



# **Using Scanner Data To Answer Food Policy Questions**

## ***Conference***

**Wednesday, June 1 -  
Thursday, June 2, 2011**

**Economic Research Service  
1800 M Street, NW  
Waugh Auditorium  
Washington, DC**

# Mandatory fat content labelling v.s. fat tax:

Evidence from the French *fromage blanc* and yogurt market

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ERS scanner data conference  
June 1 and 2

# Trends in obesity

- Growth of obesity and overweight-related diseases:
  - More than 1 billion adults overweight in 2010 (WHO),
  - Growing share of fat in calories available for human diet (40-45% today, 20-30% a century ago).

# Taxation of unhealthy food products or fat, sugar, salt

- Functions as a disincentive to purchase unhealthy products:
  - Effects on fat, sugar, and salt purchased are quite low, and can be extremely regressive (Caraher, 2005, Mytton, 2007, Chouinard et al., 2007 and Allais et al., 2010).
  - Exceptions are Griffith et al. (2010) and Bonnet et al. (2010).

# Mandatory labelling of key nutrients

- Perfectly informs consumers about key nutrient content may help consumers moving to more healthy products.
  - Can be effective at reducing consumption or sales of some high-fat products (Mathios, 2000; Teisl et al., 2001; Kiesel and Villas-Boas, 2010).
  - Do all consumers like fat content labels?

# Main Objective

- Compare fat content mandatory labelling and fat tax:
  - Impacts on consumers: fat purchased, welfare variations.
  - Impacts on firms: market share, price, and profit variations.

# Empirical approach

- We consider French yogurt and fromage blanc market in 2007,
- using discrete demand model on scanner data, as in Griffith et al. (2010),
- and compute firms' profit maximizing response to each policy, as in Berry et al (1995, 2004), and Nevo (2001).

# Data



# Overview

- Scanner data from the Kantar Worldpanel survey collected in 2007:
  - Representative of French households food-at-home expenditures,
  - 13380 households for about 5,500,000 purchases,
  - Information on each purchase made in 2007: store, quantity, expenditure, plus a number of product characteristics.

# Why on yogurt and fromage blanc market? (I/III)

First argument: Products are highly differentiated and substitutable

Standard yogurts

Standard fromages  
blancs

Dessert yogurts

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# Why on yogurt and fromage blanc market? (II/III)

Second argument: A quite substantial share of total fat purchased

Yogurts and fromages blancs account for 2.75% of total fat purchased.

# Why on yogurt and fromage blanc market? (III/III)

Third argument: Exogenous variation in French labelling legislation

Standard fromages  
blancs



Dessert yogurts





# Why on yogurt and fromage blanc market? (III/III)

Third argument: Exogenous variation in French labelling legislation

Standard fromages  
blancs  
Mandatory



Dessert yogurts



# Why on yogurt and fromage blanc market? (III/III)

Third argument: Exogenous variation in French labelling legislation

Standard fromages  
blancs  
**Mandatory**



Dessert yogurts  
**No law**



≈5%  
Label or not



≈10%  
No label



≈10%  
No label

# Product attributes

Product characteristics		In the universal product set	In household choice set
Price (std deviation)		2.44 (1.09)	2.71 (1.22)
Products with a Label	Label	85%	81%
Skimmed		24%	22%
Half-skimmed		38%	35%
Full fat		37%	43%
Fromage Blanc		80%	78%
Texture	Smooth	75%	73%
Products with a pack size below 200g	Portion < 200g	54%	59%
Organic or bifidus products	Organic/Bifidus	4%	8%
Low-quality retailer and hard-discount brands	Low quality	20%	9%
Mid-quality retailer brands	Mid quality	39%	23%
High-quality retailer and national brands	Reference	40%	68%

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# Household characteristics

	Mean
Monthly household income in Euro	2696 (1435)
Household size	2.6 (1.33)
The meal planner is a male	4%
Single household	8%
Couple without children	23%
Couple with children	39%
Aged older than 65	31%
Body Mass Index (BMI)	24.77 (4.23)
Meal planner overweight: $BMI \geq 25$	40%
Meal planner risky-overweight: $BMI \geq 27$	26%
Meal planner obese: $BMI \geq 30$	12%
Education = Primary	25%
Education = High school	33 %
Education = Baccalaureat	26 %
Education > Baccalaureat	16 %

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# Household choice set for a period

- 14 distribution channels (retailer company  $\times$  store size):
  - Set of products sold over the year for each channel,
  - Channels visited by each household in each period are known.
- Household choice set for a period = all products available in the distribution channels visited by the household in the period:
  - Variation over households if they visited different distribution channels,
  - Variation for a given household from one period to another.

# Household choice

- When several products purchased in the period  $\Rightarrow$  draw one at random, with probabilities of selection proportional to the share of each product in the household's yearly purchases.
- We chose five periods randomly for each household  $\Rightarrow$  Panel data.



# Prices for a period

- Prices  $\Rightarrow$  for each product in each period:
  - Compute the mean unit prices in each distribution channels,
  - Average these mean unit prices over the distribution channels visited by the household,
  - Vary over time and between households, depending on visited channels.

# Summary of the market characteristics

	Outside option	Fromages blancs			Dessert yogurts	
		Skimmed	Half skimmed	Full fat	Half skimmed	Full fat
Number of products (number with a label)		54 (54)	63 (63)	63 (63)	24 (12)	20 (0)
Mean price (Std. Deviation)	0	1.99 (0.88)	1.98 (0.78)	2.95 (1.14)	2.88 (1.36)	3.09 (0.39)
Market shares inc. the outside option	5.4%	16.2%	38.9%	15.7%	6.7%	17.2%
Market shares exc. the outside option		17.1%	41.1%	16.6%	7.1%	18.2%

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# Empirical model

# MMNL advantages

- Taste heterogeneity,
- Household specific preference parameters conditional on observed choices and covariates,



# Supply side: linear pricing model

- We assume that firms:
  - Set their prices,
  - compete in Nash-Bertrand game, holding the menu of products on offer constant.

# Price and label endogeneity

- Prices and label endogeneity are corrected using control function approach of Petrin and Train (2009):
  - Price endogeneity  $\Rightarrow$  Past price variations as valid IVs.
  - Label endogeneity  $\Rightarrow$  Interactions between fat content and product categories as valid IVs.

# Estimation Results

## Coefficients (Std. dev)

	Mean	Std. dev.	Income			Man	Risky-overweight	Household size	Over 65
			First Quartile	Second Quartile	Third Quartile				
Price	-1.870*** (0.056)	1.995*** (0.030)	-0.232*** (0.063)	-0.148*** (0.057)	-0.013 (0.058)	-0.067 (0.108)	-0.042 (0.049)	0.012 (0.017)	0.263*** (0.049)
Label	0.592** (0.271)	3.85*** (0.131)	0.157 (0.330)	0.641** (0.309)	0.180 (0.320)	-0.239 (0.596)	0.288 (0.252)		-0.447** (0.245)
Half-skimmed	0.283*** (0.065)		0.664*** (0.085)	0.400*** (0.083)	0.360*** (0.089)	0.766*** (0.176)	-0.201*** (0.070)		0.189*** (0.070)
Full fat	0.250*** (0.082)		0.384*** (0.106)	0.142 (0.102)	0.229** (0.106)	0.995*** (0.207)	0.010 (0.086)		0.226*** (0.084)
Fromage blanc	1.447*** (0.162)		-0.009 (0.198)	-0.767*** (0.173)	-0.669*** (0.183)	0.303 (0.378)	-0.262* (0.136)		-0.123 (0.134)
Low-quality	-1.608*** (0.184)		0.367*** (0.121)	0.204* (0.112)	0.221* (0.119)			0.169*** (0.032)	
Mid-quality	-0.490*** (0.158)		0.364*** (0.085)	0.452* (0.077)	0.447*** (0.079)			0.069*** (0.023)	
Below 200g	1.290*** (0.053)					-0.411*** (0.151)			
Smooth	-0.651*** (0.068)								
<i>Terms to correct for endogeneity</i>									
Residuals price	0.585*** (0.056)								
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# Willingness to pay for a label

- The Maximum WTP is €1.83.
- 62% of the households have a positive WTP for fat content label on dessert yogurts.
- High consumers of dessert yogurts exhibit negative WTP.

# Firm costs, prices, margins, and total annual profits

Firm	Number of products	Predicted share	Marginal cost(€)		Mean price (€)	Mean margin	Total annual profit (€m)
			Mean	Std			
All	224		1.33	0.69	2.44	0.47	64.65
<i>Manufacturer</i>							
M1	17	19.96%	1.23	0.45	2.83	0.53	15.05
M2	11	9.03%	1.23	0.30	2.44	0.47	6.44
M3	14	6.08%	2.66	1.18	3.94	0.33	3.68
M4	3	2.57%	1.29	0.73	2.91	0.58	3.26
<i>Retailer</i>							
R1	32	12.36%	0.88	0.44	1.96	0.55	8.90
R2	16	8.65%	0.80	0.42	1.77	0.56	5.16
R3	16	7.34%	0.73	0.47	1.71	0.61	4.60
R4	42	5.40%	1.60	0.69	2.37	0.33	3.11
R5	18	4.87%	0.71	0.46	1.60	0.60	3.52
R6	12	4.33%	0.82	0.33	1.82	0.54	2.34
R7	4	4.06%	0.83	0.11	1.26	0.33	1.51
R8	21	3.41%	0.95	0.33	1.94	0.52	3.08
R9	14	3.33%	1.02	0.59	2.17	0.52	3.03
R10	4	2.44%	0.77	0.30	1.59	0.44	0.93

# Firm costs, prices, margins, and total annual profits

Firm	Number of products	Predicted share	Marginal cost(€)		Mean price (€)	Mean margin	Total annual profit (€m)
			Mean	Std			
All	224		1.33	0.69	2.44	0.47	64.65
<i>Manufacturer</i>							
M1	17	19.96%	1.23	0.45	2.83	0.53	15.05
M2	11	9.03%	1.23	0.30	2.44	0.47	6.44
M3	14	6.08%	2.66	1.18	3.94	0.33	3.68
M4	3	2.57%	1.29	0.73	2.91	0.58	3.26
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# Policy simulations

# Which policies?

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- Mandatory labelling policy imposing a fat content label on all dessert yogurts,
- Fat tax policy that increases by 10% (5%) the price of all full fat (half skimmed) products.



# Variations in market shares and prices by product category

	Outside option	Fromage blanc			Dessert yogurts	
		Skimmed fat free	Half skimmed	Full fat	Half skimmed	Full fat
Initial market shares in percent	6.18	15.88	38.09	15.46	6.77	17.62
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Share variation with no firm response in pp	4.79	1.99	3.55	3.97	-1.68	-12.62
Share variation with firm response in pp	3.86	-1.84	-6.39	-0.01	0.74	3.64
Producer price variations in Euro		0.10	0.10	0.22	-1.03	-1.38
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# Variations in profit

- Fat tax policy decreases the average profit by 4.27%,
- mandatory labelling policy decreases the average profit by 19.52%.



# Household's annual fat purchased variations in gram

	Base Fat	Fat tax		Mandatory fat label	
		No firm	Firm	No firm	Firm
		response	response	response	response
All	844	-289	-46	-325	4
<i>Meal shopper BMI</i>					
BMI<25	836	-288	-46	-323	1
25≤BMI<30	851	-287	-46	-324	8
BMI≥30	871	-303	-50	-336	13

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# Variations in household's surplus with firms' pricing response

- Fat tax policy decreases the average household's surplus by 2.54%,
- mandatory labelling policy increases the average household's surplus by 52.44%.

# Conclusion

## Summary of results

- More than 60% of consumers have a positive WTP for a fat-content label,
- Firms' pricing strategies are crucial to obtaining an accurate picture of the impacts of tax and mandatory labelling policies,
- Fat tax policy results in a decrease of fat purchased, whereas mandatory fat content labelling causes an increase of fat purchased.



# What remains to be done?

- Simulation of a new policy equilibrium must take into account firms' optimal strategies:
  - Vertical relationships between producers and retailers (see Villas-Boas, 2007, Bonnet and Dubois, 2010),
  - Entry and exit of products (see Hamilton, 2009; Draganska et al, 2009).