Consumer Privacy and Marketing Avoidance: A Static Model

Il-Horn Hann[*], Kai-Lung Hui[**], Tom S. Lee [‡], I.P.L. Png[**]

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Abstract

We introduce the concept of "marketing avoidance" – consumer efforts to conceal themselves and to deflect marketing. The setting is one where sellers market some item through solicitations to potential consumers, who differ in their benefit from the item and suffer harm from receiving solicitations. We find that seller solicitations are a strategic complement with concealment by low-benefit consumers: efforts by low-benefit consumers to conceal themselves will increase the cost-effectiveness of solicitations and lead sellers to market *more*. However, concealment by high-benefit consumers leads sellers to market *less*. Concealment causes solicitations to be shifted to other consumers, while deflection does not. We show that concealment by low-benefit consumers *increases* the overall expected harm. To the extent that the increase in consumer harm outweighs the gain in seller revenue, concealment is also socially *worse* than deflection. In general, unless the benefit from the marketed item is large relative to the harm caused by solicitations, deflection is socially preferable to concealment.

[*] University of Southern California; [**] National University of Singapore; [‡] Hanyang University. Corresponding author: Ivan Png, Tel: +65 6516-6807; http://www.comp.nus.edu.sg/~ipng/.

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1. Introduction

Privacy is a key concern for consumers (Westin 2001). Consumers use video-recorders, TiVo, caller-ID, spam filters, pop-up blockers, anonymous browsing, and other devices and techniques to avoid marketing and protect their privacy. Over 100 million telephone numbers have been registered with the U.S. "do not call" list (Federal Trade Commission 2005). Such consumer actions to avoid marketing present critical challenges to marketers:

> "What's an advertiser to do when the most affluent customers aren't compelled to watch TV commercials and are, in fact, actively avoiding them?" (Barnes 2003).

Improvements in technology are creating new techniques of marketing, and, at the same time, new ways to avoid marketing. These present new challenges to the marketing profession and public policy makers. How should marketers respond to consumer avoidance of marketing? How does their strategic interaction affect consumer privacy? What is the appropriate public policy towards marketing activities that impose harm on consumers?

Prior analytical research has assumed that consumers passively accept advertising and direct marketing. Here, we introduce the concept of "marketing avoidance", and focus on the endogenous tradeoff between seller marketing and consumer privacy in a static setting. Consumers can get some item only through seller's marketing, but the marketing imposes harm and leads them to expend resources on avoidance in two ways – concealment and deflection. There are two consumer segments – high- and low-benefit. Sellers compete to solicit customers. When they decide expenditures on solicitations, sellers cannot distinguish the two consumer segments and ignore the harm caused by their marketing.

We show that seller marketing is a strategic *complement* with concealment by low-benefit consumers. Low-benefit consumer efforts to conceal themselves will increase the cost effectiveness of marketing and lead sellers to *increase* solicitations. However, high-benefit consumer efforts in concealment and deflection lead sellers to *reduce* solicitations.

From a consumer’s point of view, concealment and deflection are substitutes: both reduce her likelihood of being solicited. However, for sellers, they differ – consumer efforts in deflection cause solicitations to be discarded, while consumer efforts in concealment shrink the “effective pool” of consumers that sellers address, and so, shift the solicitations to other consumers. We find that concealment efforts by low-benefit consumers *increase* the overall expected harm. Further, to the extent that the increase in consumer harm outweighs the gain in seller revenue, concealment is socially *worse* than deflection.

2. Related Literature

A substantial literature in economics and marketing analyzes how sellers compete to acquire customers via advertising and price (Butters 1977; McAfee 1994; McGahan and Ghemawat 1994; Baye and Morgan 2001, 2004; Chen and Iyer 2002; Chioveanu 2003; Iyer and Pazgal 2003). Separately, analytical privacy research has considered how marketers use personal information to “screen” consumers and effect price discrimination (Chen et al. 2001; Taylor 2004; Acquisti and Varian 2005; Wathieu 2006; see, also, Hui and Png 2006).

However, previous analytical research has mostly ignored the harm that marketing imposes on consumers. Advertising and direct marketing (e.g., direct mail, telephone, and fax, and electronically) impose inconvenience and other harms on consumers. Marketers do not internalize these harms, and so over-spend on advertising and direct marketing relative to the socially optimal level (Petty 2000; Dreze and Bonfrer 2005).

Van Zandt (2004) and Anderson and de Palma (2005) consider heterogeneous sellers which offer different products through direct marketing at some fixed prices. Consumers can buy the items only through the sellers’ messages, but must incur costs to “open” the messages. In this scenario, an increase in the sellers’ marketing cost may raise welfare by screening out low-quality sellers. The average message quality would rise, and more consumers would open their messages (see, also, Gantman and Spiegel 2004 and Loder et al. 2006).

By contrast, we emphasize heterogeneity among consumers and *marketing avoidance* – efforts by consumers to avoid advertising and solicitations. Motivated by the economics of security (Koo and Png 1994; Ayres and Levitt 1998), we distinguish two forms of marketing avoidance: *concealment* and *deflection*.[1] We do not take *a priori* position on the merits of marketing or consumer privacy, but rather, address the *endogenous* tradeoff among consumer surplus, privacy harms, consumers' avoidance costs, and sellers' marketing costs.

3. Setting

Like Van Zandt (2004), Anderson and de Palma (2005), and Loder et al. (2006), we consider competition among N sellers to market some item at a fixed price, p.[2] The cost to seller m of sending S_m solicitations is $C(S_m)$, where

$$C(0)=0,\ \frac{d}{dS_m}C(S_m)\geq 0,\text{ and } \frac{d^2}{dS_m^2}C(S_m)>0. \qquad (1)$$

This includes both the cost of compiling the customer list and the cost of actually sending the solicitations.[3] For simplicity, we assume the cost of producing the item is zero.

Potential consumers can buy the item only if solicited, and, in particular, they do not seek out sellers (Butters 1977; Grossman and Shapiro 1984; McAfee 1994; Van Zandt 2004; Anderson and de Palma 2005; Loder et al. 2006). They are of two types: H high types with individual demand $q_h(p)$ for the item, and L low types with individual demand $q_l(p) < q_h(p)$. Both types of consumer suffer the same harm w from each solicitation received and are risk-neutral.

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[1] This generalizes the concept of "ad avoidance" (Speck and Elliott 1997), which, in our framework, is a form of deflection.

[2] Later, in Section 7, we embed this analysis in a more general framework that encompasses price setting.

[3] Following Butters (1977), Grossman and Shapiro (1984), and McAfee (1994), the compilation of the customer list can be modeled as draws with replacement from a pool of consumer addresses. Sellers would then incur a higher cost to compile each incremental *unique* address. For instance, a U.S. Federal Trade Commission (2002) experiment suggests that the marginal cost of compiling email addresses does vary with the source of addresses. Commission investigators seeded 250 email addresses across the Internet and observed the following rates of spam: 86% of addresses posted to newsgroups, half of addresses posted on free personal Web pages, 27% of addresses posted to message boards, and 9% of addresses listed in email membership directory.

Consumers can invest effort to *conceal* themselves from solicitations being addressed to them, for instance, by registering with the "no junk mail" list, subscribing to an unlisted telephone number, or using anonymous Web browsing. Given sellers' solicitations, let the probability that consumer *j* is addressed be $\alpha(k_j)$, where k_j represents the consumer's effort in concealment and $\alpha(k_j)$ is a *probability* such that

$$\alpha(0) = 1, \; \frac{d}{dk_j}\alpha(k_j) < 0, \; \frac{d^2}{dk_j^2}\alpha(k_j) > 0, \text{ and } \lim_{k_j \to \infty} \alpha(k_j) = \underline{\alpha}, \tag{2}$$

and $1-\alpha(k_j)$ has a decreasing hazard rate.[4] The cost of concealment is $C_K(k_j)$, where

$$C_K(0) = 0, \; \frac{d}{dk_j}C_K(k_j) > 0, \text{ and } \frac{d^2}{dk_j^2}C_K(k_j) > 0. \tag{3}$$

This concealment cost does not vary with the number of solicitations received.

Further, given that the consumer has been addressed, she can invest effort to *deflect* solicitations, for instance, by using TiVo to skip advertisements, subscribing to a telephone call screening service, or installing spam filters. Let the (conditional) probability that she receives solicitations be $\rho(e_j)$, where e_j represents her effort in deflection, and

$$\rho(0) = 1, \; \frac{d}{de_j}\rho(e_j) < 0, \; \frac{d^2}{de_j^2}\rho(e_j) > 0, \text{ and } \lim_{e_j \to \infty} \rho(e_j) = \underline{\rho}, \tag{4}$$

and such that $1-\rho(e_j)$ has a decreasing hazard rate. The cost of deflection is $C_E(e_j)$, which has the same properties as detailed in (3) for $C_K(k_j)$.[5]

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[4] That is, the marginal decrease in probability of being addressed is non-increasing as the level of concealment increases. We assume no method of concealment is perfect. For instance, the U.S. Federal Trade Commission (2006) advises: "Placing your number on the registry will stop most, *but not all*, telemarketing calls" (italics added). Hence, the consumer cannot reduce the probability of being addressed below some minimum, $\underline{\alpha}$. Similarly, deflection is imperfect. Realistically, so long as one has a postal address, telephone number, or email address, receiving some solicitations is unavoidable.

[5] Both concealment and deflection encompass multiple methods with differing costs. For instance, methods of concealment from telemarketing include registering with the "do not call" list, paying for an unlisted telephone number, paying to block caller number display on outgoing calls, and not giving out one's telephone number to merchants and others. These methods should be ordered by increasing cost to conform with (3). Similarly, multiple methods of deflection can be ordered by increasing marginal cost. We assume that concealment and

The sequence of events is as follows: (i) sellers set price; (ii) sellers send solicitations; consumers choose efforts in concealment and deflection; (iii) if a high-benefit consumer receives a solicitation, she purchases $q_h(p)$ units and derives consumer surplus $V_h(p) > 0$; if she receives multiple solicitations, she purchases from one of the sellers at random. We shall focus on a separating equilibrium in which sellers price the item such that a low-benefit consumer would not buy the item even if solicited, i.e., her surplus $V_l(p) < 0$.[6]

We model the solicitations as a *probabilistic* process (Butters 1977; Grossman and Shapiro 1984; McAfee 1994), i.e., when sellers send solicitations, they do not know the consumers' individual types, but only the distribution in the "effective pool". Also, it is possible for each consumer to receive multiple solicitations from the same seller. Each consumer's "presence" in the effective pool is reduced by the extent of her concealment effort. We assume the size of the effective pool is $H' + L'$, where

$$H' = \sum_{j=1}^{H} \alpha(k_j) \text{ and } L' = \sum_{j=1}^{L} \alpha(k_j). \tag{5}$$

By (2), this specification has the reasonable properties that, if all $k_j = 0$, then all $\alpha(k_j) = 1$, and so, $H' + L' = H + L$. If all $k_j \to \infty$, then all $\alpha(k_j) = \underline{\alpha}$, and $H' + L' = [H + L]\underline{\alpha}$, which is the *minimum presence* of consumers in the effective pool.

To ensure that the analysis is tractable, we assume that consumers and sellers behave symmetrically.[7] Further, they rationally anticipate the actions of those on the other side of

deflection costs are convex. Realistically, once the consumer invests some effort in concealment or deflection, it is increasingly difficult for her to further improve the blocking or screening of solicitations (e.g., a spam filter may screen out 95% of incoming spam, but to remove the remaining 5% would require much more effort).

[6] All we need is that the low-benefit consumer's individual demand curve be sufficiently low relative to that of the high-benefit consumer. Realistically, many people have low willingness to pay for direct marketing products (counterfeit software, Viagra or Cialis, etc.). Lacking the ability to distinguish consumers, it would not be profitable for sellers to slash prices to sell to such low-benefit consumers.

[7] The focus on symmetric equilibria is common to much research in advertising and direct marketing (e.g., Grossman and Shapiro 1984; McGahan and Ghemawat 1994; Meurer and Stahl 1994; Baye and Morgan 2001, 2004; Iyer and Pazgal 2003).

the market, i.e., sellers know the extent of concealment and deflection chosen by consumers, and consumers know the amount of solicitations sent by sellers.[8]

4. Market Equilibrium

4.1 Consumer Concealment and Deflection

Consider a high-type consumer. Given sellers' solicitations, S_1, …, S_N, and her efforts in concealment and deflection, her probability of consuming the item is the probability of receiving *at least one* solicitation, which is equal to one minus the probability of receiving no solicitations. Hence, her expected surplus from consumption is

$$\alpha(k_j)\rho(e_j)\left\{1-\prod_{i=1}^{N}\left[1-\frac{S_i}{H'+L'}\right]\right\}V_h(p)\,. \tag{6}$$

The consumer incurs harm, w, from *every* solicitation received. Hence, her expected harm from the solicitations is

$$\alpha(k_j)\rho(e_j)\frac{S_1+\ldots+S_N}{H'+L'}w\,.^{9} \tag{7}$$

In symmetric equilibrium, all sellers send the same number of solicitations, $S_i = S$, for all $i = 1, \ldots, N$. Substituting in (6) and (7), and noting that $C_K(k_j)$ and $C_E(e_j)$ represent the costs of concealment and deflection, the high-type consumer j's expected net utility is

$$U_h(k_j,e_j)=\alpha(k_j)\rho(e_j)B-C_K(k_j)-C_E(e_j)\,, \tag{8}$$

where the *conditional expected net surplus* (conditional on being addressed and receiving a solicitation, and net of harm),

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[8] Note that because concealment is imperfect (refer to footnote 4), it is possible for the solicitations to reach *every* consumer, including those who invest effort in concealment. For example, using an unlisted telephone number or anonymous Web browsing would not conceal a consumer from solicitations through random digit dialing or dictionary attack respectively. Sellers do, however, anticipate the reduced "reach" to some consumers due to their effort in concealment, and would "spread" the solicitations relatively more to other consumers.

[9] The harm, w, can be interpreted as privacy invasion (e.g., annoyance), or time needed to read and delete the solicitations, and hence we assume it applies to *every* solicitation. We are grateful to a reviewer for observing that each high-type consumer benefits only from the *first* solicitation received, but suffers harm from *all* solicitations.

$$B \equiv \left\{1-\left[1-\frac{S}{H'+L'}\right]^N\right\}V_h(p)-\frac{NS}{H'+L'}w. \tag{9}$$

If the surplus from the item is large enough relative to the harm from solicitations, then, for the high-type consumer, the conditional expected net surplus is positive ($B \geq 0$). She would prefer to receive solicitations and would choose zero effort in concealment and deflection. However, if $B < 0$, then the high-type consumer would prefer *not* to receive any solicitations. In this case, by (8), her expected net utility would be negative, and she would choose efforts in concealment and deflection according to the first-order conditions,

$$-\rho(e_j)B\frac{d\alpha}{dk_j}+\frac{d}{dk_j}C_K(k_j)=0, \tag{10}$$

$$-\alpha(k_j)B\frac{d\rho}{de_j}+\frac{d}{de_j}C_E(e_j)=0. \tag{11}$$

where, for simplicity, we ignore the impact of marginal changes in concealment effort on B through H'.

Now, for low-type consumers, since $V_l(p) < 0$, they would not buy the item. Hence, a low-type consumer *j*'s expected net utility is simply

$$U_l(k_j,e_j)=-\alpha(k_j)\rho(e_j)\frac{NS}{H'+L'}w-C_K(k_j)-C_E(e_j). \tag{12}$$

Evidently, the low-type consumer will choose positive levels of effort in concealment and deflection according to the first-order conditions:

$$\frac{NS}{H'+L'}w\rho(e_j)\frac{d\alpha}{dk_j}+\frac{d}{dk_j}C_K(k_j)=0, \tag{13}$$

$$\frac{NS}{H'+L'}w\alpha(k_j)\frac{d\rho}{de_j}+\frac{d}{de_j}C_E(e_j)=0. \tag{14}$$

Our first result shows that consumers' concealment and deflection efforts are strategic *complements* (Bulow et al. 1985) with sellers' solicitations. Intuitively, an increase in seller solicitation increases harm to consumers, so they will raise concealment and deflection.

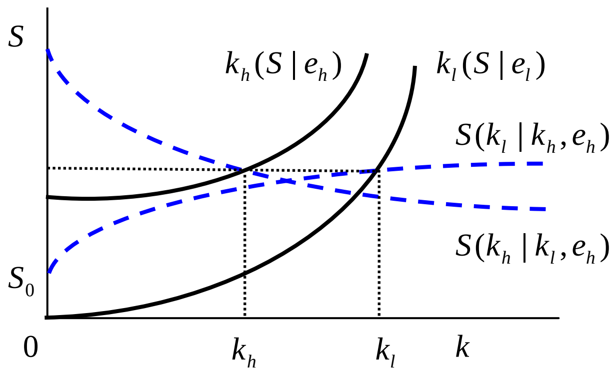
Proposition 1. Consumers' concealment and deflection efforts are strategic complements with the sellers' solicitations. [10]

Finally, in symmetric equilibrium, $k_j = k_h$ for high-type consumers and $k_j = k_l$ for low-type consumers. Hence, by (5), with regard to the effective pool of consumers,

$$H' = H\alpha(k_h) \text{ and } L' = L\alpha(k_l). \qquad (15)$$

Figure 1 shows consumers' concealment efforts as functions of seller solicitations.[11] By Proposition 1, consumer effort in concealment is increasing in seller solicitation. Further, by comparing (10) and (13), the high-type consumer derives more surplus, so she invests less effort in concealment. Hence, the high-type consumer's concealment function lies to the left of the low-type consumer's.[12] The consumers' deflection strategies are similar.

Figure 1



4.2 Seller Solicitation

Suppose that sellers $i \neq m$ choose $S_i = S$, while seller m chooses S_m. Consider a high-type consumer who has been addressed by and received a solicitation from seller m. If she also receives solicitations from j other sellers, she will buy with probability $1/[j+1]$ from seller m. Hence, she will buy from seller m with probability

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[10] For brevity, the proofs of this and all other results are provided in the online Appendix.

[11] We introduce the broken curves later: they are seller solicitations as a function of low-type (high-type) consumer concealment, holding deflection and high-type (low-type) consumer concealment constant.

[12] The shapes of the consumer concealment reaction functions depend on the functional forms of $C_K(k_j)$ and $\alpha(k_j)$, but, for our purpose, they are not important.

$$\frac{1}{j+1}\binom{N-1}{j}\left[\frac{S}{H'+L'}\right]^{j}\left[1-\frac{S}{H'+L'}\right]^{N-1-j}. \qquad (16)$$

To calculate seller *m*'s expected revenue, we must sum over all the various possibilities, $j = 0, \ldots, N-1$, take account of the probability that the consumer is high-type and her effort in deflection, and multiply by the price, the purchase quantity, and seller *m*'s number of solicitations. Accordingly, seller *m*'s expected revenue is

$$R(S_m)=\sum_{j=0}^{N-1}\frac{1}{j+1}\binom{N-1}{j}\left[\frac{S}{H'+L'}\right]^{j}\left[1-\frac{S}{H'+L'}\right]^{N-1-j}\frac{H'}{H'+L'}\rho(e_h)pq_h(p)S_m. \qquad (17)$$

Applying Lemma 1 (proved in the online Appendix) to (17), seller *m*'s profit simplifies to

$$\Pi(S_m)=\left\{1-\left[1-\frac{S}{H'+L'}\right]^{N}\right\}\frac{H'}{NS}\rho(e_h)pq_h(p)S_m - C(S_m). \qquad (18)$$

Substituting from (15) and simplifying, the first-order condition is

$$\left\{1-\left[1-\frac{S}{H\alpha(k_h)+L\alpha(k_l)}\right]^{N}\right\}\frac{H}{NS}\alpha(k_h)\rho(e_h)pq_h(p)=\frac{dC}{dS_m}. \qquad (19)$$

Proposition 2. Sellers' solicitation is a strategic complement to low-type consumers' effort in concealment, and a strategic substitute to high-type consumers' efforts in concealment and deflection.

Intuitively, if low-type consumers increase effort in concealment, they reduce their presence and hence enrich the proportion of high types in the effective pool. Hence, sellers would increase solicitations. By contrast, if high-type consumers increase efforts in either concealment or deflection, they reduce the likelihood that sellers would reach them. Accordingly, sellers would reduce solicitations.

Referring to Figure 1, the upward-sloping (downward-sloping) broken curve depicts seller solicitation as a function of low-type (high-type) consumer concealment effort, holding deflection effort and high-type (low-type) consumer concealment effort constant.[13]

4.3 Consumer-Seller Equilibrium

Our setting is not trivial. Specifically, as proved in Lemma 2 in the online Appendix, there exists an equilibrium in which sellers do send solicitations, and consumers do invest efforts in both concealment and deflection. Referring to (9), if $B \geq 0$, the equilibrium is defined by the sellers and low-type consumers, i.e., (19), (13), and (14), while if $B < 0$, the equilibrium is defined by the sellers and both consumer types, i.e., (19), (10), (11), (13), and (14).

Generally, we cannot rule out multiple equilibria – it is possible that the reaction functions of the sellers and low-type consumers intersect more than once. To ensure a unique equilibrium, we need to specify the third derivatives of the cost functions, $C(S_m)$, $C_K(k_j)$, and $C_E(e_j)$, the concealment function, $\alpha(k_j)$, and the deflection function, $\rho(e_j)$.

5. Welfare and Policy Implications

We present a partial-equilibrium analysis of how changes in demand, cost, and government policy would affect welfare.[14] Summing (8), (12), and (18) over all the H high- and L low-type consumers and the N sellers, welfare simplifies to

$$\begin{aligned} W = & \left\{1 - \left[1 - \frac{S}{H\alpha(k_h) + L\alpha(k_l)}\right]^N\right\} H\alpha(k_h)\rho(e_h)[V_h(p) + pq_h(p)] - NC(S) \\ & - H\alpha(k_h)\rho(e_h)\frac{NS}{H\alpha(k_h) + L\alpha(k_l)}w - HC_K(k_h) - HC_E(e_h) \qquad (20) \\ & - L\alpha(k_l)\rho(e_l)\frac{NS}{H\alpha(k_h) + L\alpha(k_l)}w - LC_K(k_l) - LC_E(e_l). \end{aligned}$$

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[13] The broken curves correspond to cross-sections of the seller solicitation function (which is a surface) with respect to consumer concealment and deflection. As with the consumer reaction functions, the shape of the seller solicitation function is not essential. Also, in the Appendix, specifically, the proof of Proposition 1, we show that $de_h / dk_h > 0$. Similarly, it can be shown that $de_l / dk_l > 0$. Hence, the diagram for consumer deflection is essentially the same as Figure 1.

[14] A complete equilibrium analysis requires parameterization of the cost, concealment, and deflection functions, and, in our case, unless high-type consumers take no action to avoid marketing (i.e., $B \geq 0$), such an analysis is mostly inconclusive. In general, complete equilibrium analysis is often inconclusive in the presence of peer-to-peer externalities (Gould 1980).

Comparing a typical seller's profit (18) with social welfare (20), there are two differences:

- Sellers ignore the harm caused by solicitations and consumers' costs of concealment and deflection, and hence tend to send out *too many* solicitations.
- Since we assumed elastic demand, high-type consumers enjoy some surplus, which is ignored by sellers. This causes sellers to send out *too few* solicitations. However, this effect is a standard result of any analysis of imperfect competition.

We first characterize the relationship between the harm caused by solicitations and consumer avoidance. Surprisingly, concealment efforts by low-type consumers *raise* total harm – such efforts reduce their own harm, but shift solicitations toward high-type consumers, who generally invest less effort in deflection, and hence suffer relatively more harm from solicitations. On balance, the total harm to consumers would increase.

Proposition 3. The expected harm caused by solicitations is decreasing in both consumer types' deflection effort and high-type consumers' concealment effort, but increasing in low-type consumers' concealment effort.

Given this, how should sellers be induced to internalize the externalities that they impose on consumers? Microsoft's co-founder, Bill Gates, famously advocated a "postage" charge on email to control spam (CNN.com 2004).[15] But how should the charge be set?

Proposition 4. The optimal charge per unit of seller solicitation is

$$\tau = -\left\{1-\left[1-\frac{S}{H\alpha(k_h)+L\alpha(k_l)}\right]^N\right\}\frac{H}{NS}\alpha(k_h)\rho(e_h)V_h(p) + \frac{H\alpha(k_h)\rho(e_h)+L\alpha(k_l)\rho(e_l)}{H\alpha(k_h)+L\alpha(k_l)}w. \tag{21}$$

The optimal charge is *decreasing* in the expected surplus of high-type consumers, and *increasing* in the expected harm caused by solicitations. By contrast with a simple Pigouvian

[15] This suggestion is in line with Van Zandt (2004) and Anderson and de Palma (2005), who propose raising communication costs to curb unsolicited promotions by low-quality sellers.

solution, the optimal charge depends on *the actions of the victims* of the externality (i.e., the consumers). Integrating Propositions 3 and 4, the *more* effort that all consumers spend on deflection, or the *more* effort that high-type consumers spend on concealment, or the *less* effort that low-type consumers spend on concealment, the *smaller* the charge should be.[16]

Finally, governments promote both concealment (e.g., "do not contact" lists) and deflection (e.g., HTML filters) (see, e.g., the U.S. Senate Judiciary Committee 2002). Which should they emphasize? To compare the welfare implications of concealment and deflection, we need some basis for comparison. Hence, we suppose that concealment and deflection are equally cost-effective, i.e., $\alpha(\cdot) = \rho(\cdot)$ and $C_K(\cdot) = C_E(\cdot)$.

Proposition 5. Consumer surplus is higher with deflection than with concealment if the expected net surplus from an additional solicitation to high-type consumers is sufficiently low. A sufficient condition is that $B < 0$.

Proposition 5 is intuitive. Both concealment and deflection reduce the likelihood of solicitations reaching a consumer. The key distinction is that concealment causes solicitations to be diverted to other consumers while deflection causes them to be discarded. Accordingly, consumers prefer deflection if shifting a solicitation to another consumer reduces expected net surplus. Shifting a solicitation to a low-type consumer only causes harm. Hence, taking account of the probability that a consumer is high- or low-type, consumer surplus is higher with deflection if the expected surplus to a high-type consumer is sufficiently low.

Using the same basis of comparison, that concealment and deflection are equally cost-effective, our last proposition takes into account the sellers' revenue.

Proposition 6. Deflection is socially preferable to concealment if the expected net surplus to high-type consumers and the expected revenue to sellers per unit of solicitation are

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[16] Interestingly, this implies that governments that establish "do not call" or "no spam" lists should supplement such concealment measures by charging an even *higher* tax on solicitations. By contrast, voluntary deflective measures by consumers, such as installing spam filters, would call for reduced charges. The CAN-SPAM Act requires sellers to self-identify solicitations, and hence facilitates consumer deflection.

sufficiently low. A sufficient condition is that $B < 0$ *and* that either (1) there are sufficiently many low- relative to high-type consumers, or (2) sellers' revenue from each high-type consumer is sufficiently low relative to the harm caused by solicitations.

The intuition is similar to that for Proposition 5, except that the analysis now takes account of the sellers' revenue. Essentially, the social choice between concealment vis-à-vis deflection is a tradeoff between the change in the expected surplus to consumers and the gain in seller revenue. Proposition 6 states sufficient conditions for this tradeoff.

Email marketing is so cheap that high-type consumers are deluged with so much spam that $B < 0$, and low-type consumers greatly outnumber high-types. Hence, by Proposition 6, policy-makers should emphasize deflection (e.g., spam filters and requiring all commercial emails to be marked "ADV") over concealment (e.g., "do not spam" lists). By contrast, the costs to sellers of telemarketing may be high enough that the volume of solicitations is low enough that $B \geq 0$. Proposition 6 then suggests that policy-makers may want to emphasize concealment (e.g., "do not call" lists) over deflection (e.g., caller-ID).

6. Example

Table 1 below presents empirical implications of a complete equilibrium analysis with $B \geq 0$ in the context of the "reciprocal-quadratic" specification,

$$\alpha(k_j) = \underline{\alpha} + \frac{1-\underline{\alpha}}{1+k_j} \text{ and } \rho(e_j) = \underline{\rho} + \frac{1-\underline{\rho}}{1+e_j}, \text{ and} \tag{22}$$

$$C(S_m) = cS_m^2,\ C_K(k_j) = c_K k_j^2, \text{ and } C_E(e_j) = c_E e_j^2. \tag{23}$$

Table 1. Empirical Implications

On variable	Effect of an increase in							
	$q_h(p)$	H	L	C_K	C_E	w	c	N
S	+	?	–	–	+	+	–	?
k_l	+	?	–	–	+	+	–	?
e_l	+	?	–	+	–	+	–	?

In 2003, the U.S. Federal Trade Commission established a national "do not call" list. This reduced consumers' cost of concealment from telemarketing. According to Table 1, sellers would respond by raising solicitations, as the effective pool of consumers became richer in high-type consumers. Indeed, the Direct Marketing Association (2004) reported:

> "For those direct marketers whose primary objective was to solicit direct order sales, telephone marketing again produced the highest response rate (5.78%) … Perhaps this was due to the institution of Do-Not-Call laws, leaving a *smaller, but more productive base to promote to*" (page 29) [italics added].

7. Extensions

Our model can be extended in several meaningful ways:

- Broadcast advertising. In broadcast advertising, the promotional messages are untargeted, and so consumers can only avoid by deflection (e.g., using TiVo to skip TV commercials) but not concealment. Hence, all our results on deflection apply.

- Multiple items. So far we assumed that sellers market only one item. It is straightforward to extend our analysis to marketing of multiple items, with each being marketed by a distinct group of sellers. The key feature here is that consumers (endogenously) divide into multiple market segments that can be ordered by the aggregate surpluses from consuming the items. Then, the analysis of consumer net utility and seller profit extend in an obvious way.[17]

- Heterogeneous costs. Our analysis assumed that solicitations cause the same harm to both types of consumer. Realistically, the harm caused by solicitations might differ across the segments, as, for instance, people may differ in the opportunity cost of time and tolerance

[17] Specifically, suppose there are Q products, with each product being offered by a distinct group of sellers. Each consumer is interested in a subset of the Q products. Then, we can construct consumers' expected net utilities in a similar way as leading to (8), and, for each product, the seller's profit in a similar way as leading to (18). Following the approach in Section 4, we can derive the strategic responses of sellers and consumers, and, after ranking consumers by their expected net utilities, we can derive the equilibrium.

for spam. Suppose the harms to high- and low-type consumers are w_h and w_l. Then, by the same analysis as leading to (8) and (13), so long as

$$\left\{1-\left[1-\frac{S}{H'+L'}\right]^N\right\}V_h(p)-\frac{NS}{H'+L'}w_h \geq -\frac{NS}{H'+L'}w_l, \qquad (24)$$

high-type consumers would derive more benefit from solicitations than low-type consumers. By constructing reaction functions similar to (10), (11), (13), (14), and (19), the analysis is similar to that presented above. If, however, (24) does not hold, then high-type consumers would choose more avoidance than low-type consumers. Nevertheless, the results and conclusions are similar.[18]

- Low-type consumers' demand. We assumed the demand of low-type consumers to be sufficiently low that sellers would price the item such that $V_l(p) < 0$. What happens if this does not hold, and low-type consumers would buy the item if reached by sellers? In this case, two results change. One is Proposition 2: sellers' solicitation becomes a strategic substitute to *all* consumers' concealment and deflection efforts. The other is Proposition 6: there is only one condition – that sellers' revenue from *both* high- and low-type consumers be sufficiently low relative to the harm caused by solicitations. All other results are the same.[19]

- Pricing. Our analysis can be extended to endogenize sellers' pricing in either of two ways. One way supposes that each seller is subject to monopolistic competition and sets price p before sending solicitations. Referring to (8), (12), and (18), let the equilibrium solicitations and avoidance be $(S^*, k_h^*, e_h^*, k_l^*, e_l^*)$. Then, in the prior stage, each seller maximizes expected profit by setting price according to:

[18] The only changes are: (i) In Figure 1, the high-type consumer's concealment curve lies to the right of low-type consumers, and it now starts from the origin; (ii) Proposition 3 needs to be revised – the expected harm caused by solicitations is now increasing (decreasing) in high-type (low-type) consumers' concealment effort.

[19] However, this case is less empirically relevant, as it implies all consumers would buy the item upon receiving solicitations from sellers, which does not seem realistic.

$$\frac{d}{dp}\Pi(S_m)=\left\{1-\left[1-\frac{S}{H'+L'}\right]^N\right\}\frac{H'}{NS}\rho(e_h)\frac{d}{dp}\left[pq_h(p)S_m(p)\right]-\frac{d}{dp}C(S_m(p))=0\,. \quad (25)$$

The other way to endogenize pricing supposes that sellers set prices and send solicitations at the same time under conditions of oligopoly. Then, sellers will randomize prices according to a set of distributions $F_j(p)$ over an interval, say $[\underline{p},\bar{p}]$ (Varian 1980; Narasimhan 1988; Raju et al. 1990; McAfee 1994). Each high-type consumer would buy from the seller offering the lowest price among the solicitations that she receives. The distribution of the lowest price among a set J of price distributions is

$$1-\prod_{j\in J}[1-F_j(p)]\ .$$

Then, referring to (9), the conditional expected net surplus of high-type consumers becomes

$$\begin{aligned}\tilde{B}=&\frac{S_1}{H'+L'}\left[1-\frac{S_2}{H'+L'}\right]\cdots\left[1-\frac{S_N}{H'+L'}\right]\int_{\underline{p}}^{\bar{p}}V_h(p)\frac{d}{dp}\{1-[1-F_1(p)]\}dp+\ldots\\&+\frac{S_1}{H'+L'}\frac{S_2}{H'+L'}\cdots\frac{S_N}{H'+L'}\int_{\underline{p}}^{\bar{p}}V_h(p)\frac{d}{dp}\left\{1-\prod_{j=1}^{N}[1-F_j(p)]\right\}dp-\frac{S_1+\ldots+S_N}{H'+L'}w.\end{aligned} \quad (26)$$

Referring to (18) and applying McAfee (1994), equation (5), the individual seller's profit at any price p becomes

$$\begin{aligned}\tilde{\Pi}_m(p)&=\left\{\prod_{\substack{j=1\\j\neq m}}^{N}\left[1-\frac{S_j}{H'+L'}\right]+\ldots+\prod_{\substack{j=1\\j\neq m}}^{N}\frac{S_j}{H'+L'}\prod_{\substack{j=1\\j\neq m}}^{N}\left[1-F_j(p)\right]\right\}\frac{H'}{H'+L'}\rho(e_h)pq_h(p)S_m-C(S_m)\\&=\prod_{\substack{j=1\\j\neq m}}^{N}\left[1-\frac{S_j}{H'+L'}F_j(p)\right]\frac{H'}{H'+L'}\rho(e_h)pq_h(p)S_m-C(S_m).\end{aligned} \quad (27)$$

In symmetric randomized-strategy equilibrium, $S_j = S$ and $F_j = F$, $j \neq m$, and the seller must earn equal profit, $\tilde{\Pi}_m(p)=\tilde{\Pi}_m(\bar{p})$, for all $p\in[\underline{p},\bar{p}]$. Applying these conditions to (27) yields the price distribution, F. Further, we can then substitute F in (27), differentiate with respect to S_m, and set $S_m = S$ to characterize the equilibrium solicitations, S.

With randomized pricing, we can prove results corresponding to Propositions 2, 3, and 4. However, whether Propositions 1, 5, and 6 generalize to the setting of randomized pricing is an open question for future research. The key challenge is that, by (26), the conditional expected net surplus of high-type consumers, $\tilde{B}$, is an intractable function of sellers' solicitations and price distributions.[20]

- Entry. The analysis can be further extended to endogenize the number of sellers as follows. Let $\Pi(N)$ represent the maximum seller's profit in (25) or (27), and X be the cost of entry. Then, with free entry, the profit must satisfy $\Pi(N) = X$, which endogenously characterizes the number of sellers, N. If the cost of entry is lower, there will be more sellers. Accordingly, to the extent that the cost of entry into email marketing is lower than into telemarketing, there will be more spammers than telemarketers.

Further, by (20), the direct effect of N on welfare is negative, but, by (19), an increase in N would (consequentially) lead sellers to reduce solicitations. If the consequential effect is small, increased competition may *reduce* social welfare – the increase in expected harm on all solicited consumers may outweigh the high-type consumers' gain in expected surplus and sellers' gain in revenue. Hence, if email marketing is more competitive than telemarketing, it might be more harmful as well.

8. Concluding Remarks

Consumers widely avoid marketing to protect their privacy. Our contribution is to introduce the consideration of "marketing avoidance" into analytical research. We show that consumer concealment and deflection have distinct welfare implications depending on the tradeoff between the harm caused by solicitations and the benefit brought by the marketed item.

[20] Analyses of randomized pricing in oligopoly (Varian 1980; Narasimhan 1988; Raju et al. 1990; McAfee 1994) assume that consumers are passive, hence computing this surplus is not an issue.

Our results are subject to several limitations. First, the analysis with randomized pricing left two open questions – regarding the strategic complementarity between consumer efforts in concealment and deflection with seller solicitations, and the welfare differences between concealment and deflection. These are key issues for future research.

Second, our analysis above was static, and did not allow sellers to collect consumer information in one period and use it subsequently (Chen et al. 2001; Taylor 2004; Acquisti and Varian 2005). Such learning, in the context of negative externalities imposed by seller solicitations, is another important direction for future work. In particular, it is interesting to explore if and how sellers would revise their behavior after receiving consumer responses.

Finally, we assumed that consumers do not proactively contact sellers. It would be interesting to analyze a setting where both sellers and consumers seek out each other (Robert and Stahl 1993). If interested consumers seek out sellers, sellers can reduce marketing, both saving resources and reducing consumers' privacy costs.

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