PROPOSED ABSTRACT

The Simultaneous Effects of Obesity, Insurance Choice, and Medical Visit Choice on Healthcare Costs

RALPH BRADLEY
US BUREAU OF LABOR STATISTICS
2 MASSACHUSETTS AVENUE NE
WASHINGTON, DC 20212
bradley.ralph@bls.gov

It is very well known that obesity increases the risk of diseases such as diabetes, stroke, and heart failure. The impact of caloric intake and physical activity on body weight is also very well known. There are numerous empirical studies that estimate the impact of obesity on medical costs. The most recent is Cawley and Meyerhoefer (2012) who conclude "that obesity raises medical costs by $2,741." Other studies are Thorpe et. al (2004) and Finkelstein et. al (2003).

There are public and private interventions that attempt to help overweight individuals reach their ideal body weight. At the Federal level, the US Department of Agriculture has a well funded Nutrition Education and Obesity Program. The White House has a highly visible program advocating a healthy body weight with involvement from the First Lady. The private sector has a wide variety of commercial weight loss chains with over $60 billion in revenues.

Yet despite all these interventions, obesity rates continue to climb. A proprietary study estimates that the average dieter suffers four failed weight loss attempts per year.[1] The question then is - Why are obesity rates climbing despite the well known health effects of obesity and the many resources put into weight control? The empirical studies mentioned in the first paragraph shed no light on this question, because they are not specified by a micro structure that models how body weight is determined. An example of a theoretical model of body weight determination is Dragone and Savorelli (2012). They construct a micro economic model of calorie intake that accounts for the disutility involved when the satiation level of

[1] Marketdata Enterprises, Inc., *The U.S. Weight Loss & Diet Control Market* (11th edition), 2011.

calorie intake differs from the ideal calorie intake. This disutility is heterogeneously distributed among the population. (It is easier for some people to reach their ideal weight than others.) Since these empirical studies of obesity on costs do not account for this disutility, they can only estimate an average treatment effect (ATE) - the cost differential between being obese and the unrealistic counterfactual of not being obese, but they cannot shed light on the reasons that obesity continues to grow.

Studies previous to Cawley and Meyerhoefer (2012), measure the correlation of obesity on medical costs and not the casual effects. Cawley and Meyerhoefer (2012) do recognize an endogeneity with obesity and disease, and this leads them to a two part instrumental variable strategy. However, they use the body mass index (BMI) of biological children as an instrument. Thus their study excludes all who do not have biological children. Additionally, they do not account for health insurance choice among the majority who are not eligible for public insurance programs. One cannot divorce medical spending decisions from insurance decisions. Particularly since employer sponsored plans cannot adjust premiums for BMI, one has to allow for the possibility of adverse selection of obesity when choosing insurance status, and the ex ante moral hazard effect of insured persons whose satiated caloric intake is greater than their ideal intake and must suffer disutility when moving their actual caloric intake closer to their ideal. Finally, Cawley and Meyerhoefer (2012) deal with the endogenous effect of a corner solution where the consumer seeks no medical care by using a two part model. The first part is a logit binary response model of greater than zero medical expenditures, and the second is gamma medical model using only non zero medical expenditures. Many argue that this strategy does not fully account for the endogeneity created by the first part. [2](This endogeneity is well explained in Chapter 10 of Amemiya (1985).)

I estimate the casual effects of obesity on medical costs by estimating a model whose specification accounts for the disutility of weight loss as Dragone and Savorelli (2012) do. I account for this disutility

[2] The debate between tobit models and two part models has continued for over a decade. Dow and Norton (2003) advocate the use of two part models for corner solutions.

when the consumer simultaneously chooses a caloric intake (and ultimately a BMI) and insurance status. *Ex post*, the consumer draws a random health variable whose distribution is dependent on BMI, and chooses whether or not to seek medical visits. The structural cost function has endogenous insurance and BMI variables and other exogenous variables such as age, educational level, gender, and race. Rather than estimating only a cost equation, I estimate a three equation simultaneous system for those individuals who are not eligible for public insurance. The first equation is a binary response model for obesity that allows for *ex ante* moral hazard, the second is an insurance choice equation that allows for adverse selection, and the last is a tobit expenditure model that accounts for the endogeneity created by the possibility of no medical expenditures. There is no choice whether or not be insured for the publicly insured, and therefore, I eliminate the insurance choice equation for this group.

Instead of using an instrumental variable approach, as Cawley and Meyerhoefer (2012) do, I use a control variable approach established by Newey, Powell and Vella (1999). This allows for a more efficient way to correct for endogeneity. I do not use a two part model as Cawley and Meyerhoefer (2012), but instead treat no medical expenditures as a corner solution, and use the tobit methods of Lee and Pitt (1986) to correct for the endogeneity of this corner solution. The binary response model for obesity is estimated using Blundell and Powell's (1999) approach for using a control variable to correct for endogeneity.

To shed light on the reason for rising obesity rates, I do not estimate an ATE of obesity on costs as Cawley and Meyerhoefer do. Instead, I identify exogenous variables that effect obesity and that can be changed through intervention. I find if moral hazard or adverse selection play role in offsetting the current set of public and private interventions. I then estimate the marginal treatment effects (MTE) of a marginal intervention that affects weight choice on medical spending. I believe that this is more useful because obesity will never be fully eliminated.

I use the Medical Expenditure Panel Survey (MEPS) as my data source. It is a representative survey that contains the necessary variables for estimating my system. This is also the survey that Cawley and Meyerhoefer (2012) use. MEPS started collecting BMIs for each individual in 2002, and I am able to use the years 2002 to 2009. MEPS has a wide array of endogenous and exogenous variables that affect weight levels, insurance decisions, and medical expenditures. Such variables are age, self perceived health status, gender, race, education, income, and it has a conditions file that lists the diagnosed diseases for each individual.

References

Amemiya, T., (1985), *Advanced Econometrics*, Harvard University Press, Chapter 10.

Blundell, R.W. and Powell, J.L., (1999), "Endogeneity in Semiparametric Binary Response Models," mimeo U.C. Berkeley.

Cawley, J. and Meyerhoefer, C., (2012), "The Medical Care Costs of Obesity: An Instrumental Variables Approach," *Journal of Health Economics*, 31(1), 219-230.

Dow, W.H. and Norton, E.C. (2003), "Choosing Between and Interpreting the Heckit and Two-Part Models for Corner Solutions," *Health Services & Outcomes Research Methodology*, 4, 5–18.

Dragone, D. and Savorelli, L. (2012) "Thinness and Obesity: A Model of Food Consumption, Health Concerns, and Social Pressure," *Journal of Health Economics*, 31(1), 243-256.

Finklestein, E.A., Fiebelkorn, I.C., Wang G., (2003), "National Medical Spending Attributable to Overweight and Obesity: How Much and Who is Paying?" *Health Affairs*, W3-W219.

Lee, Lung-Fei, and Mark Pitt (1986), "Microeconomic Demand Systems with Binding

Newey, W.K., Powell, J.L., Vella F. (1999) "Nonparametric Estimation of Triangular Simultaneous Equations Models," Econometrica, 67(3), 565-603.

Nonnegativity Constraints: The Dual Approach," *Econometrica*, 54(5): 1237-1242

Thorpe, K, Florence, C.S., Joski, P. (2004), "Which Medical Conditions Account for the Rise in Health Care Spending?" *Health Affairs*, web exclusive, w4-437-444.