

An Examination of Non-Contact as a Source of Nonresponse in a Business Survey

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Abstract: Following the 2003 Industrial Research and Development Survey, a nonresponse followup was conducted by telephone to ascertain reasons for nonresponse. Records were kept for each attempted telephone call to a survey nonrespondent concerning the outcome of the call attempt. The resulting call record data demonstrated that noncontact was a major source of total nonresponse, and that the most prevalent types of noncontact were disconnected telephones, and voice mails. The incidence of encountering voice mail was relatively high, but varied by time of day of call. Other factors were isolated for analysis against the likelihood of encountering voice mail, or making contact with someone at the organization. Many calls that reached someone also failed to collect reasons for original survey nonresponse due to not finding an appropriate respondent at the business, although contact names were sometimes given and not followed up on during the followup time frame. While companies could receive multiple calls to elicit reasons for original survey nonresponse, those followup attempts were not found to be overly effective.

Key Words: Response rates, Nonresponse follow-up, Voice Mail, Noncontact

1. Introduction

The prospect of declining survey response rates is a source of concern for both household and business surveys. Over the last two decades, household surveys have addressed declining response rates by attacking the non-contact component of nonresponse (Groves and Couper, 1998). Tactics include increasing the number of calls, varying the timing of calls, lengthening the data collection period, and seeking supplemental information about non-contacted units. Without an interviewer, though, self-administered surveys require different strategies.

The American Association for Public Opinion Research (AAPOR, 2004) identifies the following dispositions for mail surveys of specifically named persons, including businesses:

1. Eligible, returned questionnaires
2. Eligible, no returned questionnaire
3. Unknown eligibility, no returned questionnaire

4. Not eligible.

In self-administered surveys, when sample units fail to return their survey forms, it may be difficult to determine whether they are eligible for the survey at all. Units of unknown eligibility are retained in the denominator of the response rate proportion, perhaps artificially lowering response rates. The potential impact of reducing non-contact, then, is twofold. Response rates may be improved 1) by converting non-contacted cases to respondents or 2) by determining their eligibility so that ineligible cases can be removed from the denominator.

The purpose of this paper is to examine sources of non-contact in a business survey in the context of a Nonresponse Follow-up (NRFU) Survey associated with the 2003 Survey of Industrial Research and Development (R&D). This survey, co-sponsored by the U.S. Census Bureau and the National Science Foundation (NSF), is the primary source of information on R&D activities performed by U.S. industries. The NRFU survey was implemented to better understand the primary reasons R&D performers failed to participate in the survey, as well as to explore the non-contact component of nonresponse and its causes.

This paper focuses only on the non-contact portion of the NRFU results. Section 2 provides a brief literature review of reasons for nonresponse in establishment surveys. Section 3 describes our data collection and statistical methodologies. Our analytical results are presented in Section 4 and discussed in Section 5. In Section 6, we suggest possible implications of our results for establishment survey nonresponse reduction strategies, and we close in Section 7 with suggestions for future research.

2. Literature Review

The literature on reasons for nonresponse in establishment surveys is sparse and tends to focus on substantive reasons reporters give for failing to reply (Tomaskovic-Devey et al., 1994; Ware-Martin et al., 2000; U.S. Census Bureau, 1997). The most

¹ This report is released to inform interested parties of ongoing research and to encourage discussion of work in progress. The views expressed on statistical, methodological, or operational issues are those of the authors and not necessarily those of the U.S. Census Bureau.

common reasons identified by nonresponding companies were not survey-specific, related, instead, to reporting burden, resource constraints, staff turnover, data availability issues, missing forms, concerns for confidentiality, or company policies against survey participation.

In addition, these studies found that a major source of nonresponse in business surveys was non-contact due either to evidence that the business or the establishment may no longer be active (e.g., disconnected telephone), or the inability to identify the appropriate respondent or contact person. For example, more than 40% of the cases sampled for the 1994 R&D Survey Nonresponse Study ended in outcomes that included “no telephone listing,” “out of business,” “sold,” or unable to identify a “new contact” (U.S. Census Bureau, 1997). Address changes or new contact names were frequently needed due to out-of-date contact information for firms that had not reported in several years. Osmint et al. (1994) notes:

The practice of using lists to formulate frames in establishment surveys is often the root of nonresponse. The problem in the use of a list is that the list is frequently inaccurate. It may contain units that are indeterminately out of business or out of scope. Also, the address associated with a unit may be incorrect, resulting in a non-contact for the unit.

Dialogue among survey managers tends to focus on apparent “substantive” reasons for nonresponse. However, the consistent prevalence of non-contact in previous studies of nonresponse in establishment surveys seems to warrant further investigation. Therefore, the 2003 R&D Survey NRFU collected reasons for non-contact.

3. Methodology

The R&D Survey is collected annually by the Census Bureau using both mail and downloadable software. Data collection for the 2003 R&D Survey consisted of an initial mailing during March 2004, three follow-up mailings throughout the summer, a telephone reminder in August, and close-out in October 2004. The R&D Survey uses two questionnaire versions – a long form for companies that previously reported R&D expenditures of \$3 million or more and a short form for all others. Answers to four items are required by law, while the remaining questions are voluntary. This paper will focus only on the 2003 R&D Survey long form, which had a sample size of 2,582 and a response rate of 80.9%.

3.1 Sample Design and Data Collection

Cases eligible for the NRFU were those failing to return

their 2003 R&D Survey forms, or those that returned forms with insufficient information. Excluded from our study were 300 companies with, historically, the largest R&D expenditures, since they received intensive telephone follow-up throughout the data collection period. The list of eligible nonrespondents was updated in February, 2005, removing businesses believed to be inactive. This left 449 nonrespondents for the NRFU. Each was randomly assigned a value. The list was then sorted by that value and sent to the Census Bureau’s National Processing Center (NPC), where interviewers called nonrespondents in the listed order until the target number of interviews was reached.

The NRFU consisted of a brief questionnaire collecting reasons R&D Survey nonrespondents had for not returning their forms. NRFU data collection also included recording one or more outcomes for each call attempt, so that factors related to non-contact could be explored.

Data were collected during telephone interviews conducted on 18 February and 21–25 February 2005. No calls were made during the weekend (19–20 February) or on Presidents’ Day (21 February), a Federal holiday in the United States. Interviewers were instructed to make at least one additional contact attempt when an alternative contact name had been obtained, and up to three call attempts were permitted to obtain a completion. Calling from the randomized list continued until at least one reason for nonresponse had been obtained from 25 companies. The desired 25 interviews were obtained before the list of 449 sampled cases was exhausted.

Since the list was in simple random order, the result is a simple random sample, which forms the basis for our analysis and statistical testing. Thus, variances for sample proportions are computed as $s^2 = [(proportion) * (1 - proportion)] / (sample\ size - 1)$. We do not take account of the finite population correction factor, and the statistical tests are conservative, meaning that p-values on the margin of significance might be significant under less strict guidelines.

3.2 Limitations

Data collection was interrupted by a U.S. Federal holiday called Presidents’ Day. Although the Census Bureau telephone center was closed, most of the businesses in the R&D Survey target population were not. As a result, our data collection period consists of a week without a Monday. Given only one week of data, and that the week lacks data for Monday, findings regarding day and time calling patterns and

their outcomes may not be generalizable, but may generate hypotheses for further research.

Interviewers were instructed to always follow up on cases where an alternative contact was identified. Other than that, selecting which companies received follow-up call attempts, after unsuccessful initial calls, was mainly at the interviewer's discretion. Moreover, many of the follow-up calls were made by a single interviewer. This interviewer effect may be pertinent when considering results from the follow-up calls compared with the initial call attempts.

4. Results

Calls were made to 407 of the 449 nonresponding companies,² resulting in 62 successful contacts and 345 remaining attempted/unresolved. Sixty companies received one or two follow-up attempts, resulting in a total of 488 call attempts.³ Table 4.1 shows the number of companies in each disposition by call attempt.

For the purposes of this study, we shall consider a "successful contact" with the desired company reporter to constitute a "response" to the NRFU. The NRFU response rate after the initial calls is 13.5%. After the follow-ups, an additional 7 contacts were successful, increasing the overall response rate to 15.2%. The response rate for companies receiving follow-up calls is 7 out of 60, or 11.7%, which is significantly different from zero ($t=2.79$ $p=0.0071$).

4.1 Outcomes of Call Attempts

Since each call attempt frequently had more than one outcome, the 488 calls generated 584 outcomes. An example might be a call that reaches a person, acquires new contact information, and then is transferred to a voice mail. Table 4.2 shows the percentage of companies with a given outcome during any of its call attempts.

Around 16% of the resulting NRFU sample had a disconnected telephone, suggesting a sizeable proportion of nonrespondents were inactive during the NRFU data collection period. Contact with a person occurred for 32.6% of the companies and voice mail was encountered in 50.6% of them. Voice mail was the most common of these three general outcome categories (*Bonferroni adjusted t-test, $p=.0001$ for voice mail versus disconnected, unanswered and busy telephones, and $p=.0402$ for voice mail versus contact*).

² The 21 companies involved in NRFU pretesting have no call records.

³ The total of 488 call attempts = (347 companies x 1 call attempt/company) + (39 companies x 2 call attempts/company) + (21 companies x 3 call attempts/company).

For 67 companies, or 16.5%, an alternative contact person was identified when the original contact person had changed jobs. This suggests that not having up to date contact information is not an insurmountable obstacle. Of these 67 companies, 14, or 20.9%, also reached the new contact person on the same or a later call attempt.

Table 4.2 also shows the final disposition of NRFU companies at the close of data collection, whether the result was a successful outcome or the company merely remained attempted/unresolved. Large differences are to be expected, as some outcomes are unlikely to happen for some dispositions, e.g., a disconnected telephone is unlikely to result in a successful contact. For companies remaining unresolved, voice mail was the most common result. Note that 37.1% of the successful contacts encountered a contact that had changed jobs, suggesting that this event not need result in an unproductive interview.

For the 488 call records, 254 encountered voice mail, 169 resulted in some form of personal contact, 41 included both voice mail and a contact, and 106 were disconnected, unanswered or busy telephones. While contact⁴ and voice mail are correlated outcomes ($r = -.40$), they are neither exact complements of one another, nor are they mutually exclusive. Voice mail is only one of several possible reasons for lack of contact, and voice mail and personal contact can occur on the same call record, e.g., contact with a gatekeeper who then transfers the call to voice mail. This suggests that the relationship between voice mail and other factors may differ from the relationship of contact with those factors, which we will now examine.

Table 4.3 shows the distribution by day of the week for 481 call records for several call outcomes⁵. The day of the week does not appear to be significantly associated with the percentage of calls resulting in a successful contact, although there is a statistically significant association with the incidence of voice mail. The rate of voice mail occurring on Tuesday is significantly different from the voice mail rates on

⁴ Contact is defined as any contact with a person listed under 'Contact' in table 4.2, and excludes the outcomes 'Disconnected telephones,' 'Unanswered rings,' 'Busy signals,' 'Voice mail,' or 'Do not know or unable to locate contact person'.

⁵ Of the 488 call records, 7 failed to have any day information, and are dropped from analysis by day of the week. In addition, only 9 calls were made on the final Friday of calling, and are combined with calls made on the preceding Friday.

Wednesday, Thursday or Friday (*Bonferroni adjusted t-tests* $p=0.0014$, $p=0.0922$, $p=0.0091$, respectively). The overall contact rate does not differ significantly by day of the week, nor does the likelihood of contacting the intended person.

Table 4.4 examines the likelihood of obtaining voice mail or personal contact relative to time of day.⁶ We find a statistically significant association between time and the incidence of voice mail ($X^2_{12}=25.9621$, $p=0.0109$). Testing the likelihood of obtaining voice mail each half hour against the mean of the remaining time blocks, we find that calls made at 0930-1000 hours have a significantly lower frequency of voice mail on average, only 28.1% ($X^2_1=8.5602$, $p=0.0034$). Calls made at 1030-1100 hours have significantly higher frequency, 72.0% ($X^2_1=3.8037$, $p=0.0511$), as do calls made at 1130-1200 hours, with a rate of 75.0% ($X^2_1=6.6357$, $p=0.0100$), while the frequency of voice mail from calls made at 1200-1230 hours, 63.2%, was marginally significant ($X^2_1=2.6556$, $p=0.1032$). The latter three percentages do not differ significantly from one another, however (*t-test* $p=0.8194$, $p=0.4541$ and $p=0.2765$).

Conversely, the association between time of call and contact is not statistically significant ($X^2_{12}=12.2197$, $p=0.4282$). The contact rate during 1430 to 1500 hours, 57.9%, is significantly higher than the mean rate of 31.8% for the other time periods ($X^2_1=5.6320$, $p=0.0176$).

Table 4.5 shows the distribution of call outcomes by the company's industrial sector and by size, defined as large for companies with \$10 million or more in imputed R&D expenditures, and small otherwise. Disconnected telephones were more frequent among non-manufacturing companies than manufacturing companies, and for small companies as compared with large ones. The likelihood of obtaining a successful contact did not differ by sector or size.

The incidence of voice mail also failed to differ significantly by sector or size. Contact was significantly more likely in small companies than in large ones, but no sector differences were found. Contacting the intended person was significantly more likely in manufacturing companies than for non-manufacturing, although there was no difference associated with size.

4.2 Follow-up Calls and Calling Efficiency

Of the 488 call attempts, 81 were follow-up calls. Voice mail was encountered on 55 of the follow-ups, while contact occurred on 25 of them. Analysis suggests that

voice mail is more prevalent on the final call than on the initial call. For 61.7% of the 60 companies that received follow-up calls, the final outcome was voice mail. This is significantly larger than the incidence of voice mail on the 407 initial calls, which was 48.9% ($t=1.85$, $p=0.0649$).

Analysis also suggests that voice mail on an initial attempt is likely to lead to voice mail again on successive attempts. For the 40 companies that encountered voice mail on their initial calls and subsequently received a follow-up call, 31, or 77.5%, obtained voice mail in their last follow-up. This percentage is significantly higher than 48.9%, the probability of getting a voice mail on the initial call ($t=-3.49$, $p=0.0005$). That is, the conditional probability of obtaining voice mail on a follow-up, given that the initial call resulted in voice mail, is higher than the probability of encountering voice mail on the initial call.

The rate of personal contact for the 407 initial calls was 35.4%, which does not differ significantly from the contact rate of 30.9% for the 81 follow-ups ($t=-0.78$, $p=0.4363$). Thus, follow-up calls did not appear to be more effective than initial calls in making personal contact.

We investigated companies with disconnected phones and found that, although they had been active during the R&D Survey reference period, nearly all were no longer active at the time of the NRFU data collection. Many cases with busy signals or unanswered rings were also inactive. Calls to these companies would neither be productive nor impact the response rate. If nonrespondents remaining after primary data collection were investigated to determine their status prior to starting nonresponse follow-up, resources need not be spent calling those numbers. Remaining calls would then be relatively more productive. We can simulate this strategy using our data.

If we assume that cases among our original 407 companies with disconnected telephones and unanswered rings are out of business, 308 companies remain where contact was even possible. The personal contact rate for these 308 active companies is 44.8%, which is significantly higher than the contact rate of 35.4% for the original 407 initial calls ($t=2.25$, $p=0.0106$). Moreover, if inactive companies were eliminated, the contact rate of 44.8% for the 308 active companies is significantly greater than the contact rate of 30.9% for follow-up calls ($t=-2.27$, $p=0.0236$). This suggests that making further initial calls, after removing companies that are likely to be inactive, may be a more efficient calling strategy for

⁶ Of the 488 call records, 13 did not have a time stamp and are excluded from our time-of-day analysis, leaving 475 call records.

increasing response rates than making additional follow-up calls to companies that appear active based on the outcomes of their initial calls.

4.3 Logistic Regressions on Call Outcomes

We used logistic regression to estimate propensity models for encountering voice mail or obtaining contact. These models are behavioral in nature and are not appropriate for predictive purposes. Independent variables for both models include dichotomous indicators for industrial sector, day of the week, half-hour time blocks, and follow-up calls.⁷ We also defined a continuous variable for size as the logarithm of imputed R&D expenditures.⁸

Table 4.6 displays our logistic regression results, including estimated odds ratios for each regressor. Odds ratios represent the ratio of the probability of having voice mail relative to the probability of not having voice mail for a given factor, and, likewise, regarding contact.

Results from our estimated voice mail propensity model show that explanatory variables significantly associated with the likelihood of encountering a voice mail are the indicators for follow-up calls, the call being place on Tuesday, and calls made during the time periods 1000-1030, 1030-1100, 1130-1200, 1200-1230, and 1300-1330. The odds ratio of 2.298 for follow-up calls means they were more than twice as likely to reach a voice mail as not. Odds ratios also imply that calls made during the aforementioned time periods were roughly 2 to 4 times more likely to encounter voice mail, while calls made on Tuesday were about half as likely to do so.

Table 4.6 also shows logistic regression results for the propensity of a call attempt resulting in contact with a person. Just as follow-up calls were significantly more likely to encounter voice mail, they were significantly less likely to result in contact, 60% less likely according to the odds ratio. Unlike voice mail, the logarithm of R&D expenditures was significantly associated with contact propensity. Companies with larger R&D expenditures had a lower likelihood of personal contact. Calls made during the statistically significant time periods of 1030-1100, 1200-1230, 1230-1300, and 1330-1400 were as much as 80% less likely to result in contact. Unlike voice mail propensity, none of the days of the week were significantly associated with achieving contact.

5. Discussion

Evidence from the 2003 R&D Survey NRFU corroborates

⁷ Indicator variables omitted during estimation were, respectively, indicators for manufacturing units, calls made on Friday, calls made before 0930 hours, initial calls.

⁸ Records with imputed R&D expenditures of zero or that lacked day or time information were excluded, leaving 460 cases.

previous research that non-contact is not an inconsequential source of nonresponse. In particular, disconnected phones were found for 16.2% of the NRFU companies. Investigation into the viability of these cases found that many appeared to be out-of-business at the time of NRFU data collection in February 2005, although the proportion out-of-business during the survey reference year 2003 is unknown.

There was no guarantee that call attempts resulting in personal contact would achieve a successful outcome. Call attempts to 32.6% of the NRFU companies reached some person, while the response rate was only 15.2%. It is noteworthy, though, that, 16.5% of the NRFU companies provided alternative contacts who were eventually reached in 20.9% of these cases during our brief calling period. As a result, interviews with alternative respondents accounted for 37.1% of all NRFU successful company contacts, which differs significantly from 14.5%, the analogous proportion of unresolved cases. This suggests that identifying an alternative contact need not be a dead end for survey completion, a finding unlike previous establishment survey nonresponse studies, where difficulty identifying the correct respondent seriously thwarted response.

Voice mail was encountered on at least one call attempt for a staggering 50.6% of the companies called in the NRFU. Only 12.9% of the successful contacts encountered voice mail during the calling period, suggesting that voice mail may be a substantial, though perhaps not an unsurmountable, obstacle to response in telephone surveys of establishments.

We also found that follow-up attempts were no more or less effective in making personal contact than were initial call attempts. In addition, the conditional probability of obtaining voice mail on a later attempt after obtaining it on the initial call attempt is significantly greater than the likelihood of encountering voice mail on the first call attempt. Together, these results suggest that a more efficient calling strategy solely for the purpose of increasing response rates may be to contact fresh cases rather than to continue making follow-up calls on cases previously attempted.⁹ Our analysis further suggests that these efficiencies improve if cases likely to be out-of-business are culled from the list before undertaking nonresponse follow-up.

⁹This, however, may not be the most effective strategy for addressing nonresponse bias.

We found that obtaining voice mail was statistically associated with both the day of the week and the time of day that calls were made during the limited NRFU calling period. Calls were less likely to result in voice mail on Tuesday of the data collection week, and also before 1000 or after 1400 hours, on average. Not surprisingly, voice mail was more likely to be encountered around lunchtime local time. On the other hand, the likelihood of personal contact was not significantly associated with the day of the week or the time of day during the NRFU data collection period. Nor was the incidence of reaching the intended or alternate contact person.

Analysis by company size and type found a few differences in call outcomes. Reaching the intended/alternate contact person was more likely for manufacturing companies than for non-manufacturing companies. Making personal contact was more likely among small companies than for large ones. Higher rates of disconnected phones were encountered among small companies and companies in non-manufacturing industries. Size and type effects on the likelihood of being viable may have implications for nonresponse bias adjustments.

Results from multivariate logistic regression models of the propensities for encountering voice mail or making personal contact corroborate most of the bivariate findings for the NRFU companies. Together, these results suggest that calling cases not previously contacted may be a more efficient and effective calling strategy for nonresponse follow-up than calling cases previously attempted. In addition, calls around lunchtime, local time, should be avoided. Day of week and time of day effects are suggestive, as well, but merit further investigation before designing a nonresponse follow-up calling strategy around them.

6. Implications for Nonresponse Reduction Strategies

Our results suggest that the effectiveness of nonresponse follow-up could be improved, and efficiencies in data collection gained, if cases likely to be out-of-business could be identified and removed from the list of survey nonrespondents before follow-up data collection begins. Cases that go out of business during the collection year may well become survey nonrespondents, even though they were in business during the reference year and, thus, eligible for the survey. Follow-up attempts on such cases may be futile, an inefficient use of interviewer resources.

Findings suggest that voice mail may be less likely to be encountered during early morning and late afternoon, and that the likelihood of reaching someone peaks early in the afternoon. When conducting telephone follow-up for the purpose of nonresponse reduction, efficiencies would

likely be gained by implementing practices that decrease the likelihood of encountering voice mail or that increase the likelihood of making personal contact, such as avoiding local lunchtime for making callbacks. Calling strategies used in social surveys may be adapted to the business survey setting, such as varying the times for making callbacks. Monitoring rates of success, failure and voice mail by time of day and day of week could lead to the development of effective calling strategies that use resources efficiently.

Our findings suggest that identifying an alternative contact person does not necessarily result in a non-interview. Staff conducting nonresponse reduction follow-up calls should be informed that this outcome has potential for leading to a completed interview.

Our findings show that more successful personal contacts were obtained from calling fresh cases than from attempting to recontact cases called previously. This suggests an effective and efficient calling strategy for meeting a target response rate may be to call fresh cases rather than to continue making calls to cases that have already been attempted.

7. Suggestions for Future Research

Out-of-Business Cases: Our results indicate that 16.2% of the nonresponding companies contacted for the NRFU appeared to be nonviable at the time of NRFU collection (the evidence being nonworking phone numbers). Given the potential magnitude of out-of-scope cases, addressing declining response rates through the denominator may be worth consideration. The potential payoff of a strategy to develop a sample-based estimate of an (in)eligibility rate and its impact on response rates may be assessed through further research.

We note the effectiveness of such a strategy depends on the accuracy of the sampling frame at mail-out. The more accurate the frame, the less cost effective is this strategy. The Census Bureau's Business Register is updated with fourth quarter information for the survey reference year prior to mail-out in the subsequent data collection year. Thus, the frame for annual surveys, like the R&D Survey, is expected to be as accurate as possible at the time of mail-out.

Voice Mail: Although substantial, the prevalence of voice mail may not be an insurmountable obstacle to obtaining response, since roughly 13% of our successful contacts encountered voice mail at some point. Thus, investigating strategies for handling voice mail may be worthwhile. Voice mail among

business contacts may be analogous to answering machine use in households, a phenomenon that was researched heavily in the late 1980s and the early 1990s. Strategies for handling answering machines may be modified for voice mail and evaluated in the business context, leading to the development of effective voice mail strategies.

Call Outcomes over Time: We found statistically significant associations between several call outcomes and the weekday the call was made, as well as the time of day. However, our data represents only one week of calling – and a week without a Monday, at that. While formulating a calling strategy based solely on our study is inappropriate, we believe that our results are sufficiently compelling to warrant further investigation using a more systematic study design, the results of which could be used to identify effective calling strategies for business surveys.

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Table 4.1 Final Disposition of Companies by Call Attempt

Disposition	Number of Call Attempts			Total
	One	Two	Three	
Attempted / Unresolved	292	33	20	345
Successful Contact	55	6	1	62
Total	347	39	21	407

Table 4.2 Distribution^a of Outcomes by Final Disposition

Outcome	Final Disposition of Companies			Total
	Successful Contact	Attempted Unresolved	/	
Disconnected telephone	0.0 %	19.1 %		16.2 %
Ring/no answer or Busy signal	1.6 %	10.1 %		8.8 %
Voice mail	12.9 %	57.4 %		50.6 %
Contact				
Original or alternate contact person reached	77.4 %	2.0 %		13.5 %
“Gatekeeper,” unable to answer substantial questions	6.5 %	4.6 %		4.9 %
Intended contact person changed jobs	37.1 %	14.5 %		18.7 %
Intended contact person unavailable	1.6 %	5.5 %		5.2 %
Intended contact unknown	0.0 %	6.1 %		5.2 %
Number of Companies	62	345		407

Table 4.3 Distribution^a of Call Outcomes by Day of Week

Outcome	Total	Tuesday	Wednesday	Thursday	Friday	$\chi^2_{df=3}$ p-value
Successful Contact	13.1 %	13.6 %	12.2 %	12.7 %	15.4 %	0.9343
Voice Mail	52.6 %	37.0 %	62.6 %	50.9 %	61.5 %	0.0023
Any Contact	33.7 %	33.3 %	30.8 %	35.5 %	32.3 %	0.8511
Contact with original or alternate contact person	10.8 %	13.6 %	10.3 %	10.5 %	9.2 %	0.8344
Total Call Attempts	481	81	107	228	65	

^aColumns sum to more than 100% since outcomes are not mutually exclusive, and call records may have multiple outcomes.

^aColumns sum to more than 100% since a single company may have multiple outcomes from one or more call attempts.

Table 4.4 Distribution^a of Outcomes by Time of Day

Time	Number	Outcome	
		Voice Mail	Contact
Before 0930 hrs	45	46.7 %	37.8 %
0930 - 1000 hrs	32	28.1 %	31.3 %
1000 - 1030 hrs	53	50.9 %	26.4 %
1030 - 1100 hrs	25	72.0 %	28.0 %
1100 - 1130 hrs	48	45.8 %	33.3 %
1130 - 1200 hrs	32	75.0 %	43.8 %
1200 - 1230 hrs	57	63.2 %	38.6 %
1230 - 1300 hrs	44	56.8 %	25.0 %
1300 - 1330 hrs	39	59.0 %	28.2 %
1330 - 1400 hrs	29	48.3 %	27.6 %
1400 - 1430 hrs	19	36.8 %	26.3 %
1430 - 1500 hrs	19	42.1 %	57.9 %
After 1500 hrs	33	54.6 %	30.3 %
Total Call Attempts	475	53.1%	32.8%

^aRows sum to more than 100% since a single call record may have multiple outcomes

Table 4.5 Distribution of Call Outcomes by Sector and Size

Outcome	Total	Sector			Size		
		Manu- facturing	Non-manu- facturing	$\chi^2_{df=1}$ p-value	Small	Large	$\chi^2_{df=1}$ p-value
Disconnected telephone	13.7 %	10.2 %	16.5 %	<i>0.0464</i>	16.4 %	10.8 %	<i>0.0711</i>
Successful Contact	14.3 %	15.4 %	13.5 %	<i>0.5742</i>	14.7 %	14.0 %	<i>0.8520</i>
Voice Mail	52.1 %	55.4 %	49.4 %	<i>0.1954</i>	48.7 %	55.1 %	<i>0.1594</i>
Any Contact	34.6 %	36.3 %	33.3 %	<i>0.0423</i>	39.2 %	30.5 %	<i>0.4971</i>
Contact with original or alternate contact person	11.3 %	14.0 %	9.2 %	<i>0.0963</i>	9.4 %	13.4 %	<i>0.1642</i>
Total Call Attempts	488	215	273		232	256	

Table 4.6 Estimated Logistic Regression Models^a of Voice Mail and Contact Propensities

Variable	Voice Mail			Contact		
	Coefficient Estimate	Odds Ratio	p-value	Coefficient Estimate	Odds Ratio	p-value
Intercept term	-1.65	---	0.1089	3.25	---	0.0114
Follow-up	<i>0.83</i>	<i>2.298</i>	<i>0.0045</i>	<i>-0.91</i>	<i>0.404</i>	<i>0.0142</i>
Logarithm of research and development expenditures	0.15	1.158	0.1372	<i>-0.37</i>	<i>0.694</i>	<i>0.0041</i>
Non-manufacturing company	-0.23	0.796	0.2665	-0.21	0.815	0.3824
Call on Tuesday	-0.62	<i>0.540</i>	<i>0.0990</i>	-0.02	0.985	0.9709
Call on Wednesday	0.02	1.016	0.9644	-0.27	0.763	0.5126
Call on Thursday	-0.28	0.754	0.3702	0.01	1.011	0.9752
Call from 0930-1000 hrs	-0.05	0.948	0.9168	-0.72	0.488	0.1689
Call from 1000-1030 hrs	<i>0.77</i>	<i>2.166</i>	<i>0.0688</i>	-0.76	0.470	0.1049
Call from 1030-1100 hrs	<i>1.47</i>	<i>4.328</i>	<i>0.0076</i>	-1.63	<i>0.195</i>	<i>0.0193</i>
Call from 1100-1130 hrs	0.39	1.486	0.3512	-0.40	0.673	0.3719
Call from 1130-1200 hrs	<i>1.56</i>	<i>4.780</i>	<i>0.0038</i>	-0.95	0.388	0.1129
Call from 1200-1230 hrs	<i>1.07</i>	<i>2.911</i>	<i>0.0106</i>	<i>-0.88</i>	<i>0.417</i>	<i>0.0569</i>
Call from 1230-1300 hrs	0.57	1.767	0.1979	-1.01	0.364	0.0539
Call from 1300-1330 hrs	<i>0.98</i>	<i>2.661</i>	<i>0.0348</i>	-0.81	0.443	0.1088
Call from 1330-1400 hrs	0.47	1.593	0.3472	-1.00	0.369	0.0922
Call from 1400-1430 hrs	0.06	1.060	0.9208	-0.93	0.393	0.1587
Call from 1430-1500 hrs	0.25	1.295	0.6559	0.85	2.327	0.1498
Call after 1500 hrs	0.66	1.926	0.1632	-0.60	0.553	0.2470
Adjusted R²	0.1297		0.0002	0.1163		0.0044

^aFigures in italics indicate statistical significance.