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Rational and Non-rational Factors Determining Dietary Choices: Their Impacts on Health and on Carbon

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La Toxa, June 2012

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Introduction

- There is currently a lot of public discussion on diet and health. Growing obesity and type II diabetes is a matter of concern in most countries, including developing ones and ones that prided themselves on healthy heating habits such as a Mediterranean diet.
- At the same time medical science is continually coming up with evidence of the health implications of different food products.
- Overlaying this discussion is the policy debate on how best to reduce greenhouse gases to meet the climate challenge.
- Maybe we can achieve a double dividend: reduce GHGs and benefit health by reducing consumption of red meat, fats etc.?

How Can We Change Behaviour in This Area?

- In the case of energy:
  - Informational campaigns. (Evidence is mixed)
  - Feedback effects (especially compared to peer groups, some positive results).
  - Fiscal instruments (taxes, subsidies) (Clearly can reduce demand but with possible equity effects….)
  - “Nudges” and similar small examples of good practice can be effective.

How Can We Change Behaviour in This Area?

- In the case of diet we have less evidence:
  - Informational programs and promotion for healthy diets can have statistically significant effects, at least initially
  - Health claims for a product do results in a more favourable attitude of consumers towards the products, but for how long?
  - Restaurant labelling of nutritional information appeared to result in around 10 per cent increase in the ordering lower calorie meals (but again for how long?)

Some Current Policies for a Shift in Diet

- School meals (England).
- Denmark, which has introduced a fat tax on butter, milk, cheese, pizza, meat, oil and processed food if the item contains more than 2.3% saturated fat
- Financial penalties on companies and local governments that fail to meet specific weight reduction targets (Japan)
- Scotland proposed a minimum price of 50 pence per unit of alcohol (80 US cents or 62.5 eurocents)

Approach in this Paper

- Construct a structure that combines rational demand and supply decision making with external influences that influence that structure.
- These influences may or may not be rational.
- Allow for the fact that policy on diet works with food categories that are often different from those used in demand analysis.
- Estimate the impact of different policies on health and carbon footprints of diets.

Our Approach

- We take the AIDS system and use elasticities of demand for food products in Spain that have been estimated using this system (Molina, Angullo et al).
- We combine the system with other elasticities that have been estimated in separate studies.
- The full set is adjusted to meet the additivity, symmetry and other conditions.

Our Approach

- For close substitutes that are part of a good category in the AIDS systems (red meat is part of meat; high sugar drinks are part of all non-alcoholic drinks) we construct the QBDS, which is similar to AIDS but applies for the close substitutes that are part of an AIDS category.
- The QBDS and AIDS systems are used jointly to estimate impacts of policies.

Our Approach

- For each policy we estimate:
  - Economic welfare changes (Diamond and McFadden, 1974)
  - Changes in quantities and prices for all categories
  - Changes in a health indicator that includes amounts of carbohydrates, lipids, proteins, fibre and cholesterol (weights depend on quantity relative to WHO standard) Angullo et al, 2008.
  - The carbon footprint of the diet based on average values from PBL Dutch study

Policies Considered

- The effect of an increase in tax on alcohol of 10%?
- A tax on red meat of 10%
- The consequence of an informational program that increases the consumption of vegetables by 4% in quantity terms?
- A tax on high sugar snacks of 10%
- A tax on saturated fats of 10%.

Data from INE (Shares per Person 2006-2010)

Category	Share (%)
Bread and Cereals	2.25
Meat	3.50
Fish	1.77
Milk, Cheese and Eggs	1.80
Oils and Fats	0.40
Fruits & Vegetables (in. Potatoes)	3.14
Snacks and Sweets	0.56
Soft Drinks and Coffee, Tea	0.97
Alcoholic Drinks	0.58
Tobacco	1.38
Non-food Expenditure	83.66
Total	100.00

But Elasticities Vary a Lot in Different Studies

Table 2: Marshallian Price Elasticities for Food Items in Spanish Studies

	Molina	Angullo et al.
Bread and Cereals	-0.17	-0.76
Meat	-0.77	-0.66
Fish	-0.35	-0.18
Milk and Eggs	-0.89	-1.47
Vegetables and Fruits	-0.68	-0.18
Oils	N.A.	-0.06

We took the Angullo et al. figures initially but we will test impacts of using Molina's figures

Elasticities in the Base Case

Gross Price Elasticities	BCP	MEAT	FISH	MILK ETC.	OILS ETC.	FRUIT ETC	SNACKS	SOFT DRINKS	ALCOHOL	TOBACCO	NON-FOOD
Bread, Cereals & Potatoes	-0.80	-0.48000	-0.18	0.25	-0.111	0.07	0.00	0.00	0.00	0.00	0.22
Meat	-0.45854	-0.80	0.10	0.21	-0.33	0.12	0.00	0.00	0.00	0.00	0.15
Fish	-0.17711	0.11525	-0.65	-0.13	-0.45	-0.25	0.00	0.00	0.00	0.00	0.50
Milk, Eggs and Cheese	0.22961	0.15937	-0.14858	-1.47	0.32	-0.39	0.00	0.00	0.00	0.00	-0.25
Oils & Fats	-0.11790	-0.34417	-0.45574	0.31935	-0.61	0.40	0.00	0.00	0.00	0.00	3.50
Fruit & Vegetables	0.07825	0.11825	-0.24752	-0.35447	0.41250	-0.80	0.00	0.00	0.00	0.00	-0.13
Snacks & Sweets	-0.01801	-0.02911	-0.01403	-0.00247	-0.00105	-0.00582	-1.00	0.00	0.00	0.00	0.00
Soft Drinks & Coffee	-0.01301	-0.02480	-0.01150	-0.00149	0.00109	-0.00075	0.00410	-1.00	0.40	0.00	-0.40
Alcoholic Drinks	-0.01681	-0.02890	-0.01393	-0.00213	-0.00095	-0.00552	0.00000	0.39510	-0.50	0.00	-1.10
Tobacco	0.00021	-0.00038	-0.00018	0.01449	0.00525	-0.00199	0.01100	0.00885	0.01090	-0.50	-0.50
Non Food Exp	1.01250	0.99488	1.11582	1.14578	4.03618	0.59325	0.88095	0.42584	-0.26925	-0.09665	-1.03
Income Elasticities	0.974	1.052	0.653	1.702	0.525	0.993	1	1	1	0.5	1.002
Supply Elasticities	0.50	0.40	0.30	0.45	0.45	0.40	0.45	0.40	0.50	0.50	0.50

A Tax on Alcohol of 10%

- The demand and supply system shows a small response to the tax and an increase in the consumption of the substitute (soft drinks, coffee, tea etc.).
- The tax causes a bigger effect when the elasticities of supply are very high (effectively giving a horizontal supply curve, in which case almost all of the tax is passed on through higher alcohol prices).
- In terms of the health indicator and the carbon footprint the effects are relatively small. The health measure improves by between 0.1 and 0.8 per cent and the carbon footprint is smaller by between 0.01 and 0.07 per cent. In both cases the effect is larger with the higher elasticities.

A Tax on Red Meat

- Here we need to combine QBDS with AIDS
- QBDS gives shifts between red and other meat and converts a red meat tax to a tax on “meat”
- This is fed into AIDS to give the shifts in other goods and also gives a new meat consumption.
- The AIDS meat consumption has to match that from QBDS. If not we iterate till the two are the same.

A Tax on Red Meat

- The tax reduces the consumption of red meat significantly and increases that of other meat slightly. It also has an effect on the consumption of bread, cereals and potatoes; and of fish, milk and eggs and cheese and fruit and vegetables.
- he consumption of other goods is likely to go up if they are substitutes and go down if they are complements, but these movements are also affected by the relative supply elasticities. The higher the price elasticity of meat as a whole the greater is the fall in meat consumption and the higher the price elasticity of red meat, the greater the decline in its consumption.

A Tax on Red Meat

- The welfare impacts of the tax are small (around €0.4 per person per year in the Base Case and €1.5 in the high supply elasticity case).
- On the health side the indicator is about one per cent higher in the Base Case but 7 per cent higher in the case where the supply is perfectly elastic.
- Likewise the carbon emissions decline only 0.7 per cent in the Base Case but as much as 5 per cent in the elastic supply case. Emissions in the current diet are estimated at around 2600 kg of CO2, so a 4.9 per cent decline would be equal to 127 kg.
- At value per ton of CO2 of €20, the savings would be worth €2.55, more than the loss of direct welfare.

An Information Campaign for Fruit and Vegetables

- Still work in progress but initial estimates are based on finding a subsidy that is equivalent in quantity terms to the information campaign.
- We consider the welfare change from the subsidy as a gain.
- Estimates show a welfare gain of around €2 per person per year and a significant gain in the heath indicator.

Conclusions

- Diets are changing and becoming less healthy
- Underlying factors are a combination of supply and demand
- Changes can be made through fiscal and other polices
- Analysis of these policies requires a framework that combines rational choice with external factors that may influence preferences
- Existing demand systems are inadequate when the policies focus on sub-groups within demand systems

Conclusions

- We propose combining traditional demand systems with ones that focus on goods that are close substitutes.
- Preliminary results show small traditional welfare losses for possible taxes on “bad goods”
- But health impacts are also relatively small, although they do depend on supply elasticities.
- Likewise carbon impacts are also sensitive to supply elasticities.

Further Work

- Test sensitivity to demand elasticities
- Evaluate more programs, involving sub-groups of goods.
- Evaluated the health impacts in more depth.
- Estimate demand systems for close substitutes.
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Thank you!

Muchas Gracias!