On the Value of Privacy from Telemarketing: Evidence from the "Do Not Call" Registry

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Abstract

Despite tremendous debate and policy interest, there has been relatively little research into the issue of how much individuals value their privacy. In this paper, I estimate the demand for privacy from telemarketing as provided by state-level "do not call" registries. I then project the demand curve for the federal "do not call" registry and compute the perceived value of the "do not call" registry to range from $13.19 to $98.33 per household. The implied national gain in consumer welfare (relative to the state level registries) ranged from $1.42 to $11.62 billion.

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Introduction

Rapid advances in technology have enabled marketers to create new ways of marketing to individuals on a large scale. These same technological developments present major challenges to individual privacy and public policy (Bainbridge 2003). Indeed, the Electronic Privacy Information Center declares that "Public opinion polls consistently find strong support among Americans for privacy rights in law to protect their personal information from government and commercial entities".[1]

Consumers have been particularly incensed by telemarketing, especially as it has become automated. The U.S. Federal Trade Commission established the "do not call" registry in June 2003. Other governments are following. Australia's registry became operational in May 2007.[2] Canada has enacted legislation and will soon open the registry.[3]

However, industry advocates have asserted that complying with privacy legislation would cost billions of dollars (Hahn 2001; Turner 2001). The conflict between privacy advocates and industry motivates my research objective: Exactly how much do individuals value their privacy? The real policy issue is not whether consumers value privacy. The real issue is how much they value their privacy. Despite tremendous debate and policy interest, there has been relatively research into this question (Hui and Png 2006). Indeed, it has been conjectured that "measuring the value of consumer privacy may prove to be intractable" (Ward 2001).

Businesses need to know the value of privacy in developing marketing strategy. Governments need this information to decide on privacy regulation. For instance, Laudon (1996) and Varian (1997) have advocated the regulation of privacy through markets in personal information. However, the economic viability of such markets depends on how much individuals value their privacy.

In this paper, I focus on the value of privacy from telemarketing as provided by the federal "do not call" registry. The U.S. federal "do not call" registry was established by The Do-Not-Call Implementation Act of 2003.[4] The Implementation Act required the Federal Trade Commission and Federal Communications Commission to report annually on the "effectiveness of the national registry". In response, the agencies provided the findings of two telephone surveys of consumers whether they were aware of the registry, whether they

[1] http://www.epic.org/privacy/survey/ [Accessed, 27 June 2007].

[2] Australian Government, Department of Communications, Information Technology and the Arts, "Do Not Call Register", Document ID: 35056 | Last modified: 5 July 2007, 11:28am.

[3] Canadian Radio-Television and Telecommunications Commission, "CRTC moves a step closer to establishing a National Do Not Call List", Press Release, July 3, 2007.

[4] Public Law No. 108-10, §2, 117 Stat. 557, 557 (2003).

had registered, and the impact on telemarketing calls (U.S. GAO 2005). However, the agencies provided no estimates of the perceived value of the registry.

Varian et al. (2004) calculated the value of the federal "do not call" registry to range from $0.55 to $33.21 per household per year, which they acknowledged to be "an enormous gap".[5] By contrast, in the present study, I applied econometric methods to state-level "do not call" registries to estimate the demand for privacy from telemarketing. Using the parameters of the demand curve, I computed three estimates of the value of the federal "do not call" registry: $13.19, $50.57, and $98.33 per household, depending on the specification.

Based on these estimates, the implied national gain in consumer welfare was $1.42 billion, $6.00 billion, and $11.62 billion respectively. These numbers would provide an empirically based response to the Congressional mandate to report on the effectiveness of the national "do not call" registry.

"Do Not Call" Registry

To address consumer dissatisfaction with telemarketing, the U.S. Federal Trade Commission (FTC) established the "do not call" registry. Within 24 hours of its opening on June 27, 2003, over 10 million telephone numbers were registered. Up to February 2007, total registrations exceeded 139 million. Chairman of the Harris Poll, Humphrey Taylor (2004), remarked, "In my experience these results are remarkable. It is rare to find so many people benefit so quickly from a relatively inexpensive government program."

Prior to the establishment of the federal "do not call" registry on June 27, 2003, twenty-nine states had already set up state-level "do not call" registries. As affirmed by the U.S. District Court for the Middle District of Florida in the case, *State of Florida, Department of Agriculture and Consumer Services, v. The Sports Authority Florida, Inc.*, state-level "do not call" registries could apply to both in-state and out-of-state telemarketers.[6] Indeed, some businesses saw the state-level "do not call" registry as a means to limit competition from out-of-state telemarketers.[7]

As of June 30, 2004, a total of 17 states had transferred their state-level "do not call" registries to the FTC. I used these state-level registrations to estimate the demand curve for

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[5] To be precise, Varian et al.'s (2004) estimate ranged from $60 million to $3.6 billion a year. With 108.4 million households, this was equivalent to a range of $0.55 to $33.21 per household per year.
[6] 2004 U.S. District Court, LEXIS 29646, June 4, 2004, at 14-15.

[7] "Wisconsin itself is being sued for its state no-call list by state trade associations, who argue that the state's no-call law had been meant to block out-of-state telemarketing calls, not those made by local businesses." "National No-Call Registry May Spark State Suit", *DM News*, July 28, 2003.

the federal registry.[8] The key to this estimate is that many of the states charged a fee for their "do not call" registries, which fee differed among the states. By contrast, the FTC provided the federal "do not call" registry to all households at the same price of zero, and hence did not yield any variation on which to estimate a demand curve.

Demand for Privacy

Referring to Figure 1, my empirical strategy was to use the proportion of households registered with the state-level "do not call" registry, R_s, and the corresponding fee, *p*, to estimate a parsimonious model of the demand for the state-level "do not call" registry. Formally, the demand function was

$$R_s = f(p, X), \tag{1}$$

where *X* is a vector of other variables that might possibly affect registrations.

In common with many econometric studies (Greene (2000), page 214), I specified the demand equation in three alternative ways: a linear equation,

$$R_s = \alpha_1 + \beta_1 p + \gamma_1 X, \tag{2}$$

semi-log-linear equation,

$$R_s = \alpha_2 + \beta_2 \ln(1+p) + \gamma_2 \ln X, \tag{3}$$

and log-linear equation,[9]

$$\ln(1+R_s) = \alpha_3 + \beta_3 \ln(1+p). \tag{4}$$

Suppose that federal-level registration provided more effective protection against telemarketing or was better publicized. Then, as Figure 1 depicts, the demand for federal registration would be higher than the demand for state registration.[10] By suitable adjustment of the estimates of (2)-(4), I could then construct the demand for federal registration.

Data and Estimates

My source of state-level information was the FTC's reports of the *net* transfer of state registrations to the federal registry as of June 30, 2004. Table 1 describes the data on the state-level registries. Since the FTC reported the transfer net of any duplicates with numbers already in the federal registry, the FTC's report *under-stated* the actual number of state

[8] As explained below, my sample actually comprised just 16 states.

[9] For the semi-log-linear specification, I added one to the fee to ensure that the logarithm would be finite. I made a similar adjustment to both the registration rate and fee in the log-linear specification. Any indicator variables were specified in absolute rather than logarithmic form.

[10] As explained below, the data do support this supposition. I explain the other variables in Figure 1 below.

registrations.[11] Table 2 summarizes the data used for estimation. All of the equations were estimated with ordinary least squares.

Referring to (2), in the baseline linear specification, the dependent variable was the state-level registration rate, defined as the net number of registrations transferred to the federal register as of June 30, 2004 divided by the number of households, while the explanatory variables were a constant and the state registration fee (for 5 years, which was the effective period of federal registration):

Table 3, column (a), reports the results. The coefficient of the registration fee was – 0.01193 and significant at the 95% level. The average registration rate was 26.76%, while the standard deviation of the fee was $9.507. Accordingly, an increase in the fee by one standard deviation would have been associated with a reduction in the registration rate by 11.34%, or 0.42 of the mean registration rate. Hence, the estimated coefficient was also economically significant.

I checked the robustness of the baseline linear specification in three ways. Households for whom time is more valuable might be expected to be more likely to subscribe to the “do not call” registry. A good proxy for opportunity cost of time would be household income. In addition, it seems plausible that more educated consumers might be more aware of the registry and so, more likely to register. Accordingly, in the next specification, I included two additional explanatory variables – median household income and the percentage of population with a bachelor degree.

Table 3, column (b), reports the results. Compared with the baseline linear specification, the coefficient of the registration fee was slightly larger (smaller in absolute value) but still significant at the 95% level. Contrary to prediction, the coefficient of median household income was negative, but not significant. Consistent with prediction, the coefficient of education (percentage of population with a bachelor degree) was positive but not significant.

In the second variant of the baseline linear specification, I included an indicator of whether the state registry was established before 2003. The reason was that some states established state-level registries primarily to “pre-register” residents for the federal registry, which opened on June 27, 2003 (Varian et al. 2004).

[11] According to Varian et al. (2004), Appendix A, Mississippi did not provide a state-level registry. However, the FTC (2006) reported receiving a net transfer of 15,798 numbers from that state. I excluded this state from the estimates as I did not have information on the fee charged for its registry, if any. Hence, my sample comprised 16 states.

Table 3, column (c), reports the results. Compared with the baseline linear specification, the coefficient of the registration fee was almost the same and significant at the 95% level. The coefficient of "Pre-2003" was not significant.

Through a series of experiments, Shampan'er and Ariely (forthcoming) have shown that consumer demand may be discontinuous at a price of zero. Specifically, the quantity demanded at a zero price is discretely larger than the quantity demanded at a very low price. In the third robustness check, I estimated the baseline specification, including only the 5 states that charged for the registry.

Table 3, column (d), reports the results. Compared with the baseline linear specification including all states with state-level registries reported in column (a), the coefficient of the registration fee was just a little smaller in magnitude. However, owing to the limited degrees of freedom, the coefficient was imprecisely estimated.

The major difference between the baseline specification estimated on all states with state registries (column (a)) and only those states that charged a fee (column (d)) was in the constant, which reflects the demand at a zero price. Consistent with the experimental findings of Shampan'er and Ariely (forthcoming), the constant was smaller in the sample of states that charged fees, and the difference from the constant in the all-state sample was 1.6 times the estimated standard error of the constant in the all-state sample.

Having considered the four variants of the linear specification in terms of goodness of fit and statistical significance of the explanatory variables, I preferred the baseline (a). Next, I used the baseline to compare the demand for federal registration vis-à-vis state registration. For each state, I used the baseline specification to predict the registration rate with a zero fee, and then compared the prediction with the actual federal registration rate in June 2004. On average, the baseline *under-predicte*d the actual federal registration rate in the states by 36.4%. This result is consistent with the demand for federal registration being higher than that for state registration.

Next, referring to (3) and (4), I estimated the semi-log-linear and log-linear specifications. Table 3, columns (e) and (g), reports the estimates of the baseline specification – with only a constant and the fee as explanatory variables. I also estimated the variants including household income and education, and including the pre-2003 indicator. However, these additional explanatory variables were not statistically significant.

In both semi-log-linear and log-linear specifications, with restriction of the sample to states that charged non-zero fees, the constant was *larger* than in the sample of all states with state registries – in Table 3, compare columns (e) with (f), and (g) with (h) respectively.

Moreover, the respective differences were more than double the estimated standard error of the constant in the sample of all states. This difference is contrary to the experimental findings of Shampan'er and Ariely (forthcoming). Accordingly, the evidence seems mixed as to whether the estimated demand from all states with state registries under or over-states the demand if the fee is zero.

When fitted to the state-level data, the baseline semi-log-linear and log-linear specifications (in the sample of all states with state registries) with a zero fee *under-predicted* the actual federal registration rate in the states by an average of 33.6% and 35.4% respectively.

Using each of the three estimated baseline specifications, I then constructed the demand for the federal "do not call" registry. For simplicity, I explain the procedure for the linear specification here, and detail the corresponding procedures for the semi-log-linear and log-linear specifications in the Appendix.

Referring to Figure 1 and equation (2), the challenge was to construct the demand for the federal "do not call" registry,[12]

$$R_f = \lambda_1 - \mu_1 p . \quad (5)$$

Referring to Figure 1 and equations (2) and (5), a *very conservative* approach was to assume that the demands for the federal and state registries had the same price intercept, $p_{f0} = p_{s0}$, but different quantity intercepts, $\lambda_1 > \alpha_1$. Then, by (5), $\lambda_1 = R_f(0)$, where $R_f(0)$ was the actual registration rate with the federal registry, and $p_{f0} = \lambda_1 / \mu_1$, and so, $\mu_1 = R_f(0) / p_{f0}$. Now, by (2), $p_{s0} = \alpha_1 / \beta_1$. Hence, the federal demand would be

$$R_f = R_f(0) - \frac{\beta_1 R_f(0)}{\alpha_1} p . \quad (6)$$

The various registries were provided at little or no charge, hence income effects are negligible. Accordingly, and the benefit provided by the federal registry would be

$$\int_0^{R_f(0)} p_f(R) dR = \frac{1}{2} p_{s0} R_f(0) = \frac{\alpha_1}{2\beta_1} p_{s0} R_f(0) , \quad (7)$$

where $p_f(.)$ is the federal-level inverse demand curve. Further, by (2) and Figure 1, the benefit provided by the state registry would be

$$\int_0^{R_s} p_s(R) dR = \frac{1}{2}\left[p_{s0} + \frac{\alpha_1 - R_s}{\beta_1} \right] R_s , \quad (8)$$

where $p_s(.)$ is state-level inverse demand curve.

[12] Since I preferred the baseline specification, in (3), $X = 0$.

Referring to Figure 1, a *best guess* would be to assume that the demand for the federal registry was a uniform shift of the demand for the state registry. By (2) and (5), this means that $\mu_1 = \alpha_1$ and $\lambda_1 = R_f(0)$. Hence, the federal demand would simplify to

$$R_f = R_f(0) + \beta_1 p \,. \tag{9}$$

Referring to Figure 1, the benefit provided by the federal registry would be

$$\int_0^{R_f(0)} p_f(R)dR = \frac{1}{2} p_{f0} R_f(0) = \frac{[R_f(0)]^2}{2\beta_1} \,. \tag{10}$$

Table 4, columns (a)-(c), reports the results from the very conservative and best guess approaches for the various states with the baseline linear specification. The average benefit from the state-level registry was $2.86 per household. The average benefit from the federal-level registry was $7.50 by the very conservative approach and $13.39 by the best guess.

Similarly, Table 4, columns (d)-(i), reports the results from the very conservative and best guess approaches for the various states with the other baseline specifications. All three specifications provided quite similar numbers for the benefit from the state-level registry – ranging from $2.76 with the log-linear specification to $2.86 with the linear specification. Likewise, the estimated benefits from the federal registry by the very conservative approach were quite similar – ranging from $5.45 with the log-linear specification to $7.50 with the linear specification.

The big difference was in the best guess for the federal registry – ranging from $13.19 with the linear specification to $50.57 with the log-linear specification to $98.33 with the log-linear specification. The difference is due to the inherent structure of the specified demand curves.

One benchmark against which to compare the estimated benefit from the federal registry is the fee that telephone service providers charge for an unlisted telephone number. In 2006, Verizon’s monthly fee for an unpublished telephone number was $0-1.50, $2.50, $0-2.50, and $4.95 in the states of California, New York, Pennsylvania, and Texas respectively. On an annual basis, these fees ranged up to $59.40. Compared with these fees, my estimates of the benefit from the federal registry seem quite plausible.

It is also useful to calculate the impact of the federal “do not call” registry on consumer welfare. Conceptually, for each state, this would be the difference between the benefit from the federal registry less the benefit from the state registry, if any, multiplied by the number of households. Formally, the gain in consumer welfare would be

$$\left[\int_0^{R_f(0)} p_f(R)dR - \int_0^{R_s} p_s(R)dR \right] N \,, \tag{11}$$

where N is the number of households in the state. Using the best guess of the demand for the federal “do not call” registry, the total gain in consumer welfare in the 50 states and the District of Columbia ranged from $1.42 billion with the linear specification to $11.62 billion with the log-linear specification to $6.00 billion with the semi-log-linear specification.

Concluding Remarks

Previous analyses (Varian et al. 2004; Beard and Abernethy 2005; Anderson 2007) of consumer’s value of the federal “do not call” registry were all based on illustrative calculations. By contrast, I used econometric methods to compute various estimates of the perceived value of the federal “do not call” registry, ranging from $13.19 to $98.33 per household.

Another way to interpret these computations is that, for the average household which subscribed to the “do not call” registry, the expected consumer surplus from telemarketing must have been less than the privacy cost. The telemarketing industry must increase consumer value from telemarketing by at least the value of the “do not call” registry in order to persuade households to remove their telephone numbers from the registry and so accept telemarketing.

My findings are subject to two limitations. First, they obviously depend on the specified demand functions. I have applied all of the usual specifications. I have also checked the robustness of the specifications, in particular to the extreme of a zero fee. The second limitation is that the demand for the federal “do not call” registry was driven in part by huge publicity. Figure 2 graphs reports of “do not call” in the media between June 2003 and June 2004. The philosophical question is then whether the benefit from the “do not call” registry should be measured from the demand curve including the impact of publicity or just from the “intrinsic” demand, excluding the impact of publicity. Unfortunately, without data on the publicity of state-level registries, there was no way to estimate such an “intrinsic” demand.

Future research must consider a fundamental collective action problem that the telemarketing industry faces in raising consumer benefit from telemarketing. The consumer’s benefit from telemarketing is an expectation (equivalently, an average) over all the telemarketing offers that she expects to receive. So, the consumer will decide whether or not to accept telemarketing according to the average benefit expected from *all telemarketing offers*.

However, each individual telemarketer will decide its offer based on its own profit, rather than the profit of the entire industry. Accordingly, in deciding its offers, it will ignore any negative externality on other telemarketers. Each telemarketer will provide too little benefit to consumers, and hence, the number of consumers who accept telemarketing will fall short of the social optimum.[13]

[13] See Hann et al. (2007) for a formal analysis.

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Table 1: State "do not call" registries

	With state registry[1]	Pre-2003[1]	Fee[1]	No. transferred[2]	No. registered with federal[3]
Alabama	1	1	0	36,799	881,498
Alaska	1	1	35		81,606
Arizona	0	0			1,397,786
Arkansas	1	1	25	39,000	448,806
California	1	0	0	1,579,422	7,781,423
Colorado	1	1	0	1,068,254	1,534,941
Connecticut	1	1	0	415,275	920,284
Delaware	0	0			184,448
DC	0	0			165,913
Florida	1	1	30	114,627	3,873,541
Georgia	1	1	13	191,773	1,861,251
Hawaii	0	0			165,163
Idaho	1	1	30		226,824
Illinois	0	0			2,734,685
Indiana	1	1	0		468,326
Iowa	0	0			676,477
Kansas	1	0	0	444,084	712,608
Kentucky	1	1	0	762,500	1,026,246
Louisiana	1	1	0		545,360
Maine	1	1	5	46,098	284,973
Maryland	0	0			1,420,066
Massachusetts	1	0	0	1,073,782	1,828,055
Michigan	0	0			2,308,379
Minnesota	1	0	0	1,002,587	1,474,535
Mississippi	0	0		15,798	390,041
Missouri	1	1	0		785,903
Montana	0	0			185,566
Nebraska	0	0			395,670
Nevada	0	0			488,210
New Hampshire	0	0			339,287
New Jersey	0	0			1,985,748
New Mexico	0	0			333,746
New York	1	1	0	2,065,434	4,343,319
North Carolina	0	0			1,959,011
North Dakota	1	0	0	46,950	152,068
Ohio	0	0			2,580,001
Oklahoma	1	0	0	442,996	778,604
Oregon	1	1	19		660,276
Pennsylvania	1	1	5	1,866,161	3,418,632
Rhode Island	0	0			222,522
South Carolina	0	0			818,461
South Dakota	0	0			165,426
Tennessee	1	1	0		841,635
Texas	1	1	2.5		3,236,436
Utah	0	0			466,394
Vermont	1	1	5		113,317
Virginia	0	0			1,837,726
Washington	0	0			1,417,825
West Virginia	0	0			308,490
Wisconsin	1	0	0		672,585
Wyoming	1	1	5		93,472

Sources: (1) Varian et al. (2004), Appendix A; (2) FTC 2006; (3) FTC 2004.

Table 2: Summary Statistics

	Data source	Unit	Mean	Std. dev.	Min	Max
No. of state registrations	FTC	‘000	699.73	678.87	36.80	2,065
No. of households	Census	‘000	3,048	3,106	254.5	11,856
Fee (for five years)	Varian et al. 2004, Appendix A	$	4.84	9.507	0	30
Pre-2003	Varian et al. 2004, Appendix A	n.a.	0.625	0.5	0	1
Median household income	American Community Survey	$‘000	42.526	6.2657	34.141	56.803
Percent of population with bachelor degree	American Community Survey	%	25.874	4.6814	18.600	35.800

Table 3: Demand for state "do not call" registry (Dependent variable: Proportion of households registered)

	(a) linear	(b) linear	(c) linear	(d) linear (states with fee)	(e) semi-log-linear	(f) semi-log-linear (states with fee)	(g) log-linear	(h) log-linear (states with fee)
Constant	0.3254 (0.04508)***	0.07309 (0.2769)	0.3344 (0.06752)***	0.2516 (0.1094)*	0.3397 (0.04677)***	0.4684 (0.2194)	0.2853 (0.03669)***	0.4028 (0.1779)
Fee (for five years)	-0.01193 (0.004334)**	-0.009729 (0.004756)**	-0.01156 (0.004919)**	-0.008630 (0.005877)	-0.08955 (0.03135)***	-0.1361 (0.08223)	-0.07328 (0.02460)***	-0.1158 (0.06668)
Pre-2003	--	--	-0.01729 (0.09353)	--	--	--	--	--
Median household income	--	-0.003821 (0.01698)	--	--	--	--	--	--
Education	--	0.01512 (0.02346)	--	--	--	--	--	--
No. of observations	16	16	16	5	16	5	16	5
Adjusted R^2	0.3050	0.2808	0.2535	0.2242	0.3231	0.3031	0.3443	0.3350
F-statistic	7.583	2.952	3.547	2.156	8.158	2.740	8.878	3.015
Average discrepancy from actual federal registration rate	–36.4%	--	--	--	–33.6%		–35.4%	--

*** Significant at 99% level, ** Significant at 95% level.

Table 4: Benefit from federal and state registries

	Linear specification			Semi-log-linear specification			Log-linear specification		
	State	Fed-very cons	Fed-best	State	Fed-very cons	Fed-best	State	Fed-very cons	Fed-best
Alabama	0.5570	6.8953	10.7137	0.8139	5.2798	24.765	0.879	5.079	20.414
Alaska	0.0000	4.8513	5.3034	0.0000	3.7147	4.311	0.000	3.689	4.568
Arizona	0.0000	9.3039	19.5057	0.0000	7.1241	181.488	0.000	6.623	94.760
Arkansas	0.9336	5.6889	7.2927	1.2875	4.3561	8.937	1.370	4.269	8.679
California	2.8897	8.9505	18.0523	2.9449	6.8536	135.723	2.948	6.402	76.545
Colorado	1.5799	11.4935	29.7674	3.3843	8.8008	1093.97	3.281	7.951	330.588
Connecticut	4.4321	9.4841	20.2689	3.5431	7.2622	210.467	3.442	6.735	105.519
Delaware	0.0000	8.2803	15.4501	0.0000	6.3404	78.135	0.000	5.978	50.536
DC	0.0000	9.1730	18.9610	0.0000	7.0239	162.982	0.000	6.541	87.595
Florida	0.4585	7.9584	14.2722	0.6802	6.0939	59.893	0.738	5.772	41.189
Georgia	1.5041	8.0514	14.6077	1.8997	6.1651	64.679	1.980	5.832	43.712
Hawaii	0.0000	5.3702	6.4985	0.0000	4.1120	6.791	0.000	4.050	6.835
Idaho	0.0000	6.1481	8.5177	0.0000	4.7077	13.214	0.000	4.580	12.121
Illinois	0.0000	8.0645	14.6553	0.0000	6.1751	65.383	0.000	5.840	44.078
Indiana	0.0000	2.7172	1.6638	0.0000	2.0806	0.540	0.000	2.144	0.650
Iowa	0.0000	7.9668	14.3023	0.0000	6.1003	60.310	0.000	5.777	41.411
Kansas	4.0666	9.1805	18.9918	3.5203	7.0296	163.984	3.413	6.546	87.990
Kentucky	3.5070	8.7081	17.0878	3.4822	6.6680	111.173	3.376	6.249	65.978
Louisiana	0.0000	4.4464	4.4550	0.0000	3.4047	2.999	0.000	3.404	3.288
Maine	2.0387	7.2631	11.8873	2.3709	5.5615	33.652	2.429	5.321	26.153
Maryland	0.0000	9.4558	20.1479	0.0000	7.2404	205.619	0.000	6.717	103.755
Mass.	3.8796	10.2346	23.6034	3.5067	7.8368	389.703	3.400	7.195	163.554
Michigan	0.0000	8.1052	14.8036	0.0000	6.2063	67.619	0.000	5.866	45.235
Minnesota	3.1847	9.9949	22.5108	3.4630	7.6532	320.123	3.357	7.049	142.419
Mississippi	0.0000	5.0392	5.7221	0.0000	3.8586	5.088	0.000	3.821	5.297
Missouri	0.0000	4.6913	4.9593	0.0000	3.5922	3.739	0.000	3.577	4.018
Montana	0.0000	6.9206	10.7925	0.0000	5.2992	25.295	0.000	5.096	20.769
Nebraska	0.0000	7.9886	14.3807	0.0000	6.1170	61.407	0.000	5.791	41.993
Nevada	0.0000	7.9865	14.3729	0.0000	6.1154	61.297	0.000	5.790	41.935
New Hamp.	0.0000	9.3867	19.8546	0.0000	7.1875	194.275	0.000	6.674	99.572
New Jersey	0.0000	8.6728	16.9496	0.0000	6.6409	107.989	0.000	6.227	64.557
New Mex.	0.0000	6.5201	9.5795	0.0000	4.9925	18.084	0.000	4.830	15.763
New York	4.3857	8.3209	15.6017	3.5306	6.3714	80.792	3.434	6.004	51.842
N. Carolina	0.0000	8.1685	15.0356	0.0000	6.2548	71.246	0.000	5.907	47.089
N. Dakota	3.6058	8.1500	14.9676	3.2854	6.2406	70.166	3.239	5.895	46.540
Ohio	0.0000	7.8532	13.8971	0.0000	6.0133	54.898	0.000	5.704	38.494
Oklahoma	4.4368	7.9161	14.1209	3.5468	6.0615	57.834	3.444	5.745	40.086
Oregon	0.0000	6.3891	9.1984	0.0000	4.8922	16.197	0.000	4.742	14.381
Penn	4.2698	9.7110	21.2501	3.5360	7.4359	253.572	3.429	6.875	120.657
Rhode I.	0.0000	7.3734	12.2509	0.0000	5.6459	36.882	0.000	5.393	28.140
S. Carolina	0.0000	7.1196	11.4221	0.0000	5.4516	29.862	0.000	5.227	23.759
S. Dakota	0.0000	7.5383	12.8051	0.0000	5.7722	42.294	0.000	5.501	31.370
Tennessee	0.0000	5.0000	5.6334	0.0000	3.8286	4.916	0.000	3.793	5.137
Texas	0.0000	5.7812	7.5313	0.0000	4.4268	9.672	0.000	4.332	9.291
Utah	0.0000	8.4579	16.1200	0.0000	6.4764	90.463	0.000	6.091	56.492
Vermont	0.0000	6.3847	9.1859	0.0000	4.8889	16.137	0.000	4.739	14.337
Virginia	0.0000	8.9822	18.1803	0.0000	6.8778	139.308	0.000	6.422	78.036
Washington	0.0000	8.1165	14.8448	0.0000	6.2149	68.251	0.000	5.873	45.561
W. Virginia	0.0000	5.7499	7.4500	0.0000	4.4028	9.416	0.000	4.310	9.079
Wisconsin	0.0000	4.2484	4.0671	0.0000	3.2531	2.502	0.000	3.263	2.785
Wyoming	0.0000	6.4130	9.2674	0.0000	4.9105	16.526	0.000	4.758	14.625
Average	**2.858**	**7.503**	**13.387**	**2.800**	**5.745**	**98.325**	**2.760**	**5.451**	**50.572**

Figure 1: Demand for "do not call"

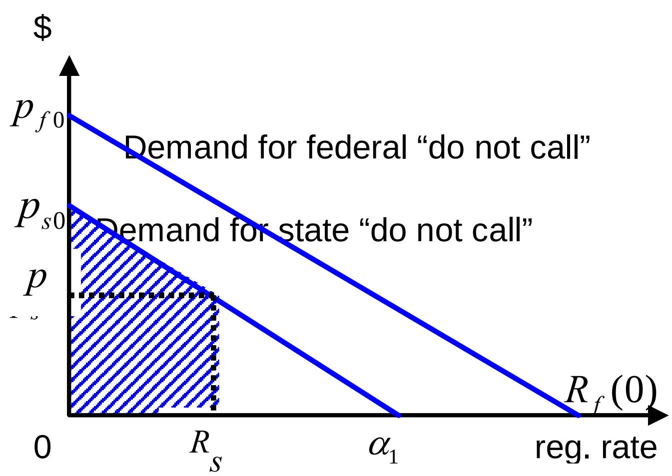
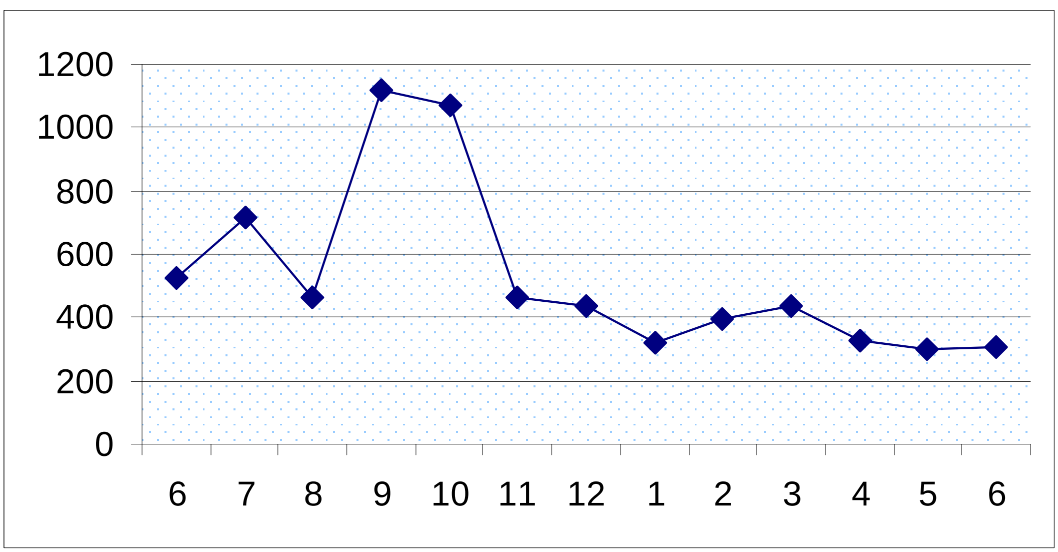


Figure 2: Media reports of "do not call"



Source: Factiva

Appendix

Recall from (4) that the baseline log-linear specification was

$$\ln(1+R_s)=\alpha_3-\beta_3\ln(1+p)\,. \qquad (4)$$

Re-arranging (4) and exponentiating, I have

$$p=-1+\exp\left\{\frac{\alpha_3}{\beta_3}-\frac{1}{\beta_3}\ln(1+R_s)\right\}=-1+\frac{\exp\left(\frac{\alpha_3}{\beta_3}\right)}{\exp\left(\frac{1}{\beta_3}\ln(1+R_s)\right)}$$

$$=-1+\frac{\exp\left(\frac{\alpha_3}{\beta_3}\right)}{\exp\left(\ln(1+R_s)^{\frac{1}{\beta_3}}\right)}=-1+\exp\left(\frac{\alpha_3}{\beta_3}\right)[1+R_s]^{-\frac{1}{\beta_3}}. \qquad \text{(A1)}$$

By integrating (A1) over R_s, the total benefit (area under the demand curve) is

$$\int pdR_s=-\int dR_s+\exp\left(\frac{\alpha_3}{\beta_3}\right)\int[1+R_s]^{-\frac{1}{\beta_3}}dR_s=-R_s+\exp\left(\frac{\alpha_3}{\beta_3}\right)\frac{1}{-\frac{1}{\beta_3}+1}[1+R_s]^{-\frac{1}{\beta_3}+1}. \qquad \text{(A2)}$$

Referring to (4), the log-linear specification of the demand for the federal "do not call" registry was

$$\ln(1+R_f)=\lambda_3-\mu_3\ln(1+p)\,, \qquad \text{(A3)}$$

where λ_3 and μ_3 are coefficients to be estimated. By similar analysis as leading to (A2), the total benefit (area under the demand curve) is

$$\int pdR_f=-R_f+\exp\left(\frac{\lambda_3}{\mu_3}\right)\frac{1}{-\frac{1}{\mu_3}+1}[1+R_f]^{-\frac{1}{\mu_3}+1}. \qquad \text{(A4)}$$

Comparing (4) with (A3), the very conservative approach assumed that the demands for the federal and state registries had the same price intercept, $p_{f0}=p_{s0}$, but different quantity intercepts, $\lambda_3>\alpha_3$. By (A3), with $p=0$, $\lambda_3=\ln(1+R_f(0))$. Further, with $R_f=0$, (A3) simplifies to $0=\lambda_3-\mu_3\ln(1+p_{f0})$, and so,

$$\mu_3=\frac{\lambda_3}{\ln(1+p_{f0})}=\frac{\ln(1+R_f(0))}{\ln(1+p_{s0})}=\frac{\ln(1+R_f(0))}{\ln(1+\exp(\alpha_3/\beta_3)-1)}=\frac{\beta_3}{\alpha_3}\ln(1+R_f(0))\,, \qquad \text{(A5)}$$

after substituting $p_{s0}=\exp(\alpha_3/\beta_3)-1$ from (4).

The best guess assumed that the demand for the federal registry was a uniform shift of the demand for the state registry. By (4) and (A3), this means that $\mu_3 = \alpha_3$ and $\lambda_3 = \ln(1 + R_f(0))$.

Similarly, the baseline semi-log-linear specification was

$$R_s = \alpha_2 - \beta_2 \ln(1+p), \qquad (3)$$

Re-arranging (3) and exponentiating, I have

$$p = -1 + \exp\left\{\frac{\alpha_2}{\beta_2} - \frac{R_s}{\beta_2}\right\} = -1 + \exp\left(\frac{\alpha_2}{\beta_2}\right)\exp\left(-\frac{R_s}{\beta_2}\right). \qquad (A6)$$

By integrating (A6) over R_s, the total benefit (area under the demand curve) is

$$\int p dR_s = -\int dR_s + \exp\left(\frac{\alpha_2}{\beta_2}\right)\int \exp\left(-\frac{R_s}{\beta_2}\right) dR_s = -R_s - \beta_2 \exp\left(\frac{\alpha_2}{\beta_2}\right)\exp\left(-\frac{R_s}{\beta_2}\right). \qquad (A7)$$

Referring to (3), the semi-log-linear specification of the demand for the federal "do not call" registry was

$$R_f = \lambda_2 - \mu_2 \ln(1+p), \qquad (A8)$$

where λ_2 and μ_2 are coefficients to be estimated. By similar analysis as leading to (A2), the total benefit (area under the demand curve) is

$$\int p dR_f = -R_f + \exp\left(\frac{\lambda_2}{\mu_2}\right)\frac{1}{-\frac{1}{\mu_2}+1}[1+R_f]^{-\frac{1}{\mu_2}+1}. \qquad (A9)$$

Comparing (3) with (A8), the very conservative approach assumed that the demands for the federal and state registries had the same price intercept, $p_{f0} = p_{s0}$, but different quantity intercepts, $\lambda_2 > \alpha_2$. By (A8), with $p = 0$, $\lambda_2 = R_f(0))$. Further, with $R_f = 0$, (A8) simplifies to $0 = \lambda_2 - \mu_2 \ln(1 + p_{f0})$, and so,

$$\mu_2 = \frac{\lambda_2}{\ln(1+p_{f0})} = \frac{R_f(0)}{\ln(1+p_{s0})} = \frac{R_f(0)}{\ln(1+\exp(\alpha_2/\beta_2)-1)} = \frac{\beta_2 R_f(0)}{\alpha_2}, \qquad (A10)$$

after substituting $p_{s0} = \exp(\alpha_2/\beta_2) - 1$ from (3).

The best guess assumed that the demand for the federal registry was a uniform shift of the demand for the state registry. By (3) and (A8), this means that $\mu_2 = \alpha_2$ and $\lambda_2 = R_f(0)$.