Journal of Official Statistics
Vol. 9. No. 1, 1993, pp. 109–119

Turning Administrative Systems into Information Systems

Fritz Scheuren and Tom Petska[1]

Abstract: This article is an overview of the tax and economic statistics operations conducted at the U.S. Internal Revenue Service under the Statistics of Income (SOI) program. In addition to providing a brief glimpse of the operations and uses of SOI information, the article describes how the program is attempting to modernize itself to better meet the needs of its many customers within the U.S. Treasury Department, Congress, and the public at large.

Key words: Tax return information; administrative records; tax policy analysis; microsimulation; confidentiality.

1. Introduction

Statistical work conducted within large administrative structures can have a somewhat different character than that carried out in exclusively statistical settings. Our experience as the statistical component of a large tax collection organization, the U.S. Internal Revenue Service (IRS), certainly bears this out. Although interweaving statistical and administrative activities has its limitations, SOI can (and does) act as a focal point for a broader and better use of administrative systems for statistical purposes.

This short "autobiography" highlights the statistical procedures and operations that we employ in the SOI Division to meet the many needs of our customers. Section 1 provides a brief introduction to who we are. Sections 2 and 3 focus on specifics about our operations, programs, and customers. Section 4 consists of a partial list of the challenges before us and invites those who have similar challenges to join in a common effort. In this paper, at various points, we also touch on the research activities that are part of our daily work. Full citations are available; the research articles themselves can be found in our regular series on the statistical uses of administrative records (Alvey, W., Kilss, B., and Jamerson, B. (eds.) 1981–1992).

1.1. Some history

Histories of statistics, depending on the author, have our profession beginning at least as a descriptive activity in China around 2 A.D. (with their first census). In those early days, there was no separation

[1] Fritz Scheuren is Director and Tom Petska is Chief of the Coordination and Publications Staff, Statistics of Income Division, Internal Revenue Service (R:S), P.O. Box 2608, Washington, D.C. 20013–2608, U.S.A.

Acknowledgments: The authors would like to acknowledge the assistance of the many persons who commented on drafts of this article and the members of the Statistics of Income Division who assisted in its preparation, especially Yahia Ahmed, Wendy Alvey, and Ruth Schwartz.

between the statistical and administrative undertakings of government; indeed, the term "statistics" comes from the word "state" and, in its original usage, meant simply numerical "facts about the state." Modern statistical inference probably began around 1750, although the concept of probability emerged around 1660 (e.g., Fienberg 1992). We at IRS have ties to these foundations of our profession, and IRS statisticians proudly see themselves directly linked to these traditions.

Our statistical work at IRS actually began about 80 years ago with ratification of the sixteenth amendment to the U.S. Constitution (in 1913) and, later that year, the enactment of the first modern U.S. income tax law. The Revenue Act of 1916 required the annual publication of statistics. Despite many revisions to the tax law, the original goal of that Act, to collect statistical information on tax collections, continues today. Specifically, the current Internal Revenue Code (which is based on the Tax Reform Act of 1986) states that we will –

> ". . . prepare and publish, not less than annually, *statistics* reasonably available with respect to the operations of the internal revenue laws, including classifications of taxpayers and *of income*, the amounts claimed or allowed as deductions, exemptions, and credits."

For reasons now obscure, the words in italics above were joined together to give the IRS statistical operations its name – the "Statistics of Income (SOI) program."

The U.S. uses a self-assessment system for the collection of most Federal taxes. Under this system, taxpayers, whether individuals or businesses, report their financial affairs and calculate their tax liabilities, which are then subject to audit by the IRS. Our basic data source is primarily these tax returns and related documents. While this source is quite different from survey-oriented agencies, the SOI program still has the same overall mission as other government statistical organizations – to collect and process data so that they become meaningful information and to disseminate this information to its customers and users; hence, the title of our article, "Turning Administrative Systems into Information Systems."

The costs of administering the U.S. Federal income tax system are substantial; the annual budget of the U.S. Internal Revenue Service for the current (1993) fiscal year is $7.1 billion. The SOI program presently requires an annual budget of about $25 million (about 0.4% of the IRS total) to accomplish its statutory responsibilities. If revenues from reimbursable studies are also considered, the SOI figure amounts to nearly $28 million. Thus, despite its key role in converting administrative data into statistical information, the SOI program represents a very small portion of IRS resources – often resulting in a relatively low priority in the overall IRS mission.

Perhaps our greatest organizational strength is the close relationship we have with key government decisionmakers at the highest levels within the U.S. Federal executive and legislative branches. This closeness assures a high degree of relevance in our work. Still, many of our products are prepared for and made available to the general public.

2. From Data to Information

SOI core statistical systems have much in common with those of other government statistical organizations (Fellegi 1987). This section describes, in some detail, how these statistical activities are applied in SOI programs. Statistical sampling is a major tool in our study designs (Subsection 2.1), and

computers are a ubiquitous element in our environment. Data collection is a highly structured and disciplined process (Subsections 2.2 and 2.3). Sample estimates are usually obtained by randomization-based weighting of selected cases (Subsection 2.4); public-use microdata files are made available after being "sanitized" to meet disclosure concerns. Aggregate tables are compiled and frequently published (Subsection 2.5), and research on methods, often driven by operating concerns, is conducted in ongoing attempts at improvement.

2.1. *SOI sample design and selection*

U.S. tax returns are filed and administratively processed in one of ten IRS regional locations, called "service centers." Once processed, the data from each of these centers are compiled into a computerized "master file" system, which is the administrative backbone of the agency. SOI operations begin by sampling returns from the master file system; the master file offers a sampling frame that enables use of efficient and sophisticated sample designs.

Generally, statistics compiled for the SOI studies are based on stratified probability samples of returns. As the returns are processed in the master file system, they are assigned sampling strata based on criteria such as income (or other measures of economic size), industry, and presence of supplemental forms or schedules. Each taxpayer, whether an individual or business, has a unique number – the social security number for individuals and the employer identification number for businesses. These unique taxpayer identification numbers (TIN's) are used as the seed for a pseudo-random number (a transform of the TIN) which, along with the sampling strata, determines whether a given return is to be selected into the sample.

The algorithm for generating the TIN transform stays the same from year to year. Consequently, by applying an approach suggested by Ben Tepping and the late Morris Hansen (Westat, Inc. 1974), we select any return into the SOI sample provided that it falls into a stratum with the same or higher probability of selection. If it falls into a stratum with a lower selection probability, the likelihood of selection will correspond to the ratio of the second year to the first year's selection probabilities. (See also Sunter 1986.)

Of over 200 million tax returns processed each year for administrative purposes, only about half a million are sampled for statistical analysis. However, since sampling rates generally increase with increases in the size of financial amounts (for example, income or assets), the returns in the samples are, on average, disproportionately larger and more complex than those in the administrative (population) files. Thus, in comparison to IRS administrative processing, which captures 100% of the tax returns but only limited item content, SOI programs collectively represent a small overall volume – however, with a proportionately higher fraction of complex returns and much more item content.

2.2. *Data capture techniques*

After sampling, the electronically available information from the master file system is substantially augmented with additional data items captured from the (still largely paper) tax returns themselves. Statistical abstraction can take as little as a few minutes for a simple return to as long as several days for a large multinational corporate return.

Until a few years ago, the basic SOI information processing was conducted in a "batch-mode," involving several operational units at all ten service centers. Within

each center, data were manually abstracted from the returns, key-entered, and error corrected by different employees in different functional units. A fragmented system such as this denied "ownership" and accountability and was not conducive to maintaining high levels of quality.

To improve the quality and efficiency of SOI field processing, a network of minicomputers was built solely for statistical processing. This new system, which is now fully deployed, uses on-line transaction processing so that all data capture operations are completed in one pass. In addition to reducing handling costs and removing overlapping responsibilities, accountability and ownership have been improved because one person is now responsible for assuring the validity of all data processing for any sample case. (Philosophically, although implemented with different hardware and software, this approach closely resembles BLAISE, developed by the Netherlands Central Bureau of Statistics.)

Another processing improvement was to reduce the number of field sites to just five of the ten IRS service centers. Programming is done mainly by staffs of computer specialists at three "hub" sites. The backbone of the system is a Treasury Department telecommunications network, which electronically links the geographically dispersed operations so that data can be efficiently transferred between locations. This capability enables "experts," wherever located, to better monitor processing and to accelerate efforts to attain still higher levels of quality.

2.3. *Data cleaning and completion*

Due to substantial penalties for misreporting, the detailed income and expenditure data on tax returns are generally regarded as more reliable than similar survey data. Even so, SOI employees go to great lengths to protect against nonsampling errors, such as those due to taxpayer or data entry error. Extensive on-line tests for consistency and reliability are made based on the structure of the tax law and the improbability of various data combinations. Subsamples of work are independently reprocessed and compared as a further check.

Missing data problems arise, albeit infrequently (under 1% of the cases). To handle these, missing items can sometimes be obtained through telephone or written follow-ups. More often, though, the missing data are obtained through imputation. For example, an estimate can be made using: other information on a return (or in an accompanying schedule); prior-year data for the same taxpayer; or data from a "similar" return for the same year. The multiple imputation techniques of Rubin (1987) have proven highly successful too, and their use is increasingly applied to our work.

2.4. *Weighting and estimation*

On the whole, the SOI approach to making statistical summaries, using design-based inferences for the calculation of estimates and their standard errors, is quite straightforward. In our applications, the probability with which a return is selected for an SOI sample depends on the sampling rate prescribed for the stratum in which it is classified. Weights are computed by dividing the (population) count of returns filed for a given stratum by the count of sample returns for that same stratum. In some studies, it is possible to improve the estimates by employing post-strata, based on supplemental criteria or refinements of those used in the original stratification. Weights are then computed for these post-strata using additional population counts – oftentimes with fairly computer-intensive methods, such as raking ratio estimation.

Model-assisted estimates and bootstrapping techniques have been explored for selected SOI programs, but their deployment remains infrequent. A combination of randomization weighting and model-assisted techniques is now used to make preliminary estimates prior to the completion of sampling. In one application, because the cases obtained late in the sampling period are not random (they tend to be more complex), propensity score weighting has been tried (Czajka, Hirabayashi, Little, and Rubin 1992).

2.5. Published tables and user analyses

Extensive aggregate tables have always been produced as part of the SOI program. While many of these continue to be solely for government analysts and policymakers, there is also a large (paper) publication effort in the quarterly *SOI Bulletin* and other annual and periodic SOI reports. Electronic media products are increasingly available on magnetic tape, floppy disk, CD ROM, and in a computer bulletin board format.

Microsimulation modeling "experiments" have become the *modus operandi* in the U.S. and many other countries for policy analysis (Wolfson, Gribble, Bordt, Murphy, and Rowe 1990). This is the case for SOI data users as well. Recently, the U.S. National Academy of Sciences made a number of important recommendations for improvements to microsimulation modeling (Citro and Hanushek (eds.) 1991), and we have begun to rethink our work as a result. Prior to the National Academy report, a major redesign effort for our microdata products had already begun, and further efforts are now being planned, especially on improving metadata (e.g., as in David 1992).

3. Programs and Customers

SOI data are the key source of information used by the U.S. Treasury's Office of Tax Analysis and the Congressional Joint Committee on Taxation for revenue estimation and analyzing the functioning of the tax system. SOI data are also used extensively to measure and analyze the U.S. economy in the National Income and Product Accounts of the U.S. Commerce Department's Bureau of Economic Analysis. Other users of SOI data cover a broad spectrum of researchers, tax practitioners, and the public at large. (See Table 1.) Equally broad is the wide range of SOI studies. As briefly described below, these studies, numbering nearly 60 in all, encompass topics involving individuals, businesses, international activities, nonprofit organizations and many other specialized areas.

3.1. SOI individual program

Income and tax statistics from individual income tax returns have been published annually by the IRS beginning with tax year 1913. The content of this and related programs is largely determined by the Treasury for use in tax policy analysis and in estimating future tax revenues. The needs of other researchers for individual income tax data are addressed on a cost-reimbursable basis.

Historically, the main individual SOI program has been based on large annual cross-sectional samples; currently, though, a major redesign of the program is being conducted jointly with Treasury (and Congressional) staff (Czajka and Walker 1989). The program is being refocused in three respects:

1. Because the annual cross-sectional samples were not conducive to multi-year modeling, for such events as sales of capital assets, the sample has been redesigned, creating a large panel of

Table 1. Statistics of income user inquiries by type, 1992

Inquirer	Telephone	Written
Total	100.0%	100.0%
Business:		
Consultant/researcher	19.4	17.5
Accounting firm	3.4	8.0
Law firm	3.0	5.9
Other private business	6.9	5.9
Government:		
Congressional	4.9	1.7
Internal Revenue Service	16.1	1.5
Other Federal government	8.5	1.3
State/Local government	7.7	13.5
Public library	–	0.2
Other:		
Trade association	6.0	10.9
College or university	5.4	15.2
Private citizen	11.5	13.5
Student	1.2	0.8
Foreign	0.5	1.7
Media	5.0	2.1
Other	–	0.2

individuals imbedded within the annual cross-sectional samples.

2. Family "economic units," reflecting households rather than individuals, are more desirable as the focus of tax analysis. Thus, social security numbers of dependents reported on the tax returns of parents are being used to obtain dependents' returns which are linked to parents' returns to form tax family units.
3. Finally, stratifiers and selection rates have been restructured to enhance existing samples of returns with greater policy interest, such as those with very high incomes or relatively complex returns.

In the U.S., providers of income (employers, banks, etc.) must report income they pay out and submit a summary to the taxpayer and the IRS. These so-called "information documents" can be linked to the tax return to verify that the return is complete. In a study just underway, these information documents have been linked to tax returns on a record-by-record basis (using social security numbers). The resulting linked file makes it possible to examine the combined income of taxpayers and their dependents. A striking feature of the project is that the combined database covers over 97% of the U.S. population. This high coverage suggests that the U.S. consider giving a substantially expanded role to administrative records in census-taking. Further work on administrative record census-taking is being planned and could well parallel research conducted in Canada and elsewhere (e.g., Jensen 1987; Leyes 1991; and van de Stradt 1992).

3.2. SOI business programs

Although businesses can be legally organized in a variety of ways, most U.S. business activity is conducted by corporations, partnerships, or sole proprietorships. Information from SOI programs for these three types of businesses is published annually. For corporations this annual series, like that for individuals, goes back to 1913; for sole proprietorships and partnerships, the unincorporated types of business, these series go back to 1917 and 1939, respectively. In addition to their use in tax policy analysis, the sole proprietorship and partnership studies are the only source of data available to the Commerce Department for use in estimating unincorporated business net income or loss in the National Income and Product Accounts.

3.3. SOI international, nonprofit, and estate and wealth studies

International studies are conducted biennially or periodically in two broadly-defined areas: foreign investment and activity abroad by U.S. persons and investment and activity in the U.S. by foreign persons. Major statistical programs are also conducted annually or periodically on nonprofit organizations.

Included among the other special studies is a project that examines Federal taxes paid at death. These so-called "estate tax studies" are conducted annually based on the returns filed for the estates of very wealthy decedents. In addition, SOI periodically undertakes use of estate tax returns and mortality rates to estimate the wealth of top (living) wealthholders (Smith and Calvert 1965). In estimating wealth, we employ the estate multiplier technique originated by Mallet in the U.K. in the nineteenth century (Mallet 1908). A long-term research project is also underway based on estate tax filings from 1916 to the present to examine intergenerational transfers of wealth through inheritance. All the work for the period 1916 to 1950 has been completed and, for some regions of the U.S., data through the mid-1970's have been obtained.

4. Shaping the Future

It goes almost without saying that, as civil servants, we are reluctant risktakers. Despite this seemingly unavoidable tendency, preparing for the future is a task full of opportunities. Some areas where the SOI program is shaping, or being shaped by, the future include: the continuing revolution going on in statistics, computing, and allied professions; changes in management styles and organizational practices (driven largely by Japanese successes in quality and productivity); and, last but not least, SOI's attempts to address its continuing chronic weaknesses in meeting growing customer needs and demands. Each of these "opportunity challenges" is looked at briefly, followed by some concluding remarks.

4.1. Changes in statistical practice

Historically, SOI, like most government statistical agencies, has retained a much stronger "enumerative" or descriptive focus than an "analytic" or "inferential" one (Norwood 1989). For SOI to continue this enumerative focus is a major impediment to developing an improved structure of information collection and analysis. Without a doubt, the "science" side of our business must be given greater emphasis (as advocated in Triplett 1991). A more analytical focus will not only allow us to continue to attract and retain outstanding employees, but it will also bring us closer to our customers. Recent years have seen encouraging trends, with much SOI work now being done jointly with our major customers. The coming

improvements in microsimulation modeling, partly driven by new SOI longitudinal samples, should see this trend continue.

Many government statistical agencies, including SOI, have not kept up with the explosive growth of statistical theory and methods. This is ironic because, in some cases, important methodological developments are being made within the government. Many such agencies, again including SOI, are trying to change this. Most SOI statistical methods are close to best practice; however, the range of tools employed, while growing, remains fairly narrow. An example of the way our methods will continue to grow and modernize is the partnership role SOI has taken, under the leadership of the U.S. Federal Reserve Board, in periodically mounting the Survey of Consumer Finances – an exceedingly complex series of household interviews designed to estimate personal wealth (Kennickell and Woodburn 1992).

We have also entered into a partnership with the U.S. Bureau of Labor Statistics in the use of cognitive methods (e.g., Tanur and Fienberg 1992) as a way of improving tax forms (our "questionnaires"). Indeed, there has been an increasing institutional acceptance at IRS of this improved approach because it both reduces taxpayer burden and elicits more accurate responses.

4.2. *Restructuring management practices*

Long-term initiatives are underway to improve quality management in SOI. During the 1980's, conventional quality control techniques for detecting errors were slowly replaced by quality improvement techniques designed primarily to prevent errors. Japanese practices have been studied, and the ideas of both Deming and Juran are being implemented (e.g., Deming 1986; Juran 1988).

Table 2. SOI 1993 total quality organization plan strategies

Customer focus – Provide greater access to SOI data in a more timely and flexible manner. Develop and market new products and services designed to increase benefits to customers.
Employee focus – Make SOI a more desirable, fulfilling, and productive place for people to work. For example, build communication systems that facilitate a freer exchange of information within SOI and with customers and suppliers.
Lean production – Create data processing systems that are "best in class." For example, develop the capability to accept changes throughout project life cycles. Reduce the amount of rework or corrections needed at each processing stage of a project. Help suppliers develop and maintain a steady workflow and a stable workforce.
Measurement systems – Integrate and improve existing quality and resource measurement systems to aid project teams in achieving self-management.
Planning processes – Develop an increasingly systematic planning process to improve the focus of SOI quality initiatives.

Our early piecemeal improvement attempts are now giving way to an integrated approach. In particular, SOI has just begun deploying its second annual total quality organization (TQO) plan. (See Table 2.)

The five key strategies are: a sharpened focus on customers; increasing efforts towards a flatter, more participatory structure to foster change; continuing incremental improvements towards deployment of "lean production" (Womack, Jones, and Roos 1990) in our processing systems; putting tough, tangible measurements in place; and, finally, working toward even better plans for future years.

As a result of these initiatives, the relationships between SOI and our customers

and suppliers are changing. Productivity and quality gains have already been enormous. For example, in 1980, the SOI program consisted of 26 projects; now, in 1992, this number has more than doubled to about 60. Furthermore, this two-fold growth in programs was accompanied by a parallel four-fold increase in the amount of data extracted from the various tax and information returns, *all at virtually no increase in inflation-adjusted costs*. The substantial productivity achieved is due to many factors, including methodological enhancements and computing improvements discussed earlier, but perhaps most of all to our still early efforts to embrace modern management techniques.

We are proud of what has been achieved so far. On the other hand, much more remains to be done if our new way of doing business is to fully succeed. The key to the eventual outcome will be the extent to which all of our people are drawn into the process and the degree to which teamwork structures – *emphasizing reciprocal responsibility* – replace traditional hierarchies.

4.3. Chronic weaknesses

Despite recent strides, SOI systems continue to have major chronic weaknesses. Two of these, timeliness and access, which may be concerns elsewhere, bear some discussion. Timeliness of SOI studies has become a primary focus for improvement and one in which some successes have been achieved. All of the major SOI studies have a sampling period that extends for one year (or more) beyond the close of the applicable accounting period to ensure the inclusion of late filed returns. Significant efforts are being made to complete statistical processing within a minimum time after the close of the filing period. Forecasts of final results are now becoming more frequent, and our plans call for still more, to enable projections "on demand."

Finding ways to obtain wider public access, while protecting taxpayers' confidential information, is considered extremely important to SOI. Tax returns are protected by law from public scrutiny, and strict procedures govern the handling of returns and computer tape files containing such information. Even after specific identifiers (e.g., name, address, and social security number) are removed, the remaining tax return data may still be confidential. SOI's main customers (Treasury and the Joint Committee on Taxation) are authorized to receive detailed tax return (microdata) files, so computer tape files of tax return information are regularly provided.

Public-use microdata files of individual tax data have been produced regularly since 1960. These files are particularly important since, in the U.S., they are the only source of information on high income individuals and the only reliable source of information on property income. Moreover, making more tax microdata publicly available to researchers outside of government has been done on a very limited basis (Spruill 1983). Broadening access, despite the difficulties (e.g., Dalenius 1988), is being given a new emphasis. Some approaches we plan to examine involve ideas in Paass (1988), Rubin (1992), and Duncan and Lambert (1989), among others.

4.4. Concluding comments

In this article there has been some discussion about what the Statistics of Income Program is and what it is trying to become. In comparison to most other major U.S. government statistical agencies, SOI is small. Because our mission is highly focused, most of what we do is not widely known, even in the U.S., let alone internationally.

We have strong traditions that give us a sense of continuity and confidence – unfortunately, sometimes at the price of being overly conservative in the face of a changing environment.

As part of efforts to meet future goals, SOI has participated in and contributed, in a modest way, toward many of the worldwide paradigm shifts now sweeping statistics and statistical organizations. We have benefitted especially from the revolution in computing, albeit belatedly; the quality revolution is also one where we started late but where we have made some important strides. Applying newly invented or improved concepts and tools to old problems has been energizing; indeed, the excitement has not only led us to tackle new problems, it has given us the impetus to "reinvent ourselves."

We have come to believe that only by reinventing ourselves will we be able to successfully address the present and anticipate the future needs of all our customers. Towards this goal, comments and suggestions are sought. We invite those who have similar challenges to join in a common effort (Hostetter 1992).

5. References

Alvey, W., Kilss, B., and Jamerson, B. (eds.) (1981–1992). Statistics of Income and Related Administrative Record Research, U.S. Department of the Treasury, Internal Revenue Service. (See also Kilss, B. and Alvey, W. (eds.) (1984). Statistical Uses of Administrative Records: Recent Research and Present Prospects, U.S. Department of the Treasury, Internal Revenue Service, Vols. I and II; and Kilss, B. and Alvey, W. (1985), Record Linkage Techniques – 1985, U.S. Department of the Treasury, Internal Revenue Service.)

Citro, C.F. and Hanushek, E.A. (eds.) (1991). Improving Information for Social Policy Decisions: The Uses of Microsimulation Modeling, Volume 1, Review and Recommendations. Washington, D.C.: National Academy Press.

Czajka, J., Hirabayashi, S.M., Little, R.J.A., and Rubin, D.B. (1992). Evaluation of a New Procedure for Estimating Income and Tax Aggregates from Advance Data. Journal of Business and Economic Statistics, 10, 117–131.

Czajka, J. and Walker, B. (1989). Combining Panel and Cross-sectional Selection in an Annual Sample of Tax Returns. Proceedings of the American Statistical Association, Section on Survey Research Methods, 463–468.

Dalenius, T. (1988). Controlling Invasion of Privacy in Surveys. Stockholm, Sweden: Statistics Sweden.

David, M. (1992). Metadata Systems for Statistics of Income Data Products. University of Wisconsin, Department of Economics (unpublished working paper).

Deming, W. (1986). Out of the Crisis. Cambridge, MA: MIT Press.

Duncan, G. and Lambert, D. (1989). The Risk of Disclosure for Microdata. Journal of Business and Economic Statistics, 7, 207–217.

Fellegi, I. (1987). Some Mathematical Statistical Research Problems in Statistics Canada. A paper presented at the Annual Meeting of the Statistical Society of Canada. Quebec, Canada.

Fienberg, S. (1992). A Brief History of Statistics in Three and One-Half Chapters: A Review Essay. Statistical Science, 7, 2, 208–225.

Hostetter, F. (1992). As this personal communication notes, the Statistical Services Division of Revenue Canada has already joined SOI in a long and fruitful partnership.

Jensen, P. (1987). The Quality of Administrative Data from a Statistical Point of View: Some Danish Experience and Considerations. Proceedings of Statistics Canada Symposium on Statistical Uses of Administrative Data, 291–300.

Juran, J.M. (1988). Juran on Planning for Quality. New York: Macmillan.

Kennickell, A. and Woodburn, L. (1992). Methodological Issues in the Estimation of the Distribution of Household Net Worth: Results from the 1989 Survey of Consumer Finances. Proceedings of the American Statistical Association, Section on Survey Research Methods (forthcoming).

Leyes, J. (1990). An Administrative Record Paradigm: A Canadian Experience. Statistical Policy Working Paper 20. Seminar on Quality of Federal Data. Federal Committee on Statistical Methodology, Office of Management and Budget, 66–76.

Mallet, B. (1908). A Method of Estimating Capital Wealth from the Estate Duty Statistics. Journal of the Royal Statistical Society, 71, 65–84.

Norwood, J.L. (1989). The Influence of Statistics on Public Policy. Proceedings of the Symposium on Statistics in Science, Industry and Public Policy, 30–42.

Paass, G. (1988). Disclosure Risk and Disclosure Avoidance for Microdata. Journal of Business and Economic Statistics, 6, 487–500.

Rubin, D. (1987). Multiple Imputation for Nonresponse in Surveys. New York: John Wiley & Sons.

Rubin, D. (1992). Comments on Confidentiality – A Proposal for Satisfying All Confidentiality Constraints Through the Use of Multiply-Imputed Synthetic Micro-Data (unpublished).

Smith, J. and Calvert, S. (1965). Estimating the Wealth of Top Wealth-Holders from Estate Tax Returns. Proceedings of the American Statistical Association, Business and Economics Statistics Section, 248–265.

Spruill, N. (1983). The Confidentiality and Analytic Usefulness of Masked Business Microdata. Proceedings of the American Statistical Association, Section on Survey Research Methods, 602–607.

Sunter, A.B. (1986). Implicit Longitudinal Sampling from Administrative Files: A Useful Technique. Journal of Official Statistics, 2, 161–168.

Tanur, J.M. and Fienberg, S.E. (1992). Cognitive Aspects of Surveys: Yesterday, Today, and Tomorrow. Journal of Official Statistics, 8, 5–17.

Triplett, J. (1991). The Federal Statistical System's Response to Emerging Data Needs. Journal of Economic and Social Measurement, 17, 3–4, 155–177.

van de Stradt, H. (1992). Is a Census Still Necessary? Experiences in the Netherlands. Proceedings of the Annual Research Conference, Bureau of the Census (forthcoming).

Westat, Inc. (1974). Results of a Study to Improve Sampling Efficiency of Statistics of Corporation Income. Bethesda, MD (unpublished technical report).

Womack, J., Jones, D., and Roos, D. (1990). The Machine That Changed the World. New York: Macmillan.

Wolfson, M., Gribble, S., Bordt, M., Murphy, B., and Rowe, G. (1990). The Social Policy Simulation Database and Model: An Example of Survey and Administrative Data Integration. U.S. Department of Commerce. Survey of Current Business, 69, 5, 36–40. (See also the discussion by Scheuren which follows in the same issue.)

Received September 1992
Revised October 1992.