

Factors Affecting Response to the Occupational Employment Statistics Survey

Polly A. Phipps and Carrie K. Jones

Bureau of Labor Statistics

Phipps_p@bls.gov

Jones_carrie@bls.gov

Introduction

Response rates are increasingly a source of concern for government agencies and other organizations conducting establishment surveys. While there has not been a consistent pattern of increasing nonresponse, in the past several decades it has become more difficult to achieve and maintain high response rates (Christianson and Tortora, 1995, Interagency Group on Establishment Nonresponse, 1998). While establishment surveys conducted by the government have higher response rates on average than other organizations, government agencies are not exempt from low response rates or declines in response to ongoing surveys. Given the concern with response rates, one would expect to find a substantial literature on who participates in establishment surveys and who does not. However, as many have noted, the literature on establishment survey participation is fairly small, and quantitative studies are even less common. Our interest is in contributing to the literature by exploring survey participation through an analysis of establishment characteristics and survey design and administration factors. Ultimately, we hope that understanding these factors will provide direction on how to address nonresponse and improve the quality of survey estimates.

For our analyses, we use the Occupational Employment Statistics survey (OES), a bi-annual establishment survey measuring occupational employment and wage rates for wage and salary workers by industry for the U.S., States, certain U.S. Territories, and Metropolitan Statistical Areas within States. This voluntary survey of establishments with one or more employees is conducted by State employment workforce agencies in cooperation with the Bureau of Labor Statistics. While the response rate achieved by OES is quite high at approximately 76 percent, there is considerable variation by state, industry, and establishment size (Jones, 1999).

We first review the literature on establishment survey response and nonresponse, and then provide background on the OES sample, data collection procedures, and state survey administration. Next, we describe OES response rates over time by major areas of interest, including establishment size, size of metropolitan area, and industry groups, and we describe patterns of nonresponse, including survey refusals. Finally, using data from the May 2006 OES survey, the Quarterly Census of Employment and Wages, and a survey of state administrative practices, we use logistic regression models to predict the likelihood of survey response. We test the effect of a number of conceptual factors on response to the 2006 OES survey, including establishment characteristics, such as establishment age, multi-establishment firm status, industry, size, location; and survey design and administration factors, including survey form type, nonresponse followup strategies, State staff composition, experience, and turnover, and selection into other BLS surveys. A small percentage of OES data are collected centrally by the BLS national and regional offices. Given the differences in collection methods, we do not use it in this paper, and for the same reason, we exclude U.S. Territories.

Establishment Survey Response and Nonresponse

There is a large literature on household survey response rates, and while the corresponding establishment survey literature is not as extensive, it covers many of the same topics. These include nonresponse standards (Hidiroglou, Drew and Gray, 1993), nonresponse trends (Interagency Group on Establishment Nonresponse, 1998), procedures or experiments designed to increase response (Moore and Baxter, 1993), and post-survey adjustments for nonresponse (Sommers, Riesz, and Kashihara 2004), among others. The establishment survey literature is limited in the number of studies that analyze the likelihood of participation using establishment and survey administration characteristics. An excellent example of this type of research in household surveys is Groves' and Couper's (1998) analysis of factors that influence participation using six household surveys and decennial census records. As a conceptual framework, the authors use features of the study population that are not under

the control of the survey researcher (social environment and household characteristics), and features under researcher control (survey design and interviewer characteristics) to explore survey response.

Several studies have set out a theoretical framework and proposed factors that influence the likelihood that establishments will respond to a survey request (Tomaskovic-Devey, Leiter, and Thompson, 1994; Willimack, Nichols, and Sudman, 2002). Willimack, Nichols, and Sudman (2002) have proposed a theory for establishment survey response that includes factors affecting the external environment, the business, the respondent, and the survey design; the components are shown in Exhibit 1. Using Groves and Couper's (1998) conceptual framework they identify factors that are and are not under the control of the survey researcher. Those not under researcher control include the external environment, the business, and respondent characteristics. Survey research organizations can control sample and instrument design, other types of survey materials (e.g., instructions), contact strategies, mode of administration, and timing, among others. They base their theory on qualitative exploratory research conducted by the U.S. Census Bureau to study the reporting process in large multi-unit firms.

Willimack and colleagues propose under the external environment that weak economic conditions can affect participation, since fewer staff may be available to complete a survey, and businesses may be more reluctant to disclose information. Survey climate, i.e., the number of survey requests a business receives, may affect response, as well as other reporting requirements that are a higher priority than survey participation. They consider data availability a strong component of response, and related to a number of factors, including business characteristics such as size, type, industry, ownership, and the availability of staff to respond to mandatory and voluntary surveys. Respondent characteristics include having authority to provide data or delegate the task, capacity or knowledge of the data, and motivation to attend to the task. The authors find that of the survey design characteristics, particularly mode of administration, contact during high workload time periods, and contact strategies to prenotify or identify respondents are important for unit response rates. Overall, Willimack and colleagues propose that businesses weigh the burden of the survey response against business goals in their decision on whether to participate, and that the external environment, business, respondent, and survey design are factors in the weighing of survey burden and business goals.

Exhibit 1. Business Survey Participation (Willimack et al., 1998)

External environment	Business	Respondent	Survey design
Economic conditions	Data availability	Authority	Sample
Survey climate	---Business characteristics	Capacity	Survey topic
Legal/regulatory requirements.	---Organizational structure	Motivation	Instrument design
	---Management needs		Mode of administration
	---Regulatory reporting		Time schedules
	Environmental dependence		Contact strategies
	Company policy		Respondent identification
	Resource availability		Legal authority
			Survey sponsor
			Confidentiality

Tomaskovic-Devey and colleagues (1994) propose that organization complexity is related to authority and capacity to respond to a survey, and the organizational environment influences the capacity and motive to respond. Their view of authority, capacity, and motivation is associated with the larger organization, rather than concentrated with the respondent. Authority to respond can be formal or informal, organizational capacity refers to practices and processes tied to assembling the requested information, and there can be individual or organizational motives regarding information disclosure. They test their theory using survey data from a North Carolina employment and health survey and establishment public records. The authors find that establishments that are subsidiaries, large, have higher profits, and have greater sales concentration are less likely to respond, while establishments with high R and D intensity, and in price, safety regulated, and publicly-traded industries, are more likely to respond. They did not find industry categories significantly associated with response after controlling for organizational factors. They conclude that motive measures are most important in explaining response: establishments in profitable and concentrated markets are more independent of their environment and less likely to respond to a survey request, while price, safety regulated, and publicly traded industries have a higher motive to cooperate and shape

public opinion. For capacity measures, they argue that increased establishment size is a reflection of dispersal of information and less capacity to respond.

The conceptual frameworks for establishment survey response have had very limited testing. One of the reasons for the lack of empirical studies is likely a limited number of explanatory variables available in the survey data. An exception to this is a study by Potter (2000) analyzing nonresponse characteristics using the 1996 Nursing Home component of the Medical Expenditure Panel Survey. In this study, market, establishment, and survey administration characteristics were tested. Market characteristics included a state-level Medicaid reimbursement measure, and county-level data items for the establishment location: rural/urban, market environment (hospital and nursing home beds per capita and per population 75 and above, percent for profit nursing home beds), and county health status (influence mortality rate). Characteristics of the nursing home establishment included type of ownership, number of beds and residents, and federal certification for reimbursement under Medicare. Survey design characteristics were twofold: endorsement by the state nursing home association and interviewing field cost strata. Interviewer characteristics included demographics, work experience and caseload. Significant predictors of nonresponse included two market measures: a flat rate Medicaid reimbursement, as opposed to more generous reimbursement method, and counties with a lower supply of hospital beds. Related to market measures, whether the nursing home was hospital based increase the likelihood of response, as did location in the Midwest, compared to the northeast, south, or west. One survey design characteristic --areas requiring an overnight stay to collect data compared to larger clusters of cases--increased response. And a number of interviewer characteristics were associated with lower nonresponse, including white interviewers, interviewers with some college, and greater interviewer experience.

An analysis of the schools and staffing establishment survey sponsored by the National Center for Educational Statistics (1997) used logistic regression analysis to predict response for public schools. Univariate analyses showed that minority enrollment, region, urban/rural location, school level, size and type significantly affected response. However, the multivariate analysis found only three factors -- school level, size, and type—with a significant effect on nonresponse. The researchers found that secondary schools were more likely to respond than combined secondary and elementary schools, and elementary schools only; small schools were more likely to respond than larger schools; and schools that offer regular instruction, as opposed to special instruction in vocational, special, or alternative courses were more likely to respond.

Several other studies have focused on establishment nonresponse. Sommers and colleagues (Sommers, Riesz, and Kashihara, 2004) found that establishment employment, state, industry, age of firm, single or multi-unit firm, urban/rural county, and average wage were significant in predicting response. Tulp, Hoy, Kusch and Cole (198) used an experimental design to test the effect of mandatory and voluntary reporting. They found that mandatory reporting is more effective in obtaining higher response for establishments overall, and for establishments new to the survey and establishments who had previous survey exposure under mandatory conditions. Respondent identification has been explored by Moore and Baxter (1993), who found mixed results for use of contact name, i.e., small business with a contact name had higher response, particularly in wholesale, finance/real estate/insurance and small service sectors; while having or not having a contact did not affect large business response.

While conceptual frameworks have been offered and some empirical studies have explored participation in establishment surveys, many more studies are necessary to understand the dimensions of establishment survey participation. In fact, a 1998 Interagency Group on Establishment Nonresponse listed research on the characteristics and correlates of nonresponse as an area in need of development. This analysis is the first step in exploring and attempting to model OES survey participation.

OES Background

The Occupational Employment Statistics (OES) survey is primarily a mail survey. Data are collected by the State Workforce agencies, in cooperation with the Bureau of Labor Statistics, US Department of Labor. OES data are collected by analysts in State government offices. For survey administration purposes the State OES offices are grouped into six regions. Each region has a BLS office, and BLS personnel are assigned to guide, monitor, and assist the State OES offices.

Respondents report the number of employees by occupation and wage ranges. The occupational employment and wage data from sampled establishments are used to calculate employment estimates for nearly 800 occupations annually for the 50 States, the District of Columbia, Puerto Rico, the US Virgin Islands, and Guam as well as the nation as a whole. OES also produces employment and wage estimates for Metropolitan Statistical Areas (MSAs) as well as specific industries. Occupations are classified using the Standard Occupational Classification (SOC) system while industries are classified using the North American Industry Classification System (NAICS).

The OES Sample

The survey is conducted over a rolling 6-panel semi-annual (or 3-year) cycle. Each panel's sample contains approximately 200,000 establishments. Over the course of a 6-panel cycle, approximately 1.2 million establishments are sampled. When possible, non-government establishments are only sampled once every six panels. A census of Federal government, executive branch only, is taken for every panel. A census of State government units is taken every November.

The sample is drawn from a universe of about 6.5 million establishments across all non-farm industries. The sample is stratified by geography, industry, and employment size. The sample frame comes from Unemployment Insurance (UI) reports filed by almost all establishments. Only establishments in Guam as well as the railroad industry are exempt from mandatory UI filing; the frame for those units is obtained elsewhere.

Data Collection

The OES survey collection instrument consists of 97 industry-specific survey forms used for medium and large sized firms and one open-ended survey form used for smaller firms. Respondents report employment data by occupation across 12 wage bands, using a matrix format. The industry-specific forms have occupations already printed on the form and range in length from 16 to 24 pages, as shown in Exhibit 2. In addition, there is one 32-page form for colleges and universities and a 44-page form for government units. The occupations on each form are selected based on industry staffing patterns derived from previously collected data. Most survey forms cover a 3-digit NAICS industry. However, there are some forms that, due to heterogeneous staffing patterns, cover only a 4-digit NAICS industry. The 4-page open-ended form, in Exhibit 3, has space for respondents to write-in the occupations found in their forms. This form is used primarily for small size establishments, and each state defines their own values for "small"; the top value ranges from 9 to 99 employees, depending on state.

Exhibit 2. Example of occupation found on an industry-specific form

OCCUPATIONAL TITLE AND DESCRIPTION OF DUTIES		NUMBER OF EMPLOYEES IN SELECTED WAGE RANGES (Report Part-time Workers According to an Hourly Rate)												Total Employment	
		A	B	C	D	E	F	G	H	I	J	K	L		T
		Hourly (part-time or full-time)	under \$7.00	\$7.00 - 9.48	\$9.49 - 11.06	\$11.07 - 13.24	\$13.25 - 15.24	\$15.25 - 18.24	\$18.25 - 20.49	\$20.50 - 23.99	\$24.00 - 28.74	\$28.75 - 33.24	\$33.25 - 38.99		\$39.00 - 46.74
Annual Salary (full-time only)	under \$15,000	\$15,000 - 19,799	\$19,800 - 24,999	\$25,000 - 31,719	\$31,720 - 40,039	\$40,040 - 50,959	\$50,960 - 64,479	\$64,480 - 81,639	\$81,640 - 103,479	\$103,480 - 131,639	\$131,640 - 166,399	\$166,400 and over			

Management Occupations
(Managers in this section generally have other managers/supervisors reporting to them.)

Chief Executives -
Determine and formulate policies and provide the overall direction of companies or private and public sector organizations within the guidelines set up by a board of directors or similar governing body.

A	B	C	D	E	F	G	H	I	J	K	L	T

11-1011

Exhibit 3. Example of space found on the open-ended write-in form

OCCUPATIONAL TITLE AND DESCRIPTION OF DUTIES		NUMBER OF EMPLOYEES IN SELECTED WAGE RANGES (Report Part-time Workers According to an Hourly Rate)												Total Employment	
		A	B	C	D	E	F	G	H	I	J	K	L		T
		Hourly (part-time or full-time)	under \$7.00	\$7.00 - 9.48	\$9.49 - 11.06	\$11.07 - 13.24	\$13.25 - 15.24	\$15.25 - 18.24	\$18.25 - 20.49	\$20.50 - 23.99	\$24.00 - 28.74	\$28.75 - 33.24	\$33.25 - 38.99		\$39.00 - 46.74
Annual Salary (full-time only)	under \$15,000	\$15,000 - 19,799	\$19,800 - 24,999	\$25,000 - 31,719	\$31,720 - 40,039	\$40,040 - 50,959	\$50,960 - 64,479	\$64,480 - 81,639	\$81,640 - 103,479	\$103,480 - 131,639	\$131,640 - 166,399	\$166,400 and over			

The OES survey is initially mailed out to almost all establishments in the sample. The initial mailing is done by a central mail facility and occurs as close to the survey reference date as possible; either November 12th or May 12th. Three follow-up mailings are sent to non-respondents at approximately 3-4 week intervals. The initial mailing as well as the first two follow-up mailings use a mix of industry-specific survey forms with occupations already printed on them for the larger firms as well as the open-ended form for the smaller establishments. The last mailing uses only the open-ended survey form regardless of establishment size. Telephone follow-up calls are made to non-respondents. Some data for larger establishments is collected via personal visits. Other modes of collection include email, phone-in, facsimile, and electronic media such as disc or tape. The percentage of total responses returned via each collection mode for the May 2006 panel is shown in Exhibit 4.

Exhibit 4. Respondent Collection Mode, May 2006

Collection Mode	Percentage	Collection Mode	Percentage
Mail	71.9%	Personal visit	0.2%
Electronic unspecified	3.6%	Diskette, CD, DVD	0.6%
Hard copy printout	0.9%	E-mail	7.1%
Phone Call	11.8%	Fax	3.9%

State Survey Administration

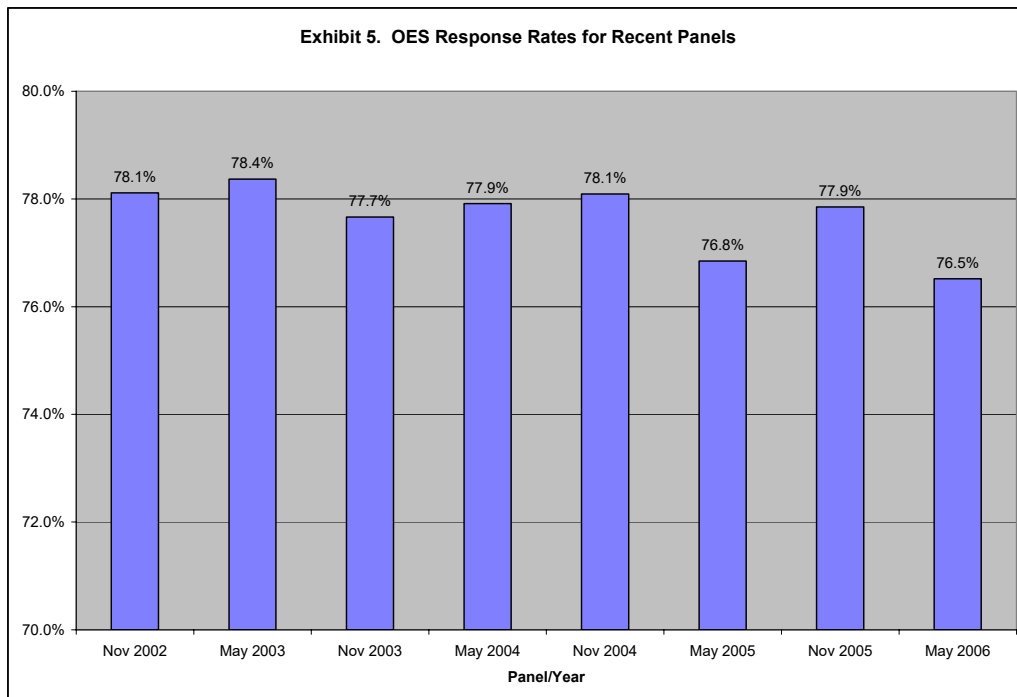
State agencies follow general federal guidelines in conducting the OES survey, but states are allowed flexibility and in turn, utilize different practices and procedures. In addition, state sample sizes vary dramatically. For example, Wyoming, with a sample of 743 establishments accounts for .4 percent of the OES sample, while California, with 15,691 establishments in the sample, accounts for 8.8 percent (See Appendix 1, Table 1). Since states vary in size and practice, we gathered information about states and state survey administration. These data were provided by the regional offices and included information on staff composition, staff vacancies, size of the staff, management structure, and procedures used during the May 2006 survey panel. The full set of results is shown in Appendix 1, Table 2, and we highlight some results below.

Personnel is an important part of survey administration. In May 2006, the number of full-time equivalent positions in States funded by BLS ranged from 1.3 to 18, with an average of 5.1 positions. On average, about three out of five positions were managerial or professional positions. About 60 percent of state personnel in management positions had over six years of OES experience, while approximately 32 percent of non-management staff had over six years of experience. Approximately 35 percent of states had some unfilled positions during the May 2006 panel, and 22 percent used staff from other programs, while only six percent hired temporary staff.

As discussed, states can utilize different survey procedures. The timing of telephone nonresponse followup varies by states: Approximately 58 percent of states begin telephone followup calls after the first survey mailing, 24 percent after the second mailing, and 20 percent after the third or fourth mailing. Over 40 percent of states mail a nonresponse follow up letter to potential respondents at some point in survey administration – about 18 percent of states mail it to all nonrespondents, while 25 percent of states target specific firms or industries for the letter. Over 75 percent of states did not experience mail or other major survey administrative problems in the May 2006 panel.

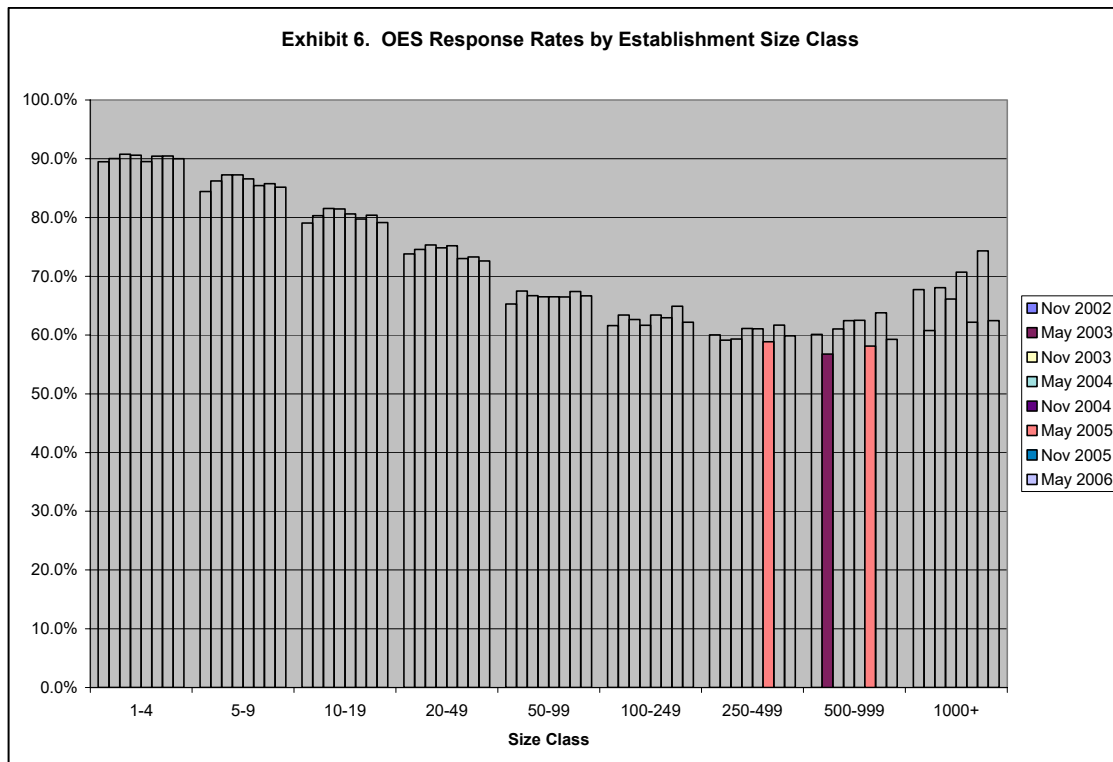
Historical OES Response Rates

OES response rates are quite high and fairly consistent over time, as shown in Exhibit 5. For most years the response rate for the November panel is slightly higher when compared to the May panel. This boost is due in part to the inclusion of State government data in November panels. State government data is often quite large and easier for the State office to collect from their co-workers in the State’s personnel office. Response rates for the May panel show a small decline from 78.4 to 76.5 percent from 2003 to 2006.



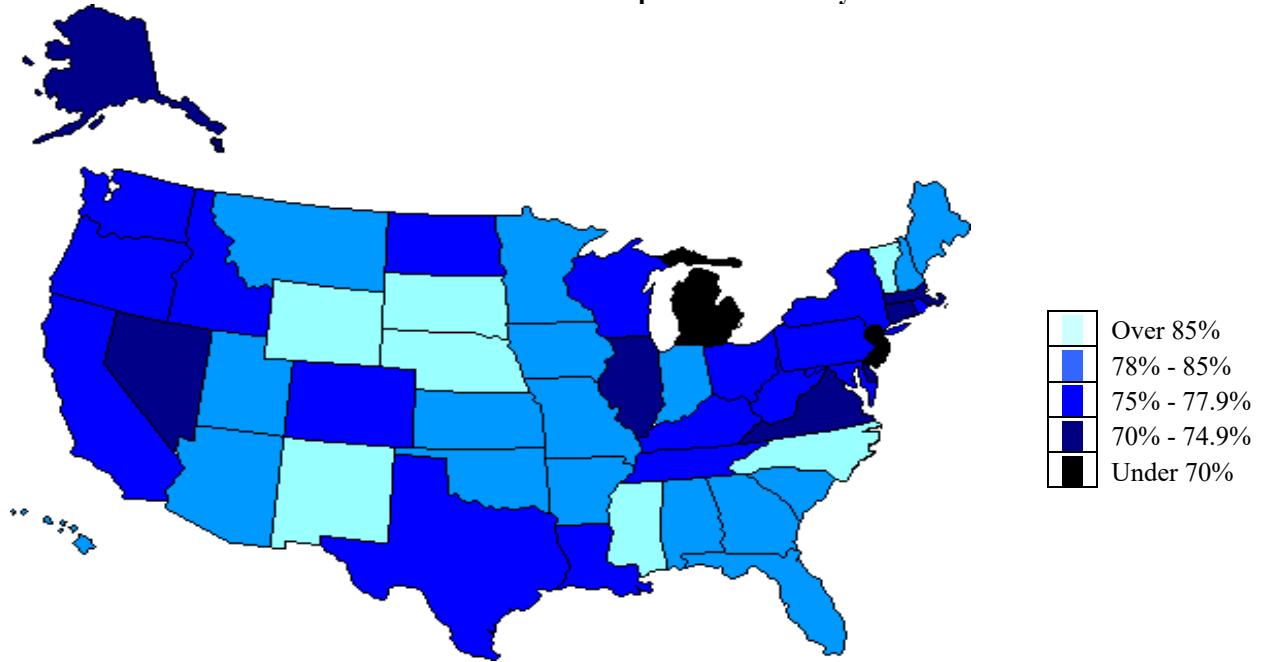
Response Rates by Employment Size

Response rates grouped by the size of the establishments show that small establishments have much higher rates than large establishments, up to 30 percentage points difference. Exhibit 6 also shows small declines in the response rates over time in establishments with five to 49 employees, but a less consistent trend in larger firms. In fact, firms with 250 to over 1,000 employees show some increases in the response rates over time. It is assumed that larger firms are more likely to have the technology to provide data by means of electronic filing and they are more likely to use it for completing the OES survey. In addition, many of the establishments in the larger size classes have staff dedicated to completing government forms and surveys (Willimack et al., 2002). Also, many State offices have diligent analysts who seek out a contact person in large establishments and work at creating and maintaining a cooperative relationship and rapport with the contact in order to facilitate the collection of the data.



Response rates for State offices collecting OES data range between 57 percent and 91 percent, shown in Exhibit 7 and also in Table 1 in the Appendix. State partners that collect the data are required to meet a 75 percent response rate in each panel, in either establishments or employment, as well as in each Metropolitan Statistical Area (MSA). In Oklahoma, North Carolina and South Carolina, responding to the OES survey is mandatory. OES response rates mapped out across the nation do not reveal any geographic pattern or indication of survey administration differences. Looking at the six regional office territories (Boston, Philadelphia, Atlanta, Chicago, Dallas, and San Francisco) also does not reveal any clear pattern that might indicate survey administration differences. However, Atlanta and Dallas regional offices have the highest response rates, with Chicago third overall (Appendix 1, Table 3), which could indicate survey administration differences or also regional differences, as the south and midwest often have higher response rates than the northeast and west.

Exhibit 7. State OES Response Rates – May 2006

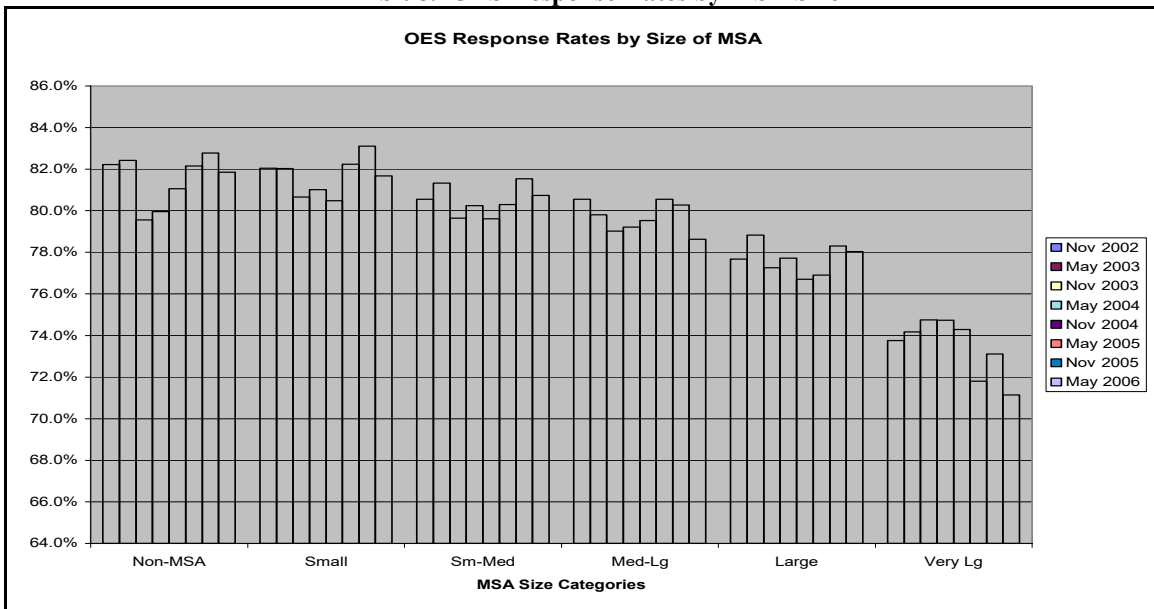


Response Rates by MSA

State analysts suggest that the larger the Metropolitan Statistical Area (MSA), the harder it is to collect data. They indicate that establishments in larger msa’s are less likely to respond by mail and are also difficult to reach during telephone follow-ups. Response rates by MSA shown in Exhibit 8 indicate this to be true, and only 66 percent of respondents in MSAs of one million or more population size reported by mail in the May 2006 panel, compared to 71.9 percent of all respondents (see Exhibit 4). Response rates for non- and smaller MSAs are in the lower 80s, while the larger MSAs are in the lower 70s.

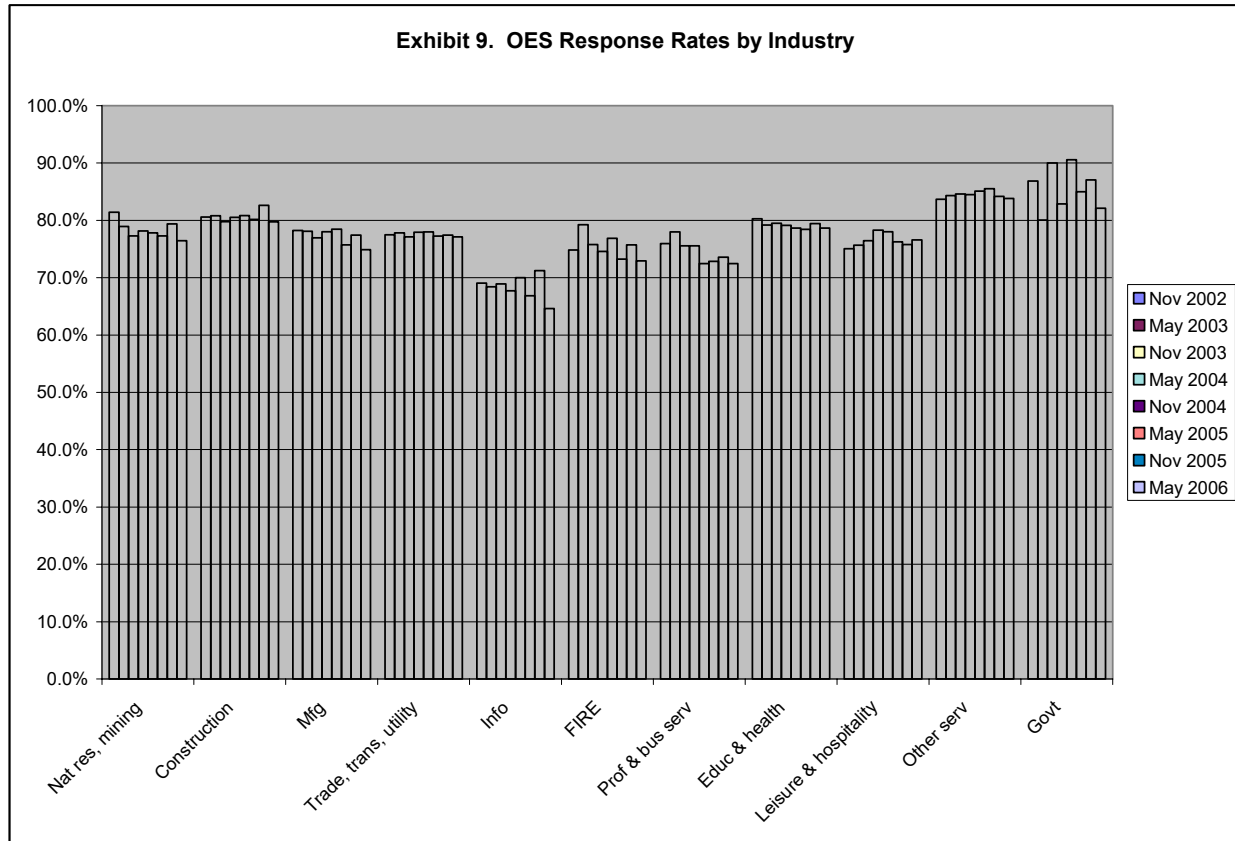
State analysts report that contacts in firms in the larger MSAs often complain that they are too busy to respond. The cultural environment of firms found in larger MSAs or perhaps the cultural environment of the larger MSAs themselves seems to influence the decision of whether or not a firm participates in the survey. State analysts report that it takes many phone calls and lots of persuasion to collect data from these firms.

Exhibit 8. OES Response Rates by MSA Size



Response Rates by Industry

Response rates by industry groups show some differences (Exhibit 9), but not nearly the differences seen by size class or msa. The information services industry has the lowest response rates while other services and government show the highest response rates. In recent November panels the response rates for information services and finance, insurance, and real estate (FIRE) have been slightly higher than in May panels. Informal interviews suggest that this could be attributed to good timing; those industries, especially FIRE, tend to be involved in closing out their fiscal year accounting during the November collection period and find it easier to submit data they are already working on.



Nonresponse Rates

Nonrespondents to the OES include establishments that do not mail back the survey form, those that communicate their non-participation (refusals), those that do not return phone calls, and those that submit incomplete employment data. Nonresponse rates have been consistent over time; they have varied between 21.6 percent and 23.5 percent.

State OES nonresponse rates vary a great deal: between 9 percent and 43 percent. Anecdotally State analysts attribute the differences in the level of nonresponse to the size of the sample the State must collect, the number of larger MSAs the State has (which State analysts believe negatively impacts the likelihood an establishment will agree to participate), and the number of larger units in the State samples. Regional personnel also cite varying levels of expertise, different State operational practices, and personnel shortages and issues as additional factors that affect nonresponse.

Nonresponse is lowest for firms with less than five employees. Informal interviews with State analysts suggest that this is at least partially attributed to State analysts' preferences for smaller firms. Contacting appropriate payroll personnel in these units is often easier. These firms also have smaller amounts of data so they are easier to code into the OES system. During a push to meet the mandatory 75 percent response rate, States will often concentrate on collect data from the smallest establishments. Nonresponse peaks when surveying larger establishments; those with 250 to 999 employees. Nonresponse subsides slightly with the largest establishments, those with more than 1000 employees.

Refusal Rates

Establishments that communicate their desire to not participate in the OES Survey are classified as refusals. In recent panels refusal rates range between 2.7 percent and 3.7 percent of the sample. As a portion of the overall nonresponse rate, refusals have ranged between 12.5 percent and 16.6 percent.

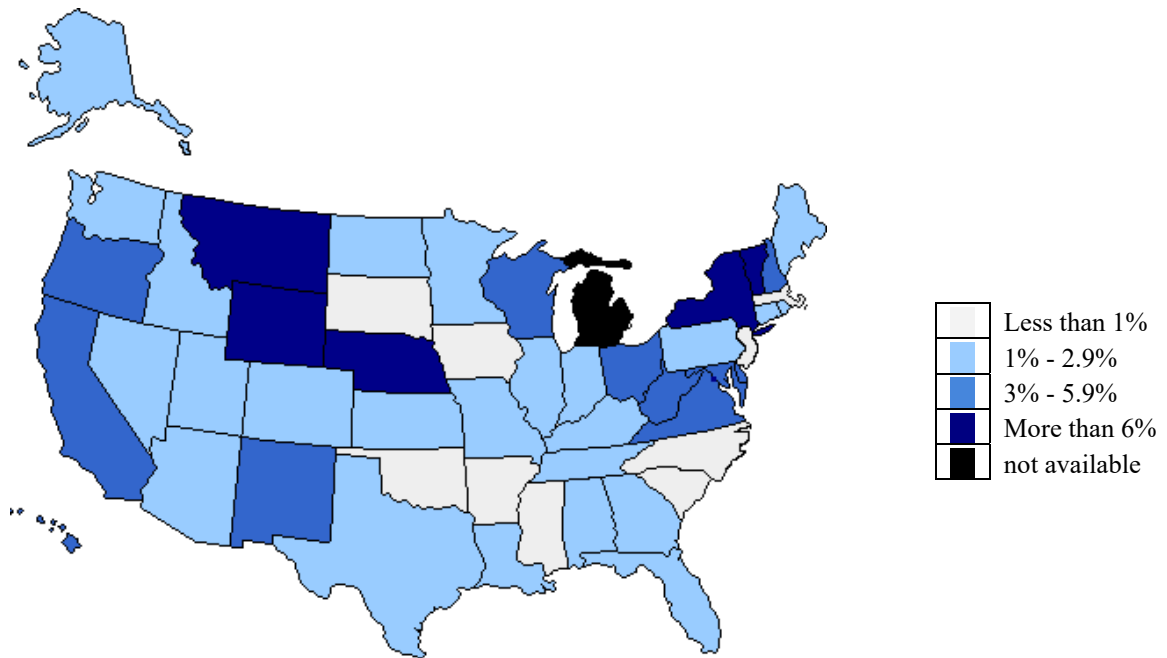
Exhibit 10. Refusal Rates

Nov 2002	3.0%	13.7%
May 2003	3.3%	15.5%
Nov 2003	3.4%	15.3%
May 2004	3.5%	15.7%
Nov 2004	2.7%	12.5%
May 2005	3.5%	15.0%
Nov 2005	3.7%	16.6%
May 2006	3.5%	15.1%

State refusal rates, shown in Exhibits 11, range between 0.0 percent and 11.8 percent. There is substantial anecdotal evidence that lower refusal rates and lower non-response rates in general are tied to the expertise and “people skills” of individual State analysts.

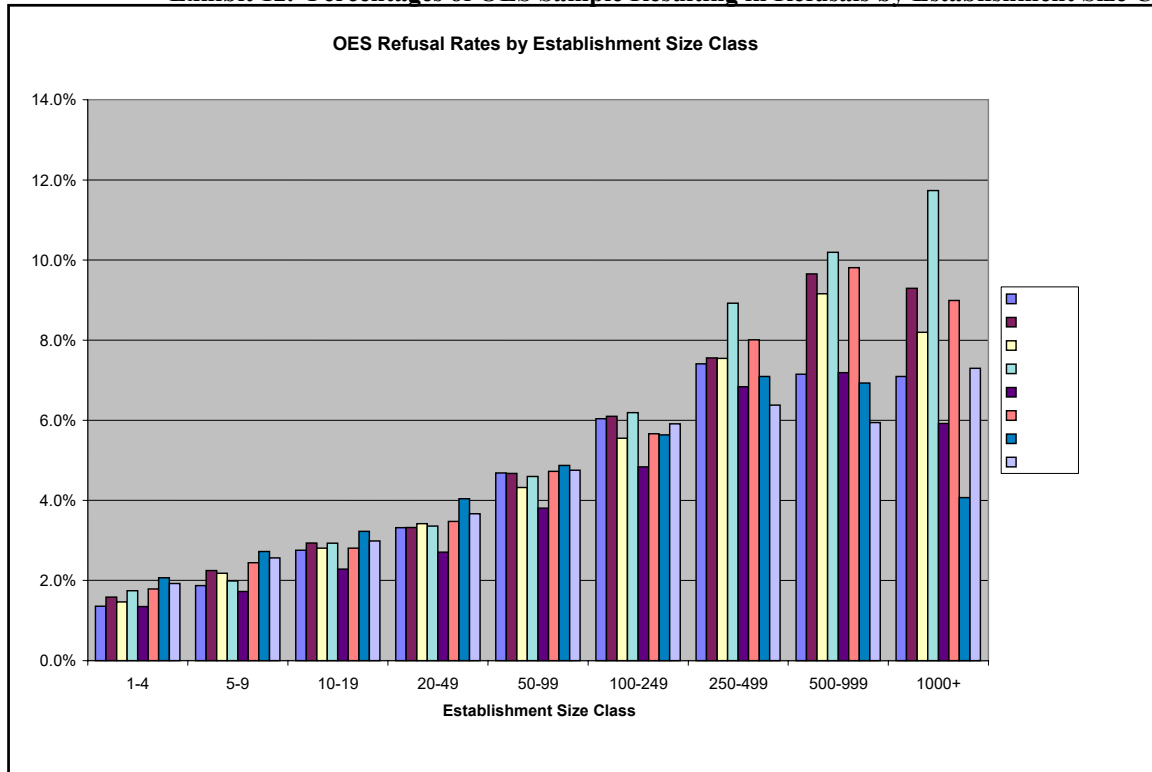
Refusal rates mapped out across the nation again do not reveal any geographic or regional pattern, as shown below.

Exhibit 11. State Refusal Rates – May 2006



Refusal rates by establishment size class for the May 2006 panel range between two and seven percent, as shown in Exhibit 12. Refusals by establishment size class show a directly proportional relationship. Similar to the reverse observed with overall response rates, refusal rates slightly decrease for the largest establishments. This may be due to larger establishments having personnel assigned to complete government paperwork and reports.

Exhibit 12. Percentages of OES Sample Resulting in Refusals by Establishment Size Class



Multivariate Data and Analysis

To analyze survey participation, we use data from the 2006 May OES panel. We include establishments in the sample that are collected by BLS partners in the United States, which covers 179,000 establishments in 50 states and the District of Columbia. We exclude one industry and one group of multi-establishment firms, due to different data collection procedures: the federal government, which is centrally collected by the BLS national office us, and establishments whose data are centrally collected by regional offices through a special arrangement with some multi-establishment firms.

We organize our analyses using the framework outlined by Willimack and colleagues, that of establishment or business, survey administration, and external environment characteristics. We are not able to include respondent characteristics, but hope to do so in future analyses. Respondent characteristics, such as contact name, title, and department, are in overlapping OES text data fields and are difficult to separate. Exhibit 13 includes the variables that we have available to test under each area.

In addition to OES establishment characteristics discussed earlier (employment size, industry, metropolitan statistical area size), we include five additional establishment characteristics listed in the first column of Exhibit 14 in the analysis from the BLS Quarterly Census of Employment establishment frame tied to the collection of unemployment insurance tax data. The additional items include whether an establishment is part of a multi-establishment firm that crosses states and/or is part of a multi-establishment firm within the state, how many state unemployment insurance accounts are attached to the multi-establishment, whether the establishment provides support services to other establishments in a firm, and the age of the firm (measured by the first unemployment insurance liability date). The response rates for these data items in the May 06 panel are reported in Table 3 in the appendix. To summarize: lower response rates are found for multi-establishment firm either across states or within a state and establishments providing support services for a firm, and higher response is observed as an establishment increases in age.

The survey administration characteristics listed in column 2 in Exhibit 13 originate in both the OES data and from the 2006 May panel state questionnaire discussed earlier. From the OES data, we use BLS region, state sample size, whether the survey is mandatory in a state, and whether an unstructured or industry-specific form was sent by the state partner. From the QCEW, we use a data item that indicates if any wage or employment data were missing, imputed or of problematic quality, to

indicate a pattern of problem reporting for the establishment. Also from the QCEW, we are able to determine if the establishment was in the sample for another BLS survey, the Current Employment Statistics Survey, to assess potential burden. Response rates for these data items are listed in Table 3 of the appendix and show that being in the CES sample, having missing or imputed UI/QCEW data, and receiving an industry specific form (the latter is highly associated with employment size) reduces response rates, while mandatory state surveys have higher response rates. From the state questionnaire, we use data items on staffing, data collection practices and problems, and state government events, listed in Table 2 in the appendix.

Exhibit 13

Employment size	BLS Region	In CES sample
Industry	State sample size	Employment size
MSA size	State mandatory survey	MSA size
State multi-establishment	Survey form type	Significant state economic change
Number of State UI accounts	Missing or imputed UI wage or employment data	State population change 05-06
U.S. multi-establishment	In CES sample	State revenue change 05-06
Provides auxiliary support services to other company establishments	Staff number, composition, experience	
Establishment age	Staff reductions, use of non-regular staff	
	Data collection practices	
	Nonresponse followup timing	
	Survey administration problems	
	State govt/agency events	

We have few variables to measure the external environment of the establishment, including whether the establishment is in the ces sample to measure the survey environment, employment size, msa, whether there were significant state economic events as measured by the state questionnaire, the state population change from 2005-06 from Bureau of the Census data, and 2005-06 state general fund revenue change from the Association of State Budget Officers.

We use logistic regression models to fit the response outcomes, which predict the probability of whether the establishment responded or not. We provide the chi-square statistics and significance levels for each data item, and the exponentiated value of the coefficient, which can be interpreted as an odds ratio (values greater than one indicate an improvement in response). Finally, we compare different models using the rescaled R^2 for variance explained and the likelihood ratio.

Establishment Model Results

Exhibit 14 provides the Chi-square statistics and significance levels of the variables in the establishment model. Employment size, followed by industry, and whether or not the establishment is part of a multi-state firm have the largest Chi-square values, with employment size much larger than other variables. This is followed by the age of a firm, MSA size, number of state UI accounts, whether the establishment is part of a state multi-unit firm, and auxiliary status. The odds ratios, shown in Exhibit 15, show that having an employment size of less than 100 increases the likelihood of response. Being outside or in metropolitan statistical area with a lower population increases the probability of response compared to the most populous MSA; however, it is not a linear trend, due to a higher likelihood of response from establishments in MSAs with 500-999,000 persons. The results for industry show that information and finance have lower probability of response than local government establishments. One can speculate that many of the white-collar industries within the finance and information are likely to have fairly well developed records systems for reporting data. While all industries have a lower probability of response than local government, a number of service industries—education and health, leisure and hospitality, and all other services have a higher probability of reporting compared to manufacturing, an industry with a history of strong records-keeping practices. Establishment age, perhaps associated with better reporting capabilities and more established staffing, increases the likelihood of response, as does the number of state UI accounts associated with an establishment. However, being part of a multi-unit firm, either across states or within a state reduces the likelihood of response compared to single unit establishments, as does providing support services to other establishments in a firm.

Exhibit 14

Employment Size	5	5302.71	<.0001
MSA	5	149.70	<.0001
Industry	10	1418.57	<.0001
Multi-State unit	1	1272.05	<.0001
State Multi-unit	1	55.80	<.0001
No. of state UI accounts	1	91.64	<.0001
Auxiliary status	1	12.83	0.0003
Establishment age	1	348.15	<.0001

Exhibit 15

Intercept	.0879	1.17	Industry		
Employment Size			Nat res, mining	<.0001	0.47
1-9	<.0001	4.25	Construction	<.0001	0.58
10-49	<.0001	2.01	Mfg	<.0001	0.55
50-99	<.0001	1.38	Trade, trans, utility	<.0001	0.56
100-249	.1268	1.10	Information	<.0001	0.32
250-999	.7570	1.02	Finance	<.0001	0.42
1000+		1.0	Prof & bus	<.0001	0.50
MSA			Educ, health	<.0001	0.75
Not MSA	<.0001	1.43	Leisure, hospitality	<.0001	0.64
50-149,999	<.0001	1.31	Other services	<.0001	0.63
150-249,999	<.0001	1.29	Local government		1.0
250-499,999	<.0001	1.25	US multi-unit		
500-999,999	<.0001	1.33	Single unit	<.0001	1.85
1,000,000+		1.0	Multi unit		1.0
Establishment age	<.0001	1.01	State multi-unit		
No. state UI accounts	<.0001	1.01	Single-unit	<.0001	1.12
Auxiliary status			Multi unit		1.0
Not Auxiliary	0.0003	1.20			
Auxiliary		1.0			

Survey Administration Model Results

Exhibits 16 and 17 display the results of the survey administration model. Survey form type, which is highly associated with the employment size of the firm, has a very high Chi-square value with the longer, industry form having a much lower probability of response, controlling for all other survey administration variables. Establishments in states that do not have a mandatory survey have a lower probability of response, as would be expected. Whether or not an establishment is in the CES sample is not significant in this model. BLS regional results may reflect administrative practices, but also could reflect geographic or cultural differences in reporting. The data, show that establishments in Atlanta, Philadelphia and Chicago regions have a higher probability, and Boston and Dallas have a lower probability of response compared to San Francisco. Having a higher percent of managerial staff and no decrease in staff positions increases the likelihood of response, but other staffing variables do not show the same pattern. The number of positions, having staff and managers with greater than four years of experience, unfilled positions, and using temporary or staff from other programs lowers the probability of response. One can speculate that staff and managers with the greatest tenure and not having unfilled positions could be associated with burn out, and that using staff outside of regular staffing could be associated with inexperience. However, more testing of staffing variables using different cut-offs is important to understanding the patterns. The timing of first telephone followup calls indicates that calling after the first mailing is most important in predicting response. Other survey administration

variables are difficult to assess, for example, the greater the number of data collection practices utilized, the lower the probability of response. It may be that states with more difficulty historically in reaching higher response rates utilize more of the practices. Also, establishments in states reporting no survey administrative problems and no state government or agency events have a lower probability of response. It may be that states reporting those types of problems, particularly administrative problems, are those that have efficiently identified problems and feel comfortable relating them to regional personnel (who collected the state questionnaire data).

Exhibit 16

BLS Region	5	430.37	<.0001
State sample size	1	95.84	<.0001
State mandatory survey	1	444.00	<.0001
Survey form type	1	5099.04	<.0001
Missing/imputed UI data	1	23.45	<.0001
CES sample	1	1.29	<.2566
Staff FTE positions	1	165.59	<.0001
Percent Managerial	1	348.15	<.0001
Has staff with 4+ yrs exp	1	112.58	<.0001
Has managers with 4+ yrs exp	1	62.32	<.0001
Unfilled positions	1	176.04	<.0001
Used non-regular staff	1	132.18	<.0001
Had decrease in FTE	1	74.32	<.0001
No. of data collection practices	1	27.56	<.0001
Timing of telephone followup	3	267.62	<.0001
Survey admin problems	1	18.68	<.0001
State govt/agency events	1	52.84	<.0001

Exhibit 17

Intercept	<.0001	11.57	No staff with 4+ yrs exp	<.0001	1.27
			Staff with 4+ yrs exp		1.0
Boston	<.0001	.83	No managers with 4+ yrs exp	<.0001	1.14
Philadelphia	<.0001	1.28	Managers with 4+ yrs exp		1.0
Atlanta	<.0001	1.62	No unfilled positions	<.0001	.72
Chicago	<.0001	1.28	Unfilled Positions		1.0
Dallas	.2928	.97	No non-regular staff	<.0001	0.77
San Francisco		1.0	Used non-regular staff		1.0
State sample size	<.0001	1.0	No decrease in FTE	<.0001	1.29
Not mandatory state	<.0001	.38	Had decrease in FTE		1.0
Mandatory state		1.0	No. of data collection practices	<.0001	0.95
Industry form	<.0001	.42	Phone followup begins after		
Unstructured form		1.0	1 st mailing	<.0001	1.34
No missing/imputed UI data	<.0001	1.13	2 nd mailing	<.0001	.82
Missing/imputed		1.0	3 rd mailing	<.0001	1.08
Not in CES sample	<.0001	1.02	4 th mailing		1.0
CES sample		1.0	No admin problems	<.0001	.90
No. FTE positions	<.0001	.91	Admin problems		1.0
Percent Managerial	<.0001	1.48	No state gov/agency events	<.0001	.84
			State gov/agency events		1.0

External Environment Model Results

The external environment model shows that employment size has the greatest impact, as measured by the chi-square values, as shown in Exhibit 18. Employment size in one form or another has the greatest impact overall in the models, and we hope to investigate the role of size further in future analyses, using interactions. Clearly, the size of the establishment affects the reporting environment, with larger establishments having more government reporting, and perhaps less commitment to completing voluntary surveys. Increasing MSA size decreases the probability of response, again with the exception of the 500-999,000 category. Establishments in larger MSAs may operate in a cultural environment that reduces the likelihood of response, although one can speculate that establishments in smaller MSA might face more difficult economic conditions that could discourage response. We are exploring adding other economic survey data items that might measure market competitiveness by industry and msa, which could improve this model. Significant state economic changes reduced the likelihood of response, state population change had a small effect, while state revenue changes were not significant. Finally, not being in the CES sample lowers the probability of response, which is a item that was insignificant in the survey administration model. This is somewhat contrary to expectation in that establishments operating in a survey environment that is demanding in reporting requirements might be less likely to participate. However, one can argue that greater reporting requirements are handled best by those that face the greatest burden, given staffing and records keeping capabilities.

Exhibit 18

In CES sample	1	43.08	<.0001
Employment size	5	6297.28	<.0001
MSA size	5	745.18	<.0001
Significant state economic change	1	345.01	<.0001
State population change 05-06	1	74.94	<.0001
State revenue change 05-06	1	1.59	0.2076

Exhibit 19

Intercept	.3428	.94	MSA		
			Not MSA	<.0001	1.51
Not in CES		.89	50-149,999	<.0001	1.34
In CES sample		1.0	150-249,999	<.0001	1.32
Employment Size			250-499,999	<.0001	1.27
1-9	<.0001	3.93	500-999,999	<.0001	1.32
10-49	<.0001	1.89	1,000,000+		1.0
50-99	<.0001	1.28	No significant economic change	<.0001	1.65
100-249	.8933	.99	Significant economic change		1.0
250-999	.0502	.89	State pop change	<.0001	1.0
1000+		1.0	State revenue change	0.2076	1.0

Full Model Results

Exhibits 20 and 21 show the results of the inclusion of all variables in the three models. The direction of nearly all the variables remains the same, with a few minor exceptions. Employment size has the largest chi-square value, although smaller, the trend is consistent in that establishments with fewer than 100 employees are more likely to respond. Other items with large values tied to the establishment include whether the establishment is part of a firm that crosses states and industry, as well as establishment age and MSA. These variables are in the same direction as in the establishment model, in that multi-state status decreases, but age increases the probability of response. Information and finance have the lower probability of

response, while many of the services are more likely to respond than mining, construction, manufacturing, and transportation industries, but overall all industries have a lower response than local government. MSA results are mixed, with not being located in an msa being associated with the highest response. Survey administration results are very similar, with region, mandatory survey, form type, telephone followup timing, unfilled positions and use of non-regular staff having a large impact. Telephone follow timing shows a trend of the greatest probability of response after the first mailing, with the second and third mailings also increasing response, compared to followup after the final mailing. External environment variables are in the same direction, with significant state economic factors having a high chi-square value.

Exhibit 20

Establishment			
Employment Size	5	2034.35	<.0001
MSA	5	218.85	<.0001
Industry	10	1097.05	<.0001
Multi-State unit	1	1303.82	<.0001
State Multi-unit	1	39.87	<.0001
No. of state UI accounts	1	84.99	<.0001
Auxiliary status	1	11.48	0.0007
Establishment age		363.05	<.0001
Survey administration			
BLS Region	5	382.58	<.0001
State sample size	1	4.58	.0323
State mandatory survey	1	153.58	<.0001
Survey form type	1	123.50	<.0001
Missing/imputed UI data	1	39.99	<.0001
CES sample	1	31.95	<.0001
Staff FTE positions	1	17.46	<.0001
Percent Managerial	1	35.31	<.0001
Has staff with 4+ yrs exp	1	99.83	<.0001
Has managers with 4+ yrs exp	1	52.28	<.0001
Unfilled positions	1	176.04	<.0001
Used non-regular staff	1	112.53	<.0001
Had decrease in FTE	1	15.51	<.0001
No. of data collection practices	1	36.32	<.0001
Timing of telephone followup	3	41.19	<.0001
Survey admin problems	1	16.80	<.0001
State govt/agency events	1	13.69	.0002
Significant state economic change	1	148.41	<.0001
State population change 05-06	1	70.01	<.0001
State revenue change 05-06	1	81.28	<.0001

Exhibit 21

Intercept	.3642	1.13	BLS Region		
			Boston	<.0001	1.22
1-9	<.0001	3.67	Philadelphia	<.0001	1.80
10-49	<.0001	1.91	Atlanta	<.0001	1.99
50-99	<.0001	1.40	Chicago	<.0001	1.91
100-249	.0643	1.12	Dallas	<.0001	1.27
250-999	.7026	1.03	San Francisco		1.0
1000+		1.0	State sample size	<.0001	1.0
			Not mandatory	<.0001	.54
Not MSA	<.0001	1.25	Mandatory		1.0
50-149,999	<.0001	1.18	Industry form	<.0001	.81
150-249,999	<.0001	1.22	Unstructured form		1.0
	<.0001		No missing/imputed UI data	<.0001	1.19
250-499,999		1.12	Missing/imputed		1.0
500-999,999	<.0001	1.22	Not in CES sample	<.0001	.90
1,000,000+		1.0	CES sample		1.0
Nat res, mining	<.0001	.47	No. FTE positions	<.0001	.97
Construction	<.0001	.57	Percent Managerial	<.0001	1.25
Mfg	<.0001	.54	No staff with 4+ yrs exp	<.0001	1.28
Trade, trans, utility	<.0001	.56	Staff with 4+ yrs exp		1.0
	<.0001		No managers with 4+ yrs exp	<.0001	1.13
Information		.32	Managers with 4+ yrs exp		1.0
Finance	<.0001	.42	No unfilled positions	<.0001	.73
Prof & bus	<.0001	.50	Unfilled Positions		1.0
Educ, health	<.0001	.77	No non-regular staff	<.0001	.74
Leisure, hospitality	<.0001	.64	Used non-regular staff		1.0
Other services	<.0001	.62	No decrease in FTE	<.0001	1.13
Local government		1.0	Had decrease in FTE		1.0
Establishment age	<.0001	1.01	No. of data collection practices	<.0001	.94
No. state UI accounts	<.0001	1.01	Phone followup begins after		
			1 st mailing	<.0001	1.37
Not Auxiliary unit	.0007	1.19	2 nd mailing	<.0001	1.18
Auxiliary unit		1.0	3 rd mailing	<.0001	1.18
			4 th mailing		1.0
Single-unit	<.0001	1.88	No admin problems	<.0001	.90
Multi unit		1.0	Admin problems		1.0
			No state gov/agency event	.0002	.90
Single-unit	<.0001	1.11	State gov/agency event		1.0
Multi unit		1.0			
No significant economic change	<.0001	1.8	State pop change	<.0001	1.0
Significant economic change		1.0	State revenue change	<.0001	1.0

Model Testing

Comparing the models in Exhibit 22, we see that the establishment model explains more of the variation and has a better fit than the survey administration or external environment models. The establishment model includes data items theoretically not under the control of the survey organization, thus its strength poses a dilemma in how to proceed to address nonresponse. All of the first three models are heavily influenced by the effect of size, either through the employment size itself or the survey form type, in the case of the survey administration model. We hope to disentangle the meaning of employment size through future analysis of interactions with industry, msa, establishment age, and multi-establishment status. There may be proxy variables at an industry level that measure establishment characteristics such as data availability and staffing resource patterns we could utilize; the latter data are likely to be found in the OES. We also can explore and reconceptualize variables in the survey administration model, include additional information we are gathering on the modes that are more likely to be offered to respondents by each state (such as email reporting), and conduct further analysis of form type through interactions with establishment and survey administration variables. In addition, we plan further analysis of state sample size, which was significant in the survey administration model, and its interactions with industry, msa, and employment size in the future. Since survey design and administration is theoretically under the control of the survey researcher, it is a critical area for further research. For the external environment model, we are investigating additional data items that might better capture economic conditions and the legal and regulatory climate associated with states, msa and industries.

The full model, reduces the effect of size somewhat, and with all variables from the other models included explains about 12 percent of the variance, a substantial increase over the models focusing on only one conceptual areas of survey participation. While we have much more to explore in model testing and alternative variable construction, it appears that each conceptual area -- the establishment, survey administration and external environment -- is important in explaining participation in the OES survey.

Exhibit 22

Establishment	.1042	12678.03	<.0001
Survey Administration	.0649	7882.13	<.0001
External environment	.0775	9458.22	<.0001
Full Model	.1229	15048.14	<.0001

APPENDIX

Table 1. Sample Distribution and Response Rate by State, May 2006 panel

Alabama	01	3619	2.0	82.5	Missouri	29	4096	2.3	80.7
Alaska	02	691	.4	73.7	Montana	30	1023	.6	84.0
Arizona	04	2529	1.4	78.1	Nebraska	31	1647	.9	91.3
Arkansas	05	2323	1.3	80.6	Nevada	32	1453	.8	73.1
California	06	15691	8.8	74.4	New Hampshire	33	1641	.9	80.2
Colorado	08	3352	1.9	77.1	New Jersey	34	5260	2.9	56.6
Connecticut	09	3097	1.7	70.8	New Mexico	35	1408	.8	89.9
Delaware	10	825	.5	76.5	New York	36	8513	4.8	74.8
District of Columbia	11	453	.3	73.7	North Carolina	37	5401	3.0	91.4
Florida	12	8943	5.0	77.1	North Dakota	38	926	.5	77.4
Georgia	13	4321	2.4	82.9	Ohio	39	7671	4.3	74.6
Hawaii	15	949	.5	78.1	Oklahoma	40	2431	1.4	79.1
Idaho	16	1183	.7	75.8	Oregon	41	2876	1.6	76.9
Illinois	17	5545	3.1	71.2	Pennsylvania	42	7679	4.3	74.5
Indiana	18	4842	2.7	80.8	Rhode Island	44	954	.5	75.4
Iowa	19	2912	1.6	82.6	South Carolina	45	2975	1.7	84.7
Kansas	20	2276	1.3	77.9	South Dakota	46	966	.5	91.1
Kentucky	21	2855	1.6	75.7	Tennessee	47	3518	2.0	75.0
Louisiana	22	3283	1.8	75.0	Texas	48	11379	6.7	74.8
Maine	23	1408	.8	78.3	Utah	49	1718	1.0	79.0
Maryland	24	2902	1.6	74.3	Vermont	50	839	.5	86.3
Massachusetts	25	4460	2.5	74.0	Virginia	51	4563	2.6	73.5
Michigan	26	5298	3.0	65.6	Washington	53	3858	2.2	76.6
Minnesota	27	3540	2.0	77.9	West Virginia	54	1692	1.0	74.9
Mississippi	28	1888	1.1	89.5	Wisconsin	55	4585	2.6	76.0
					Wyoming	56	743	.4	89.6

Table 2. State and District Survey Results, May 2006 (N=51)

		Number of Staff	
Mean	5.1	< 1 – 3 years experience	43%
Standard Deviation	3.3	4 - 6 years experience	25%
Range	1.3 – 18.0	> 6 years experience	32%
Sum	259	Total	100%
		Data Collection Practices	
Mean	3.4	Used BLS spreadsheet for address refinement	57%
Standard Deviation	3.0	Used address refinement postcards	31%
Range	.5 – 13.0	Used email for data collection	98%
Sum	171.5	Collected multi units separately from centralized mailings	43%
Use staff from other programs?	22%	Mailed nonresponse letter to all nonrespondents	18%
Missing	1	Mailed nonresponse letter to some nonrespondents	25%
Hire temporary staff?	6%	Nonresponse Telephone Followup	
Missing	2	After 1 st mailing	57%
		After 2 nd mailing	24%
Increase	4%	After 3 rd mailing	16%
Decrease	22%	After 4 th mailing	4%
About the same	75%	Survey Administration Problems	
Unfilled positions	35%	Late mail delivery	5%
Mean	.47	Other mail problems	12%
Standard Deviation	.78	Other survey admin problems	6%
Range	.3 -3.4	None of the above	76%
		State Events	
< 1 – 3 years experience	23%	Significant economic changes	4%
4 – 6 years experience	17%	Significant administrative changes	12%
> 6 years experience	59%	Agency restructuring	8%
Total	100%	Other agency transitions or moves	18%

Table 3. Distribution of Variables and Final Response Rate (N=179,000)

All States/DC	179000		76.5			
Emp Size Class						
1-4	28925	16.2	89.5	Industry		
5-9	29826	16.7	84.9	Nat res, mine	1803	1.0 76.4
10-19	32405	18.1	79.5	Constr.	14768	8.3 79.7
20-49	39236	21.9	73.1	Mfg	17129	9.6 74.9
50-99	23718	13.3	67.6	Trade, trans, utility	41469	23.2 77.1
100-249	15411	8.6	61.8	Information	3978	2.2 64.6
250-499	5722	3.2	60.3	Finance	12210	6.8 72.9
500-999	2328	1.3	59.4	Prof & bus	25429	14.2 72.5
1000+	1429	.8	62.6	Educ, health	27485	15.4 78.6
MSA				Leisure, hospitality	21265	11.9 76.6
Not MSA	36833	20.6	81.9	Other serv	9584	5.4 83.8
50-149,999	14105	7.9	81.7	Local govt	3880	2.2 82.1
150-249,999	13808	7.7	80.7	Multiple state unit	51665	24.4 65.0
250-499,999	20712	11.6	78.6	Single state unit	127335	75.6 80.2
500-999,999	19113	10.7	78.0	State multiple unit	49878	27.9 70.3
1,000,000+	74427	41.6	71.1	State single unit	129122	72.1 78.9
Regional Offices				State multiple UI acct	29530	16.5 69.4
Boston	21792	11.7	75.2	State single UI accts	149470	83.5 77.9
Philadelphia	24510	13.1	70.3	Auxiliary service estab	1958	1.1 61.8
Atlanta	35253	18.7	81.7	Non-aux est.	177042	98.9 76.7
Chicago	39427	21.2	76.0	CES sample overlap	18611	10.4 72.2
Dallas	35444	19.0	78.1	No overlap	160389	89.6 77.0
San Francisco	30689	16.3	75.3	Mandatory state	10807	6.0 86.8
Estab. Age		Years		Non- mandatory	16893	94.0 75.9
Mean	44750	13.2	74.5	Missing/impu ted UI data	9667	5.4 73.1
Quartile 1	44750	4.1 yrs	74.9	No miss/imp UI data	169333	94.6 76.7
Median	44750	9.2 yrs	77.2	Industry form	87304	48.7 68.9
Quartile 3	44750	18.9 yrs	79.5	Unstructured form	91696	51.2 83.8

Bibliography

- 1998 Interagency Group on Establishment Nonresponse. "Revisiting the Issues and Looking to the Future." Presented at the 1998 Conference of the Council of Professional Associations on Federal Statistics (November).
- 1999 Jones, Carrie K. "Response Rates Analysis: An Analysis of the 1996/1997 Occupational Employment Statistics Survey Response Rates." Bureau of Labor Statistics.
- 1993 Moore, Danna L. and Rodney K. Baxter. "Increasing Mail Questionnaire Response Rates for Surveys of Businesses: A Telephone Follow-up Procedure as an Element of the Total Design Method." Presented at the International Conference on Establishment Surveys, Buffalo, N.Y. (June).
- 1997 National Center for Educational Statistics. An Analysis of Total Nonresponse in the 1993-94 Schools and Staffing Survey. Washington, DC (NCES 98-243).
- 2000 Potter, D.E.B. "Characteristics of Nonrespondents in a National Longitudinal Survey of Nursing Homes." Proceedings of the Second International Conference on Establishment Surveys, pp. 1510-1515.
- 2004 Sommers, John, Steven Riesz, and David Kashihara. "Response Propensity Weighting for the Medical Expenditure Panel Survey – Insurance component (MEPS – IC)," ASA section on Survey Research Methods, pp 4410 - 17.
- 1994 Tomaskovic-Devey, Jeffrey Leiter, and Shealy Thompson. "Organizational Survey Nonresponse." *Administrative Science Quarterly* 39: 439-457.
- 198 Tulp, Daniel R., C. Easley Hoy, Gary L. Kusch, and Stacey J. Cole. "Nonresponse under Mandatory Vs. Voluntary reporting in the 1989 Survey of Pollution Abatement Costs and Expenditures (PACE). Industrial Statistics Working paper, U.S. Census.
- 1991 Van Liere, Kent D., Robert M. Baumgartner, Pamela P. Rathbun, and Bobbi Tannenbaum. "Factors Affecting Response Rates in Surveys of Business and Organizations. Presented at the Annual Meeting of the American Association for Public Opinion Research, Scottsdale, AZ (May).
- 2002 Willimack, D.K., Nichols, E., and Sudman, S. (2002). "Understanding Unit and Item Nonresponse in Business Surveys," in *Survey Nonresponse*, R. Groves et al., New York: Wiley.