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DATA COLLECTION IN THE U.S. BUREAU OF LABOR STATISTICS' CURRENT EMPLOYMENT STATISTICS SURVEY

Contributed Paper

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I. Introduction

1.   The U.S. Bureau of Labor Statistics' Current Employment Statistics (CES) survey is a large-scale, quick-response, establishment survey that utilizes numerous modes of data collection. The CES program produces monthly estimates of employment, hours, and earnings, by industry, for the nation, states, and metropolitan statistical areas. The data produced by the survey are utilized by federal and state government policy makers, and by economists, Wall Street, businesses, and others, to assess the health of the U.S. economy. The national data from the program have been designated by the U.S. Office of Management and Budget as Principle Federal Economic Indicators. Data from the survey are used to produce four news releases each month.

2.   The CES program was, for many decades, a mail-based survey. The CES program has changed its data collection strategy significantly over the last few decades. Mail is no longer the primary mode of collection for the survey; instead, mail is now primarily used as part of the strategy for soliciting cooperation from businesses new to the survey.

3.   In this paper the authors present a broad background of the CES program, a timeline of major changes to data collection operations and procedures, and a synopsis of the current multi-modal procedures used to collect data for the survey.

II. Background

A.   A Broad History of the CES Program

4.   In October 1915, the U.S. Bureau of Labor Statistics (BLS) started to collect and publish employment statistics on a monthly basis for four industries: boots and shoes, cotton goods, cotton finishing, and hosiery and underwear. By November 1916, the survey had been expanded to cover nine additional industries, and in December 1916, the survey had a sample size of 574 establishments. By October 1923, 52 manufacturing industries were covered by the survey. In December 1929, the sample size for the survey included 34,400 establishments. The Great Depression (1930s) and World War II (1939-1945) both highlighted the importance of current information on industry employment, and led to the survey becoming more comprehensive. The

current scope of the survey is all non-farm industries. The size of the sample collected every month is very large, including 141,000 businesses covering approximately 486,000 individual establishments.

5. A mail shuttle form was the primary method used to collect data for the survey from 1915 through 1983. The shuttle form was mailed to the business, where the form was filled out for the month and mailed back. BLS agents would receive the form, key-punch the data, and mail it back to the business. The form would thus shuttle back and forth until it was filled out for 12 months, and then a new form was mailed to the business. In 1984, the staff of the CES program began exploring innovative electronic methods to improve data collection for the program. Since then, Computer Assisted Telephone Interviewing, Electronic Data Interchange, Touchtone Data Entry, and Web collection have eclipsed mail to become the major modes of data collection for the survey.

B. CES Data Uses and Users

6. The CES program produces over 44,000 data series every month. Among these data are series on employment, hours, earnings, overtime hours, hours and earnings of production and nonsupervisory employees, women employees, and employment diffusion indexes. These data are among the first available indicators of current economic trends each month, and they are used to assess the overall health of the economy (using employment), to assess earnings trends (using average hourly earnings), and to identify short-term fluctuations in demand (using average weekly hours). CES data series are used as inputs into other major U.S. economic indicators, including Personal Income, Industrial Production, Index of Leading Economic Indicators, Index of Coincident Indicators, and Productivity measures. CES data are also used to assess other areas of business, research, and policy, including public policy, wage negotiations, economic research and planning, and industry studies.

7. The CES data collected for the program are used to produce four news releases each month. The data for *The Employment Situation* and the *Real Earnings* news releases are revised twice, while the data for the *Regional and State Employment and Unemployment* and the *Metropolitan Area Employment and Unemployment* news releases are revised once. To accomplish this, data for a reference period continues to be collected two to three months past the initial release. This schedule requires the data collection operation to be managed against five deadlines every month to produce these revised and initial estimates.

III. Data collection in the CES survey

A. Data Collection: 1915 - 1983

8. The CES survey was almost exclusively collected by mail in a decentralized environment until the early 1990s. Each month, individual State Workforce Agencies funded by BLS would mail the survey form to establishments to fill out and mail back as soon as possible. Collection rates for the preliminary estimates ranged between 40 to 50 percent; however, by the final release of the estimates almost 90 percent of the data had been collected.

9. Mail reporting was prone to several types of error, and error correction was slow and problematic. States had to examine the data and determine if the error was introduced by the respondent or occurred when it was being transcribed by the state. If respondent follow-up was necessary a phone call or personal visit would be used depending on the perceived importance, complexity of the error, or available resources.

10. Receiving the form in the mail served as the prompt to report data. Non-response was treated with a phone call, personal visit, or sample substitution depending on how important the state deemed the establishment was when making its estimates.

11. Mail collection is costly in several different ways. The forms had to be mailed to respondents each month and they mailed them back using Business Reply Mail envelopes, so postage was paid twice each month. Then there is the labor cost to transcribe, compile, perform edit reconciliation, and follow up on non-respondents. Lastly, lower response rates for preliminary estimates lead to larger revisions.

B. Data Collection 1984 – 2003; Innovative Electronic Methods Explored

(a) Computer Assisted Telephone Interview (CATI), 1984

12. The CES program began to experiment with Computer Assisted Telephone Interviewing (CATI) in 1984 with 400 test cases. A larger-scale production test started in 1987, involved 11 states, lasted 7 years and ended with a test sample size of 5,500 cases. BLS decided CATI was a viable option for the CES program and by 1995 about 10,000 cases were collected each month through CATI. Collection had also been centralized in regional data collection centers.

13. CATI-collected data offers several advantages over other methods of collection. The timeliness of the data is greatly improved; this is especially important to the CES program since there are only 10 to 16 days to collect the data before the preliminary release of the estimates. CATI collection rates for the preliminary release typically average around 85 percent. Respondents are mailed a postcard each month with the scheduled appointment time that ideally occurs as soon as the data are available at a mutually agreeable time. The postcards serve as an advance-notice prompt. Compared to self-reporting methods, respondents have more incentive to report on time as they are aware that someone will be calling to collect their data. With self-reporting, it is up to the respondent to initiate the collection procedure.

14. In addition to timeliness, CATI-collected data contain fewer errors. While the respondent is still on the phone, their microdata are being edited in real time as the interviewer is entering it into the system. Most questionable changes in data can be reconciled immediately leading to fewer revisions in the published estimates between releases. Without immediate validity checks, data that fail edit checks may not be corrected before the first release, lowering the amount of usable sample data. Or data that were reported wrong initially, but were used in the first release, would cause revisions when corrected at a later time.

15. Another driving force behind the CES program's decision to collect data through CATI was the transition from a quota-based sample to a probability sample. Prior to this point, solicitation and refusal conversion activities were not standardized. However, collecting data from the specific establishment that was selected to be in sample is critical to the success of the probability sample design. All newly selected sample units are enrolled and initially collected by the CATI Data Collection Centers (DCCs). During the initiation phase the registry[1] information is verified and updated as necessary. Respondents are educated on data uses, data items, and the collection cycle. Refusal conversion activities are a routine part of the collection activity in the DCCs.

16. The main disadvantage of CATI collection is the interviewer cost. For the CES program, CATI collection costs account for a significant portion of the overall collection resources.

(b) Touchtone Data Entry (TDE), 1987

17. As the use of touchtone phones expanded in the United States, CES began to experiment with Touchtone Data Entry (TDE) as a way to lower collection costs compared to CATI, but have higher response rates than mail. Tests started in 1987 with 200 cases divided equally between Maine and Florida. The CES program had great success with TDE collection. Between 1994 and 2003 over 30 percent of the CES sample was collected by TDE.

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[1] The CES sample registry includes information from the sampling frame on the location, industry, and employment of all businesses in the sample.

18.   Respondents transition from CATI collection to self-reporting on TDE after about 6 months of training. Once respondents are comfortable with the concepts and the timing, they are offered TDE as a reporting option. Respondents that are identified as difficult cases, either because of the complexity of their payrolls or because they are likely to become refusals, are kept on CATI collection.

19.   The CES program experimented with various prompting methods and incentives over the years to arrive at the current procedures, which maximize collection rates for the preliminary release of the estimates, while optimizing data collection resources. TDE collection rates typically vary from 75 to 80 per cent for the first release of estimates.

20.   When TDE was first introduced, each state had its own toll-free number and was responsible for edit reconciliation and staffing a help desk to answer respondents' questions. To minimize respondent burden, data are edited after the session is over. For this reason there is a delay between when the data are collected and when they can reasonably be corrected. This is one of the main disadvantages to TDE collection.

(c)   Voice Recognition (VR), 1989

21.   By the late 1980s, only 75-85 per cent of CES respondents had a touchtone phone. Since the CES program did not have resources for full CATI collection and desired higher response rates than what mail was able to provide, voice recognition (VR) software was explored. Similarly to TDE, VR was offered to respondents after they had been introduced to the survey and its concepts by CATI interviewers.

22.   During testing, VR was favorably accepted by respondents, yielded collection rates similar to TDE, and had about the same error rate. However, by the time the testing phase had ended, the use of touchtone phones had become even more widespread and the CES program decided not to devote resources to another self-reporting method using the telephone since the TDE systems were already established.

(d)   Electronic Data Interchange, 1995

23.   Automated collection methods up to this point relied on the survey programs themselves to have sophisticated technologies available to them, but there was a low technological burden on the respondent. However, as computer usage became more common in the business world, the concept of electronic data interchange (EDI) became more widespread. The BLS has several surveys that collect data from employers. Large employers, especially those with multiple worksites in many states, tend to be included with certainty in several BLS surveys. Large employers wanted to know how BLS could reduce their reporting burden as a condition of their participation.

24.   The CES program opened up the EDI center in February 1995, specifically to collect data electronically from very large employers. Shortly after the EDI center opened, the Multiple Worksite Report[2] (MWR) – part of the BLS' Quarterly Census of Employment and Wages program – was also added as one of the reports that businesses could submit to the EDI center.

25.   EDI reporting lowered the response burden for these large employers as well as their cost of reporting. BLS benefited by improving data quality, reducing collection costs, and capturing more data. The EDI center created a single file format for CES and MWR, reducing design costs for both the respondent and BLS. There is significant start-up time and cost associated with converting a company to EDI reporting; however, ongoing collection costs for both surveys are

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[2] The Multiple Worksite Report (MWR) form asks most multi-location employers (with 10 or more employees) to provide employment and wage data for all of their establishments covered under one Unemployment Insurance (UI) account in a State.

low. A company has to be willing to devote resources to create files, answer any follow-up data quality questions, and be willing to transmit the file in time to be used in estimates.

26.   Once the test files are of acceptable quality, the company will start submitting monthly files to the EDI center via one of several secure means. One of the disadvantages of EDI reporting is that it is *all or nothing*, either a firm transmits a file in time for first release or not. Usually the EDI center's last contact with the company is someone in the business's IT department, who cannot answer questions about changes in the data. If the payroll staff have changed between implementation and the present time, finding someone in the company who can answer questions can sometimes be difficult. EDI collection rates are the most volatile of all the CES collection methods as some respondent files are transmitted every month on the same calendar day regardless of when the preliminary release of the estimates is scheduled.

(e)   One Point Touchtone Data Entry (One Point TDE), 1996

27.   In June 1996, One Point Touchtone Data Entry originated with two states. Instead of individual states having their own toll-free TDE number and associated support, states elected to turn responsibilities over to BLS. Under the One Point TDE model, BLS was responsible for collection, prompting, updating registry information, and error corrections. The changes were transparent to the respondent, but it allowed the Bureau to start consolidating resources. In addition, prompting and editing procedures were standardized.

(f)   FAX, 1995

28.   The CES program needed a way to collect data from medium sized firms—those that were too small for EDI collection, but where TDE or even traditional CATI was too burdensome. FAX technology was becoming more widespread in the establishment world, so the CES program developed a faxable version of the traditional form specifically for respondents who provide data for multiple worksites. Each month a blank form is faxed to the respondent, which serves as a reminder to report the data. After that, the data are faxed back and key punched in by CATI interviewers. The error rate is similar to other methods of self-reporting.

29.   In terms of cost, FAX is less expensive than mail or CATI, but more expensive than TDE. The collection rate for FAX is similar to CATI at first closing, averaging around 85 per cent.

(g)   Web Reporting, 1996

30.   The CES survey was the first U.S. Federal Survey to experiment with internet reporting. Unlike TDE which only requires access to a touchtone phone, internet collection relies on the respondent having access to a computer, an internet connection, and email. The CES program started off with a small scale test of seven TDE respondents, which quickly grew to over 50 respondents. By 1998, the CES program decided to support internet collection.

31.   One of the biggest advantages over TDE was that the prior month's data could be displayed. This provided visual clues to the respondent and allowed for fairly complex editing while the respondent was still engaged in the session. Also item response rates are the highest of any collection method, perhaps because respondents are compelled to fill in the grid which mirrors that used on the collection form.

32.   Prompting is similar to TDE in the timing and message, although instead of FAX, Web respondents receive the prompt through email. The edit failure rates are lower than TDE because data can be edited in real time. Sending prompts electronically and the lower error rate means Web reporting is more cost efficient for the Bureau.

33.   Since CES was an early innovator in the use of the Internet, a lot of trial and error occurred during this time. Collection rates were not as high as TDE because respondents needed a password to log onto the system or to install a digital certificate. These added features, while

providing more security, proved to be a barrier to entry as respondents forgot passwords or the knowledge did not get passed on if there was a respondent change. This is unlike TDE because the only information respondents need is their CES report number.

C. Data Collection 2004 – 2012; Innovation Continues

(a) One Point TDE, 2004

34. By July 2004, all states agreed to consolidate their TDE processes to the One Point TDE system maintained by BLS. This allowed for even more efficiencies in BLS. Instead of funding each state to staff a help desk, make prompting phone calls, and follow up with edit errors, those activities were centralized.

(b) The decline of mail-based reporting

35. At the time the probability sample was introduced, there were several options to report CES data that did not involve mail, were easier for the respondent, were more cost efficient for the Bureau, and produced higher collection rates. The CES program stopped promoting mail as a reporting method and used it only as an option of last resort. By 2008, the last of the mail respondents were converted over to other collection methods, and mail currently is only used to mail the enrolment packages, replacement forms, and postcard reminders.

(c) Web-Lite, Internet Data Collection Facility

36. In 2004, CES Web collection was moved to the BLS enterprise-level Internet Data Collection Facility (IDCF). The consolidated platform offered BLS several advantages. There only had to be one system to manage security and continuity of operations for multiple survey programs. Also Web pages were standardized in look and feel and an individual respondent could report for different BLS surveys in the same session. As more BLS programs began to offer Web collection, the price per transaction decreased.

37. At the same time, Web response rates were consistently below those of TDE even though both modes were self-reporting methods that should appeal to similar types of respondents. In 2006, BLS conducted a test to see if a new version of the CES Web collection site that did not require passwords yielded higher collection rates. The new version - referred to as "Web-Lite" - required respondents to only remember their unique CES 9-digit report number and use a CAPTCHA[3] authentication. The results were favorable as the collection rate and respondent satisfaction was higher under the Web-Lite version.

38. However, there was a trade-off between less security and higher collection rates. Since only the unique CES report number was necessary to report data, previous months' data and respondent-identifying information could not be shown during the session. This means that edits comparing current months' data to prior months could not be performed in real time. Also updating contact information became more problematic since the respondent did not know if CES had the correct information on file. Despite these drawbacks, the CES program concluded that consistently higher collection rates under the Web-Lite system were worth giving up some features of the more secure model. CES currently only transitions self-reporters to the Web-Lite version of the website.

39. In 2005, the CES program added several data items to its monthly survey: all employee hours and earnings, and gross monthly earnings for all employees (this latter item was later dropped). Since

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[3] The term CAPTCHA (for Completely Automated Public Turing Test To Tell Computers and Humans Apart) was coined in 2000 by Luis von Ahn, Manuel Blum, Nicholas Hopper and John Langford of Carnegie Mellon University. CAPTCHAs are used to ensure that the data entry attempt is made by a human and not a computer.

the number of items CES was requesting of its respondents almost doubled, the TDE interview was viewed as too long and burdensome for most respondents. As a result, BLS started to transition respondents from CATI to Web over TDE in most cases. TDE is still offered to respondents who specifically request it, or to those who only report employment, such as Government units. Currently, TDE typically has a higher collection rate at the preliminary release of the estimates than Web; however, 85 percent of TDE respondents are in local government, who tend to have higher collection rates than average. Starting in 2011, Spanish was offered as an option to Web respondents, and in 2012 for TDE respondents.

(d) Email, 2006

40. At the same time the CES program was testing Web-Lite, it was also investigating email data collection. Email transmissions are designed to work by transmitting the data that are displayed on the screen. Thus the only method to transmit the data is to click reply and fill in the data on the embedded form, which may or may not display correctly for the end-users due to many different HTML rendering standards employed by email clients. CES used a third party software package that tried to circumvent the inherent downside of email data transmission by embedding HTML that implicitly allowed respondents to access the website through the submit button. The process only worked under very specific conditions and the data collection involved heavy manual intervention. Based on this feedback, the CES program elected not to pursue email data collection any further.

(e) WebFTP, 2007

41. In 2007, BLS assumed responsibility for the remaining state data collection and editing operations. As a result of the centralization activities, several states that were receiving files electronically indicated that they wanted CES to take over processing. West Virginia had created an Excel spreadsheet for respondents to report their data that was very popular for medium-sized businesses. Using the West Virginia spreadsheet as a template, CES began to offer a standardize Excel spreadsheet to select respondents and referred to the option as WebFTP. This reporting method is offered to respondents who have at least five locations but less than 100. The files are uploaded electronically using the same website as CES Web-Lite; instead of viewing the data grid, these respondents are shown a file upload option.

42. Respondents in mid-sized firms are very comfortable with Excel, which is both a positive and negative. There is no learning curve; however, there are savvy users who will modify the worksheet or link the CES worksheet to one of their own, which causes problems during data processing. WebFTP is very efficient if the submitted spreadsheets can be processed without human interaction. However, when there are problems, they tend to take longer to fix and require a higher degree of specialized review. Also respondents sometimes think that a person reviews the spreadsheets individually, and will include comments that may or may not be read in a timely manner. Prompting and edit corrections are handled in a similar manner to Web.

(f) A New Form for Solicitation and Ongoing Collection

43. The CES survey form has not altered substantially from the 1-page grid design since 1939. Over time, problems with the form have arisen and as a result the CES program designed a new booklet style form to address some of the reoccurring issues. The new form design was field tested in 2011 and the beginning of 2012. Two of the goals were to provide a clearer explanation of what the respondent was asked to do and to persuade respondents to participate. In terms of response rates, the redesigned form performed as well as the current 1-page form, but the biggest difference was in item response. The booklet style form consistently had higher item response rates during the testing cycle. CES CATI interviewers responsible for enrolling new sample members also indicated they preferred the new form over the old. The U.S. Office of Management and Budget approved the new booklet style form and the large scale rollout will begin in January 2013.

IV.   Current Methods, Costs, and Collection Rates

44.   Currently, the CES monthly data collection operations include most of the methods, or modes, discussed in this paper. For the initial solicitation, the program achieves a response rate in excess of 75%. Because the program keeps businesses in the survey for multiple years CES reports a collection rate for ongoing sample response. The collection rate calculation removes from the denominator those businesses that are out-of-scope or out-of-business, and those that have declined to participate in the survey. The optimization of sample collection across modes is fairly straightforward; excluding businesses who report by EDI, the program keeps as many respondents on CATI as possible. For those businesses that are not reporting via EDI and who cannot be retained as a CATI reporter, they are offered their choice of self-reporting method (with Web being the first option mentioned to most respondents). The distribution of sample over time by collection mode, and the current collection rates and costs are provided in the tables below.

Table 1. Distribution of CES sample by collection mode over time

Collection Mode	1915	1993	2004	2011
Mail	100%	86%	3%	0%
CATI	0	4	20	18
TDE	0	8	27	4
EDI	0	0	30	45
FAX	0	0	14	5
WEB	0	0	1	25
Other	0	2	5	3

Table 2. Collection rates and costs by mode, 2011 Average

Mode	Collection rates at first release	On-going collection cost, per unit
CATI	90.8%	$10.38
TDE	84.6%	$2.88
EDI	59.2%	$.50
FAX	85.8%	$5.86
WEB	78.5%	$2.40
Other	Varies	Varies

V.   Concluding Remarks

45.   The CES data collection process is a very large monthly operation with critical deadlines several times each month. These operations are managed centrally, and conducted in four Data Collection Centers, an Electronic Data Interchange Center, and an Internet Data Collection Facility. Data are collected by various modes from 141,000 businesses representing 486,000 establishments every month.

46.   The transition of data collection from decentralized operations in over 50 states to the central management of the DCCs has resulted in substantial efficiencies, by reducing duplicative management structures while maintaining enough geographic separation in data collection sites to protect against single points of failure due to adverse events. Managing data collection operations in this multi-modal environment is challenging: it requires a staff of professionals dedicated to this task who can identify and resolve problems very quickly when they occur. And it requires a staff of experts who continue to innovate so that the program maintains its reputation as a principle economic survey of the 21st century.

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