Customer Panel Quality Survey (CPQS) Wave 19 Nonresponse Follow-up Study
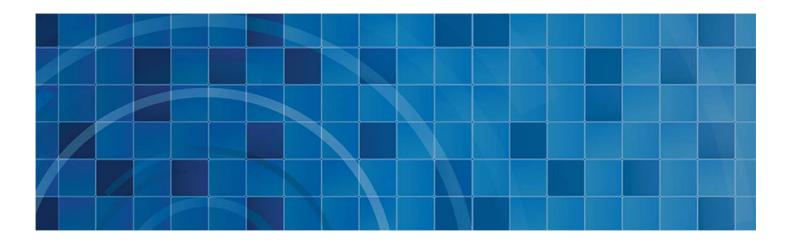
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The USPTO Customer Panel Quality Survey (CPQS) has been conducted for nineteen waves, with each wave occurring every three or six months, using a rotating panel design. Each wave consists of two panels, where one panel is surveyed for the first time and one panel is surveyed in its second consecutive wave. Customers are randomly sampled within strata defined by the size of the firm to which they belong, in terms of both number of customers and number of patent applications submitted. The purpose of this report is to document the results of a nonresponse follow-up survey that was conducted after wave 19. The follow-up sample consisted of nonrespondents[1] that were known to be eligible[2] in the original sample, which resulted in a total of 1,033 follow-up cases that were mailed follow-up postcards. Both panels of wave 19 within the rotating panel design were eligible for the follow-up survey (panels 19 and 20). These panels were analyzed both together and separately. The main wave 19 survey concluded on August 26, 2013. The nonresponse follow-up survey mail out was on September 9, 2013, and data collection ended on October 9, 2013.

The nonrespondents were sent a postcard with one question (modification to Q7):

"Consider your experiences with USPTO Patent Examiners in the past three months. How would you rate overall examination quality for this time period?"

The possible answers were:

1. Very Poor

2. Poor

3. Fair

4. Good

5. Excellent

6. Have not communicated with patent examiners in the past 3 months

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[1] These included nonrespondents, refusals, and cases that were ineligible in the prior 3 months but received a mailing in wave 19.

[2] Cases with unknown eligibility status were dropped since they cannot be contacted (e.g., they are no longer at the firm).

This question is the same item as Q7 in the original questionnaire, except that answer choice 6) was only included in the follow-up survey. The follow-up survey was conducted mainly to help determine how different wave 19 main survey respondents are from main survey nonrespondents. This was done by comparing the responses to the Q7 question between main survey respondents and follow-up postcard respondents. The assumption was that the respondents to the postcard follow-up (who were originally main survey nonrespondents) would be more like main survey nonrespondents than they are like main survey respondents in terms of their response to Q7. If this assumption held, it would potentially indicate some bias due to nonresponse.

Nonresponse bias is measured by two terms: the nonresponse rate, and differences between respondents and nonrespondents. To explain further, we introduce the following expression for nonresponse bias for a sample mean ($\bar{y}_R$):

$$Bias(\bar{y}_R) = (1 - W_R)(\bar{Y}_R - \bar{Y}_N),$$

where W_R is the weighted unit response rate, $\bar{Y}_R$ is the population mean of the respondent stratum, and $\bar{Y}_N$ is the population mean for the nonrespondent stratum. While the response rate (first component) is universally recognized as a measure of survey quality, it is not by itself a good indicator of nonresponse bias. The difference between respondents and nonrespondents (second component) is just as important. Theoretically, even if the response rate is 55 percent, as it was in wave 19, if there is no difference in the mean of the characteristic y between respondents and nonrespondents, then bias does not exist. In practice, the second component is unknown; however, typically proxies (auxiliary data) are used to estimate the difference. Weighting adjustments are used to reduce nonresponse bias, although it is widely recognized that some nonresponse bias remains in survey estimates.

For all analyses, survey base weights were used to account for the unequal within-household probabilities of selection, and were adjusted to account for cases with unknown eligibility status. Replicate weights were used to adequately reflect the impact of the sample design on variance estimates. The weights for the main survey respondents were the wave 19 base weights, adjusted for unknown eligibility status. The weights for the follow-up respondents were additionally adjusted to account for individuals who did not participate in both the main survey and the follow-up. This assumes that main survey nonrespondents were more similar to the follow-up respondents than they were to the main survey respondents. Together with the main survey respondents, the weights account for the entire eligible population.

For the nonresponse adjustment, the classification software package Search was used to create the initial adjustment cells for nonresponse. Search employs a hierarchical tree algorithm described in Sonquist, Baker, and Morgan (1974). Cell sizes were limited to 23 or more cases in each analysis. (The Search software is a freeware product developed and maintained by the University of

Michigan.) The chi algorithm in Search produces a classification tree, which reveals the domains as defined by combinations of variables with the most differential response rates, thereby leading to domains with the highest potential for nonresponse bias. This is the same approach as is used in the main survey weighting procedures.

Analyses were performed using 1,329 main survey respondents compared with 202 follow-up respondents; all with nonmissing responses to Q7. A bivariate analysis (response indicator versus each auxiliary variable) was used to compare the distribution of the main survey participants to the distribution of the follow-up sample participants for both Q7 and for the mean of Q7 across several auxiliary variables.

Follow-up respondents who answered "No applications in the past 3 months" were excluded from the analysis as ineligible. Respondents from both the main survey and the follow-up who were missing answers to Q7 were also excluded from the analysis.

Two approaches were used to test for statistical differences between main survey respondents and follow-up respondents. First, to test differences in the categorical responses to Q7, the hypothesis of independence between the characteristic and participation status was tested using a Rao-Scott modified Chi-square statistic at the 10 percent level (see Appendix B of the WesVar User's Guide for more information at http://www.westat.com/Westat/pdf/wesvar/WV_4-3_Manual.pdf). Secondly, to see if there were differences within subgroups, we computed a mean score of the categorical responses to Q7 for each subgroup, treating Q7 as a continuous variable, with a larger mean score indicating a more favorable response. The difference between means was tested using a t test, which was adjusted using the Benjamini-Hochberg procedure (Benjamini and Hochberg, 1995; Thissen, 2002), to control the overall false discovery rate for a family of comparisons. The B-H critical values are shown in the appendix.

The absolute and relative differences between the respective estimates for the main survey respondents and the follow-up respondents are given in each table. The relative difference is calculated as the absolute difference divided by the estimate from the main survey respondents. The relative difference is a measure of the size of the difference compared to the main survey estimate.

As mentioned earlier, all analyses are presented for main survey respondents and follow-up respondents both together and separately for panels 19 and 20.

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Results 4

The results are shown in tables 5-1 through 5-6. In tables 5-1 through 5-3, we present the distribution of Q7 with the five categorical responses, and also with three categories by collapsing "very poor" with "poor" and "good" with "excellent", both overall and separately for panels 19 and 20. Secondly, in tables 5-4 through 5-6, we show the overall mean response of Q7 and also the mean of Q7 by selected characteristics, both overall and separately for panels 19 and 20.

For the overall set of main survey and follow-up respondents, the chi-square test result is significant for the full distribution of Q7 (table 5-1), with the follow-up respondents 9 percentage points higher in the response of "excellent". Table 5-2 (second time panelists, i.e. panel 19) also shows a significant chi-square result with the follow-up respondents more than 13 percentage points higher in the "excellent" category. While a difference of about 4 percent for the "excellent" category was observed for new panelists (panel 20 in table 5-3), it is not significant. The recode of Q7 does not show a significant difference between the main survey and the follow-up, overall or for either of the panels. However, the "good/excellent" category is 2 percent higher for follow-up respondents overall.

The difference between main survey respondents and follow-up respondents for the mean of Q7 was not statistically significant overall or for either of the two panels. For the subgroups, after adjusting for multiple comparisons, there were six significant differences, as follows:

- Table 5-4: Census region=Northeast (both panels together)

- Table 5-4: newest registered customers (both panels together)

- Table 5-5: Census region=Northeast (panel 19)

- Table 5-5: type of customer=attorney (panel 19)

- Table 5-5: second oldest registered customers (panel 19)

- Table 5-6: type of customer=agent (panel 20)

In all but one of these results (table 5-4, newest registered customers) the follow-up respondents had a more favorable response.

Finally, table 5-4 also shows the overall estimated bias for the mean of Q7 and for each subgroup, calculated using the corresponding weighted wave 19 response rate for each one. These results show that the overall bias is small but the amount of bias varies across the subgroups, as expected given the differences among the subgroup estimates.

Conclusions **5**

Based on this analysis, the conclusions are:

- Statistically significant differences that were detected between the main survey and follow-up respondents in the categorical responses to Q7 seem to indicate a somewhat brighter outlook regarding the quality of patent examinations, particularly in second time panelists (panel 19).

- For the mean responses to Q7, both overall and by panel, there were no significant results.

- There are only a few significant differences by characteristic while controlling the overall false discovery rate using the B-H approach. The subgroups with significantly brighter outlooks regarding the quality of patent examinations are:

    - Customers in the northeast region (both panels together and panel 19)

    - Customers who are attorneys (panel 19)

    - Customers who are in the second oldest registered group (panel 19)

    - Customers who are agents (panel 20)

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Table 5-1. Percentage distribution of Q7 by response status: Overall

Characteristic	Main survey (percent)	Standard error	Follow-up (percent)	Standard error	Difference	Relative difference	Chi-square p-value
Q7							0.0251
1-very poor	1.84	0.49	1.58	1.16	-0.263	-0.143	
2-poor	7.29	0.96	8.98	2.30	1.683	0.231	
3-fair	38.16	1.64	34.65	3.63	-3.515	-0.092	
4-good	48.90	1.56	42.16	4.48	-6.736	-0.138	
5-excellent	3.81	0.56	12.64	3.30	8.830	2.318	
Q7 collapsed							0.6617
1/2 very poor/poor	9.14	1.04	10.56	2.55	1.420	0.155	
3-fair	38.16	1.64	34.65	3.63	-3.515	-0.092	
4/5 good/excellent	52.71	1.55	54.80	3.85	2.095	0.040	

Table 5-2. Percentage distribution of Q7 by response status: by Panel 19

Characteristic	Main survey (percent)	Standard error	Follow-up (percent)	Standard error	Difference	Relative difference	Chi-square p-value
Q7							0.0113
1-very poor	2.06	0.74	0.94	0.89	-1.126	-0.611	
2-poor	6.97	1.29	9.66	3.42	2.692	0.386	
3-fair	39.07	2.20	30.06	5.43	-9.001	-0.230	
4-good	47.60	2.20	41.62	5.70	-5.977	-0.126	
5-excellent	4.31	0.85	17.72	4.91	13.412	3.113	
Q7 collapsed							0.2920
1/2 very poor/poor	9.03	1.45	10.59	3.52	1.566	0.173	
3-fair	39.07	2.20	30.06	5.43	-9.001	-0.230	
4/5 good/excellent	51.91	2.23	59.34	5.57	7.435	0.143	

Table 5-3.   Percentage distribution of Q7 by response status: by Panel 20

Characteristic	Main survey (percent)	Standard error	Follow-up (percent)	Standard error	Difference	Relative difference	Chi-square p-value
Q7							0.6349
1-very poor	1.62	0.66	2.20	2.12	0.583	0.317	
2-poor	7.63	1.20	8.32	3.06	0.690	0.090	
3-fair	37.23	2.28	39.05	5.31	1.823	0.049	
4-good	50.23	2.17	42.68	6.43	-7.552	-0.150	
5-excellent	3.30	0.73	7.75	3.47	4.457	1.352	
Q7 collapsed							0.8794
1/2 very poor/poor	9.25	1.36	10.52	3.68	1.273	0.138	
3-fair	37.23	2.28	39.05	5.31	1.823	0.049	
4/5 good/excellent	53.53	2.21	50.43	5.90	-3.095	-0.058	

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Table 5-4.   Average response of Q7 by selected categorical variables: Overall

Characteristic	Main survey (mean)	Standard error	Follow-up (mean)	Standard error	Difference	Relative difference	t test p-value	Estimate of bias
Q7	3.46	0.02	3.55	0.07	0.098	0.028	0.2260	0.044
Census region (CREG)								
Northeast	3.49	0.05	3.89	0.16	0.399	0.114	0.0182*	0.178
Midwest	3.47	0.05	3.53	0.12	0.059	0.017	0.6592	0.026
South	3.46	0.04	3.53	0.13	0.068	0.020	0.6013	0.031
West	3.40	0.06	3.27	0.18	-0.128	-0.038	0.5183	-0.055
Agent/attorney (TYPE)								
Agent	3.40	0.06	3.55	0.18	0.156	0.046	0.3849	0.066
Attorney	3.47	0.03	3.56	0.08	0.096	0.028	0.2953	0.043
Sample domain (DOMAIN)								
Large firms, 50 customers or less	3.44	0.03	3.50	0.09	0.061	0.018	0.5336	0.029
Large firms, more than 50 customers	3.50	0.04	3.52	0.14	0.019	0.005	0.9025	0.010
Firms, number of applications between 150 and 275	3.44	0.06	3.30	0.14	-0.138	-0.040	0.3974	-0.059
Firms, less than 150 applications	3.45	0.04	3.69	0.15	0.239	0.069	0.1182	0.097
Top-filer firms or independent inventors	3.50	0.19	3.40	0.22	-0.100	-0.029	0.7165	-0.056
Registration number (REG_NO_R)								
Oldest registered customers	3.52	0.06	3.67	0.14	0.153	0.044	0.3158	0.063
Second oldest registered customers	3.49	0.05	3.71	0.14	0.221	0.063	0.1374	0.100
Second newest registered customers	3.38	0.05	3.51	0.20	0.132	0.039	0.5115	0.061
Newest registered customers	3.43	0.05	3.12	0.11	-0.309	-0.090	0.0107*	-0.140

* Significant under B-H approach

Table 5-5.   Average response of Q7 by selected categorical variables: by Panel 19

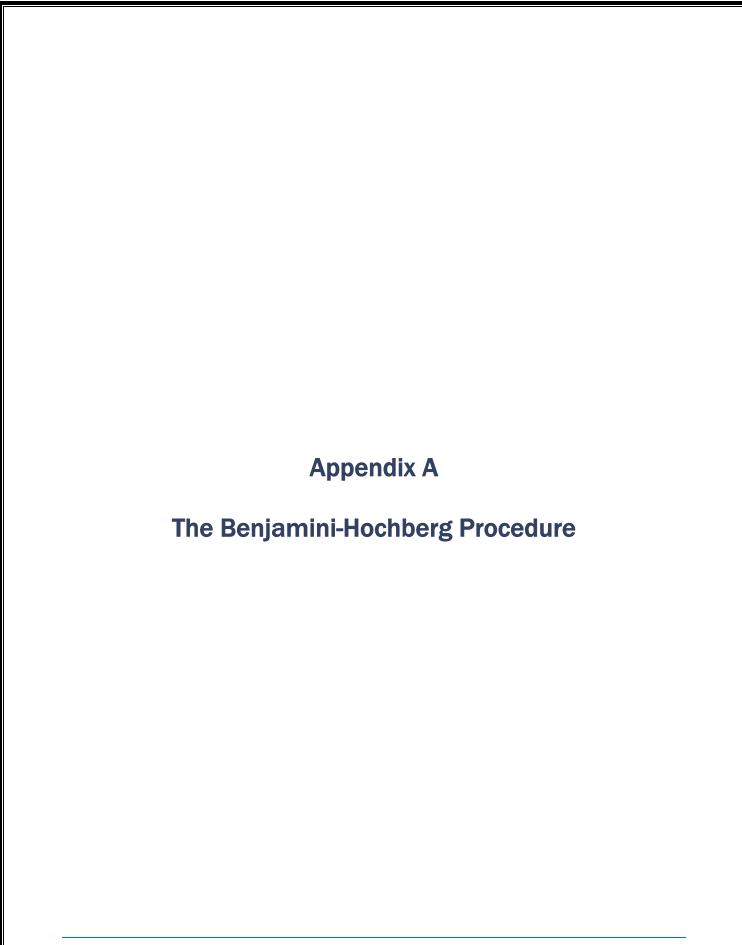| Characteristic	Main survey (mean)	Standard error	Follow-up (mean)	Standard error	Difference	Relative difference	*t* test *p*-value
Q7	3.45	0.04	3.66	0.11	0.204	0.059	0.0700
Census region (CREG)							
Northeast	3.45	0.07	4.07	0.20	0.629	0.183	0.0030*
Midwest	3.55	0.07	3.57	0.15	0.022	0.006	0.8950
South	3.39	0.07	3.54	0.21	0.151	0.045	0.4810
West	3.44	0.08	3.57	0.23	0.130	0.038	0.6090
Agent/attorney (TYPE)							
Agent	3.38	0.10	3.28	0.24	-0.099	-0.029	0.6900
Attorney	3.46	0.04	3.74	0.12	0.278	0.080	0.0270*
Sample domain (DOMAIN)							
Large firms, 50 customers or less	3.46	0.04	3.38	0.13	-0.081	-0.023	0.5710
Large firms, more than 50 customers	3.50	0.05	3.70	0.22	0.201	0.057	0.3690
Firms, number of applications between 150 and 275	3.41	0.08	3.57	0.26	0.153	0.045	0.5760
Firms, less than 150 applications	3.43	0.07	3.84	0.21	0.418	0.122	0.0570
Top-filer firms or independent inventors	3.87	0.22	3.28	0.39	-0.590	-0.152	0.1770
Registration number (REG_NO_R)							
Oldest registered customers	3.53	0.08	3.70	0.22	0.168	0.048	0.4770
Second oldest registered customers	3.46	0.07	3.87	0.17	0.409	0.118	0.0220*
Second newest registered customers	3.31	0.09	3.44	0.20	0.129	0.039	0.5540
Newest registered customers	3.49	0.06	3.22	0.20	0.269	0.077	0.2020

* Significant under B-H approach

Table 5-6.   Average response of Q7 by selected categorical variables: by Panel 20

Characteristic	Main survey (mean)	Standard error	Follow-up (mean)	Standard error	Difference	Relative difference	t test p-value
Q7	3.46	0.03	3.46	0.10	-0.005	-0.001	0.9660
Census region (CREG)							
Northeast	3.53	0.08	3.75	0.24	0.221	0.063	0.3870
Midwest	3.39	0.06	3.50	0.19	0.106	0.031	0.6000
South	3.54	0.06	3.52	0.13	-0.014	-0.004	0.9210
West	3.35	0.08	2.92	0.22	-0.426	-0.127	0.0840
Agent/attorney (TYPE)							
Agent	3.41	0.08	4.00	0.00	0.588	0.172	<0.0001*
Attorney	3.48	0.04	3.41	0.11	-0.070	-0.020	0.5850
Sample domain (DOMAIN)							
Large firms, 50 customers or less	3.41	0.04	3.67	0.12	0.257	0.075	0.0630
Large firms, more than 50 customers	3.49	0.07	3.34	0.20	-0.155	-0.044	0.5000
Firms, number of applications between 150 and 275	3.46	0.07	3.09	0.15	-0.365	-0.106	0.0480
Firms, less than 150 applications	3.47	0.06	3.55	0.19	0.079	0.023	0.7040
Top-filer firms or independent inventors	3.25	0.26	3.50	0.24	0.250	0.077	0.4840
Registration number (REG_NO_R)							
Oldest registered customers	3.50	0.08	3.64	0.18	0.140	0.040	0.4930
Second oldest registered customers	3.52	0.06	3.52	0.19	0.001	0.000	0.9940
Second newest registered customers	3.45	0.08	3.58	0.32	0.131	0.038	0.6900
Newest registered customers	3.35	0.06	3.05	0.13	-0.298	-0.089	0.0420

* Significant under B-H approach

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Appendix A

The Benjamini-Hochberg Procedure

The Benjamini-Hochberg Procedure

To improve the power of tests involving multiple comparisons, the Benjamini-Hochberg (1995) procedure offers an approach to control the overall false discovery rate (FDR); that is, it controls the *proportion* of significant results that are Type I errors. The B-H critical value (α_i) for the each test i as sorted in descending order by p-value, is computed as follows:

$$P_i = \frac{(G - i + 1) \times 0.10}{G}$$

Benjamini-Hochberg critical values for the USPTO wave 19 nonresponse follow-up survey:

Index	B-H critical value
2 levels	
1	0.100
2	0.050
4 levels	
1	0.100
2	0.075
3	0.050
4	0.025
5 levels	
1	0.100
2	0.080
3	0.060
4	0.040
5	0.020