

Evaluating the Role of Income on the Impact of Fat Taxes: A Dynamic Structural Model of Snack Consumption

Shantanu Mullick¹

Nicolas Glady

¹ Shantanu Mullick is Assistant Professor of Marketing at Eindhoven University of Technology and will be the presenting author. Nicolas Glady is Professor of Marketing at ESSEC Business School. We are grateful for helpful comments from Harald van Heerde, Brett Gordon, Albert Bemmaor, Peter Ebbes, seminar participants at Marketing Dynamics 2016, and participants at ESSEC research seminars. All remaining errors are our own. Contact information: s.mullick@tue.nl; glady@essec.edu.

Abstract

To tackle rising obesity rates, countries such as Mexico (2014), USA (2014), France (2012), Denmark (2011), and Finland (2011) have introduced a tax on snacks with high sugar or fat content.² These are known as “fat taxes”. As other countries, such as UK, Ireland, Romania and Italy, debate the introduction of “fat taxes”, there have been calls for additional empirical research to guide policy. Policy makers are concerned by the impact of “fat taxes” on consumers from the low-income group as they are more prone to obesity (Ford and Dziewaltowski 2008).

Previous studies which have examined the impact of “fat taxes” have certain limitations. Sharma et al. (2014) use descriptive models which suffer from the Lucas critique. Jensen and Smed (2013) use data before and after a “fat tax” was implemented. But the authors caution that their short observation window after the tax makes the long term impact of the tax difficult to judge. Khan, Misra and Singh (2015) use a static structural model where consumers do not stockpile. However, studies show consumers stockpile frequently purchased goods, and find that static models overestimate price sensitivity when consumers stockpile (Hendel and Nevo 2006).

Clinical studies suggest that a demand model to study the impact of a tax on consumption of sugar-based snacks needs to incorporate a reinforcement effect where past consumption can increase current consumption (Avena and Gold 2011).³ Reinforcement effect can be modelled using the rational addiction theory (Becker and Murphy 1988). Hence, to evaluate the role of income on the impact of “fat taxes”, we build a dynamic structural model of rational addiction with endogenous consumption and stockpiling. We extend Gordon and Sun’s (2015) dynamic

² Denmark subsequently repealed the tax in 2013.

³ For a discussion on how reinforcement effect is different from habit formation see Gordon and Sun (2015).

model of rational addiction by permitting a consumer's addictive stock to depend on her income. Thus we can compare the impact of a tax on low-income consumers with the impact of a tax on higher income consumers.

We apply our model to a data set from UK that records consumers' purchases for in-home consumption, and tracks their out-of-home consumption of sugar-based snacks. The importance of out-of-home consumption has been underscored by a recent FDA study (FDA News Release, 2014), thereby making our data apt for our research question. Our data points to the presence of an addictive stock among consumers, and indicates that consumers stockpile.

Our dynamic structural model detects the presence of a reinforcement effect. We also find that low-income consumers have a greater propensity to consume sugar-based snacks compared to higher income consumers. Further, our counterfactuals show that the reduction in demand due to a "fat tax" is 12 percent less among consumers from the low-income group compared to consumers from the higher income group. Our findings lend credence to the suggestion that, to change the consumption pattern of low-income consumers, a "fat tax" should be coupled with a tax rebate on healthy food (Mytton et al. 2007).

Keywords: Fat taxes, Dynamic Structural Models.

References

- Avena, N.M. and Gold, M.S. (2011) Food and addiction – sugars, fats and hedonic overeating. *Addiction* 106 (7):1214-1215.
- Becker, G. S. and Murphy, K. M. (1988) A theory of rational addiction. *Journal of Political Economy* 96 (4):675-700.
- FDA News Release (2014). Accessed at <http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm423952.htm>
- Ford, P. B., and Dzewaltowski, D.A. (2008) Disparities in obesity prevalence due to variation in the retail food environment: three testable hypotheses. *Nutrition reviews* 66.4:216-228.
- Gordon, B. G. and Sun, B. (2015) A dynamic model of rational addiction: evaluating cigarette taxes. *Marketing Science* 34(3):452-470.
- Hendel, I. and Nevo, A. (2006) Sales and consume inventory. *RAND Journal of Economics* 37(3):543-571.
- Jensen, J.D. and Smed, S. (2013) The Danish tax on saturated fat – short run effects on consumption, substitution patterns and consumer prices of fats. *Food Policy* 42:18-31.
- Khan, R., Misra, K. and Singh, V. (2015) Will a fat tax work. *Marketing Science* 35(1):10-26.
- Mytton, O., Gray, A., Rayner, M. and Rutter, H. (2007) Could targeted food taxes improve health. *Journal of Epidemiol Community Health* 61:689-694.
- Sharma, A., Hauck, K., Hollingsworth, B. and Siciliani, L. (2014) The effects of taxing sugar sweetened beverages across different income groups. *Health Economics* 23(9):1159-1184.