



Mandatory labels, taxes and market forces: An empirical evaluation of fat policies



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ABSTRACT

The public-health community views mandatory Front-of-Pack (FOP) nutrition labels and nutritional taxes as promising tools to control the growth of food-related chronic diseases. This paper uses household scanner data to propose an *ex-ante* evaluation and comparison of these two policy options for the *fromage blanc* and dessert yogurt market. In most markets, labelling is voluntary and firms display fat labels only on the FOP of low-fat products to target consumers who do not want to eat fat. We here separately identify consumer preferences for fat and for FOP fat labels by exploiting an exogenous difference in legal labelling requirements between these two product categories. Estimates of demand curves are combined with a supply model of oligopolistic price competition to simulate policies. We find that a feasible *ad valorem* fat tax dominates a mandatory FOP-label policy from an economic perspective, but both are equally effective in reducing average fat purchases.

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1. Introduction

In the context of a worldwide rise in overweight and obesity, mandatory labelling and tax policies have attracted a great deal of interest from policy makers and public health advocates. We here provide an empirical evaluation of these policies, focusing for heuristic purposes on a segment of the yogurt market. Using a structural econometric approach, we estimate the impact of Front-of-Pack (FOP) fat labels on key market and health outcomes, such as the equilibrium prices, market shares, firm profits, consumer welfare, fiscal revenues and fat purchases. We show that mandatory labelling reduces average fat purchases, despite market forces – consumer valuation of (and reaction to) information and prices, and firm pricing strategies – that may defeat such a well-intended public health policy. However, a feasible *ad valorem* fat tax policy is found to be as effective in terms of public health, and more effective in terms of economic surplus.

Fat in calories available for human diet represents between 40 and 45% of total daily calorie intake in most OECD countries, as against 20–30% one century ago. This trend has been related to cardiovascular and cancer risks and to the spectacular growth in obesity and overweight, which has reached epidemic proportions globally, with more than 1 billion adults being overweight worldwide in 2010 (see OECD, 2010; Etilé, 2011, for example).

In this context, the OECD has called for the implementation of tax policies on food items with high fat or sugar contents (Cecchini et al., 2010).¹ Nutritional taxes on unhealthy food are attractive for two reasons. A first standard reason is that they may compensate various externalities such as the healthcare overspendings generated by the growth of diet-related diseases.² Second, they may help reduce the lack of self-control that people have over their food

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¹ In 2009–2010, additional taxes on sugary drinks were proposed in at least 17 U.S. States; Denmark introduced a 25% tax increase on ice cream, chocolate, sweets and soft-drinks in January 2010 (Danish Ministry of Taxation, 2009), and a tax on fat in October 2011, which was withdrawn in November 2012; in Hungary, a tax on various processed products was imposed in 2011; in France, a tax on soft-drinks was introduced in January 2012.

² Finkelstein et al. (2009) estimate that, for the U.S. in 2006, obesity and overweight alone are associated with \$86 billion of medical spending, representing about 10% of national medical expenditures. The total cost of obesity and overweight for

choices. Marketing studies have shown that individual perceptions of product characteristics are naturally biased, which is used by the food marketing to influence consumer choices (Chandon and Wansink, 2011).

A separate public policy proposed by the European Parliament is the mandatory labelling of the nutrients content on FOPs: this is more salient and easier to use than the back-of-pack nutritional facts panel, which is already mandatory.³ To date, FOP nutritional labelling has been voluntary for almost all food products. FOP labels may *a priori* help consumers move from high to low fat-content products (Wansink et al., 2004; Grunert and Wills, 2007). Whether FOP fat labels are effective at decreasing fat purchases and increasing consumer welfare, and whether they should remain voluntary or become mandatory are important research questions.

One key element of the debate is that voluntary FOP labelling does not only play an informational role; it also contributes to differentiation and market segmentation. When labelling is voluntary, firms are more likely to display fat labels on the FOP of low-fat products to target consumers who do not want to eat fat. This has two consequences. First, a firm decision to introduce a FOP label may depend on unobserved consumer tastes, rendering this product attribute endogenous in the demand function. Second, it is not obvious that making FOP labels mandatory will yield significant and important welfare gains for consumers. Given that the absence of a label can currently be used to infer that the product is not low in fat, mandatory fat labels will essentially help them to better discriminate varieties within the range of products with moderate to high fat levels.

We here exploit an exogenous source of variation in legal labelling requirements in the French market for yogurts to identify the causal impact of fat-content labels on consumer choice. This market includes three broad categories of products: standard yogurts, *fromages blancs* and dessert yogurts.⁴ The French labelling legislation requires firms to signal the percentage of fat contained in *fromages blancs* by a fat-content label displayed on the front of the packaging, while fat-content FOP labelling is not mandatory for yogurts. The observation of households purchasing patterns reveal that households tend to substitute between *fromages blancs* and dessert yogurts, but not between *fromages blancs* and standard yogurts. We thus restrict the analysis to the relevant market for *fromages blancs*, which include dessert yogurts but not standard yogurts. The products fall into three fat categories: skimmed, semi-skimmed and full-fat. Firms never put FOP fat-content labels on full-fat dessert yogurts, while 50 percent of semi-skimmed dessert yogurts have one. They are required to do so for all *fromages blancs*, whatever their fat content. Combining this exogenous variation with firm labelling strategies for dessert yogurts, and using the variations in market shares between dessert yogurts and *fromages blancs* and between products with different fat contents, we can disentangle the consumer preferences for fat-content labels from their preferences for fat. In the empirical application, we use

the French public health insurance is estimated at 4.2 billion euros (in 2003), i.e. 4.5% of annual public health expenditures (Emery et al., 2007). In the U.K., the total medical cost of obesity and overweight was estimated at 1.5 billion pounds in 2002, which represents 3.7% of total net National Health Service expenditures (McCormick and Stone, 2007). Using an instrumental variable approach, Cawley and Meyerhoefer (2012) suggest that these estimates tend to underestimate the actual medical costs, as unobserved heterogeneity (e.g. a strong preference for the present) may be positively correlated with Body Mass Index and negatively correlated with access to healthcare.

³ See EUFIC (2012).

⁴ The *fromage blanc* is a creamy, soft, fresh, white cheese made with whole, semi-skimmed or skimmed milk. In this paper, following the French legislation, we include in the *fromage blanc* category the *faisselles*, which have similar culinary uses. Dessert yogurts include products such as strained/Greek style yogurts and *fromages blancs* or yogurts mixed with cream or other animal fats.

scanner data from a representative panel of French households, with information on their monthly purchase decisions in 2007, as well as on product and on household characteristics.

We apply a three-steps structural econometric strategy that has been recently used by Bonnet and Réquillart (2013) to analyse soft-drink taxes. In a first step, we use scanner data, disaggregated at both the household and product levels, to estimate a discrete choice model of demand allowing for substitutions both between varieties of *fromages blancs* or dessert yogurts and towards an outside option. We represent consumer preferences using a Mixed Multinomial Logit model, controlling for the (usual) endogeneity of prices, but also for the endogeneity of fat-content labels on dessert yogurts. We do so by constructing a control function based on the exogenous source of variation in labelling requirements that has been described above. This estimation approach identifies household-specific preference parameters and the demand curves for the varieties on the market. In a second step, we model the supply side as an oligopoly proposing differentiated products and competing *à la Nash* in a Bertrand game, in the spirit of Berry et al. (1995), Nevo (2001). We use the estimated demand curves to identify the price-cost margins for each product and the unit costs of production for firms. Knowing all parameters of firm pricing strategies and consumer purchasing behaviours, we are eventually able to simulate in a third step the new market equilibrium implied by each policy.

We compare the mandatory labelling policy to a fat tax policy based on *ad valorem* tax variations that are compatible with the Value Added Tax (VAT) framework that has been implemented in France in January, 2014: a VAT of 5% is applied to skimmed products, 10% to semi-skimmed products, and 20% to full-fat products. As the VAT rate for yogurts and *fromages blancs* was at 5.5% in 2007, the simulated fat tax amounts to increasing VAT by 14.5 percentage points (pp) and 4.5 pp for full-fat and semi-skimmed products, respectively, and decreasing VAT by 0.5pp for skimmed products. We find that the mandatory labelling and fat tax policies reduce household fat purchases by –8% and –7%, respectively. Although quantitatively similar, the impacts of these two policies differ according to the Body Mass Index (BMI) of the household main shopper. The fat tax policy yields higher reductions in fat purchases when the BMI is *above* 27, while the mandatory labelling policy achieves larger effects for BMIs *under* 27. We also find that firm price responses are much stronger in the case of the mandatory labelling policy. This is made possible by the sizeable initial margins on dessert yogurts, and high price elasticities just after the policy shock. The fall in margins is partially offset by the recovery of large market shares, which limits profit losses. However, only the market leader, which *ex-ante* has 30% of the market, can neutralize the fall in profit. A back-of-the-envelope analysis also reveals that the fat tax would yield aggregate economic benefits, because it generates high revenues for public finance. By comparison, the mandatory labelling generates large economic costs due to a fall in firm profits that is offset neither by an increase in consumer welfare nor by any additional fiscal revenues.

This research contributes to the flourishing literature on market-based public health policies targeting food-related chronic diseases. While food taxes have been extensively studied (see *inter alia*, Chouinard et al., 2007; Allais et al., 2010; Fletcher et al., 2010; Finkelstein et al., 2013), empirical econometric evidence on the impact of food labels and mandatory labelling policies on natural purchasing behaviour is much more scarce. The major obstacles are the difficulty of finding exogenous sources of variations in firm labelling decisions and credible control groups. Some market-level analysis has exploited quasi-natural experiments, such as changes in labelling legislation due to the enactment of the Nutrition Labelling and Education Act (Mathios, 2000; Variyam, 2008), or

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