Experimenting with contact strategies to aid adaptive design in business surveys

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Abstract: The U.S. Census Bureau conducted a series of experiments to evaluate alternative contact strategies for use in the upcoming 2017 Economic Census. We hoped to identify effective mail strategies that increase timeliness of response and reduce the number of cases receiving more-costly follow-ups, especially those involving telephone contacts. These experiments were incorporated into the collection of several inter-census (annual and quarterly) business surveys. This paper summarizes results from five experiments and discusses their potential for application in adaptive design approaches for business surveys.

Key Words: establishment survey, contact strategies, mail experiment

1. Introduction

The Census Bureau conducts the Economic Census (EC) every five years for reference years ending in -2 and -7. Non-farm employer businesses are asked to report a variety of financial and operational data for every establishment, which is defined as a discrete location where business activities take place and for which records are maintained. Among its more prominent uses, results from the EC are used to update the sampling frame and provide benchmarks for the inter-census surveys, to produce County Business Patterns and other data products, and as inputs to estimates of U.S. Gross Domestic Product and National Income and Product Accounts produced by the Bureau of Economic Analysis.

The 2017 EC is being re-engineered with regard to select data items and collection procedures. The most significant change in collected data is the expanded collection of product sales (which includes both goods and services) across all industry sectors, based on the North American Product Classification System. In addition, a new online data collection system is in development, and with this new system, the Census Bureau will no longer provide paper questionnaires as a response mode for its business data collections. In consideration of these changes, we decided to evaluate current and new contact strategies to maximize business participation in the 2017 EC by conducting experiments using the inter-census surveys.

Our review of the literature found much research on contact strategies with household surveys, but examples of business survey contact strategy research are fewer. Most of the research we found involved increasing the number of contacts and/or increasing the frequency of contacts, e.g., adding advance or reminder contacts and accelerating the mailout of reminders (Chun and Robertson (1995), Claveau and Turmelle (2012), Crawford et al. (2001), Franklin et al. (2007), Groves et al. (1997), Hughes and Tancreto (2015), Kaplowitz et al. (2004), Matthews (2012), Reiser (2013), Shih and Fan (2008),

[1] Any views expressed are those of the author and not necessarily those of the U.S. Census Bureau.

Tancreto 2012, Tuttle et al. 2010, Zotti et al. 2016)). These studies generally indicate that increasing the number and frequency of contacts has a positive effect on response, though results are varied with regard to which types and combinations of contacts were found to be effective.

A smaller body of research suggests that the messages contained in mail contacts may positively affect survey participation. Landreth (2002) found that one of the more persuasive types of information that respondents seek in survey requests addresses how their data will be used. More recent research with household respondents corroborates this finding (Eggleston et al. (2016); Fulton et al. (2016)). In research with a business labor survey, Groves et al. (1997) found some indication that the communications containing the greatest amount of information about the survey and the surveying agency achieved higher cooperation as firm size increased. Hedlin et al. (2008) conducted a study on an establishment survey in which similar messages were sent to respondents. Although there was no demonstrable effect on response rates, they found in a post-survey follow-up that respondents who received results from past surveys were more likely to find the survey useful. These examples support Groves and Couper's (1998) and Dillman et al.'s (2009) assertions that survey participation can be enhanced by raising the perceived benefit of the survey and the uses to which results are applied.

However, household survey research at the Census Bureau (Dillman et al. 1996) found that more detailed messages about the benefits of survey participation did not significantly improve response, and that response was most significantly improved simply by printing a statement that response is required by law on the envelope. Leslie et al. (2004) and Barth et al. (2016) found similar results in mail tests for the American Community Survey. Tulp et al. (1991) found that communicating the mandatory nature also improved response to a business survey (though it is not clear how the mandatory status of the survey was communicated).

Based on our review of the literature, we identified several strategies to test in an initial round of experiments. Generally, these strategies are:

- Sequence – Increasing the number and/or frequency of contacts
- Messages – Presenting information about surveys that increases their perceived value and reduces the perceived cost of participation.
- Envelope appearance and labeling

We designed experiments to test one or more variations of these strategies using several annual surveys and one quarterly survey. The next sections provide an overview of the experimental methods and summarize the results from the individual experiments.

1.1 Methodology

In each experiment, cases were assigned randomly to experimental groups. This was accomplished by sorting lists of cases by Employer Identification Number (EIN) or a survey control number, which are assumed to be random, and systematically assigning them to the groups in each experiment. The resulting samples were tested to ensure balance with regard to certain factors (where applicable):

- Survey units sampled with certainty vs. non-certainty, which is based on each unit's impact on survey estimates;
- Prior year response status (response vs. nonresponse);
- Industry sub-groups with variations in types of data collected

In most experiments, small numbers of special cases were excluded from assignment to the experiment groups because of special efforts to facilitate their response on the part of the survey programs. These include:

- Businesses with special mailing arrangements for multiple reporting units;
- Cases assigned to staff who provide personal assistance for companies with the greatest impact on estimates;
- Business locations with new or reactivated EIN's (does not apply to SQ-CLASS – see below).

The balance testing and exclusion of special cases was intended to control for differences between groups that may bias the results of the experiments.

The measures used to evaluate the experiments variously included check-in (return) rates, unweighted response rates, and mean time to respond based on responses or check-ins. Check-in rates represent the percentage of cases that provided a response, while response rates represent the percentage of cases that provided a valid response. Different measures of response were used by researchers working somewhat independently and using their own discretion. Analytical methods included logistic regression and analysis of variance.

The typical contact strategies of these surveys in which the experiments were conducted include mail and telephone contacts. Companies are initially mailed a survey invitation, and nonrespondents are mailed one or more post-due-date follow-up reminders. These mail contacts are in the form of letters containing information about the survey (including legal authority and reporting requirements), due dates, and information for accessing an electronic reporting instrument. Telephone nonresponse follow-ups (TFU) usually occur after the final mailed follow-up reminder. TFU cases are prioritized on the basis of their impact on estimates, and randomness of their assignment to experiment groups is assumed because of the balance testing noted above. The control groups in each experiment received the usual contacts, and the treatment groups received the usual contacts except as noted.

With one exception (described later), all of the surveys used for these experiments select multi-year samples. Thus the experiments were conducted with businesses that had been sent the survey requests before, though not necessarily to the same respondents or to the same contact persons within the businesses.

2. Results

2.1 Contact Strategy #1: Sequence

We conducted two experiments involving enhanced mail contact sequences, with control groups receiving the regular contact sequences.

2.1.1 Sequence Experiment #1: Business Professional and Classification Survey[2]

The first sequence experiment was conducted with the Business Professional and Classification Survey (SQ-CLASS)[3] which is a quarterly survey of businesses in the service sector industries with new or reactivated EIN's ("births"). SQ-CLASS requests

[2] Originally presented by Hernandez et al. at the 2016 American Association of Public Opinion Research Conference.

[3] For more information about SQ-CLASS: https://bhs.econ.census.gov/bhs/sqclass/about.html

information necessary to classify the industry for new locations and incorporate them into the sampling frames of the Bureau's other service sector surveys. An important feature of this survey is that it is often completed by respondents who do not have prior experience with the Census Bureau's business surveys. This is important because larger companies are frequently sampled for multiple surveys (certainty cases), and the Census Bureau's business surveys' samples are generally longitudinal, with samples being used for multiple collection cycles; as a result, respondents often develop reporting routines to make response preparation more efficient in subsequent survey cycles (Willimack and Nichols (2010); Willimack et al. (1999)). Therefore, the SQ-CLASS experiment offered an opportunity to evaluate the contact strategy with companies likely not to be biased by prior survey experience.

The SQ-CLASS experimental treatment involved the addition of a pre-due-date reminder letter, which was mailed about three weeks before the survey due date. This letter is very similar in content and appearance to the initial letter and other follow-up reminder letters. The sample consisted of 15,369 presumed businesses which were nonrespondents as of the creation of the pre-due-date reminder mail file; 4,640 were randomly assigned to the treatment group, and 10,729 to the control group.

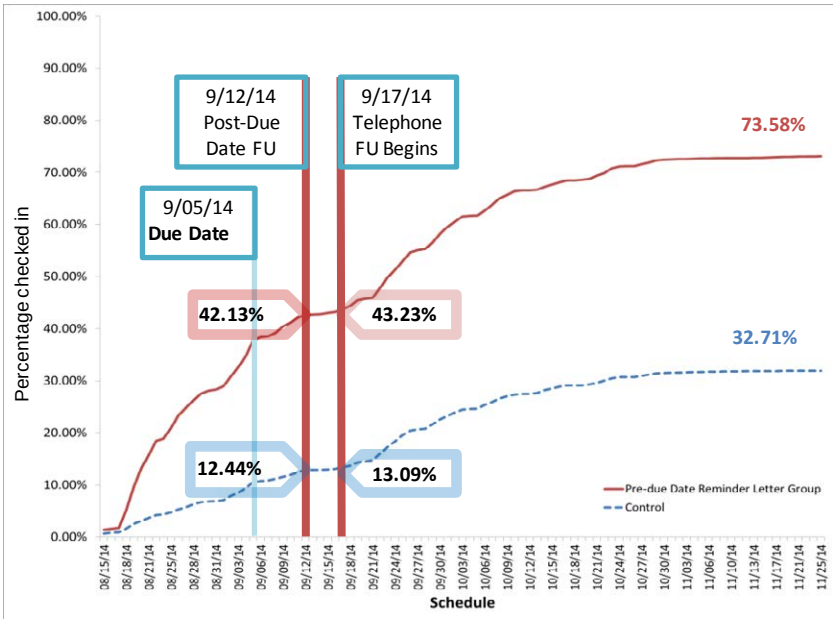

Figure 1: Cumulative check-ins (%) for nonrespondents receiving the pre-due-date reminder letter compared to the control group (SQ-CLASS) Percentage checked in

Figure 1 shows the cumulative check-in rates for the two experimental groups. Check-in rates for both groups increased as they approached the due date, but the check-in rate for the group receiving the pre-due-date reminder quickly became significantly higher than that of the control group, and remained so throughout the collection period. Table 1 presents the regression test results for check-ins as of the due date at the start of telephone follow-up, and Table 2 presents the results for responses at the end of collection. Comparison of mean check-in rates shows that respondents that received the pre-due date reminder letter checked-in in significantly fewer days on average (mean=42.2) than those that did not receive the extra letter (mean = 49.9; $F_{DF=1}$=199.47; p<.0001). Comparison of mean numbers of nonresponse follow-up telephone calls to businesses shows that

respondents that received the pre-due date reminder letter received significantly fewer calls on average (mean=1.8) than those that did not receive the extra letter (mean=2.2; $F_{DF=1}$=116.73; p<.0001).

Table 1: Effects of reminder letter before post-due-date mail follow-up, and before telephone follow-up (check-ins) (SQ-CLASS)

	DF	Wald Chi-Square	Pr > ChiSq
Before Post-Due-Date Mail Follow-up (check-ins)	1	1534.637	<.0001
Before Telephone Follow-up (check-ins)	1	1547.831	<.0001

Table 2: Effect of reminder letter on final response (SQ-CLASS)

	DF	Wald Chi-Square	Pr > ChiSq
Final response	1	1952.4897	<.0001

2.1.2 Sequence Experiment #2: 2014 Annual Retail Trade Survey[4]

The second sequence experiment was conducted with the 2014 Annual Retail Trade Survey (ARTS), which is a survey of businesses engaged in retail and accommodations (food service, hotels, etc.) industries.[5] This experiment involved a factorial design in which the experimental groups were mailed, respectively, a pre-due-date reminder (about two weeks before the due date), an accelerated post-due-date reminder (mailed about two weeks earlier than the usual reminder, for the first reminder only), and both the pre-due-date and accelerated follow-up reminders. The control group received only the typical mail sequence, and all groups were subject to TFU. All groups received only a letter at each mailout.

Figure 2 shows the cumulative unweighted responses for each of the four experiment groups. The thickness of the bands represent 90% confidence intervals. Just prior to the due date (DD), responses from the groups that received the pre-due-date reminder (PDD) started to accumulate more quickly than for the other two groups. Similarly, responses from the groups that received the accelerated follow-up (AFU) began to increase more quickly from those did not receive that treatment. The normal follow-up mailing (FU) groups began to increase at approximately the same interval after the follow-up was sent as the AFU group. The final unweighted response rates from all three experimental treatment groups were significantly higher than that of the control group (Langeland et al. 2016).

[4] Originally presented by Langeland and Tuttle at the 2016 International Conference on Establishment Surveys.

[5] For more information about ARTS: https://bhs.econ.census.gov/bhs/arts/about.html

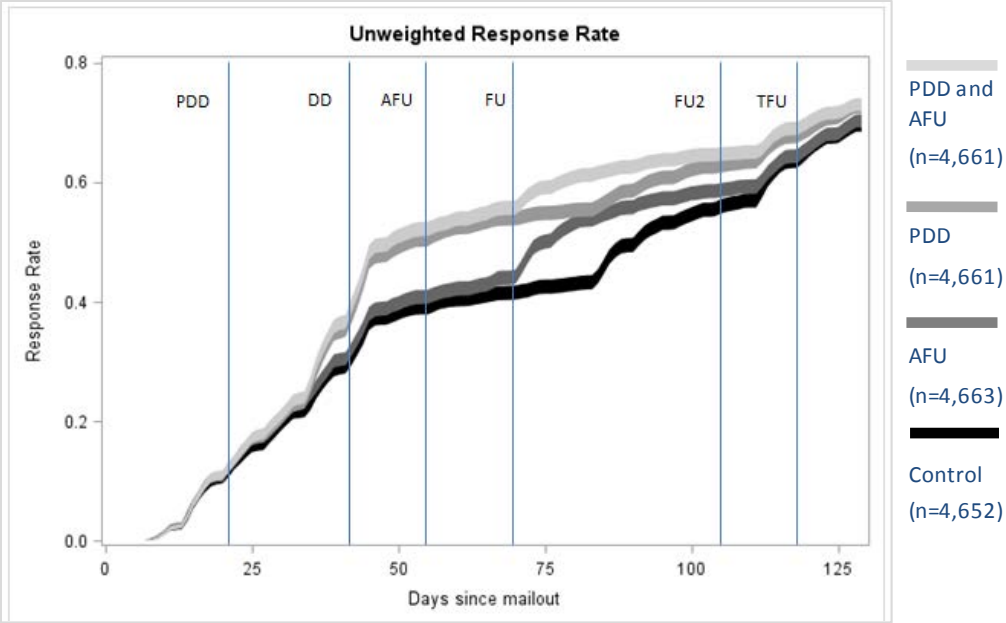

Figure 2: Cumulative unweighted response for 2014 ARTS experiment groups

2.2 Contact Strategy #2: Messages

We conducted an experiment to test alternative messages, which were included as flyers accompanying the usual survey letters.

2.2.1 Message Experiment: 2015 Services Annual Survey[6]

The Services Annual Survey (SAS) collects details of revenues, expenses, and other financial information on an annual basis from businesses in the service sector.[7] In this experiment, we compared the effects of flyers with various messages intended to enhance the perceived value of the survey or reduce the perceived cost of participation. This experiment was intended to test the hypothesis that respondents who are directly exposed to information about the survey's results or the important uses of the results would place a higher value on the survey and on their cooperation with the survey, with detectable effects on timeliness and overall response.

The first flyer (Figure 7) presented information about SAS, including key uses and users of SAS data products, and a colorful table showing total annual revenues for six industries collected by the survey over the preceding 11 years. This flyer was intended to convey the impression that SAS serves as an important source of information used by businesses, trade associations, journalists, and other government agencies. The chart showing changes in the selected industries' revenues over time, including the economic downturn during the 2008 recession, was intended to capture respondents' attention and tell a story about the economic fortunes of the service sector, a story made possible by SAS and businesses' participation in the survey.

The second flyer (Figure 8) advertised the Census Business Builder tool, an application on the Census Bureau's website intended to be used by people looking to open or expand a business. The tool allows users to create customized reports containing summary

[6] Tolliver and Langeland (2016) internal report
[7] For more information about SAS: https://bhs.econ.census.gov/bhs/sas/index.html

economic and demographic data for any desired geographic areas for which the Census Bureau publishes statistics. The flyer does not refer to SAS specifically, but states that the Business Builder tool and other Census Bureau data products rely on "the participation of businesses like yours in our surveys." The use of this flyer was intended to see if respondents would associate their survey participation with the broader mission of the Census Bureau and its contribution to society.

The third flyer (Figure 9) presented information about electronic reporting, with illustrations showing the steps for accessing the online reporting system, and listing some of the burden-reducing features of the instrument. As a more informative and visually appealing version of other ER flyers routinely used in production (which typically lack illustrations, and have very simple formatting), this flyer was included in the experiment to compare messages about the benefits of electronic reporting (i.e., reducing the perceived cost) to those about the benefits of the surveys themselves (i.e., enhancing the perceived value).

Each experimental group was assigned one of three flyers in addition to a standard letter. The control group received only a standard letter. Each group received the same package for initial request and follow-up reminders. All three flyers were printed in color and contained illustrations as well as text.

We provide comparisons at day 40 (four days after the due date), and at day 100, the latest date for which data were available at the time of analysis. Figure 3 shows no overall difference between the experimental groups, even when examining prior respondents and prior nonrespondents separately (the thickness of the bands represent 90% confidence intervals). However, results from regression analysis with prior respondents (Table 3) show small but statistically significant differences. Most of the observable differences are associated with Flyer 3. Overall, Flyer 3 appears to be associated with response that is 1.2% lower than the no-flyer treatment across all industry subgroups at day 40, though the difference is no longer significant at day 100.

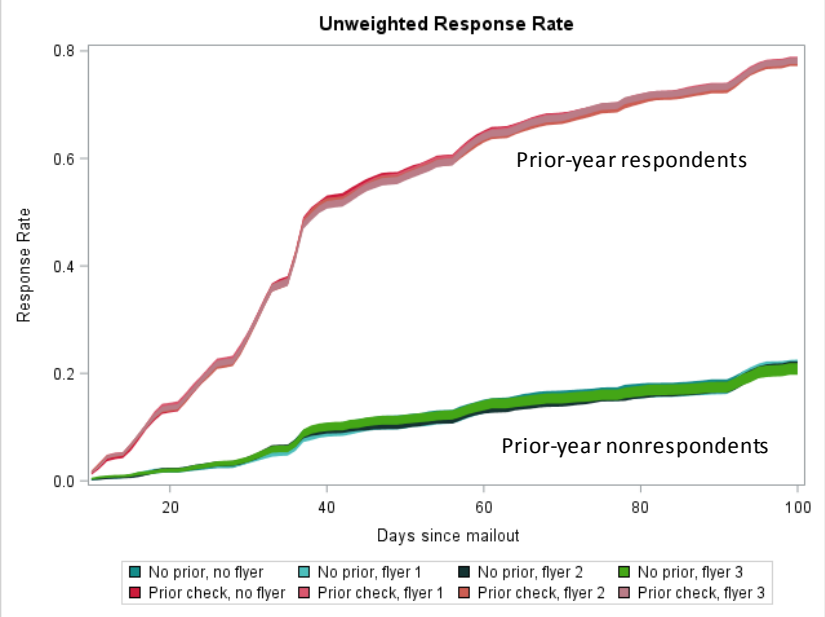

Figure 3: Unweighted responses, stratified by prior response status (2015 SAS)

Table 3: Effects of flyers by industry sub-group at day 40 and day 100; unweighted responses from cases that responded in the prior year (2015 SAS)

Analysis of Maximum Likelihood Estimates	Day 40			Day 100		
Parameter	Estimate	Change in Pr(Resp) wrt to Reference	Pr> ChiSq	Estimate	Change in Pr(Resp) wrt to Reference	Pr> ChiSq
Intercept	0.009	0.00	0.4966	1.179**	0.145	<.0001
Finance[1]	0.226**	0.056	<.0001	-0.260**	-0.050	<.0001
Healthcare[1]	-0.068**	-0.017	0.0002	0.070**	0.012	0.0013
Information[1]	-0.068*	-0.017	0.0219	0.003	0.000	0.9372
Transportation[1]	-0.071*	-0.018	0.0067	0.043	0.008	0.1625
Flyer1[2]	0.016	0.004	0.4285	0.016	0.003	0.516
Flyer2[2]	0.030	0.007	0.1457	-0.006	-0.001	0.7975
Flyer3[2]	-0.046*	-0.012	0.0233	-0.017	-0.003	0.4793
Certainty	0.089**	0.022	<.0001	0.046**	0.008	0.0001
Finance×Flyer1[3]	0.060	0.015	0.181	0.064	0.011	0.2099
Finance×Flyer2[3]	0.060	0.015	0.1837	0.054	0.010	0.2806
Finance×Flyer3[3]	-0.127*	-0.032	0.0046	-0.127 **	-0.024	0.0098
Healthcare×Flyer1[3]	0.004	0.001	0.9088	0.036	0.006	0.3487
Healthcare×Flyer2[3]	-0.077*	-0.019	0.015	-0.031	-0.006	0.4202
Healthcare×Flyer3[3]	0.087**	0.022	0.0063	0.088*	0.015	0.021
Information×Flyer1[3]	0.039	0.010	0.4478	-0.029	-0.005	0.6342
Information×Flyer2[3]	0.012	0.003	0.8065	-0.003	-0.001	0.9616
Information×Flyer3[3]	0.002	0.000	0.9741	-0.024	-0.004	0.6876
Transportation×Flyer1[3]	-0.071	-0.018	0.1169	-0.049	-0.009	0.3587
Transportation×Flyer2[3]	0.034	0.008	0.4531	0.001	0.000	0.9904
Transportation×Flyer3[3]	-0.008	-0.002	0.852	0.039	0.007	0.4702

[1]Reference group = all other sectors combined. [2] Reference group = control (no flyer) treatment.
[3] Reference group = all-other-sectors group and no-flyer treatment. * p<.05. **p<.01

In addition, Table 3 shows several statistically significant interaction effects of the various flyers between different industry sub-groups. For instance, the effect of Flyer 3 on response rate varies by industry sub-group. It appears to exacerbate slightly the negative effect in Finance, while offsetting it in Healthcare, relative to its effect in the reference group. However, the effect appears to diminish somewhat by day 100. A statistically significant interaction effect found for Flyer 2 appears to slightly diminish response rates in the Healthcare industry, relative to the reference group, and disappears by day 100.

2.3 Contact Strategy #3: Appearance of the Envelope

We conducted two experiments to evaluate differences in the appearance of the envelope.

2.3.1 Envelope Experiment #1: 2014 Annual Wholesale Trade Survey[8]

The Annual Wholesale Trade Survey (AWTS) is an annual survey of businesses in the wholesale trade sector, collecting sales, purchases, inventories, and expenses.[9] In the 2014 AWTS experiment, we compared the use of red ink to the standard black ink in an imprinted due date/past due notice on the envelope (see Figure 4). These treatments were applied in the initial mail and all follow-up reminders.

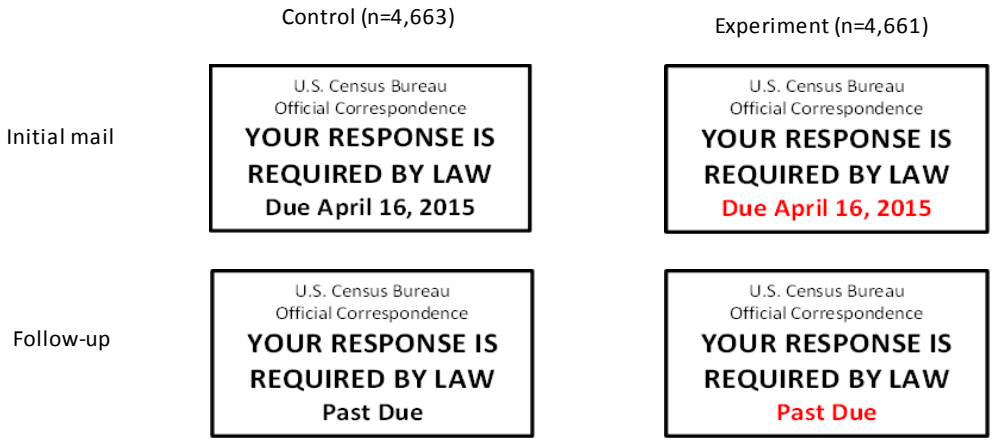

Figure 4: Imprinted messages on 2014 AWTS envelopes

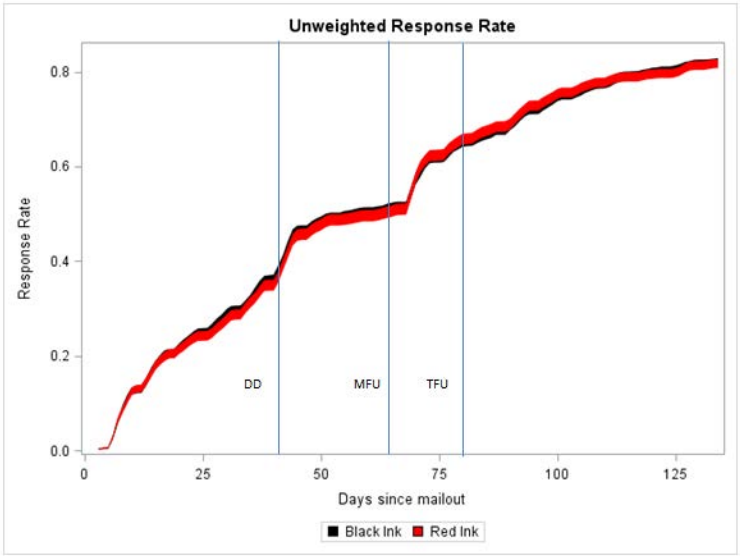

Figure 5: Unweighted responses (2014 AWTS)

Figure 5 shows no apparent difference in unweighted response rates overall between the two treatments (Wald $\chi^2_{DF=1}=1.2587$; p=0.26). However, analysis revealed a statistically significant interaction effect, whereby the red ink treatment appeared to increase response rates among cases that were nonrespondents in the prior collection cycle (Wald

[8] Originally presented by Langeland and Tuttle at the 2016 International Conference on Establishment Surveys.
[9] For more information about AWTS: https://bhs.econ.census.gov/bhs/awts/about.html

$\chi^2_{DF=1}$=4.3499; p=0.04). In addition, another statistically significant interaction showed that the effect of the red ink on response rates differed among wholesale industry sub-groups (Wald $\chi^2_{DF=2}$=4.9136; p=0.09). The red ink appeared to increase response rates among the industry sub-group Agents, Brokers, and Electronic Markets relative to other types of wholesalers.

2.3.2 Envelope Experiment #2: 2015 Annual Retail Survey (ARTS)[10]

In the 2015 ARTS, we compared two sizes of envelope. The idea for this experiment was the result of a recommendation from past EC respondents participating in focus groups to evaluate outreach strategies, who suggested a larger envelope might be more effective in getting respondents' attention. In this experiment, the treatment group received initial and follow-up mailings in half-page-sized envelopes (9.5"x6"); the control received initial and follow-up mailings in standard letter-sized envelopes (9.5"x4"). Figure 6 shows minimal differences in check-in rates between the two treatments, which reached statistical significance only at the due date (p=0.021). We also found a statistically significant difference in mean days from mailout to check-in, with the red ink group checking in on average in 36.7 days, compared to 36.12 days for the control group ($F_{DF=1}$=4.37; p=0.04). However, this difference of less than one day has little value in practice.

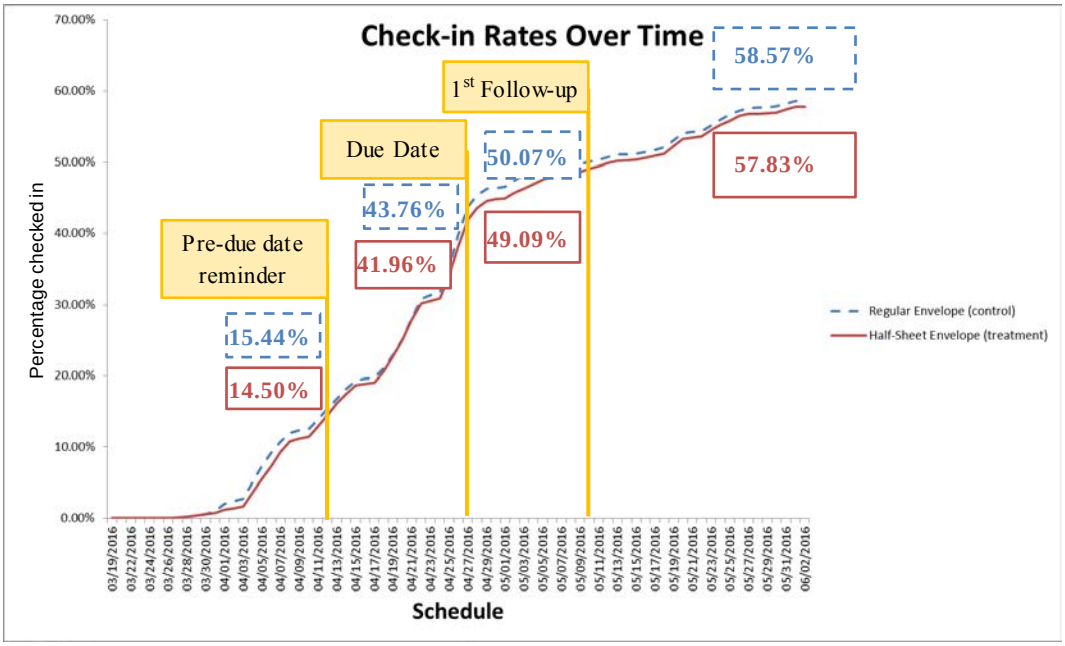

Figure 6: Check-in rates for 2015 ARTS

2.4 Limitations

These experiments were conducted within multi-year survey samples (except SQ-CLASS, which samples births). As noted above, research has shown that business survey respondents in longitudinal samples develop reporting routines (Willimack and Nichols (2010); Willimack et al. (1999)) which may have overshadowed the interventions attempted in these experiments. As such, many of the respondents who received our experimental treatments may be accustomed to receiving the

[10] Hernandez (2016) internal report

survey requests and response processes somewhat "routinized." New-to-sample respondents and gatekeepers may react differently.

3. Discussion

3.1 Sequence Experiments

In evaluating the three types of strategies tested across the six experiments, the greatest success clearly came from increasing the number and frequency of contacts. Both experiments showed a significant improvement in timeliness of response and overall response in the treatments groups receiving the additional reminder before the due date. The 2014 ARTS experiment also showed a benefit from accelerating post-due-date reminders, and from combining these two strategies. This latter finding corroborates other research indicating the existence of an additive effect from multiple contacts in a sequence (Dillman et al. 2009, p. 253). The success of these experiments has resulted in the implementation of pre-due-date reminders and accelerated follow-ups in the Census Bureau's business surveys, and their planned implementation for the 2017 EC.

The results of the ARTS sequence experiment suggest that there is an optimal interval between contacts. In designing a sequence of contacts, an optimal strategy should leave enough time for one contact to obtain its full effect before the next one is sent (ibid, p.251). This point deserves careful consideration and would benefit from further research, as response to establishment surveys often requires a significant amount of time and effort compared to typical household surveys. Business surveys generally request information contained in records, requiring respondents to query databases and identify and coordinate participation from specialized data providers, in the context of competing priorities and responsibilities. The challenge for the surveyor is identifying optimal intervals between contacts such that respondents are contacted often enough that they remember the prior contact, but not so often that they do not have enough time to prepare their response or become annoyed.

This point is of special significance to a collection like the EC, for which the burden associated with response can vary greatly due to differences in company size, organizational complexity, scope of activity with regard to industry classification, etc. Smaller, simpler, and more homogeneous companies may not require as much time to respond, and so may react favorably to more-frequent contacts than larger and more diverse companies. The same may hold true for less-complicated surveys, perhaps regardless of company size. The combination of variables related to survey and business complexity make it unlikely that a "one-size-fits-all" optimal interval between contacts can be found.

3.2 Message Experiment

Overall, the test of messages in survey communications showed modest success. Messages promoting ER were associated with overall reduced responses, and produced opposite results in two industry sub-groups in the SAS experiment. It should be noted that the Finance industry sub-group tends to report earlier than the other groups identified in the experiment (based on the higher response propensity at day 40 compared to day 100), and in this context the ER flyer may have interfered with otherwise-effective response processes. By contrast, the later-reporting Healthcare sub-group reacted positively to the ER flyer at both points in time, suggesting receptiveness to encouragement toward timelier reporting.

3.3 Envelope Experiments

Printing the survey due date and "past due" in red ink did not improve survey response overall, but did increase response from prior-year nonrespondents and, rather modestly, from one industry sub-group. Perhaps as significant from a practical standpoint, the red ink did not negatively affect response from prior respondents, so we purport that this strategy may be implemented without threatening already-cooperative respondents.

The envelope-size experiment revealed no improvement in response from larger envelopes, but rather the opposite at one point in time. However, the differences between treatment groups were small and not practically significant, so use of this strategy should not be discouraged out of hand.

3.4 Implications for adaptive design

The Census Bureau's surveys of businesses, unlike its demographic surveys and census, are conducted primarily in one mode (web). Paper-based collection is rapidly being phased out, and collection of data via telephone does not exist except in rare instances. The predominance of one mode of collection means that, unlike typical adaptive designs, it is not possible to achieve gains by maximizing responses from the less-expensive response mode before escalating to a more-expensive one. Instead, it is the mode of communication that can be manipulated to achieve maximum benefit and/or minimal cost. Our experiments indicate promising strategies for getting responses from "reliable" respondents earlier using cheaper mail contacts, which let us focus more expensive strategies (TFU, certified mail) on resistant cases later in collection cycles.

McCarthy et al. (2015) note that establishment surveys conducted by national statistical institutions (NSI's) tend to have an advantage in that the NSI's usually have extensive historical data about their sampling units. This enables them to produce accurate response propensity models based on the past reporting behaviors of many of the same sampling units, and allocate optimal contact strategies in advance of mailout.

One of the challenges we faced in designing and fielding these experiments has to do with the fact that the Census Bureau is a large-scale survey production environment, which involves complex and inter-related processes geared toward gaining economies of scale to maximize efficiency and minimize cost and error. Embedding experiments in these production processes has involved additional work for the operations staff with tight schedules. Every experimental group in each experiment required the creation of additional sampling specifications, programming, and mail files. In addition, more and smaller mail batches required additional quality assurance tests. This additional workload has had to be considered throughout the conduct of the experiments, and the constraints of mailout operations placed some limits on the design of the experiments, especially the multi-factorial designs. In the current operating paradigm, similar limitations would be expected in the implementation of adaptive survey designs involving targeted contact strategies for survey sub-groups. Additional research is needed to identify additional contact strategies that have clear statistical and practical benefits.

4. Recommendations for future research

We recommend future research be conducted to identify effective contact strategies and their optimal implementation. One line of research should continue to look for ways to take advantage of the most evidently successful strategy, variations in the sequence of

survey contacts. We recommend further research especially on the intervals between contacts, the number of contacts, and initial mailout and due dates, to determine optimal strategies. This is likely to vary by survey, so comparable experiments involving different surveys are advisable. In addition, the Census Bureau's planned authentication portal, which will require respondents to create accounts and register valid email addresses, may enable the use of email contacts; future research should evaluate the effectiveness of using emails to supplement and even replace mail contacts.

We believe the results of our experiments indicate the potential for using enhanced messages to increase business survey response. One of the challenges acknowledged by others (Dillman et. al. (2009); Groves and Couper (1998)) is the need to tailor the communication of the benefits of a survey relevant to the individual respondents. The diversity of business survey respondents and their businesses (industry, geography, size of business, etc.) make it unlikely that messages can be developed that are broadly relevant. Our SAS flyers attempted to do this by demonstrating the utility of the survey results to various data users in government, the private sector and news media, and by presenting high-level results for various industries captured by the survey, though with no detectable effects. However, the move toward exclusive use of electronic reporting instruments and the possibility of crafting email messages with embedded HTML raise the possibility of using electronic communications to more easily tailor messages based on known company and industry characteristics. In addition, we recommend that experts in related disciplines (communications, marketing, graphic design, infographics, etc.) be utilized in the creation of more appealing and relevant messages.

Lastly, we recommend that future research attempt to identify relevant business and respondent characteristics not currently contained in survey frames, such as the position or title of respondents within their companies and their roles in survey response, and measures of organizational complexity such as the number and functions of respondents and business units involved in response processes within individual companies. Such measures of organizational complexity may assist with targeting companies in need of additional resources and/or motivation to fulfill their survey requests. For example, Keller et al. (2011) reported that respondents may play active roles in obtaining and reviewing data from other sources in their companies, or they may act as coordinators and "pass-throughs" for data primarily gathered by others, with demonstrable effects on data quality. Distinguishing between late but diligent and reliable respondents from those with less-active roles in response may allow surveyors to focus resources on assisting the latter.

Acknowledgements

This paper summarizes research by Census Bureau staff whose work should be acknowledged: Aryn Hernandez, Kevin Tolliver, Joshua Langeland, Jennifer Beck, Fane Lineback, and Cha-Chi Fan. The author would also like to thank Stephanie Coffey and Benjamin Reist for their support and assistance.

In particular, the author would like to thank Kevin Tolliver for additional analyses not presented in his original report, and Diane Willimack and Fane Lineback for their thoughtful and thorough editorial and methodological review of this paper.

References

Barth, D., Zelenak, M. F., Asiala, M. E., Castro, E., and Roberts, A. (2016) 2015 Envelope Mandatory Messaging Test: Final Report. Suitland, MD: U. S. Census Bureau. Retrieved from https://www.census.gov/content/dam/Census/library/working-papers/2016/acs/2016_Barth_01.pdf

Chun, Y. I., and Robertson, K. W. (1995) The Effects of Advance Letters and Reminder/Thank You Letters on Reducing Nonresponse in an Establishment Survey: An Experimental Study. Proceedings of the Section on Survey Research Methods, Alexandria, VA: American Statistical Association: 1151-1256.

Claveau, J., and Turmelle, C. (2012) An Embedded Experiment to Test Non- Response Follow-Up Strategies when Using Electronic Questionnaires. Paper presented at the Conference of European Statisticians, Paris, France.

Crawford, Scott D., Mick P. Couper, and Mark J. Lamias (2001). Web Surveys: Perceptions of Burden. *Social Science Computer Review* 19(2001): 146-162.

Dillman, D. A., Smith, J. D., and Christian, L. M. (2009) Internet, Mail, and Mixed Mode Surveys: the Tailored Design Method. Hoboken, NJ: John Wiley & Sons.

Dillman, D. A., Singer, E., Clark, J. R., and Treat, J. B. (1996) "Effects of Benefits Appeals, Mandatory Appeals, and Variations in Statements of Confidentiality on Completion Rates for Census Questionnaires." Public Opinion Quarterly, 1996 60(3): 376- 389.

Eggleston, C., Childs, J. H., and Nichols, E. (2016) Conjoint Analysis of Survey Invitation Messages: A New Method to Understand What Moves People to Respond. Presented at the Federal CASIC Workshop, Suitland, MD.

Franklin, J. W., Simpson, J. B., Wine, J. S., and Paoli, N. R. (2007). Developing a Contact Strategy to Maximize Self-Administered Web Participation. Presented at American Association for Public Opinion Research Conference, Anaheim, CA.

Fulton, J., Morales, G., and Childs, J. H. (2016) Effects of Messaging to Encourage Response to the American Community Survey. Presented at the American Association of Public Opinion Research Conference, Austin, TX.

Groves, Robert M., David Cantor, Mick Couper, Kerry Levin, Kate McGonagle, Eleanor Singer, and John Van Hoewyk. "Research Investigations in Gaining Participation from Sample Firms in the Current Employment Statistics Program." Proceedings of the Survey Research Methods Section, American Statistical Association: 289-294.

Groves, R. M., and Couper, M. P. (1998) Nonresponse in Household Interview Surveys. Hoboken, NJ: John Wiley & Sons.

Hedlin, D., Lindkvist, H., Bäckström, H., and Erikson, J. (2008) "An Experiment on Perceived Survey Response Burden Among Businesses." Journal of Official Statistics 24.2 (2008): 301-318.

Herndandez, A., Fan, C., and Tuttle, A. (2016) The Effect of a Pre-Due Date Reminder Letter on Nonresponse in a Business Survey. Presented at the American Association of Public Opinion Research Conference, Austin, TX.

Herndandez, A. (2016) 2015 ARTS Contact Strategies Experiment Results (internal report). Suitland, MD: U. S. Census Bureau.

Hughes, T., and Tancreto, J. (2015) Refining the Web Response Option in the Multiple Mode Collection of the American Community Survey. Presented at the European Survey Research Association Conference, Reykjavik, Iceland.

Kaplowitz, M.D., T.D. Hadlock and R. Levine (2004) A Comparison of Web and Mail Survey Response Rates. Public Opinion Quarterly 68(1): 94–101.

Keller, S., Hough, R.S., Falconer, T., Curcio, K. (2011) Characteristics of Large Company Respondents to an Economic Survey." Presented at the 2011 Joint Statistical Meetings, Miami Beach, FL.

Landreth, Ashley (2002) Final report: Results and Recommendations from Cognitive Interviews with Selected Materials from the American Community Survey. Suitland, MD: U. S. Census Bureau. Retrieved from http://www.census.gov/srd/papers/pdf/ssm2003-10.pdf

Langeland, J. and Tuttle, A. D. (2016) Improving Data Collection: Results from Two Contact Strategy Experiments in Economic Surveys. Presented at the Fifth International Conference on Establishment Surveys, Geneva, Switzerland.

Langeland, J. (2016) Improving Data Collection: Results from Two Contact Strategy Experiments in Economic Surveys (internal report). Suitland, MD: U. S. Census Bureau.

Leslie, T. F., Griffin, D. H., McGovern, P. D., and Raglin, D. A. (2004) Measuring the Impact of Questionnaire and Envelope Messages on Respondent Behavior. Presented at the 2004 Joint Statistical Meetings, Toronto, Ontario, Canada.

Marquette, Erica and Diana Vinton (2016) 2014 COS/ASM Multi-unit Contact Strategies Test (internal report). Suitland, MD: U. S. Census Bureau.

McCarthy, J., Wilson, T., and Dau, A. (2015) Adept Adaptations: Developing Alternative Strategies in Adaptive Survey Designs. Presented at the Federal Committee on Statistical Methods Conference, Washington, D. C.

Matthews, B. (2012) 2011 American Community Survey Internet Tests: Results from Second Test in November 2011 (internal report). Suitland, MD: U. S. Census Bureau.

Reiser, C. N. (2013) Internet Response for the Decennial Census—2012 National Census Test. Presented at the American Association of Public Opinion Research Conference, Boston, MA.

Shih, T. and Fan, X. (2008) Comparing Response Rates from Web and Mail Surveys: A Meta-Analysis. Field Methods, 2008 (20) 3: 249-271.

Tancreto, J. (2012) 2011 American Community Survey Internet Tests: Results from First Test in April 2011 (internal report). Suitland, MD: U. S. Census Bureau.

Tolliver, K. and Langeland, J. (2016) Service Annual Survey Contact Strategy Experiment (internal report). Suitland, MD: U. S. Census Bureau.

Tulp, Jr. D.R., C. E. Hoy, G.L. Kusch, and S.J. Cole (1991). Nonresponse under Mandatory vs. Voluntary Reporting in the 1989 Survey of Pollution Abatement Costs and Expenditures (PACE). In JSM Proceedings, Survey Research Methods Section. Alexandria, VA: American Statistical Association: 272-277.

Tuttle, A. D., Pick, K., Hough, R. S., Mulrow, J. M. (2010) Experimenting with Pre-contact Strategies for Reducing Nonresponse in an Economic Survey. In JSM Proceedings, Survey Research Methods Section. Alexandria, VA: American Statistical Association: 5253- 5262.

Willimack, D. K. and Nichols, E. (2010) A Hybrid Response Process Model for Business Surveys. Journal of Official Statistics, 2010 26(1): 3-24.

Willimack, D. K., Nichols, E., and Sudman, S. (1999). Understanding the Questionnaire in Business Surveys. In JSM Proceedings, Survey Research Methods Section. Alexandria, VA: American Statistical Association: 889-94.

Zotti, A., Avenilla, L., Coffey, S., and Walejko, G. (2016) The Effects of Sending a Pre-notice Postcard in a CAPI-conducted Survey. Presented at the American Association of Public Opinion Research Conference, Austin, TX.

Figure 7: 2015 SAS flyer 1

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The Annual Services Report is the only source of estimates of annual revenues for the service industries. Summary data (total revenue and total expenses) are provided at the sector, sub-sector and industry group level. Detailed expense data are published for select sectors and subsectors. Industry specific data, such as product line and source of funding, are provided for select industries. In addition, there are data for select kinds of business by federal income-tax status (taxable and tax-exempt).

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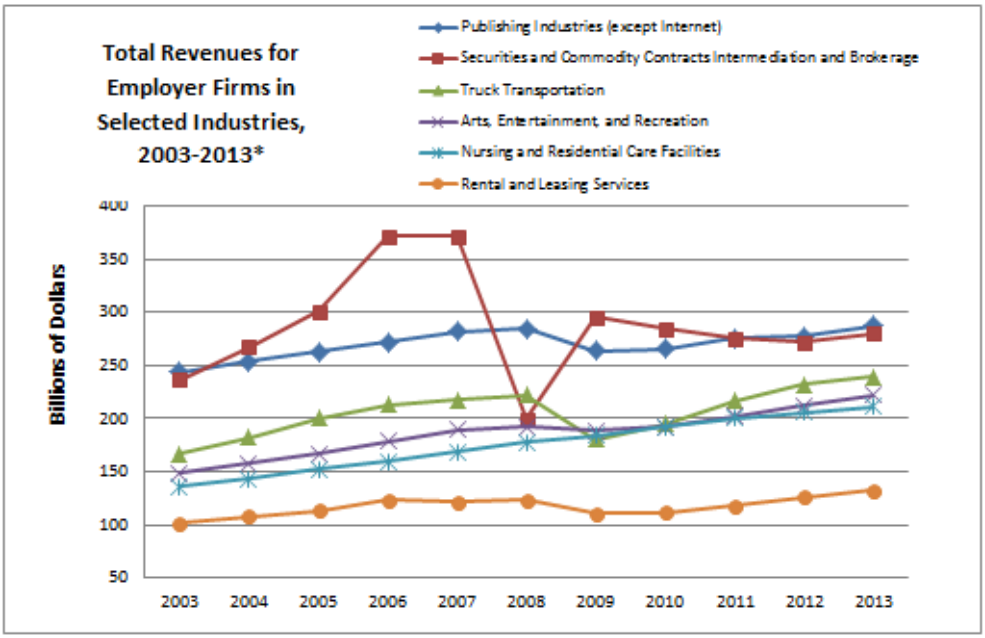

*The data presented in this table are based on estimates released on November 19, 2014. Please note that these estimates will be benchmarked to the 2012 Economic Census and are not considered final. Revised estimates are scheduled for release in early 2016.

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Figure 8: 2015 SAS Flyer 2

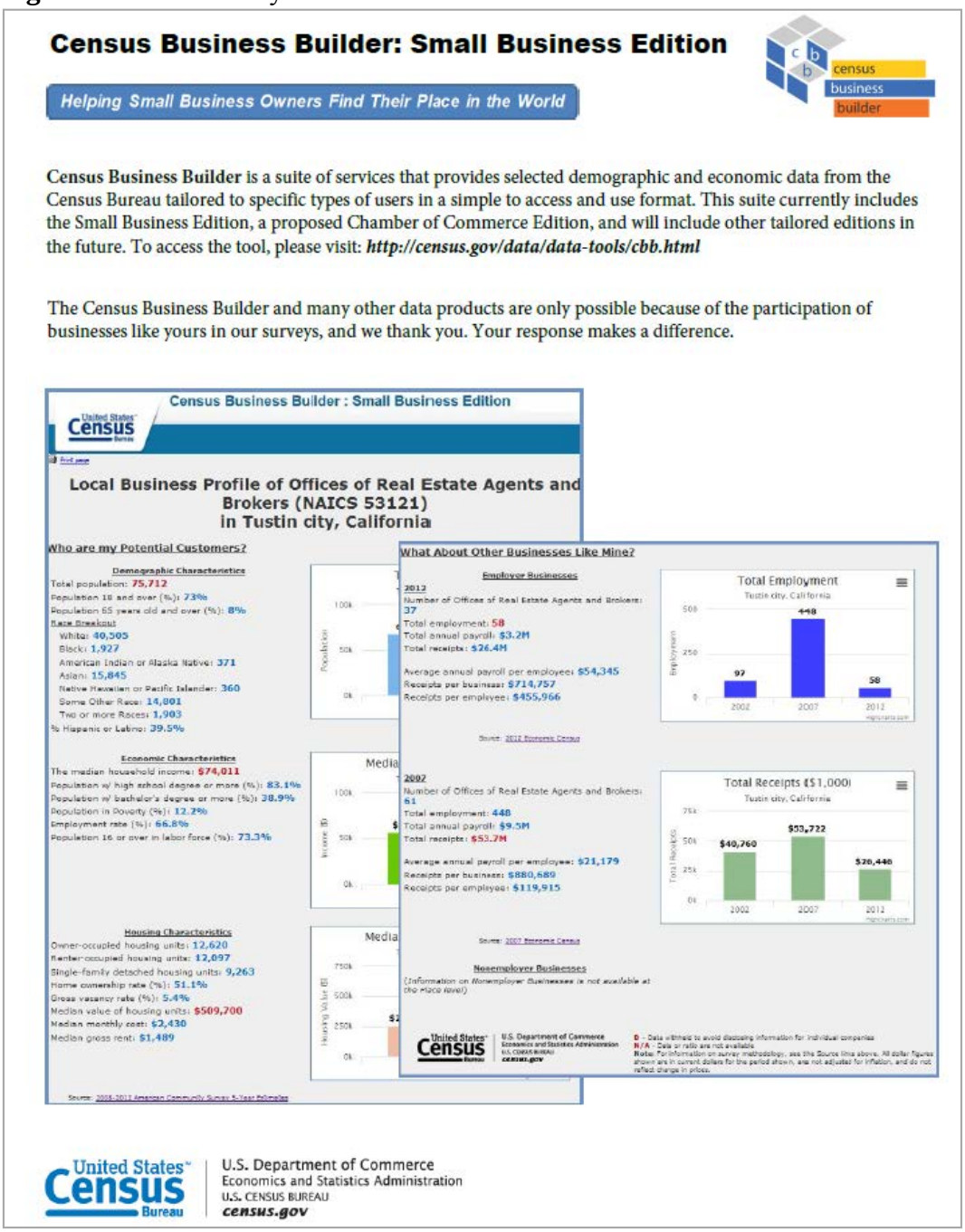

Figure 9: 2015 SAS Flyer 3

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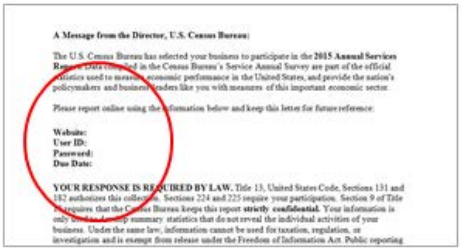

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