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Abstract

Using a unique dataset on health club attendance from Quebec, we look at the relationship between actual and expected attendance and how these relate to a reported measure of self-control problems at the time of contract signing. We find that a large majority of contract choices appear inconsistent purely on financial grounds: 47.5% of members would be better off paying the fee for a single visit each time they go to the gym rather than signing a long-term contract. The median total cost of making a mistake on this decision is $262. We then compute that almost all members have made the right decision once we use subjective expectations of the number of visits per week at the time of contract choice. Next, we study how actual attendance following contract choice is related to baseline reports of self-control. We find that reports of self-control problems at baseline are associated with low future attendance and that attendance decreases faster, in particular after New Year. Finally, those with a large gap between expected and realized attendance have a much lower probability of contract renewal. Our results are consistent with a model of health club participation where agents underestimate the severity of their self-control problems.

JEL-Code: D000, D120, D910.

Keywords: self-control, gym attendance, expectations, obesity.

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1 Introduction

Policies aiming to make people more active are argued to be of prime importance in developing strategies to fight the obesity epidemic, but also in preventing disease and improving longevity (WHO, 2010). Several OECD countries have engaged in the design of preventive health policies in which physical activity holds a crucial role (OECD, 2010). For example, provisions of the Affordable Care Act in the United States were specifically put in place to promote healthy lifestyles (Anderko et al., 2012). The design and effectiveness of such policies depend in large part on determinants of individual behavior when it comes to doing physical activity. For example, the RAND Workplace Wellness Programs Study found very limited effects of wellness programs on weight, health and health care costs in the United States (Mattke et al., 2013). According to the study, more than 70% of firms offering a wellness program included a fitness program, most often in the form of a monetary incentive to register at a health club. However, less than 20% of all workers of these firms participated in the program, and the authors reported limited health benefits. For fitness programs, low attendance of participating individuals could partially explain these results.

Anecdotal evidence suggests that many members sign off on long-term agreements then seldom attend after the first few months of the membership. One study that looks directly at the issue is DellaVigna & Malmendier (2006). The authors collected data from three health clubs in New England. They found that the average price per visit for individuals with a membership was much higher than the price they would have paid without being a member. A key explanation was that members were too optimistic regarding future attendance at the time of choosing their type of membership. DellaVigna & Malmendier (2006) collected additional data from a small sample of gym members in California to obtain information on attendance expectations and found that expectations appeared much higher than actual gym attendance. However, they could not survey the respondents of the health clubs for which they had data on attendance, which precluded them from analyzing the relationship between expectations and actual attendance at the individual level. In two field experiments, Charness & Gneezy (2009) analyzed how the frequency of gym attendance is influenced by monetary incentives. They found a large increase in participation, entirely driven by self-reported low-attendance individuals. They also find evidence of habit formation. Their results were replicated by Acland & Levy (2010) who also found that individuals over-predict future attendance. These results can be interpreted as evidence of partial naiveté regarding one's self-control. Other studies, such as Babcock & Hartman (2010), find that social pressures and herding may increase the frequency of physical activity . None of these studies had access to actual reported measures of self-control, both ex ante and ex post expectations.

We constructed a unique dataset based on data from a major health club organization for new members at 14 clubs in the Montreal area. In addition to data on the contract chosen in September 2011 and about subsequent visits until August 2012 (12 months), we use reports from paper surveys conducted at the time of membership sign-up that asked questions on expectations of future attendance and on self-control problems. One unique feature of our data set is that it contains a self-assessed measure of motivation problems as well as measures of actual and expected visits. To understand how expected and actual visits are linked at the individual level, we use a model adapted from O'Donoghue & Rabin (2001) where members might underestimate the extent of their self-control problems, defined as a difficulty to follow through with plans. The model delivers predictions as well as a measure of naiveté regarding self-control that can be directly inferred from the data.

We first use these data to investigate whether contract choices are consistent with the expected price per visit, using both actual future visits (invoking rational expectations) and subjective expectations as revealed in the paper questionnaire. Second, we investigate how the discrepancies between actual and expected visits depend on the presence of self-control problems. Third, we investigate how the presence of such problems affects the evolution of attendance after the sign-up. Finally, we study how our measures of naiveté regarding self-control relates to the probability of contract renewal after one year.

Purely on financial grounds, we find that 47.7% of choices appear irrational when using actual visits, while more than 95% of choices are consistent once we rely on the expected number of visits at the time of signing the contract. Members typically overestimate their number of visits. We estimate that the median total cost is $262 for those making a mistake. Furthermore, we find that expressed self-control problems correlate with actual visits to the gym but not with expected number of visits to the gym. Hence, members appear to underestimate the impact of their self-control problems. Finally, we investigate whether the measure of naiveté we construct, based on the difference between subjective and realized number of visits, correlates with the likelihood of contract renewal. The result suggests that this gap is negatively correlated with the probability of renewal. One interpretation of this result is that members update their beliefs about the extent of their self-control problem and thus are less likely to renew.

In section 2, we lay out a model that allows us to derive predictions regarding the relationship between expectations, actual visits and self-control problems. In section 3, we present the data and methods used in the empirical analysis. Second 4 presents the results and section 5 concludes.

2 Heath Club Contracting and Expectation Formation

To understand how expectation formation, actual visits and self-control problems are related, we build a simple model in an environment that allows agents to potentially underestimate their degree of self-control. The model is adapted from O'Donoghue & Rabin (2001) and Acland & Levy (2010).

We take an individual who acts for a large number of periods denoted by $t = 0, 1, ...$ One period represents an opportunity to exercise at a health club (for example, every two days). The timing of the problem is as follows: at $t = 0$ the agent signs a membership contract with the health club. For all subsequent periods $t > 0$, he sequentially decides whether or not he exercises.[1]

[1] Without loss of generality we make the assumption that rational individuals discount time geometrically at the unit rate $\delta = 1$.

We denote a contract by a triple $(n, \theta(n), \gamma(n))$ where n is the duration of the contract, most likely in days, $\gamma(n)$ is the fee that must be paid upon signing it, and $\theta(n)$ is a per-visit fee. Consistently with the facts that we have observed, we make the assumption that for any contract such that $n > 1$, then $\gamma'(n) > 0$, but the daily price of membership falls with n, which requires that $n\gamma'(n) < \gamma(n)\ \forall n$. For example, a 12-month contract could cost \$30 per month and a 6-month contract, \$40 per month. In the case of long-term contracts, θ is typically zero and γ represents the present value of the (fixed) cost on the contract, which does not depend on the number of visits.

Each visit to the gym generates a delayed (and implicitly discounted) payoff denoted by h, which stands for health benefits.[2] On the other hand, exercising at time t is subject to an immediate random cost of effort, denoted by e_t. It is drawn from a time-invariant, IID distribution $F(e)$ with support $[0, \bar{e}]$. We assume, without loss of generality, that $F(e)$ is strictly increasing and twice continuously differentiable, with the associated density function $f(e) = F'(e)$.

2.1 Experienced utility

Individuals perform two types of actions in this model. First, they choose if they enroll in a long-term contract with the gym at $t = 0$. Then, at each subsequent period $\tau > 0$, they sequentially decide if they exercise or if they stay home. Let us denote the sequential decision to exercise at t using the binary decision function $g_t \in \{0, 1\}$ where $g_t = 1$ when one exercises. From an ex ante perspective, the experienced utility of an individual i is given by

$$W = -\gamma(n) + E\left\{\sum_{t=1}^{n} g_t(e_t)[h - e_t - \theta(n)]\right\} \tag{1}$$

For simplicity we assume that experienced utility does not discount time.

[2]We assume that h is the same for all individuals. This assumption is not important to our results, and it will avoid redundancy with other utility parameters (discount factors).

2.2 Sequential decisions to exercise and actual expected number of visits

The sequential decisions to exercise depend on an individual's decision utility, which encompasses his self-control problems. At any ex post period $\tau > 0$ an individual takes (n, γ, θ) as given. He observes his real level of self-control β, and his realized cost of exerting effort $e_t \in [0, \bar{e}]$. Since θ is now sunk the decision-utility function of someone with a self-control problem is therefore

$$U_t = g_\tau(e_\tau)[\beta h - e_\tau - \theta(n)], \quad t > 0. \tag{2}$$

The additional discount factor β in (2) is allowed to differ across individuals. It represents the behavioral mistake that leads to time-inconsistent behavior. An individual with $\beta < 1$ is considered to have self-control problems, which leads him to undervalue the long-term health benefits h as compared to the immediate cost of exercising e_t. The extent of one's self-control problem can also be captured by $(1 - \beta)$.

One can clearly see from (2) that it is sequentially optimal to exercise, which is to set $g_t(e_t) = 1$ if and only if $\beta h - e_\tau - \theta \geq 0$. Notice that the per-visit cost θ reduces the likelihood that this condition will be satisfied. On the other hand, the up-front fee γ is now sunk and does not appear in the equation. Rearranging, we see that the individual exercises in any given period if and only if $e_t \leq \beta h - \theta$. To guarantee an interior solution, we make the assumption that $\beta h - \theta > 0$.

Using the cumulative distribution function for the cost of effort, we form ex ante expectations on the number of visits to the gym. We denote the actual expected number of visits by $E[v]$, where

$$E[v(\beta, \theta, n)] = nF(\beta h - \theta). \tag{3}$$

From (3) one can see that, for any strictly increasing cumulative distribution function $F(e)$, the expected number of visits is decreasing in $(1 - \beta)$, which provides us with our first testable predition.

Prediction 1. *The objective number of visits is negatively correlated with actual problems* *of self-control.*

Proof: Denote $E[v] = nF(h-(1-\beta)h-\theta)$. Differentiating $E[v]$ with respect to $(1-\beta)$ gives us the effect of actual self-control problems on the expected number of visits: $\partial E[v]/\partial(1-\beta) = -hnF'(\beta h - \theta) < 0$.

2.3 Subjective expectation ex ante

We now focus on an individual's subjective expectation about his number of visits in the future. Doing so allows us to introduce the notions of naiveté and of sophistication in our discussion. As shown before, any individual with $\beta < 1$ is time-inconsistent and has problems of self-control.

In what follows we allow individuals to be naive ex ante about their future self-control problems. Ex ante, an individual who has erroneous beliefs about his future problems of self-control expects that at $\tau > 0$ he will discount h using a factor $\hat{\beta} < \beta$ where

$$\hat{\beta} = \alpha + (1-\alpha)\beta \quad \in [\beta, 1]. \tag{4}$$

The parameter α thus captures one's level of naitevé.[3] In the special case where $\alpha = 0$, an agent is fully aware, ex ante, of his future motivation problems. On the other hand, $\alpha = 1$ captures complete naiveté and the individual believes that he will always believe so as to maximize his experienced utility, which does not discount h.

Thus, at the time of choosing a contract, one's subjective expectations about the number of visits to the health club are

$$E[\hat{v}(\hat{\beta}, \theta, n)] = nF(\alpha + (1-\alpha)\beta)h - \theta). \tag{5}$$

From (5) we can derive our second testable prediction:

Prediction 2. *Reports of self-control problems correlate negatively with the subjective num-*

[3] Acland & Levy (2010) used a similar formulation, referring to α as to one's projection bias.

ber of visits.

Proof: Someone who reports having more self-control problems has a lower α. Differentiating $E[\hat{v}]$ with respect to α gives $(1-\beta)F'(\cdot) > 0$.

Finally, the fact that $E[v] > E[\hat{v}]$ yields our third prediction:

Prediction 3. *The expected number of visits will be larger than the actual number of visits when members are naive about their self-control problems.*

All three predictions are testable from data if we can observe expectations at the time of signing a contract, actual visits and ex ante reports of self-control problems.

2.4 Ex post measure of naiveté

From subjective and objective visits, it is not possible to identify α separately from β. However, we can recover the distribution of $\frac{\hat{\beta}_i}{\beta_i}$ where i denotes the respondent. Let us first assume that effort e is log normally distributed, which means taht $\log(e)$ is normally distributed with c.d.f. $\Phi(\cdot)$. Using this and the fact that the per-visit fee θ equals zero for long-term contracts, the frequency of workout satisfies $v_i/n = \Phi(\log(\hat{\beta}_i) + \log(h_i))$. Denoting by Φ^{-1} the inverse of the normal cumulative distribution function, we derive a simple expression for the naiveté measure:

$$s_i \equiv \frac{\hat{\beta}_i}{\beta_i} = \exp(\Phi^{-1}(\hat{v}_i/n) - \Phi^{-1}(v_i/n)). \tag{6}$$

Because the real distribution of costs of efforts is unknown, we also derive an expression for s_i when e_i is not log normally distributed. We focus on distributions that are defined on positive domains. Let us denote by $F(\cdot)$ the appropriate c.d.f. for the cost of effort. Using

$$v/n = F(\beta h - \theta) \tag{7}$$

$$\hat{v}/n = F(\hat{\beta} h - \theta) \tag{8}$$

and the fact that $\theta = 0$ for long-term contracts, we find that

$$s_i = \frac{F^{-1}(\hat{v}_i/n)}{F^{-1}(v_i/n)}. \tag{9}$$

Figures in appendix report the distribution of s_i for log normally distributed costs of efforts, but also when $F(\cdot)$ is chi-squared distributed with respectively 1 and 2 degrees of freedom, and for a gamma distribution with 2 degrees of freedom. The figure shows that a large part of the population overestimates their ability to exert self-control and has $s_i > 1$.

Since we can expect that over time members update their beliefs about their degree of sophistication over time, we should also see a negative relationship between the measure of ex post sophistication and the probability of contract renewal. This leads to a fourth prediction if learning is present:

Prediction 4. *The degree of naiveté should correlate negatively with the probability of contract renewal of members if learning is present.*

We test this prediction using data on contract renewal.

3 Data

We collected data from a large network of health clubs in Quebec. We focused on 14 clubs in the Montreal region. These are centrally managed with harmonized pricing and contract menu. The amenities of each club are similar. We targeted all new contracts signed in September 2011, which is one of the busiest months (after January). New or renewing members choose a contract in September among the various options offered by the network. Contracts vary in terms of duration. Shorter ones are more costly per month. In the sample, the vast majority of them (over 95%) are annual. At each visit, members swipe a card that automatically records attendance. These data are transmitted to the administrative office of the network. We obtained monthly attendance for each new member between September 2011 and August 2012.

We obtained 1,475 valid membership records. The attendance file also contains information on date of birth, address, gender, status (new member or not), the type of membership, the price of the membership and the club in which the member signed the contract. Members are allowed to attend any club in the network. These visits are recorded in the database irrespective of which club members go to. However, the vast majority of members attend the club where they signed the contract. We constructed the average number of visits per week as the ratio of the number of visits per month to the number of weeks in the month. We name this variable the "objective number of visits per week."

When signing a contract, members were asked to fill in a paper questionnaire. We collected the paper questionnaires at each club and recorded the answers in a data file. The content of the questionnaire is varied. In particular it contains one question on the expected number of visits per week at the gym. A free-form answer is recorded. We term this variable "subjective expected number of visits per week".

Members are also asked in the paper questionnaire about their problems with motivation. One question asks them whether they sometimes postpone training. An answer on a 5-point scale (never too often) is recorded. Another question asks whether they have difficulty maintaining the frequency of their training. An answer is recorded on the same 5-point scale. Answers to these two questions are highly correlated. We take an average of the scores and we divide the respondents in two groups, those with a score of less than 2.5 and those with a score of more than 2.5. The second group is considered as having self-control problems while the first group is not.

In Table 1, we report descriptive statistics on the variables used in the analysis. Members are on average 33.94 years old and 55.7% are female. Of the members who signed up in September 2011, 83.4% of members who signed up in September 2011 had experience with health clubs while 75.5% were new to this network. On average, members went 1.37 times per week at the club between September 2011 and August 2012. But they expected to go almost 3 times per week at the time of signing their contract and filling the form. The average motivation index is 2.47 (before splitting into two groups), and 50.5% of members are classified as having self-control problems per our definition.

Note that the deviation in percentage correlates positively with self-assessed problems of self-control. This is consistent with our model since we estimate that individuals reporting having self-control problems also have a β that is lower than those who do not.

Variable	Mean	Std. deviation	Min	Max	N
Age	33.94	12.33	16	84	1 475
Female	0.557	0.497	0	1	1 486
Experience with health clubs	0.834	0.372	0	1	1 015
New member with this health club	0.755	0.430	0	1	1 486
Objective visits/week	1.370	1.403	0	10.604	1 486
Subjective visits/week	3.002	0.759	1	7	963
Motivation index (1/5)	2.465	1.133	1	5	749
Self-control problems (motivation index > 2.5)	0.505	0.500	0	1	749

Table 1: **Descriptive Statistics**. Descriptive statistics on key variables used in the analysis. Please refer to text for variable definitions.

As can be seen from Table 1, not all members completed the form. Cases where no form was filled were rare. The number of valid records varied according to the question asked. For motivation questions, we recorded 749 valid answers. For the question on the expected number of visits, we recorded 963 valid answers. Non-response could be non-random. For those that did not complete a questionnaire, we have information on their actual number of visits, age, gender and club location. We estimated a logit model of the probability of missing information in these questions as a function of these covariates. Interestingly, none of the member level covariates were statistically significantly associated with missing information on the questionnaire. However, the amount of missing information varied across clubs with some clubs having much lower completion rates than others. Hence, in all analysis that involve regressions, we include club fixed effects.

4 Results

4.1 Objective and subjective expected visits

We first look at the distribution of objective and subjective visits per week to test Prediction 2. Figure 1 shows histograms. It is clear that members overestimate their average number of visits per week. As seen in Table 1, the actual average number of visits is 1.37 while the average subjective expected number of visits is 3.002. This difference of 1.63 visits is statistically different from zero (t-stat = 32.18). Hence, members are optimistic at the time of signing their contract. Less than 9% attend more than 3 times a week. The last panel in Figure 1 shows that underestimation is widespread and that very few actually overestimate the number of visits they will make on average.

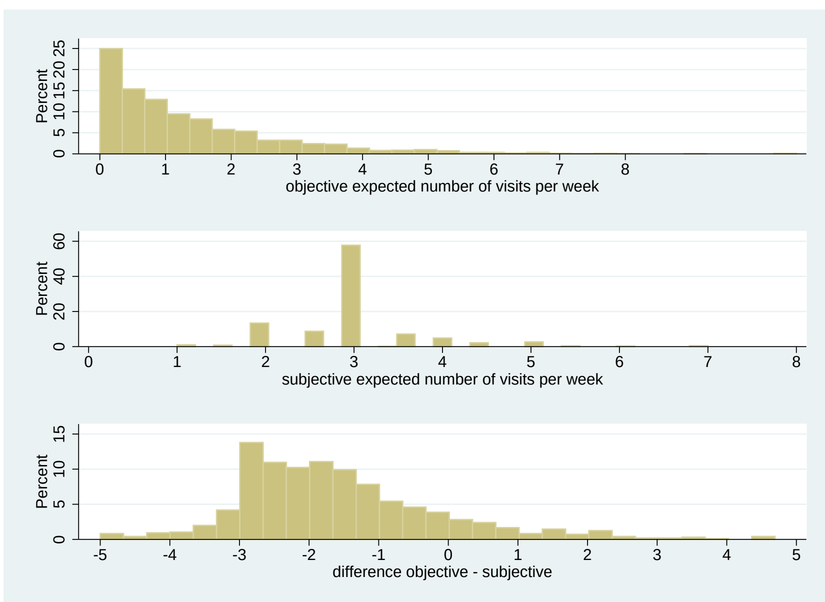

Figure 1: Objective and Subjective Number of Visits per Week

The fee based price is $14.95 per visit. A natural question is whether members go to the gym enough to rationalize their choice. The median monthly price of an annual membership is $39.10. The price varies according to additional services, such as private training sessions that one might purchase. But the median price does not include additional benefits that a single visit would not provide. Hence, one needs to go to the gym more than 2.6 times per month, every month, to make the annual membership worthwhile.

In Figure 2, we plot the distribution of the cost per visit computed as the monthly price divided by the actual average number of visits per month and the expected number of visits per month. There is considerable variation in the cost per visit with most of the variation coming from the number of visits rather than the fixed cost of the membership. Using the objective number of visits per month (actual), the average cost is \$26.9 per visit. Using \$14.95 as the cutoff for making the right decision, we find that only 59% of respondents have a cost per visit that is lower than the cost of a single pass.

We can compute the total cost of this mistake by taking the difference between the total cost of their membership over this period and subtracting the cost they would have incurred in buying single passes each time they visit the gym. For those making a mistake over this period, the average error is \$277 while the median is \$229. The cost of making a mistake is large. For those making the right choice, given their actual number of visits, the average gain from buying an annual membership is \$446.50.

The bottom panel in Figure 2 reports the average cost per visit using the subjective expected number of visits at the time of initial enrolment. Given the numbers we reported previously on the subjective expected number of visits, it is not surprising to see that the bulk of the distribution is below the cutoff of \$14.95 for a single pass. In fact, 98% of members are making the right decision at the time of signing the contract, conditionally on their initial beliefs. But this apparent naiveté on the part of some members is costly ex post.

4.2 Determinants of objective and subjective expected visits

This result raises an important question: what are the characteristics that correlate with this widespread optimism? We look at the determinants of the average actual number of visits, log(objective) and the subjective expected number of visits at the time of signing the contract, log(subjective). Finally, we also look at the percentage of deviation between

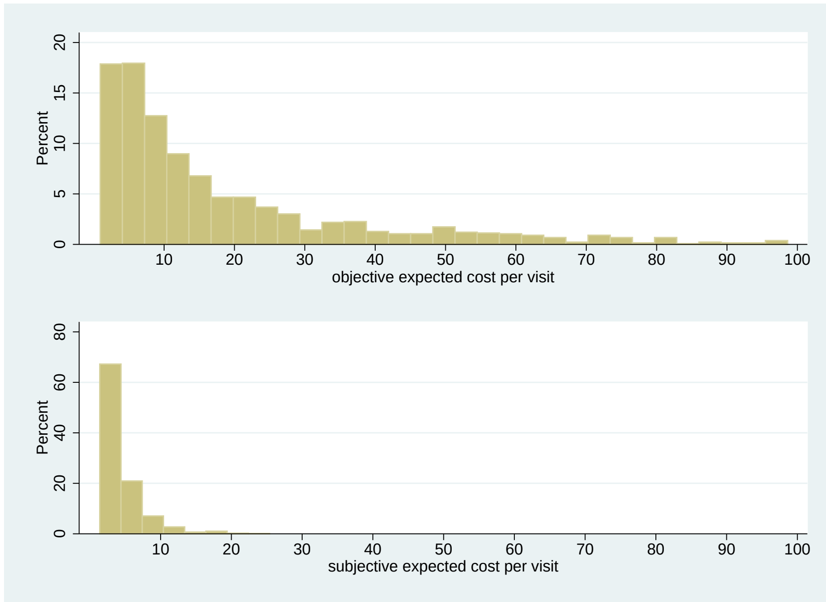

Figure 2: Objective and Subjective Expected Cost per Visit

subjective and objective expected number of visits. We estimate a linear regression with age, gender, an indicator for self-reported self-control problems, two indicators for whether the respondent has experience with health clubs and is a new member of this network, and finally club fixed effects. The relationship with reports of self-control problems allows us to test Predictions 1 and 3. Table 2 reports estimates.

The first column reports results for the objective number of visits. Those with self-control problems have 20% lower attendance on average (-0.205, t = 2.39). Hence reports of self-control are predictive of the actual number of visits that confirms prediction 1. However, looking at the second column, we see that those with self-control problems do not expect to attend the gym less often than do those without such problems (-0.016, t=0.81). Hence, Prediction 3 implies that agents are very naive with respect to their self-control problems. The last column confirms this. Those with self-control problems have in general subjective expected visits that are 17.9% higher than those without self-control problems.

Variable	Objective visits	Subjective visits	% Deviation
Age	0.001	-0.0.003	-0.005
	(0.17)	(3.96)	(1.41)
Female	-0.143	-0.073	0.068
	(1.63)	(3.86)	(0.75)
Self-control problems	-0.219	-0.028	0.192
	(2.55)	(1.51)	(2.18)
New member	-0.001	-0.015	0.010
	(0.01)	(0.68)	(0.10)
Experience	-0.068	0.027	0.084
	(0.55)	(0.99)	(0.66)
Club fixed effects	Yes	Yes	Yes
N	697	684	668
R^2	0.057	0.068	0.046

Table 2: **Overall Attendance and Self-control**. *Notes:* Regression of log objective expected visits, subjective expected visits and the % deviation between the two (subjective - objective) on controls as well as club fixed effects. T statistics are reported in parenthesis.

4.3 Predictive value of subjective expected visits and self-Control

One might be worried that the expected number of visits has no predictive value for the actual number of visits and this would explain why the expected number of visits does not correlate with reported self-control problems. To investigate this issue we estimate a poisson model, in panel, of the evolution of monthly visits as a function of age, gender, experience, new membership, self-control indicator and the expected number of visits per month at the time of signing the contract. We also include month fixed effects as attendance generally declines with time. We use both a pooled and a random effects poisson model (with gamma random effects). Table 3 reports estimation results.

The two specifications give similar results. The subjective number of visits per month is predictive of the number of actual visits per month. Expecting one additional visit per month is associated with a 16% increase in the actual number of visits. Given that the average number of visits per month is 5, this represents roughly 0.8 additional visits. Hence, the self-reported expectations are highly predictive of actual visits. Since self-control problems did not correlate with the expected number of visits, one should not be surprised

Variable	Pooled poisson	Random effects poisson
Age	0.010	0.009
	(2.69)	(2.48)
Female	-0.031	-0.062
	(0.38)	(0.71)
New member	-0.027	-0.003
	(0.30)	(0.03)
Experience	-0.016	-0.007
	(0.15)	(0.05)
Subjective visits	0.165	0.177
per month	(3.26)	(3.01)
Self-control	-0.257	-0.238
problems	(3.20)	(2.85)
Month fixed effects	Yes	Yes
Club fixed effects	Yes	Yes
$\log(\alpha)$		.0130
		(2.48)
N	7 524	7 524
log Likelihood	-3.28e04	-2.15e04

Table 3: **Panel Attendance and Self-control**. *Notes:* Count models estimated on monthly data. First column reports coefficient of a pooled poisson model with clustered standard errors at the member level. Second column estimates a random effect poisson model where random effects are gamma distributed with variance alpha. This specification soundly rejects the hypothesis that alpha = 0 (chi-square = 1.4e04). T-statistics are reported in parenthesis.

to find that even when controlling for the expected number of visits, those with self-control problems go less often to the gym. The magnitude of the effect in column 1 is similar to the one estimated in Table 2 (-0.195, t = 2.55), confirming this suspicion.

An interesting question to ask is whether the effect of self-reported self-control problems is immediate at the start of the membership or only occurs after some time. To investigate this issue, we re-estimated a poisson model with gamma distributed random effects, this time allowing for month fixed effects to be different between the two groups (those with self-control problems and those without). The estimated fixed effects relative to the number of visits in October of someone without self-control problems are plotted in Figure 4.

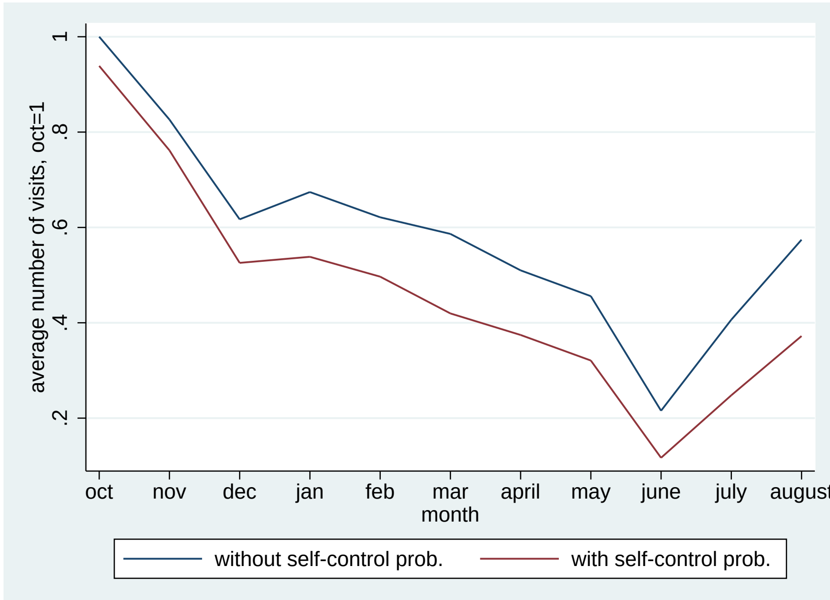

Figure 3: Average Number of Visits and Self-reported Self-control Problems

From October to December, the number of visits declines roughly at the same pace for both groups. During that period, the difference in attendance between the two groups is less than 10%. There is an uptick in attendance in January for both groups. The gap between the two groups then becomes much larger starting in January. In May, members with self-control problems go to the gym 70% less often than they did when they started. The decline is less abrupt for those without self-control problems.

4.4 Do self-control problems affect contract renewals?

Are self-control problems a good or a bad thing for health clubs? After all, individuals who are unrealistically optimistic about their motivation levels disburse more money in gyms than they should. On the other hand, out of frustration or discouragement those who eventually realize their mistakes may simply decide to do business with other clubs or to simply quit exercising.

To verify whether and how self-control problems are linked to renewal, we gathered data on contract renewals. We constructed a binary variable that equals 1 if an individual have signed a new contract after the expiration of the original one, and 0 otherwise. No contracts were automatically renewed. An overwhelming majority of people originally had 12-months contracts, and most of those who renewed re-opted for year-long agreements. However, the renewal rate if very low, around 31%. Since effort devoted to recruiting is costly, understanding what drives renewal may be important.

The middle column in Table 4.4 reports the estimates of a logistic regression of renewal on control variables as before and on $s_i = (\hat{\beta}/\beta)$, which measures by what percentage individuals overestimate their levels of self-control. The results show that renewal is negatively correlated with overestimation of self-control.

To provide a quantitative assessment of this effect, the third column in Table 4.4 report the marginal effect of a change of one unit of s_i on the average renewal probability. As it turns out, a 1% over-estimation of self-control is associated with a reduction of around 0.07 point of percentage of renewals. Since on average β is overestimated by around 2.3 times, the effect is large: our analysis suggests that this difference can account for a decrease of around 9.1 percentage points in renewal rates. Given the renewal rate was 31% in the sample, this effect is large.

5 Conclusion

This paper uses new data on membership records from health clubs in Quebec to investigate the relationship between actual and expected gym attendance as well as the role played by self-control problems. We find that a large portion of the members is optimistic regarding their attendance at the time of signing their contract, and that those who are optimistic are more likely to also express problems with self-control. The cost of this over-optimism can be large, at the median close to $262. Our findings are consistent with a model where members with self-control problems underestimate severely the future impact of their self-control problems on gym attendance. Interestingly, we find that members who deviate the most from their expectations are much less likely to renew their membership.

Variable	Coeff	Marginal effects
Age	0.020	0.003
	(2.84)	(2.90)
Female	0.351	.056
	(1.98)	(2.00)
New member	1.347	0.214
	(5.58)	(5.96)
Experience	0.408	.065
	(1.75)	(1.76)
$\log(\hat{\beta}/\beta)$	-0.613	-0.097
	(-8.78)	(-10.32)
Club fixed effects	Yes	Yes
N	885	885
Pseudo R^2	0.1827	

Table 4: **Contract Renewal and Self-control**. *Notes:* Logistic regression of contract renewal on controls, $\log(\hat{\beta}/\beta)$ and club fixed effects. The second column shows regression estimates and t-statistics. The third column reports the marginal effects, computed using the delta method.

These results could have important implications for the design of membership plans. New members typically over-estimate the number of visits they plan to make to the gym. Although it might be profitable for networks to exploit this difference to lock-in members in expensive long-term contracts, the likelihood of renewing membership is much lower for members who realize that they actually did not go to the gym often. Hence, networks seeking to maximize profits in the long-run may actually care about renewing contracts instead of repeatedly having to go after new membership. Networks could potentially increase their renewal rate by first making members aware of overall patterns of behaviour in the population (optimism) and then targeting those who express self-control problems to try and increase their participation. Incentives such as reminders and text messages, etc, could potentially be useful to increase attendance, and ultimately renewals of memberships. The objectives of both governments and gym networks may be aligned in this case.

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A Figures for $s_i = \frac{\hat{\beta}}{\beta}$

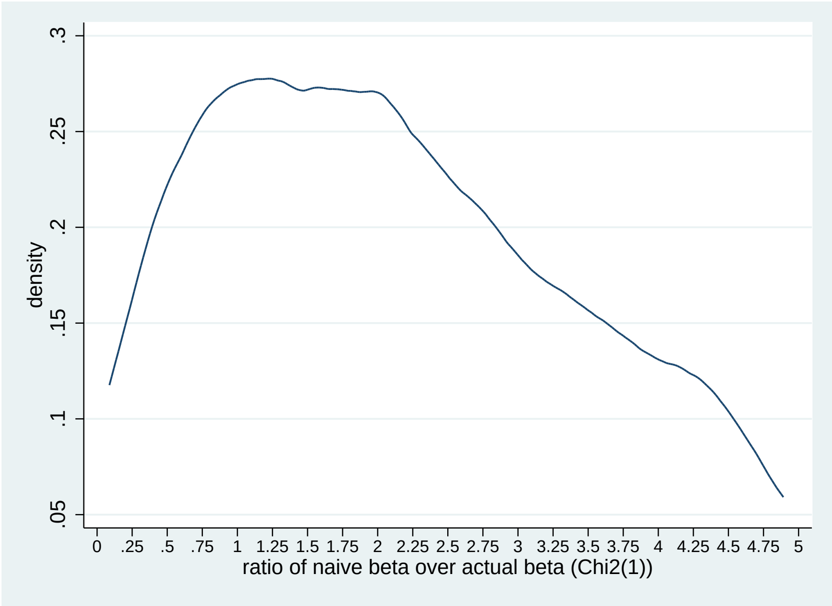

Figure 4: Ratio of Naive Beta to Actual Beta – chi-square(1)

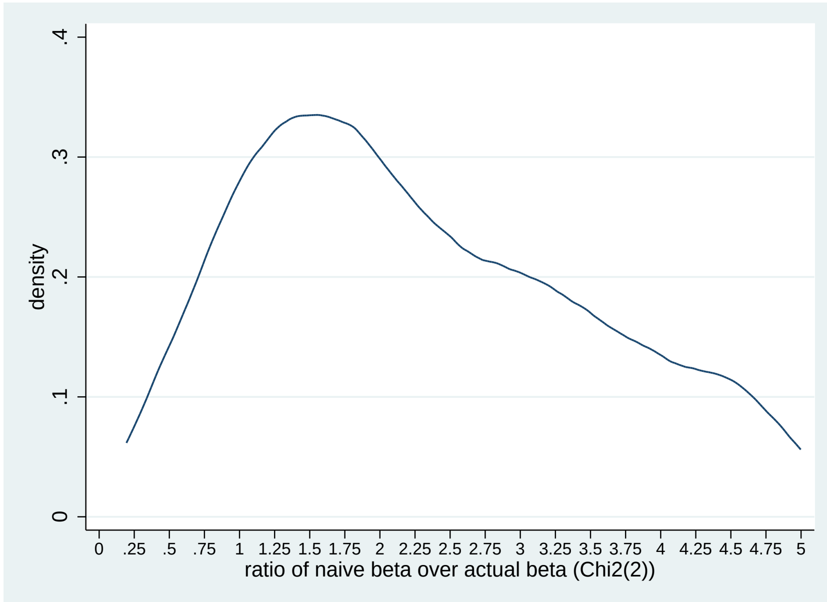

Figure 5: Ratio of Naive Beta to Actual Beta – chi-square(1)

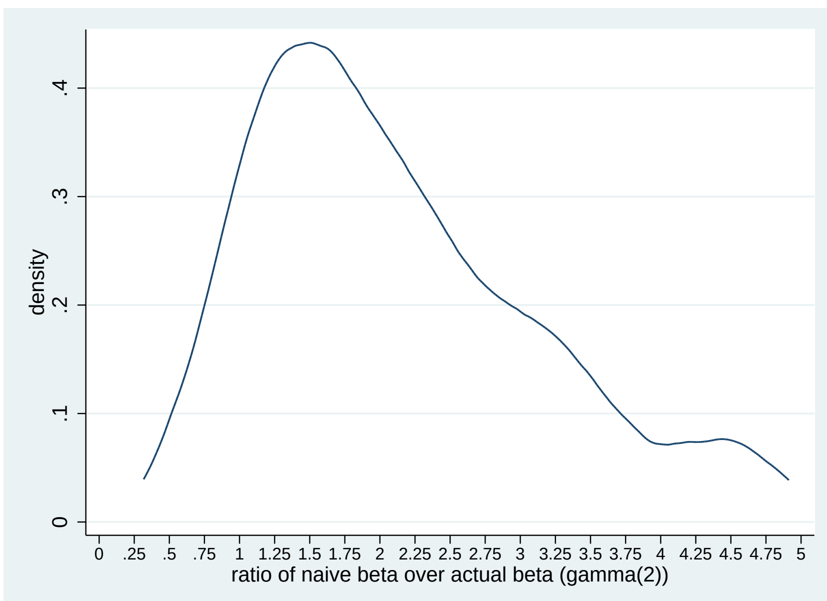

Figure 6: Ratio of Naive Beta to Actual Beta – gamma(2)

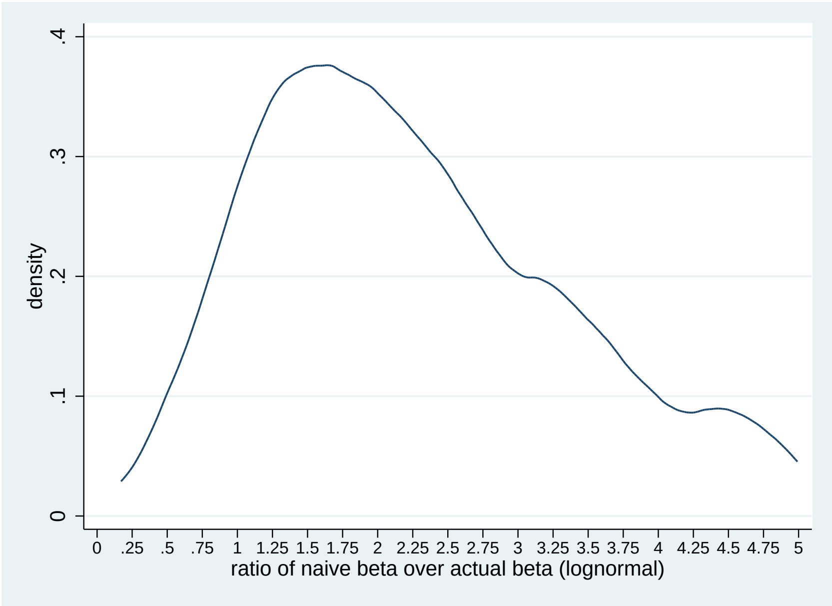

Figure 7: Ratio of Naive Beta to Actual Beta – lognormal