Date: January 6, 2009   **Memo:**   36.0

To: Martin Rater, USPTO

From: David Ferraro
             Reviewer: Tom Krenzke

Subject: PTO Wave 6/7 Nonresponse Follow-up Report

Introduction

The purpose of this memo is to document the results of the nonresponse follow-up study conducted during Waves 6 and 7. The follow-up sample consisted of nonrespondents[1] that were known to be eligible[2] in the original sample. Only nonrespondents rotating out of the sample[3] were eligible for the followup sample. The nonrespondents were sent a postcard with one question (modification to Q7) being asked:

"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

Note that this is the same as Q7 in the original questionnaire except that answer #6 was only included in the follow-up study. The intention of the follow-up study is to compare the responses to this question between those that responded to the main survey in the outgoing panel with those that responded to the follow-up postcard (also in the outgoing panel). The assumption is that the respondents to the postcard follow-up are like nonrespondents to the main survey so that there is some indications of potential bias due to nonresponse.

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[1] STATUSW6 = 2 and STATUSW7 = 2 for Waves 6 and 7, respectively

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

[3] C2GROUP = 6 and 7 for Waves 6 and 7, respectively

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In the follow-up, half of the sample was assigned to receive a white postcard and half was sent a green postcard to see if colored cards help increase response rates to the followup survey. The set of nonrespondents was sorted by variables related to nonresponse prior to allocation of the colored postcard. For Wave 6 as an example, the sort variables were the response to Q7 in Wave 5, whether or not the customer was in the original panel 6 (2nd successive wave) or the supplemental panel 6 (first and last wave)[4], type of nonresponse based on the disposition code, and firm ID. The resulting sort order was based on auxiliary variables that were correlated with response propensity.

The follow-up study was conducted in order to help answer the following questions:

1.   How different are the Wave 6/7 respondents from the followup respondents?
2.   How different are the followup respondents from the followup nonrespondents?
3.   Do the results impact what can be done in weighting to reduce the bias due to nonresponse?
4.   What is the impact of the colored postcard on followup response rates?

Methodology

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 43 percent, 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.

However, in the case with the nonresponse follow-up sample, the bias can be written as

$$Bias(\bar{y}_R) = (1 - W_R)(\bar{Y}_R - (\bar{Y}_{FU} + \bar{Y}_{NR}))$$

where $\bar{Y}_{NR}$ is the population mean of the follow-up nonrespondent stratum, and $\bar{Y}_{FU}$ is the population mean for the follow-up respondent stratum.

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[4] Based on the variable GROUP

A bivariate analysis (response indicator versus each auxiliary variable) compares the distribution of the participating households to the distribution of the total eligible sample of households for several auxiliary variables. Survey base weights were used to account for the unequal within-household probabilities of selection, and replicate weights were used to adequately reflect the impact of the sample design on variance estimates. The weights for the follow-up respondents were adjusted to account for nonrespondents to both the main survey and the follow-up. This assumes that nonrespondents were more similar to the follow-up respondents than the main survey respondents. Together with the main sample respondent, the weights account for the entire eligible population. Adjustment cells were created using the Search software (WesSearch) using the same approach as used in the normal weighting procedure.

Follow-up respondents that answered "No applications in the past 3 months" were excluded from the analysis as ineligible. For informational purposes, the complete distributions by wave and postcard color are shown in table 1.

To test for statistical differences, the distribution of Q7 for wave respondents was compared with the distribution for follow-up respondents and similarly within the follow-up study for the salmon and white postcard types. We used two approaches in the tests. To test the categorical responses, 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. Secondly, we computed an average score of the categorical responses treating them as continuous variables, with the larger the average score the more favorable the response. The difference between means was tested using a t test. Additionally, the continuous variables were tested using the Benjamin-Hochberg procedure to control the overall false discovery rate for a family of comparisons. The B-H critical values are shown in the appendix. See the internal PTO Memo 30 for details on the B-H procedure. The bias and relative bias are also given in each table. The bias is the difference between the respective estimates for the main survey respondents and the follow-up respondents (equivalent to the formula above). The relative bias is calculated as the bias divided by the estimate from the eligible sample. The relative bias is a measure of the size of the bias compared to the eligible sample estimate.

Results

The results are shown for Waves 6 and 7 in tables 2 through 6 and 7 through 11, respectively. We first present the results comparing the main survey to follow-up respondents. Q7 is shown with the five categorical responses and with three categories by collapsing "very poor" with "poor" and "good" with "excellent". Since the sample size in each category is fairly small, collapsing might show more differences. Secondly, we show the overall average response of Q7 and by selected characteristics. We then present comparisons of the two postcard types within the follow-up sample. The response rates by postcard type are shown first. Then Q7 is shown by postcard similar to Q7 as categorical and as averages.

Wave 6. For Wave 6, there were no statistical differences in the categorical responses between the follow-up and main survey respondents though some of the differences are large (table 2). Differences were not detected due to the large standard errors on the estimates from the follow-

up sample. Generally though the responses were more positive for the follow-up. This can also be seen in terms of average response where the overall average was larger for the follow-up but is not significant (table 3). The only statistical difference by variable was the sample domain for firms with less than 150 applications had a more favorable response for the follow-up respondents than for the main survey (table 3).

Looking at the comparison of postcard types, the response rate was higher for the salmon-colored (32%) postcard than for the white postcard (30%), but the difference was not significant (table 4). In terms of the responses, there were no statistical differences in the categorical responses between postcard colors (table 5). The overall average was higher for the white postcard but not significant (table 6). There were two p-values less than 0.10 related to differences by characteristic, which are the sample domain for firms with less than 150 applications and registration numbers are less than 33229 – each having a more favorable response for the white postcard (table 6). However, neither were significant while controlling the overall false discovery rate using the B-H approach.

Wave 7. For Wave 7, there were no significant differences in the categorical responses between the follow-up and main survey respondents but again the follow-up had a more favorable response (table 7). In terms of average response, the overall difference was not significant but again more favorable for the follow-up. There were four p-values less than 0.10 related to differences by characteristic, however only agents and other registration numbers (those recently registered) were significant while controlling the overall false discovery rate (table 8). In each case the follow-up had a more favorable response.

Looking at the comparison of postcard types, the response rate was higher for the white-colored postcard (33%) than for the salmon (25%), unlike Wave 6, and the difference was significant (table 9). In terms of the responses, the categorical responses were significantly different (table 10). The white postcard had a much larger proportion in the fair category than the salmon postcard but smaller proportions in all the other categories. For the average response, the overall average was not significant but the difference was in the opposite direction from Wave 6 (table 11). The only statistically significant differences by characteristic while controlling the overall false discovery rate was firms with registration numbers between 44155 and 50724 with the salmon postcard having a more favorable response (table 11). There were four other characteristics with p-values less than 0.10.

Conclusion

Based on this analysis, the conclusions are:

- There are no statistically significant differences detected between the main survey and follow-up respondents in their categorical responses to Q7 for either Wave 6 or 7.
- There are, however, fairly large relative differences in both waves. These differences are not detectable due to the large standard errors of the estimates from the follow-up study. The responses were generally more positive for the follow-up.
- For the average responses, the overall averages were not significant.
- There are only a few significant differences by characteristic while controlling the overall false discovery rate using the B-H approach. It is expected that 10% of the difference

would be significant by chance. In Wave 6, only one of the fifteen differences tested (6.7%) was significant, the sample domain for firms with less than 150 applications. In Wave 7, two of the fifteen differences tested (13.3%) were significant, agents and other registration numbers (those recently registered).

- In regards to postcard type, there were significant differences between the different colors for response rates and categorical responses only in Wave 7.The response rate was higher for the white postcard as was the proportion of the fair category. The direction of the differences was not consistent in Wave 6.

- For the average responses by postcard type, the overall averages were not significant. There was only one significant difference (6.7%) by characteristic, firms with registration numbers between 44155 and 50724, in Wave 7.

Table 1.   Complete distribution of Q7 by postcard type and wave

Q7	Salmon (percent)	Standard Error	White (percent)	Standard Error
Wave 6				
1-very poor	5.44	3.13	4.90	2.23
2-poor	15.74	4.66	11.20	3.43
3-fair	32.23	6.18	33.80	5.95
4-good	20.82	4.38	30.95	5.59
5-excellent	3.19	1.85	3.71	2.45
6-no applications	22.57	5.44	15.45	3.80
Wave 7				
1-very poor	6.51	2.95	3.34	1.64
2-poor	12.63	4.18	10.92	3.15
3-fair	20.81	4.33	39.76	6.00
4-good	28.19	6.37	25.20	4.31
5-excellent	11.41	5.50	0.83	0.86
6-no applications	20.44	5.26	19.94	5.47

Table 2.   Percentage distribution of Q7 by response status: Wave 6

Characteristic	Main Survey (percent)	Standard Error	Follow-up (percent)	Standard Error	Difference	Relative difference	Chi-Square p-value
Q7							0.2610
1-very poor	3.93	0.99	6.41	2.47	2.478	0.630	
2-poor	22.89	2.14	16.80	3.47	-6.090	-0.266	
3-fair	46.51	2.50	40.80	4.92	-5.705	-0.123	
4-good	24.70	2.31	31.73	4.51	7.031	0.285	
5-excellent	1.97	0.75	4.26	1.97	2.286	1.161	
Q7 collapsed							0.2059
1/2 very poor/poor	26.83	2.33	23.21	4.05	-3.612	-0.135	
3-fair	46.51	2.50	40.80	4.92	-5.705	-0.123	
4/5 good/excellent	26.67	2.34	35.98	4.53	9.317	0.349	

Table 3.   Average response of Q7 by selected categorical variables: Wave 6

Characteristic	Main Survey (mean)	Standard Error	Follow-up (mean)	Standard Error	Difference	Relative difference	t test p-value
Q7	2.98	0.04	3.11	0.09	0.127	0.043	0.2451
Census Region (CREG)							
Northeast	3.05	0.08	2.99	0.17	-0.053	-0.017	0.7899
Midwest	2.91	0.10	3.19	0.16	0.278	0.096	0.1609
South	2.94	0.09	3.03	0.19	0.087	0.030	0.6732
West	3.03	0.09	3.22	0.15	0.195	0.064	0.2848
Agent/Attorney (TYPE)							
Agent	2.86	0.09	3.16	0.18	0.294	0.103	0.1494
Attorney	2.99	0.05	3.10	0.10	0.114	0.038	0.3467
Sample Domain (DOMAIN)							
Large firms, 50 customers or less	3.01	0.06	2.90	0.13	-0.102	-0.034	0.4591
Large firms, more than 50 customers firms, number of applications between	3.01	0.11	3.27	0.19	0.259	0.086	0.2653
150 and 275	2.96	0.11	2.78	0.27	-0.181	-0.061	0.5521
firms, less than 150 applications	2.95	0.07	3.32	0.12	0.371	0.126	0.0164*
top-filer firms or independent inventors	3.66	0.75	-	-	NA	NA	NA
Registration number (REG_NO_R)							
REG_NO < 33229	3.00	0.11	3.27	0.19	0.269	0.090	0.2489
33229 <= REG_NO <= 42055	3.06	0.09	3.01	0.16	-0.057	-0.019	0.7552
42055 < REG_NO <= 50724	2.90	0.07	3.03	0.19	0.129	0.044	0.5264
other	2.94	0.10	3.11	0.13	0.171	0.058	0.3094

* significant under B-H approach

Table 4.   Response rates by postcard type: Wave 6

Characteristic	Salmon (percent)	Standard Error	White (percent)	Standard Error	Difference	Relative difference	t test p-value
Response rate	32.13	3.26	29.69	2.97	-2.440	-0.076	0.5545

Table 5.   Percentage distribution of Q7 by postcard type: Wave 6

Characteristic	Salmon (percent)	Standard Error	White (percent)	Standard Error	Difference	Relative difference	Chi-Square p-value
Q7							0.7667
1-very poor	7.03	3.99	5.79	2.62	-1.235	-0.176	
2-poor	20.33	5.82	13.25	4.01	-7.081	-0.348	
3-fair	41.63	7.16	39.98	6.55	-1.648	-0.040	
4-good	26.89	5.51	36.60	6.45	9.705	0.361	
5-excellent	4.13	2.37	4.38	3.00	0.258	0.063	
Q7 collapsed							0.4329
1/2 very poor/poor	27.36	6.67	19.04	4.79	-8.317	-0.304	
3-fair	41.63	7.16	39.98	6.55	-1.648	-0.040	
4/5 good/excellent	31.02	5.48	40.98	6.48	9.964	0.321	

Table 6.   Average response of Q7 by selected categorical variables: Wave 6

Characteristic	Salmon (mean)	Standard Error	White (mean)	Standard Error	Difference	Relative difference	t test p-value
Q7	3.01	0.13	3.21	0.11	0.197	0.065	0.2340
Census Region (CREG)							
Northeast	2.78	0.28	3.17	0.16	0.390	0.140	0.2261
Midwest	3.01	0.20	3.32	0.25	0.311	0.103	0.3342
South	2.91	0.20	3.21	0.30	0.296	0.102	0.3895
West	3.40	0.25	3.06	0.14	-0.339	-0.100	0.2346
Agent/Attorney (TYPE)							
Agent	3.23	0.22	3.06	0.31	-0.166	-0.051	0.6596
Attorney	2.98	0.15	3.22	0.12	0.242	0.081	0.1839
Sample Domain (DOMAIN)							
Large firms, 50 customers or less	2.92	0.18	2.89	0.18	-0.036	-0.012	0.8862
Large firms, more than 50 customers	3.51	0.26	3.00	0.29	-0.503	-0.143	0.1991
firms, number of applications between 150 and 275	2.63	0.38	2.98	0.34	0.353	0.134	0.4748
firms, less than 150 applications	3.08	0.15	3.56	0.16	0.476	0.155	0.0331
top-filer firms or independent inventors	-	-	-	-	NA	NA	NA
Registration number (REG_NO_R)							
REG_NO < 33229	2.85	0.26	3.50	0.19	0.655	0.230	0.0372
33229 <= REG_NO <= 42055	3.08	0.26	2.94	0.19	-0.144	-0.047	0.6433
42055 < REG_NO <= 50724	2.98	0.30	3.09	0.21	0.112	0.038	0.7669
other	3.07	0.14	3.22	0.30	0.155	0.051	0.6354

Table 7.   Percentage distribution of Q7 by response status: Wave 7

Characteristic	Main Survey (percent)	Standard Error	Follow-up (percent)	Standard Error	Difference	Relative difference	Chi-Square p-value
Q7							0.2780
1-very poor	4.48	0.99	5.90	1.90	1.424	0.318	
2-poor	18.19	1.72	14.60	3.10	-3.586	-0.197	
3-fair	46.90	2.28	39.55	4.77	-7.351	-0.157	
4-good	27.90	2.12	33.18	4.37	5.283	0.189	
5-excellent	2.54	0.87	6.77	3.32	4.229	1.666	
Q7 collapsed							0.1672
1/2 very poor/poor	22.67	1.96	20.51	3.70	-2.162	-0.095	
3-fair	46.90	2.28	39.55	4.77	-7.351	-0.157	
4/5 good/excellent	30.43	2.11	39.95	4.33	9.512	0.313	

Table 8. Average response of Q7 by selected categorical variables: Wave 7

Characteristic	Main Survey (mean)	Standard Error	Follow-up (mean)	Standard Error	Difference	Relative difference	t test p-value
Q7	3.06	0.04	3.20	0.09	0.145	0.047	0.1471
Census Region (CREG)							
Northeast	3.01	0.10	2.87	0.23	-0.132	-0.044	0.6077
Midwest	2.98	0.10	2.99	0.23	0.008	0.003	0.9737
South	3.04	0.09	3.45	0.14	0.413	0.136	0.0149
West	3.22	0.08	3.25	0.19	0.036	0.011	0.8503
Agent/Attorney (TYPE)							
Agent	2.87	0.12	3.76	0.29	0.884	0.308	0.0057*
Attorney	3.08	0.04	3.12	0.09	0.041	0.013	0.6834
Sample Domain (DOMAIN)							
Large firms, 50 customers or less	3.08	0.05	3.08	0.11	-0.001	0.000	0.9944
Large firms, more than 50 customers	2.98	0.09	3.34	0.35	0.363	0.122	0.3286
firms, number of applications between 150 and 275	3.00	0.09	2.76	0.28	-0.236	-0.079	0.4267
firms, less than 150 applications	3.07	0.09	3.35	0.14	0.279	0.091	0.0987
top-filer firms or independent inventors	3.47	0.35	-	-	NA	NA	NA
Registration number (REG_NO_R)							
REG_NO < 33229	3.26	0.09	3.18	0.19	-0.076	-0.023	0.7118
33229 <= REG_NO <= 42055	2.99	0.09	3.16	0.11	0.171	0.057	0.1897
42055 < REG_NO <= 50724	2.96	0.08	2.78	0.20	-0.185	-0.062	0.4085
Other	3.01	0.08	3.64	0.22	0.631	0.210	0.0082*

* significant under B-H approach

Table 9.   Response rates by postcard type: Wave 7

Characteristic	Salmon (percent)	Standard Error	White (percent)	Standard Error	Difference	Relative difference	t test p-value
Response rate	25.48	3.04	33.30	3.40	7.820	0.307	0.0850

Table 10.   Percentage distribution of Q7 by postcard type: Wave 7

Characteristic	Salmon (percent)	Standard Error	White (percent)	Standard Error	Difference	Relative difference	Chi-Square p-value
Q7							0.0504
1-very poor	8.19	3.59	4.18	2.02	-4.009	-0.490	
2-poor	15.88	5.18	13.64	3.86	-2.240	-0.141	
3-fair	26.16	5.43	49.67	6.58	23.511	0.899	
4-good	35.43	7.67	31.47	4.92	-3.957	-0.112	
5-excellent	14.34	6.76	1.04	1.07	-13.304	-0.928	
Q7 collapsed							0.0395
1/2 very poor/poor	24.07	6.04	17.82	4.84	-6.249	-0.260	
3-fair	26.16	5.43	49.67	6.58	23.511	0.899	
4/5 good/excellent	49.78	7.41	32.51	4.96	-17.262	-0.347	

Table 11.   Average response of Q7 by selected categorical variables: Wave 7

Characteristic	Salmon (mean)	Standard Error	White (mean)	Standard Error	Difference	Relative difference	t test p-value
Q7	3.32	0.18	3.12	0.09	-0.203	-0.061	0.3367
Census Region (CREG)							
Northeast	3.30	0.36	2.62	0.23	-0.679	-0.206	0.1182
Midwest	2.47	0.45	3.38	0.17	0.910	0.369	0.0666
South	3.48	0.21	3.42	0.16	-0.066	-0.019	0.7993
West	3.68	0.39	3.06	0.11	-0.619	-0.168	0.1207
Agent/Attorney (TYPE)							
Agent	4.04	0.37	3.33	0.20	-0.717	-0.177	0.0940
Attorney	3.16	0.17	3.09	0.09	-0.063	-0.020	0.7502
Sample Domain (DOMAIN)							
Large firms, 50 customers or less	3.05	0.22	3.09	0.14	0.034	0.011	0.9012
Large firms, more than 50 customers	3.44	0.60	3.21	0.40	-0.230	-0.067	0.7487
firms, number of applications between 150 and 275	2.15	0.56	3.13	0.19	0.982	0.458	0.0951
firms, less than 150 applications	3.66	0.21	3.11	0.13	-0.544	-0.149	0.0251
top-filer firms or independent inventors	-	-	-	-	NA	NA	NA
Registration number (REG_NO_R)							
REG_NO < 33229	3.23	0.31	3.13	0.18	-0.099	-0.031	0.7794
33229 <= REG_NO <= 42055	2.98	0.20	3.26	0.13	0.276	0.093	0.2955
42055 < REG_NO <= 50724	3.48	0.21	2.50	0.20	-0.980	-0.282	0.0010*
other	3.72	0.38	3.55	0.15	-0.177	-0.048	0.6667

* significant under B-H approach

Appendix

Benjamin-Hochberg critical values

Index	B-H critical value
2 levels	
1	0.1000
2	0.0500
4 levels	
1	0.1000
2	0.0750
3	0.0500
4	0.0250