WHEN TEMPTATION OVERWHELMS WILL POWER: OBESITY AND HAPPINESS

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Abstract: Obesity has become a major health issue. Research in economics has provided important insights how technological progress reduced the relative price of food and contributed to the increase in obesity. However, the increased availability of food might well have overstrained self-control and led to suboptimal consumption decisions relative to people's own standards. We propose the economics of happiness as an approach to study the phenomenon. Based on proxy measures for experienced utility, it is possible to directly address whether some observed behavior is sub-optimal and therefore reduces a person's well-being. It is indeed found that obesity decreases the well-being of individuals who report limited self-control while it does not so for others.

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I. Introduction

An outside observer would probably make two remarks about food in rich industrialized countries: First, food is available in abundance, and second, food and drinks are in close reach almost anytime everywhere. What does it mean for people's well-being that there is access to a rich choice of food and drinks at home, in the car, at the fueling station, in the post office, in the entrance and the exit of toy shops, etc.? There are two possible views. On the one hand, the new situation can be seen as a gift of economic progress and organizational innovations allowing people to satisfy their preferences for food at lower (transaction) costs than in the past. On the other hand, the omnipresent possibilities for immediately gratifying wants and desires can be seen as an obstacle to pursue long-term plans about a healthy diet.

There is an obvious link to obesity and the related health problems. The question is whether the weight gains and its health consequences are the result of an optimally chosen lifestyle whereby the health insurances and taxpayers finance a large amount of the monetary costs of obesity, or whether people consume too much judged by their own standards.

The identification of causes and in particular of the role of bounded rationality in the obesity phenomenon poses a major challenge to social science research and in particular to economics. In the revealed preference approach of standard micro-economic analysis, consumer choice is considered to be the result of rational utility maximization. Individuals are assumed to be perfectly informed about what brings how much utility and to be perfectly capable of maximizing it. These assumptions thus exclude right from the beginning any systematic mistakes in consumption choice, for example, due to limited self-control.

In this paper, (i) the possibility of systematic errors in consumption is taken seriously and (ii) an empirical strategy is proposed to directly study the utility consequences of consumption decisions. This is made possible by a recent development in economics: data on reported subjective well-being is analyzed to approximate individuals' utility (see, e.g., Kahneman et al. 1999; Frey and Stutzer 2002b; a; 2005). People's behavior is assessed relying on their ex post evaluation in terms of experienced utility. It can then - in principle - be discriminated between competing theories that make the same predictions concerning individual behavior, but differ in what they put forward as individual utility levels (for applications, see Gruber and Mullainathan 2005; Benesch et al. 2006).

Here, the relationship between people's body mass index and their reported subjective well-being is studied. It is hypothesized that people with limited self-control suffer reduced well-being when they are obese while people with strong will power do not. The empirical analysis is based on a unique data set combining information on people's weight, height, perceptions of control over their life and eating behavior as well as a multi-item measure of subjective well-being. It is found that people who report a lack of will power as an obstacle to a healthy diet (i) are more likely to be obese and (ii) suffer from reduced subjective well-being when they are obese, ceteris paribus. These results are complemented by an analysis of the covariates and determinants of obesity taking into account socio-demographic factors as well as ignorance about health, and a wide range of obstacles to a healthy diet.

In the next section, the obesity phenomenon and its consequences and causes are briefly presented focusing on the issue of limited self-control. Section III presents testing strategies for the identification of limited self-control in observed body mass. The emphasis is on ex post evaluations based on experienced utility. The empirical analysis is presented in section IV. Section V offers concluding remarks.

II. The Economics of Obesity and Self-Control

Obesity is on the rise in many western countries and with it illnesses such as diabetes and heart disease. Observers call it an "obesity pandemic" comparable to big threats such as global warming and bird flu or talk of it as the epidemiological landslide of the last two decades.[1] Overweight and obesity is defined relative to people's weight to height ratio in metric units, as captured in the body mass index (BMI): BMI=kg/m2. Adults with a BMI≥30 kg/m2 are classified as obese and those with a BMI≥25 kg/m2 as overweight. In many European countries, the prevalence of obesity has risen three-fold or more since the 1980s (Sanz-de-Galdeano 2005; WHO Europe 2005). In Europe, adults today have, on average, a BMI of almost 26.5. Over the world, the percentage of obese adults varies between around 3 percent in South Korea and Japan, 8 percent in Switzerland, more than 22 percent in the United Kingdom, and more than 30 percent in the United States (see figure 1). In the United States, adult obesity rates have more than doubled since the 1980s. In the year 2000, three in ten adults were classified as obese (Flegal et al. 2002).

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[1] See, e.g., the reporting of the Associated Press from the International Congress on Obesity in Sidney (Sullivan 2006).

Overweight accounts for 10-13 percent of deaths and 8-15 percent of healthy days lost due to disability and premature mortality (DALY) in the European Region (World Health Organization 2002).

A debate has started about the economic causes of this phenomenon, as well as its consequences (see, e.g., Cutler et al. 2003; Finkelstein et al. 2005; Rashad 2006). Increased obesity has been explained by the relationship of energy expenditure to energy intake. Energy expenditure is lower nowadays because manual labor has been replaced by more sedentary work due to technological changes (Lakdawalla and Philipson 2002). However, this trend started long before the obesity endemic took off. The increase in calories consumed fit the obesity pattern better and is of sufficient magnitude to account for its increased prevalence (Putnum and Allshouse 1999). In particular, higher snack calories are responsible for higher energy intake for men and even more so for women (Cutler et al. 2003).

What is the economic rationale behind the shifting energy household? Looking at relative prices suggests that, since the early 1980s, they decreased for calorie-dense foods and drinks relative to fruits and vegetables, which are less energy-dense (Finkelstein et al. 2005). These price reductions were made possible by new technologies in food production, in particular for prepackaged and/or prepared food. People have reacted by eating more frequently (snacking), eating bigger portions and spending less time on food preparation.

The question arises how these increases in body weight, causing considerable harm to people's health, are to be evaluated. Do people eat too much? What is the standard for "too much" if people have free choice when and how much they want to eat? Traditional economics advises us to resort to consumer sovereignty under such conditions. "Even with full information about the benefits of physical activity, the nutrient content of food, and the health consequences of obesity, some fraction of the population will optimally choose to engage in a lifestyle that leads to weight gain because the costs (in terms of time, money, and opportunity costs) of not doing so are just too high" (Finkelstein et al. 2005, 252). This might apply all the more because health insurances and taxpayers finance a large amount of the monetary costs of obesity. Moreover, obesity can be rationalized presuming a high discount

rate for outcomes in the future. The argument of variation in individual discount rates as an explanation for increased obesity is put forward, e.g., in Komlos et al. (2004).[2]

However, the possibility of individually consuming "too much" food is excluded by assumption in the revealed preference approach. Yet, in order to uphold this view, one would have to reconcile the prevalence of obesity with other behavioral regularities, like people spending large sums of money on diets and health clubs, or people's weight yo-yoing as they go from one diet to the next.[3]

An alternative approach accepts that people might face self-control problems when exposed to the temptation of immediate gratification from food when they are hungry or have a craving for something sweet, fatty or salty (see, e.g., Offer 2001). There is a rich literature on the control of eating emphasizing physiological mechanisms (Blundell and Gillett 2001; Smith 2006). In particular, humans are endowed with a system of weight regulation that favors weight gains over weight losses to reduce any future risk of starvation. While this ability was evolutionary advantageous it is a challenge to conscious control of food intake today. People then consume more food and calories and consume more frequently than what they consider good for themselves when they think about and plan their diet. People are aware of this phenomenon, however, more so for others than for themselves (Taylor et al. 2006). Thus, people judge their own and other people's consumption behavior as irrational in the sense that they think that they would be better off if they would consume less of these goods and care more for their future well-being. Such self-control problems involve two aspects: myopia and procrastination. In both cases, the present is emphasized at the expense of the long-term. When affected by myopia, people focus on consuming in the present and lack discernment or long-range perspective in their thinking and planning, thus undermining their well-being over time. In this respect, generally goods offering immediate benefits at negligible immediate marginal costs are tempting. Procrastination focuses on putting off or delaying an onerous activity (like exercising) more than a person would have liked when having evaluated it beforehand. In economics, this inconsistent time preference is most prominently formulated in

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[2] In an empirical analysis for the Netherlands, Borghans and Golsteyn (2006) conclude, however, that it is unlikely that BMI increased because of an increase in the time discount rate.

[3] This argumentation on the revealed preference approach does not exclude that observed behavior can give clear indications of a problem with the control of body mass, e.g., when people inflict cost on themselves in order to make eating chocolate less attractive. However, the revealed preference approach provides no reason to search for such contradictory patterns in consumption behavior. To the contrary, it rather urges the researcher to look for rationalizations.

models of hyperbolic discounting (see, e.g., Laibson 1997). A low discount factor (i.e. a discount factor decreased by β, $\beta \in (0,1)$) is applied between the present and some point in time in the near future and a constant discount factor δ thereafter. An excellent account of the recent extensive empirical and theoretical literature on time inconsistent preferences is provided in Frederick et al. (2002).

With regard to obesity the self-control issue is explicitly addressed in Cutler et al. (2003), whereby its relevance in the assessment of consumers' welfare is discounted because it would require only some exercise on the part of overweight people to balance their energy household. Observed inactivity thus seems to indicate that overweight people do not suffer from their body mass. However, the trade-off is calculated, assuming that people have self-control problems with eating, but not with taking physical exercise. This asymmetry does not fit our casual observations.

For thinking about policy proposals, it is important to know whether and to what extent people face a self-control problem when tempted by the abundance of food. Is obesity rational and reflecting a taste for food so that it can be reduced to an issue of externalities in a publicly regulated and funded health system? Or does it reflect ignorance and a lack of imagination of its consequences requiring some sort of information policy? Or must obesity be treated like smoking where some people lack will power to control their behavior? The challenge for research is thus to disentangle the several behavioral reasons of obesity.

III. Testing Strategy and Previous Evidence

Based on observed behavior, it is difficult to discriminate between the view of consumers as rational actors and consumers facing self-control problems. Independent of whether people have a strong taste for fatty food, are ignorant or lack imagination of health consequences or suffer a lack of will power, a higher likelihood of overweight and obesity is predicted in today's environment of food affluence.

We see three approaches how to shed light on the possible behavioral forces behind the obesity phenomenon. The first two approaches look for patterns in behavior that cannot easily be reconciled with standard utility maximization. The third approach rests on the idea to separate the consumption decision from the utility thereby produced. This creates the necessary degree of freedom so that revealed behavior can systematically diverge from utility maximization.

A. Previous approaches to identify problems of self-control

Prediction of behavior with indicators of limited self-control. This approach starts out with a standard model of individual behavior. It is studied whether the explanatory power of the (empirical) model is increased when the variation in people's level of self-control is taken into account. Empirically, limited self-control is captured (i) by using behavioral markers like not having a bank account or having had many hangovers from alcohol consumption in the recent past (see, e.g., DellaVigna and Paserman 2005), (ii) by letting people choose in experiments between immediate payoffs and higher delayed payoffs (Thaler 1981), or (iii) by measures of self-report. There is a rich literature in psychology developing and applying survey measures of self-control (e.g. Tangney et al. 2004) or related psychological measures like conscientiousness (for an application in economics see Ameriks et al. 2006) and mastery. "Conscientiousness describes socially prescribed impulse control that facilitates task- and goal-directed behaviors, such as thinking before acting, delaying gratification, following norms and rules, and planning, organizing, and prioritizing tasks" (John and Srivastava 1999, p. 121). "Mastery refers to the extent to which people see themselves as being in control of the forces that importantly affect their lives" (Pearlin et al. 1981, p. 340). In addition, there are more specific survey measures relying on scenarios (Ameriks et al. 2006) or direct reporting of self-control problems in some specific dimension of consumption. In our empirical analysis, measures of reported mastery and of domain specific reported will power are applied.

Self-infliction of costs. A problem of self-control is diagnosed if people are observed spending a lot of money or time to change their behavior. In the context of obesity, this 'smoking gun' approach looks for traces like, e.g., spending a lot of money to stay in a clinic where mainly unsugared tea is served. More generally, self-binding mechanisms are voluntarily chosen to reduce the utility of some activity or to make short-term revisions of consumption plans less attractive.

B. Proposal for a testing strategy based on experienced utility

Ex post evaluation in terms of experienced utility. The third approach proposes two extensions of the traditional emphasis on ex ante evaluation and observed decision. First, the standard economic concept of decision utility is complemented with the concept of experienced utility (Kahneman et al. 1997). The latter refers to an individual's evaluation of actual experiences in terms of positive and negative affects or satisfaction. This separation of

concepts makes it possible that orderings of experiences systematically diverge from orderings of options derived from observed behavior. The second extension is closely related to the first, and emphasizes ex post evaluations as a valuable source of information about the possibility of bounded rationality in people's decision-making. How do people fare after they have made decisions? Or, is some consumption pattern related to higher or lower subjective well-being, ceteris paribus? This approach is promising as it puts forward a proxy for utility to evaluate choice behavior. However, the approach is subject to the same econometric difficulties faced by studies that examine the determinants of behavior, i.e. the possibility of omitted variable and endogeneity bias.

Two recent studies develop and apply strategies to deal with the issue of endogenity. In a test for self-control problems in smoking, Gruber and Mullainathan (2005) study the effect of an increase in tobacco taxes on the reported happiness of people who are predicted to smoke. Contrary to the standard prediction, they find that these people are made better off. Benesch et al. (2006) study the reaction to a difference in the opportunity set rather than a price change. It is tested whether the life satisfaction of heavy TV viewers is increased or reduced if they can choose from a large number of TV channels rather than a small number of channels. The standard economic prediction would be that a larger opportunity set does not make people worse off. With a self-control problem more choice can worsen time inconsistent behavior. The empirical findings in fact supports the hypothesis that limited self-control is partly responsible for the large amount of time devoted to TV viewing.

Reported will power, behavioral patterns and experienced utility. In this paper, another variant of the identification strategy based on experienced utility is applied. It is studied whether the ex post evaluation of some behavior systematically varies between groups of people who differ in the degree of will power. For the phenomenon of obesity, it is hypothesized that obesity makes people worse off in terms of experienced utility if the increased body mass is due to a self-control problem. However, if people do not lack will power, a BMI above 30 does not enter negatively into the evaluation of people's subjective well-being. Any correlation between the level of will power and subjective well-being as such is statistically captured in the constant term.

Four remarks shall clarify the underlying assumptions, strengths and weaknesses of the approach:

1. It is no problem for the approach if – in terms of the current application – fat people are jollier. The approach does not rely on a specific benchmark correlation between the studied phenomenon and subjective well-being. A strong preference for food (and thus a higher BMI) can be positively or negatively correlated with reported well-being. It is rather predicted that obese people judge their overall well-being less favorable relative to people with normal weight when they indicate to have limited will power than when they do not.

2. The approach explicitly tests for effects in individual welfare. This seemingly obvious aspect is important to repeat because it leaves the judgment to the individual on how to evaluate a certain life-path. In the language of multiple selves, the question is whether the self engaged in the moment or the puritan one with a detached long-term view should count. In a sense, the approach can also be seen as a validity check of the applied indicator of limited will power understood as an obstacle in pursuing individual welfare.

3. The testing strategy as formulated above relies on two qualities of the self-control problem under study. First, individuals are aware of their limited will power (as self-reports for its indication are used). Second, self-control behavior is generalizing across different consumption decisions. This means that limited will power affects behavior across-the-board.

   Depending on the application, this latter assumption might be questionable. In our case, it means that a high BMI need not be positively correlated with the exertion of will power in other areas. There is, however, the possible scenario that people prefer to be weak-willed and fat rather than to be weak-willed and a chain smoker. Weak-willed people who are obese would then not necessarily judge their well-being less favorable than those who are not obese and the testing strategy fails to identify limited will power reducing individual welfare.

   The assumption that self-control behavior generalizes across activities can, however, be relaxed in the concrete application. Consumption activities that are close substitutes for people with limited will power can be simultaneously taken into account in the empirical analysis. We include smoking when studying the robustness of our results (see sub-section IV.C).

4. As the approach is not based on an experimental design offering causal effects, issues of omitted variable bias and reversed causality need special attention. In our analysis, we

control for a wide range of individual characteristics. Moreover, in the robustness analysis, we address issues of causality. In particular, we take into account whether people turn towards eating when they feel depressed.

In sum, the proposed strategy combines the idea of exploiting supplementary information on the variation in people's level of will power and the idea of an ex post evaluation based on experienced utility. This is seen as the main conceptual point of the paper. In the concrete empirical application presented in section III, 'old' and 'new' approaches to study self-control problems are applied in a complementary way.

C. Previous evidence on obesity and subjective well-being

Reported subjective well-being provides information about people's evaluation of their situation *after* they have decided about their food and beverage consumption. Two predictions summarize the conflicting views on the role of limited will power in obesity. If technical "progress" in producing fatty food is indeed a major driving force behind obesity, the standard economic model predicts that individuals will become heavier and happier. However, if individuals have self-control problems, we would expect them to become heavier and less happy.

There is a growing literature on empirical research studying whether obese people are less satisfied. According to an empirical investigation for roughly 8,000 young women, obesity is related to lower satisfaction with work, family relationships, partner relationship and social activities (but not satisfaction with friendships) (Ball et al. 2004). Other studies report correlations between obesity and symptoms of depression, whereby the risk of depression is higher for obese women than obese men (e.g. McElroy et al. 2004; Needham and Crosnoe 2005). These findings, however, provide only limited insights, as the correlations can be due to third variables affecting both eating behavior and subjective well-being, or because low life satisfaction and stress can lead to obesity. The latter has been studied in a longitudinal analysis for 5,867 pairs of twins (Korkeila et al. 1998). It is found that a high level of stress, as well as a low level of life satisfaction are both predictors of weight gain over six years and for certain groups of people over 15 years of age. Another panel study addresses the reverse relationship. Taking baseline mental health into account, it analyzes the long term consequences of obesity, finding an increased risk for depression (Roberts et al. 2002). These results are valuable to assess the relevance of the phenomenon, but they have to be

supplemented with further evidence to identify the contribution of self-control problems to the link between obesity and subjective well-being.

Alternatively, it is possible to characterize conditions where attempts to recapture self-control are encouraged. It is to be expected that those people who stand to lose a lot from being obese, or who have access to resources, are more successful in controlling their behavior. For example, obese women seem to suffer a salary and promotion penalty (see the references in Finkelstein et al. 2005). They have strong incentives to control their body weight and might suffer the most when their lack of will power leads to failure. Consistent with this point of view, people in the top income quintile, or in professions with a low prevalence of obesity, report the largest well-being costs of obesity (Felton and Graham 2005).

IV. Empirical Analysis

A. Data

The empirical analysis is based on data from the Swiss Health Survey 2002 compiled by the Swiss Federal Statistical Office. The specific data set for Switzerland is chosen for two reasons. First, it offers the unique combination of information about people's body mass, subjective well-being and self-control. Second, it includes a representative sample of a Western country experiencing the increased availability of food. However, there is the drawback that Switzerland is not representative with regard to the prevalence of obesity (see figure 1). As there is a lower fraction of obese people in Switzerland than in most other Western countries, the emphasis will be on the quality of results rather than on the quantification of effects.

The Swiss Health Survey combines responses from a telephone survey and a questionnaire mailing going to the same people. The sampling population was the resident population aged 15 and over. 19,706 individuals were interviewed and 16,141 of them responded to a supplementary written questionnaire. For 19,471 respondents there is complete information about their body mass. Figure 2 shows the weighted distribution of the BMI index differentiating between four categories: underweight, normal weight, overweight and obese. The percentage of obese people in the adult population amounts to 7.7% in 2002, an increase of 2.3 percentage points since 1992. 29.4% are overweight and 49.9% normal weight. There

is also a substantial fraction of 13.0% having a BMI below 20 and thus being rated underweight.

[Figure 2 about here]

People's subjective well-being is assessed using eight questions from the Bern Questionnaire of Subjective Well-Being (Grob et al. 1991). The questions are reported in the appendix.

Variation in self-control between people is assessed using a general measure of reported mastery and a specific measure of reported will power in pursuing a healthy diet. The mastery scale is from Pearlin et al. (1981) whereby 4 out of 7 questions were included in the survey (see appendix). In our sample, 24.1% of the subjects report that they feel in control over their life, i.e. all questions of limited mastery are completely denied. Domain specific will power is derived from the following survey item: "Many people – maybe you too – attach importance to a healthy diet. Do you see obstacles for somebody who pursues a healthy diet? Please tick all reasons that apply! … 'lack of will power, lack of belief in success'." Limited will power with regard to a health diet is reported by 25.5% of people in the sample. The full list of possible obstacles to a healthy diet will be taken into account in the empirical analysis. They are also reported in the appendix.

The Swiss Health Survey includes information for a wide range of other individual characteristics. They are taken into account in the empirical analysis. Descriptive statistics are presented in table A.1 in the appendix.

B. Results

Two sets of results are presented. First, the covariates of body mass are studied. The baseline estimation includes standard demographic and socio-economic factors. Thereafter, the empirical model is extended by indicators of ignorance and limited will power. Second, people's body mass is related to their subjective well-being. We test whether there are differential effects for people with full and limited will power as hypothesized above.

Limited will power and obesity

According to standard categorization, people's body mass falls in either of four categories underweight, normal weight, overweight or obesity. Even though these categories follow the metric of the BMI, they are not inherently ordered. Underweight and obesity are related but separate phenomenon, i.e. obesity is not just less underweight and underweight is not just less obesity. Therefore, in order to empirically study the covariates of low and high BMI a

multinomial regression approach is applied. Table 1 shows relative risk ratios from a multinomial logit regression whereby the base outcome is normal weight. Relative risk ratios compare the probability of some outcome in two categories in the case of dummy variables or the change in the probability of some outcome for an increase of the independent variable by one unit in the case of continuous variables. If the relative risk ratio equals 1, the outcome is equally likely in both categories. Z-values reflect whether the estimated relative risk ratios are statistically different from one. While we have to take all possible outcomes of BMI jointly into account in the statistical analysis, we focus on obesity when discussing the results.

[Table 1 about here]

For the Swiss sample, the covariates of obesity are as follows:

- The probability of being obese increases up to the age of 55-59 and then declines again. A person in the age category 55-59 has a 2.68 greater probability to be obese than a person in the age category 35-39.

- The probability of a woman to be obese is 0.64 relative to a man.

- People with a level of education higher than mandatory schooling have a statistically significantly smaller probability of being obese.

- Widowed people are slightly more likely to be obese than married people.

- Foreigners are more likely to be overweight than nationals and about equally likely to be obese.

- Relative to fulltime job holders, part-time job holders are less likely and people doing housework or being chronically ill are more likely to be obese.

- The probability of an individual being obese decreases with income.

The results so far do not speak to the issue of limited will power and obesity. The correlations with demographic and socio-economic variables rather reflect many factors associated with body mass and serve as a baseline to study additional factors. Table 2 presents the results for two of them: ignorance and will power. Estimations A and B each include an indicator for ignorance towards future health outcomes. This can be interpreted as a high discount rate in the traditional economic sense. We find that people who report that health is not a relevant issue for them are statistically significantly more likely to be obese than people who report that health is either relevant or very important for them. The relative risk ratio indicates a 1.51

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greater probability. Consistent with this, people who care about their diet are less likely to be obese, with a risk ratio of 0.81 relative to people who do not care.

[Table 2 about here]

Estimation C presents correlations between reported obstacles to a healthy diet and body mass. The relative risk ratios have thereby to be interpreted with caution. Social desirability and self-justification might well distort some of people's self reports and thus measured correlations. However, in estimation C all the survey items are jointly included and not all items are equally attractive to justify overweight or obesity. Five obstacles to a healthy diet are found to be statistically significantly related to a respondent being obese: not enough choice in shops, healthy food is relatively expensive, not enough support from fellow men, strong preference for good food, and lack of will power. While the high relative risk ratio of 1.83 for obesity in the case of a strong preference for good food can well capture taste, it can also reflect a cheap excuse for being overweight or obese. Such an alternative interpretation is much less plausible for the correlation with lack of will power. It is difficult to think of a reason for obesity, which makes it attractive for people to falsely report a lack of will power. It rather seems that a lack of will power when it comes to a healthy diet in fact increases the probability of being obese, the relative risk ratio being 1.41.

Estimation D studies the differential obesity risk for a general indicator of perceived control. No statistically different probability is found in the group with full and limited self-control. In our analysis predicting behavioral outcomes, the relative risk ratio with domain specific reports of will power thus indicates some bounded rationality in food consumption while the relative risk ratio with the general indicator does not.

Obesity and subjective well-being

People's judgments of their subjective well-being allows a further evaluation of some behavioral outcome. According to the basic hypothesis, obesity is expected to negatively affect the subjective well-being of those with limited will power. For them, obesity is not meant to be the outcome of rational food consumption but rather of time inconsistent behavior. The dependent variable reported subjective well-being is now an ordinal measure. We estimate ordered probit regressions and calculate marginal effects for the top category of subjective well-being. For dummy variables, the marginal effects indicate the change in the probability of reporting high subjective well-being. In table 3, results for two different specifications are presented. Specification A includes people's body mass in four categories

plus their age in categories and their sex. This specification assures that no other choice variables pick up any potential negative consequence of obesity on well-being. Specification B includes a large set of covariates of subjective well-being. The Swiss Health Survey provides sufficient information about individual characteristics to specify a micro econometric well-being function as usually applied when testing economic issues. Table A.2 in the appendix presents the results for such a specification including all the control variables and covering the full sample. They confirm previous findings in the literature on the correlates of happiness. The findings for the BMI are also shown in the lower half of the first column in table 3.

[Table 3 about here]

In both equations with the full sample, obesity is negatively correlated with subjective well-being. However, the partial correlation is not statistically significant in specification B. Moreover, the partial correlations are not yet a test of the theoretical prediction. A very high BMI is hypothesized to negatively affect well-being if it is the result of limited self-control but not otherwise. Therefore, the partial correlation between obesity and subjective well-being are separately estimated for people with full and limited self-control. Both indicators of self-control are applied: mastery and domain specific will power. Table A.3 in the appendix shows the number of observations for each combination of body mass and self-control. In the least populated cell (full mastery x obesity), there are still 276 observations. The distribution of characteristics thus allows an implementation of the proposed empirical test.

With two specifications each, results from eight estimations are summarized in table 3. Consistent with the basic hypothesis, obesity is related with lower subjective well-being when people have limited self-control but no statistically significant effect is found for the sample of people classified as having full self-control. The marginal effect is largest with specification A for the sample of people who report a lack of will power as an obstacle to a health diet. The probability of reporting high subjective well-being is 3.4 percentage points lower for people who are obese rather than normal weight, whereby the baseline probability for people in the reference group is 8.6 percent.[4]

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[4] We also studied the differential effect of obesity on subjective well-being estimating an interaction term in the full sample. The size of effects is similar to those in table 3 for both indicators and both specifications. However, for the general indicator of self-control, the general effect of obesity on subjective well-being is imprecisely measured and reduces the statistical significance of the interaction term below conventional levels (p=0.156 in specification B). For the specific indicator of self-control,

Together, the pieces of evidence of both approaches indicate that the phenomenon of obesity can only be understood when going beyond revealed preference and the assumption of unlimited consumer sovereignty but taking limited will power into account.

C. Robustness analysis and discussion

There are three related open issues with the applied approaches: the generalization of self-control behavior, reverse causality, and the distinction between outcome and process as possible reasons for reduced well-being when somebody is obese. As far as possible, we address these issues empirically conducting robustness tests of the results in table 3.

The first issue is regarding the nature of limited self-control. People are exposed to many opportunities, with low immediate marginal costs, but high marginal benefits. The question arises whether people with a self-control problem make myopic decisions when faced with all, or most, of these opportunities. Or whether they are able to control some challenges to self-control, but find it too difficult to control all of them. The latter view fits in with the idea that there is a limited capacity for self-regulation. Resisting one temptation may result in poorer regulation of a concurrent desire for immediate gratification or vice versa (Muraven et al. 1998).

For the identification of limited will power in our approach either it has to be assumed that self-control behavior generalizes across-the-board or tempting activities that are close substitutes have to be taken into account statistically.[5] The idea that self-control resembles a muscle might be particularly relevant in understanding the interplay between obesity and smoking (Gruber and Frakes 2005). People who work on controlling their eating behavior might give up on resisting cigarettes and vice versa.[6] We therefore include in our test for the negative effect of obesity also information about whether somebody is a smoker or non-smoker. For the main specification B with the specific indicator of self-control, we find

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the interaction term with obesity is highly statistically significant (z=-3.59 in specification B). All results are available from the author on request.

[5] This condition can also explain why a domain specific indicator of will power is a better predictor of obesity and reduced well-being of obese people than a general indicator of perceived control.

[6] Moreover, people's ability to self-regulate in a certain domain may not only depend on the effort they invest in other domains, but also on effort invested in the successful performance of tasks in daily work and family life (if they involve self-regulatory exertion of effort). This line of argument might be pursued to explore the relation between increased demands on women at home and on the job on the one hand and female obesity on the other hand.

almost identical marginal effects as before. For people with limited self-control, the marginal effect of obesity is -0.026 (before -0.027). For people with full self-control, the marginal effect of obesity is 0.005 (before 0.005). The main result is thus robust to the inclusion of the closest substitute tempting to overconsumption.

The second concern might be about causality. To what extent do the consequences of obesity due to limited will power reduce subjective well-being and to what extent does the experience of reduced well-being lead to stress/frustration eating and obesity? This is a most valid concern even though we do not interpret the correlation between obesity and subjective well-being as such but rather the differential effect for people with full and limited self-control. The data set at hand allows taking directly into account whether somebody turns to eating when stressed. The written questionnaire includes the following item: "In the following, a description is provided how people can react to various difficult, stressful and annoying situations. Please tick what you typically do when you are stressed. … 'I eat something.' … very untypical, rather untypical, part-part, rather typical, very typical." We include the responses to this item as additional control variables in the equation explaining subjective well-being (see specification B in table 3). The test is now whether obesity still reduces subjective well-being more in case of limited will power than in case of full will power and taking into account whether somebody turns to eating when stressed. Table 4 shows the results.

[Table 4 about here]

Stress eating is negatively correlated with subjective well-being in the full sample, keeping body mass constant. Moreover, the marginal effects are sizeable. While the baseline probability for people to report subjective well-being in the top category is 8.4 percent, this probability is reduced by between 1.7 and 3.7 percentage points if stress eating is not 'very untypical' but 'rather untypical' up to 'very typical'. The differential effect of obesity on subjective well-being between people with limited and full self-control is, however, not explained by stress eating. For the general indicator of self-control, the difference in the marginal effects of obesity on individual well-being is slightly larger when people with limited and full self-control are compared. For the specifications applying the specific indicator of self-control, the difference in marginal effects is slightly reduced. However, people who lack will power for a healthy diet still report a significantly lower subjective well-being when they are obese (marginal effect = -2.0 percentage points), while there is no such

negative effect for people who report full self-control. A direct test for reverse causation thus cannot explain the reduced well-being of obese people in case of limited will power.

The third question is whether reduced will power as such, rather than its consequences, is responsible for lower well-being. Limited will power might well repeatedly lead to experiences of frustration because plans about one's diet were not realized. People who experience self-control problems then suffer reduced self-esteem, and thus lower subjective well-being. Related empirical evidence is found in a community sample of 2,000 adults (Greeno et al. 1998). In addition to a higher BMI, also the lack of perceived eating control was associated with lower satisfaction with life. For men, it was only the lack of eating control that was correlated with reported subjective well-being. This line of reasoning is important in order to understand the relationship between appearance norms, body image and eating disorders (Derenne and Beresin 2006). In our analysis, this aspect is not directly studied. However, the level effect of limited will power on people's well-being is statistically taken into account when estimating separate equations as it enters into the constant term.

V. Concluding Remarks

Obesity has become a major health issue in most Western countries. There is now a big debate of the role of government in people's food consumption or whether people should be "free to choose obesity". Policy proposals range from doing nothing to extending nutrition labels, restricting advertisement for fast-food restaurants on television and limiting availability of junk food in schools (for empirical analyses, see, e.g., Anderson and Butcher 2005; Chou et al. 2005; Variyam and Cawley 2006). Key to a fruitful discourse is some understanding of the causes of obesity. This has spurred tremendous research in many different sciences. Research in economics has provided a large amount of insights how technological progress and therewith a reduction of the relative price of food contributed to the increase in obesity. However, any analysis solely based on the revealed preference approach is not well equipped to study whether some behavior in fact reflects people's long-term plans. The increased availability of food might well have overstrained self-control and led to suboptimal consumption decisions relative to people's own standards.

In this paper, we propose empirical strategies to explore the role of limited will power in obesity and present respective evidence. We emphasize the potential insights from directly studying people's ex post evaluation of their consumption choice in terms of reported subjective well-being. In a large representative sample for Swiss adults, it is found that people

with limited will power in pursuing a healthy diet suffer reduced subjective well-being when they are obese. In contrast, no such reduction in well-being is estimated for people who are in control over their diet. These findings support the view that increased availability of food and drinks makes life harder for people who are prone to revise their consumption plans when they are tempted.

Some people, of course, react and protect themselves from temptation, e.g., by not going shopping with an empty stomach or by not taking food to the front seat of their car. Still, more and more evidence suggests that this is not enough and that there is need for institutional innovations that help people with self-control problems to protect themselves while neither causing high costs to people who do not struggle with food consumption nor undermining self-control any further.

Appendix

Subjective well-being (translated from Grob et al. 1991)
To what extent apply the following statements to you?
- My future looks bright.
- I enjoy my life more than most other people.
- I am satisfied how my life plans materialize.
- I get well along with those things in my life that cannot be changed.
- What ever happens, I make the best of it.
- I enjoy my life.
- My life looks meaningful to me.
- My life proceeds on the right course.

Possible answers: 1=completely wrong, 2=very wrong, 3=rather wrong, 4=rather accurate, 5=very accurate, 6=completely accurate.

Responses are summed up (SWB_tot) and summarized on a six point scale according to the following criteria:
SWB_tot>=44 & SWB_tot<=48 → SWB=6
SWB_tot>=40 & SWB_tot<44 → SWB=5
SWB_tot>=36 & SWB_tot<40 → SWB=4
SWB_tot>=32 & SWB_tot<36 → SWB=3
SWB_tot>=28 & SWB_tot<32 → SWB=2
SWB_tot>=8 & SWB_tot<28 → SWB=1

Mastery (based on 4 out of 7 questions from Pearlin et al. 1981)
When you think about your life, how strongly do you agree or disagree with the statements about yourself?
- There is really no way I can solve some of the problems I have.
- Sometimes I feel that I'm being pushed around in life.
- I have little control over the things that happen to me.
- I often feel helpless in dealing with the problems of life.

Possible responses: completely agree, rather agree, rather disagree completely disagree.

Obstacles to a healthy diet
Many people – maybe you too – attach importance to a healthy diet. Do you see obstacles for somebody who pursues a healthy diet? Please tick all reasons that apply!
- High expenditure of time for shopping and preparation
- Not enough choice in shops
- Not enough choice in restaurants and canteens
- Healthy food is relatively expensive
- Not enough support from fellow men
- Fellow men keep me off
- Strong preference for good food
- Strong preference for abundant food
- Habits and necessities of everyday life
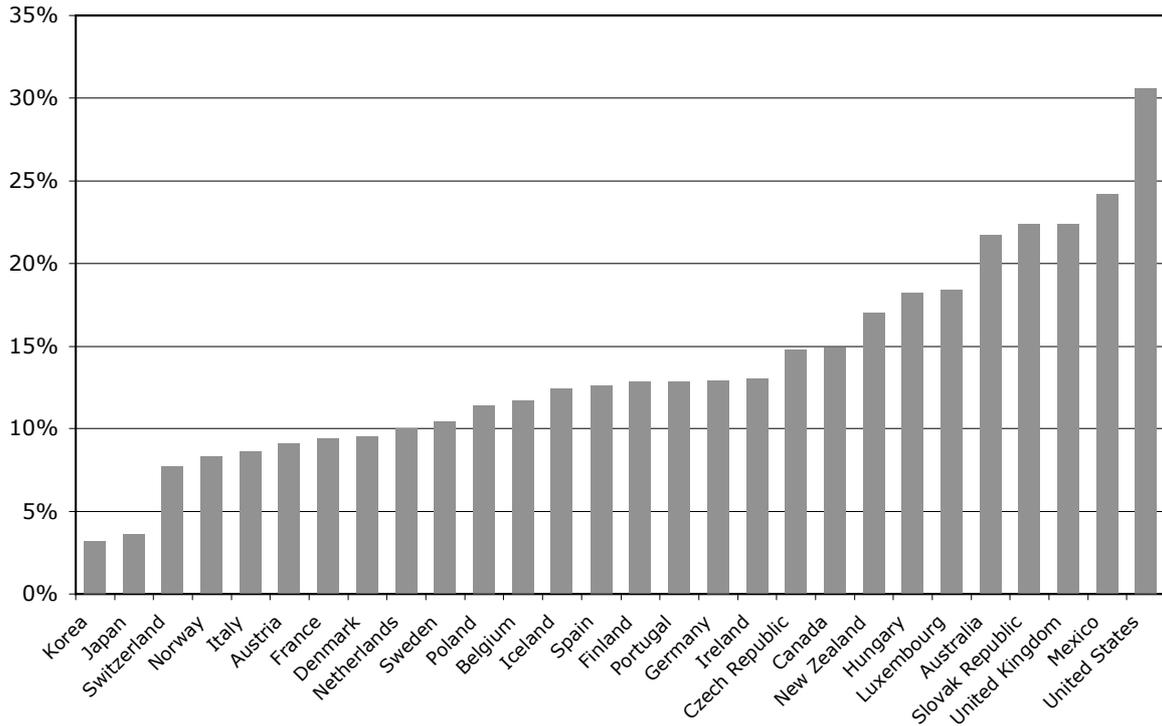- Lack of will power, lack of belief in success

Figure 1. Obesity across countries

Note: Percentage of population aged 15 and over, with a BMI greater than 30 (2003 or latest available year).
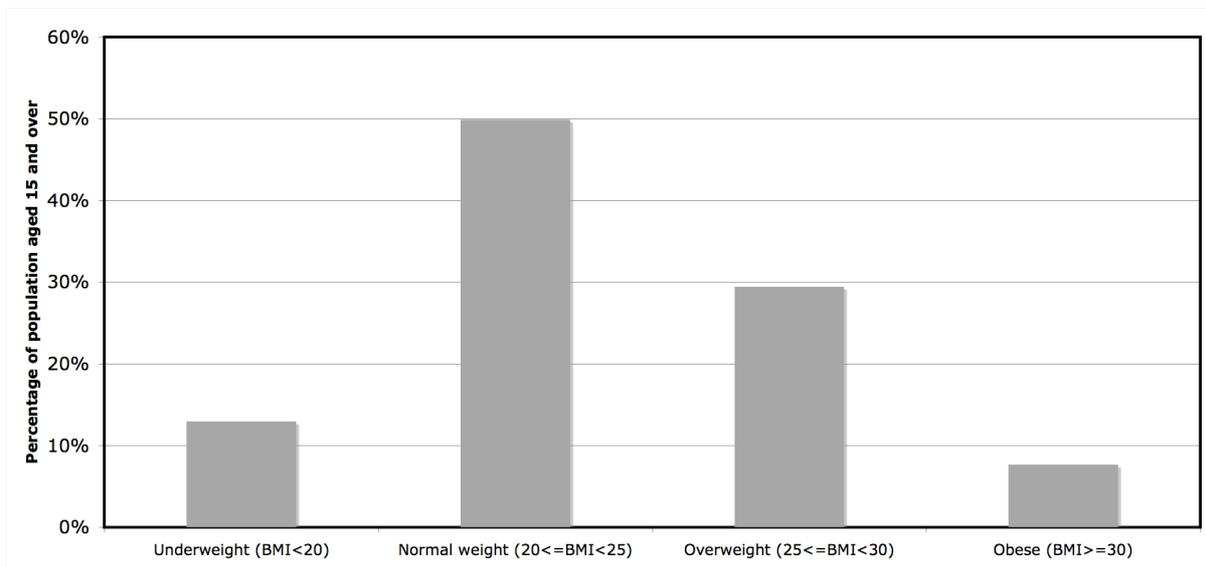
Source: OECD Factbook 2005.

Figure 2. Distribution of BMI in the adult population of Switzerland, 2002

Note: Weighted estimation based on a sample of 19,471 observations.

Source: Swiss Health Survey 2002.

Table 1. Covariates of Low and High BMI in Switzerland, 2002

	Underweight			Overweight			Obese		
	RRR		z-value	RRR		z-value	RRR		z-value
Demographic factors									
Age 15-19	2.137	**	5.21	0.284	**	-7.08	0.124	**	-5.10
Age 20-24	1.494	**	3.21	0.619	**	-3.72	0.745		-1.36
Age 25-29	1.222	(*)	1.89	0.874		-1.39	0.912		-0.53
Age 30-34	0.988		-0.13	0.956		-0.58	0.817		-1.35
Age 35-39				Reference group					
Age 40-44	0.898		-1.10	1.190	*	2.30	1.450	**	2.80
Age 45-49	0.901		-0.99	1.331	**	3.61	2.138	**	5.82
Age 50-54	0.655	**	-3.70	1.684	**	6.60	2.272	**	6.20
Age 55-59	0.527	**	-5.39	1.739	**	7.15	2.680	**	7.81
Age 60-64	0.470	**	-5.65	1.832	**	7.50	1.875	**	4.56
Age 65-69	0.360	**	-4.93	2.158	**	6.90	2.358	**	4.86
Age 70-74	0.375	**	-4.35	2.044	**	5.91	2.351	**	4.56
Age 75-79	0.523	**	-2.85	2.142	**	5.95	2.066	**	3.64
Age 80 and older	0.644	(*)	-1.95	1.326	*	2.08	1.130		0.56
Female	4.443	**	22.85	0.528	**	-15.01	0.644	**	-6.54
Level of education									
Mandatory schooling				Reference group					
Secondary general edu.	1.302	*	2.43	0.539	**	-6.65	0.429	**	-5.53
Secondary prof. education	1.180	*	2.12	0.783	**	-4.64	0.648	**	-5.65
Tertiary professional edu.	1.195		1.47	0.787	**	-3.21	0.488	**	-5.75
University	1.816	**	5.31	0.435	**	-9.39	0.299	**	-7.70
Marital status									
Married				Reference group					
Single	1.380	**	4.59	0.744	**	-5.74	1.052		0.62
Widowed	1.121		1.00	0.975		-0.37	1.201	(*)	1.83
Divorced	1.321	**	3.03	0.910		-1.49	1.021		0.21
Separated	1.384	(*)	1.69	0.783	(*)	-1.66	1.365		1.53
Citizenship status									
Foreigner	0.886		-1.55	1.229	**	3.81	1.109		1.18
Main life circumstances									
Fulltime job				Reference group					
Part-time job	1.243	**	3.70	0.754	**	-5.41	0.742	**	-3.50
Family company	1.580		1.49	0.897		-0.43	1.142		0.34
In education	1.330	*	2.46	0.732	*	-2.02	0.692		-1.22
Unemployed	1.522	*	2.50	0.945		-0.42	1.181		0.82
Housework	1.248	**	3.20	0.880	*	-2.25	1.194	*	2.00
Retired	1.500	*	2.17	0.945		-0.56	1.171		1.04
Chronically ill	1.473	*	2.13	0.903		-0.85	2.043	**	4.69
Income									
Ln(equivalence income)	0.993		-0.12	0.851	**	-4.08	0.766	**	-4.62
No. of obs.	19435								
Pseudo R^2	0.084								

Notes: Multinomial logit regression. Further control variables not shown are 'education not defined', 'other paid activity', 'other life circumstances', 'income not available'. Significance levels: (*) .05<p<.1, * .01<p<.05, ** p<.01.
Data source: Swiss Health Survey 2002.

Table 2. BMI and Reported Ignorance and Will Power Towards Health and Nutrition

	Underweight		Overweight		Obese	
	Estimated relative risk ratios, base outcome is 'normal weight' (multinomial logistic regression)					
	RRR	z-value	RRR	z-value	RRR	z-value
Estimation A						
Importance of health for one's life						
Covariates of BMI			Included			
Health is not important	1.184 (*)	1.90	1.300 **	4.05	1.513 **	4.15
Health is relevant			Reference group			
Health is very important	1.152 *	2.13	0.995	-0.10	0.912	-1.19
No. of obs.	15504					
Pseudo R^2	0.086					
Estimation B						
Care for one's diet						
Covariates of BMI			Included			
Does not care			Reference group			
Cares about diet	0.894 *	-2.04	0.929 (*)	-1.88	0.810 **	-3.46
No. of obs.	19420					
Pseudo R^2	0.085					
Estimation C						
Obstacles to a healthy diet						
Covariates of BMI			Included			
High expenditure of time	1.141 *	2.24	0.977	-0.51	0.957	-0.60
Not enough choice in shops	1.132	1.37	1.048	0.65	1.266 *	2.08
Not enough choice in restaurants and canteens	1.038	0.60	0.945	-1.20	0.885	-1.57
Healthy food is relatively expensive	0.971	-0.52	1.017	0.41	1.196 **	2.64
Not enough support from fellow men	0.884	-1.22	1.099	1.24	1.232 (*)	1.81
Fellow men keep me off	1.075	0.48	0.918	-0.75	0.965	-0.21
Strong preference for good food	0.832 **	-2.96	1.451 **	8.77	1.829 **	8.93
Strong preference for abundant food	0.761 **	-3.11	1.156 *	2.49	1.143	1.45
Habits and necessities of everyday life	0.907 (*)	-1.66	1.009	0.21	1.083	1.10
Lack of will power	0.991	-0.14	1.101 (*)	1.92	1.406 **	4.36
No. of obs.	14202					
Pseudo R^2	0.096					
Estimation D						
Mastery						
Covariates of BMI			Included			
Limited self-control			Reference group			
Full self-control	0.966	-0.51	0.970	-0.66	0.946	-0.73
No. of obs.	14516					
Pseudo R^2	0.088					

Notes: Multinomial logit regression. Same control variables included as in Table 1. Significance levels: (*) .05<p<.1, * .01<p<.05, ** p<.01.

Table 3. BMI and Reported Subjective Well-Being

	Full sample		General indicator of self-control: Mastery		Specific indicator of self-control: Lack of will power is an obstacle to a healthy diet	
			limited self-control	full self-control	limited self-control	full self-control
Marginal effects for the top category of SWB						
Specification A						
Underweight	-0.012	**	-0.010 **	0.029	-0.012	-0.011 *
	(4.43e-3)		(3.13e-3)	(2.05e-2)	(8.18e-3)	(5.39e-3)
Normal weight			Reference group			
Overweight	-0.003		-0.001	-0.018	-0.010	-0.001
	(3.46e-3)		(2.66e-3)	(1.26e-2)	(6.46e-3)	(4.18e-3)
Obese	-0.014	**	-0.012 **	-0.003	-0.034 **	-0.002
	(5.16e-3)		(3.76e-3)	(2.09e-2)	(7.63e-3)	(6.83e-3)
Control variables			Age categories and sex included			
Baseline prob.	0.099		0.055	0.230	0.086	0.097
No. of obs.	15108		10681	3392	3458	10117
Pseudo R^2	0.002		0.002	0.004	0.003	0.002
Specification B						
Underweight	-0.008	(*)	-0.007 *	0.028	-0.010	-0.006
	(4.32e-3)		(3.01e-3)	(2.04e-2)	(7.71e-3)	(5.31e-3)
Normal weight			Reference group			
Overweight	-0.004		-0.002	-0.012	-0.010 (*)	-0.002
	(3.32e-3)		(2.49e-3)	(1.26e-2)	(6.07e-3)	(4.01e-3)
Obese	-0.008		-0.008 *	0.013	-0.027 **	0.005
	(5.17e-3)		(3.69e-3)	(2.15e-2)	(7.49e-3)	(6.88e-3)
Control variables			All factors included (see appendix A.2)			
Baseline prob.	0.092		0.050	0.225	0.078	0.090
No. of obs.	15108		10681	3392	3458	10117
Pseudo R^2	0.021		0.021	0.019	0.027	0.021

Notes: Marginal effects based on ordered probit regression. Standard errors in parentheses. Significance levels: (*) $.05<p<.1$, * $.01<p<.05$, ** $p<.01$.
Data source: Swiss Health Survey 2002.

Table 4. Reverse Causality: Stress Eating

	Full sample	General indicator of self-control: Mastery		Specific indicator of self-control: Lack of will power is an obstacle to a healthy diet	
		limited self-control	full self-control	limited self-control	full self-control
Marginal effects for the top category of SWB					
Underweight	-0.009 *	-0.007 *	0.023	-0.013 (*)	-0.007
	(4.19e-3)	(2.99e-3)	(2.09e-2)	(7.61e-3)	(5.07e-3)
Normal weight	Reference group				
Overweight	-0.001	-0.001	-0.010	-0.003	-0.001
	(3.32e-3)	(2.51e-3)	(1.33e-2)	(6.35e-3)	(3.95e-3)
Obese	-0.003	-0.007 (*)	0.020	-0.020 *	0.008
	(5.33e-3)	(3.77e-3)	(2.15e-2)	(8.20e-3)	(7.03e-3)
Stress eating - very untypical	Reference group				
- rather untypical	-0.025 **	-0.006 *	-0.073 **	-0.022 **	-0.022 **
	(3.16e-3)	(2.53e-3)	(1.32e-2)	(6.06e-3)	(3.79e-3)
- part-part	-0.017 **	-0.005 (*)	-0.028 (*)	-0.015 *	-0.015 **
	(3.54e-3)	(2.81e-3)	(1.58e-2)	(6.84e-3)	(4.23e-3)
- rater typical	-0.037 **	-0.015 **	-0.061 **	-0.034 **	-0.034 **
	(3.57e-3)	(2.87e-3)	(2.09e-2)	(6.64e-3)	(4.38e-3)
- very typical	-0.018 **	-0.011 **	0.049	-0.022 *	-0.006
	(5.78e-3)	(4.24e-3)	(3.37e-2)	(9.49e-3)	(7.95e-3)
Control variables	All factors included (see appendix A.2)				
Baseline prob.	0.084	0.048	0.216	0.076	0.081
No. of obs.	13699	10082	2991	3291	9141
Pseudo R^2	0.024	0.022	0.022	0.030	0.024

Notes: Marginal effects based on ordered probit regression. Standard errors in parentheses. Significance levels: (*) .05<p<.1, * .01<p<.05, ** p<.01.
Data source: Swiss Health Survey 2002.

Table A.1. Descriptive Statistics

	Mean / fraction	Std. dev.		Mean / fraction	Std. dev.
Subjective well-being	3.76	1.309	Citizenship status		
BMI	24.24	4.176	National	90.14%	
Demographic factors			Foreigner	9.86%	
Age	47.81	17.044	Main life circumstances	39.20%	
Male	45.26%		Fulltime job	21.20%	
Female	54.74%		Part-time job	0.54%	
Level of education			Family company	0.48%	
Mandatory schooling	14.79%		In education	4.76%	
Secondary general edu.	6.08%		Unemployed	1.70%	
Secondary prof. edu.	58.46%		Housework	20.32%	
Tertiary professional edu.	10.46%		Retired	17.53%	
University	7.31%		Chronically ill	2.28%	
Marital status			Other	1.36%	
Married	55.62%		Income		
Single	26.30%		Ln(equivalence income)	8.23	0.499
Widowed	7.86%				
Divorced	8.77%				
Separated	1.45%				
Household composition					
1 adult	28.01%				
2 adults	53.75%				
3 adults	10.58%				
4 adults and more	7.65%				
No children	72.86%				
1 child	10.90%				
2 children	12.05%				
3 children and more	4.19%				

Notes: Descriptive statistics is for the sample underlying the estimation in table A.2 based on 15,108 observations. Mean income is calculated based on 14,160 observations.
Data source: Swiss Health Survey 2002.

Table A.2. Covariates of Subjective Well-Being in Switzerland, 2002

	Ordered probit regression			
	Coefficient	z-value	Marginal effect for a score of 6	z-value
BMI				
Underweight	-0.053 (*)	-1.91	-0.008 (*)	-1.96
Normal weight			Reference group	
Overweight	-0.022	-1.08	-0.004	-1.09
Obese	-0.047	-1.42	-0.008	-1.46
Demographic factors				
Age 15-19	0.125 (*)	1.74	0.022	1.62
Age 20-24	0.293 **	5.04	0.058 **	4.33
Age 25-29	0.195 **	4.39	0.036 **	3.96
Age 30-34	0.120 **	3.35	0.021 **	3.15
Age 35-39			Reference group	
Age 40-44	-0.064 (*)	-1.78	-0.010 (*)	-1.84
Age 45-49	-0.040	-1.01	-0.006	-1.03
Age 50-54	-0.037	-0.88	-0.006	-0.90
Age 55-59	0.034	0.83	0.006	0.82
Age 60-64	0.135 **	3.04	0.024 **	2.83
Age 65-69	0.353 **	5.86	0.071 **	4.96
Age 70-74	0.357 **	5.39	0.072 **	4.53
Age 75-79	0.405 **	5.74	0.084 **	4.73
Age 80 and older	0.525 **	6.68	0.117 **	5.27
Female	0.086 **	4.11	0.014 **	4.12
Level of education				
Mandatory schooling			Reference group	
Secondary general edu.	-0.047	-1.09	-0.008	-1.12
Secondary prof. education	0.030	1.07	0.005	1.07
Tertiary professional edu.	0.104 **	2.71	0.018 *	2.57
University	0.021	0.50	0.004	0.49
Marital status				
Married			Reference group	
Single	-0.214 **	-6.37	-0.033 **	-6.78
Widowed	-0.077 (*)	-1.76	-0.012 (*)	-1.84
Divorced	-0.113 **	-3.02	-0.018 **	-3.22
Separated	-0.238 **	-3.18	-0.034 **	-3.78
Household composition				
1 adult			Reference group	
2 adults	0.098 **	3.28	0.016 **	3.29
3 adults	0.095 *	2.40	0.016 *	2.28
4 adults and more	0.182 **	3.97	0.033 **	3.61
No children			Reference group	
1 child	0.049	1.55	0.008	1.51
2 children	0.063 (*)	1.83	0.011 (*)	1.78
3 children and more	0.123 *	2.53	0.022 *	2.36
Citizenship status				
Foreigner	-0.119 **	-4.06	-0.018 **	-4.33
Main life circumstances				
Fulltime job			Reference group	
Part-time job	-0.059 *	-2.56	-0.010 **	-2.62
Family company	0.121	1.04	0.022	0.97
In education	-0.004	-0.08	-0.001	-0.08
Unemployed	-0.367 **	-5.46	-0.048 **	-7.20
Housework	-0.027	-1.02	-0.004	-1.03
Retired	-0.182 **	-3.46	-0.028 **	-3.75
Chronically ill	-0.578 **	-9.23	-0.065 **	-14.40

Income					
Ln(equivalence income)	1.415	**	8.43	0.422 **	6.56

No. of obs.	15108	
Pseudo R^2	0.021	

Notes: Ordered probit regression. Further control variables not shown are 'education not defined', 'other paid activity', 'other life circumstances', 'income not available', 'interview in French', 'interview in Italian'.
Significance levels: (*) .05<p<.1, * .01<p<.05, ** p<.01.
Data source: Swiss Health Survey 2002.

Table A.3. Distribution of Observations

	Underweight	Normal weight	Overweight	Obese	Total
Mastery					
Limited self-control	1,451	5,461	2,977	792	10,681
	(10.31%)	(38.80%)	(21.15%)	(5.63%)	(75.90%)
Full self-control	352	1,692	1,072	276	3,392
	(2.50%)	(12.02%)	(7.62%)	(1.96%)	(24.10%)
Total	1,803	7,153	4,049	1,068	14,073
	(12.81%)	(50.83%)	(28.77%)	(7.59%)	(100.00%)
Will power in keeping a healthy diet					
Limited self-control	458	1,710	975	315	3,458
	(3.37%)	(12.60%)	(7.18%)	(2.32%)	(25.47%)
Full self-control	1,247	5,098	3,000	772	10,117
	(9.19%)	(37.55%)	(22.10%)	(5.69%)	(74.53%)
Total	1,705	6,808	3,975	1,087	13,575
	(12.56%)	(50.15%)	(29.28%)	(8.01%)	(100.00%)

Data source: Swiss Health Survey 2002.

References

Ameriks, John, Andrew Caplin, John Leahy and Tom Tyler (2006). Measuring Self Control Problems. Forthcoming in *American Economic Review*.

Anderson, Patricia M. and Kristin F. Butcher (2005). Reading, Writing and Raisinets: Are School Finances Contributing to Children's Obesity? NBER Working Paper No. 11177, Cambridge, MA.

Ball, Kylie, David Crawford and Justin Kenardy (2004). Longitudinal Relationships among Overweight, Life Satisfaction, and Aspirations in Young Women. *Obesity Research* 12(6): 1019-1030.

Benesch, Christine, Bruno S. Frey and Alois Stutzer (2006). TV Channels, Self Control and Happiness. IEW Working Paper No. 301, University of Zurich.

Blundell, John E. and Angela Gillett (2001). Control of Food Intake in the Obese. *Obesity Research* 9(Suppl. 4): 263S-270S.

Borghans, Lex and Bart H. H. Golsteyn (2006). Time Discounting and the Body Mass Index, Evidence from the Netherlands. *Economics and Human Biology* 4(1): 39-61.

Chou, Shin-Yi, Inas Rashad and Michael Grossman (2005). Fast-Food Restaurant Advertising on Television and Its Influence on Childhood Obesity. NBER Working Paper No. 11879, Cambridge, MA.

Cutler, David M., Edward L. Glaeser and Jesse M. Shapiro (2003). Why Have Americans Become More Obese? *Journal of Economic Perspectives* 17(3): 93-118.

DellaVigna, Stefano and M. Daniele Paserman (2005). Job Search and Impatience. *Journal of Labor Economics* 23(3): 527-588.

Derenne, Jennifer L. and Eugene V. Beresin (2006). Body Image, Media, and Eating Disorders. *Academic Psychiatry* 30(3): 257-261.

Felton, Andrew and Carol Graham (2005). Variance in Obesity across Cohorts and Countries: A Norms-Based Explanation Using Happiness Surveys. Mimeo, The Brookings Institution.

Finkelstein, Eric A., Christopher J. Ruhm and Katherine M. Kosa (2005). Economic Causes and Consequences of Obesity. *Annual Review of Public Health* 26: 239-257.

Flegal, Katherine M., Margaret D. Carroll, Cynthia L. Ogden and Clifford L. Johnson (2002). Prevalence and Trends in Obesity among US Adults, 1999-2000. *JAMA* 288(14): 1723-1727.

Frederick, Shane, George Loewenstein and Ted O'Donoghue (2002). Time Discounting and Time Preference: A Critical Review. *Journal of Economic Literature* 40(2): 351-401.

Frey, Bruno S. and Alois Stutzer (2002a). *Happiness and Economics: How the Economy and Institutions Affect Well-Being*. Princeton and Oxford: Princeton University Press.

Frey, Bruno S. and Alois Stutzer (2002b). What Can Economists Learn from Happiness Research? *Journal of Economic Literature* 40(2): 402-35.

Frey, Bruno S. and Alois Stutzer (2005). Testing Theories of Happiness. In: Luigino Bruni and Pier Luigi Porta (eds). *Economics and Happiness. Framing the Analysis*. Oxford: Oxford University Press: 116-146.

Greeno, Catherine G., Christine Jackson, Elizabeth L. Wiliams and Stephen P. Fortmann (1998). The Effect of Perceived Control over Eating on the Life Satisfaction of Women and Men: Results from a Community Sample. *International Journal of Eating Disorders* 24(4): 415-419.

Grob, Alexander, Ruth Luthi, Florian G. Kaiser and August Flammer (1991). The Bern Subjective Well-Being Questionnaire for Adolescents (Bfw). *Diagnostica* 37(1): 66-75.

Gruber, Jonathan H. and Michael Frakes (2005). Does Falling Smoking Lead to Rising Obesity? NBER Working Paper No. 11483, Cambridge, MA.

Gruber, Jonathan H. and Sendhil Mullainathan (2005). Do Cigarette Taxes Make Smokers Happier. *Advances in Economic Analysis and Policy* 5(1): 1-43.

John, Oliver P. and Sanjay Srivastava (1999). The Big Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives. In: Lawrence A. Pervin and Oliver P. John (eds). *Handbook of Personality: Theory and Research*. New York: Guilford Press: 102-138.

Kahneman, Daniel, Ed Diener and Norbert Schwarz (eds) (1999). *Well-Being: The Foundations of Hedonic Psychology*. New York, NY: Russell Sage Foundation.

Kahneman, Daniel, Peter P. Wakker and Rakesh Sarin (1997). Back to Bentham? Explorations of Experienced Utility. *Quarterly Journal of Economics* 112(2): 375-405.

Komlos, John, Patricia K. Smith and Barry Bogin (2004). Obesity and the Rate of Time Preference: Is There a Connection? *Journal of Biosocial Science* 36(2): 209-219.

Korkeila, M., J. Kaprio, A. Rissanen, M. Koskenvuo and T. I. A. Sorensen (1998). Predictors of Major Weight Gain in Adult Finns: Stress, Life Satisfaction and Personality Traits. *International Journal of Obesity* 22(10): 949-957.

Laibson, David (1997). Golden Eggs and Hyperbolic Discounting. *Quarterly Journal of Economics* 112(2): 443-77.

Lakdawalla, Darius and Tomas Philipson (2002). The Growth of Obesity and Technological Change: A Theoretical and Empirical Examination. NBER Working Paper No. 8946, Cambridge, MA.

McElroy, Susan L., Renu Kotwal, Shishuka Malhotra, Erik B. Nelson, Paul E. Keck and Charles B. Nemeroff (2004). Are Mood Disorders and Obesity Related? A Review for the Mental Health Professional. *Journal of Clinical Psychiatry* 65(5): 634-651.

Muraven, Mark, Dianne M. Tice and Roy F. Baumeister (1998). Self-Control as Limited Resource: Regulatory Depletion Patterns. *Journal of Personality and Social Psychology* 74(3): 774-789.

Needham, Belinda L. and Robert Crosnoe (2005). Overweight Status and Depressive Symptoms During Adolescence. *Journal of Adolescent Health* 36(1): 48-55.

OECD (2005). *OECD Factbook 2005: Economic, Environmental and Social Statistics*. Paris: OECD.

Offer, Avner (2001). Body Weight and Self-Control in the United States and Britain since the 1950s. *Social History of Medicine* 14(1): 79-106.

Pearlin, Leonard I., Elizabeth G. Menaghan, Morton A. Lieberman and Joseph T. Mullan (1981). The Stress Process. *Journal of Health and Social Behavior* 22(4): 337-356.

Rashad, Inas (2006). Structural Estimation of Caloric Intake, Exercise, Smoking, and Obesity. NBER Working Paper No. 11957, Cambridge, MA.

Roberts, Robert E., William J. Strawbridge, Stephane Deleger and George A. Kaplan (2002). Are the Fat More Jolly? *Annals of Behavioral Medicine* 24(3): 169-180.

Sanz-de-Galdeano, Anna (2005). The Obesity Epidemic in Europe. Discussion Paper No. 1814, IZA, Bonn.

Smith, Trenton G. (2006). Reconciling Psychology with Economics: Obesity, Behavioral Biology, and Rational Overeating. Working Paper No. 2006-4, School of Economic Sciences, Washington State University.

Sullivan, Rohan (2006). Health Experts Warn on Obesity Pandemic. *New York Times*, September 3, 2006.

Tangney, June P., Roy F. Baumeister and Angie Luzio Boone (2004). High Self-Control Predicts Good Adjustment, Less Pathology, Better Grades, and Interpersonal Success. *Journal of Personality* 72(2): 271-324.

Thaler, Richard H. (1981). Some Empirical Evidence on Dynamic Consistency. *Economic Letters* 8(3): 201-207.

Variyam, Jayachandran N. and John Cawley (2006). Nutrition Labels and Obesity. NBER Working Paper No. 11956, Cambridge, MA.

WHO Europe (2005). The Challenge of Obesity in the WHO European Region. *Fact sheet EURO* 13.

World Health Organization (2002). *The World Health Report 2002*. Geneva: World Health Organization.