NEW SERVICE MODEL BASED ON PRESENT BIASED PREFERENCES

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Abstract

New goal-setting service models betting on consumers not fulfilling their obligations in the future, a human tendency identified and supported in economics and marketing literature, have been proliferating recently. Of critical interest is whether these new service models generate a higher profit than the traditional retailer model. Our research shows that consumers' valuation of the underlying product or service, how naïve consumers are in believing meeting the requirement in the future (i.e., their present-biased preferences), and how differently consumers treat losses versus gains (i.e., the mental account effect) are three key factors affecting the profitability of these new service models.

Keywords: Goal setting, Present-biased preferences, Mental accounting, E-commerce.

1 INTRODUCTION

A new e-commerce business phenomenon has surfaced that allows consumers to make commitment contracts, for example, lose weight, be on diet, make savings, etc, and keep tracking of their goals. Consumers will be awarded for fulfilling the commitment while penalized otherwise. A much talked example that has recently made onto Harvard Business School (John et al. 2014) and Economist[1] is the start-up company StickK, whose name stands for "stick to it" and the second K for "contract". A StickK consumer can commit to lose twenty pounds in twenty weeks, and pledge $100 for every pound she loses. If the consumer achieves the goal of losing twenty pounds in twenty weeks, she gets her $2,000 back; otherwise, she loses the $2,000 wager. Websites that operate like StickK are emerging in the market[2], for instance, 21habit, Habit Changer, and Beeminder. These nascent e-commerce businesses are mostly less than three years old. Collectively, they are called goal setting platforms. They incentise consumers to set goals and bet on consumers' not fulfulling their goals in order to make a profit on the commited wagers. However, not all goal setting platforms collect the lost wagers. For example, StickK allows consumers to donate the lost wager to her favorite charity or anyone of her choosing. In this study, we will consider a general model setup where the goal setting platforms profit from the lost wagers.

The goal setting platforms are built upon two basic principals from behavioural economics: 1) present-biased preference and 2) mental accounting. Present-biased preference is a term coined by O'Donoghue and Rabin (1999) to explore individuals' tendency to place more weight on the immediate moment when considering trade-offs between the immediate moment and any future moment. One classic example is the widely used rebate program in marketing. A rebate returns a small portion of the purchase price to consumers; however, a specific procedure must be followed, which requires non-trivial effort on the consumers' part. Consumers are required to submit the rebate request within a certain time window, with the cash rebate normally arriving in about eight to twelve weeks after handling and processing. Quite a few consumers mistakenly believe that their future selves will complete the rebate request when deciding whether to make the purchase. However, the slippage rate, which is the percentage of inaction, is found to be very high and will convert to the merchant's profit (Gilpatric 2009). This biased preference plays a key role in consumers' decision making. In plain words, consumers care more about now than about future. The theory of mental accounting, first named by Thaler (1985), points out that for humans, all gains and losses are not viewed the same, and losses loom larger than gains. That is, the negative utility of monetary losses is steeper than the positive utility of gaining the same amount of money. In the case of goal setting platforms, consumers will incur "losses" in the forms of losing the wagers when they do not fulfill their obligations. The concept of mental accounting has also been applied to finance area (Barberis and Huang 2001). The core mechanism is a fight between immediate gain and future loss. A proper analysis of goal setting platform needs to incorporate the mental accounting characteristics into the economics model.

Of critical interest is whether the new business of goal setting is sustainable? To address this issue, we take into consideration of both present-biased preference and mental accounting to model the consumers' behavior on goal setting platforms, and benchmark the traditional case where there is no obligations and no penalty. The remainder of the paper is organized as follows. Section 2 lists the related work to our study. Section 3 outlines the stylized analytical models of goal setting and the benchmark case. Section 4 addresses our key research question and investigate the profitability of different business models. Section 5 concludes the paper by summarizing the managerial insights of our analyses and providing some possible directions for future research.

2 RELATED WORK

Prior literature in behavioural economics has shown that humans tend to reap immediate rewards or to prevent immediate costs and overly optimistic about their self-control in the future (O'Donoghue &

[1] See the report on Economist: http://www.economist.com/node/10661442
[2] See the report on Forbes: http://www.forbes.com/sites/tjmccue/2013/01/07/11-stellar-tools-to-keep-new-years-resolutions

Rabin 1999; O'Donoghue & Rabin 2002; Frederick et al. 2002). It is formally termed present biased preference, which is analytically capture by Gilpatric (2009) as follows.

$$U^t(u_t, u_{t+1}, \cdots, u_T) \equiv \delta^t u_t + \beta \sum_{\tau=t+1}^{T} \delta^\tau u_\tau, \quad (1)$$

where u_t is the instantaneous utility a consumer receives at time t and U^t represents her intertemporal preferences at time. The parameter δ represents the traditional time-consistent discounting factor, while the possible time-inconsistent preference for the present-period utility compared to all future periods is captured by β, where $\beta \in (0,1]$. Those consumers who have a $\beta < 1$ is considered "present-biased" since they place less weight to the future utility represented by the second term in Eq. (1) as compared with the present utility described by $\delta^t u_t$.

3 THE MODEL

Without loss of generality, we following Gilpatric (2009) and normalize the total number of consumers to 1, and the time-consistent discounting parameter δ in Eq. (1) is simplified as 1. Let v be the consumers' valuation of the underlying product or service offered by goal setting platform, and r be the reward that consumers receive if they successfully fulfill the goals. Since each consumer faces with the same product or service and the same signup procedure, we consider consumers' valuation homogeneous across all consumers. For ease of presentation, we use the term "service" to refer to "product or service" from now. We propose a two period setting where consumers decide whether to contract with goal setting platform or not at time $t = 1$. And if yes, the consumers spend some effort cost c to fully or partially exercise the required obligation and the contract terminates at $t = 2$. Table 1 summarizes the notations used in the paper.

p	Regular price of the underlying service in the traditional retailer model
w	Wager contracted by a consumer with the goal setting platform
c	A consumer's effort cost to fulfill the required obligation
h	Wholesale price paid by the retailer for each consumer, $h \geq c$
v	Consumers' valuation of the underlying service, $v \geq h$
α	Mental accounting factor, $\alpha \geq 1$
β	Present-biased preference, $\beta \in (0,1]$
r	Reward a consumer receives for fulfilling the obligation
δ	The time-consistent discounting factor

Table 1. Summary of notations.

3.1 Benchmark Case

In the benchmark case, consumers pay the price p for the service. Since there is no consumer betting in the traditional retailer model, there is no associated reward, i.e., $r = 0$. However, consumers still incur the same effort cost c, such as transportation cost to access the service. Consumers will purchase the service at time $t = 1$ if

$$v + \beta(0 - c) \geq p. \quad (2)$$

That is, consumers will purchase the service at time $t = 1$ if $\beta \leq (v - p)/c$. Consumers are heterogeneous in present-biased preference β, which is captured by a comulative distribution function $G(\beta)$. The retailer determines the price p to maximize the profit as follows.

$$\underset{p}{\text{Max}}\,\pi_R(p) = (p-h)\cdot G\left(\frac{v-p}{c}\right), \tag{3}$$

where the retailer pays the wholesale price $h \geq c$, and $p-h$ is the profit perunit sale. For ease of analytical expositions, we let the present-biased preferences follow a uniform distribution in the unit interval from now on.

3.2 Goal Setting Platform

At time $t=1$, the consumer's participation decision is influenced by her belief of fulfilling the obligation if the discounted reward βr is greater than his effort cost c. However, naive consumers at time $t=1$ will mistakenly believe that they will meet the requirement later if the reward simply exceeds the effort cost, i.e., $r \geq c$. Hence, an offer that satisfies the following condition, $c \leq r \leq c/\beta$, will lead the naive consumers to believe that they can meet the obligation later, but in fact they will fail at time $t=2$. Consumers will participate at time $t=1$ if consumers' valuation of the service plus the discounted reward net effort cost exceeds the price $v+\beta(r-c) \geq p$. However, consumers will perceive that the price they pay as αw ($\alpha \geq 1$) because of the mental accounting phenomenon. Since the reward they may get back in the future $t=2$ is the participation constraint becomes $v+\beta(w-c) \geq \alpha w$, or equivalently,

$$\beta \geq (\alpha w - v)/(w-c). \tag{4}$$

At time $t=2$, consumers who will fulfill the required obligation are those whose present-biased preferences parameter β's are outside the range of naive ones ($c \leq r \leq c/\beta$). That is,

$$\beta w \geq c. \tag{5}$$

The number of participants $1-G[(\alpha w-v)/(w-c)]$ is obtained from Eq. (4) and the number of winners from Eq. (5) equals $1-G(c/w)$. On goal setting platform, the revenue is from the participants who lose the wager, and the number of losers is the number of participants minus the number of winners specified by $\{1-G[(\alpha w-v)/(w-c)]\}-[1-G(c/w)]$. The platform will pay the wholesale price h for consumers who use the service at time $t=2$, but losers will not fulfill the required obligation and thus never access the service. Hence, the profit function π_S is the revenue net the wholesale price incurred on the winners. The platform solves the following profit maximization problem.

$$\underset{w}{\text{Max}}\,\pi_S = w\cdot\left\{\left[1-G\left(\frac{\alpha w-v}{w-c}\right)\right]-\left[1-G\left(\frac{c}{w}\right)\right]\right\}-h\cdot\left[1-G\left(\frac{c}{w}\right)\right] \tag{6}$$

subject to

$$\frac{\alpha w-v}{w-c} \leq \frac{c}{w} \tag{7}$$

$$\frac{\alpha w-v}{w-c} \geq 0 \tag{8}$$

$$\frac{c}{w} \leq 1 \tag{9}$$

$$w \geq 0 \tag{10}$$

Inequality (7) ensures that the number of winners is no larger than the number of participants. Inequality (8) ensure the number of participants is no more than the total number of consumers. Inequality (9)

guarantees that the number of winners is nonnegative. Inequality (10) requires that the wager w be nonnegative.

4 PRELIMINARY RESULTS

We conduct a numerical analysis to compare both cases since we are not able to find the closed form solution due to the complexity of the problem. For the baseline values of parameters, the effort cost c is set as 1, and other parameters are set in relation to c. For example, consumers' valuation of the service $v = 3.7$ indicating that consumers value the service at 3.7 times as high as the effort cost. The choosing of the baseline values conforms to our analytical analysis. Table 2 shows the baseline values of parameters in our analyses.

Parameters	Baseline values
Consumers' valuation of the service v	$v = 3.7$
Wholesale price h	$h = 1.08$
Effort cost c	$c = 1$
Mental accounting parameter α	$\alpha = 1.09$

Table 2. Baseline parameters for numerical analysis.

Figure 1 plots the behavior of the merchant's profit with respect to consumers' valuation of the service while holding all other parameters constant. Our preliminary results show a cutoff point. When consumers' valuation of the service is low, goal setting platform is able to induce all consumers to participate and thus make a bigger profit. The traditional retailer model is the optimal in the region of high consumers' valuation of the service. When consumers' valuation of the service is high, the optimal profit in the traditional retailer is increasing, but goal setting platform's profit is decreasing.

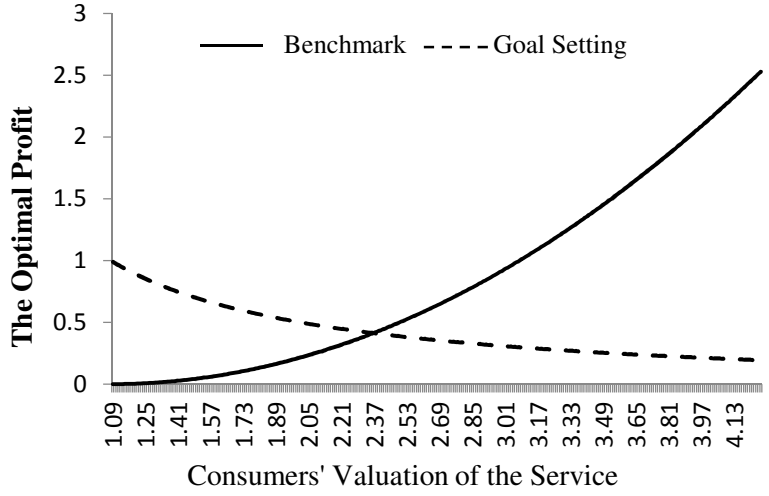

Figure 1. Optimal profit versus consumers' valuation.

5 CONCLUSION

Goal setting platforms have been receiving increasing attentions from the business world. Companies like StickK are leveraging on consumers' present-biased preference and mental accounting behaviors to encourage commitment contracts and making profit from contract default. In this paper, we borrow the terms of present-biased preference and mental accounting from behavioral economics to model the consumers' decision and analyze the goal setting platform's profit. At this stage of research, we are able to solve the problem analytically and find a cutoff point. When consumers' valuation of the service is low, goal setting platform is able to induce all consumers to participate and thus make a bigger profit. The traditional retailer model is the optimal in the region of high consumers' valuation

of the service. When consumers' valuation of the service is high, the optimal profit in the traditional retailer is increasing, but goal setting platform's profit is decreasing. Platforms thus are advised to properly design and position the service, which will influence consumers' valuation.

There are several interesting avenues for future research. For example, one possibility is to employ a general present-biased preference to determine the distribution of consumers as well as the profitability. We assume the present-biased preference follows a uniform distribution. Another possibility is to analyze how the profitability would change if the retailer is using the goal-setting platforms to sell a digital good or a physical good.

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References

Barberis, N. and Huang, M. (2001). Mental accounting, loss aversion, and individual stock returns. The Journal of Finance, 56 (4), 1247-1292.

Frederick, S., Loewenstein, G. and O'donoghue, T. (2002). Time discounting and time preference: A critical review. Journal of Economic Literature, 351-401.

Gilpatric, S.M. (2009). Slippage in rebate programs and present-biased preferences. Marketing Science, 28 (2), 229-238.

John, L. Norton, M. and Norris, M. (2014). Making stickK stick: The business of behavioral economics. Harvard Business School Case 514-019

O'Donoghue, T. and Rabin, M. (1999). Doing it now or later. The American Economic Review, 89 (1), 103-124.

O'Donoghue, T. and Rabin, M. (2002). Addiction and present-biased preferences. Department of Economics, UCB.

Thaler, R. (1985). Mental accounting and consumer choice. Marketing Science, 4 (3), 199-214.