A Note on Income and Substitution Effects in Dieting

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As we all have surely observed, the ubiquitous salad bars in restaurants are a source of great irony as we watch the dieter's efforts go to waste (no pun intended) with the mounds of toppings that are heaped upon an otherwise tasteless, albeit low-calorie, commodity like lettuce. Aside from the frequent non-testable "explanations" which designate the dieter's lack of self-control, however, there may in fact be an application of income and substitution effects that will go some way towards resolving this paradox.

Consider one of the possible tradeoffs the dieter faces: that between (volume of) food, a good, and the resulting (anticipated) level of fat, a bad. The dieter then maximizes utility subject to the constraint given by the average calorie content of the food available, $B = CF$. This can be visualized with appropriate modifications in the usual way.

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See Richard H. Thaler and H. M. Shefrin, "An Economic Theory of Self-Control," *Journal of Political Economy, March/April, 1981*, for a more detailed analysis of how people attempt to reconcile such myopic behavior (e.g., "plugging out") with a conflicting longer-run ideal (e.g., staying trim).
Letting the indifference curves be concave to reflect the goodness and badness of food and calories, respectively, the dieter maximizes utility at the tangency of the highest utility curve $u_1$ given the prevailing average calorie/food ratio $b_2 = (C/P)_2$, consuming $F_2$ food and getting $C_2$ fat.

Let the dieter then be offered a low-calorie food, such as lettuce, thereby rotating the CIP ratio downward to $b_2$. Non-dieters, presumably, would expect the dieter to remain at $F_2$ and limit calories to $C_2$. This I call the gross income effect since the Hicks-compensated ratio would not necessarily achieve tangency at that point. As we know, however, this outcome would only occur if the calorie demand for food was perfectly inelastic. Instead, the substitution effect, which I have facetiously christened the "glutton effect," moves the dieter along and up $b_2$ to tangency with $u_2$, where he consumes $F_2$ food and gets $C_2$ calories. The income effect moves the dieter to a higher indifference curve, even if he consumes the same volume of food, while the glutton effect moves him along the higher indifference curve to consume more food. The dieter still loses weight, but not as much as may have been otherwise expected.

In the face of a statistic given on a recent (1993) NOVA program to the effect that 95% of dieters fail to consistently lose weight, it would seem that successful diets in one way or another, take the glutton effect into account and make appropriate restrictions to reduce it. For example, a diet that allowed one to eat all he wanted of just low-calorie foods would not be predicted to be as successful as one where not only what but how much could be eaten was predetermined. The trouble with diets, of course, is that the dieters cheat. On the Thaler/Shefrin framework, the present utility of additional calories exceeds the discounted utility of the potential weight loss due to the lower calorie consumption. That is, the dieter "backslidest" from $u_2$ to $u_1$. It may well be that the tendency of $u_1$ occurs at the same calorie intake level as before (though our graph does not support this).

The purpose of this note was simply to illustrate what is believed to be a new and interesting application of income and substitution effects in explaining the "dieter's dilemma." By no means is this intended to be a complete exposition of the dieter's problems, and there may very well be other ways to get the same results herein (e.g., by looking at it from the production side with isoquant contours, etc.). Nor does this deal with the problem of taxes of low-calorie food vs. high-calorie food. Perhaps most seriously, it does not deal with the metabolic thermostat. But it may be helpful, at least, in giving some theoretical support to the already well-known hardships of the perennial phenomenon of dieting.

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