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Betting on weight loss . . . and losing: personal gambles as commitment mechanisms

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Professional bookmakers rarely accept bets from individuals who directly control the outcome of the bet. We analyse a unique exception to this rule and a potential policy innovation in the battle against obesity: a weight loss betting market. If obese individuals have time-inconsistent preferences then commitment mechanisms, such as personal gambles, should help them restrain their short-term impulses and lose weight. Correspondence with the bettors confirms that this is their primary motivation. However, it appears that the bettors in our sample are not particularly skilled at choosing effective commitment mechanisms. Despite payoffs of as high as $7350, approximately 80% of people who spend money to bet on their own behaviour end up losing their bets. Empirical analysis of the betting market yields further insights. Males are treated very differently compared to females: being male is considered equivalent to having an extra 6 months to lose the same amount of weight. Movements in the market price also confirm the belief that rigidity is preferred to flexibility in setting successful weight loss targets.

I. Introduction

This article sheds light on a potential policy innovation in the battle against obesity. While it is clear that obesity imposes significant costs (Finkelstein *et al.*, 2003; Shimokawa, 2008) and many individuals are not at their preferred weight, it is less clear what weight-loss methods are most effective. A comprehensive study by Ayyad and Andersen (2000) finds that for overweight individuals, long-term median success rates from dieting are only 15%. Economic intuition suggests that incentives could play an important role in tackling obesity, much as they have proven successful in treating similar problems such as smoking and substance abuse (Dallery and Lancaster, 1999; Silverman *et al.*, 1999; Dallery *et al.*, 2001; Dallery and Glenn, 2005). However, very few studies have been conducted on direct economic incentives to lose weight. Recent experimental work by Charness and Gneezy (2009) suggests that paying students to go to the gym can increase mean attendance rates. A study by Wing and Jeffrey (2001) compared various intervention strategies designed to promote weight loss, including monetary incentives. They find that paying

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participants $25 per week for achieving and maintaining weight loss goals had no effect on outcomes.[1]

In this article, we investigate an incentive scheme that typically averages $100 per week: high stakes gambles on personal weight loss. For the past 15 years, the British betting agency, William Hill, has accepted bets from people who are trying to lose weight, at odds of up to 50:1 and with payoffs of over $7000.[2] The person placing the bet, whom we refer to as the 'bettor', wins the bet if he loses a specific amount of weight by a certain date. If successful, he receives a payoff based on the odds and the size of the wager.

At first it seems puzzling that a bookmaker would accept a high-stakes bet from someone who arguably has control over the outcome. While gambling is a common activity, it is rare that the bettor has direct influence over the probability of winning. In a number of these weight bets, the bettor could win the bet by reducing his daily food consumption by the equivalent of a Starbucks hot chocolate. Analysis of correspondence with the bettors suggests a plausible explanation for this unusual market: time-inconsistency (Strotz, 1956; Phelps and Pollak, 1968; Akerlof, 1991; Laibson, 1997; O'Donoghue and Rabin, 1999; Benabou and Tirole, 2004; Eisenhauer and Ventura, 2006; Fudenberg and Levine, 2006). Bettors are aware that their preferences are inconsistent across time so they actively seek out commitment mechanisms (weight bets) to alter their own behaviour.

In this article, we present some of the first evidence on market provision of weight loss commitment mechanisms. Despite being aware of their own behavioural biases, bettors have limited success in designing appropriate mechanisms for themselves (80% of bets are lost). This has important implications for the burgeoning online market in commitment mechanisms.[3] Empirical analysis of the betting market provides further insights: there are strong gender differences in terms of designing successful commitment mechanisms and a flexible mechanism is actually perceived as an obstacle rather than an advantage.

II. Weight Loss Betting Data

We gathered a unique data set on weight loss betting with the assistance of a bookmaker in the UK. The data comprise betting slips and correspondence between bettors and the bookmaker William Hill over the period 1993 to 2006. Typically, each bet begins with a letter or email from the bettor to William Hill, outlining the amount of weight the person would like to lose and over what time period.[4] This correspondence provides considerable insight into the bettors' motivations. To analyse this correspondence we developed a system to code language relevant to the bettors' motivation using a binary absence/presence score. The first column in Table 1 describes the type of language used, and the second and third columns report the frequency with which this language appears in the communication data. The second column gives the frequency of coding for the entire sample, while the third column restricts the sample to only those bettors who actually discuss their motivation for making the bet. 55% of bettors who discuss their motivation use language that highlights the difficulty they have experienced in trying to lose weight.[5] The correspondence also reveals that 70% of bettors who discuss their motivation use language similar to, 'I want to use the bet as a commitment mechanism.'[6] This strongly accords with the hypothesis that bettors have time-inconsistent preferences and are aware of the consequences.

William Hill claim to initially accept all applications for weight loss bets, however, many applicants withdraw once they discover that they must agree to the bet being publicized. Although winning a weight loss bet is rare, each winning bet is costly for William Hill. Based on our data, the bookmaker generates an average yearly loss of about $500 from weight loss bets. However, this excludes the important but

[1] In a similar vein, a very recent article by Volpp *et al.* (2008) finds that economic incentives produced significant weight loss during the intervention but that this loss was not maintained.
[2] All amounts listed in dollars have been converted from nominal British Pounds (GBP) to year 2007 US dollars.
[3] See, for example, www.stickK.com and www.fatbet.net
[4] The amount to be wagered is set by William Hill and is typically around $140. William Hill then requests additional information from the bettor, including age, gender and starting weight.
[5] Examples of language used include: '*I've tried every diet, and I can do just brilliantly for three days, then for all my hard work and misery, my husband rewards me with a Cornetto Magnifico* [ice-cream], *my favourite. Then, the next day, I feel like I've ruined everything, so give up all together*'; '*. . . tried joining two gyms and other exercise and diet programmes over the years but so far nothing has worked*'.
[6] Examples of language used include: '*I hope you will choose to accept my bet as this will give me a great incentive to finally lose the weight that I should have done long ago*'; '*I wonder if looking to a reward of money might keep me on track*'.

Table 1. Pre-bet correspondence frequencies

Description	Correspondence	Motivation sample
Bettor views the bet as a commitment mechanism	0.31	0.70
Bettor has experienced difficulty losing weight	0.38	0.55
Bettor hopes to raise money for charity	0.16	0.20
Bettor hopes to generate publicity	0.16	0.35
Bettor explains their diet/exercise plans in detail	0.22	0.20
N	45	20

Notes: 'Correspondence' describes proportions of the total sample providing each type of correspondence. 'Motivation Sample' refers to the subset of the entire sample that discussed a motivation for losing weight.

difficult-to-measure publicity benefits. For example, weight loss bets regularly generate full-page articles promoting William Hill in the British tabloid press.[7] Our estimate of the cost may also be biased upward, since the missing bets are more likely to be ones in which the bettor loses.[8]

William Hill place a number of conditions on the structure of each bet. First, there is always a maximum stake (of around \$140), and bettors usually wager the maximum allowed. Second, each bettor must be weighed at the start of the bet by a medical physician who must also confirm that losing the desired amount of weight does not pose a health risk to the bettor. Finally, at the end of the bet, a winning bettor must again be weighed by a doctor in order to claim their prize.

Descriptive statistics are presented in Table 2, which shows that 80% of bettors lose their bets. Odds for the bets range from 5:1 to 50:1 and potential payoffs average \$2332.[9] The average daily weight loss that a bettor must achieve to win their bet is 0.39 lbs. In terms of reducing caloric intake to lose weight, this is equivalent to reducing daily consumption by two Starbucks hot chocolates. The first insight we draw from this market is that although bettors are aware of their need for commitment mechanisms, those in our sample are not particularly skilled at selecting the right mechanisms.[10] Bettors go to great lengths to construct elaborate constraints on their behaviour, which are usually unsuccessful.

III. Empirical Analysis of the Betting Market

Given that bettors are not particularly skilled at designing their own incentive structures, we now wish to formally test what characteristics influence the success of these mechanisms. There are some important and obvious concerns with testing hypotheses using the data obtained from the betting market. The sample size is small and there is a selection bias problem. There is not much we can do about this; results should be interpreted within the context of a small self-selected sample.

An additional concern is that a model with the bet outcome as the dependent variable and bet characteristics as the explanatory variables is likely to suffer from omitted variables bias. There are many unobserved factors which influence an individual's ability to lose weight (for example, thyroid activity, personal motivation, etc.). Estimates obtained from regressing the bet outcome on bet characteristics will almost certainly be inconsistent. There is a potential solution to this problem. Although the best measure of a bet's outcome is the actual result, a good proxy is the market price (the odds) initially offered for the bet. Unobserved factors such as a bettor's motivation cannot directly influence the market price because they are, by definition, unobserved by the price-maker. The potential for omitted variables inconsistency is significantly reduced if we use the

[7] The cost of a one page black and weight advertisement in *The Sun*, the main outlet for weight bets stories, is approximately \$41 000. *Source*: http://www.ngn-advertising.com/

[8] This is because winning bets tend to be big news stories. We have performed Lexis-Nexis searches for any weight loss bets, and to the best of our knowledge, we are not missing any winning bets.

[9] Dividing the potential payoff by the duration of the bet in weeks gives an average weekly incentive of \$99.

[10] Although it is possible that the motivation for betting on weight loss is just like any other betting market (enjoyment, risk-seeking or profit-making), there are a number of features of this market that suggest bettors are using bets primarily to tackle perceived self-control problems. First, the bettors themselves state that they are signing up for weight loss bets because they need a commitment mechanism. This strongly accords with behavioural models of time-inconsistent preferences. Not a single bettor explained their motivation for making the bet in terms of the thrill or enjoyment of gambling. Second, there are significant costs for the bettor that make weight bets different to standard gambles. Aside from the obvious cost of losing weight there are considerable transactions costs: for example, each bettor must arrange at least one and possibly two consultations with their local doctor. Finally, the amounts being wagered are not frivolous (the average wager is \$143).

Table 2. Summary statistics

Variable	Observations	Mean	SD	Min.	Max.
Winner	51	0.20	0.40	0	1
Male	51	0.39	0.49	0	1
Age	49	35.22	7.40	22	58
Bet ($)	51	143.01	87.61	50.80	486
Odds	51	18.63	12.12	5	50
Payoff ($)	51	2331.95	1522.88	406.50	7350
Starting weight (lbs)	50	263.14	59.99	152	441
Target weight (lbs)	50	183.97	42.35	124	280
Weight to be lost (lbs)	51	78.48	33.80	28	168
Duration (days)	51	243.49	138.71	28	718
Daily weight loss rate (lbs)	51	0.39	0.18	0.16	1

Note: All dollar values in 2007 US dollar equivalents.

bet odds as our dependent variable, y_i. The drawback is that we are now testing what the market *perceives* as influential not necessarily what *is* influential. However, the market price should incorporate all available information and provide an accurate estimate of the probability that the bet will be won. We assume a simple linear specification and estimate the following model using Ordinary Least Squares (OLS):

$$y_i = \alpha + \beta_1 Male + \beta_2 Age + \beta_3 Starting\_weight + \beta_4 Weight\_to\_be\_lost + \beta_5 Duration + \varepsilon_i$$

The results in column (1) of Table 3 suggest that the market believes males are more likely to win their bets, that longer bets are more likely to be winners, and that age is not a factor. From the bookmaker's perspective, being male is an equivalent advantage to having an extra 6 months to lose the same amount of weight.[11] The sign on the *Weight_to_be_lost* variable makes sense but is not statistically significant. One-half of the people who made weight loss bets for charitable purposes won, a significantly higher fraction than noncharity bets. In column (2) we test whether the market incorporates this information into the odds. The coefficient on *Charity* is large and negative, but it is not significant.

We now want to test if the market is factoring time-inconsistency into its pricing decisions:

> *Hypothesis*: *If bettors are time-inconsistent, the odds for a bet to lose W pounds in T days to receive π dollars should be less than the odds for n consecutive bets to lose W/n pounds in T/n days to receive π/n dollars.*

As outlined by O'Donoghue and Rabin (2005), if bettors are time-consistent and future costs are uncertain then *flexibility* is preferred over *rigidity*. Having 10 days to lose 10 lbs is preferred to 10 bets to lose 1 lb in 1 day because the bettor has the flexibility to recover from an unexpectedly high-cost day as well as the freedom to front-load on low-cost days. However, if bettors are time-inconsistent, then too much flexibility will allow their impatience to get the better of them and make it harder to win the bet.[12]

The estimated coefficient on *Duration* from the previous regression model represents the marginal impact of *Duration* on the odds, holding all other explanatory variables constant. For example, the coefficient should be interpreted as the change in the odds when there is a change from a bet to lose 10 lbs in 10 days to a bet to lose 10 lbs in 20 days. To test our time-inconsistency hypothesis, we instead want to know what happens when we change from a bet to lose 10 lbs in 10 days to a bet to lose 20 lbs in 20 days. We want to estimate the marginal impact of changing the duration of the bet, holding the daily weight loss rate constant.[13] To this end, we estimate the following model:

$$y_i = \alpha + x_i'\beta + \delta Weightrate_i + \varepsilon_i$$

where $Weightrate_i$ is the average daily weight loss rate and x_i is a vector of controls.[14]

[11] This finding is generally supported by the medical and exercise literature (McArdle *et al*., 2006; Whaley *et al*., 2006).
[12] This is a similar test to the experiments by Ariely and Wertenbroch (2002), who find that regularly spaced and exogenously imposed deadlines improve the performance of subjects on various tasks relative to subjects with a single final deadline.
[13] This approach assumes that the key measure of a bet's difficulty is the daily weight loss rate and not the total weight to be lost.
[14] The controls are the same as before: the bettor's gender, age, starting weight and the duration of the bet.

Table 3. Odds regressed on bettor characteristics

	(1) Odds	(2) Charity	(3) Weight rate
Male	−7.354**(3.288)	−6.542* (3.632)	−8.698** (2.748)
Age	−0.343 (0.243)	−0.315 (0.255)	−0.165 (0.223)
Starting weight	−0.00525 (0.0492)	−0.00351 (0.0507)	0.00469 (0.0230)
Weight_to_be_lost	0.161 (0.113)	0.155 (0.117)	
Duration	−0.0369** (0.0162)	−0.0367** (0.0163)	0.0262* (0.0149)
Charity		−4.336 (4.123)	
Weight loss rate			43.10** (9.810)
Constant	31.55** (12.75)	30.60**(13.21)	3.533 (9.958)
N	48	48	48
R^2	0.224	0.232	0.325

Notes: Robust SEs in parentheses. All regressions adjust for clustering at the bettor level.
** and * indicate significance at the 5 and 10% levels, respectively.

Results are presented in the final column of Table 3. The sign of the coefficient on the *Duration* variable has now completely reversed from negative to positive and the estimated coefficient is statistically significant at the 10% level. The market appears to believe that, holding the weight loss rate constant, increasing the duration of a bet decreases the probability that the bettor will succeed. This provides fairly strong support for the time-inconsistency hypothesis.

IV. Discussion

In this article we present some unique data on an innovation used to combat the growing problem of obesity: betting on yourself. Our data and analysis suggest that weight loss incentives need to account for gender differences and, especially, for time-inconsistent preferences. These insights may be relevant for policies that target the private or public costs of obesity. For example, Bhattacharya and Sood (2006) suggest incorporating body weight changes when calculating insurance premiums. If consumers pay insurance premiums either annually or bi-annually, then these added costs might provide little incentive for people who are time-inconsistent. While the policy would shift the obesity externality costs onto obese individuals, it might do little to affect underlying health outcomes. We do not claim that our analysis is a thorough or ideal assessment of betting as a weight loss commitment device; further research is clearly needed.[15] However, we believe it is important to recognize where innovative, market-based weight-loss mechanisms have developed and what lessons they offer for future research and policy efforts.

This unique market also sounds a cautionary note about market provision of commitment mechanisms and the current proliferation of online 'bet-on-yourself' services. The individuals in this market are aware that they require commitment mechanisms but seem unable to design appropriate mechanisms for themselves. The bettors could have earned thousands of dollars for accomplishing something that they wanted to do anyway and signed up for of their own volition. This raises an important question about behavioural policy interventions: at what point do irrational agents start to behave rationally enough to take advantage of voluntary schemes designed to overcome their irrationality?

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References

Akerlof, G. A. (1991) Procrastination and obedience, *American Economic Review*, **81**, 1–19.

Ariely, D. and Wertenbroch, K. (2002) Procrastination, deadlines, and performance: self-control by precommitment, *Psychological Science*, **13**, 219–24.

[15] See, for example, the promising results in Volpp *et al.* (2008).

Ayyad, C. and Andersen, T. (2000) Long-term efficacy of dietary treatment of obesity: a systematic review of studies published between 1931 and 1999, *Obesity Reviews*, **1**, 113–99.

Benabou, R. and Tirole, J. (2004) Willpower and personal rules, *Journal of Political Economy*, **112**, 848–86.

Bhattacharya, J. and Sood, N. (2006) Health insurance and the obesity externality, *Advances in Health Economics and Health Services Research*, **17**, 281–321.

Charness, G. and Gneezy, U. (2009) Incentives to exercise, *Econometrica*, forthcoming.

Dallery, J. and Glenn, I. (2005) Effects of an internet-based voucher reinforcement program for smoking abstinence: a feasibility study, *Journal of Applied Behavior Analysis*, **38**, 349–57.

Dallery, J. and Lancaster, J. S. (1999) Individual differences in behavioral tolerance to amphetamine and the economic context of reinforcement loss, *Behavioural Pharmacology*, **10**, 257–69.

Dallery, J., Silverman, K., Chutuape, M., Bigelow, G. E. and Stitzer, M. E. (2001) Voucher-based reinforcement of dual drug abstinence in treatment-resistant methadone patients: effects of reinforcer magnitude, *Journal of Experimental and Clinical Psychopharmacology*, **9**, 317–25.

Eisenhauer, J. G. and Ventura, L. (2006) The prevalence of hyperbolic discounting: some European evidence, *Applied Economics*, **38**, 1223–34.

Finkelstein, E. A., Fiebelkorn, I. C. and Wang, G. (2003) National medical spending attributable to overweight and obesity: how much, and who's paying, *Health Affairs*, **3**, 219–26.

Fudenberg, D. and Levine, D. K. (2006) A dual-self model of impulse control, *The American Economic Review*, **96**, 1449–76.

Laibson, D. (1997) Golden eggs and hyperbolic discounting, *Quarterly Journal of Economics*, **112**, 443–77.

McArdle, W. D., Katch, F. I. and Katch, V. L. (2006) *Exercise Physiology: Energy, Nutrition, and Human Performance*, Lippincott Williams and Wilkins, Philadelphia, PA.

O'Donoghue, T. and Rabin, M. (1999) Doing it now or later, *American Economic Review*, **89**, 103–24.

O'Donoghue, T. and Rabin, M. (2005) Incentives and self-control, *mimeo*, University of California, Berkeley.

Phelps, E. S. and Pollak, R. A. (1968) On second-best national saving and game-equilibrium growth, *Review of Economic Studies*, **35**, 185–99.

Shimokawa, S. (2008) The labour market impact of body weight in China: a semiparametric analysis, *Applied Economics*, **40**, 949–68.

Silverman, K., Chutuape, M. A., Bigelow, G. E. and Stitzer, M. L. (1999) Voucher-based reinforcement of cocaine abstinence in treatment-resistant methadone patients: effects of reinforcement magnitude, *Psychopharmacology*, **146**, 128–38.

Strotz, R. H. (1956) Myopia and inconsistency in dynamic utility maximization, *Review of Economic Studies*, **23**, 165–80.

Volpp, K. G., John, L. K., Troxel, A. B., Norton, L., Fassbender, J. and Loewenstein, G. (2008) Financial incentive-based approaches for weight loss: a randomized trial, *JAMA*, **300**, 2631.

Whaley, M. H., Brubaker, P. H., Otto, R. M. and Armstrong, L. E. (2006) *ACSM's Guidelines for Exercise Testing and Prescription*, Lippincott Williams & Wilkins, Philadelphia, PA.

Wing, R. R. and Jeffrey, R. W. (2001) Food provision as a strategy to promote weight loss, *Obesity Research*, **9**, S271–5.