Indirect Tax Reforms: The Case of Spain

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Alternative title of the presentation:

When the MATHS can say something about real world….

For example: **It is possible to implement Pareto improving indirect tax reforms in Spain?**

Related work:

- ***India (Ahmad and Stern,1984)***
- ***Norway (Christiansen and Jansen, 1978),***
- *Belgium (Decoster and Schokkaert, 1990),*
- *Canada (Cragg, 1991),*
- *Germany (Kaiser and Spahn, 1989),*
- *Italy (Brugiavini and Weber, 1988 and Liberati, 2001)*
- *Pakistan (Ahmad and Stern, 1991).*
- *Ireland (Madden, 1995)*
- *Greece (Kaplanoglou and Newbery, 2003)*

Nothing done for Spain

The theory (Diamond-Mirrlees):

- Production side:
  - Constant returns to scale.
  - Producer prices (*p*) are fixed.

- The government requires an amount T of resources collected via taxes (*t*) on goods.
  - Goods are indexed by *i, i=1…N.*

- Household factor incomes are fixed.
  - Consumer price: $q_i = p_i + t_i \longrightarrow dq = dt$.
  - Household are indexed by *h, h=1… H.*

The Problem:

The government solves the following maximization problem:

$$\underset{\{t_1,t_2,\ldots,t_n\}}{\text{Max.}} \; W = W\left(V^1(q_1,\ldots q_n), V^2(q_1,\ldots,q_n)\ldots, V^H(q_1,\ldots,q_n)\right)$$

$$\text{st.} \quad T = \sum_{i=1}^{n} t_i X_i \qquad \text{where} \quad X_i = \sum_{h=1}^{H} x_i^h$$

Solving with K.T.

$$L = W\left(V^1(q_1,..q_n), V^2(q_1,\ldots,q_n)\ldots, V^H(q_1,\ldots,q_n)\right) + \lambda\left(\sum_{i=1}^{n} t_i X_i - \bar{T}\right)$$

Definition *Marginal Revenue Cost*: **cost at the margin in terms of revenue forgone when a tax is lowered so as to provide one extra unit in welfare**

$$\lambda_i = \frac{\partial R / \partial t_i}{\partial W / \partial t_i}$$

$$\beta^h = \frac{\partial W}{\partial V^h}\frac{\partial V^h}{\partial m} \qquad \frac{\partial W}{\partial t_i} = -\sum_h \beta^h x_i^h$$

$$\frac{\partial R}{\partial t_i} = r_i = X_i + \sum_k t_k \frac{\partial X_k}{\partial t_i} = X_i\left(1 + \sum_k \frac{q_k X_k}{q_i X_i} \cdot \frac{t_k}{q_k}\frac{q_i \partial X_k}{X_k \partial q_i}\right) = X_i\left(1 + \sum_k \frac{\omega_k \tau_k \varepsilon_{ki}}{\omega_i}\right)$$

$$\lambda_i = \frac{\sum_h q_i x_i^h \left(1 + \sum_h \sum_k \frac{\omega_k^h \tau_k \varepsilon_{ki}^h}{\omega_i^h}\right)}{\sum_h \beta^h q_i x_i^h}$$

τ is the tax on good *k* as a proportion of consumer price and ε is the uncompensated cross-price elasticity of good *k* with respect to good *i*

f.o.c implies that MRC (λ) should be equal for all goods.

PARETO IMPROVING TAX REFORM PRINCIPLE:

if $MRC_i > MRC_s$ then higher t_i and lower t_s

Second order conditions are satisfied given the concavity of the Social Welfare Function.

Four elements of data:

1. Household expenditure on goods (from a survey).
2. Demand derivatives (from a demand system estimation).
3. Effective taxes.
4. Welfare weights.

1. Spanish Household Budget Continuous Survey:

- Provided by the 'Instituto Nacional de Estadística'.
- Available since 1984.
- It provides trimester and annual information about household resources and their expenditure on goods.
- The survey established the interview of households throughout 8 quarters.
- We used a longitudinal panel for year 1998. It has 9.891 observations and it represents 12.089.302 households and a population of 39.505.758.

2. Demand system estimation:

- Quadratic Almost Ideal Demand System (QUAIDS) for 16 commodities groups.
- The sample for the demand system estimation covers the period 1985-1997. (Change of methodology)
- Method of estimation: two stage least squares and non-linear instrumental variables.

3. Taxes:

- We use the effective taxes for each commodity group that was computed using a weighting sum of the different taxes for each good.

Data Requirements

Some descriptive statistics and the effective taxes:

Commodities	Expenditure per equivalent adult				
	mean	median	standard deviation	budget share	Effective tax (%)
1.Food & non-alcoholic drinks	1821.72	1675.40	1028.28	0.1995	6.037
2.Alcoholic beverages	79.83	18.46	170.95	0.0077	16
3.Tobacco	179.20	86.43	248.13	0.0196	16
4.Clothing & footwear	729.01	554.75	689.14	0.0708	16
5.Housing expenditure	2242.79	1962.82	1410.55	0.2398	0
6.House keeping & services	918.65	668.06	924.31	0.0896	15.87
7.Fuel for housing	130.12	83.70	130.83	0.0139	16
8.Services	307.94	154.24	457.82	0.0290	2.46
9.Petrol	374.90	263.89	437.28	0.0362	16
10.Private transport services	290.24	156.15	392.70	0.0258	9.13
11.Public transport services	98.20	18.98	185.80	0.0094	7
12.Communications	202.65	166.41	166.95	0.0210	16
13.Leisure	1584.18	1080.10	1754.09	0.1362	6.98
14.Education	192.46	30.30	393.97	0.0163	12.64
15.Other non-durable goods	178.94	103.88	298.27	0.0183	11.56
16.Durable goods	1025.48	188.43	2606.16	0.0670	16

4. Definition of welfare weights

Consider an additive iso-elastic social welfare function (Atkinson):

$$W = \sum_h U^h$$

where

$$\begin{cases} U^h(I^h) = \dfrac{k(I^h)^{1-e}}{1-e} & if\ e \geq 0, e \neq 1 \\ U^h(I^h) = k \log(I^h) & if\ e = 1 \end{cases}$$

$$U'(I^h) = \quad \beta^h = \left(\frac{I^1}{I^h} \right)^e$$

Where I^h is the equivalent income of household h

Values of λ_i for different levels of inequality aversion.

Commodities	Effective tax (%)	e=0	rank	e=1	rank	e=2	rank	e=5	rank
1.Food & non-alcoholic drinks	6.037	**0.9816**	12	**0.4025**	10	**0.2056**	6	**0.0722**	5
2.Alcoholic beverages	16	**1.1698**	5	**0.4435**	4	**0.2119**	5	**0.0668**	6
3.Tobacco	16	**1.3537**	2	**0.5499**	2	**0.2774**	2	**0.0953**	2
4.Clothing & footwear	16	**0.9604**	15	**0.3564**	15	**0.1661**	15	**0.0485**	13
5.Housing expenditure	0	**1.1183**	9	**0.4360**	6	**0.2170**	4	**0.0750**	4
6.House keeping & services	15.87	**1.0021**	11	**0.3701**	12	**0.1754**	11	**0.0551**	11
7.Fuel for housing	16	**1.1377**	7	**0.4417**	5	**0.2189**	3	**0.0761**	3
8.Services	2.46	**0.9811**	13	**0.3593**	14	**0.1669**	14	**0.0495**	12
9.Petrol	16	**1.1468**	6	**0.4265**	7	**0.1982**	8	**0.0578**	8
10.Private transport services	9.13	**1.2956**	3	**0.4573**	3	**0.2044**	7	**0.0563**	9
11.Public transport services	7	**0.9717**	14	**0.3601**	13	**0.1710**	12	**0.0553**	10
12.Communications	16	**1.1158**	10	**0.4168**	8	**0.1977**	9	**0.0613**	7
13.Leisure	6.98	**1.1213**	8	**0.3842**	11	**0.1676**	13	**0.0445**	15
14.Education	12.64	**0.8244**	16	**0.2700**	16	**0.1136**	16	**0.0282**	16
15.Other non-durable goods	11.56	**26.9443**	1	**10.3604**	1	**5.0223**	1	**1.6167**	1
16.Durable goods	16	**1.2179**	4	**0.4149**	9	**0.1785**	10	**0.0447**	14

Observation (1):

(a) The rank correlations suggest that the rankings, and thus the tax reform recommendations, show relatively strong sensitivity to the value of *e*. See for example the rank correlation among foods and leisure

This result suggests that distributional considerations matter a lot in the ranking of goods.

Indirect taxes seem to be a relatively efficient means of addressing distributional issues and reducing inequality in Spain.

This is in contrast with previous results on Developed countries. (Sah,1983) provides a clear exposition of why we should expect that results.

Observation (2):

(b) Need to correct externalities. The consumption of goods such as alcohol, tobacco and petrol may give rise to social costs, which can be reduced by the imposition of corrective taxes. Education should be subsidized given the positive externalities.

Since we do not incorporate such effects in this model, it is possible that the observed rankings of these goods is explained by this factor.

Conclusions

To conclude:

there exists the possibility of implementing Pareto improving tax reforms in Spain.

To be done:

-inversion of the optimal problem

-Estimation of a new demand system