available information for the nonrespondent cases (only the administrative data are available), the technique for imputation appears to have been reasonably effective with respect to the employment, payroll, and receipts. However, one improvement to the procedures that was put into effect with the 1982 Census of Construction Industries was to match each nonrespondent to a respondent based on the respondent's mailout SIC, not the

respondent's tabulation SIC as was done in the 1977 census. In the 1982 procedure the nonrespondent's mailout SIC was changed to the matching respondent's tabulation SIC, if the respondent's SIC changed. The new

procedure is especially useful when the mail-out SIC is likely to be in error. More detail about this study can be found in King and Ricketts (1980).

## 5. Evaluation of the Use of Administrative Record Data for Nonemployers in the 1977 Census of Construction Industries

*Edward K. Ricketts*

Information in the final summary report of the 1977 Census of Construction Industries (CCI) on establishments that have no employees (i.e. nonemployers), is derived from administrative sources. The published data consisted of a count of establishments and total receipts, by legal form of organization, by 2-digit Standard Industrial Classification (SIC) code, and by size of total receipts. The total number of such establishments in the 1977 CCI was 708 000.

A sample of 2 610 establishments was selected from this universe and mailed a short general questionnaire. The same questionnaire was used for employer establishments which had no SIC codes in the administrative records. The objectives of the study were to:

1. Assess the accuracy of the assumption that these cases were nonemployer firms;
2. Assess the accuracy of the SIC code which was derived from the Principal Industrial Activity code assigned by Internal Revenue Service; and
3. Estimate the differences between administratively collected receipts and Census Bureau collected data on receipts.

Relating to the first objective, of the 708 000 cases (establishments), an estimated 42 000 were duplicates of cases included in the employers tabulation of the CCI. These cases were larger, (\$84 000 average receipts), than the general cases in the nonemployer category (\$32 000 average receipts). Note that undupli-

cation with establishments originally SIC coded into other areas was not done.

An estimated 166 000 cases were found to be misclassified at the 2-digit SIC level. 86 000 of these cases were not in construction. Because comparable studies were not made in all other economic sectors, only 41 000 cases were reclassified into the construction sector by these studies. 80 000 cases in construction were misclassified at the 2-digit SIC level. This problem was most noticeable in SIC Group 16 (General Contractors other than Building Construction), where many Excavating and Foundation Work Contractors (SIC 1794) had originally been classified.

Prior experience with employer firms had shown that total receipts reported to the Census Bureau were likely to be larger than those reported to administrative agencies. The difference observed in the employers had been about 4 percent of the total receipts. For the nonemployers in 1977, the observed difference was nearly 26 percent, with administratively collected receipts lower. This was most noticeable in the Special Trade Contractors (SIC Group 17), and the General Building Contractor (SIC Group 15). There was virtually no difference in SIC Group 16.

The net results of these changes were to increase total receipts by one half of one percent (\$17 805 million to \$17 887 million), even though the number of nonemployer firms was reduced by 12 percent (from 708 000 to

621 000). The greatest effect was on SIC Group 16, which lost 75 percent of establishments and 55 percent of receipts. In the study of employer firms, the change was in the same

direction, but not to the same extent. Details of this study are given in King and Ricketts (1980).

## 6. The Evaluation of the Use of Administrative Record Data for Below Cutoff Establishments in the 1977 Censuses of Retail Trade and Service Industries

*Carol S. King and Mitchell L. Trager*

For each Standard Industrial Classification (SIC) in the retail trade and selected services areas, a cutoff was set so that each single unit establishment with annualized payroll above the cutoff was mailed a 1977 Economic Censuses questionnaire. For employer establishments with payroll below the cutoffs, an approximate 10 percent sample was also mailed questionnaires as part of the censuses. For the balance of the below cutoff establishments, administrative record data were used in lieu of response data for the basic data items of sales/receipts, payroll and employment. The below cutoff evaluation study was designed to compare the responses for the basic data items for this 10 percent sample with the administrative data that would have been tabulated had this sample not been mailed. Through this comparison, estimates of the differences between response data and administrative data for all below cutoff establishments could be obtained.

The comparisons between the census response data (i.e., tabulated data) and the data that would have been used had no response been available (i.e., administrative data) were accomplished by examining ratios of administrative data to tabulated data for various SIC groups and by examining shifts in sales and annual payroll by size classes. On the whole, the tabulated data of the below cutoff

establishments were higher than the administrative data.

For retail, the evaluation study estimated that only 95.8 percent of the establishments would have been SIC coded as retail and thus tabulated in the retail census had they been mailed a census questionnaire. For the establishments that remained in retail, administrative sales and annual payroll were respectively 13.0 percent (.5)<sup>4</sup> and 3.4 percent (.2) lower than the sales and annual payroll available from retail census response data. The study showed that for 48.1 percent of the retail establishments, administrative sales and census response sales were within 5 percent of each other. For 44.8 percent of the establishments, census annual payroll and administrative annual payroll were within 5 percent of each other. Even though response data were higher overall than administrative data, for a substantial minority of establishments the opposite was true.

For services, the evaluation study estimated that only 97.4 percent of the establishments would have been SIC coded as service establishments and thus tabulated in the service census had they been mailed a census questionnaire. For the establishments that

<sup>4</sup> Numbers in parantheses after estimates are estimated standard errors.

remained in services, administrative receipts and annual payroll were, respectively, 9.0 percent (.3) and 8.7 percent (2.7) lower than the receipts and annual payroll available from the service census response data. The study showed that for 49.0 percent of the service establishments, administrative receipts and census receipts were within 5 percent of each other. For 46.7 percent of the establishments, census annual payroll and administrative annual payroll were within 5 percent of each other. As in retail, census response data were higher overall than administrative data, even though for some establishments the reverse was true.

As was mentioned above, the study determined that SIC classification errors were not too severe at the retail and service levels if census questionnaires were not mailed. The study also estimated that 89.6 percent of the

retail establishments and 96.1 percent of the service establishments would have been coded into the same 2-digit SIC had they been mailed a census questionnaire. The misclassifications are larger at finer SIC levels. When misclassifications do occur, the product or service is likely correct, but the customer to whom it is being offered appears to be incorrectly determined. For other information about this evaluation study, see King and Trager (1981).

Though this study showed substantial differences between administrative record data and census collected data, these differences were not unexpected. Previous evaluation studies have shown that census response data are higher, especially in the area of sales or receipts. No evaluation studies, including this one, have tried to uncover and to quantify in a statistically valid way the reasons for the differences.

## 7. Evaluation of the Use of Administrative Record Data for Nonemployers in the 1977 Censuses of Retail Trade and Service Industries

*Michael Z. Shimberg and Mitchell L. Trager*

Instead of mailing to nonemployer establishments in the 1977 Censuses of Retail Trade and Service Industries, administrative record data were used. These data were used both to code each establishment into a Standard Industrial Classification (SIC) and to account for the establishment's sales or receipts. These establishments, which were usually small in receipts or sales, were not mailed census questionnaires in order to reduce respondent burden and processing cost. The administrative data for these establishments came almost entirely from the Internal Revenue Service Form 1040 schedule C and Form 1065 records.

In order to evaluate the quality of the administrative data, the Census Bureau

selected a stratified sample of approximately 10 000 establishments out of the approximately 1 700 000 nonemployer establishments tabulated in the retail and service censuses. For this study service only includes SICs beginning with 7 (except 702 and 704) and SICs 8072, 81, and 891. The evaluation study consisted of a survey in which each establishment in the sample was mailed a short questionnaire to ascertain its SIC and receipts. Comparisons were then made between the data reported in this survey and the administrative data tabulated in the censuses. These comparisons uncovered some serious deficiencies in the administrative record data.

The study estimated that only 63 percent of administratively coded retail establishments responded as retail. In the following 2-digit SICs, less than 50 percent of the administratively coded establishments in the study were found in the same SIC:

SIC	Description	Percent
52	Building Materials, Etc.	31
53	General Merchandise Stores	23
57	Furniture Stores, Etc.	34
59	Miscellaneous Retail	44

Of the establishments coded into retail by both administrative records and the results of the evaluation study, administrative sales were 7.1 percent (3)<sup>5</sup> higher than the response sales from the evaluation survey. This result was unexpected and still remains unexplained. When all establishments coded as retail by administrative records are examined, administrative sales were 9.5 percent lower than the response sales from the evaluation survey. These results varied by detailed SIC, and for many individual establishments, administrative sales were higher than response sales.

For services, the study estimated that only 70 percent of the administratively coded service establishments responded as services. In only one 2-digit SIC did less than 50 percent of the administratively coded establishments respond in the same SIC. This was for SIC 73,

business services, where only 43 percent of the establishments responded in the same SIC.

Of the establishments coded into services by both administrative records and the results of the evaluation study, administrative receipts were .7 percent (2) higher than response receipts from the evaluation survey. This difference was not statistically significant because of sampling error. When all establishments coded as services by administrative records were considered, administrative receipts were 12.3 percent lower than response receipts.

This evaluation study thus showed some significant differences between administrative data and census response data. Some insight into the differences in SIC coding was gained. Many times coding of administrative records appeared to be wrong due to errors in class of customer rather than errors in the product or service classification. For example, an establishment may sell used automobiles and so report on the administrative record; but if the class of customer is missing, e.g., individuals or business establishments, this establishment could either be in retail with SIC 5521 or wholesale with SIC 5012. In order to avoid questioning the evaluation study respondents about their administrative record receipts data, no direct questions were asked about the differences between response receipts and administrative receipts when these were different. Hence no reasons for these differences were obtained.

<sup>5</sup> Numbers in parantheses after estimates are estimated standard errors.

## 8. The Evaluation of the Use of Administrative Record Data for Establishments which were Nonrespondents to the 1977 Censuses of Wholesale Trade, Retail Trade or Service Industries

*Thomas C. Dyke*

The purpose of this study was to investigate the differences between the administrative record data for establishments which were nonrespondents to the 1977 Censuses of Wholesale Trade, Retail Trade or Service Industries and the reported data for these establishments acquired by intensive follow-up procedures used in the evaluation study. The universe for the study consisted of those establishments which did not respond to these 1977 Censuses except for establishments in Alaska or Hawaii.

Since administrative records were usually used in the censuses to impute data for these nonrespondent establishments, the evaluation survey was designed to obtain data from a sample of these delinquent establishments and compare certain key data items. These data items were sales/receipts, annual payroll, first quarter payroll, and first quarter employment. The sample was designed and selected in late 1978 and early 1979 after nonrespondents to the censuses were identified. Within each of the three censuses, the sample was stratified by type of unit, by Standard Industrial Classification (SIC) code, and by an annual sales/receipts value carried on the mailout record. In all cases, a systematic sample was chosen within each stratum with the sample sizes designed to obtain an approximate 2.5 percent coefficient of variation (CV) on the ratio of reported to administrative receipts.

Creation of the final sample data was a process involving several stages. Unfortunately, an error was made such that the resulting sample did not represent the precise universe that was desired. The ultimate universe for the sample was those nonresponding estab-

lishments for which the sales/receipts stratification value was between \$50 000 and \$16 500 000. This universe contained 171 149 single-unit establishments (those belonging to companies with only one establishment) and 33 961 multiunit establishments (those belonging to companies with more than one establishment). The total sample size was 3 903 establishments, with 2 680 single-units and 1 223 multiunits. The telephone interviewing began in March 1979. Data collection lasted throughout all of 1979, terminating in the beginning months of 1980. The data were compiled on actual census forms and were eventually keyed from the forms. Analysis of the data began in June 1980. A time-consuming editing process was necessary for these keyed data to produce the files that were used for the estimation of the ratios. This editing was mainly concerned with item nonresponse for data on the forms and for problems connected with the Census File Number, the primary identifier for matching an establishment's reported data in the evaluation to its initial record. Minor problems were also encountered with duplicate returns and placing an establishment in the proper census because of uncertainty connected with the SIC code.

Of the 3 903 establishments in the sample, interview records were generated for 3 279 establishments, for an 84 percent response rate. Single-unit establishments displayed a higher response, 91.5 percent, than multiunit establishments which had a response rate of 67.7 percent.

There is some reason to suspect that the data collected in the evaluation study were not completely accurate since the data were

collected by telephone interviewing and the universe was those establishments which already exhibited their reluctance to respond to the 1977 Censuses. However, there is no evidence to suggest that this observation should lead to invalidating the results of the study. While too much faith should not be placed in exact values, certain trends are quite clear. Using a ratio estimator of survey reported data to administrative data, there is little doubt that overall the reported data exceeded the administrative data. The differences observed varied widely by the variable in question and the census area, but the employment data showed larger differences than the other variables. Also, multiunit establishments displayed this phenomenon much more strongly than did single units.

To alleviate the problem of outliers in the

survey estimates, various methods were used for treating outliers. In this summary we give the results for one such estimator. In this estimator, the reported value was set equal to 7.5 times the administrative value if it was greater than that, and the reported value was set equal to the administrative value divided by 7.5 if it was smaller than that. Using this estimator, the table below summarizes the findings:

The ratio estimator of reported data to administrative data exceeded 1.0 for each variable studied in the three censuses, but as the table below shows, the ratio was not always significantly different from 1.0. Similar results held when single-unit establishments and multiunit establishments were examined separately. For further results and a detailed explanation of this evaluation study, see Dyke (1984).

Ratio: Reported Data to Administrative Data<sup>6</sup>

Census Item	Wholesale Trade	Retail Trade	Service Industries
Sales/Receipts	1.038 (.0355)	1.053* (.0262)	1.113** (.0296)
Annual Payroll	1.103** (.0315)	1.041* (.0192)	1.068* (.0278)
1st Quarter Payroll	1.134** (.0343)	1.054** (.0204)	1.071* (.0287)
Employment	1.181** (.0358)	1.145** (.0270)	1.252** (.0361)

\* Significantly different from 1.0 at the 5 % level.

\*\* Significantly different from 1.0 at the 1 % level.

<sup>6</sup> Numbers in parentheses below estimates are estimated standard errors.



9. Content Evaluation of the 1977 Economic Censuses

Carol Corby

The main purpose of the content evaluation study was to provide a measure of the accuracy of the published census figures for employment, payroll, and receipts. Samples were drawn from establishments which responded to the 1977 Economic Censuses. Nonrespondents to the censuses and nonmail companies were not included in this study. Personal visit interviews were conducted at sample establishments, during which detailed information was collected concerning the accuracy of the data reported on the census

form. Highly accurate values for the census items then were constructed from the reinterview data. Estimates of total for each census item were obtained from the sample using the highly accurate value for each establishment and using the value that was tabulated in the census publications. The ratio of these estimates of total, shown below, then became the measure of the accuracy of the respondent (to the census) portion of the published census figure.

$$\hat{R} = (\text{Total Reinterview Estimate})/(\text{Total Tabulation Estimate})^7$$

Census Item	Retail Trade	Wholesale Trade	Selected Services	Manufactures
Employment	.9885 (.0099)	.9861* (.0075)	.9931 (.0237)	.9971 (.0065)
First Quarter Payroll	.9765 (.0174)	.9675** (.0072)	1.0118 (.0215)	.. ..
Annual Payroll	.9795 (.0164)	.9940 (.0050)	.9995 (.0122)	1.0076 (.0110)
Sales, Receipts or Value of Shipments	.9840** (.0073)	.9347** (.0192)	1.0324 (.0338)	1.0452 (.0311)

\* Significantly different from 1.0 at the 10 % level.  
\*\* Significantly different from 1.0 at the 5 % level.  
.. = not available.

The ratios for retail sales, wholesale sales, wholesale employment, and wholesale first quarter payroll are significantly different from 1.0, indicating that, for these items, the respondent portion of the published total is too high.

The report also includes ratios of the reinterview total to the originally reported

total and the tabulated total to the reported total. These ratios, combined with those shown above, indicate the following ( $\leq$  indicates ratios not significantly different from 1.0):

<sup>7</sup> Below the value of each  $\hat{R}$ , the estimated standard error appears in parenthesis.

For retail sales and wholesale sales:

reported total  $\leq$  reinterview total  $<$  tabulation total

which suggests that census editing changes the data too far in the right direction.

For manufactures value of shipments:

reported total  $\leq$  tabulation total  $<$  reinterview total

which suggests that census editing goes in the right direction but not far enough.

For services receipts:

tabulation total  $\leq$  reported total  $<$  reinterview total

which suggests that census editing goes in the wrong direction.

In order to evaluate the accuracy of a census item, the definition of that item was broken down into its individual components. For example, employment includes part time workers and workers on paid leave, but

should not include partners. During the interviews, respondents were asked whether a reported figure included or excluded each component correctly. When an error had been made, the size of the error was obtained. The results of these detailed questions indicated that no specific components were responsible for a significant portion of the error in the published figures. Each individual component was important for only a few establishments relative to the total number of establishments, and the error made on one component by all establishments was small relative to the total error in the census item. This led to the conclusion that reporting error cannot be significantly reduced by minor improvements to the census forms or instructions. For more explanation of this evaluation study and detailed estimates derived from the study, see Corby (1984).

## 10. Evaluation of the Geographic Coding for the 1977 Economic Censuses

*John F. Judge, Jr.*

One of the primary objectives of the economic censuses is to produce statistics for geographic areas which, for some of the economic censuses, include counties and incorporated places of 2 500 population or more. Accurate assignment of geographic classification codes ("geocodes") to business establishments is required if these geographic area statistics are to be meaningful to those interested in using the data. Geocodes are assigned based on the establishment address, and each address that is received for processing must be assigned a complete set of geocodes, regardless of the adequacy of the address or of the geographic reference files used to code the addresses.

The geocoding evaluation of the 1977 Economic Censuses was accomplished in three parts using a random sample of economic

establishments selected nationwide. The sample for the study consisted of 16 019 establishment addresses which were assigned geocodes during the 1977 Economic Censuses. In the first part of the evaluation study all these establishments addresses were clerically geocoded. For the second part of the study, a subsample of 3 043 of these addresses were field checked. The third part of the study used the 8 111 establishment addresses of the full sample where the establishment had payroll in 1977.

In the first part of the evaluation, each of the 16 019 establishment addresses were clerically assigned a complete set of geocodes including state, county, and place codes. These clerically assigned geocodes were the comparison standard by which the census-

assigned geocodes would be evaluated—either correct, incorrect, or a determination could not be made. This clerical check measured the quality of the geocoding algorithms. For the second part of the evaluation study, the subsample of 3 043 establishments was sent to the field staff, and interviewers attempted to locate the true physical location of each one. Geocodes were assigned to each true physical location, if it could be located, and then compared to the census-assigned geocodes. This field check measured the quality of the geocode itself.

In the third part of the evaluation, each included establishment was matched to the 1977 Economic Census data base and the data on payroll and receipts were extracted. The clerically assigned geocodes from the first part of the evaluation study were used here. The establishments, their payroll, and their receipts were then tabulated as to whether the census-assigned geocodes of the establishments had been geocoded correctly or incorrectly or no determination could be made.

The quality of geocoding accuracy in the 1977 Economic Censuses compared favorably to the geocoding accuracy in the 1972 Economic Censuses. Data from the clerical address check showed that 88.9 percent of the addresses were geocoded correctly to the place level using the available information as opposed to 87.1 percent in 1972. The data from the field check shows that more of the establishment addresses reflect the true physical location in 1977 than in 1972 (82.3 vs. 80.2 percent). The comparison for the field check is only for retail and service establishments because only these establishments were field checked in the 1972 censuses.

The rate of geocoding accuracy of the published economic data is better than the corresponding rate as measured by establishments. For the sample in the third part of the evaluation, the geocoding accuracy rate was 91.8 percent. For payroll and receipts the corresponding accuracy rates were 95.8 and

95.2 percent. Because a mistake in geocoding a large establishment would have a worse effect on the published payroll and receipts than a mistake for a smaller one, more attention is given to accurate geocoding of these large cases, which is borne out by the above results.

The geocoding accuracy is very good at the state and county level, whether measured by a clerical address check or by a field check. The clerical address check showed accuracy at the state level to be 93.7 percent and at the county level to be 93.3 percent, while the field check showed that the geocoded address is in the same state as the true physical location 87.7 percent of the time and in the same county 85.5 percent of the time. The third part of the evaluation study showed that payroll and receipts again geocoded better than the establishments at the state and county levels (99.2 and 98.7 percent for payroll; 99.0 and 98.9 for receipts; and only 96.6 percent and 96.3 percent for establishments).

The major drawback to accurate geocoding is the quality of the input addresses. Establishment addresses classified as geographic (i.e., those that can be pinpointed on a map) have a greater probability of being correct than do those which are classified as nongeographic in nature, whether measured by a clerical address check (93.5 percent versus 69.3 percent) or by a field check (79.8 percent versus 60.2 percent). Of those geographic addresses that are street addresses, meaning that all elements required for accurate geocoding are present, the probability of correct geocoding climbs to 94.1 and 80.1 percent, as measured by the two checks. The greatest gain in increased geocoding quality can be made by improving the quality of the incoming addresses for single-unit establishments (establishments belonging to companies with only one establishment).

All of the percentages cited in this summary are conservative estimates of the level of geocoding accuracy. That is, if an address

could not be determined to have been geocoded correctly or incorrectly, it was assumed to be geocoded incorrectly. However, there were some sample design problems that may lead to upward biases in the estimates of correct geocoding percentages. The percentages of correct geocoding stated above all have standard errors of about two percent or less. For further information on this study, see U.S. Bureau of the Census (1982, 1985).

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