Energy Taxes in a Multisectoral INFORUM-type Model

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Outline

- What is an energy tax? And an environmental tax?
- Multisectoral models and energy taxes
- Data requirements in a multisectoral model setting
- Energy PSUTs
- Energy Use Tables

What is an energy tax? (1/2)

- It's a charge levied by the State on the consumption of energy products, it is considered a tax on product according to the ESA95 classification of *indirect taxes* and an environmental tax according to the ESA95 classification of *Environmental Taxes*.
- An environmental tax is a tax whose tax base is a physical unit (or a proxy of it) that has a proven specific negative impact on the environment. Following Eurostat, four subsets of environmental taxes are distinguished:

- **Energy taxes**
- Transport taxes
- Resource taxes
- Pollution taxes

What is an energy tax? (2/2)

- ***Energy taxes*** include levies on energy products used for both transport and stationary purposes, such as: petrol, Diesel, LPG, fuel oil, Natural gas, Coal, Coke, Biofuels, Electricity. As a convention, CO2 taxes are also included here.
- *Transport taxes* are related to the ownership and use of motor vehicles
- *Resource taxes* are related to the extraction and the subsequent depletion of natural resources
- *Pollution taxes* are related to measured or estimated emissions to air and water, the management of solid waste and noise. For example they are levied on NOx emissions, SO2 content of fossil fuels, waste management in general.

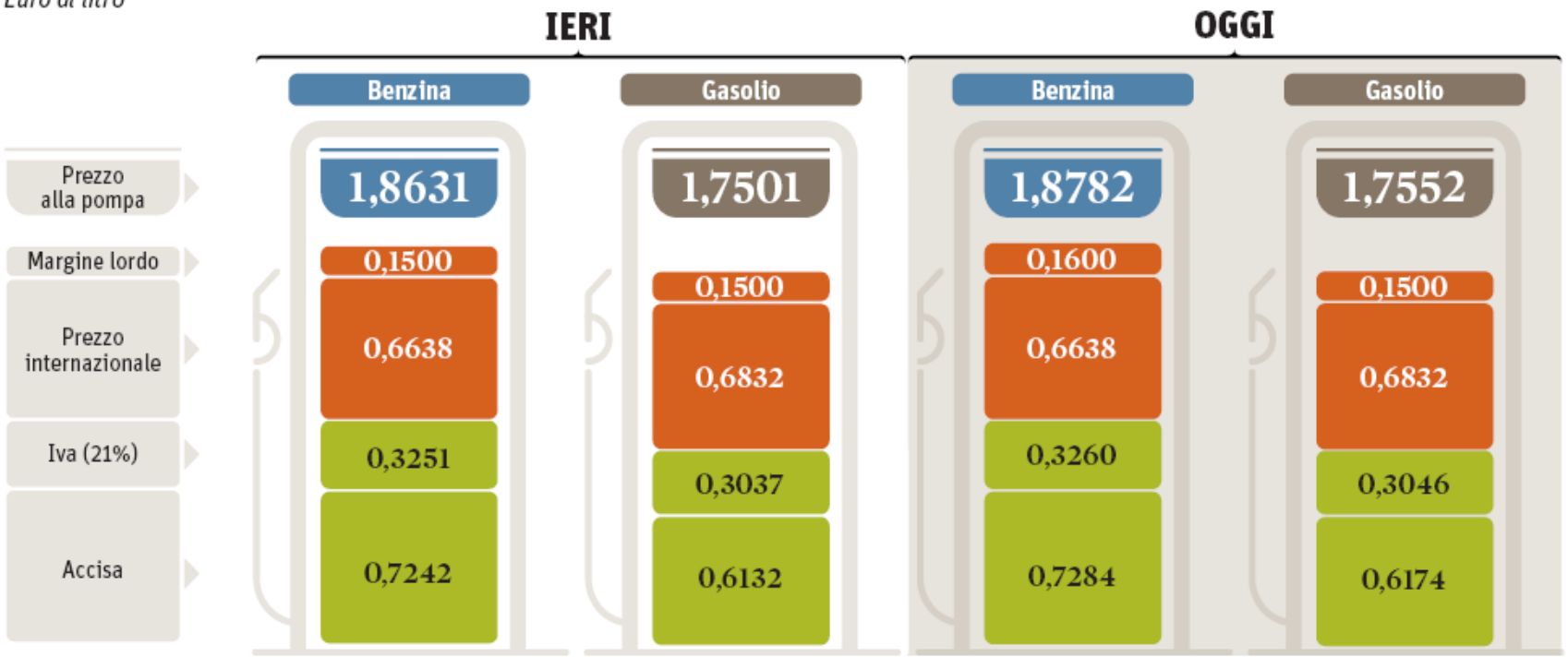
Some data about Italy

- Indirect taxes (including VAT) represent 46% of total tax yield.
- Energy taxes amount to 25% of indirect taxes
- Transport taxes are 4% of indirect taxes and half of them are paid by firms
- Pollution taxes amount to a negligible share (0.002) of indirect taxes

Sole 24 ore – 11 August 2012

Il caro carburante

PREZZI E MARGINI DELLA BENZINA E DEL GASOLIO
Euro al litro



Why multisectoral models are the best tool to analyze the impact of energy taxes? (1/2)

- Heterogeneity of economic sectors :

  - Differences in input mix: the tax burden differs because of the production process (e.g. more/less energy intensive)

  -Sectoral tax exemptions and sectoral tax rates

- Tax shifting on prices differs by sectors (e.g. sheltered/not sheltered sectors)
- International competitiveness effects (are exports taxed or exempted?)

Why multisectoral models are the best tool to analyze the impact of energy taxes? (2/2)

Aggregate macromodels cannot estimate the direct and indirect (through intermediate consumption) effects of indirect taxes: the effect on inflation is underestimated.

Multisectoral models are well suited to compute indirect effects on prices and to envisage alternative scenarios of tax shifting. If the model includes international trade, effects on international competitiveness con be effectively estimated.

Moreover if a carbon tax is taken into account, MM can easily include a NAMEA type of dataset to estimate not only the economic but also the environmental effects of introducing an environmental tax.

Energy tax base

- In order to model energy taxes, tax bases need to be identified

- Tax bases are represented by energy uses by product by purpose and economic activity

- This 3-dimensional database is crucial to simulate the impact of energy taxes reform (avoid the double counting problem)

Taking Energy into account(s)

- EUROSTAT current plans: to build Energy PSUTs (Physical Supply and Use Tables)
- All energy flows are quantified in physical natural units (tonnes, cubic metres etc.) as in energy statistics

Energy PSUTs

Figure 1 – Basic structure of Physical Supply and Use Tables for energy flows

SUPPLY

Energy flows	Economy			Environment
	Industries	Households	RoW	
(i) resources				
(ii) products				
(iii) residuals				

= not applicable

USE

Energy flows	Economy				Environment
	Industries (intermediate consumption)	Final uses			
		Households (final consumption)	Changes in inventories	RoW	
(i) resources					
(ii) products					
(iii) residuals					

= not applicable

Source: adapted from Eurostat (2010)

These matrices show *gross* supply and *gross* use of energy products by economic activity therefore “double counting” can occur (i.e. the same energy that is embodied in different products at different stages is counted more than once)

→ primary energy products which are transformed into secondary energy products

Which data energy have we got already?

- *The past:*

  The 1975, 1980, 1982 and 1988 Istat EUTs (Energy Use Tables in physical and monetary terms by activity and purpose)

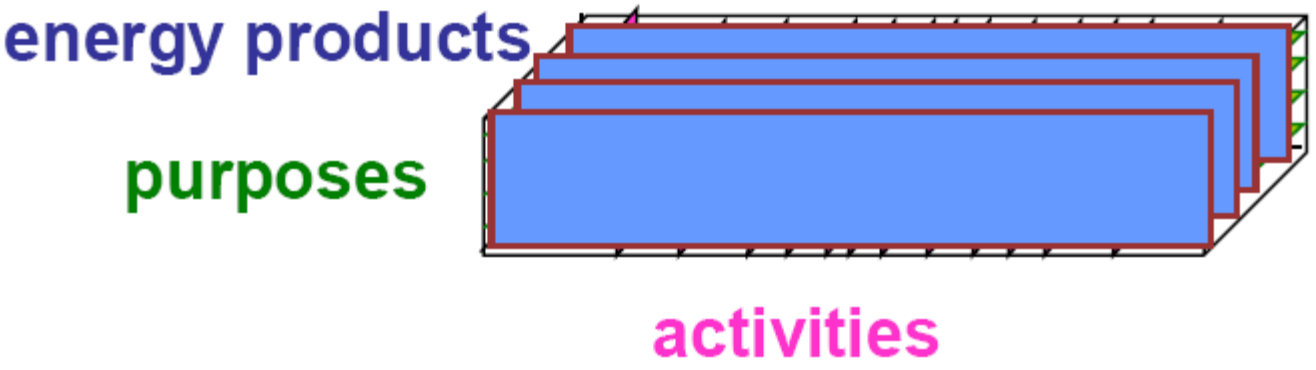
❖ produced and published before the 1990s in connection with the construction of the energy sector of the Input/Output Table (whose data on the transactions of some energy products are obtained by the "price x quantities" method)

❖ provided data on the use of 25 energy products by 92 production activities plus private consumption; for each product, the total amount used was broken down by 4 types of use ("transport", "heating", "non-energy use" and "other use") and by origin of supply ("domestic production" and "imports")

The 1988 EUT was used within INTIMO to simulate the introduction of a carbon tax in Italy (Bardazzi, Grassini, Piacentino, 1994)

Which data energy have we got already?

- The current EUTs (Energy Use Tables by type of use) in physical units broken down by energy product *(27),* type of use *(8)* and economic activity *(101 production activities + households).* Can be seen as set of two-dimensional tables:



The split by purpose and by user

PURPOSES			includes: PRODUCTION ACTIVITIES	HOUSEHOLDS
Energy use with combustion	Heating use		heating (office building, factory, …)	heating (home)
	Transport use	Road transport	road transport carried out both as principal and secondary activity and as ancillary activity (own account)	road transport by households (own account)
		Off-road transport	railway, air and maritime transport as well as all operations of ships, boats, tractors, construction machinery, lawn mowers, military and other equipment	off-road transport by household (mainly operations of boats and lawn mowers)
	Transformation in energy products	Electricity	energy products used to produce electricity (transformation in electricity)	
		Other energy products	energy products used to produce energy products different from electricity (transformation with combustion in energy products different from electricity)	
	Other energy use with combustion		energy products used in production processes (excluding heating, transport and transformation)	energy products used in cooking and for hot water
Energy use without combustion			energy products used to produce other energy products (transformation without combustion in energy products); use of electricity	use of electricity
Non-energy use			energy products used to produce non-energy products (transformation in non-energy products); energy products used for non energy purposes (degreasing, dry cleaning, …)	energy products used for non energy purposes (degreasing, lubrication, …)

- ISTAT has recently released – for the first time since the early 90s – the energy use time series 1990-2008 by purpose and economic activity (without the split by product)
- These figures are gross of transformations: double counting con occur.

Double counting is limited

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	Transformation in energy products	Electricity	energy products used to produce electricity (transformation in electricity)	[redacted]
		Other energy products	energy products used to produce energy products different from electricity (transformation with combustion in energy products different from electricity)	[redacted]
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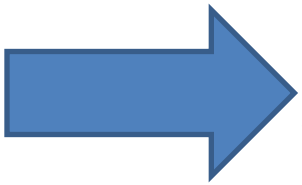
- In the original data source, the 3-dimensional nature of the data (27 products x 8 purposes x 102 activities) ensures that no figure is affected by double counting



therefore this is the data level we are going to work in INTIMO

Thank you for your attention

Long run Price formation with *ad valorem* and excise tax in sector j

$$p_j = \sum_{i=1}^{n} a_{ij}\left[p_i(1+\alpha_{ij})\right](1+t_{ij}) + v_j$$

Italian energy tax rates (2011) and EU Commission proposal

Motor Fuel					Business/ Heating		
	Minimum tax rates (ETD)	Current tax rates (Italy) 2011	Target minimum tax rates (2018)		Minimum tax rates (ETD)	Current tax rates (Italy) 2011	Target minimum tax rates (2018)
Petrol	359	613	359	H Fuel Oil	15	63,75	67,4
Gasoil	330	472	390	Gasoil	21	141,66	57,37
Kerosene	330	337	392	Kerosene	0	101,25	56,27
Lpg	125	227	500	Lpg	0	68,33	64,86
Natural gas	2,6	0,078	10,7	Natural gas	0,15	0,32	1,27
Non business use				Business use			
Electricity	0,5	3,1	0,54	Electricity	1	4,7	0,54

(*) In this table ETD tax base are shown: (1000 litres for Petrol, Gasoil, Kerosene; 1000 Kg dor Lpg and Fuel Oil, Gj for Natural Gas and MWh for Electricity
Source: EU Excise duties (2011) and EU Commission (2011), documentation on Energy Directive revision proposal

OWN AND CROSS-PRICE ELASTICITIES IN A KLEM MODEL

Small and medium enterprises

Elasticity	Labour	Mat.& Serv.	Energy	Capital
Labour	-0.03	-0.15	0.07	0.12
Mat.& Serv.	-0.07	-0.01	0.05	0.02
Energy	0.45	0.76	-1.12	-0.08
Capital	0.47	0.19	-0.05	-0.61

Large enterprises

Elasticity	Labour	Mat.& Serv.	Energy	Capital
Labour	0.01	-0.19	0.05	0.12
Mat.& Serv.	-0.08	0.002	0.07	0.01
Energy	0.34	1.07	-1.22	-0.19
Capital	0.41	0.08	-0.09	-0.40

Source: Bardazzi, Oropallo, Pazienza (2009)