ABSTRACT

Title of dissertation: THE USE OF EMAIL
IN ESTABLISHMENT SURVEYS

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This dissertation evaluates the effectiveness of using Email for survey solicitation, nonresponse follow-up, and notifications for upcoming scheduled interviews in an establishment survey setting. Reasons for interest in the use of Email include the possibility that it could reduce printing and postage expenses, speed responses and encourage online reporting. To date, however, there has been limited research on the extent to which these benefits can in fact be realized in an establishment survey context.

In order to send an Email for survey purposes, those administering a survey must have Email addresses for the units in the sample. One method for collecting Email addresses is to send a prenotification letter to sampled businesses prior to the initial survey invitation, informing respondents about the upcoming survey and requesting they provide contact information for someone within the organization who will have knowledge of the survey topic. Relatively little is known, however,

about what makes a prenotification letter more or less effective. The first experiment on which this dissertation reports varies the content of prenotification letters sent to establishments selected for participation in a business survey in order to identify how different features affect the probability of obtaining a respondent's Email address. In this experiment, neither survey sponsorship, appeal type, nor a message about saving taxpayer dollars had a significant impact on response.

The second experiment is a pilot study designed to compare the results of sending an initial Email invitation to participate in an establishment survey to the results of sending a standard postal invitation. Sampled businesses that provided an Email address were randomized into two groups. Half of the units in the experiment received the initial survey invitation by Email and the other half received the standard survey materials through postal mail; all units received the same nonresponse follow-up treatments. The analysis of this experiment focuses on response rates, timeliness of response, mode of response and cost per response. In this production environment, Email invitations achieved an equivalent response rate at reduced cost per response. Units receiving the Email invitation were more likely to report online, but it took them longer on average to respond.

The third experiment built on the second and was an investigation into nonresponse follow-up procedures. In the second experiment, at the point when the cohort that received the initial survey invitation by Email received their first nonresponse follow-up, there was a large increase in response. The third experiment tests whether this large increase in response can be achieved by sending a follow-up Email instead of a postal reminder. Sampled units that provided an Email address were

randomized into three groups. All units received the initial survey invitation by Email and all units also received nonresponse follow-ups by Email. The treatments varied in the point in the nonresponse follow-up period at which the Emails were augmented with a postal mailing. The analysis focuses on how this timing affects response rates and mode of response. The sequence that introduced postal mail early in nonresponse follow-up achieved the highest final response rate. All mode sequences were successful in encouraging online data reporting.

The fourth and final experiment studies the use of Email in a monthly business panel survey conducted through Computer Assisted Telephone Interviewing (CATI). After the first month in which an interviewer in this survey collects data from a business, she schedules a date to call and collect data the following month. The current procedure is to send a postcard to the business a few days prior to the scheduled appointment to serve as a reminder of the upcoming interview. The fourth experiment investigates the effects of replacing this reminder postcard with an Email. Businesses in a sample that included both businesses for which the survey organization had an Email address and businesses for which no Email address was available were randomized into three groups. The first group acts as the control and received the standard postcard; the second group was designated to receive an Email reminder, provided an Email address was available, instead of the postcard; and the third group received an Email reminder with an iCalendar attachment instead of the postcard, again provided an Email address was available. Results focus on response rates, call length, percent of units reporting on time, and number of calls to respondents. The experiment found that the use of Email as a reminder for a

scheduled interview significantly increased response rates and decreased the effort

required to collect data.

THE USE OF EMAIL
IN ESTABLISHMENT SURVEYS

by

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Dedication

In loving memory of Mom.

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List of Abbreviations

AAPOR	American Association for Public Opinion Research
AIDA	Attention, Interest, Desire, Action
BLS	Bureau of Labor Statistics
CATI	Computer Assisted Telephone Interview
CAPI	Computer Assisted Personal Interview
CES	Current Employment Statistics
DCC	Data Collection Center
DOL	Department of Labor
MSA	Metropolitan Statistical Area
MLE	Maximum Likelihood Estimate
NAICS	North American Industry Classification System
NAICS2	2-digit North American Industry Classification System code
NRFU	Nonresponse Follow-up
NSI	National Statistical Institute
OES	Occupational Employment Statistics
SAQ	Self Administered Questionnaire
SES	Socioeconomic Status
SWA	State Workforce Agency
QCEW	Quarterly Census of Employment and Wages
UI	Unemployment Insurance

Chapter 1:   Introduction

In surveys of establishments the use of self administered questionnaires (SAQs) is prevalent due to the nature of the information being requested. Business respondents are usually asked about data that can be queried through record lookup using commonly understood language (Chester and Maily, 1989; Snijkers et al., 2013, chap. 2). Additionally, SAQs provide the benefit of allowing time for respondents to query and compile data at their own pace. SAQ are also cheaper to collect compared to other modes since they don't require interviewers to collect the data.

Historically, SAQs were sent to establishments through the mail as survey forms. In recent decades, many surveys have made electronic reporting available to respondents through online portals. Surveys conducted online further reduce cost compared to other modes since there is no need for the print and postage of paper forms, there are no interviewers and data do not need to be converted into electronic form (Dillman et al., 2009; Couper, 2000). Two common methods for inviting respondents to online questionnaires are sending a letter through the mail that contains a URL or by sending an Email with a clickable link. While the latter method offers cost reduction through the elimination of print and postage, it may be difficult to incorporate. Many survey frames do not include Email addresses and

so studies using Email as a mode of invitation are typically limited to specialized population (e.g. students at a university, workers within a company, members in an organization).

The first study, presented in Chapter 2, of this dissertation addresses the issue of using survey frames that lack Email addresses. Some national statistical institutes (NSI) are able to obtain Email addresses from tax records. However, it is likely that the Email address listed in the tax documentation is not the Email address of the desired respondent within the business. Identifying the person in the business who will be able to answer the survey question is an additional challenge for establishment surveys (Edwards and Cantor, 2004; Sudman et al., 2000; Willimack and Nichols, 2010; Bavdaz, 2010; Snijkers et al., 2013, pp. 62). Another approach is to use an Email address that was collected when the respondent completed a previous round of the survey. With this method, data collectors are attempting to contact the same individual within a business, which addresses the concern of identifying the proper respondent. However, there are drawbacks with this method as well. One concern is turnover within a business, that is, the person who responded in the previous wave may no longer be employed at the company. Confidentiality is another issue when using an Email address from a previous response. If a company contracts with an accountant or payroll manager, the contractor's Email address will be on file. If a company separates with the contractor and the survey organization sends them a survey invitation, then the contractor knows the company has been sampled, which is a disclosure breach. Finally, the American Association of Public Opinion Research (AAPOR) report on online panels states that research organizations should not send

unsolicited Emails (Baker et al. (2010), see also `www.insightsassociation.org/`
`issues-policies/casro-code-standards-and-ethics`).

In order to use Email addresses for survey invitations while being mindful of the aforementioned considerations, the BLS Occupational Employment Statistics (OES) survey uses a method involving prenotification letters. One month prior to sending the survey request, OES mails a prenotification letter (an advance mailing) to sampled establishments letting them know that they have been selected for the survey. The prenotification letter includes a section requesting the contact information for a person in the business who will have knowledge of the survey topic (see Chapter 2 for more detail). Respondents who return the prenotification letter and include an Email address are then eligible for contact though Email. In Chapter 2 I discuss the details and results of an experiment that alters the content of the OES prenotification letters with the goal of increasing captured contact information.

The current survey paradigm of increasing costs and stagnant budgets is forcing data collection operations to innovate in their production methodology. One area of interest is examining the effects of inviting respondents to a survey through the use of Email. While some work has been done on this topic for special populations (see Section 3.1.2), there is a gap in the literature with respect to the effectiveness of Email invitations for surveys of establishments. By using Email to invite businesses to a survey, data collectors may realize a cost savings. Furthermore, since no survey form is being delivered to the establishments, there is potential for an increase in online reporting. In Chapter 3, I report on the results of two experiments that examine the effects of using Email for survey invitations and nonresponse follow-ups.

While SAQs provide cost savings and respondent ease in establishment surveys, they also have their downsides. One such drawback is the timeliness of responses. In a mail setting, there is added time to response due to the time required to deliver the mail form. Even when using Email to contact respondents where the delivery time is instantaneous, there may still be a delay in response if the respondent simply sets it aside. The fact that there is no direct interaction with the respondent may reduce the motivation for response or the respondent may simply forget about the survey request until reminded, adding time until data are collected. In surveys such as the Current Employment Statistics (CES) survey at the Bureau of Labor Statistics (BLS), estimates are produced monthly and thus time to response is of great concern. In such cases, SAQs may not be the best option and another mode, such as computer assisted telephone interviews (CATI) may be more appropriate. CATI offers the motivational aspect of interacting with another human whereas a SAQ does not. The lack of additional motivation in SAQs may lead to a lower response rate or an increase in the average amount of time it takes to respond.

CES is a monthly panel survey in which respondents are initially contacted by phone for a CATI interview and eventually pushed to online self reporting in later months. In order to deal with the short data collection windows, analysts (data collectors) will schedule an interview with businesses reporting by CATI for a particular day the following month. Prior to the scheduled interview, CES sends respondents a postcard as a reminder of their upcoming appointment. In an effort to save money, CES managers were interested in replacing the postcard reminders with Email reminders. Chapter 4 reports on the results of an experiment that tests

the effectiveness of Email as a method to remind respondents of their upcoming CATI interview. In the next section, I describe the response theory that is used as a framework for the experiments.

1.1   AIDA Model

The framework for this dissertation rests on the AIDA model from the marketing literature. In marketing theory, the AIDA model is used to attract the attention of potential clients, arouse their interest and create their desire to complete the final buying action (Li and Yu, 2013). The model, originally developed in 1898 (see Barry (1987) for a description of the model evolution), refers to Attention, Interest, Desire and Action (AIDA) which are described in relation to survey methodology below. For the survey framework, a potential buyer is replaced with a potential respondent.

- Attention (or Awareness): How to attract the attention of sampled units. This can be thought of as how do we make respondents aware of the survey request or scheduled interview? The typical modes of postal mail, phone calls, Emails and personal visits are tools used to promote attention.

- Interest: How do you gain the interest of potential respondents? This may include the use of incentives, making the survey topic salient, mentioning the survey sponsor or including informational brochures with mailings.

- Desire: Convince respondents that providing information is of benefit. In surveys, you may wish to communicate how the survey results will be of use

to either the respondent or the community. For example, in federal surveys, a potential respondent may have an increased desire to respond if they know the results of the survey will drive policy decisions affecting them.

- Action: Provide a convenient way to respond to the survey. This corresponds to reducing the burden of response as much as possible. This can be achieved by offering sequential mode options, conducting cognitive interviews to make sure questions are easily understood, or offering help desks.

In the marketing paradigm, the total number of potential buyers will decrease at each step, represented by the inverted triangle in Figure 1.1 and the goal is to maximize the number of buyers in the bottom portion of the triangle. The same is true in survey methodology - we wish to maximize the number of respondents. This dissertation will not engage in testing the AIDA model, but rather use it as a way to frame the experiments.

By incorporating persuasion theory with the AIDA model, survey practitioners can hope to increase the size of all levels of the pyramid. With persuasion theory, two information processing approaches are identified: the systematic approach and the heuristic approach (Snijkers et al., 2013, pp. 401). A systematic approach is used when individuals make decisions based on a thorough processing of information and arguments. A heuristic approach is used when an individual uses cognitive shortcuts to make decisions, without putting much effort into information processing. Individuals with different backgrounds are likely to approach some situations requiring decision making differently. For example, consider the decision of how to
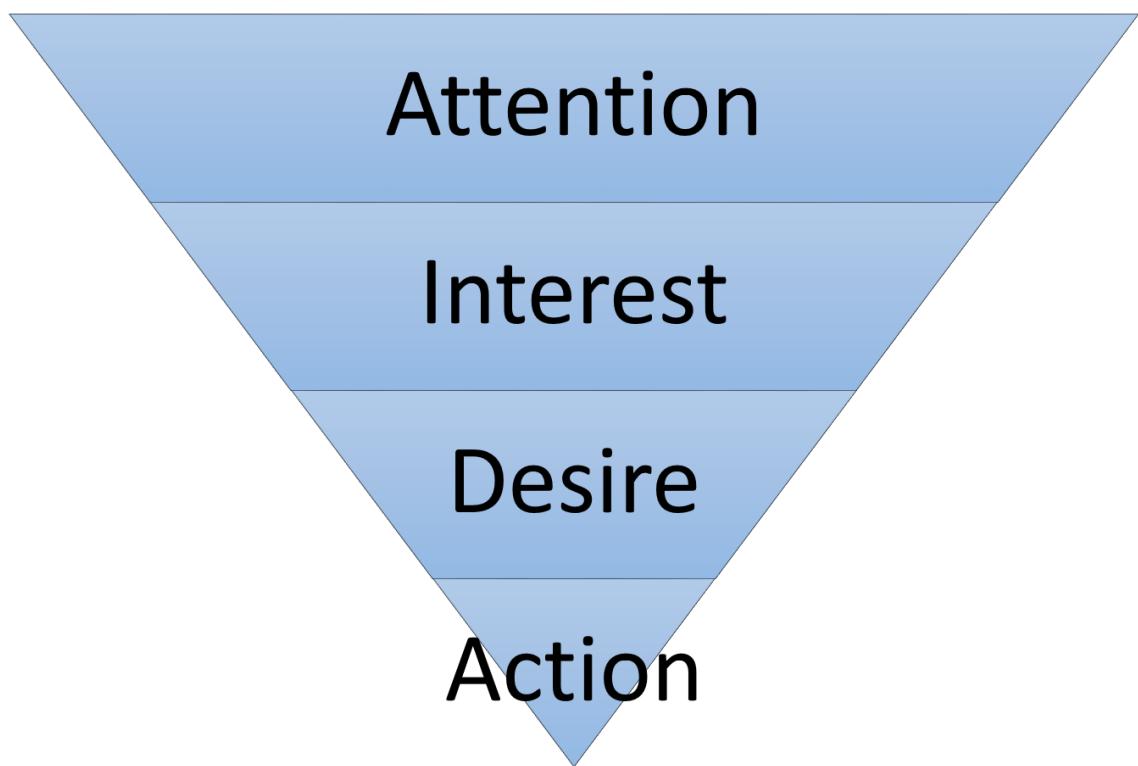
Figure 1.1: AIDA model

save money. Someone with an actuarial background, having an advanced knowledge in the theory of interest, may carefully process available options in a systematic way, knowing that investments may outperform savings accounts over time. Someone who doesn't have much financial literacy may use a heuristic approach and assume that a checking or savings account is the best option.

Systematic and heuristic decision making are mirrored in psychology and discussed by Thaler and Sunstein (2008, pp. 19) in a dichotomy of ways of thinking. The first method of thinking is a reflective method which is deliberate, controlled, deductive and self-conscious. When deciding whether to go to law school or pursue a Ph.D. in survey methodology, you are most likely using your reflective system. This system closely resembles the systematic approach from persuasion theory. The second method of thinking is the automatic system. This system is instinctive, uncontrolled, effortless, and unconscious. This system of thinking more closely resembles the heuristic approach to decision making.

Humans are subjected to an enormous volume of data everyday and cannot afford to spend time evaluating and analyzing every decision they encounter. For that reason, we rely on a set of heuristics (or our automatic system) to reduce the cognitive burden of dealing with the world. Many individuals in our society may consider responding to a survey request as a mundane task and may not put forth much cognitive effort in deciding whether or not to participate. Thus, it is important from a survey practitioner perspective to understand how individuals rely on heuristics. In the next section, I describe one such set of heuristics, known as compliance principles, and their application to survey methodology and the AIDA

model.

1.2 Compliance Principles

In an effort to build a theoretical framework for survey participation, Groves, Cialdini and Couper (1992) applied Cialdini's compliance principles (Cialdini, 2009) to the survey methodology field which was later adapted to business surveys by Snijkers et al. (2013). The compliance principles are grounded in psychology and posit that when faced with a mundane decision, people often do not evaluate all factors of the situation, but rather, rely on a set of heuristics. For example, when deciding whether or not to participate in a survey, respondents may have little interest in evaluating survey materials and thus may not spend a lot of cognitive effort in determining whether or not to comply with a survey request. Rather, they rely on heuristics (or automatic thinking) and the following compliance principles:

Reciprocation. The tendency to comply with a request is enhanced when an individual believes she will benefit from her efforts. In the survey framework, reciprocation can be found in the form of prepaid monetary incentives or gifts. In establishment surveys, many national statistical institutes try to convey how survey estimates will benefit the business. Some survey programs offer tailored brochures based on data from previous surveys to show how the business may use the data. The reciprocation principle is related to social exchange theory as discussed by Dillman (2009). The theory states that recipients are most likely to respond if they expect that the perceived benefits of doing so will outweigh the perceived costs of

responding. Thus, a goal of survey letters should be to to increase the perceived rewards to responding.

Commitment & Consistency. This is the tendency for individuals to behave in a manner congruent with their worldview. In a survey setting this may have implications for what should be communicated with respondents. For example, if survey sponsors believe that their population of study is interested in advancing knowledge (such as graduate students at a university), they should communicate how the survey results will be used to produce such knowledge. Federally-sponsored surveys are funded through taxpayer dollars and, since the average citizen has an interest in efficient use of taxpayer money, this suggests that including language about how a prompt response saves taxpayer dollars should be included. This also suggests that if a sampled unit has responded to a survey before, they will be more likely to respond to future requests.

Authority. People are more likely to comply with a request when it comes from a legitimate authority. In a survey context, this implies respondents should be more willing to provide data when the survey sponsor is recognized as having a legitimate need for the data. This is beneficial to federally-sponsored surveys or surveys from academic institutions since they are largely recognized as having a justifiable need to collect data and are trusted to keep responses confidential. Dillman (1991) also mentions authority as a method of enhancing survey response by increasing trust.

Social Validation. This is the notion that people tend to have the same behaviors and beliefs as others in the same social group. Data collectors may men-

tion high cooperation rates from other sampled members as a way to encourage the social validation principle. Groves, Couper and Cialdini mention that this approach may have an adverse affect on response if respondents have the view, if others are willing to participate, why should I volunteer my time? Scarcity, however, could attenuate any such effect.

Scarcity. The scarcity principle suggests that people are more likely to comply with a request when the opportunity do so is rare. In a survey setting, practitioners could invoke the notion of scarcity by communicating the sampling methodology, e.g. by stating that "only 1,000 households were selected in the nationwide sample," or "you represent about 6,000 other persons like yourself." However, as Groves, Couper and Cialdini note, the proliferation of survey requests may negatively impact the scarcity principle.

Liking. This principle invokes the idea that people are more willing to help those whom they view in a favorable light. Groves, Couper and Cialdini mention the following factors that may tend to enhance liking: similarity of attitude, background, and dress; praise; cooperation; and physical attractiveness. In a survey setting, an interviewer may choose to dress differently based on the neighborhood in which they are conducting the interview. For example, in a low income neighborhood, the interviewer may choose to wear casual dress instead of professional attire to invoke a sense of similarity with the respondent. In an Email context where there is no personal contact, the sponsor of a survey may also appeal to respondents if they are aware of the sponsoring organization.

The compliance principles may provide useful guidance for the design of survey

letters that will maximize the number of sampled units passing through each phase of the AIDA model. The compliance principles can be thought of as informing the best nudges to encourage response.

1.3   Nudges and Channel Factors

In their book *Nudge*, economists Thaler and and Sunstein (2008) describe a method for influencing decisions. In short, a choice architect is someone who has the responsibility for organizing the context in which people make decisions (pp. 3). If you design the ballot voters use to choose candidates, or if you are a doctor and must describe the alternative treatments available to a patient, you are a choice architect. In a similar fashion, if you are a survey practitioner designing survey letter content, you are a choice architect. A nudge is any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing economic incentives. For example, suppose an employer would like to encourage employees to save money. The employer may decide to pay their employees on the 1$^{\text{st}}$ and 15$^{\text{th}}$ of the month or every other week. By choosing to pay employees every other week, twice a year the employees will receive three paychecks in a month (pp. 10). With an extra paycheck, employees are nudged to save more.

Channel factors are a similar concept to nudges. The concept comes from the field of behavioral economics. Channel factors are small, seemingly insignificant, changes in a process that can lead to large effects on behavior. For example, a

social psychologist called a sample of residents in Indiana as part of a survey and asked them to predict what they would say if asked to spend three hours collecting money for the American Cancer Society. A few days later, a representative from the American Cancer Society called households asking for volunteers. The households that were called as part of the survey volunteered at a rate of seven times more than households that were not called for the survey (Sherman, 1980). In this case, simply asking respondents to predict their likelihood of volunteering acts as a channel factor to significantly increase actual volunteer rates. See Chapter 4 for more discussion on channel factors.

Using nudges and channel factors to enhance data collection techniques may be an effective way of increasing response rates or reducing interviewer effort. In the next section, I discuss how channel factors, nudges and the compliance principles are related to the AIDA model.

1.4   Relating the Theories

By using the Cialdini compliance principles as a guide for the creation of survey letter content, practitioners may create nudges to promote survey participation. For example, consider the compliance principle of authority. Emphasizing that the survey comes from an organization seen as having a legitimate need to collect data may increase respondents' desire to comply with the survey request. It is possible that a federally-sponsored survey may increase interest in the survey request as well. Drawing on the authority principle, a nudge is created to increase the number of

participants moving through the AIDA triangle towards a response.

In Chapter 2 I use Cialdini's compliance principles (Cialdini, 2009) as a guide to design an experiment that varies the content of survey letters in an effort to maximize response to a request for contact information. The experiment varies the content of survey letters by altering the survey sponsor, a plea for help, and a message about saving tax payer dollars. These features are designed to gain the attention of respondents, increase interest in the survey and promote a desire to respond, which focus on the top three portions of the AIDA pyramid.

The mode of contact may affect the Attention portion of the AIDA model. Personal visits, phone calls, postal mail, and Email are all likely to generate different levels of attention. It may be more difficult to ignore a mailed survey form than an Emailed survey request. In Chapter 3 results are presented on a pair of experiments that test Email against postal mail for survey invitations and reminders. The use of a clickable URL in the Email invitation may act as a channel factor to increase response, which relates to the action portion of AIDA.

In Chapter 4, Email and postal mail contacts are examined again, this time in a panel survey. When interviews are scheduled each month, reminders for the upcoming interview are used to increase awareness. As mentioned in the prior paragraph, different modes are likely to generate different levels of awareness. In this experiment, I examine the effects of using Email reminders in comparison to a postcard. The use of Email may also act as a channel factor. Recipients of an Email in a business survey are likely to be on the same device as their work calendar. Thus, it may be easier for respondents to update their daily schedule and further

strengthen the awareness of the interview.

Chapter 2:   Effects of Prenotification Letter Content on Capturing Contact Information in an Establishment Survey

2.1   Survey Letter Content

In order to send survey invitations by Email, you must first have an Email address for units in your sample. This is a particular challenge in surveys of general populations (as opposed to students at a university where all students have a known Email on file). To obtain Email addresses, the Occupational Employment Statistics (OES) survey mails a prenotification letter to sampled establishments approximately one month prior to the initial survey invitation. The prenotification letter informs the businesses about the upcoming survey and requests they provide contact information to the BLS of someone within the organization who will have knowledge of the survey topic (e.g. someone in payroll). Respondents may contact the BLS by phone, fax, Email, or they may mail in their response, but must provide their own postage.

Since surveys have low priority for businesses (Willimack et al., 2002; Snijkers et al., 2013, ch. 2), it is important to understand what factors of communication may encourage response. In the AIDA model (see Section 1.1) the encouragement of

response corresponds most directly to interest and desire. Tomaskovic-Devey et al. (1994) describe three dimensions that affect the response behavior of an individual within an organization: authority (having permission to respond to the request), capacity (ability to fulfill the request) and motivation (desire to fulfill the request). Lorenc et al. (2012) mentions that respondents of business surveys are typically not users of the survey outputs, so emphasizing the utility of the surveys may increase the perceived benefit of responding and in doing so, increase the desire to respond. Motivation can be placed into a spectrum with intrinsic motivation (self driven) at one end and extrinsic motivation (influenced by outside factors) at the other (Torres van Grinsven et al., 2014). Extrinsic motivation can be targeted and potentially manipulated at negligible cost by altering the content of survey letters. In the literature on survey letters, common features that are varied are the appeal of the survey and survey sponsorship. In an effort to maximize response to a request for business contact information, an experiment was carried out that altered the content of prenotification letters. The following sections review a conceptual framework for the impact of letter content on increasing motivation and response rates and prior empirical results found in the literature.

2.1.1 Conceptual Framework - Compliance Principles

In an effort to build a theoretical framework for survey participation, Groves, Cialdini and Couper (1992) applied Cialdini's compliance principles (Cialdini, 2009) to the survey methodology field. The compliance principles are grounded in psy-

chology and posit that when faced with a mundane decision, people often do not evaluate all factors of the situation, but rather, rely on a set of heuristics. For example, when deciding whether or not to participate in a survey, respondents may have little interest in the request and thus may not spend a lot of cognitive effort in determining whether or not to comply. Rather, they rely on the following compliance principles:

- Reciprocation

- Commitment & Consistency

- Authority

- Social Validation

- Scarcity

- Liking

For details on each compliance principle and their relation to survey methodology, see Section 1.2.

Snijkers, Berkenbosch and Luppes (2007) examined the utility of compliance principles as they relate to survey requests for establishments. In their study, the authors found that businesses are most sensitive to the reciprocation, authority and liking principles and somewhat sensitive to the commitment and consistency and the social validation principles.

The U.S. Census Bureau conducted cognitive interviews with laboratory respondents to identify design principles for survey letter design (Landreth, 2004).

The research found that respondents tend to skim survey letters and generally only recall two or three key messages, such as survey topic or sponsor. Data uses statements were found to be the most salient and consistently recalled aspect of the letters, though they were not always accurately recalled. In a hypothetical survey situation, respondents stated that their decision to cooperate with the survey request was driven by data uses statements and survey sponsor; see Section 2.1.2.1 for their relation to the compliance principles. It should be noted that one should use caution when generalizing the results of a hypothetical request to real survey practice.

2.1.2 Prior Empirical Findings

The compliance principles are a useful framework to address the interest and desire portion of the AIDA model. The literature suggests that data usage statements and survey sponsorship may relate to both interest in a survey and desire to complete the survey. In the following two sections, I review empirical results found in the literature that address appeals and survey sponsorship.

2.1.2.1 Appeals

Three types of appeals commonly found in the literature are egoistic, help-the-sponsor, and social utility. Egoistic appeals tend to explain how the survey results will be of benefit to the respondent. From social exchange theory, Dillman argues that the respondent is more likely to respond if she or he believes that the anticipated

benefits of responding outweigh the anticipated costs. Altruistic appeals explain how a survey response will benefit others. The liking and authority principles suggest the use of altruistic help-the-sponsor appeals while the commitment and consistency principle is better matched with altruistic social utility appeals.

In an early study of appeals, Linsky (1965) varied the content of cover letters in a survey of a state nurses' association. Respondents were mailed 1 of 16 different version of a cover letter that either included or excluded each of the following: an argument for the importance of the research (social utility appeal); an explanation of the importance of the respondent in the study (egoistic appeal); an appeal to help those conducting the study (help-the-sponsor); and personalization of the cover letter through use of a hand-written personal salutation and signature. Linsky found that including an egoistic appeal significantly increased response rates (43% vs 30%) and including personalization significantly increased response (40% vs 32%). Neither of the altruistic appeals had a significant impact on response.

Champion and Sear (1969) conducted an experiment in a mail survey of residents from two Tennessee cities. The cover letter for the survey either contained an egoistic or a help-the-sponsor appeal. The authors found that the egoistic appeal achieved a significantly higher response rate (37%) than the altruistic appeal (33%). However, after examining subgroups of respondents broken out by high, medium and low socioeconomic status (SES) it was found that households with a low SES responded more to the egoistic appeal while households with a high SES responded more to the altruistic appeal. This implies that altruistic and egoistic appeals may have differential effects between subgroups of a population.

Dillman, Gallegos and Frey (1976) conducted a series of experiments that tested the effect of using a social utility appeal in a telephone interview setting. In one experiment, interviewers called respondents and used different introductions that either included or didn't include the social utility appeal. In a follow-up test, advanced mailings were sent to sampled households prior to the telephone call; the mailings either included or excluded the social utility appeal. In both experiments, the social utility appeal was not found to affect refusal rates. One possible explanation for the lack of effect in these experiments is that the social utility appeal was appended to other treatments. In the former experiment, the appeal was added to a reward treatment that offered to send results of the survey to the respondent and thus increased the overall length of the introductory statement. In the latter experiment, the appeal was added to a treatment that explained the sampling nature of the experiment and thus also increased the length of the letter.

Houston and Nevin (1977) examined the effects of cover letter appeal and sponsor in a survey of households in Wisconsin. Four appeal conditions (egoistic, help-the-sponsor, social utility, and a combination of the three) were crossed with two survey sponsors (a university and a commercial survey firm) to produce eight versions of a cover letter. The authors found no difference in the main effects for appeal condition where response varied from a low of 40% in the combined condition to a high of 43% in the social utility cohort. There were significant interaction effects between survey sponsor and appeal. When the university was listed as the sponsor, the egoistic appeal performed the worst (36%) and social utility the best (47%). When the commercial firm was mentioned as sponsor, the help-the-sponsor appeal

attained the lowest response (37%) while the egoistic appeal achieved the highest (47%). These results indicate a need to pay attention to interaction effects between sponsorship and appeal.

Jones and Linda (1978) tested the affects of appeal type in a mail survey of individuals who held group meetings such as conventions. In the cover letter of the survey, respondents were given one of three appeals: the results would be of benefit to the user of the facilities (egoistic); the results would be of benefit to science (social utility); or the results would benefit the resort (help-the-sponsor). The authors found that response rates for the egoistic and social utility appeals (both 31%) were significantly higher than the help-the sponsor appeal (26%). The authors also varied the sponsor of the survey between a government agency, a university or a public business firm. There was no significant interaction effect between survey sponsor and appeal type.

In a study of households, Webster (1997) examined the effects of four types of appeals where an interviewer either hand delivered a SAQ and remained on site until the questionnaire was completed or dropped off the questionnaire and returned to pick it up at a later date. The appeals were used in the introductory statements by the interviewers and consisted of a help-the-sponsor, social utility, or egoistic appeal and were contrasted with a control with no appeal. The different appeals were found to significantly affect response rates with the help-the-sponsor appeal achieving the highest rate (89%) followed by the egoistic appeal (80%), social utility appeal (67%) and no appeal (47%). An interaction effect with appeal and whether or not the interviewer remained on site was also found to be related to response,

which implies that appeal may have a different effect under different circumstances.

In another pair of experiments, Childers, Pride and Ferrell (1980) varied the type of appeal presented to respondents in the postscript of a cover letter. The type of appeals tested were help-the-sponsor, social utility, egoistic, and a control with no appeal. In the first experiment, the survey was sent to a sample of academicians where the survey sponsor was a research firm. The authors found that the control group achieved the highest response rate, which was significantly higher than the response rate for the social utility group. The second experiment was a survey of business practitioners subjected to the same treatments as in the first experiment. This time the survey sponsor was a major university. In this case there were no significant differences found among the four groups.

Yu and Cooper (1983) conducted a meta-analysis of design effects on response rates in a more general setting that included both probability and convenience sampling and spanned different modes. The authors found no difference in applying a social utility appeal nor a help-the-sponsor appeal at a significant level. The authors also examined survey sponsorship, but in the articles they reviewed, no control condition existed so they were unable to draw any inference.

In the National Survey of College Graduates, Redline, Oliver and Fecso (2004) manipulated the appeal in six versions of a cover letter. Two versions of a social utility appeal were used where one version included visual design changes. The other versions were an egoistic appeal offering the respondent a chance to voice their opinion, a version with no appeal, and what the authors refer to as an authoritative appeal. These five versions were compared to a benchmark letter that was used

in previous waves of the survey. Response rates for the letters ranged from a low of 28.63% (benchmark letter) to a high of 30.45%, with a marginally significant difference between the two.

In a mail survey of corporate presidents of *Fortune* 500 companies, Kerin and Harvey (1976) varied the content of the cover letter to include either an egoistic or a help-the-sponsor appeal. The authors found that the altruistic appeal significantly increased response rates in comparison to using an egoistic appeal (41% vs 30%).

2.1.2.2   Survey Sponsor

Another feature easily manipulated in survey letters is acknowledgement of the survey sponsor. Sponsorship is related to the liking principle. If respondents have a favorable image of the survey sponsor, they may be more likely inclined to comply with the survey request. It is also related to the authority principle since some organizations are viewed as having a legitimate need to collect data (Dillman et al., 2009, pg. 389). In this manner, sponsorship may also make the survey topic more salient to the respondents. Below I review studies that have experimented with varying the survey sponsor.

Two of the studies mentioned in the appeals section also studied the effect of survey sponsor. Houston and Nevin (1977) found no significant difference in response rates between a university sponsor and a commercial firm sponsor (42% vs 40%). However, as mentioned earlier, they did find a significant interaction effect between sponsor and appeal type. Jones and Linda (1978) found a difference in

response rates when comparing sponsorship by a government agency, a university or a public business firm (29%, 35%, 25% respectively). There was no significant interaction effect between survey sponsor and appeal type.

In his review of research on mail surveys, Scott (1961) presented results from an experiment conducted in a survey about television and radio programs. Three sponsors were used in the experiment: the Central Office of Information (a government agency), the London School of Economics and Political Science, and the British Market Research Bureau (a commercial agency). Scott found that the government sponsorship achieved higher response rates (99.3%) than both the university sponsorship (88.7%) and the commercial firm (90.1%). Response rates were not significantly different between the university sponsorship and the commercial firm.

Brunner and Carroll Jr. (1969) studied the effect of prenotification letters in a household survey. Half of their sample was randomized into a condition that did not receive a letter and the other half received a letter a few days prior to an interviewer arriving at their house. The households that received the prenotification letter were further randomized into whether the letterhead contained information from the University of Maryland or a relatively new consulting firm in the area. Overall, the authors found no difference in response between the letter and no letter conditions. However, when contrasting the differences in letterhead, the authors noticed a significant difference in response between the University letterhead and the consulting firm (72.5% vs 46.1%). The authors posit that a private firm as a survey sponsor may actually harm response.

Doob and Freedman (1973) embedded an experiment into a mail survey about

automobile ownership and television consumption for households in San Mateo County, California. Half of the subjects received requests from the Survey Research Center, Stanford University; the other half received requests from Industrial Research Associates. Subjects were also randomized into whether they received no incentive, a 5 cent prepaid incentive, or a 20 cent prepaid incentive. The authors found that people generally complied more to the University sponsor than to the commercial one; people were more likely overall to comply when money was included; and increasing amounts of money decreased the difference between the two sponsors.

In a face-to-face household survey of consumer expenditure data, Sudman and Ferber (1974) examined the affect of sponsorship on response. The two sponsors used in the experiment were the U.S. Census Bureau and the University of Illinois Survey Research Laboratory. The authors found that cooperation rates of the sample during the initial interview were higher for the Census Bureau sponsorship than the University Laboratory (62.9% vs 56.9%). The difference in response was more pronounced in the suburbs than in an urban area.

In a study of banking and financial attitudes in a particular metropolitan area Peterson (1975) examined five different response inducement techniques for a mail survey. The techniques were all dichotomous and each served as a factor in the experimental manipulation. They consisted of: sponsor (university or business), postage (stamped or metered), return envelope (business-reply or stamped envelope), follow-up (whether or not a follow-up postcard was sent), and addressing (respondent's address was typed or on a label). The author found that using a uni-

versity sponsor significantly improves response rates over a business sponsor (33.7%
vs 20.7%). The use of a business reply envelope and sending a follow-up postcard
also significantly improved response. There were no significant differences found for
type of postage or for type of addressing.

Hawkins (1979) examined the effect of sponsorship in a marketing survey.
Residents of Eugene, OR were sampled for a study about sentiments for local de-
partment stores. Respondents were told the sponsor of the survey was one of the
following: a university business research bureau, a research firm, or a department
store. When examining the response rates, Hawkins found the university and re-
search firm sponsorship elicited a higher response rate than the department store
(45.6%, 51.5%, 29.6% respectively). There was no significant difference between the
university and research firm sponsor treatments.

Vocino (1977) investigated sponsorship in a mail survey of members of a pro-
fessional organization. Sampled members received a cover letter that either had the
professional organization in the letterhead, with the letter signed by a well known
member of the organization, or a letter that had a university in the letterhead, with
the letter signed by a relatively unknown member of the organization. Vocino found
that the letter containing the professional organization in the letterhead and signed
by a well known member of the organization increased response rates by about 3%.

Presser, Blair and Triplett (1992) examined the affects of sponsorship in a
RDD survey in the District of Columbia. When interviewers called households they
identified the sponsor as either the Washington Post or the University of Mary-
land. The University of Maryland achieved a slightly higher response rate than the

Washington Post, though the difference was not significant (64.6% vs 61.4%). The authors do note that there was a clear difference in response distribution on one topic. The lack of difference in response rates may because residents of D.C. are familiar with both the Washington Post and the University of Maryland.

Fox, Crask and Kim (1988) conducted a meta-analysis of techniques that induce response in mail surveys. The authors identified 82 articles that experimentally varied treatments related to mail surveys, including: inclusion of a prenotification letter; inclusion of a follow-up postcard; postage type; notification of cutoff date; university sponsorship; color of questionnaire; and an inclusion of a postscript asking for cooperation. The analysis found that, on average, university sponsorship, prenotification letter by mail, and postage type (stamped return versus business reply) produced the largest increases in response rates. The average effect size estimate for university sponsorship was an 8.9% increase in response rates.

Boulianne, Hlofstad and Basson (2010) note that, in more recent years, research on the effects of survey sponsorship on response patterns has become scarce. With the development of online surveys, there is added interest in the role of survey sponsorship as it relates to the authenticity of the survey request. To help fill this gap, the authors conducted an experiment in an online study about campus transportation issues that targeted affiliates of a particular university. The sample was stratified by affiliation type (faculty/staff and students) and whether or not the sampled member was a commuter. The sample was randomized into two groups that had either the university survey center or the university transportation department as the survey sponsor. The authors did not find any significant difference in

response rates between the two sponsors including at all subgroup levels. They did, however, find a difference in break-off rates for students; the students that received the request from the transportation department were significantly less likely to break off.

In a systematic review of strategies to increase response rates to postal questionnaires, Edwards et al. (2002) found that questionnaires originating from universities were more likely to be returned than questionnaires from other sources with an odds ratio of 1.31 (95% confidence interval 1.11 to 1.54). Contrary to this finding, a meta-analysis of mail survey response-inducing techniques by Yammarino et al. (1991) found no significant effect of sponsorship on response rates. The authors acknowledge the discrepancy may be due to the level of aggregation they used, which resulted in a limited number of data points for their analysis.

In another meta analysis of factors affecting response rates to mail surveys, Heberlein and Baumgartner (1978) examined the impact of various features of methodologies on response rates. The authors found that government sponsored research achieves an additional 12.4% response compared to similar studies with equal numbers of contacts and similar salience to the respondent. The authors posit that salience to the respondent is increased with government sponsorship since the results of the survey may affect an individual through policy changes. Goyder (1982) followed the analysis of Heberlein and Baumgatner with a study of his own using additional citations. Results from the two studies largely were in agreement, in particular with respect to the finding that government sponsorship tends to increase response rates. The study findings were more different where coding of the predic-

tor variables was somewhat subjective, such as saliency of the survey topic to the respondent population.

In a survey of dealerships for a major manufacturer, Faria and Dickinson (1996) varied the sponsor of the survey in a cover letter attached to the questionnaire. Half of the units were told the survey sponsor was a university and the other half were told the sponsor was a commercial market research firm. The authors found that the university sponsorship achieved a significantly higher response rate than the commercial firm sponsorship (84% vs 67%).

2.1.3 Summary

Though this is not a comprehensive review of the literature, it does illustrate the wide assortment of populations and modes under which survey letter content has been examined. The review of research on appeals reveals inconsistent conclusions. Linsky (1965) and Champion and Sear (1969) found egoistic appeals to achieve higher response rates, though Champion and Sear noted that appeal type had a differential effect based on the socioeconomic status of the population. Kerin et al. (1976) and Webster (1997) found that altruistic appeals performed the best, with Webster finding that the altruistic appeal increased response 42% compared to a no appeal condition. Contrary to these results, Dillman et al. (1976), Houston and Nevin (1977), Childers et al. (1980), Yu and Cooper (1983), and Redline et al. (2004) found no significant differences among different types of appeal. Surprisingly, in one study, Childers et al. (1980) found that using no appeal increased response rates.

The review of studies examining the impact of survey sponsor revealed a similar lack of consistency in the results. Jones and Linda (1978), Hawkins (1979), and Faria and Dickinson (1996) all found university sponsorship to increase response rates compared to government and private sponsors while Houston and Nevin (1977) found no difference. The meta-analyses of Fox et al. (1988) and Edwards et al. (2002) found university sponsorship to increase response rates while Heberlein and Baumgartner (1978), Goyder (1982) and Sudman and Ferber (1974) saw higher response from government sponsored surveys. Yammarino et al. (1991) and Presser et al. (1992) found no difference in response rates by sponsorship. However, in general, university and government sponsorship seem to outperform private industry.

In their quantitative review, Yammarino et al. (1991) mention "Only research conducted between 1965 and 1981 was included. We believed research prior to 1965 might not be generalizable to present-day surveying because of changes in respondent habits." If we applied the same logic to this literature review (conducted in 2019), then we would only consider papers published after 2003. One caveat to the Yammarino approach is that since 2003, few studies on survey letter content were identified, so no generalizations can be made. The notion that behaviors in general are differential through the generations is supported by the marketing literature. For example, in their paper, Williams and Page (2011) describe the U.S. generations in terms of the times in which they grew up as well as the characteristics, lifestyles, and attitudes of the group.

The lack of consistent results is almost certainly impacted by the experimental design of the studies as well. The populations studied varied greatly (CEOs,

students, members of a nursing association, academicians, etc.) as did the mode in which the experiment was conducted (CATI, personal interview, and mail). Given the behavioral variations between different populations and the dearth of research conducted in general business surveys, research is needed to see how sponsorship and appeal type impact response in an establishment survey setting.

2.2   Survey Letter Content Experiment

To address the lack of research concerning survey letter content in a business survey context, an experiment was conducted that varied survey sponsor, appeal type and a message about saving taxpayer dollars. The motivation for the experiment was to increase the interest and desire (from the AIDA model) of respondents in order to maximize response. Section 2.2.1 describes the survey in which the experiment was conducted and Section 2.2.2 reviews the design of the experiment.

2.2.1   The Survey

The experiment was conducted in the U.S. Bureau of Labor Statistics Occupation Employment Statistics survey (OES). The OES is conducted twice per year and the sample consists of approximately 200,000 non-farm establishments. Data for the OES are collected through a federal-state cooperation with the Bureau of Labor Statistics (BLS) and State Workforce Agencies (SWAs). The BLS provides the procedures and technical support, draws the sample, and produces the survey materials, while the SWAs collect the data (U.S. Bureau of Labor Statistics, 2018).

The sampling frame is derived from the list of establishments maintained by SWAs for unemployment insurance purposes. Establishments to be surveyed are selected in order to represent every metropolitan and non-metropolitan area in every state, across all surveyed industries and establishment of various sizes. The SWAs mail the survey materials to the selected establishments and make follow-up calls to request data from non-respondents or to clarify responses.

The OES program produces employment and wage estimates for over 800 occupations. These are estimates of the number of jobs in these occupations and of the wages paid in those jobs. The estimates are available for the nation as a whole, for individual States, and for metropolitan statistical areas (MSAs), metropolitan subdivisions, and non-metropolitan areas; national occupational estimates for specific industries are also available.

Occupational employment data are used to develop information regarding current and projected employment needs and job opportunities. This information is used in the production of state education and workforce development plans. These data enable the analysis of the occupational composition of different industries, and the comparison of occupational composition across states and local areas, including analysis for economic development purposes. OES employment estimates also are used by educational administrators to identify industries that employ the skills gained by those enrolled in career-technical training programs. In addition, OES survey data serve as primary inputs into occupational information systems designed for those who are exploring career opportunities or assisting others in career decision making.

2.2.2 Experiment Design

During the November 2018 OES data collection cycle, six SWAs volunteered their sample for an experiment to test the impact of prenotification letter content on capturing contact information. The distribution of industries[1] in the sampled SWAs is compared to the distribution of industries in the U.S. in Table 2.1. Though the selection of SWAs was not random, the industries within the SWAs are reflective of the nation of a whole. Address refinement, which is the process of collecting and verifying address information of sampled units, typically begins one month prior to the initial survey invitation. During a normal cycle, analysts from the SWAs log responses to the prenotification letters while simultaneously making other efforts (such as calling businesses or visiting company websites) to collect contact information. Since efforts outside of logging responses to the prenotification letter would confound any results from an experiment, the prenotification letters were mailed two weeks earlier than normal and analysts refrained from contacting sampled units for four weeks, leaving some time after the experiment concluded to do further address refinements before the survey invitations were sent.

The content of the prenotification letters varied three treatments that were guided by Cialdini's compliance principles and relatedly, social exchange theory, both described in Section 1.2. The first treatment is authority of the sender, which in this case, is the survey sponsor. The SWAs are collecting data on behalf of

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[1]The distributions of occupations between the volunteer states and nation was also examined and found to be similar

the Bureau of Labor Statistics so the two natural choices of sponsors would be the relevant state workforce agency or the Bureau of Labor Statistics. However, after talking with a few analysts it was recommended that we use the U.S. Department of Labor (the BLS is an agency within Department of Labor) since many respondents are not familiar with the BLS. The unfamiliarity with the BLS was echoed in a focus group with respondents (Kaplan and Edgar, 2018). For the sponsorship treatment, the three sponsors used were the U.S. Department of Labor, the corresponding state workforce agency, or both the DOL and SWA in the header of the prenotification letter. Note that the choice of survey sponsor also could be grounded in the liking principle since some respondents may have various opinions of their different levels of government. Dillman et al. (2009)[p. 389] mention that federal government surveys often have a greater legitimacy than other sponsors. However, it may be that respondents in some states are more likely to have an unfavorable view of the federal government. A small government with limited power is a principle widely invoked by political conservatives. Therefore, I provide the following hypotheses:

- **H2.1:** DOL sponsorship will achieve a higher overall response rate than only the SWA.

- **H2.2:** The effect of sponsorship will vary in magnitude and direction among the states. The SWA sponsorship will generate a higher response in conservative states. The DOL sponsorship will generate a higher response in liberal states.

The second treatment of the experiment is guided by both social exchange

theory and the compliance principles. The second sentence of each letter employed utilized an altruistic social utility appeal or an egoistic appeal. The egoistic appeal let the company know how the statistics produced by the survey could benefit the company: "The information you provide will allow your business to make accurate and reliable operational decisions, such as identifying employment demands in your industry." The altruistic appeal provides information to the business about how society will benefit from their response: "The information being requested is a critical part of projecting future employment demands which benefits students and job-seekers." Using a social exchange approach, Dillman et al. (1996) argue that a respondent is more likely to respond if the benefits of responding outweigh the costs. Since businesses have two goals (1) to produce goods or sevices and (2) to maintain the viability of the origination over time (Snijkers et al., 2013)[p. 40] it is hypothesized that an egoistic appeal will outperform an altruistic appeal. However, some organizations are not profit driven and their purpose is to serve society, for example, school systems and other government agencies. In this case altruistic appeals that invoke the commitment and consistency principle may be a more powerful motivator. This leads to the following hypotheses:

- **H2.3:** The egoistic appeal will achieve a higher overall response rate than the altruistic appeal.

- **H2.4:** The impact of appeal type will vary in magnitude and direction among industry types. The altruistic appeal will generate a higher response in industries with prevalent work in non-profits. Such industries might include

government, education and health care.

The final treatment was whether or not the following statement was included after the due date:"Your prompt response is appreciated and will save taxpayer dollars." Since taxpayers have a vested interest in responsible use of government monies, this treatment is related to the commitment and consistency principle. A thank you in the message also invokes the reciprocity principle. The following hypothesis follows:

- **H2.5:** Including the message about saving taxpayer dollars will increase the response rate.

Since the literature revealed that interactions between sponsor and appeal may exist (Houston and Nevin, 1977), the experiment fully crossed the treatments in a $3x2x2$ design (see Appendix A for the 12 versions). Sampled units from the six states ($n = 12,052$) were randomized into the twelve versions while controlling for business size (defined by number of employees on frame data) and industry (defined by 2-digit NAICS code) where sample size allowed. Two states did not have enough sample to control for both size and industry. Table 2.2[2] defines the size classes and shows the number of units in each category. Table 2.3 defines the 2-digit NAICS codes and the amount of sample represented in each industry. A breakdown of the sample size by treatment and size class and by treatment and industry can be found in Appendix B.

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[2]Sample sizes do not include postal returns.

Table 2.1: Distribution of Industries for Sample and US

NAICS2	Sample Dist	US Dist	Difference
11	0.9%	1.1%	-0.2%
21	0.2%	0.3%	-0.1%
22	0.2%	0.2%	0.0%
23	8.9%	8.5%	0.4%
31-33	3.6%	3.7%	-0.1%
42	7.6%	6.4%	1.2%
44-45	11.2%	10.9%	0.2%
48-49	2.5%	2.6%	-0.1%
51	1.9%	1.8%	0.1%
52	5.9%	5.1%	0.7%
53	4.4%	4.2%	0.2%
54	13.6%	12.8%	0.8%
55	1.0%	0.7%	0.3%
56	6.8%	5.8%	1.1%
61	1.5%	1.3%	0.2%
62	11.2%	16.6%	-5.4%
71	1.6%	1.5%	0.1%
72	7.6%	7.5%	0.2%
81	9.3%	8.9%	0.4%

Table 2.2: Description of Size Classes

Size Class	Number of Employees	n
1	1 - 4	2,727
2	5 - 9	1,883
3	10 - 19	2,038
4	20 - 49	2,074
5	50 - 99	1,047
6	100 - 249	724
7	250 - 499	341
8	500 - 999	153
9	1000 +	123
Total		11,110

Table 2.3: Description of Industries

Two Digit NAICS Code	Industry Description	n
11	Agriculture, Forestry, Fishing and Hunting	57
21	Mining, Quarrying, and Oil and Gas Extraction	43
22	Utilities	46
23	Construction	971
31 - 33	Manufacturing	1,053
42	Wholesale Trade	766
44 - 45	Retail Trade	1,051
48 - 49	Transportation and Warehousing	346
51	Information	258
52	Finance and Insurance	461
53	Real Estate and Rental and Leasing	287
54	Professional, Scientific, and Technical Services	1,119
55	Management of Companies and Enterprises	113
56	Administrative and Support Services	850
61	Educational Services	354
62	Health Care and Social Assistance	1,484
71	Arts, Entertainment, and Recreation	319
72	Accommodation and Food Services	511
81	Other Services	772
99	Government	249
Total		11,110

2.3 Results

Analysts from the six volunteer states logged responses into an Excel file that captured the date of the returned letters and the mode by which it was returned. Analysts also indicated on the Excel sheet if the prenotification letter was returned as undelivered. If an establishment responded and reported they were out of business, I considered that a response since they reacted to the letter. Response rates are defined as the number of responses divided by the number of mailed letters less postal delivery returns. The fully crossed design of the experiment permits a collapsing of the twelve versions of the prenotification letters to examine the main effects of the treatments. In the following sections, I explore the results of the experiment.

2.3.1 Appeals

Of all the 12,052 prenotification letters sent, 942 (7.8%) were undeliverable. Among the remaining 11,110 letters, the overall response rate was 33.5%. As expected, the egoistic appeal condition performed slightly better than the altruistic appeal (34.0% vs 33.0%), though the difference was not significant ($\chi^2(1) = 1.31, p = 0.25$).

Champion and Sear (1969) found the appeal type had a differential effect on response depending on the respondent's socioeconomic status. To determine if appeal type had an interaction with business characteristics, I developed logistic models to control for covariates known to influence response and to test the significance of appeal type and business characteristic interactions. Table 2.4 presents three models

that test the interaction of appeal with state, size class and industry.

Table 2.4: Wald Tests for Individual Effects - Appeals

Model	Variable	p-value
1	Appeal	0.4498
	State	<.0001
	Appeal x State	0.7189
2	Appeal	0.3112
	Size Class	<.0001
	Appeal x Size Class	0.2132
3	Appeal	0.1516
	Industry	0.1381
	Appeal x Industry	0.2201

Model 1 from Table 2.4 included appeal, state and the interaction between appeal and state to predict response to the prenotification letter. The Wald test p-values show that state is a significant predictor of response, but there is no evidence that appeal type nor the interaction between appeal and state are influential of response behavior.

Model 2 included appeal, size class and the interaction between appeal and size class as predictors. Only the main effect of size class was found to be a significant predictor of response. Similarly, in Model 3 I test the predictive power of industry, appeal and their interaction. None of the predictors in Model 3 were found to be significantly related to response. The full presentation of the analysis of maximum

likelihood estimates can be found in Appendix C.

Response rates for the two appeal conditions were not significantly different under a chi-square test nor as predictors in logistic regression models. Therefore, there is not evidence to support hypotheses **H2.1** (DOL sponsorship will achieve a higher overall response rate than only the SWA) nor **H2.2** (the effect of sponsorship will vary in magnitude and direction among the states).

2.3.2   Survey Sponsor

Next I examine the effect of survey sponsorship on response behavior. Letters with only the State Workforce Agency in the header achieved the highest response rate at 34.6%, though they were not significantly higher than letters with the Department of Labor in the header (33.0%) nor a combination of the SWA and DOL (32.9%) ($\chi^2(2) = 3.08, p = 0.21$).

To test if sponsorship had an interaction with business size class, industry or state, I again created logistic regression models to predict response propensities to the prenotification letters.

Model 4 from Table 2.5 included sponsor, state and the interaction between sponsor and state to predict response to the prenotification letter. The Wald test p-values show that state is a significant predictor of response. There is no evidence that sponsorship is a significant predictor of response, however, we see that the interaction between sponsor and state is marginally significant. The marginally significant interaction between state and sponsor can be seen in Figure 2.1. The

Table 2.5: Wald Tests for Individual Effects - Sponsorship

Model	Variable	p-value
4	Sponsor	0.8111
	State	0.0321
	Sponsor x State	0.0768
5	Sponsor	0.5546
	Size Class	0.8644
	Sponsor x Size Class	0.3808
6	Sponsor	0.8221
	Industry	0.1635
	Sponsor x Industry	0.8011

Blue 1, 2, and 3 clusters represent the three states in the experiment that voted Democratic in the previous (2016) presidential election and Red 1, 2, and 3 are the three states that voted Republican. The whiskers on the bars represent the 95% confidence intervals. The results do not show a consistent pattern with regards to which sponsorship performs the best. This may be due to the limited number of states that volunteered for the experiment. The full presentation of the analysis of maximum likelihood estimates can be found in Appendix C.

Model 5 included sponsor, size class and the interaction between sponsor and size class as predictors. Neither of the independent variables, nor their interaction, were found to be significant predictors of response. Similarly, in Model 6 I test the predictive power of industry, appeal and their interaction. None of the predictors
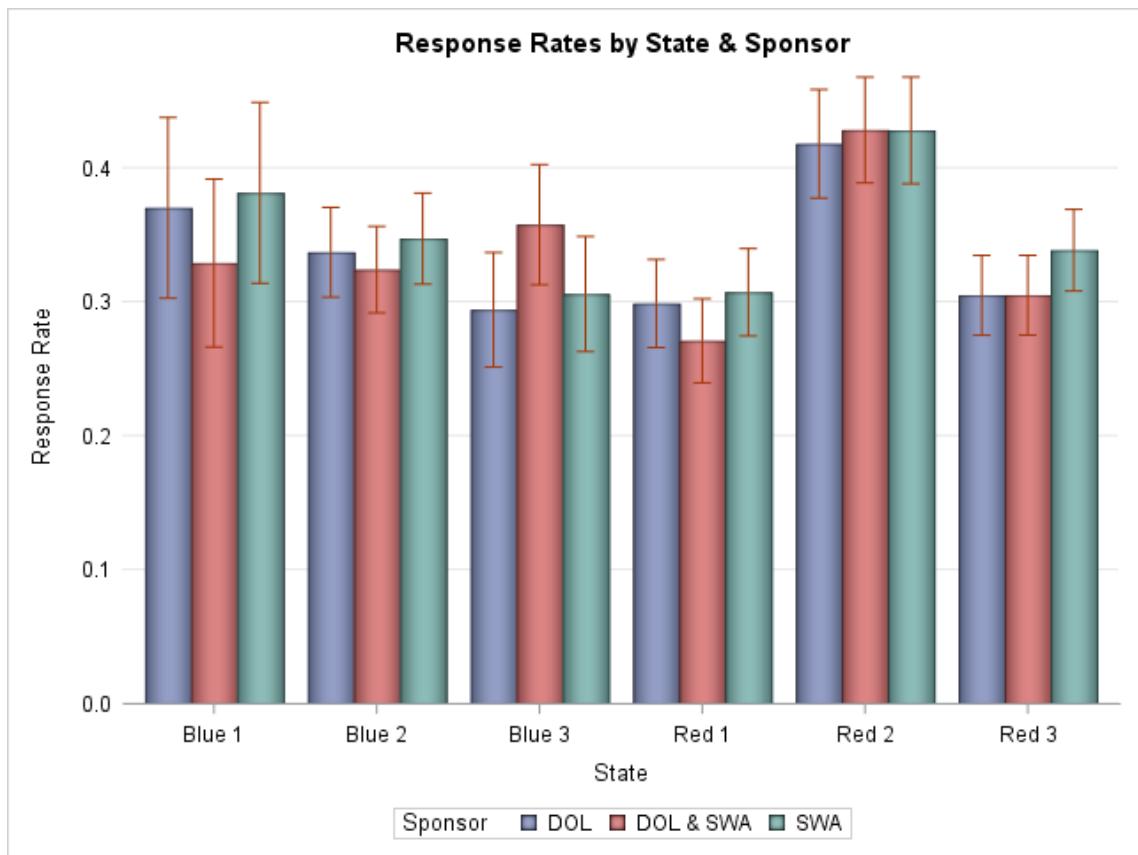
Figure 2.1: Response by State and Sponsor

in Model 3 were found to be significantly related to response.

Based on the results of the chi-square test and output of the logistic models, I find a lack of evidence to support hypothesis **H2.3** (the egoistic appeal will achieve a higher overall response rate than the altruistic appeal) and only marginal evidence to support hypothesis **H2.4** (the impact of appeal type will vary in magnitude and direction among industry types).

2.3.3   Thank You and Tax Comment

The final treatment in the experiment was whether or not a thank you and message about how a prompt response saves tax payer dollars was included after the due date. The inclusion of the message yielded a 34.1% response rate that is slightly higher than the 33.0% rate from excluding the message ($\chi^2(1) = 1.40, p = 0.24$). Table 2.6 presents the output from logistics regression models used to predict propensity to respond while controlling for certain business characteristics.

In Models 7 and 8 the thank you and tax message was used as a predictor in logistic regression models along with state (Model 7) and size of the business (Model 8). Neither of the models found the message nor the interaction of the message with the specified business characteristics to be a significant predictor of response. However, in Model 9, after accounting for industry classification, including the message becomes a significant positive predictor of response. The full presentation of the analysis of maximum likelihood estimates can be found in Appendix C.

To investigate this result, Table 2.7 displays the response rates by industry

Table 2.6: Wald Tests for Individual Effects - Due Date Message

Model	Variable	p-value
7	Message	0.1980
	State	0.0197
	Message x State	0.3039
8	Message	0.1457
	Size Class	0.8705
	Message x Size Class	0.4872
9	Message	0.0476
	Industry	0.1569
	Message x Industry	0.0962

and by whether or not the message was included. Response rates by industry are varied and the direction of message inclusion effect is also varied from industry to industry. The results indicate that industry might matter when considering the message inclusion, but there is not sufficient evidence to say for which industries. This lends some support for hypothesis **H2.5** (including the message about saving taxpayer dollars will increase the response rate).

2.3.4 Treatment Interactions

In the review of previous empirical research, one study found a significant interaction between sponsorship and appeal type (Houston and Nevin, 1977). Since the experiment was fully crossed, I am able to examine if a significant interaction

between sponsorship and appeal type exists. The response rates for the twelve versions of the letters are presented in Table 2.8 in descending order of response. There is a difference of 5.6% between the best performing letter and the worst performing letter. A t-test between the two results in a p-value of 0.0097. Since we are comparing 12 different versions of the letter, two at a time, we are making 66 comparisons and should adjust the threshold for significance accordingly. With a Bonferroni correction, we would claim statistical significance for p-values less than $.05/66 = 0.00076$. Thus, I fail to find significant interactions among the treatments.

Since individuals receiving the survey request may not have the authorization to respond to a survey request, the content of letters in a survey of businesses may have an attenuated affect. Small businesses may behave more similarly to household respondents since the likelihood the owner of the business is the one receiving the request increases as the number of employees decreases. To test this theory, the results of this section were replicated using the outcome from only small businesses (those with less than 5 employees). The analyses again failed to find a significant relationship between response propensity and any of the treatments.

2.3.5   Mode of Response

Though not designed as part of the experiment, a noteworthy result was found when analyzing the mode of response. Respondents were offered three modes of response: Email, telephone or fax. Though OES did not provide a return envelope, some respondents did mail back their prenotification letter with postage at their own
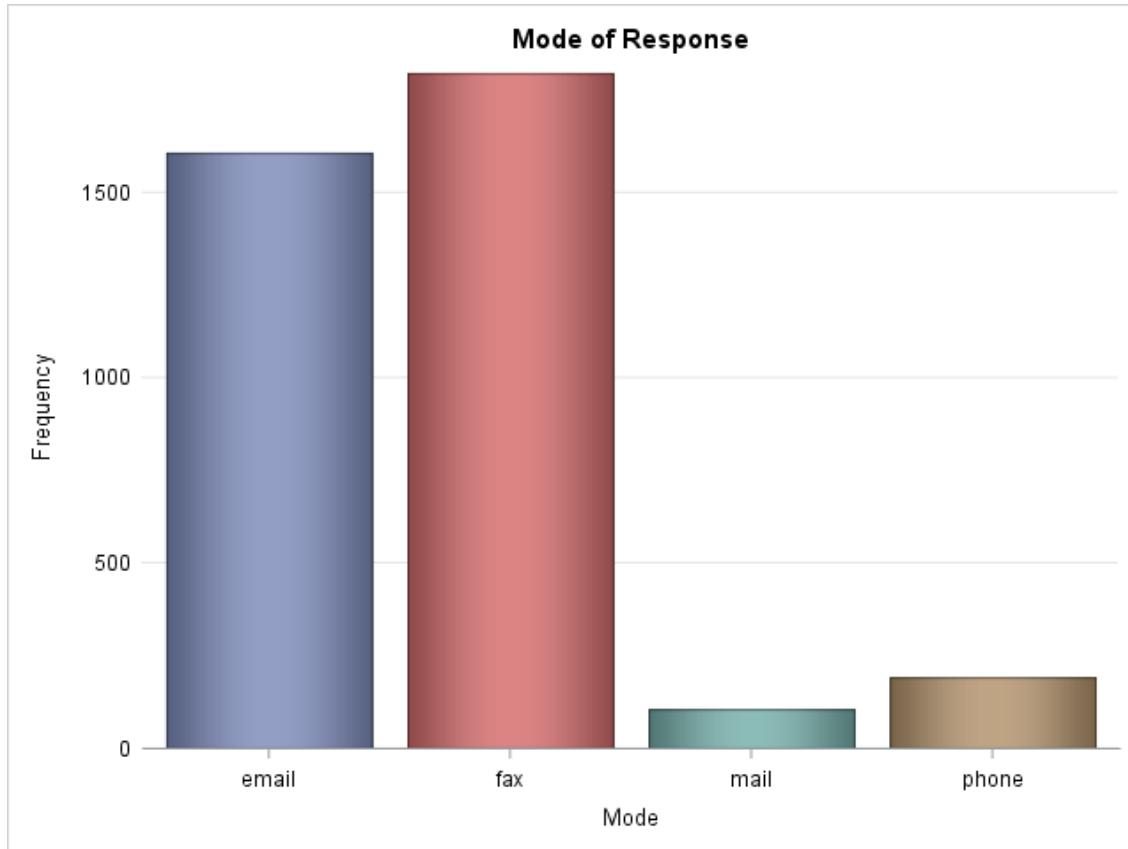
Figure 2.2: Mode of Response Frequency Counts

expense. Frequency counts for mode of response are presented in Figure 2.2. The most frequent mode of response for all prenotification letters was by fax $(n = 1,822)$ followed by Email $(1,607)$.

From a survey management point of view, an Email response to the prenotification letter is preferable. With an Email, analysts logging responses are able to copy and paste the contact information provided which reduces the likelihood of typos. Email responses also eliminate the potential for illegible handwriting which reduces the workload of analysts. From a respondent's standpoint, sending the response by fax may be the most convenient option. Filling out a few lines on a single

piece of paper and faxing it off may be easier than switching modes to a computer, typing in an Email address, and making sure the contact information is properly labeled. The results suggest that for simple surveys of businesses, fax should not be discounted as a response option.

Table 2.7: Response Rates by Industry and Message Inclusion

Two Digit NAICS Code	Include Message	Exclude Message
11	40.7	30.0
21	56.3	33.3
22	43.5	34.8
23	32.0	35.6
31 - 33	37.2	35.4
42	31.2	30.2
44 - 45	33.1	30.1
48 - 49	35.0	25.8
51	30.8	28.1
52	33.9	35.9
53	26.2	23.2
54	33.8	33.0
55	24.5	33.3
56	31.8	26.2
61	33.3	37.9
62	37.0	36.1
71	29.9	32.7
72	30.1	26.9
81	38.7	36.8
99	44.8	49.6
Overall	34.1	33.0

Table 2.8: Response Rates for the 12 Versions

Sponsor	Appeal	Message	n	RR
SWA	Egoistic	No	922	36.2%
DOL + SWA	Egoistic	Yes	945	35.3%
SWA	Altruistic	No	922	34.9%
DOL	Egoistic	Yes	912	34.6%
DOL + SWA	Altruistic	Yes	950	34.6%
SWA	Egoistic	Yes	926	34.0%
SWA	Altruistic	Yes	928	33.4%
DOL	Egoistic	No	906	32.9%
DOL	Altruistic	No	910	32.3%
DOL	Altruistic	Yes	915	32.2%
DOL + SWA	Egoistic	No	935	31.1%
DOL + SWA	Altruistic	No	939	30.6%

2.4 Discussion

The use of prenotification letters to collect Email addresses in an establishment setting is a promising method. By sending a single mailing, Email addresses were collected for one third of the sample, drastically reducing analyst workloads. However, the experiment failed to produce evidence that content of the letters are a driving force in an establishment's decision to respond.

In this experiment, I investigated how survey sponsor, appeal type and a brief message after the due date affect response to the prenotification letter request. The use of appeals attempt to persuade the respondent into complying with the survey request by targeting the desire portion of the AIDA model. In a business survey environment, it was hypothesized that an egoistic appeal would outperform an altruistic appeal since businesses have a primary goal of remaining viable over time and egoistic appeals inform the business how the survey results may benefit the business. The results from the experiment failed to find evidence for a relationship between appeal type and response to the prenotification letter. The interaction between appeal type and business characteristics was also examined and no significant interaction effects were found.

Next, it was hypothesized that different sponsors would create different levels of interest in a survey request and different levels of desire to fulfill the request. By targeting the interest and desire components of the AIDA model I aimed to increase the overall action, that is, prenotification letter response. The sponsorship of a survey invokes the authority and liking compliance principles. It was expected

that the federal sponsorship (DOL) would achieve a greater response than that of a state workforce agency since the Federal Government is seen as having a legitimate need to collect survey data. The results from the experiment failed to find evidence for a relationship between sponsor and response to the prenotification letter. Model 4 found that the interaction term between sponsor and state was marginally significant at predicting response, lending some evidence for certain states having different reactions to various levels of government. Given the limited amount of states involved in the experiment, a broader study in the future would be welcomed.

The final treatment in the experiment was the inclusion or exclusion of the following message after the due date: "Your prompt response is appreciated and will save taxpayer dollars." It was hypothesized that this comment would increase desire to respond to the survey. All taxpayers have a vested interest in their government being a responsible steward of taxpayer dollars. By including the message after the due date, the commitment and consistency compliance principle is invoked. After controlling for industry type, a logistic regression model found some evidence that inclusion of the message increases response. The results indicate that industry might matter when considering the message inclusion, but there is not sufficient evidence to say for which industries.

A limitation of this study may be the salience of the treatments to the respondents. For the sponsorship condition, the treatment varied the emblem (or logo for SWAs) and name displayed in the header of the letter. Since the SWAs were collecting and logging the data, the return address for the prenotification letters had to be the address for the SWAs. The envelopes used were dual window envelopes

so the first thing a respondent would see when encountering the survey letter is the return address of the SWA. Furthermore, since the SWAs collect the data on behalf of the BLS, the SWAs had to be mentioned in the body of the letter in order to establish their legitimacy.

The prenotification letters used in the experiment were constrained to a single page in length. This page contained the header, the mailing address, legal information, information for response, and a section of the page to fill in respondent contact information. This left room for a short paragraph introducing the survey, of which, one sentence was altered for the egoistic and altruistic appeals treatment. The short explanation of why data provided are valuable may not have resonated with respondents.

Chapter 3:   The use of Email for Invitations and Reminders in an Establishment Survey

3.1   Overview

In this chapter I will review the motivation, methodology and results for a pair of experiments that test the effects of Email and paper mail contacts in an establishment survey.

The first experiment examines the effects of a postal mail survey invitation in comparison to an Email survey invitation in a production environment. The second experiment builds on results from the first experiment in an effort to find an optimal mode sequence for nonresponse follow-up. Conducted outside of a production environment, all units receive the survey invitation by Email and the mode of contact for non-responding units varies by group.

Section 3.1.1 reviews a conceptual framework that describes mechanisms at work behind postal and Email survey invitations. Section 3.1.2 reviews empirical research found in the literature. Section 3.2 describes the first experiment and findings from the research while Section 3.3 reviews the second experiment.

3.1.1 Conceptual Framework

The mode of contact used for survey invitations is directly related to the awareness portion of the AIDA model. If a respondent does not pay attention to the request, there is little chance they will respond to the survey. Different modes of contact are likely to have differential impacts on level of awareness and retention of that awareness.

Cernat and Lynn (2018) describe three mechanisms through which Email communications may increase propensity to respond to a survey compared to mail alone. The first is that Emails may increase the chance of the respondent receiving the survey request. Though Cernat and Lynn are describing a model for household surveys, the same may be true of business respondents. In household surveys, Emails tend to arrive in a personal inbox, checked only by the personal recipient, whereas postal mail is delivered to a mailbox that may be shared with other residents. In a business survey, Emails may be delivered to a personal inbox or they may be addressed to a department, such as payroll@business.com. In household surveys, Emails are typically checked multiple times a day from multiple locations, whereas a mailbox requires a visit to a physical location and may not be done often. The same is likely to be true for business surveys.

Groves et al. mention that non-contact is a major component of survey non-response for household surveys (Groves and Couper, 1998). However, this is not necessarily true in establishment surveys. Establishment surveys conducted through the BLS go through extensive address refinement that identifies out-of-scope or out

of business units and updates the contact information for the remainder of the sample. The eligible units are contacted multiple times by phone, Email, postal mail or a combination of the three. A conversation with one program manager indicated that noncontact for business surveys is close to 0%, so the issue of non-contact may not be of great concern for business surveys.

The second mechanism mentioned by Cernat and Lynn is that survey invitations by Email may reduce the burden on respondents when they complete a survey online. When an Email is used, a URL may be embedded in the message that the respondent can click to be automatically directed to a personalized online portal. The embedded URL may act as a channel factor by allowing easy access to the survey and promote survey participation. When a letter is sent through postal mail requesting online data submission, a respondent must type in the URL and may be required to enter a user name and password. The additional effort required to access the online survey may negatively impact survey participation. This is likely to be true in surveys of businesses as well.

The third mechanism is that Emails serve as additional communications to respondents. The additional reminders and different mode of reminders, are likely to increase survey participation in both household and business surveys. It is well known that additional contacts boost response rates (Kittleson, 1997; Edwards et al., 2009; Cook et al., 2000; Dillman et al., 2009; Langeland and Tuttle, 2016). Therefore, adding Email contacts to postal mail should increase the propensity to respond, though practitioners should take caution to avoid annoying respondents.

There are several other mechanisms that may impact the effectiveness of Email

contacts. Willimack and Nichols (2010) found that business respondents are enthusiastic about the ability to report data online. Since Email invitations offer an easy way to access online data submission portals through embedded URLs, Email invitations should reduce burden on respondents and increase response propensity. The respondents in their study were computer savvy and the data necessary to complete most requests were already in electronic form. It should be noted that the study only examined very large businesses and it is unclear if the results are generalizable to smaller establishments.

There are also potential negative effects of using Email as a mode of communication. The low cost of sending Email and the gaining share of the population with access to the internet has caught the attention of marketing agencies, public polling organizations, governmental offices, and social science researchers (Sills and Song, 2002; Callegaro et al., 2015). This has resulted in a surge of unwanted Email commonly referred to as "spam" (Cranor and LaMacchia, 1998). Email is the most ubiquitous form of communication with an estimated 3.8 billion Email users worldwide. The total worldwide Email traffic, including both business and consumer Emails, is estimated to be over 281 billion Emails per day (The Radicati Group, 2018). This is in contrast to the approximately 150 billion pieces of postal mail sent annually (United States Postal Service, 2018).

The sheer volume of Emails received may cause concern about the potential efficacy of using Email as a mode of survey invitation. However, there are methods that may increase the likelihood that the recipient of an Emailed request will view the invitation as legitimate. Porter and Whitcomb mention five ways that using

a mixed-mode approach, such as sending a prenotification letter through the mail, may enhance response rates (Porter and Whitcomb, 2007). By using a mailed prenotification letter that lets the respondent know about the upcoming survey request, it may be possible to avoid the appearance of sending an unsolicited Email. A mailed notice also helps distinguish a legitimate survey request from a marketing message, invokes the compliance principle of reciprocity, provides another medium of communication for those that don't check Email often, and allows for the inclusion of prepaid incentives.

The use of Email spam filters also has reduced concerns about digital junk mail. Many Email services provide filters to scan for spam and malware. The filters may include reputation filtering (flagging enterprises with known spam-based IP addresses), content filters that review Emails for advertisements, or custom filters that are based on a set of heuristics. Email in the work environment may have stricter spam filters that further reduce unwanted Email. One study of Email users at work (Fallows, 2002) found that 60% of work Emailers receive 10 or fewer messages a day and 71% say that only a little of the work Email they receive is spam. Fallows also found that 88% of Emailers check their Email at least once per day.

There is also concern about clickable URLs in Emails that may lead to a phishing website or websites that host a virus or malware (Callegaro et al., 2015, pg. 134). The URL skepticism may be compounded in surveys of businesses since many employers require their employees to avoid suspicious Emails. Closely related are concerns that data submitted through Email or online portals may be intercepted by malicious parties, so that issues of privacy arise. Willimack and Nichols (2010)

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mention that a few companies in their study had confidentiality concerns about using the web to submit data. Couper et al. (2008) found that attitudes towards privacy and perceptions of risk have an impact on willingness to participate in a survey. So if a business has a concern about providing data electronically, an Email invitation may negatively impact response.

Given the potential benefits and negative consequences of using survey Emails, and the unknown effect they may have in an establishment setting, more research is needed on their use. In the next section, I review empirical results from the literature that relate to the use of Email in survey communications.

3.1.2 Prior Empirical Findings

As mentioned in Chapter 1, the use of Email as a mode of survey invitation requires that Email addresses be available for sampled units. This restricts most experiments on the effectiveness of Emails to special populations where Email addresses are available for all units, such as surveys of students at a particular university. Results from experiments carried out in these specialized populations may not generalize to surveys of businesses, but they may hint at the likely success of the strategy. In a study of engineers involved in academic research, Birnholtz and colleagues (2004) sampled 434 researchers and randomized them into three treatments groups for a web survey. Two groups received the survey invitation through mail with instructions for completing the survey online. One mail group received a $5 cash incentive while the other mail group received a $5 Amazon gift certificate.

The third group received an Email invitation to the survey along with a $5 Amazon gift certificate. Response rates were higher for the two mailed groups at 57% for the cash group and 40% for the gift certificate group whereas the Email units achieved a 32% response rate. While the Email response rate was not significantly different from the mail with gift certificate response, this is likely due to the small sample size.

In a survey of university students, Kaplowitz et al. (2004) examined response rates for students who received an Email invitation to a web survey under various treatment regimes and compared those rates to the rates for students who received a paper form. Students in the Email group were randomized into one of four treatments: received an Email invitation; received an advance notice postcard followed by an Email invitation; received an Email invitation followed by a postcard reminder; or received both the advance and reminder postcard along with the Email invitation. Students in the paper form group received an advance postcard, a hard copy survey form with cover letter, a reminder postcard, and a replacement form. The mail group achieved the highest response rate (31.5%), though it wasn't significantly different from that for the Email group that received an advance postcard (29.7%). The mail group was also about eight times more expensive to collect per response than the advance postcard plus Email group. The group that only received an Email invitation had the lowest response rate (20.7%). The authors also mention that the mean age was 24 years old for the Email groups and 31 years old for the mail group. This may imply that different types of people are responding to the Email invitations.

In contrast to the previous studies where a specialized population was sampled, Bandilla et al. (2012) conducted an experiment in a survey of the general population. However, it should be noted that the population of this study was persons who previously had responded to the German General Social Survey, internet users, willing to participate in a follow-up survey, and willing to provide an Email address. The authors go on to mention that the demographics for this subgroup differ from the overall respondent pool on items such as education, gender and trust in people. In their experiment, respondents were randomized into four treatment groups defined by whether the survey invitation was sent by Email or mail and whether or not a mailed prenotification letter was sent. They found that the Email invitation with a mailed prenotification letter achieved the highest response rate (57%) while using Email alone was the lowest (40%). The response rate for both mail treatments was 51%. In a followup study, the authors note that a mixed-mode design of web and mail significantly increases response rates and increases the representativeness of the respondent pool in terms of selected demographic and attitudinal questions (Bandilla et al., 2014).

Kaplowitz et al. (2012) conducted another university-based study in which students, staff, and faculty were sampled and randomized into two groups for an online survey. One group received up to two postcard invitations containing a URL and login information and a final Email reminder; the other group was sent up to three Email invitations containing a clickable URL. Since there is a mode switch in the postcard group, the authors report response rates after two attempted contacts as well as the final response rates. After two contact attempts, there were differential

response patters in the subgroups. Faculty response was higher for the Email group than the postcard group (33% vs 21%, $p < 0.01$) and a similar result was found for staff (36% vs 32%, $p < 0.10$). There was no significant difference for students (15% vs 14%). After the third contact (which is an Email for both groups) the response for faculty remains higher in the Email group (40% vs 33%, $p < 0.01$) while the difference dissipates for staff (both groups at 43%) and a significant difference emerges for students (19% vs 22%, $p < 0.01$). The results for the student group indicate the usefulness of multiple modes of invitation.

In an online survey of faculty instructors at a university, sampled members were randomly assigned to three experimental groups and sent a mailed invitation letter with a \$2 cash incentive; a mailed invitation letter only, or an Emailed invitation (Dykema et al., 2013). Nonrespondents were sent two Email reminders for all treatments. Before the first Email reminder was sent, response rates were: mail with incentive 13%; mail only 13%; Email group 9%. There is no statistical difference in these rates, which may be attributable to the relatively small sample size of about 90 members per treatment. After the second Email reminder, response rates increased to: mail with incentive 38%; mail only 30%; Email group 19%. The authors note that including an additional mode of invitation has a positive effect on response and theorize that by including an incentive with the mailing, subsequent Emails will seem less like unsolicited contacts.

Millar and Dillman (2011) conducted a pair of experiments in a survey of undergraduate college students regarding their experiences at the university. The authors found that using a postal invitation to a web survey with Email nonresponse

prompts was not a significant improvement over an Email invitation with the same Email nonresponse prompts (21.2% vs 20.5% respectively).

The previous results from specialized populations and of the general public are mixed in results on the effectiveness of Email as a mode of invitation. Evidence for the effectiveness of Email invitations in establishment surveys is even more sparse. I now review the few examples of Email use in establishment surveys found in the literature.

One example comes from Statistics Canada where an experiment was conducted to inform a nonresponse follow-up (NRFU) strategy for their newly implemented Electronic Questionnaires. In the study, businesses with Email addresses on file (see Claveau and Turmelle (2012) for details on gathering Email addresses) were randomized into four treatment groups. All treatments received the initial survey invitation via Email and NRFU began one month later. Treatment 1 was an Email reminder, then telephone follow-up with three additional Emails at one month intervals. Treatment 2 was four Email follow-ups at two week intervals; no telephone calls to respondents were allowed (unless requested by a respondent). Treatment 3 started with telephone follow-ups and also included three reminder Emails at one month intervals. Treatment 4 was one telephone attempt followed by three emails at two week intervals. Since the experiment was conducted during production, Treatment 2 and Treatment 4 eventually had to be switched to full telephone follow-up in order to meet production standards. Prior to switching, response rates for Treatment 1 and Treatment 3, the two groups that were receiving continual CATI follow-ups, were highest at about 62%. Treatment 4 achieved 54%

and Treatment 2, which only used Email reminders, produced a 48% response rate.

In an experiment investigating the effects of Email invitations and reminders for an establishment survey (Sakshaug et al., 2018), units with Email addresses on file were randomized into four treatment groups: paper invitation with paper reminder; paper invitation with Email reminder; Email invitation with paper reminder; and Email invitation with Email reminder. The highest response rates were found in the paper-paper (20%) and Email-paper (18%) groups and the lowest response rates were the paper-Email (13%) and Email-Email groups (6%).

In another establishment survey, Westat conducted an experiment on behalf of the National Science Foundation's Survey of Science and Engineering Research Facilities (Jodts et al., 2016). Institutional coordinators at academic institutions were sampled and randomized into two groups that received either a mail invitation to the web survey through FedEx or an Emailed invitation. The authors found no difference in response rates between the two modes of invitation. The study also examined number of contact attempts and speed of response, finding no difference between the two modes.

3.1.3   Push to Web

Another benefit of using Email instead of postal mail to invite respondents to a survey is that it is easier to push them to report data electronically. The benefits of electronic response are many. With online reporting, it is possible to employ real time edit checks that improve data quality and reduce the need to follow-up with

respondents to clarify data. Practitioners may also utilize automated skip patterns that reduce burden on the respondent. With data already in electronic form, there is less need for analysts to key in data, thereby reducing the likelihood of data entry errors. However, despite these advantages, it is important to understand any potential negative consequences of pushing respondents to web such as a decline in response rates. The following studies have investigated the use of mode to push respondents to web reporting.

In the 2008 National Survey of Recent College Graduates, Mooney et al. (2012) conducted a study to investigate how mode of response varied with whether or not respondents received a paper questionnaire with the initial survey invitations. Half of the sample was mailed a letter and asked to report data online while the other half received the mailed letter along with a paper questionnaire. Prior to the first nonresponse follow-up (a second mailing), the treatment group that only received the letter was reporting online at a rate of 97% while the group that received the paper questionnaire was only reporting online at 59%. After six weeks of CATI follow-up, the letter group was still reporting online at a significantly higher rate (76% vs 58%).

In a panel survey of U.K. households, Cernat and Lynn (2018) tested the effects of Email use in addition to postal mail in a sequential mixed-mode design. Sampled members were randomized into either a single-mode computer assisted personal interview (CAPI) or a mixed-mode web followed by CAPI treatment. Sampled households were randomized whether or not they provided an Email address in a prior wave so units that did not provide an Email address in the mixed-mode

treatment did not receive the Email invites nor reminders. The authors found that the additional Emails provided in the mixed-mode treatment did not significantly affect response propensity. However, the respondents who received the additional Emails were more likely to report in the web mode as opposed to CAPI.

Ellis et al. (2013) examined the effects of withholding paper forms in an establishment survey setting. In a national survey of jails, Ellis and colleagues randomized their sample into two main cohorts that either received a survey letter inviting the respondent to submit data online or received a full survey packet, including a paper form, with the option of reporting online. The authors found that withholding the paper form achieved equivalent response rates, did not significantly impact time until response, resulted in more respondents choosing to report online, and produced cost savings. It is important to note that the experiment was conducted in an annual survey in which the respondents are accustomed to reporting data.

3.1.4 Summary

The mixed results concerning Email and postal mail invitations in regards to response rates likely are driven by differences in study designs. The study populations include general households in Germany, students at a particular campus, engineers, jails, and other groups. The studies also are mixed with respect to whether the Email invitations are preceded by an advanced postal mailing or not. No general conclusion can be drawn from the identified studies. The push to web literature, however, is uniform in finding that withholding paper forms increases web report-

ing. The mixed results from specialized populations and lack of literature on Email invitations to establishment surveys suggest further research is needed to evaluate Email communications with businesses.

3.1.5 Research Questions

The next two sections report on a pair of experiments designed to answer the following research questions:

1. What are the effects of using Email invitations instead of postal invitations on response rates?

2. Do Email invitations affect propensity to report data online?

3. Does the use of Email affect time to response?

4. Are there cost savings to be realized by replacing postal mail with Email?

Based on the theoretical framework coupled with the empirical results I hypothesize the following. The mode of invitation is related to the attention portion of the AIDA model. A survey request sent by Email should be more likely to get to its intended target than a postal invitation since Email addresses are specific to one user. Mail requests may be screened out by gatekeepers or may be delivered to the wrong address. By this logic, Email should have a greater impact on attention than postal mail. On the other hand, it may be that Email requests are quickly forgotten or not viewed as legitimate. Since a delivered postal invitation will remain on a respondent's desk until they choose to discard of it, I hypothesize that a postal

request will retain a higher level of attention than Email requests and will achieve a higher response rate than an Email request.

- **H3.1:** Postal invitations achieve a higher response rate than Email invitations.

By withholding a paper survey form, it is likely that respondents will be encouraged to report their data online.

- **H3.2:** Using Email invitations will increase online reporting compared to mailing paper forms.

Since the possibility exists that Email requests may be quickly forgotten, it is likely a respondent receiving an invitation through Email will need a follow-up. The need for a reminder will increase the time until response.

- **H3.3:** Postal invitations decrease time to response compared to Email invitations.

Since there are minimal costs associated with sending Email invitations, it is likely that the marginal cost per response will be less for units receiving an Email invitation. The OES survey has a fixed staff dedicated to collecting OES responses, so the staffing cost (CATI) is fixed. The only costs considered in the experiment are the printing and postage of survey materials and the processing costs for returned data.

- **H3.4:** Cost per response is less for Email invitations than postal mail invitations.

3.2 Experiment 1 - Email vs Paper Invitations

In November 2016, OES conducted an experiment carried out during production to test the effects of Email survey invitations compared to postal mail invitations. Units from ten states were randomized into two groups in which they received the initial survey invitation either by Email ($n = 3,037$) or by postal mail ($n = 2,896$). Sample counts by business size class and industry can be found in Appendix D. To obtain Email addresses, units were sent an advance mailing called a prenotification letter that informs respondents about the upcoming survey request and also asks respondents to provide contact information for someone in the business who will be knowledgeable about the survey topic (e.g. someone in payroll). Respondents may provide contact information through fax, Email, phone, or the online instrument. Though it wasn't an explicitly stated option, some respondents mailed in their contact information, providing their own postage. Since units that respond to the prenotification letter are likely different than units that do not, only establishments that responded to the prenotification letter and provided an Email address were included in the experiment ($\approx 25\%$ of the sample). The randomization into treatment groups stratified by industry (defined by 2-digit North American Industry Classification System (NAICS) code) and size class (defined by number of employees on frame data). Ten SWAs volunteered to be part of the experiment. The distribution of industries[1] in the volunteer SWAs is compared to the distri-

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[1]The distributions of occupations between the volunteer states and nation was also examined and found to be similar

bution of industries in the U.S. in Table 3.1. The volunteer SWAs are slightly over-representative in the health care and social assistance industries (NAICS2 = 62).

Data collectors were asked to refrain from contacting establishment for two weeks after the initial invitations were sent in mid-November in order to gauge the effects of contact mode without any confounding communications. After the two weeks, normal procedures resumed and data collectors were allowed to contact establishments including attempting phone contacts. In addition to the initial invitation, all nonrespondents received three additional mail reminders and three Email reminders. Table 3.2 gives the dates for additional mail and Email contacts. Note that for some mailings the table states a letter or a form was sent, this is because OES sends small units (business with less than 50 employees) a full survey form that includes an option to report online while large establishments only receive a letter asking the business to report their data online.

The outcomes of interest for the experiment were response rates, mode of response, time until response and cost per response.

3.2.1 Results: Experiment 1

3.2.1.1 Response Rates

Response rates over time for the two groups are presented in Figure 3.1; the thickness of the bands represents 95% confidence intervals. At the end of November 2016, we can see the effect of Email vs paper mail invitation on response rates before

the SWAs were allowed to intervene. At this point in the experiment, the responses were 37.1% and 26.8% for the Mail and Email groups, respectively. A Chi-square test shows the difference at this point to be highly significant ($\chi_1^2 = 73.32, p < 0.001$). After the first follow-up mailing the week of December 5th, both groups show a pronounced increase in response and the overall rates for the two groups begin to converge. Another less pronounced increase in response rates is seen after the second follow-up mailing during the week of January 3rd, bringing the response rates between the two groups even closer. The first Emailed reminder was sent January 17th, which also may have contributed to the increase in response rates seen in mid-January.

Final response disposition codes for all sampled units were mapped into one of three codes: respondents, nonrespondents, and out-of-scope (e.g. returned mail). Response rates were then calculated as the number of respondents divided by the sum of the number of respondents and nonrespondents (AAPOR RR2). The Mail group achieved a final response rate of 86.7% with the Email group attaining 85.6%. A Chi-square test fails to detect a difference in the rates ($\chi_1^2 = 1.68, p = 0.19$). This result is encouraging since the cheaper mode of invitation ultimately achieved an equivalent response rate. See Section 3.2.1.4 for details on cost.

The remainder of the follow-up mailings and Emails do not appear to have any great effects on response. Rates continue to gradually increase for both groups, with no significant difference remaining as of the beginning of March. It is important to note that CATI interviews were in use from the start of December, however, no call history records are available so we do not know how many times respondents were
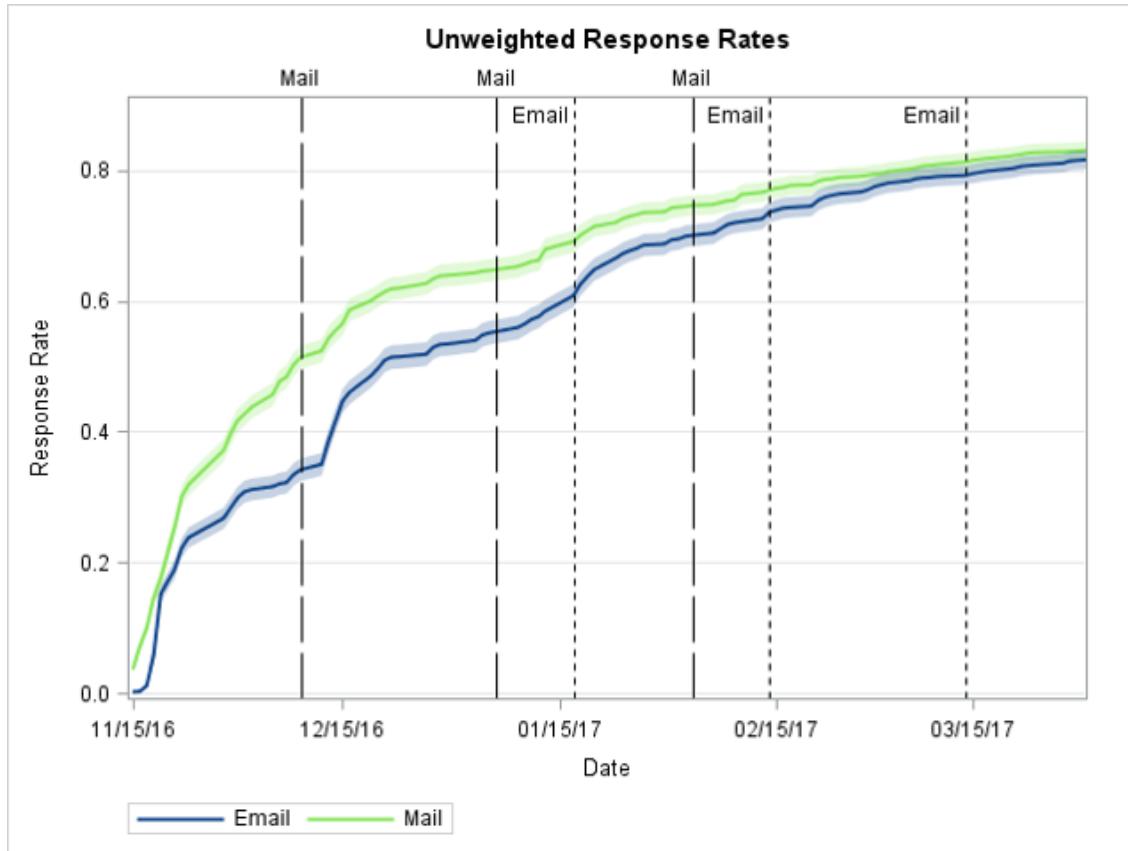
Figure 3.1: Mail vs Email Response Rates

contacted and it is not clear if certain cases were targeted by CATI. However, the fraction of cases collected by CATI was similar between the two groups and very small in proportion. Ultimately, 70 Mail and 84 Email cases were collected by CATI (2.7% and 3.4% of responding cases respectively).

Logistic regression models were created to estimate final response propensity while controlling for known confounders of response. A subset of models tested can be found in Table 3.3. None of the logistic models presented, nor others tested, provide significant evidence that the treatment group was a significant predictor of final response. However, there is still some evidence to support hypothesis **H3.1**

(postal invitations achieve a higher response rate than Email invitations). Prior to the analysts interventions, the postal mail invitation group's response rate was approximately 10% higher than the Email invitation group's response rate. For details on the analysis of maximum likelihood estimates, see Appendix E.

3.2.1.2 Mode of Response

Establishments selected for participation in the OES survey may choose among several modes of response: paper survey form; electronic (web) survey form; a hard copy printout of the electronic form; phone call; Email and facsimile. Of the units that responded, Table 3.4 shows the percent of each group that responded in the various modes.

Approximately 85% of all reporting units responded by either a paper survey form or with the web instrument, regardless of group treatment. However, it appears that units in the Email group were significantly more likely to respond via the web. To test if reporting units that received an Email solicitation were more likely to respond electronically, logistic models were created. Response modes were collapsed into a binary variable with one category of electronic response by the web instrument and another category response by all other modes. Table 3.5 displays output from a subset of tested logistic models that include covariates known to influence response. For details on the analysis of maximum likelihood estimates, see Appendix E.

In all models presented and in all others tested, Group was found to be a significant, positive predictor of web reporting. This aligns well with previous empirical

results and the notion that withholding a survey form will increase online reporting. Figure 3.2 displays the percent reporting through the web instrument by size of the business. Recall that large businesses (greater than 49 employees) are initially sent a survey letter requesting for data submission online while small businesses are sent a full survey form with the option to report online. The plot clearly shows that withholding the survey form from small businesses increases online reporting. For the large businesses, there is not a significant difference in web reporting between the Mail and Email groups. This is expected since the survey form is being withheld from large businesses. Furthermore, large businesses are more likely to have electronic records to consult for survey questions that are more easily reported in a spreadsheet than written by hand.

Though state analysts were making additional contacts with businesses throughout data collection, the difference in web reporting between the two groups still exists and seems to be driven by the initial contact mode. Given the results, there is support for hypothesis **H2.2** (using Email invitations will increase online reporting compared to mailing paper forms). In the next section, I formally examine whether the initial mode of contact impacted the speed of response.

3.2.1.3 Survival Analysis

Survival analysis is used to analyze data in which the time until an event is the estimate of interest. When time to failure is not normally distributed or data are censored, normal regression assumptions are violated (www.ucla.edu) and survival
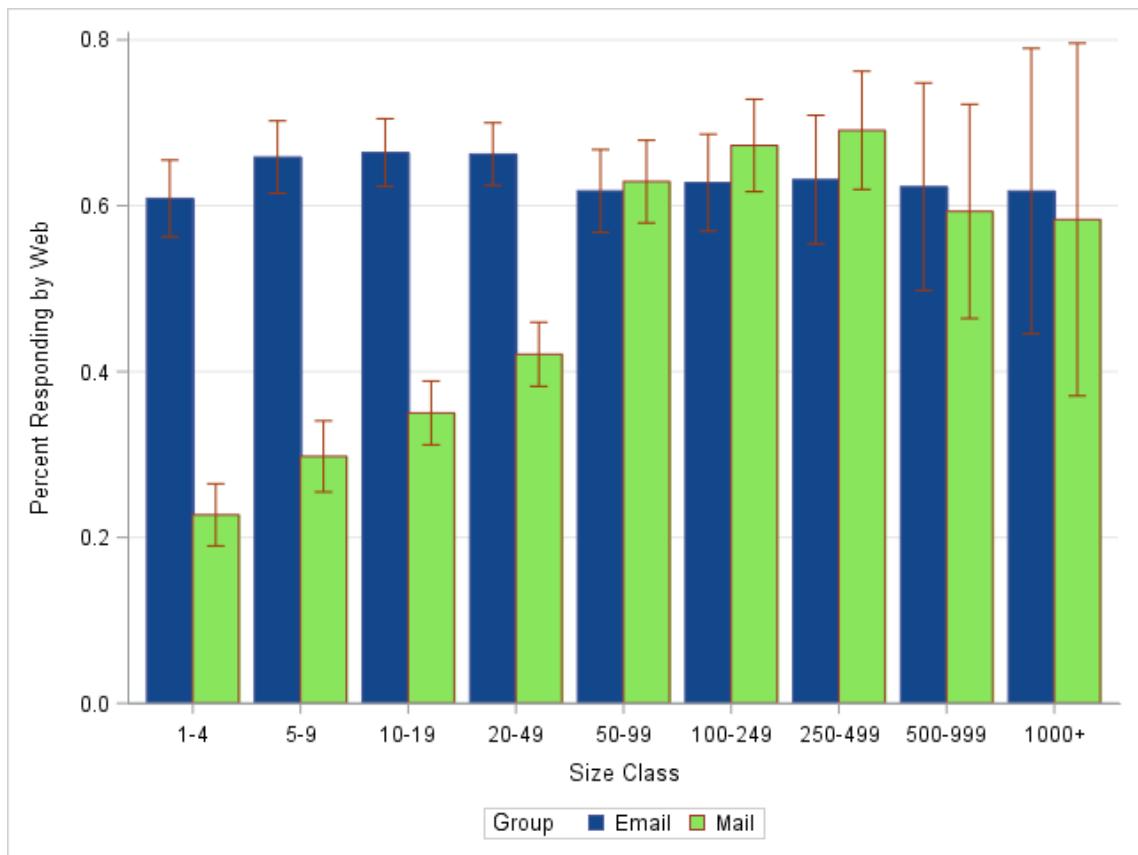
Figure 3.2: Web Reporting by Size Class

models are required. In this section, the term "survival" is used to mean that a unit is a nonrespondent; a unit becomes a "failure" when it responds. Response status data is considered censored because we do not know what happened to units that were still survivors when the study concluded. Specifically, we do not know if the surviving units (nonrespondents) would have eventually responded if data collection ran indefinitely.

The survivor function $\hat{S}_T(t) = Pr(T \geq t)$ is the probability that a unit survives past time t and is the basis of survival analysis. The Kaplan-Meier estimator is a nonparametric maximum likelihood estimator of the survivor function (Kaplan and Meier, 1958). The Kaplan-Meier estimator is defined as:

$$\hat{S}_T(t) = \prod_{t_i \leq t} \frac{n_i - d_i}{n_i}$$

where n_i is the number of units at risk (remaining nonrespondents), and d_i is the number of units that fail (respond) at time t_i. In this analysis, t_i is measured in days since the experiment began, n_i is the number of nonrespondents on day t_i and d_i is the number of units that respond on day t_i. I used PROC LIFETEST in SAS to create Kaplan-Meier estimators for the Mail and Email groups. The output contains three widely accepted tests for homogeneity (Lawless, 2011) which are shown in Table 3.6.

To estimate the difference in which the treatment groups are failing, Cox proportional hazards regression (Cox, 1972) was used. The hazard function relates back to the survival function as follows:

$$h_T(t) = \frac{f_T(t)}{S_T(t)}$$

where

$$f_T(t) = -\frac{d}{dt}S_T(t)$$

is the probability density function for the random variable T. An interpretation of the hazard function is the probability of a unit failing at time t given that it has survived until time t. Cox regression models the hazard function as:

$$h(t) = h_0(t)exp(\boldsymbol{x}\boldsymbol{\beta_x})$$

for a vector of covariates $\boldsymbol{x}$. The term $h_0(t)$ is the baseline hazard function that represents the hazard when all $\boldsymbol{x} = \boldsymbol{0}$ (www.ucla.edu), this acts like the intercept in a logistic regression model. The models are fit using maximum likelihood methods, which estimate the regression parameters that maximize the probability of observing the given set of survival times.

The hazard ratio is the ratio of probabilities that a failure will occur at time t given survival to time t and is expressed as:

$$\hat{HR} = \frac{h_0(t)exp(\hat{\beta}_1 x_1 + ... + \hat{\beta}_j(x_j + 1) + ... + \hat{\beta}_p x_p)}{h_0(t)exp(\hat{\beta}_1 x_1 + ... + \hat{\beta}_j(x_j) + ... + \hat{\beta}_p x_p)} = exp(\hat{\beta}_j)$$

This expression is useful since it does not depend on time t so it allows us to interpret the effect of a one-unit change in covariates on the overall expected hazard. Using PROC PHREG in SAS, the treatment group was used as a predictor to create a survival model. The hazard ratio for the treatment group with Email as the reference category is 0.809. The 95% confidence interval for the hazard ratio is (0.766 , 0.855). The interpretation of the hazard ratio is that units in the Email group are 20.1% less likely to fail (respond) on any given day. See Appendix E for additional survival models that include business characteristics for predictors.

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The tests for homogeneity indicate that the groups are failing at different rates and the hazard ratio indicate Mail units are failing more quickly. This lends further evidence that Email may not be as well suited as postal mail for increasing and maintaining awareness of a survey request. It may be that the presence of a physical letter or form on the desk of the respondent acts as a reminder to respond to the survey, whereas an Email invitation may be viewed once and quickly forgotten. It is also possible that some Email units never received the initial invitation due to misspelled Email addresses or spam systems. Unfortunately the delivery status of the Emails was not captured. These units would not have an opportunity to respond until nearly a month later when the first paper reminder was sent to all units. There is strong evidence for hypothesis **H3.3** (postal invitations decrease time to response compared to Email invitations).

Though Email units were found to respond at a slower pace, they may be cheaper to collect per response. If field time allows, it may be cost effective to send an Email invitation first and follow-up with a more expensive mode. In the next section, I present the results of a cost analysis.

3.2.1.4 Cost Analysis

The final goal of the experiment was to determine if any cost savings could be realized through the use of an Emailed survey invitation. The costs considered are the marginal costs for printing and postage of the mailed letters and forms along with the processing fees for collected data. Unfortunately, no call history records

were available for CATI data collection, so we are not able to assess costs for cases collected by phone. Overall, 70 Mail cases and 84 Email cases were collected by phone so I assume an approximately equal CATI cost for each group. Table 3.7 expands on Table 3.2 to include the mailing costs.

The variable mailing cost in November and January arises from whether a unit received a letter (invitation or reminder) or a full survey packet. As mentioned previously, smaller establishments received a survey packet with an option to report data online and larger establishments received a letter with a web invite. A processing fee of $0.64 was assessed to all responding units. The equivalent processing cost across mode of response is due to the requirement that an analyst must enter or code response information into the system manually. In December a reminder letter was mailed to all nonrespondents and in February a full survey packet was mailed to all nonrespondents.

The total cost for all mailings and processing fees for the Mail group was $11,479. The total for the Email group was $8,633. The average cost per sampled unit was $4.36 for units receiving the initial survey invitation by mail and $3.48 for units receiving the initial survey invitation by Email. The average cost per completed interview (ignoring costs for nonresponding units) was $3.51 for the Mail group and $2.73 for the Email group. The reduction in cost for the Email units is largely driven by the initial November mailing. There were 2,091 units in the Mail group that received the $0.74 letter and 946 units in the Mail group that received the $1.44 survey form, compared to the 2,896 units in the Email group that received Email for an initial mailing cost of $0. The marginal cost for the initial contact for

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the Mail group was $\$0.74 * 2,091 + \$1.44 * 946 = \$2,909.58$ and $\$0$ for the Email group. As mentioned in Section 3.2.1.2, units in the Email group were much more likely to respond online. This will likely further save cost but data on time spent per case are not available to quantify the amount. Given these results, there is support for hypothesis **H3.4** (cost per response is less for Email invitations than postal mail invitations).

3.2.2 Summary of Experiment 1

It is important to remember that this experiment was conducted in a production environment where state analysts were making additional contacts with units to gain response. The state analysts are a fixed staff dedicated to collecting data for OES. Under theses conditions, the use of Email as a mode of survey invitation was found to be beneficial in an establishment survey setting. Email invitations achieved an equivalent response rate to postal invitations at a reduced cost. Units receiving the Email invitations were also significantly more likely to respond through the web instrument. However, units receiving an Email invitation took longer to report their data.

In the first experiment, analysts were asked to refrain from contacting units for a two week period at the beginning of data collection. This allowed for a glimpse of the unconfounded response behavior of the two treatment groups. It was clear that before interventions occurred, the postal mail group was outperforming the Email group in terms of response by nearly 10 percentage points. To get a better

understanding of how Email invitations affect response without additional contacts,

a second experiment was conducted outside of a production environment.

Table 3.1: Distribution of Industries for Sample and US

NAICS2	Sample Dist	US Dist	Difference
11	1.0%	1.1%	-0.1%
21	0.2%	0.3%	-0.1%
22	0.1%	0.2%	0.0%
23	7.3%	8.5%	-1.2%
31-33	3.7%	3.7%	0.0%
42	5.5%	6.4%	-0.9%
44-45	9.1%	10.9%	-1.8%
48-49	2.4%	2.6%	-0.3%
51	1.9%	1.8%	0.1%
52	4.5%	5.1%	-0.7%
53	3.7%	4.2%	-0.5%
54	11.8%	12.8%	-1.0%
55	0.5%	0.7%	-0.2%
56	4.7%	5.8%	-1.1%
61	1.2%	1.3%	-0.1%
62	26.4%	16.6%	9.8%
71	1.6%	1.5%	0.0%
72	6.6%	7.5%	-0.9%
81	8.0%	8.9%	-1.0%

Table 3.2: Contact Dates - Experiment 1

Date	Intervention	Group
October 3-7	Prenotification mailing	All

November 1 test begins - randomize units into two groups

Date	Intervention	Group
November 7-10	Random A: Mailed form or letter invitation	Mail
November 15	Random B: Initial Email invitation	Email

November 28 test ends - standard data collection procedures

Date	Intervention	Group
December 5-9	First follow-up mailing - letter	All
January 3-6	Second follow-up mailing - form or letter	All
January 17	First follow-up Email	All
February 1-3	Third follow-up mailing - form	All
February 14	Second follow-up Email	All
March 14	Third follow-up Email	All

Table 3.3: Wald Tests for Individual Effects - Response Rates

Model	Variable	p-value
1	Group	0.3557
	State	<.0001
	Group x State	0.0723
2	Group	0.7551
	Size Class	<.0001
	Group x Size Class	0.9776
3	Group	0.9914
	Industry	0.2680
	Group x Industry	0.8867

Table 3.4: Mode of Response - Experiment 1

Collection Mode	Group	
	Mail	Email
Survey Form	37.6%	11.9%
Web Instrument	47.9%	74.3%
Hard Copy Printout	0.1%	0.1%
Phone Call	2.7%	3.4%
Email	7.3%	7.6%
Fax	4.4%	2.8%

Table 3.5: Wald Tests for Individual Effects - Web Response

Model	Variable	p-value
1	Group	<.0001
	State	<.0001
	Group x State	0.0106
2	Group	<.0001
	Size Class	<.0001
	Group x Size Class	<.0001
3	Group	<.0001
	Industry	<.0001
	Group x Industry	0.0033

Table 3.6: Test of Equality over Strata

Test	Chi-Square	DF	p-value
Log-Rank	60.18	1	<.0001
Wilcoxon	118.27	1	<.0001
-2Log(LR)	63.64	1	<.0001

Table 3.7: Contact Dates with Costs - Experiment 1

Date	Intervention	Group	Cost
October 3-7	Prenotification mailing	All	$0.74
November 1 test begins - randomize units into two groups			
November 7-10	Random A: Mailed form or letter invitation	Mail	$0.74 or $1.44
November 15	Random B: Initial Email invitation	Email	$0.00
November 28 test ends - standard data collection procedures			
December 5-9	First follow-up mailing - letter	All	$0.74
January 3-6	Second follow-up mailing - form or letter	All	$0.74 or $1.44
January 17	First follow-up Email	All	$0.00
February 1-3	Third follow-up mailing - form	All	$1.44
February 14	Second follow-up Email	All	$0.00
March 14	Third follow-up Email	All	$0.00

3.3 Experiment 2 - Mode Sequence

Two features of the first experiment in this chapter led to the design of a second experiment with Email communications to establishments. Since the first experiment was conducted in a production setting, interviewers were engaged in CATI follow-ups to nonrespondents in order to meet their production goals. Though the additional contacts occurred in both treatment groups, the results of Experiment 1 are somewhat limited in their generalizability. Second, after the first nonresponse mailing was sent to all units, there was a large increase in response for the Email group. It is unclear if the pronounced increase was due to an additional reminder or if the change in mode was driving the response. In order to answer these questions, a second experiment was developed in a non-production environment in which all units received the initial survey invitation by Email and treatments varied the point in data collection at which nonrespondents received a postal mailing.

3.3.1 Experiment Design

During the November 2017 data collection cycle for the Occupational Employment Statistics survey an experiment was conducted to determine the effects of augmenting Emails with a postal mailing at different points in nonresponse follow-up. The experiment was conducted outside of a production environment so interviewers were not making additional calls to units to meet their production goals, thus, no confounding of additional contacts was present.

One month prior to the initial survey invitations, sampled establishments were

sent a prenotification letter informing them about the upcoming survey and request-ing that they provide the contact information of someone within the business who would have knowledge of the survey topic (e.g. someone in payroll). Companies that responded to the prenotification letter with contact information including an Email address were eligible for the experiment.

All units received the initial survey invitation through Email in November of 2017. Emails to all nonrespondents were sent at one month intervals and the treatments varied at which month the Email reminders were augmented with a postal mailing. The three treatment groups were given the names Mail 3 ($n = 2,794$), Mail 23 ($n = 2,812$), Mail 123 ($n = 2,886$), to indicate the nonresponse prompts in which they received a postal mailing along with an Email. Sample counts by business characteristics can be found in Appendix D. The treatment groups underwent the following nonresponse sequences:

The outcomes of interest for the experiment are response rates and mode of response.

3.3.2 Results: Experiment 2

3.3.2.1 Response Rates

The same methodology for calculating response rates in Experiment 1 is used. The final response disposition codes for all sampled units were mapped into one of three codes: respondents, nonrespondents, and out-of-scope. Response rates were then calculated as the number of respondents divided by the sum of the number

Table 3.8: Contact Dates - Experiment 2

Date	Intervention	Mail 3	Mail 23	Mail 123
October 18	Prenotification mailing	x	x	x
November 16	Initial Email invitation	x	x	x
December 8	**First** postal reminder			x
December 14	First Email reminder	x	x	x
January 5	**Second** postal reminder		x	x
January 11	Second Email reminder	x	x	x
February 2	**Third** postal reminder	x	x	x
February 8	Third Email reminder	x	x	x

of respondents and nonrespondents (AAPOR RR2). The group receiving the most postal mailings MAIL 123 achieved the highest response rate (67.91%) followed by MAIL 23 (63.66%) and Mail 3 (56.41 %). A Chi-square test finds there is a significant difference in the response rates ($\chi^2_2 = 81.98, p < 0.0001$).

Response rates over the course of the experiment for the three groups are presented in Figure 3.3; the thickness of the bands represents 95% confidence intervals. The initial Email invitation was sent to all units on November 16th. Just prior to the first round of nonresponse follow-up, all three groups had a response rate of about 18% and were not significantly different from one another. In mid-December, units in group MAIL 123 received both a postal mail and Email reminder. Units in groups MAIL 23 and MAIL 3 only received the Email reminder. Shortly after the postal mailing was sent, there is a large increase in response for group MAIL

123. The Email reminder appears to have a small impact on response for groups MAIL 23 and MAIL 3. The next round of nonresponse follow-up occurred in early January. This time, Mail 123 and Mail 23 received a postal reminder along with an Email. Mail 3 only received the Email reminder. At this point, we see a large increase in response for group MAIL 23, this is the first time these units received a postal mailing. Group MAIL 123 (second postal mailing) shows a marginal increase in response while the response pattern for MAIL 3 (no postal mailings) is largely unaffected. The final round of nonresponse follow-up occurred in early February. This time, all units received both a postal reminder and an Email reminder. This is the first time MAIL 3 received a postal reminder and we see a large increase in response for units in this group. Mail 23 shows a slight increase in response and the response pattern for MAIL 123 is largely unaffected.

The response plot lends evidence for hypothesis **H3.1** (postal invitations achieve a higher response rate than Email invitations) Postal contacts appear to have a larger impact on increasing response rates than Emails. However, if the infrastructure exists, this experiment suggests that Email should be used in conjunction with postal mail. The large increase in response seen for the Email group in Experiment 1 by sending a postal mail follow-up was not duplicated by sending a reminder Email, so there is benefit of following an Email with postal mail. By sending an Email for the initial contact, almost a fifth of the sample was collected without printing or postage of any survey materials. In the next section I review how the various treatment regimes impacted the mode of response.
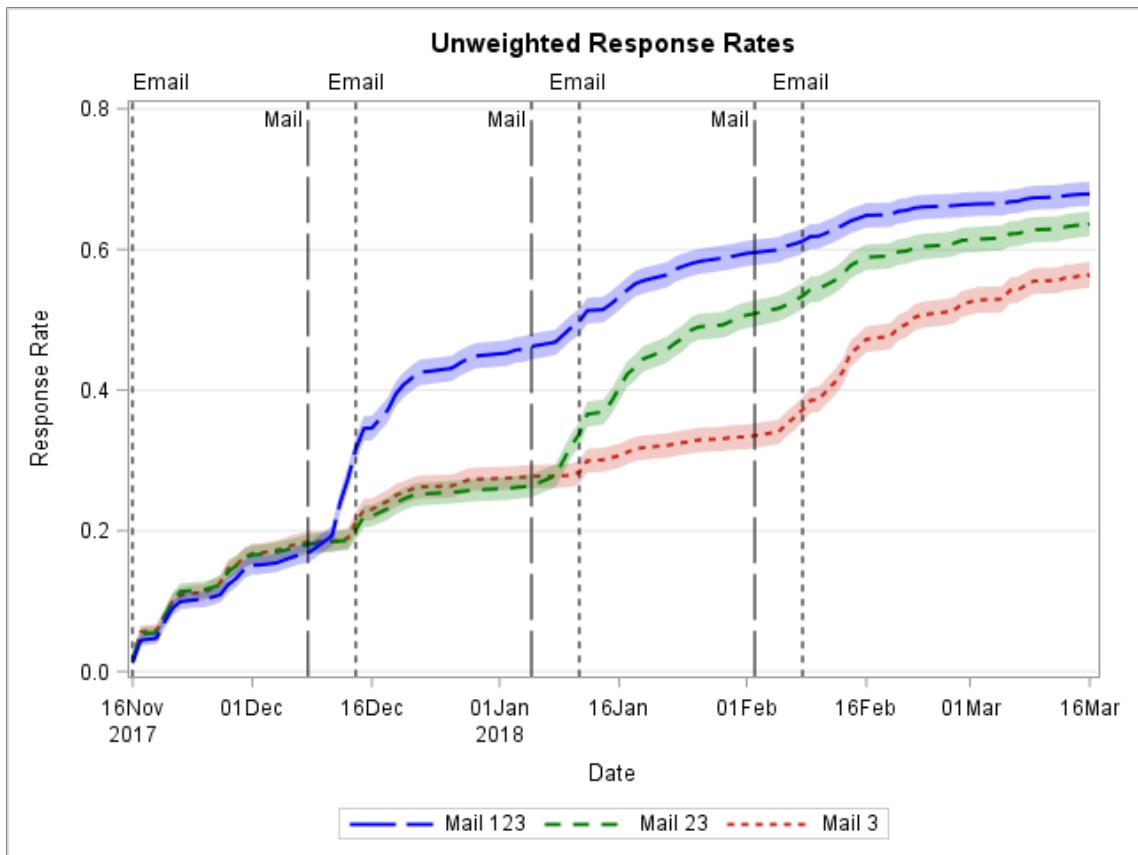
Figure 3.3: Mode Sequence Response Rates

3.3.2.2 Mode of Response

In Experiment 2, establishments could respond by Email, facsimile, phone, mailing back the survey form, or through the web instrument. The web instrument is the preferred method of response since it eliminates analyst keying errors, respondents go through edit checks and you can automate skip patters. Table 3.9 shows the percent of respondents in each group reporting by the various modes.

Table 3.9: Mode of Response - Experiment 2

Mode	MAIL 123	Mail 23	Mail 3
Web Form	82.04%	71.73%	69.02%
Survey Form	9.29%	18.04%	18.92%
Email	6.53%	7.88%	9.14%
Phone	1.38%	0.95%	1.33%
Fax	0.77%	1.40%	1.59%

It may seem counterintuitive that MAIL 123, the group that received the most postal mailings, is reporting data through the web instrument at the highest rate. In order to understand this phenomenon, it's necessary to understand what the postal mailings were. Although this experiment was conducted outside of a production environment, the mailings still had to follow a production schedule. The first mailing that units in group MAIL 123 received was a letter reminding respondents of the survey request and asking them to report their data online. The first mailing that units in group MAIL 23 received was either a survey letter or a

survey form depending on the size of the business. The first mailing that units in group MAIL 3 received was a full survey form for all units. This result provides further evidence that withholding a survey form is an effective means of increasing online reporting.

All groups reported through the web instrument at approximately 70% or above. This is similar to the results from Experiment 1 where the Email group reported through the web at a rate of 74.3%, whereas the Mail group reported through the web at a rate of 47.9%. Though Experiment 2 did not use a treatment where units were initially invited to the survey through a postal mailing, the consistent results for online reporting are likely driven by the Email invitation. Thus, there is support for hypothesis **H3.2** (using Email invitations will increase online reporting compared to mailing paper forms).

3.4   Discussion

This chapter reported the results of two experiments involving Email contacts to businesses for survey purposes. The mode of survey communication may be tied to the attention portion of the AIDA model with different modes generating different amounts of attention. Since there isn't a physical form or letter to remind respondents of the survey request, it was hypothesized that Email invitations do not generate as much attention as a postal mailing and will thus, result in less action (response).

The first experiment served as a pilot study to test the effects of using Email invitations in an establishment survey. Businesses received either a postal mail invitation or Email invitation to the survey. The analysis found that units receiving the Email invitation achieved an equivalent overall response rate, were cheaper to collect per response and were more likely to report their data through the web instrument than units in receiving the invitation through postal mail. The Email units, however, took longer to report their data. The first experiment was conducted in a production environment in which state analysts were making additional efforts to contact respondents. Thus, the results of the experiment can only be generalized to instances in which a dedicated staff is collecting data.

Given the success of Email invitations in the first experiment, a second experiment was conducted to evaluate an optimal point in data collection to introduce postal mailings. This experiment found that approximately a fifth of the units in the experiment responded by just sending a single Email. However, sending a postal

mailing early in nonresponse follow-up significantly increased response rates. All treatment groups in the experiment were reporting through the web instrument at a rate of 70% or greater. When comparing these results to the results of the first experiment where units receiving a postal invitation only reported through the web at a rate of 48%, there is a evidence for the importance of withholding a survey form in an effort to increase online reporting.

The pair of experiments demonstrate that Email can be a useful supplement to postal mail in an establishment survey, but should not be used as a replacement. There is potential for cost savings by reducing the amount of printing and postage needed to capture response. There is also a benefit in pushing respondents to the web that was realized by withholding a survey form. Though this can be done by sending a survey letter inviting respondents to report data online, it is cheaper to send an Email.

There are limitations to these experiments that should be addressed in future research. In the first experiment, no paradata on the number of calls was recorded so it is unclear how much of the response behavior was affected by analyst intervention. A future experiment should capture these data in an effort to more accurately determine how well Email invitations work in a production environment. In the second experiment, only three treatment regimes were tested. The treatments were varied in the total amount of contacts establishments received and the type of first postal mailing. A future experiment may control for these confounders. It would also be beneficial to vary the timing of the first postal reminder. When using Email as a mode of invitation, it is possible a respondent will see the Email, set it aside

for the moment, and quickly forget it. If the first postal reminder is sent one month after the Email invitation, then approximately two months will have elapsed since the respondent received the prenotification letter. By moving the postal reminder follow-up to two weeks after the initial Email invitation, nonrespondents may be more likely to remember the prenotification letter and, thus, more likely to respond.

Chapter 4:   The use of Email as a Reminder for a Scheduled Interview in an Establishment Survey

4.1   Outline

Chapter 4 examines the role of Email in reminding respondents of an upcoming scheduled interview in an establishment panel survey. I begin the chapter with a literature review that first examines a conceptual framework regarding the use of appointment reminders which borrows from the behavioral economics literature and addresses the Attention and Action components of the AIDA model. In Section 4.2.2 I then review previous research containing related empirical results. Section 4.3 describes the Current Employment Statistics (CES) survey, the design of the experiment, and the research questions with their hypotheses. In Section 4.4 I walk through the results of the experiment. And I conclude the chapter with a discussion in Section 4.5.

4.2 Literature Review

4.2.1 Conceptual Framework

The use of postcards and Emails to remind respondents of their scheduled upcoming interview is most directly related to the attention and action portions of the triangle in the AIDA model. Behavioral economists have initiated the concept of "channel factors," which are small situational factors that can have large influences on behavior by guiding behavior in a particular direction(Lewin, 1951). For example, in a study of college students who were given a persuasive message about the value of inoculation against tetanus, only 3% of students took the step to get inoculated. However, when the students were given the same message with a map of the campus health center circled and asked to decide on a particular time, the percentage of students getting the inoculation increased to 28% (Leventhal et al., 1965).

Another example of channel factors comes from a study of unbanked, lower-income residents of Chicago (Bertrand et al., 2006). The purpose of the study was to identify a method to increase take-up of bank accounts among the poor. A survey of people who had participated in a financial education workshop found that approximately 50% of those in attendance reported opening their first account. In a subset of workshops, a channel factor was introduced to increase take-up. A bank representative was invited to be present and participants who were interested had the opportunity to complete the bank paperwork at the workshop itself. The authors found a large positive effect on take-up when introducing the bank representative

as a channel factor.

Given that channel factors may have a big impact on response, we may find a positive effect by using Email reminders instead of postcards to increase awareness of the upcoming scheduled interview. Many workers use an iCalendar such as Microsoft Outlook to keep track of their schedule. When a person receives an Email at work, they are likely to be on the device that runs their iCalendar and thus it is likely to be easy for the respondent to populate their schedule. Another benefit of Emails is that they allow the sender to attach an iCalendar attachment. A respondent can simply click the attachment and their iCalendar will be automatically populated. However, the attachment could have a negative effect on response since it may be viewed as malicious. In contrast, a postcard reminder requires the respondent to retain the postcard, or at least the information on the postcard, until they can access their iCalendar on a device.

A discussion on the use of Email and postal mail as a mode of communication in a survey context can be found in Section 3.1.1. In the next section I review the relevant empirical results found in the literature that relates to the use of reminders.

4.2.2   Prior Empirical Results

In a review of the literature, very little was found related to use of reminders for scheduled interviews nor the scheduling of interviews in general. The CES, a monthly panel survey with between 10 and 16 days for data collection, is somewhat unusual with regard to the need to collect data quickly. The following are exper-

iments identified that are related to scheduling interviews or using reminders for interviews.

Statistics Canada (Hardy, 2017) conducted an experiment in their Farm Financial Survey in which nonrespondents were assigned to one of three conditions: no reminder letter (the control group); a reminder letter; or a reminder letter with a process change. The process change was a new methodology in which nonrespondents were asked to call Statistics Canada and schedule an appointment for data collection within five days of receiving the letter. Using the reminder letter increased the response rate from 59% (the control) to 61%, however the increase was not significant. Using the process change letter increased response to 63% which is a statistically significant increase ($p < 0.05$). It is worth noting that, in this experiment, both treatment conditions received an additional contact, something that is known to be positively correlated with response rates (Kittleson, 1997; Sheehan, 2001; Yammarino et al., 1991).

The University of Michigan's Institute for Social Research conducted an experiment with scheduling interviews in the Panel Study of Income Dynamics Transition into Adulthood Supplement (LeClere et al., 2018). Respondents were randomized into two groups that either received an invitation to schedule their interview online (via letter, Email and text) or were not given the option to schedule the interview. Respondents in the former group used a commercial online scheduling system that allowed them to select a day and time to complete their interview. The authors found that the group able to schedule the interview achieved higher response rates during the early part of data collection and data collection costs were lower for this

group due to fewer attempts needed to contact them.

Kreuter et al. (2014) experimented with the use of preassigned interview times in the Medical Expenditure Panel Survey Household Component. A random subset of sampled households was informed about a preset appointment date when an interviewer would visit their household to conduct the interview. The remaining households served as the control group and received an advance mailing indicating an interviewer would contact them in the coming week. Treatment cases were assigned to an appointment day of the week and time of day of the completed interview in the previous round. The authors found that using the preassigned scheduled interview times reduced the level of interviewer effort required to complete an interview. However, the authors note that some respondents found the assignment of times to be presumptuous and suggest considering a "dentist's office approach," where the interviewer schedules the next round with the respondent at the completion of the current round.

A brief segue into the medical literature finds that postcard reminders are an effective method for getting patients to keep appointments. In a study of patients at a pediatric office, patients were randomized to whether they received a postcard reminder one week prior to their scheduled appointment or not (Nazarian et al., 1974). The patients who received the postcard reminder kept their appointments at a significantly higher rate than those that did not (64% vs 48%). The ties to keeping an appointment in a survey setting are tenuous since a patient has an inherent interest to see a doctor and businesses have no such interest to respond to a survey. However, the study does highlight how a simple channel factor can have

a dynamic impact.

4.2.3 Summary

Given the dearth of literature on both scheduled interviews and reminders for scheduled interviews, more research would be welcomed. The literature suggests that the use of appointments increase data collection efficiency and that reminders increase kept appointment rates. Based on these findings, an experiment was developed to test the effectiveness of replacing postcard reminders with Email reminders for a scheduled interview in an establishment survey.

4.3 Methodology

The experiment was conducted in the U.S. Bureau of Labor Statistics Current Employment Statistics (CES) survey. The CES is a monthly panel survey that provides employment, hours, and earnings estimates based on payroll records of business establishments. Data produced from the CES survey include nonfarm employment series for all employees, production and non-supervisory employees, and women employees, as well as average hourly earnings, average weekly hours, and average weekly overtime hours (in manufacturing industries) for both all employees and production and non-supervisory employees.

The CES samples approximately 149,000 business and government agencies on a monthly basis. Because of the cost and workload associated with enrolling new sample units, all units remain in the sample a minimum of 2 years. To ensure all units meet this minimum requirement, CES has established a "swapping" procedure. The procedure allows units to be swapped into the sample that were newly selected during the previous sample year and not re-selected as part of the current probability sample. The procedure removes a unit within the same selection cell and places the newly selected unit from the previous year back into the sample. To reduce respondent burden, a similar procedure swaps units out of the sample that have been sample members for 4 or more consecutive years. The swap out procedure removes an old unit within the same selection cell and replaces it with a new unit. Approximately 66 percent of the CES sample for private industries overlaps from the previous year's sample to the current sample.

To understand the experiment, it helps to know the CES data collection methodology. The CES has four data collection centers (DCCs) to cover collection operations for the BLS. The DCCs are staffed by CATI interviewers who focus solely on CES collection. A fifth DCC exists for the sole purpose of collecting data through an electronic data interchange. Beginning in January 2018, one CATI DCC volunteered its sample to examine the effects of replacing a reminder postcard with an Email. Sampled establishments in the CES first go through address refinement, which is the process of making sure the right contact information is available for all units. The Quarterly Census of Employment and Wages (QCEW) provides a basis for contacting establishments, but the contact information may be incomplete or wrong, or may not contain information for a person familiar with payroll. Interviewers spend a week cleaning this information for newly-sampled units by contacting the establishments, verifying addresses and phone numbers and asking for a specific person to contact who is familiar with payroll. If no information is provided, interviewers may use Google or some other online resource to find addresses and phone numbers. It is also possible that an establishment may have gone out of business. If an interviewer reaches a dead phone line, they can check with the Secretary of State in the state where the establishment is located to see if they have it on record that the company has gone out of business.

Once an interviewer verifies the contact information, she mails a packet to the establishment, addressed to the person noted in the address refinement stage. The packet contains a summary of the most recent jobs report along with a CES survey form. The jobs report is the monthly release of employment statistics that

include the unemployment rate (from the Current Population Survey) and estimates of employment, hours and earnings (from CES). The packet usually takes around a week to be delivered, so interviewers will schedule a call to the company a week from the date of mailing. The call to the company begins the enrollment phase. During this time, interviewers attempt to make contact with the establishments to gain cooperation for the survey, answer any questions respondents may have, and gather some basic payroll information. The basic payroll information collected during the enrollment call is: how often are employees paid (weekly, bi-weekly, twice a month, monthly); when does the payroll begin and end (Sun-Sat, Mon-Sun, etc.); when are employees paid (e.g. Friday after pay period ends?); and a verification of the establishment's unemployment insurance (UI) number, which is printed on the third page of the survey form. The pay period information is used to determine when a good time would be to call back to collect data for the period that includes the 12th of the month. The interviewer wants to make sure that the respondent will have the payroll summary information by the time they call to collect the data.

After the enrollment week, focus moves to data collection, which runs through the end of the month. First closing data collection ends on the last week of the month in order to prepare the jobs report, which generally is released the first Friday of the following month. After interviewers collect data from an establishment, they will schedule a date the following month for an interview. Prior to the scheduled interview, a postcard reminder is sent to the business. In a production environment where postal addresses are available for all units and Email addresses are only available for some units, what is the impact on response behavior when the reminder

postcard is replaced with an Email?

Each month from January to June 2018, all sampled establishments from a volunteer DCC ($n \approx 1,200$, see Table 4.1 for details) entered the experiment and were randomized into one of three treatment groups while controlling for business size (defined by number of employees on frame data) and industry (2-digit NAICS code). The "Postcard" group received the postcard reminder; the "Email" group received an Email reminder, and the "Calendar" group received an Email reminder with an iCalendar attachment that, when clicked, would auto populate the respondent's iCalendar. Establishments sampled in January received their first reminder in February (or no reminder for Email groups if a valid Email was not provided) and their response behavior was recorded every month through June. Similarly, units sampled in February received their first reminder in March and their response behavior was recorded through June. The pattern repeats for units sampled in March, April and May.

Table 4.1: Sample Counts by Month

Month	n	Percent w/Email	n w/Email
Feb	1,164	34.4%	400
Mar	2,498	35.3%	882
Apr	3,679	35.5%	1,307
May	5,077	35.5%	1,800
Jun	6,558	33.5%	2,196

4.3.1 Research Questions

The following research questions and their hypotheses will be addressed.

1. What is the impact on response rates when the reminder postcard is replaced with an Email?

   - **H4.1:** "Email" and "Calendar" will have higher response rates than "Postcard." Based on the AIDA model and behavioral economics, the use of Email will serve as a channel factor that will increase awareness of the scheduled interview. I suspect that establishments for which an Email address is available will be more likely to enter the appointment in their iCalendar and thus, more likely to be available for the interview.

2. What is the impact on number of calls required to complete an interview when the reminder postcard is replaced with an Email?

   - **H4.2:** "Email" and "Calendar" will require fewer call attempts than "Postcard" when an Email address is available. Mirroring the logic from Hypothesis **H4.1**, "Email" and "Calendar" create channel factors that increase awareness of the appointment.

3. What is the impact on call length required to collect data when the reminder postcard is replaced with an Email?

   - **H4.3:** "Email" and "Calendar" will require less call time than "Post-card" when an Email address is available. Since the respondent will have

higher awareness of the appointment, they will be more prepared for the interview. CES collects factual data so it is possible to prepare for the interview which will reduce the time required to collect the data.

4. How does replacing the reminder postcard with an Email impact the ability of units to respond on schedule?

- **H4.4:** "Email" and "Calendar" will have a higher percentage of units reporting on time than "Postcard" when an Email address is available. The argument mirrors Hypothesis 1.1.

4.4 Results

Outcomes for the experiment were captured from February through June of 2018. The results were analyzed each month and were found to be largely consistent from month to month. For the analysis, I focus on the results for June. The four outcomes examined are response rates, number of calls, call length and percent of units reporting on time.

4.4.1 Response Rates

Final response disposition codes for all sampled units were mapped into one of two codes: respondents and nonrespondents. Response rates were then calculated as the number of respondents divided by the sum of the number of respondents and nonrespondents (AAPOR RR2). For the month of June, the Postcard group achieved a response rate of 68.4%. The Email group was slightly lower at 68.0% and the Calendar group was the lowest at 67.1%. A Chi-square test fails to detect a difference in the rates ($\chi_2^2 = 0.86, p = 0.65$). Response rates for the other months are shown in Table 4.2. The response rates do not vary significantly across the treatment conditions.

The response rate results appear to show a lack of evidence for Hypothesis **H4.1** (Email and Calendar will achieve a higher response rate than postal). However, it is important to remember that all enrolled units were randomized into the treatment groups regardless of whether or not they provided an Email address. This means that there are units in the "Email" and "Calendar" groups that did not receive

	Postcard		Email		Calendar			
Month	**n**	**RR**	**n**	**RR**	**n**	**RR**	**ChiSq**	**Pr >ChiSq**
Feb	383	66.8%	395	71.1%	386	69.2%	1.684	0.431
Mar	821	69.2%	847	70.1%	830	68.4%	0.569	0.752
Apr	1,208	69.5%	1,248	69.3%	1,223	68.8%	0.141	0.932
May	1,669	70.9%	1,718	68.9%	1,690	67.8%	3.807	0.149
Jun	2,162	68.4%	2,214	68.0%	2,182	67.1%	0.859	0.651

a reminder for their upcoming interview. To more appropriately examine the effect of the treatments, it is necessary to subset the data to include only the units that provided an Email address for all three treatment groups. After removing the units that did not provide an Email address (approximately one third of the sample provided an Email address), the June response rate for the "Postcard" group was found to be 81.4%. The increase in this subgroup's response rate is understandable since those who provided an Email address are more likely to be cooperative respondents. The response rates for the subset of the "Email" and "Calendar" groups for whom an Email address was available was 98.2% and 97.7% respectively. A chi-square test finds there is a significant difference in response rates ($\chi^2_2 = 190.77, p < 0.0001$) between the treatments. To examine the difference between individual treatments, three t-tests were performed. Comparing the "Postcard" group to the "Email" group yielded a significant difference ($t = 11.06, p < .0001$) as did the comparison of "Postcard" to "Calendar" ($t = 10.51, p < 0.0001$). There was no significant dif-

ference found between the "Email" and "Calendar" groups ($t = -0.75, p = 0.4541$). The results are very similar across prior months as seen in Table 4.3 where the "Email" and "Calendar" groups maintain a response rate 10% or higher than that of the "Postcard" group.

Table 4.3: Response Rates by Month (subset)

	Postcard		Email		Calendar			
Month	n	RR	n	RR	n	RR	ChiSq	Pr >ChiSq
Feb	136	83.1%	139	98.6%	125	97.6%	31.19	<.0001
Mar	289	85.1%	306	95.8%	287	97.2%	37.58	<.0001
Apr	432	84.0%	440	97.0%	435	99.1%	94.08	<.0001
May	603	85.4%	600	99.0%	597	98.7%	135.25	<.0001
Jun	741	81.4%	729	98.2%	726	97.7%	190.77	<.0001

Establishments sampled for a CES panel typically remain in CATI collection for at least five months before being offered self-reporting. Since respondents are subject to treatments for at least five months, this allows us to examine the effects of the treatments to determine if they have consistent effects across months-in-sample. Figure 4.1 displays the June response rates by treatment group for each of the five panels in the analysis. The response rates are only for units that provided an Email address. Panel represents when a unit was enrolled into the survey. Units in the "018A" were enrolled in January which means June is the fifth month they have received the treatment. Similarly, panel "018B" are units enrolled in February, which means June is the fourth month they have received the treatment, etc. Examining

the response rates, the pattern is consistent over time. The impact of sending an Email reminder does not appear to dissipate after repeated exposure to treatments.
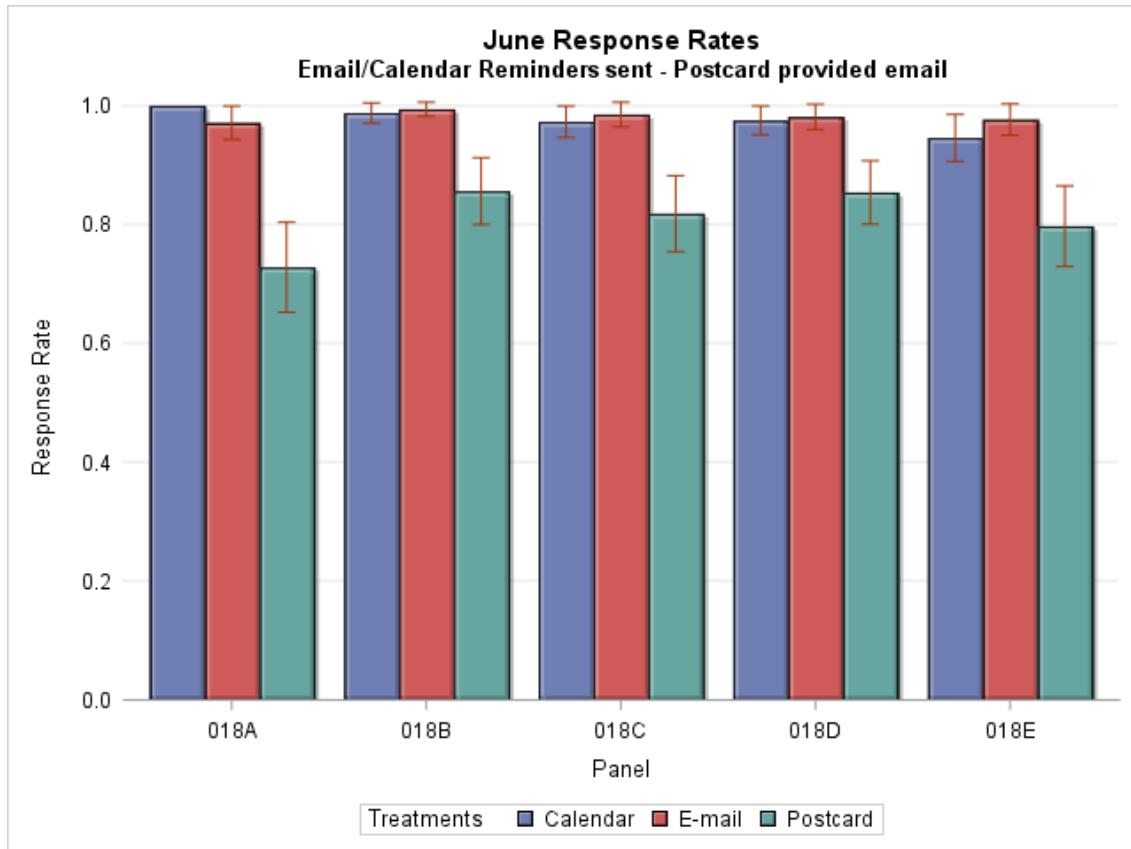
Figure 4.1: Response Rate by Panel (subset)

When examining the subset of units that provided an Email address, there is strong evidence that sending an Email reminder acts as a channel factor to increase awareness of the upcoming interview (Hypothesis **H4.1**). In the next section I review the results for number of calls required to complete an interview.

4.4.2   Number of Calls

If a respondent is aware of their upcoming scheduled interview, there should be fewer call attempts required to reach them. To see if there are any differences in distributions I first examine the distributions of call attempts including both respondents and nonrespondents. A few percentiles and the mean for each group can be seen in Table 4.4. Examining the percentiles, there doesn't appear to be a difference in the distribution in number of calls to respondents. This is confirmed with a Wilcoxon rank-sum test (see Wackerly et al. 2008, pg.755) presented in Figure 4.2. To compare the mean number of calls, three t-tests were performed ("Postcard" vs "Email", "Postcard" vs "Calendar", and "Email" vs "Calendar"). No significant difference was detected with the tests.

Table 4.4: Distribution of Total Calls Per Case - June

Group	n	25th	Mean	Median	90th	95th	99th	Max
Postcard	2,162	1	3	2	5	7	12	23
Email	2,214	1	3	2	5	7	13	26
Calendar	2,182	1	3	2	5	8	12	25
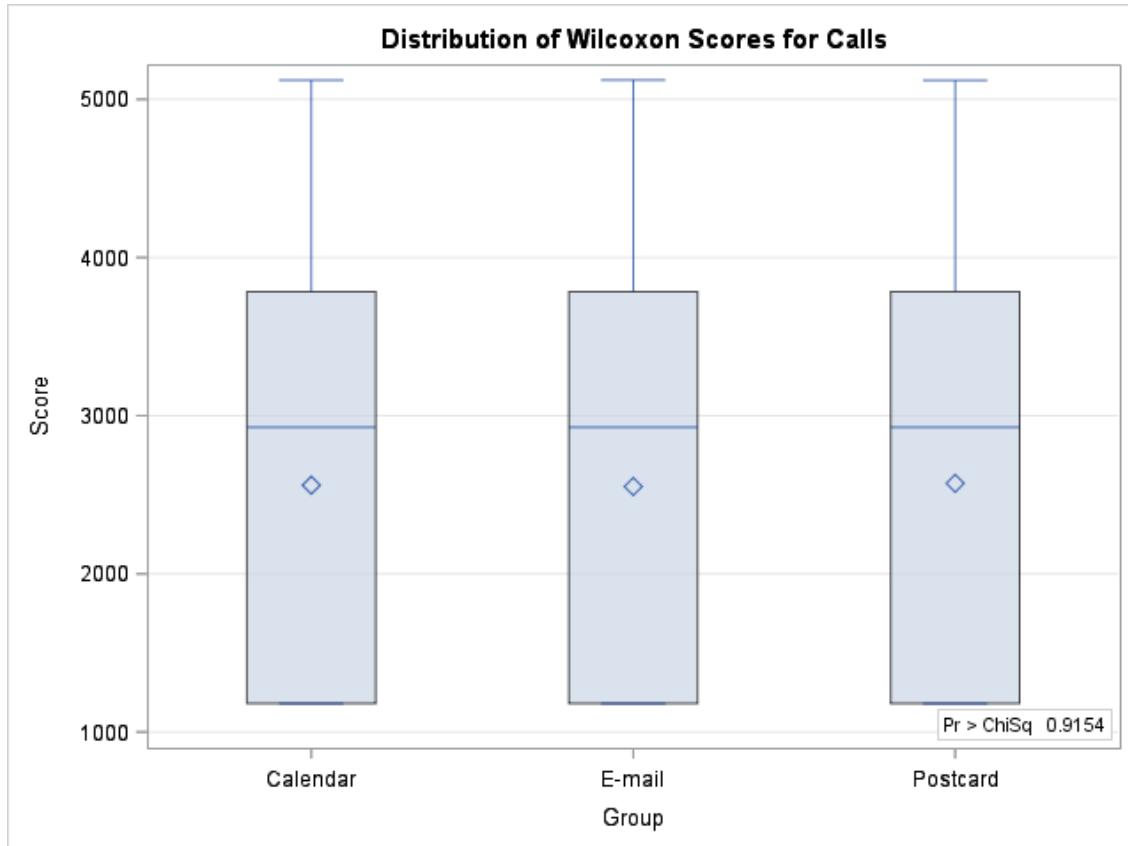
Figure 4.2: Call Distribution

The distributions of number of calls per case do not provide evidence for Hypothesis **H4.2** ("Email" and "Calendar" will require fewer call attempts than "Postcard"). However, as mentioned in Section 4.4.1, only about 30% of units in the "Email" and "Calendar" groups are receiving the interview reminder since the majority of respondents did not provide an Email address. To better understand the impact of the treatments on number of calls per sampled unit, the results again are presented only for units that provided an Email address. In Table 4.5 we see that when respondents in the "Email" and "Calendar" groups are receiving their reminder for the scheduled interview, both the mean and median number of calls

per sampled unit are lower than for units in the "Postcard" group. The Wilcoxon rank-sum presented in Figure 4.3 suggests that there is a difference in the total call distribution between the three groups.

Table 4.5: Distribution of Total Calls Per Case - June (subset)

Group	n	25th	Mean	Median	90th	95th	99th	Max
Postcard	741	1	3	2	5	7	13	23
Email	729	1	2	1	5	6	13	26
Calendar	726	1	2	1	4	6	11	21
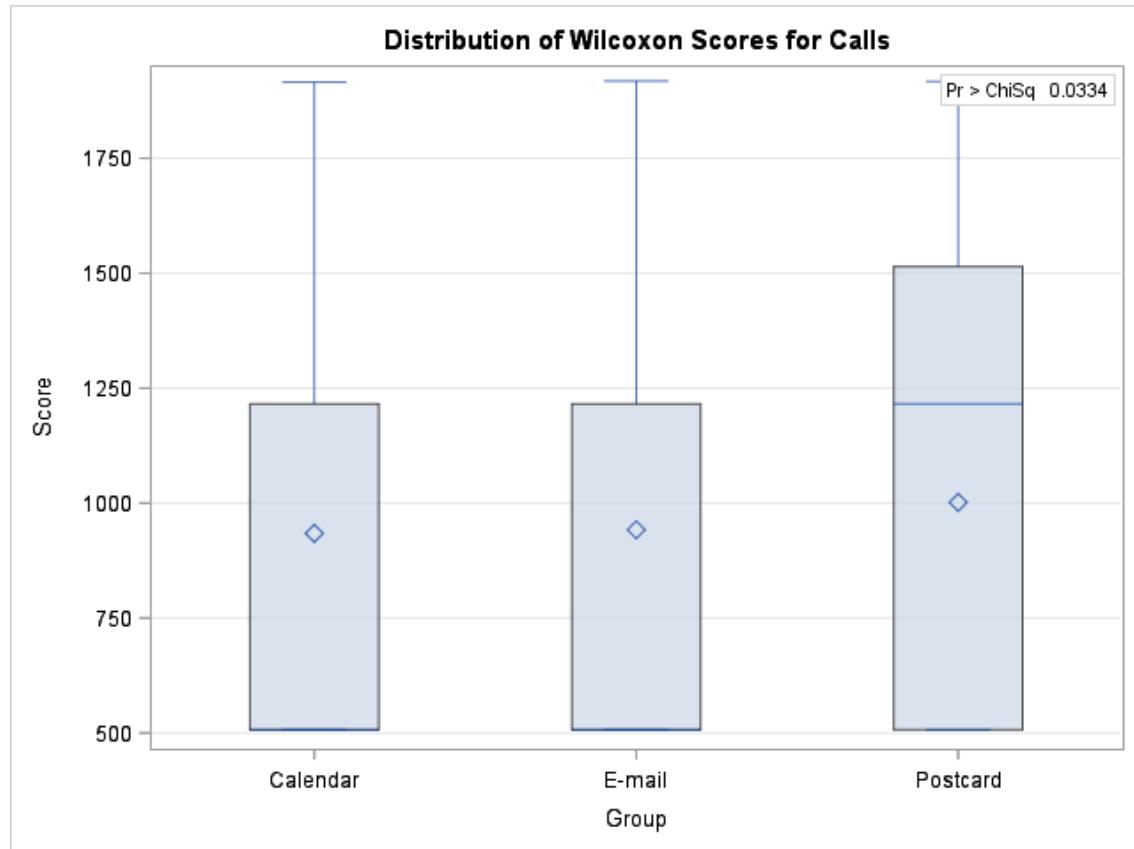
Figure 4.3: Call Distribution (subset)

The analysis of units receiving the treatments lends support for Hypothesis **H4.2** ("Email" and "Calendar" units require fewer calls). There is evidence that sending an Email to respondents is an effective channel factor that increases awareness of the upcoming interview. This reduces the effort required by interviewers to contact respondents.

In the next section, I present the results for the average call length required to collect data. We have seen that the use of Email reminders increases awareness of an upcoming interview, but we have not examined if the increased awareness also encourages preparation for the interview. In the next section, I see if the Email reminders nudge respondents to prepare by examining average call lengths of the treatment groups.

4.4.3 Call Length

The CES collects payroll information from establishments such as number of employees at a business, number of hours worked and earnings. These data are typically available to respondents prior to the scheduled interview and may be queried ahead of time. To investigate whether the "Email" or "Calendar" treatments encourage this preparation, I examine the time interviewers spent on the phone collecting data. If respondents are prepared for the interview, it is likely there will be a reduction in length of the interview. One caveat to this analysis is that the call length wasn't recorded as time spent by respondents on the phone, but rather, the time a case was open. This means that if an interviewer opened a case, conducted an

interview, and then left to get lunch without closing the case, the call length would continue running. A distribution of the call lengths (in seconds) for those units reporting data in June for each group is found in Table 4.6. To reduce potentially inflated call times, any case with a call length exceeding 30 minutes is excluded from the analysis. It is assumed that the potentially inflated call lengths are evenly distributed among the treatment groups.

Table 4.6: Distribution of Call Lengths (seconds)

Group	n	5th	25th	Mean	Median	90th	95th	99th	Max
Postcard	2,748	82	192	547	361	1,178	1,569	3,049	5,164
Email	2,808	78	187	574	377	1,258	1,833	2,798	5,169
Calendar	2,772	81	191	577	377	1,303	1,840	3,257	5,300

Additionally, the data provided for each case represented the total call length spent on that case for the entire month. So if more than one call was made to a unit, the reported 'call length' is the aggregate time spent on that case. Since I am only interested in the call length when an analyst made contact with a unit and collected data, I assume all calls to a business except for the final call were non-contacts. After speaking with a data collection specialist in a regional office, it is estimated that non-contacts add approximately 10 seconds to a case's accumulated time. So the call time under analysis is the total case time minus 10 seconds for each call that is not the final contact. That is, if c_i is the number of calls to unit i and T_i is the total reported time spent on unit i then the call time t_i under analysis is:

$$t_i = T_i - 10 * (c_i - 1)$$

After removing the outliers and adjusting for number of calls placed to an establishment, the mean call length for responding units in the "Postcard" group is 443 seconds. The mean call length for responding units in the "Email" group is 451 seconds. A t-test fails to find a significant difference in mean call length between the "Postcard" and "Email" groups ($p = 0.5393$). The mean call length for responding units in the "Calendar" group is 438 seconds, a t-test fails to find a significant difference in mean call length between either the "Calendar" and "Postcard" groups ($p = 0.7292$) or the "Calendar" and "Email" groups ($p = 0.3448$).

The t-tests in the proceeding paragraph are for the full sample of responding units and give the reader an idea of the effects of the treatments in a production environment. However, as mentioned previously, not all units in the "Email" and "Calendar" groups received reminders since some of them failed to provide an Email address. To better understand the impact of the treatments on call length, I repeat the analysis of call lengths for responding units that provided an Email address. For this subset, the mean call length for the "Postcard" group is 456 seconds. Calls to the "Email" group took an average of 409 seconds. A t-test now finds a significant difference in average call length between units in the "Postcard" and "Email" groups ($p = 0.0156$). The average call length for reporting units in the "Calendar" group is 379 seconds; t-tests indicate this is significantly different from the average call length in the "Postcard" group ($p = 0.0009$) but not significantly different from the "Email" group ($p = 0.1138$).

The analysis of the units that provided an Email address suggests that Email reminders are an effective way to increase attention of an upcoming survey request

and lends support for Hypothesis **H4.3** ("Email" and "Calendar" will require less call time than "Postcard" when an Email address is available). The Email reminders may act as a channel factor by reducing the effort required to populate the appointment in a respondent's iCalendar. With an increase in the likelihood that a respondent makes a note of the upcoming meeting also may come an increase in the likelihood they will prepare for the interview, thus reducing the time required to report their data. In the next section, I evaluate the proportion of the sample that reports their data on time.

4.4.4 Reporting on Schedule

In Section 4.4.1 it was shown that replacing a postcard reminder with an Email did not have a significant impact on the overall response rate of the whole sample but did have a large positive impact on response rates for the subgroup of units that provided an Email address. The examination of response rates only tells us whether or not units in the treatment groups eventually responded. But analysts scheduling interviews try to keep an organized schedule for their case load, so reporting on time is an important topic of interest. In this section, I examine the impact of reminder type on the percent of units reporting data on time, first for the whole sample, then for the subset of units that provided an Email address.

A unit was considered to report on schedule if it reported data in June (the month of analysis) and the date on which they responded was on or before the scheduled interview date. Respondents have the contact information of the analyst

in charge of their case so they are able to call and report their data ahead of time in the event something comes up that prevents them from keeping their scheduled appointment. Table 4.7 displays the number of units reporting data in June for each treatment group, the percent of those units reporting on time, and the average delay in days for late reporting units.

Table 4.7: Percent of Units Reporting on Time

Group	n	Percent On Time	Avg Delay[1]
Postcard	1,392	51.5%	7.97
Email	1,393	52.5%	9.29
Calendar	1,383	52.5%	8.64

A chi-square test fails to find a significant difference in the percent of units reporting on time between the three treatment groups ($\chi_2^2 = 0.3727, p = 0.8300$). However, a t-test does find evidence for a difference in the average delay for late reporting units between the "Email" and "Postcard" groups. This lends some support to the notion that a postal mailing may remain on a respondent's desk, acting as a physical reminder of the survey request and encouraging the respondent to contact the analyst rather than waiting to be contacted.

Again, since not all units in the "Email" and "Calendar" groups were sent a reminder, I subset the data to the units that provided an Email address and reanalyze the data. The results are found in Table 4.8. The results for the subset of units are largely consistent with results for the full sample of respondents. A Chi-

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[1]Average number of days past the scheduled interview date it took late reporters to respond.

square test fails to find evidence for a difference in the percentage of units reporting on time between the groups ($\chi^2_2 = 3.7388, p = 0.1542$). Among the three t-tests to compare the difference in average number of days late reporters are delayed, the only significant difference is between the "Email" and "Postcard" groups ($p = 0.0120$). From the analyses, I find a lack of support for Hypothesis **H4.4** ("Email" and "Calendar" will have a higher percentage of units reporting on time than "Postcard" when an Email address is available).

Table 4.8: Percent of Units Reporting on Time (subset)

Group	n	Percent On Time	Avg Delay[2]
Postcard	542	50.4%	7.48
Email	716	54.5%	9.59
Calendar	709	55.7%	8.89

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[2]Average number of days past the scheduled interview date it took late reporters to respond.

4.5 Discussion

The use of Email and iCalendar reminders are useful tools for panel surveys when interviews are scheduled ahead of time. However, their effectiveness is largely dependent on the ability of survey operations to collect Email addresses. Results from the experiment found little difference in response behavior or effort required to collect data when the full sample was analyzed. However, when conducting the analysis on the subset of units that provided an Email address, it was found that the "Email" and "Calendar" groups significantly outperformed the "Postcard" group in measures of increased response rates (supporting **H4.1**), a reduction in the number of calls required to collect data (supporting **H4.2**), and a reduction of call length required to collect data (supporting **H4.3**).

Support for hypotheses **H4.1, 4.2** and **4.3** suggest that Email reminders are effective at increasing awareness of scheduled interviews. Email reminders may act as a channel factor by reducing the burden for respondents to populate their iCalednar. By reducing the burden to populate an iCalendar, respondents will be more likely to do so. With an iCalendar scheduled, the awareness of the scheduled interview is increased and under the AIDA model, there should be more respondents. The evidence to support this theory is seen in Section 4.4.1 where the subset of both the "Email" and "Postcard" groups achieved a near 100% response rate. Another mechanism that may be at work is the commitment and consistency compliance principle (see Section 1.2). By agreeing to participate in an upcoming interview a respondent has made a commitment. Entering the scheduled interview in an iCal-

endar enhances the commitment so that when it is time to collect data, respondents feel some compunction to act consistently with those commitments.

During this experiment, all reminder Emails were sent during the CES reference week (the week that includes the 12th of the month). This means that some units received the Email reminder (or postcard reminder) a few days prior to their schedule interview while other units received the reminder a few weeks prior to the interview. A future study would be welcomed to determine if the amount of time between receipt of the Email reminder and the scheduled interview date has an impact on response behavior.

As mentioned earlier, the impact of Email reminders depends on the ability of data collectors to acquire Email addresses. During the enrollment of units sampled for CES, data collectors do not want to increase the burden on respondents by asking for any more information than is necessary. Since requesting an Email address is one more piece of information, guidelines and training should be established to help data collectors deal with the additional burden. Techniques may stress the convenience of reminders and the reduction of waste from producing postcards.

Chapter 5:   Discussion

This dissertation evaluated the use of Email communications in an establishment survey context. The AIDA model was used as a framework and the experiments focused on different portions of the triangle. By using nudges or channel factors, the experiments attempted to increase the number of sampled units passing through a particular portion of the AIDA model. In Chapter 2, I reviewed a method for collecting Email addresses in a general establishment survey context. By sending an advance letter requesting contact information to businesses one month prior to the initial survey invitation, OES was able to capture Email addresses for approximately one third of the sample. The experiment used Cialdini's compliance principles and social exchange theory as a guide to create nudges to increase interest and desire to complete the request. The different nudges were then tested to determine if the content of the advance survey letter had any impact on contact information response rates. The first treatment varied the sponsorship of the survey by altering the the header of the letter to include either the Department of Labor, the corresponding state workforce agency, or a combination of the two. The second treatment varied the opening paragraph to of the letter to include either an egoistic or altruistic appeal. The final treatment in the experiment is whether or not a thank

you and a brief message about a prompt response saving tax payer dollars was included after the due date. None of the treatments were found to have a significant impact on response with contact information. It may be that small textual changes do not create enough of a nudge to influence respondent's behavior.

In Chapter 3, a pair of experiments examined the utility of Email as a mode of delivering survey invitations and nonresponse follow-ups. With Email invitations and reminders, the survey requests are delivered directly to the personal inbox of the responding individual within the establishment whereas a postal invitation may be delivered to a shared physical mailbox. It is likely individuals in a workplace environment check their Email more frequently than their postal mail. Furthermore, delivering an Email invitation allows for the inclusion of a clickable URL. However, a postal invitation delivered to a respondent may sit on a respondents desk acting as a physical reminder of the survey request while an Email may quickly be forgotten. It was hypothesized that Email may act as a channel factor to increase online reporting by withholding a survey form, but ultimately Email wouldn't maintain the same level of awareness as a postal mailing and thus, wouldn't generate the same level of response. The results suggest that Email invitations should be used in conjunction with postal mail. Email invitations alone do not generate the same level of response as postal mail, but they do offer savings in production costs and promote online reporting.

Chapter 4 examined the use of Email in a panel survey. When scheduling an interview with a respondent for the next wave of the survey, it is possible to send a reminder prior to the scheduled date. It was hypothesized that sending an

Email would act as a channel factor by reducing the burden on the respondent of populating their iCalendar. If the respondent populates their iCalendar, it is more likely they will be aware of the upcoming interview and take action to be available and prepared for the interview. For the subgroup of respondents that provided an Email address, units receiving the Email reminders responded at a higher rate, required fewer calls to collect data, and interviewers spent less time on the phone collecting their data.

Respondents do not typically spend a lot of time fully considering whether or not they will participate in a survey. Thus, it is important for survey methodologists to understand what heuristics respondents use when making their decision. The AIDA model serves as a useful framework for designing experiments that may have an impact on how aware respondents are of the survey request, how interested respondents are in the survey, their desire to complete the survey, and actions they take to complete the survey. As seen in Chapter 4, small changes in methodologies may have large impacts on response. In that experiment, replacing a postal reminder of an appointment with an Email reminder led to significant improvements in respondent behavior. Similarly in Chapter 2, withholding a survey form led to a substantial increase in the percentage of units reporting online.

There are clearly areas where more research would be welcomed. In Chapter 2, the content of survey letters was not found to have an impact on response to a request for contact information. However, it is not clear that the treatments in the experiment were salient to the respondents. More empirical evidence on this subject should be produced to see if the results are replicated. Aside from letter content, the

visual design of the letters should also be tested. It may be that the style of letters has more impact on response than the content itself. In Chapter 3 I found that using an initial Email invitation can push respondents to report online and achieve some level of response for a reduced cost compared to postal mail. However, an optimal nonresponse follow-up regime is still left to be determined. It is likely that waiting one month to send reminders when Email is used as the initial invitation may be too long. Future research should focus on the timing of the nonresponse prompts. Finally, in Chapter 4 it was found that Email reminders for scheduled interviews in a panel survey have a positive impact on response. In general, there is a dearth of findings in the literature about scheduling interviews in a panel survey setting and methods for reminding respondents about the upcoming interview. More research would be valuable in this area. It is also not clear if this methodology will hold in a survey of households.

There are some general recommendations for practitioners interested in using Email as a method of communication in an establishment survey context. As mentioned in Chapter 1, the American Association of Public Opinion Research (AAPOR) report on online panels states that research organizations should not send unsolicited Emails (Baker et al. (2010). By requesting contact information through a prenotification letter, survey practitioners are extending a courtesy in letting the respondent know to expect an Email invitation. However, in an establishment survey context, in is not clear that the individual who receives the prenotification letter will be the individual whose contact information is provided. While it is possible the person that fills in the contact information will pass along the notice to the

person whose contact information is provided, that is by no means a guarantee. In such situations where the message is not passed along, the Email invitation may appear as spam and get deleted. In these cases, a postal mailing may be needed to establish legitimacy. Finally, in Chapter 4, the success of the Email reminders are heavily dependent on the ability of interviewers to acquire an Email address from the respondent. Getting interviewers to buy into the importance of collecting an Email address is critical and appropriate training should be developed to encourage such behavior.

Appendices

Appendix A: Prenotificaiton Letters

The following twelve pages are the twelve versions of the prenotification letter used in Connecticut for the experiment in Chapter 2. The treatments are: survey sponsor - Department of Labor (DOL) or State Workforce Agency (SWA) or both (DOL + SWA); Appeal - Egoistic or Altruistic; and whether or not a message about a prompt response saves taxpayer dollars was included. The letters are in order from version 1 to version 12 (v1-v12). The descriptions of the versions are in Table A.1.

Table A.1: Prenotification Letter Treatments

| | Treatments | | |
Version	**Sponsor**	**Appeal**	**Message**
v1	DOL	Egoistic	No
v2	DOL	Egoistic	Yes
v3	DOL	Altruistic	No
v4	DOL	Altruistic	Yes
v5	SWA	Egoistic	No
v6	SWA	Egoistic	Yes
v7	SWA	Altruistic	No
v8	SWA	Altruistic	Yes
v9	DOL + SWA	Egoistic	No
v10	DOL + SWA	Egoistic	Yes
v11	DOL + SWA	Altruistic	No
v12	DOL + SWA	Altruistic	Yes

09 237990 000000001-3
0000000000-00024 000

ESTABLISHMENTS ENGAGED IN HEAVY AND ENGINEERING
CONSTRUCTION PROJECTS, INCLUDING CHANNELS, DAMS,
DOCKS, GOLF COURSES, RAILROADS, TUNNELS, AND FLOOD
CONTROL PROJECTS.

IDCF # 09000000001   09   Est. Emp: 50
Reference Date:Nov 12, 2018   61   237990 000
Schedule # 000000001-3   QC# 000001

OFFICE MANAGER
BUSINESS 25
REPORT FOR: ALL STATE EMPLOYEES
129 MAIN ST
STE 107
CAPITAL CITY CT 12369-1258

Please Respond By: October 26, 2018

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information you provide will allow your business to make accurate and reliable operational decisions, such as identifying employment demands in your industry. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form below. Please include the 10-digit schedule number from the address label above. We would prefer that you type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000001

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to protect confidential information in its possession.

09 238112 000000001-4
0000000000-00025 000

ESTABLISHMENTS PRIMARILY ENGAGED IN POURING AND
FINISHING CONCRETE FOUNDATIONS AND STRUCTURAL
ELEMENTS OF NONRESIDENTIAL BUILDINGS; PERFORMING
GROUT AND/OR SHOTCRETE WORK. THE WORK MAY
INCLUDE NEW WORK, ADDITIONS, ALTERATIONS,
MAINTENANCE, & REPAIRS. EXCLUDE CONCRETE COATING
AND PAVING PRIVATE PARKING AREAS.

IDCF # 09000000001   09   Est. Emp: 100
Reference Date:Nov 12, 2018   62   238112 000
Schedule # 000000001-4   QC# 000002

OWNER
BUSINESS 26
REPORT FOR: THIS LOCATION ONLY
339 TECHNOLOGY WAY
SPRINGFIELD CT 12370-1259

Please Respond By: October 26, 2018 - Your prompt response is appreciated and will save taxpayer dollars.

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information you provide will allow your business to make accurate and reliable operational decisions, such as identifying employment demands in your industry. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

   • *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form below. Please include the 10-digit schedule number from the address label above. We would prefer that you type the information directly into the email rather than scanning this page.

   • *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   • *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000002

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to protect confidential information in its possession.

09 238141 000000001-5
0000000000-00028 000

IDCF # 09000000001   09   Est. Emp: 50
Reference Date:Nov 12, 2018   63   238141 000
Schedule # 000000001-5   QC# 000003

ESTABLISHMENTS PRIMARILY ENGAGED IN RESIDENTIAL
MASONRY WORK, STONE SETTING, BRICKLAYING, AND
OTHER STONE WORK. INCLUDES NEW WORK, ADDITIONS,
ALTERATIONS, MAINTENANCE, AND REPAIRS. EXCLUDES
ERECTING CONCRETE STRUCTURES; INTERIOR MARBLE,
GRANITE OR SLATE WORK; & LAYING PRECAST STONES OR
BRICKS FOR PATIOS.

OFFICE MANAGER
BUSINESS 29
REPORT FOR: ALL STATE EMPLOYEES
130 MAIN ST
STE 108
CAPITAL CITY CT 12373-1262

Please Respond By: October 26, 2018

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information being requested is a critical part of projecting future employment demands which benefits students and jobseekers. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form below. Please include the 10-digit schedule number from the address label above. We would prefer that you type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000003

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to protect confidential information in its possession.

09 238142 000000001-6	IDCF # 09000000001 09 Est. Emp: 100
0000000000-00029 000	Reference Date:Nov 12, 2018 64 238142 000
	Schedule # 000000001-6 QC# 000004

ESTABLISHMENTS PRIMARILY ENGAGED IN NONRESIDENTIAL
MASONRY WORK, STONE SETTING, BRICKLAYING, AND
OTHER STONE WORK. INCLUDES NEW WORK, ADDITIONS,
ALTERATIONS, MAINTENANCE, AND REPAIRS. EXCLUDES
ERECTING CONCRETE STRUCTURES; INTERIOR MARBLE,
GRANITE OR SLATE WORK; & LAYING PRECAST STONES OR
BRICKS FOR PATIOS.

OWNER
BUSINESS 30
REPORT FOR: THIS LOCATION ONLY
340 TECHNOLOGY WAY
SPRINGFIELD CT 12374-1263

Please Respond By: October 26, 2018 - Your prompt response is appreciated and will save taxpayer dollars.

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information being requested is a critical part of projecting future employment demands which benefits students and jobseekers. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form below. Please include the 10-digit schedule number from the address label above. We would prefer that you type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000004

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to protect confidential information in its possession.

09 238162 000000001-7
0000000000-00032 000

ESTABLISHMENTS PRIMARILY ENGAGED IN NONRESIDENTIAL
ROOFING. INCLUDES TREATING ROOFS AND INSTALLING
SKYLIGHTS. THE WORK MAY INCLUDE: NEW WORK,
ADDITIONS, ALTERATIONS, MAINTENANCE, AND REPAIRS.
EXCLUDE INSTALLING ROOF TRUSSES AND ATTACHED
SHEATHING, OR INSTALLING DOWNSPOUTS, GUTTERS,
FASCIA, OR SOFFITS.

IDCF # 09000000001   09   Est. Emp: 50
Reference Date:Nov 12, 2018   65   238162 000
Schedule # 000000001-7   QC# 000005

OFFICE MANAGER
BUSINESS 33
REPORT FOR: ALL STATE EMPLOYEES
131 MAIN ST
STE 109
CAPITAL CITY CT 12377-1266

Please Respond By: October 26, 2018

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information you provide will allow your business to make accurate and reliable operational decisions, such as identifying employment demands in your industry. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form below. Please include the 10-digit schedule number from the address label above. We would prefer that you type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000005

*If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future***.**
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to protect confidential information in its possession.

09 238171 000000001-8
0000000000-00033 000

ESTABLISHMENTS PRIMARILY ENGAGED IN INSTALLING
SIDING OF WOOD, ALUMINUM, VINYL OR OTHER EXTERIOR
FINISH MATERIAL ON RESIDENTIAL BUILDINGS. INCLUDES
INSTALLING GUTTERS, DOWNSPOUTS, FASCIA, AND SOFFITS.
MAY INCLUDE NEW WORK, ALTERATIONS, AND REPAIRS.
EXCLUDE BRICK, STONE, OR STUCCO EXTERIOR MATERIALS.

IDCF # 09000000001   09   Est. Emp: 100
Reference Date:Nov 12, 2018   66   238171 000
Schedule # 000000001-8   QC# 000006

OWNER
BUSINESS 34
REPORT FOR: THIS LOCATION ONLY
341 TECHNOLOGY WAY
SPRINGFIELD CT 12378-1267

Please Respond By: October 26, 2018 - Your prompt response is appreciated and will save taxpayer dollars.

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information you provide will allow your business to make accurate and reliable operational decisions, such as identifying employment demands in your industry. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form below. Please include the 10-digit schedule number from the address label above. We would prefer that you type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000006

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to protect confidential information in its possession.

09 238212 000000001-9
0000000000-00036 000

ESTABLISHMENTS PRIMARILY ENGAGED IN INSTALLING AND
SERVICING ELECTRICAL WIRING AND EQUIPMENT AT
NONRESIDENTIAL JOB SITES. INCLUDE: AIRPORT RUNWAY
LIGHTING, COMPUTER AND NETWORK CABLE INSTALLATION,
AUDIO EQUIPMENT INSTALLATION, ENVIRONMENTAL
CONTROL SYSTEM INSTALLATION, ALARM SYSTEMS &
ELECTRICAL SIGNAL.

IDCF # 09000000001   09   Est. Emp: 50
Reference Date: Nov 12, 2018   67   238212 000
Schedule # 000000001-9   QC# 000007

OFFICE MANAGER
BUSINESS 37
REPORT FOR: ALL STATE EMPLOYEES
132 MAIN ST
STE 110
CAPITAL CITY CT 12381-1270

Please Respond By: October 26, 2018

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment
Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information being
requested is a critical part of projecting future employment demands which benefits students and jobseekers. The purpose of
this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If
   the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data
   request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form
     below. Please include the 10-digit schedule number from the address label above. We would prefer that you
     type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000007

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS
involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS
cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to
protect confidential information in its possession.

CONNECTICUT DEPT OF LABOR - OES
200 FOLLY BROOK BLVD
WETHERSFIELD CT 06109-1114

Connecticut Department of Labor

09 238212 000000002-1
0000000000-00037 000

ESTABLISHMENTS PRIMARILY ENGAGED IN INSTALLING AND
SERVICING ELECTRICAL WIRING AND EQUIPMENT AT
NONRESIDENTIAL JOB SITES. INCLUDE: AIRPORT RUNWAY
LIGHTING, COMPUTER AND NETWORK CABLE INSTALLATION,
AUDIO EQUIPMENT INSTALLATION, ENVIRONMENTAL
CONTROL SYSTEM INSTALLATION, ALARM SYSTEMS &
ELECTRICAL SIGNAL.

IDCF # 09000000002   09   Est. Emp: 100
Reference Date:Nov 12, 2018   68   238212 000
Schedule # 000000002-1   QC# 000008

OWNER
BUSINESS 38
REPORT FOR: THIS LOCATION ONLY
342 TECHNOLOGY WAY
SPRINGFIELD CT 12382-1271

Please Respond By: October 26, 2018 - Your prompt response is appreciated and will save taxpayer dollars.

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information being requested is a critical part of projecting future employment demands which benefits students and jobseekers. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

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   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000008

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to protect confidential information in its possession.

CT-000008

CONNECTICUT DEPT OF LABOR - OES
200 FOLLY BROOK BLVD
WETHERSFIELD CT 06109-1114

★ CONNECTICUT
DEPARTMENT
OF LABOR ★
Partner of the American
Job Center Network

U.S. Department of Labor
Connecticut Department of Labor

09 238221 000000002-2
0000000000-00040 000

ESTABLISHMENTS PRIMARILY ENGAGED IN PLUMBING,
HEATING, OR AIR-CONDITIONING CONTRACTORS PRIMARILY
WORKING ON RESIDENTIAL BUILDINGS. INCLUDE: DUCT
WORK, LAWN SPRINKLER SYSTEM INSTALLATION, FIRE
SPRINKLER SYSTEM INSTALLATION, & SEWER HOOK-UPS.
RESIDENTIAL CONTRACTORS MAY PROVIDE BOTH PARTS &
LABOR.

IDCF # 09000000002   09   Est. Emp: 50
Reference Date:Nov 12, 2018   69   238221 000
Schedule # 000000002-2   QC# 000009

OFFICE MANAGER
BUSINESS 41
REPORT FOR: ALL STATE EMPLOYEES
133 MAIN ST
STE 111
CAPITAL CITY CT 12385-1274

Please Respond By: October 26, 2018

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment
Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information you provide
will allow your business to make accurate and reliable operational decisions, such as identifying employment demands in your
industry. The purpose of this letter is to verify your company name and identify a contact person who can provide the
requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If
   the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data
   request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form
     below. Please include the 10-digit schedule number from the address label above. We would prefer that you
     type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000009

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS
involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS
cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to
protect confidential information in its possession.

CONNECTICUT DEPT OF LABOR - OES
200 FOLLY BROOK BLVD
WETHERSFIELD CT 06109-1114

CONNECTICUT DEPARTMENT OF LABOR
★ Partner of the American Job Center Network ★

U.S. Department of Labor
Connecticut Department of Labor

09 238221 000000002-3
0000000000-00041 000

ESTABLISHMENTS PRIMARILY ENGAGED IN PLUMBING, HEATING, OR AIR-CONDITIONING CONTRACTORS PRIMARILY WORKING ON RESIDENTIAL BUILDINGS. INCLUDE: DUCT WORK, LAWN SPRINKLER SYSTEM INSTALLATION, FIRE SPRINKLER SYSTEM INSTALLATION, & SEWER HOOK-UPS. RESIDENTIAL CONTRACTORS MAY PROVIDE BOTH PARTS & LABOR.

IDCF # 09000000002   09   Est. Emp: 100
Reference Date:Nov 12, 2018   70   238221 000
Schedule # 000000002-3   QC# 000010

OWNER
BUSINESS 42
REPORT FOR: THIS LOCATION ONLY
343 TECHNOLOGY WAY
SPRINGFIELD CT 12386-1275

Please Respond By: October 26, 2018 - Your prompt response is appreciated and will save taxpayer dollars.

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information you provide will allow your business to make accurate and reliable operational decisions, such as identifying employment demands in your industry. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form below. Please include the 10-digit schedule number from the address label above. We would prefer that you type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000010

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

CT-000010

CONNECTICUT DEPT OF LABOR - OES
200 FOLLY BROOK BLVD
WETHERSFIELD CT 06109-1114

CONNECTICUT DEPARTMENT OF LABOR ★
Partner of the American
Job Center Network

U.S. Department of Labor
Connecticut Department of Labor

09 238292 000000002-4
0000000000-00044 000

IDCF # 09000000002   09   Est. Emp: 50
Reference Date:Nov 12, 2018   71   238292 000
Schedule # 000000002-4   QC# 000011

ESTABLISHMENTS PRIMARILY ENGAGED IN INSTALLING OR
SERVICING NONRESIDENTIAL BUILDING EQUIPMENT
INCLUDING AUTOMATED DOORS; BOILER AND PIPE
INSULATION; CONVEYOR SYSTEMS; DISMANTLING LARGE-
SCALE MACHINERY; LIGHTNING PROTECTION EQUIPMENT;
MACHINE RIGGING; INDUSTRIAL-TYPE DOORS;& BUILT-IN
VACUUM CLEANING SYSTEM.

OFFICE MANAGER
BUSINESS 45
REPORT FOR: ALL STATE EMPLOYEES
134 MAIN ST
STE 112
CAPITAL CITY CT 12389-1278

Please Respond By: October 26, 2018

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information being requested is a critical part of projecting future employment demands which benefits students and jobseekers. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form below. Please include the 10-digit schedule number from the address label above. We would prefer that you type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000011

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to protect confidential information in its possession.

CONNECTICUT DEPT OF LABOR - OES
200 FOLLY BROOK BLVD
WETHERSFIELD CT 06109-1114

CONNECTICUT
DEPARTMENT
★ OF LABOR ★
Partner of the American
Job Center Network

U.S. Department of Labor
Connecticut Department of Labor

09 238311 000000002-5
0000000000-00045 000

ESTABLISHMENTS PRIMARILY ENGAGED IN RESIDENTIAL
DRYWALL, PLASTER, OR BUILDING INSULATION WORK.
EXAMPLES INCLUDE: ACOUSTICAL CEILING TILE AND PANEL
INSTALLATION, PLASTERING, DROP CEILING INSTALLATION,
SOUNDPROOFING, FRESCO CONTRACTORS, TAPING AND
FINISHING DRYWALL, & WALL CAVITY AND ATTIC SPACE
INSULATION.

IDCF # 09000000002   09   Est. Emp: 100
Reference Date:Nov 12, 2018   72   238311 000
Schedule # 000000002-5   QC# 000012

OWNER
BUSINESS 46
REPORT FOR: THIS LOCATION ONLY
344 TECHNOLOGY WAY
SPRINGFIELD CT 12390-1279

Please Respond By: October 26, 2018 - Your prompt response is appreciated and will save taxpayer dollars.

Dear Employer,

Next month, you will receive a request from the Connecticut Department of Labor to complete the Occupational Employment Statistics (OES) Report, which is the primary source of occupation and wage statistics in the U.S. The information being requested is a critical part of projecting future employment demands which benefits students and jobseekers. The purpose of this letter is to verify your company name and identify a contact person who can provide the requested information.

1. **Verify the company name**. Is the letter addressed to the correct company? If it is not, call us at **(860) 263-6285**. If the company name is correct, continue to step 2.

2. **Submit contact information.** Tell us who should receive the Occupational Employment Statistics Report data request. You can provide the contact information shown in the table below using any of the following three options:

   - *Email* → Send an email to **OESCONNECTICUT@IDCF.BLS.GOV** containing the information in the contact form below. Please include the 10-digit schedule number from the address label above. We would prefer that you type the information directly into the email rather than scanning this page.

   - *Fax* → Fill out the form below and fax this page to **860-263-6263**.

   - *Phone* → Call us at **(860) 263-6285**.

Contact Person:	
Job Title:	
Company Name:	
Mailing Address:	
City, State, Zip:	
Phone # (with extension):	
Email address:	

0000012

If you respond electronically or provide your email address, we may email you about Occupational Employment Statistics in the future.
By law, all information you provide to us is kept strictly confidential.

As a participant in a Bureau of Labor Statistics (BLS) statistical survey, you should be aware that use of electronic transmittal methods in reporting data to the BLS involves certain inherent risks to the confidentiality of those data. Further, you should be aware that responsible electronic transmittal practices employed by the BLS cannot completely eliminate those risks. The BLS is committed to the responsible treatment of confidential information and takes rigorous security measures to protect confidential information in its possession.

Appendix B: Prenotification Letter Treatment Counts

The following tables display the breakout of Chapter 2 sample counts by treatment and business characteristics.

Table B.1: Appeal by Size Class

Size	Altruistic	Egoistic
1	1,356	1,371
2	943	940
3	1,019	1,019
4	1,041	1,033
5	526	521
6	363	361
7	174	167
8	79	74
9	63	60
Total	5,564	5,546

Table B.2: Appeal by Industry

Two Digit NAICS Code	Altruistic	Egoistic
11	35	22
21	15	28
22	25	21
23	495	476
31 - 33	546	507
42	371	395
44 - 45	515	536
48 - 49	166	180
51	123	135
52	244	217
53	135	152
54	564	555
55	57	56
56	417	433
61	185	169
62	726	758
71	167	152
72	278	233
81	384	388
99	116	133
Total	5,564	5,546

Table B.3: Sponsorship by Size Class

Size	DOL	DOL & SWA	SWA
1	901	925	901
2	624	638	621
3	662	691	685
4	681	700	693
5	338	354	355
6	239	251	234
7	100	124	117
8	55	57	41
9	43	29	51
Total	3,643	3,769	3,698

Table B.4: Sponsorship by Industry

Two Digit NAICS Code	DOL	DOL & SWA	SWA
11	20	15	22
21	15	16	12
22	14	19	13
23	300	344	327
31 - 33	335	363	355
42	257	268	241
44 - 45	348	354	349
48 - 49	114	102	130
51	71	87	100
52	140	156	165
53	94	87	106
54	384	391	344
55	41	34	38
56	282	300	268
61	111	132	111
62	471	507	506
71	108	109	102
72	188	162	161
81	274	238	260
99	76	85	88
Total	3,643	3,769	3,698

Table B.5: Message by Size Class

Size	Excluded	Included
1	1,362	1,365
2	934	949
3	1,008	1,030
4	1,030	1,044
5	521	526
6	366	358
7	166	175
8	79	74
9	68	55
Total	5,534	5,576

Table B.6: Message by Industry

Two Digit NAICS Code	Excluded	Included
11	30	27
21	27	16
22	23	23
23	505	466
31 - 33	520	533
42	368	398
44 - 45	535	516
48 - 49	163	183
51	128	130
52	231	230
53	142	145
54	531	588
55	60	53
56	409	441
61	177	177
62	737	747
71	165	154
72	245	266
81	405	367
99	133	116
Total	5,534	5,576

Appendix C: Chapter 2 MLE Results

The following tables contain the analysis of maximum likelihood estimates (MLEs) for the logistic regression models presented in Section 2.3 and an additional table for a model that included all treatments as predictors. The itemized list references the predictors used in each model.

- Table C.1 - appeal, state, interaction

- Table C.2 - appeal, business size, interaction

- Table C.3 - appeal, industry, interaction

- Table C.4 - sponsor, state, interaction

- Table C.5 - sponsor, business size, interaction

- Table C.6 - sponsor, industry, interaction

- Table C.7 - tax message, state, interaction

- Table C.8 - tax message, business size, interaction

- Table C.9 - tax message, industry, interaction

- Table C.10 - appeal, sponsor, tax message

Table C.1: Analysis of MLEs - Appeal and State

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	-0.7168	0.0493	211.5532	<.0001
Appeal	Altruistic		1	-0.0344	0.0493	0.4878	0.4849
State	B		1	0.1576	0.0896	3.0910	0.0787
State	C		1	0.2492	0.0986	6.3892	0.0115
State	D		1	0.00320	0.0833	0.0015	0.9694
State	E		1	-0.00598	0.1172	0.0026	0.9593
State	F		1	-0.2352	0.1582	2.2116	0.1370
Appeal*State	Altruistic	B	1	0.0703	0.0896	0.6157	0.4326
Appeal*State	Altruistic	C	1	-0.0496	0.0986	0.2534	0.6147
Appeal*State	Altruistic	D	1	0.0548	0.0833	0.4329	0.5106
Appeal*State	Altruistic	E	1	-0.0726	0.1172	0.3835	0.5357
Appeal*State	Altruistic	F	1	-0.1120	0.1582	0.5010	0.4791

Table C.2: Analysis of MLEs - Appeal and Size

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept		1	-1.5465	16.7159	0.0086	0.9263	
Appeal	Altruistic		1	0.6719	16.7159	0.0016	0.9679
Size	1		1	0.5900	16.7162	0.0012	0.9718
Size	2		1	0.8576	16.7162	0.0026	0.9591
Size	3		1	0.9700	16.7161	0.0034	0.9537
Size	4		1	1.0730	16.7161	0.0041	0.9488
Size	5		1	1.0326	16.7163	0.0038	0.9507
Size	6		1	0.8614	16.7165	0.0027	0.9589
Size	7		1	0.2058	16.7172	0.0002	0.9902
Size	8		1	0.3475	16.7199	0.0004	0.9834
Appeal*Size	Altruistic	1	1	-0.6380	16.7162	0.0015	0.9696
Appeal*Size	Altruistic	2	1	-0.7758	16.7162	0.0022	0.9630
Appeal*Size	Altruistic	3	1	-0.7171	16.7161	0.0018	0.9658
Appeal*Size	Altruistic	4	1	-0.6476	16.7161	0.0015	0.9691
Appeal*Size	Altruistic	5	1	-0.6357	16.7163	0.0014	0.9697
Appeal*Size	Altruistic	6	1	-0.6965	16.7165	0.0017	0.9668
Appeal*Size	Altruistic	7	1	-0.5209	16.7172	0.0010	0.9751
Appeal*Size	Altruistic	8	1	-0.5716	16.7199	0.0012	0.9727

Table C.3: Analysis of MLEs - Appeal and Industry

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	-0.6947	0.0363	366.6476	<.0001
Appeal	Altruistic		1	-0.00213	0.0363	0.0035	0.9531
NAICS2	11		1	0.1454	0.2722	0.2854	0.5932
NAICS2	21		1	0.2766	0.3180	0.7565	0.3844
NAICS2	22		1	0.0016	0.3554	0.0000	0.9964
NAICS2	23		1	0.0259	0.0739	0.1232	0.7256
NAICS2	31-33		1	0.1304	0.0709	3.3858	0.0658
NAICS2	42		1	-0.1224	0.0828	2.1837	0.1395
NAICS2	44-45		1	-0.0789	0.0727	1.1770	0.2780
NAICS2	48-49		1	-0.1250	0.1167	1.1489	0.2838
NAICS2	51		1	-0.1774	0.1346	1.7362	0.1876
NAICS2	52		1	0.0767	0.0997	0.5920	0.4416
NAICS2	53		1	-0.4167	0.1349	9.5401	0.0020
NAICS2	54		1	0.0051	0.0703	0.0052	0.9424
NAICS2	55		1	-0.2088	0.2031	1.0573	0.3038
NAICS2	56		1	-0.2021	0.0805	6.2992	0.0121
NAICS2	61		1	0.0777	0.1131	0.4722	0.4920
NAICS2	62		1	0.1400	0.0628	4.9760	0.0257
NAICS2	71		1	-0.0876	0.1202	0.5316	0.4659
NAICS2	72		1	-0.2311	0.1005	5.2871	0.0215
NAICS2	81		1	0.1921	0.0793	5.8756	0.0154
Appeal*NAICS2	Altruistic	11	1	-0.3649	0.2722	1.7973	0.1800
Appeal*NAICS2	Altruistic	21	1	-0.2729	0.3180	0.7364	0.3908
Appeal*NAICS2	Altruistic	22	1	1.1007	0.3554	9.5916	0.0020
Appeal*NAICS2	Altruistic	23	1	0.0139	0.0739	0.0355	0.8505
Appeal*NAICS2	Altruistic	31-33	1	0.0262	0.0709	0.1369	0.7114
Appeal*NAICS2	Altruistic	42	1	-0.0448	0.0828	0.2931	0.5882
Appeal*NAICS2	Altruistic	44-45	1	-0.0303	0.0727	0.1740	0.6766
Appeal*NAICS2	Altruistic	48-49	1	-0.0485	0.1167	0.1727	0.6777
Appeal*NAICS2	Altruistic	51	1	0.0308	0.1346	0.0524	0.8190
Appeal*NAICS2	Altruistic	52	1	-0.0977	0.0997	0.9606	0.3270
Appeal*NAICS2	Altruistic	53	1	0.0248	0.1349	0.0337	0.8544
Appeal*NAICS2	Altruistic	54	1	-0.0823	0.0703	1.3713	0.2416
Appeal*NAICS2	Altruistic	55	1	-0.3136	0.2031	2.3847	0.1225
Appeal*NAICS2	Altruistic	56	1	-0.1029	0.0805	1.6317	0.2015
Appeal*NAICS2	Altruistic	61	1	0.2808	0.1131	6.1659	0.0130
Appeal*NAICS2	Altruistic	62	1	-0.0628	0.0628	1.0014	0.3170
Appeal*NAICS2	Altruistic	71	1	-0.0373	0.1202	0.0963	0.7563
Appeal*NAICS2	Altruistic	72	1	0.0909	0.1005	0.8177	0.3658
Appeal*NAICS2	Altruistic	81	1	0.0491	0.0793	0.3832	0.5359

Table C.4: Analysis of MLEs - Sponsor and State

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	-0.6640	0.0227	856.4601	<.0001
Sponsor	DOL		1	-0.0189	0.0323	0.3443	0.5574
Sponsor	DOL & SWA		1	-0.0262	0.0319	0.6751	0.4113
State	B		1	-0.0179	0.0424	0.1791	0.6722
State	C		1	0.3600	0.0453	63.0829	<.0001
State	D		1	-0.1095	0.0404	7.3489	0.0067
State	E		1	-0.0973	0.0533	3.3305	0.0680
State	F		1	0.0872	0.0720	1.4633	0.2264
Sponsor*State	DOL	B	1	0.0234	0.0602	0.1504	0.6981
Sponsor*State	DOL	C	1	-0.0088	0.0647	0.0184	0.8921
Sponsor*State	DOL	D	1	-0.0327	0.0574	0.3241	0.5691
Sponsor*State	DOL	E	1	-0.0965	0.0762	1.6042	0.2053
Sponsor*State	DOL	F	1	0.0636	0.1024	0.3853	0.5348
Sponsor*State	DOL & SWA	B	1	-0.0279	0.0597	0.2191	0.6397
Sponsor*State	DOL & SWA	C	1	0.0406	0.0637	0.4061	0.5240
Sponsor*State	DOL & SWA	D	1	-0.0250	0.0572	0.1903	0.6626
Sponsor*State	DOL & SWA	E	1	0.2011	0.0744	7.3072	0.0069
Sponsor*State	DOL & SWA	F	1	-0.1107	0.1015	1.1902	0.2753

Table C.5: Analysis of MLEs - Sponsor and Size

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	-0.8103	0.0397	415.9641	<.0001
Sponsor	DOL		1	-0.0272	0.0548	0.2467	0.6194
Sponsor	DOL & SWA		1	-0.0447	0.0594	0.5665	0.4516
Size	1		1	-0.0976	0.0546	3.1909	0.0741
Size	2		1	0.2181	0.0582	14.0579	0.0002
Size	3		1	0.2055	0.0570	12.9990	0.0003
Size	4		1	0.2568	0.0565	20.6194	<.0001
Size	5		1	0.2778	0.0691	16.1658	<.0001
Size	6		1	0.1193	0.0801	2.2180	0.1364
Size	7		1	-0.1873	0.1159	2.6150	0.1059
Size	8		1	-0.0788	0.1634	0.2324	0.6298
Sponsor*Size	DOL	1	1	-0.1008	0.0768	1.7243	0.1891
Sponsor*Size	DOL	2	1	0.1086	0.0811	1.7936	0.1805
Sponsor*Size	DOL	3	1	0.0150	0.0800	0.0350	0.8516
Sponsor*Size	DOL	4	1	0.0988	0.0790	1.5657	0.2108
Sponsor*Size	DOL	5	1	-0.0894	0.0980	0.8320	0.3617
Sponsor*Size	DOL	6	1	-0.00648	0.1130	0.0033	0.9543
Sponsor*Size	DOL	7	1	-0.1834	0.1717	1.1411	0.2854
Sponsor*Size	DOL	8	1	-0.0645	0.2278	0.0803	0.7769
Sponsor*Size	DOL & SWA	1	1	-0.0849	0.0799	1.1293	0.2879
Sponsor*Size	DOL & SWA	2	1	0.0570	0.0843	0.4571	0.4990
Sponsor*Size	DOL & SWA	3	1	0.0505	0.0827	0.3720	0.5419
Sponsor*Size	DOL & SWA	4	1	-0.0208	0.0823	0.0637	0.8008
Sponsor*Size	DOL & SWA	5	1	0.1292	0.0990	1.7016	0.1921
Sponsor*Size	DOL & SWA	6	1	0.1193	0.1136	1.1026	0.2937
Sponsor*Size	DOL & SWA	7	1	0.1091	0.1603	0.4632	0.4961
Sponsor*Size	DOL & SWA	8	1	-0.0958	0.2283	0.1762	0.6747

Table C.6: Analysis of MLEs - Sponsor and Industry

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	-0.6796	0.0348	380.8846	<.0001
Sponsor	DOL		1	-0.0405	0.0491	0.6803	0.4095
Sponsor	DOL & SWA		1	-0.0718	0.0494	2.1139	0.1460
NAICS2	11		1	0.0207	0.2753	0.0057	0.9399
NAICS2	21		1	0.3527	0.2982	1.3984	0.2370
NAICS2	22		1	0.3005	0.3153	0.9083	0.3406
NAICS2	23		1	0.0095	0.0733	0.0168	0.8970
NAICS2	31-33		1	0.1181	0.0701	2.8363	0.0922
NAICS2	42		1	-0.1331	0.0822	2.6231	0.1053
NAICS2	44-45		1	-0.0944	0.0720	1.7190	0.1898
NAICS2	48-49		1	-0.1415	0.1167	1.4696	0.2254
NAICS2	51		1	-0.2191	0.1371	2.5550	0.1099
NAICS2	52		1	0.0536	0.0994	0.2907	0.5898
NAICS2	53		1	-0.4288	0.1346	10.1519	0.0014
NAICS2	54		1	-0.00674	0.0696	0.0094	0.9228
NAICS2	55		1	-0.2000	0.1997	1.0030	0.3166
NAICS2	56		1	-0.2180	0.0802	7.3817	0.0066
NAICS2	61		1	0.0746	0.1119	0.4448	0.5048
NAICS2	62		1	0.1269	0.0619	4.2037	0.0403
NAICS2	71		1	-0.1065	0.1199	0.7886	0.3745
NAICS2	72		1	-0.2577	0.1006	6.5572	0.0104
NAICS2	81		1	0.1730	0.0788	4.8222	0.0281
Sponsor*NAICS2	DOL	11	1	0.2939	0.3735	0.6193	0.4313
Sponsor*NAICS2	DOL	21	1	0.2339	0.4129	0.3209	0.5711
Sponsor*NAICS2	DOL	22	1	-0.4967	0.4535	1.1998	0.2734
Sponsor*NAICS2	DOL	23	1	-0.0127	0.1054	0.0145	0.9042
Sponsor*NAICS2	DOL	31-33	1	0.1466	0.0994	2.1728	0.1405
Sponsor*NAICS2	DOL	42	1	0.00403	0.1162	0.0012	0.9723
Sponsor*NAICS2	DOL	44-45	1	0.1343	0.1012	1.7595	0.1847
Sponsor*NAICS2	DOL	48-49	1	-0.0793	0.1669	0.2259	0.6346
Sponsor*NAICS2	DOL	51	1	-0.1405	0.2057	0.4666	0.4945
Sponsor*NAICS2	DOL	52	1	0.0475	0.1432	0.1099	0.7402
Sponsor*NAICS2	DOL	53	1	0.0220	0.1912	0.0133	0.9083
Sponsor*NAICS2	DOL	54	1	-0.0860	0.0985	0.7613	0.3829
Sponsor*NAICS2	DOL	55	1	-0.0831	0.2799	0.0883	0.7664
Sponsor*NAICS2	DOL	56	1	-0.2274	0.1162	3.8271	0.0504
Sponsor*NAICS2	DOL	61	1	-0.1720	0.1626	1.1187	0.2902
Sponsor*NAICS2	DOL	62	1	0.0676	0.0881	0.5886	0.4430
Sponsor*NAICS2	DOL	71	1	-0.0832	0.1707	0.2375	0.6260
Sponsor*NAICS2	DOL	72	1	0.2686	0.1362	3.8915	0.0485
Sponsor*NAICS2	DOL	81	1	0.0711	0.1097	0.4201	0.5169
Sponsor*NAICS2	DOL & SWA	11	1	-0.2809	0.4234	0.4400	0.5071
Sponsor*NAICS2	DOL & SWA	21	1	-0.1121	0.4125	0.0739	0.7858
Sponsor*NAICS2	DOL & SWA	22	1	-0.5786	0.4267	1.8389	0.1751
Sponsor*NAICS2	DOL & SWA	23	1	0.0531	0.1025	0.2683	0.6045
Sponsor*NAICS2	DOL & SWA	31-33	1	-0.0106	0.0990	0.0116	0.9144
Sponsor*NAICS2	DOL & SWA	42	1	-0.0423	0.1161	0.1324	0.7159
Sponsor*NAICS2	DOL & SWA	44-45	1	0.0884	0.1015	0.7579	0.3840
Sponsor*NAICS2	DOL & SWA	48-49	1	0.1102	0.1689	0.4255	0.5142
Sponsor*NAICS2	DOL & SWA	51	1	0.0623	0.1920	0.1052	0.7457
Sponsor*NAICS2	DOL & SWA	52	1	-0.0536	0.1412	0.1442	0.7041
Sponsor*NAICS2	DOL & SWA	53	1	0.1569	0.1925	0.6641	0.4151
Sponsor*NAICS2	DOL & SWA	54	1	0.0727	0.0975	0.5551	0.4563
Sponsor*NAICS2	DOL & SWA	55	1	0.2138	0.2853	0.5613	0.4537
Sponsor*NAICS2	DOL & SWA	56	1	0.0578	0.1120	0.2660	0.6060
Sponsor*NAICS2	DOL & SWA	61	1	0.2142	0.1527	1.9662	0.1608
Sponsor*NAICS2	DOL & SWA	62	1	0.1294	0.0870	2.2099	0.1371
Sponsor*NAICS2	DOL & SWA	71	1	0.1921	0.1670	1.3241	0.2499
Sponsor*NAICS2	DOL & SWA	72	1	-0.2076	0.1478	1.9717	0.1603
Sponsor*NAICS2	DOL & SWA	81	1	-0.0278	0.1138	0.0596	0.8071

Table C.7: Analysis of MLEs - Tax Message and State

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	-0.6649	0.0227	859.0713	<.0001
Message	No		1	-0.0226	0.0227	0.9882	0.3202
State	B		1	-0.0180	0.0424	0.1807	0.6708
State	C		1	0.3614	0.0453	63.5852	<.0001
State	D		1	-0.1074	0.0404	7.0874	0.0078
State	E		1	-0.1004	0.0534	3.5354	0.0601
State	F		1	0.0855	0.0720	1.4089	0.2352
Message*State	No	B	1	0.0059	0.0424	0.0193	0.8896
Message*State	No	C	1	0.0450	0.0453	0.9863	0.3206
Message*State	No	D	1	0.0001	0.0404	0.0000	0.9975
Message*State	No	E	1	-0.1241	0.0534	5.3964	0.0202
Message*State	No	F	1	0.0791	0.0720	1.2066	0.2720

Table C.8: Analysis of MLEs - Tax Message and Size

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	-0.8061	0.0386	435.7525	<.0001
Message	No		1	-0.0460	0.0386	1.4197	0.2335
Size	1		1	-0.0977	0.0537	3.3110	0.0688
Size	2		1	0.2149	0.0574	14.0211	0.0002
Size	3		1	0.2012	0.0562	12.8031	0.0003
Size	4		1	0.2524	0.0558	20.4824	<.0001
Size	5		1	0.2764	0.0684	16.3253	<.0001
Size	6		1	0.1151	0.0796	2.0913	0.1481
Size	7		1	-0.1844	0.1147	2.5847	0.1079
Size	8		1	-0.1107	0.1644	0.4533	0.5008
Message*Size	No	1	1	-0.0400	0.0537	0.5559	0.4559
Message*Size	No	2	1	0.0422	0.0574	0.5404	0.4622
Message*Size	No	3	1	0.0240	0.0562	0.1828	0.6690
Message*Size	No	4	1	0.0421	0.0558	0.5695	0.4505
Message*Size	No	5	1	0.0946	0.0684	1.9113	0.1668
Message*Size	No	6	1	0.1288	0.0796	2.6203	0.1055
Message*Size	No	7	1	-0.1108	0.1147	0.9334	0.3340
Message*Size	No	8	1	-0.2577	0.1644	2.4583	0.1169

Table C.9: Analysis of MLEs - Tax Message and Industry

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	-0.6761	0.0343	388.1510	<.0001
Message	No		1	-0.0537	0.0343	2.4498	0.1175
NAICS2	11		1	0.0651	0.2672	0.0593	0.8076
NAICS2	21		1	0.4549	0.3095	2.1596	0.1417
NAICS2	22		1	0.2306	0.2900	0.6323	0.4265
NAICS2	23		1	0.0032	0.0731	0.0019	0.9655
NAICS2	31-33		1	0.1121	0.0698	2.5741	0.1086
NAICS2	42		1	-0.1401	0.0819	2.9235	0.0873
NAICS2	44-45		1	-0.0963	0.0717	1.8022	0.1794
NAICS2	48-49		1	-0.1630	0.1175	1.9260	0.1652
NAICS2	51		1	-0.1985	0.1342	2.1895	0.1390
NAICS2	52		1	0.0533	0.0989	0.2907	0.5898
NAICS2	53		1	-0.4386	0.1345	10.6397	0.0011
NAICS2	54		1	-0.0141	0.0693	0.0416	0.8384
NAICS2	55		1	-0.2323	0.2024	1.3168	0.2512
NAICS2	56		1	-0.2254	0.0799	7.9633	0.0048
NAICS2	61		1	0.0816	0.1109	0.5414	0.4619
NAICS2	62		1	0.1232	0.0616	3.9983	0.0455
NAICS2	71		1	-0.1109	0.1198	0.8580	0.3543
NAICS2	72		1	-0.2446	0.0993	6.0651	0.0138
NAICS2	81		1	0.1753	0.0784	4.9974	0.0254
Message*NAICS2	No	11	1	-0.1826	0.2672	0.4669	0.4944
Message*NAICS2	No	21	1	-0.4183	0.3095	1.8257	0.1766
Message*NAICS2	No	22	1	-0.1294	0.2900	0.1992	0.6554
Message*NAICS2	No	23	1	0.1358	0.0731	3.4513	0.0632
Message*NAICS2	No	31-33	1	0.0156	0.0698	0.0496	0.8238
Message*NAICS2	No	42	1	0.0304	0.0819	0.1373	0.7110
Message*NAICS2	No	44-45	1	-0.0168	0.0717	0.0547	0.8151
Message*NAICS2	No	48-49	1	-0.1652	0.1175	1.9765	0.1598
Message*NAICS2	No	51	1	-0.0100	0.1342	0.0055	0.9409
Message*NAICS2	No	52	1	0.0981	0.0989	0.9849	0.3210
Message*NAICS2	No	53	1	-0.0258	0.1345	0.0369	0.8476
Message*NAICS2	No	54	1	0.0338	0.0693	0.2374	0.6261
Message*NAICS2	No	55	1	0.2689	0.2024	1.7650	0.1840
Message*NAICS2	No	56	1	-0.0823	0.0799	1.0615	0.3029
Message*NAICS2	No	61	1	0.1524	0.1109	1.8878	0.1694
Message*NAICS2	No	62	1	0.0353	0.0616	0.3276	0.5670
Message*NAICS2	No	71	1	0.1202	0.1198	1.0068	0.3157
Message*NAICS2	No	72	1	-0.0233	0.0993	0.0548	0.8148
Message*NAICS2	No	81	1	0.0132	0.0784	0.0285	0.8660

Table C.10: Analysis of MLEs - All Treatments

Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept		1	-0.6848	0.0201	1159.8814	<.0001
Message	No	1	-0.0238	0.0201	1.4063	0.2357
Appeal	Altruistic	1	-0.0230	0.0201	1.3116	0.2521
Sponsor	DOL	1	-0.0226	0.0286	0.6263	0.4287
Sponsor	DOL & SWA	1	-0.0270	0.0284	0.9070	0.3409

Appendix D: Chapter 3, Experiment Counts

The following tables display the sample size breakouts for the two experiments in Chapter 3 by treatment and business characteristics.

- Table D.1 - Experiment 1, treatment by business size

- Table D.2 - Experiment 1, treatment by industry

- Table D.3 - Experiment 2, treatment by business size

- Table D.3 - Experiment 2 , treatment by industry

Table D.1: Experiment 1: Treatment Group by Size Class

Size	Mail	Email
1	484	432
2	440	457
3	594	518
4	632	607
5	364	369
6	275	266
7	165	152
8	59	61
9	24	34
Total	3,037	2,896

Table D.2: Experiment 1: Treatment Group by Industry

Two Digit NAICS Code	Mail	Email
11	12	14
21	20	12
22	13	9
23	248	216
31 - 33	409	393
42	225	245
44 - 45	239	228
48 - 49	81	79
51	77	55
52	150	126
53	71	91
54	287	235
55	27	22
56	175	192
61	119	139
62	379	355
71	74	72
72	110	95
81	182	168
99	139	150
Total	3,037	2,896

Table D.3: Experiment 2: Treatment Group by Size Class

Size	Mail 3	Mail 23	Mail 123
1	288	272	281
2	137	153	162
3	191	191	210
4	611	620	619
5	554	540	540
6	610	664	668
7	267	251	260
8	86	91	102
9	50	30	44
Total	2,794	2,812	2,886

Table D.4: Experiment 2: Treatment Group by Industry

Two Digit NAICS Code	Mail 3	Mail 23	Mail 123
11	89	89	90
21	86	81	86
22	70	64	78
23	160	166	167
31 - 33	192	201	204
42	138	141	145
44 - 45	136	133	142
48 - 49	121	118	115
51	100	98	97
52	139	136	143
53	103	105	104
54	131	139	136
55	119	116	124
56	119	122	122
61	202	210	223
62	197	201	203
71	147	149	147
72	142	130	139
81	156	164	168
99	247	249	253
Total	2,794	2,812	2,886

Appendix E: Chapter 3, Experiment 1 Model Details

The following tables contain the analysis of maximum likelihood estimates (MLEs) for the logistic regression models presented in Section 3.2.1. The itemized lists describe the predictors used in each model.

Logistic models for response propensity discussed in Section 3.2.1.1:

- Table E.1 - treatment, state, interaction

- Table E.2 - treatment, business size, interaction

- Table E.3 - treatment, industry, interaction

  Logistic models for propensity to respond online discussed in Section 3.2.1.2:

- Table E.4 - treatment, state, interaction

- Table E.5 - treatment, business size, interaction

- Table E.6 - treatment, industry, interaction

  Survival models discussed in Section 3.2.1.3:

- Table E.7 - treatment, state, interaction

- Table E.8 - treatment, business size, interaction

- Table E.9 - treatment, industry, interaction

Table E.1: Analysis of MLEs - Treatment and State

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	1.9462	0.0792	603.9246	<.0001
Group	Email		1	-0.0731	0.0792	0.8531	0.3557
State	B		1	-1.4587	0.1534	90.4617	<.0001
State	C		1	1.5822	0.4746	11.1134	0.0009
State	D		1	-0.2513	0.1012	6.1678	0.0130
State	E		1	-0.2714	0.1151	5.5566	0.0184
State	F		1	-0.0464	0.1579	0.0863	0.7689
State	G		1	-0.0978	0.1199	0.6660	0.4144
State	H		1	0.2655	0.1383	3.6824	0.0550
State	I		1	-0.2588	0.1299	3.9694	0.0463
State	J		1	1.1951	0.2199	29.5350	<.0001
Group*State	Email	B	1	-0.1325	0.1534	0.7464	0.3876
Group*State	Email	C	1	0.8884	0.4746	3.5040	0.0612
Group*State	Email	D	1	-0.0107	0.1012	0.0113	0.9154
Group*State	Email	E	1	0.0392	0.1151	0.1156	0.7338
Group*State	Email	F	1	0.0668	0.1579	0.1792	0.6721
Group*State	Email	G	1	-0.0135	0.1199	0.0127	0.9102
Group*State	Email	H	1	0.0618	0.1383	0.1997	0.6549
Group*State	Email	I	1	0.2815	0.1299	4.6967	0.0302
Group*State	Email	J	1	-0.0997	0.2199	0.2057	0.6502

Table E.2: Analysis of MLEs - Treatment and Size

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	1.5804	0.0500	998.2783	<.0001
Group	Email		1	-0.0156	0.0500	0.0973	0.7551
Size	2		1	0.6389	0.1110	33.1333	<.0001
Size	3		1	0.4739	0.0973	23.7156	<.0001
Size	4		1	0.3500	0.0904	14.9742	0.0001
Size	5		1	-0.0739	0.0982	0.5660	0.4519
Size	6		1	-0.0967	0.1098	0.7759	0.3784
Size	7		1	-0.5618	0.1229	20.8902	<.0001
Size	8		1	-0.4796	0.1928	6.1865	0.0129
Size	9		1	-0.9746	0.2518	14.9860	0.0001
Group*Size	Email	2	1	-0.0138	0.1110	0.0155	0.9010
Group*Size	Email	3	1	-0.0795	0.0973	0.6681	0.4137
Group*Size	Email	4	1	-0.0440	0.0904	0.2365	0.6267
Group*Size	Email	5	1	0.0331	0.0982	0.1137	0.7359
Group*Size	Email	6	1	-0.0293	0.1098	0.0715	0.7892
Group*Size	Email	7	1	-0.0403	0.1229	0.1073	0.7433
Group*Size	Email	8	1	-0.0512	0.1928	0.0704	0.7907
Group*Size	Email	9	1	0.2851	0.2518	1.2828	0.2574

Table E.3: Analysis of MLEs - Treatment and Industry

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	2.7928	21.2477	0.0173	0.8954
Group	Email		1	0.2853	21.2477	0.0002	0.9893
NAICS2	11		1	-1.6942	21.2525	0.0064	0.9365
NAICS2	21		1	5.9399	199.5000	0.0009	0.9762
NAICS2	22		1	5.5933	296.4000	0.0004	0.9849
NAICS2	23		1	-1.0477	21.2480	0.0024	0.9607
NAICS2	31-33		1	-0.9943	21.2479	0.0022	0.9627
NAICS2	42		1	-1.0339	21.2480	0.0024	0.9612
NAICS2	44-45		1	-0.8704	21.2481	0.0017	0.9673
NAICS2	48-49		1	-0.7538	21.2490	0.0013	0.9717
NAICS2	51		1	-0.9659	21.2490	0.0021	0.9637
NAICS2	52		1	-0.8326	21.2484	0.0015	0.9687
NAICS2	53		1	-0.4438	21.2493	0.0004	0.9833
NAICS2	54		1	-0.8676	21.2480	0.0017	0.9674
NAICS2	55		1	5.1734	190.3000	0.0007	0.9783
NAICS2	56		1	-1.1559	21.2481	0.0030	0.9566
NAICS2	61		1	-1.2278	21.2482	0.0033	0.9539
NAICS2	62		1	-0.9696	21.2479	0.0021	0.9636
NAICS2	71		1	-1.1639	21.2487	0.0030	0.9563
NAICS2	72		1	-1.3133	21.2483	0.0038	0.9507
NAICS2	81		1	-0.5644	21.2483	0.0007	0.9788
Group*NAICS2	Email	11	1	-0.7961	21.2525	0.0014	0.9701
Group*NAICS2	Email	21	1	-6.6200	199.5000	0.0011	0.9735
Group*NAICS2	Email	22	1	6.3961	296.4000	0.0005	0.9828
Group*NAICS2	Email	23	1	-0.4861	21.2480	0.0005	0.9817
Group*NAICS2	Email	31-33	1	-0.3699	21.2479	0.0003	0.9861
Group*NAICS2	Email	42	1	-0.2523	21.2480	0.0001	0.9905
Group*NAICS2	Email	44-45	1	-0.4661	21.2481	0.0005	0.9825
Group*NAICS2	Email	48-49	1	-0.6044	21.2490	0.0008	0.9773
Group*NAICS2	Email	51	1	-0.4807	21.2490	0.0005	0.9820
Group*NAICS2	Email	52	1	-0.3175	21.2484	0.0002	0.9881
Group*NAICS2	Email	53	1	-0.1493	21.2493	0.0000	0.9944
Group*NAICS2	Email	54	1	-0.2099	21.2480	0.0001	0.9921
Group*NAICS2	Email	55	1	6.8159	190.3000	0.0013	0.9714
Group*NAICS2	Email	56	1	-0.3497	21.2481	0.0003	0.9869
Group*NAICS2	Email	61	1	-0.3810	21.2482	0.0003	0.9857
Group*NAICS2	Email	62	1	-0.1528	21.2479	0.0001	0.9943
Group*NAICS2	Email	71	1	-0.4016	21.2487	0.0004	0.9849
Group*NAICS2	Email	72	1	-0.5052	21.2483	0.0006	0.9810
Group*NAICS2	Email	81	1	-0.3296	21.2483	0.0002	0.9876

Table E.4: Analysis of MLEs - Treatment and State

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	0.4645	0.0680	46.6848	<.0001
Group	Email		1	0.5644	0.0680	68.9366	<.0001
State	B		1	1.9571	0.3029	41.7489	<.0001
State	C		1	0.4008	0.1730	5.3682	0.0205
State	D		1	0.2373	0.0878	7.3086	0.0069
State	E		1	-0.3106	0.0964	10.3866	0.0013
State	F		1	-0.5161	0.1256	16.8906	<.0001
State	G		1	0.2538	0.1002	6.4232	0.0113
State	H		1	-0.4938	0.1006	24.1156	<.0001
State	I		1	0.0927	0.1115	0.6913	0.4057
State	J		1	0.3412	0.1197	8.1264	0.0044
Group*State	Email	B	1	-0.6442	0.3029	4.5239	0.0334
Group*State	Email	C	1	0.3621	0.1730	4.3814	0.0363
Group*State	Email	D	1	0.0131	0.0878	0.0222	0.8817
Group*State	Email	E	1	-0.1165	0.0964	1.4625	0.2265
Group*State	Email	F	1	0.1803	0.1256	2.0615	0.1511
Group*State	Email	G	1	-0.0264	0.1002	0.0697	0.7918
Group*State	Email	H	1	-0.0040	0.1006	0.0016	0.9684
Group*State	Email	I	1	0.0687	0.1115	0.3801	0.5376
Group*State	Email	J	1	0.3323	0.1197	7.7046	0.0055

Table E.5: Analysis of MLEs - Treatment and Size

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	0.8702	0.0665	171.2056	<.0001
Group	Email		1	0.3426	0.0665	26.5342	<.0001
Size	2		1	-0.7348	0.0951	59.6980	<.0001
Size	3		1	-0.5296	0.0911	33.8101	<.0001
Size	4		1	-0.3745	0.0884	17.9467	<.0001
Size	5		1	0.2115	0.1062	3.9644	0.0465
Size	6		1	0.3954	0.1213	10.6250	0.0011
Size	7		1	0.9292	0.1786	27.0567	<.0001
Size	8		1	0.4814	0.2437	3.9004	0.0483
Size	9		1	0.6930	0.4086	2.8770	0.0899
Group*Size	Email	2	1	0.5163	0.0951	29.4713	<.0001
Group*Size	Email	3	1	0.4570	0.0911	25.1757	<.0001
Group*Size	Email	4	1	0.2756	0.0884	9.7200	0.0018
Group*Size	Email	5	1	-0.3821	0.1062	12.9367	0.0003
Group*Size	Email	6	1	-0.4142	0.1213	11.6618	0.0006
Group*Size	Email	7	1	-0.4428	0.1786	6.1430	0.0132
Group*Size	Email	8	1	-0.00261	0.2437	0.0001	0.9914
Group*Size	Email	9	1	-0.5708	0.4086	1.9516	0.1624

Table E.6: Analysis of MLEs - Treatment and Industry

Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept			1	0.5340	0.0592	81.3708	<.0001
Group	Email		1	0.6245	0.0592	111.2899	<.0001
NAICS2	21		1	0.3052	0.5472	0.3111	0.5770
NAICS2	22		1	0.7847	0.5871	1.7863	0.1814
NAICS2	23		1	-0.2904	0.1203	5.8323	0.0157
NAICS2	31-33		1	0.2486	0.1001	6.1722	0.0130
NAICS2	42		1	-0.1139	0.1178	0.9353	0.3335
NAICS2	44-45		1	-0.1060	0.1204	0.7748	0.3787
NAICS2	48-49		1	-0.0949	0.1760	0.2909	0.5896
NAICS2	51		1	-0.0682	0.2022	0.1139	0.7358
NAICS2	52		1	-0.0404	0.1529	0.0699	0.7915
NAICS2	53		1	-0.6689	0.1839	13.2326	0.0003
NAICS2	54		1	0.1531	0.1168	1.7186	0.1899
NAICS2	55		1	0.6046	0.3565	2.8772	0.0898
NAICS2	56		1	-0.1732	0.1266	1.8731	0.1711
NAICS2	61		1	0.2687	0.1579	2.8984	0.0887
NAICS2	62		1	-0.1961	0.0978	4.0185	0.0450
NAICS2	71		1	0.2438	0.2177	1.2545	0.2627
NAICS2	72		1	-0.00890	0.1768	0.0025	0.9598
NAICS2	81		1	-0.2954	0.1259	5.5060	0.0190
NAICS2	99		1	0.2960	0.1466	4.0757	0.0435
Group*NAICS2	Email	21	1	0.8337	0.5472	2.3215	0.1276
Group*NAICS2	Email	22	1	0.1345	0.5871	0.0525	0.8187
Group*NAICS2	Email	23	1	0.1570	0.1203	1.7043	0.1917
Group*NAICS2	Email	31-33	1	-0.1543	0.1001	2.3782	0.1230
Group*NAICS2	Email	42	1	0.0163	0.1178	0.0192	0.8897
Group*NAICS2	Email	44-45	1	0.1739	0.1204	2.0874	0.1485
Group*NAICS2	Email	48-49	1	-0.3479	0.1760	3.9086	0.0480
Group*NAICS2	Email	51	1	-0.1587	0.2022	0.6164	0.4324
Group*NAICS2	Email	52	1	0.2682	0.1529	3.0770	0.0794
Group*NAICS2	Email	53	1	0.2576	0.1839	1.9625	0.1612
Group*NAICS2	Email	54	1	-0.00198	0.1168	0.0003	0.9864
Group*NAICS2	Email	55	1	-0.2591	0.3565	0.5282	0.4674
Group*NAICS2	Email	56	1	-0.2637	0.1266	4.3420	0.0372
Group*NAICS2	Email	61	1	-0.0629	0.1579	0.1589	0.6902
Group*NAICS2	Email	62	1	-0.2741	0.0978	7.8517	0.0051
Group*NAICS2	Email	71	1	0.3124	0.2177	2.0593	0.1513
Group*NAICS2	Email	72	1	0.1383	0.1768	0.6116	0.4342
Group*NAICS2	Email	81	1	-0.1300	0.1259	1.0657	0.3019
Group*NAICS2	Email	99	1	-0.1059	0.1466	0.5221	0.4700

Table E.7: Analysis of MLEs - Treatment and State

Parameter		DF	Parameter Estimate	Standard Error	Chi-Square	Pr >ChiSq	Hazard Ratio
Group	Email	1	-0.20535	0.02850	51.9003	<.0001	0.814
State	B	1	-0.26320	0.20103	1.7143	0.1904	0.769
State	C	1	0.40394	0.18965	4.5366	0.0332	1.498
State	D	1	0.14715	0.18182	0.6550	0.4183	1.159
State	E	1	-0.00476	0.18354	0.0007	0.9793	0.995
State	F	1	0.27183	0.18798	2.0911	0.1482	1.312
State	G	1	0.31973	0.18354	3.0348	0.0815	1.377
State	H	1	0.00487	0.18411	0.0007	0.9789	1.005
State	I	1	0.17535	0.18539	0.8945	0.3443	1.192
State	J	1	0.32962	0.18560	3.1542	0.0757	1.390

Table E.8: Analysis of MLEs - Treatment and Size

Parameter		DF	Parameter Estimate	Standard Error	Chi-Square	Pr >ChiSq	Hazard Ratio
Group	Email	1	-0.2290	0.0281	66.300	<.0001	0.795
Size	2	1	-0.0989	0.0494	4.0073	0.0453	0.906
Size	3	1	-0.1010	0.0471	4.6008	0.0320	0.904
Size	4	1	-0.1954	0.0462	17.8855	<.0001	0.823
Size	5	1	-0.5061	0.0539	88.0708	<.0001	0.603
Size	6	1	-0.4964	0.0591	70.4550	<.0001	0.609
Size	7	1	-0.5865	0.0744	62.1623	<.0001	0.556
Size	8	1	-0.5778	0.1112	26.9994	<.0001	0.561
Size	9	1	-0.5513	0.1662	11.0056	0.0009	0.576

Table E.9: Analysis of MLEs - Treatment and Industry

Parameter		DF	Parameter Estimate	Standard Error	Chi-Square	Pr >ChiSq	Hazard Ratio
Group	Email	1	-0.20503	0.02815	53.0397	<.0001	0.815
NAICS2	21	1	0.29523	0.29155	1.0254	0.3112	1.343
NAICS2	22	1	0.44136	0.32033	1.8984	0.1683	1.555
NAICS2	23	1	0.17893	0.23501	0.5797	0.4464	1.196
NAICS2	31-33	1	0.05674	0.23265	0.0595	0.8073	1.058
NAICS2	42	1	0.10962	0.23489	0.2178	0.6407	1.116
NAICS2	44-45	1	0.15356	0.23483	0.4276	0.5132	1.166
NAICS2	48-49	1	0.05379	0.24456	0.0484	0.8259	1.055
NAICS2	51	1	0.26565	0.24791	1.1482	0.2839	1.304
NAICS2	52	1	0.29334	0.23839	1.5141	0.2185	1.341
NAICS2	53	1	0.08662	0.24380	0.1262	0.7224	1.090
NAICS2	54	1	0.21781	0.23425	0.8645	0.3525	1.243
NAICS2	55	1	-0.04303	0.27767	0.0240	0.8769	0.958
NAICS2	56	1	-0.09470	0.23650	0.1603	0.6888	0.910
NAICS2	61	1	-0.05632	0.23956	0.0553	0.8141	0.945
NAICS2	62	1	-0.01819	0.23295	0.0061	0.9378	0.982
NAICS2	71	1	0.02417	0.24678	0.0096	0.9220	1.024
NAICS2	72	1	-0.04802	0.24225	0.0393	0.8429	0.953
NAICS2	81	1	0.19925	0.23634	0.7108	0.3992	1.220
NAICS2	99	1	0.11970	0.23793	0.2531	0.6149	1.127

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