

Item #19

Non-technical summary of Professor John Gibson's work on sugar
taxes

Draft non-technical summary of Dr John Gibson's sugar tax research prepared by Dr John
Gibson, for the Ministry of Health, 4 December 2016

Sent By: John Gibson <[REDACTED]> on 4/12/2016 9:56:56 p.m.
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Subject: Draft Non-technical summary (John Gibson)

Hi [REDACTED]

Here is a draft of the summary. I decided to make it a bit longer and include two graphics, so that may improve the readability.

If you have people at your end who change the writing to make it suitable for the reading level you have in mind, please send it back to me before finalizing so I can check if any meanings were changed.

Thanks

John  - Draft_non-technical_summary.docx

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Quality, Quantity, and Price: Implications for Taxing Unhealthy Foods

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Consumers respond to price rises by reducing quantity consumed, but also by downgrading the quality of what they consume. For example, if beef prices rise there will be some switching from steak to mince, as well as a reduction in the overall quantity of beef consumed. If the response of quality to price is ignored, estimates of the price elasticity of quantity demand will conflate responses on the quantity and quality margins and will overstate the effect of price on quantity. This exaggeration is especially likely in research that uses household survey data because, as first noted sixty years ago by Prais and Houthakker (1955:110), these survey data do not conform to the standard textbook demand model:

“An item of expenditure in a family-budget schedule is to be regarded as the sum of a number of varieties of the commodity each of different quality and sold at a different price.”

Since there are many different brands, package sizes, quality grades and varieties available – even for narrowly defined survey items like “fizzy soft drinks” – a consumer has scope to almost entirely buffer their quantity consumed by sliding down the quality scale as prices rise.

Some price rises are mandated by policy makers in order to cut intake of unhealthy items, like sugar-sweetened soft drinks. Failure to untangle quality and quantity responses may cause undue optimism about how taxes can help to achieve health goals. The bias from ignoring quality responses grows as price variation within a survey group exceeds price variation over time and space. For example, fizzy drinks have around an 8:1 ratio of price per unit weight as one slides down the quality scale from expensive *Coke* in small bottles to cheaper store-brand cola in large bottles. This quality gradient is shown in the figure below, based on prices in the supermarket where the author shops; the same pattern is seen in stores around the world.



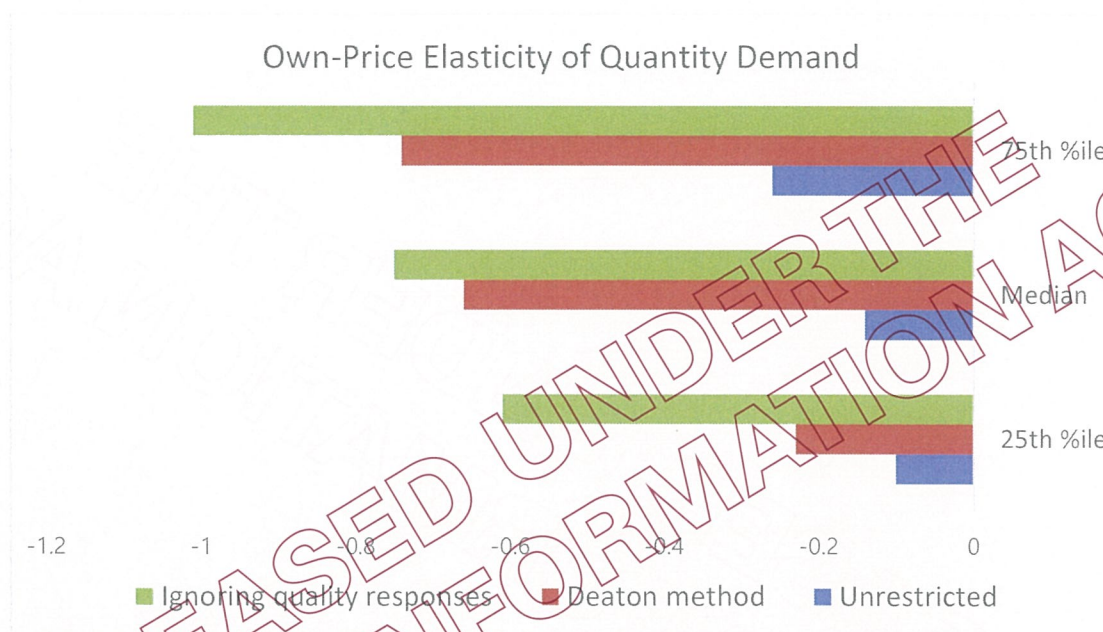
In contrast to the substantial quality-related price variation within the fizzy drinks group, there is little variation in prices of these drinks over time and space. For example, in rich countries with good roads and integrated markets, prices in the dearest areas may be up to 40 percent above those in the cheapest areas, while for middle income countries like Mexico the ratio is about 1.6:1. Even poor countries with difficult topography have ratios of only about 2:1 for the dearest to cheapest areas for soft drinks. Thus, there may be four times or more price variation within a survey group – which allows a lot of scope for adjusting quality choice – than there is price variation over space. The same is true for many other foods. It would be an incomplete analysis that ignores the large within-group variation and focuses only on the smaller price variation over time and space.

Yet most demand studies using household survey data do exactly that. They ignore price variation within survey groups (and consumer choices over quality) and just focus on the much smaller price differences over time and space. For example, when an analysis of the price effects of Mexico's peso-per-litre tax on sugar-sweetened drinks needed price elasticity of quantity demand estimates, to go from price effects to body weight effects (Grogger, 2016), extant studies lacked plausible estimates of quality response to price and likely overstated quantity responses to price. Likewise, a review of recent empirical studies (published since 2012) on taxes for sugar-sweetened drinks shows less than one-sixth deal with the quality substitution possibilities in household survey data. Yet studies that allow for all consumer responses typically find a larger adjustment to price changes on the quality margin than on the quantity margin (McKelvey, 2011; Gibson and Kim, 2013).

Almost 30 years ago, Nobel prize winner Angus Deaton developed a way to derive the response of quality to price (Deaton, 1988, 1990). The rate that consumers downgrade quality as prices rise (e.g. going from steak to mince) is assumed to operate as an income effect. This leverages off what household surveys are good at – measuring incomes or expenditures – to get at what they are bad at or rarely do, which is measuring local prices. If one had data on local prices and on an indicator of the quality choices made by consumers, Deaton's approach would not be needed because effects of price on quality could be directly estimated.

Since 2011 a few studies have used this direct estimation method, finding that consumers make far larger adjustments to quality as prices change than what Deaton's method suggests (McKelvey, 2011; Gibson and Kim, 2016). Consequently, the elasticities estimated from Deaton's method exaggerate quantity response to price, which is the same bias as in studies that completely ignore the quality response issue. There are big differences in the quantity demand elasticities that result if consumer quality adjustment is directly estimated, is derived from Deaton's indirect approach, or is not allowed at all. The figure below summarizes elasticity results for 45 food and drink items from a study in Vietnam that direct estimated quality responses to price (Gibson and Kim, 2016). If no restriction is placed on within-group quality response, the own-price elasticity of quantity demand for the median item is just -0.14, while it is -0.66 with Deaton's method and -0.75 if quality

responses are completely ignored by an analyst. A seemingly greater response of quantity to price, if consumer responses on the quality margin are either ignored or are restricted, occurs throughout the distribution; the 25th and 75th percentiles of the unrestricted elasticities are -0.10 and -0.26 but with Deaton's method they are -0.23 and -0.74 and if quality adjustment is totally ignored they are -0.61 and -1.01.



The studies by McKelvey and Gibson and Kim directly estimate the rate at which consumers adjust quality within survey groups as prices rise (e.g. sliding down the fizzy drink quality scale in the first figure) by using a proxy for the consumer's choice of quality – the unit value, which is group expenditures over group quantity. The unit value reflects the combined effect of the price level facing consumers and where they locate on the within-group quality gradient (e.g. from expensive Coke in small bottles to cheap store-brand cola in large bottles). Since these studies also have direct measures of local prices available, once price is controlled for, the quality choice is apparent.

This is not the only way to control for quality choice, and in setting where brands denote quality researchers might usefully introduce brand level effects into an analysis. For example, in a study of cigarette demand in Indonesia that simulated the effect on quantity smoked of a 10 percent rise in the excise tax, the demand-reducing effect of the tax hike was overstated by 56 percent if brand level controls were not used (Burton-McKenzie, Gibson, and Olivia, 2017). Similar approaches to controlling for quality choice are possible by using bar-coded data at the UPC (Universal Product Code) level, as long as analysts do not then aggregate disparate products into food or beverage groups, which will induce within-group quality variation. One overall lesson for practitioners from these studies is that responses to price changes that occur on the quality margin appear to be an inherent feature of demand data from household surveys, which researchers ignore at their peril.

For the users of applied demand analyses, such as advisors in policy ministries, a key question to ask of any study that they are using to inform about actual or potential health-related taxes on food and drink is what method, if any, is used to account for consumer quality responses to price rises. For example, if a study uses just a single equation for household spending (or budget shares) on a food group and no equation for quality choice then that study cannot distinguish between the lower spending of those consumers who slide down the quality scale (e.g. from expensive *Coke* in small bottles to cheaper store brand cola in large bottles) and the lower spending of the consumers who reduce quantity as prices rise. Indeed, it would be logically impossible for such a study to correctly identify quantity responses to price changes since the joint quantity-quality choice is forced into a framework that cannot identify consumer responses on two margins. Therefore, decisions about taxes on unhealthy food and drink need to allow for the fact that quantity responses to price rises may have been greatly exaggerated in much of the extant literature and it will take far higher rates of taxation to realize many of the intake reductions that are forecast.

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