Facultad de Ciencias Económicas y Empresariales
UNIVERSIDAD AUTÓNOMA DE MADRID

3rd Conference Green Growth Knowledge Platform

Implementing a Carbon Tax in Spain: How to Overcome the Fear of Inflation

Miguel Buñuel

Universidad Autónoma de Madrid

(miguel.bunuel@uam.es)

Ca' Foscari University, Venice

January 29, 2015

Introduction (I)

- A carbon tax is equivalent to a tax on CO_2 emissions
- In Spain, 2 regional governments have introduced it
- Arguments for rejecting a carbon tax
  - Spain traditionally had high rates of inflation and energy intensity
- "Tariff deficit" problem
  - Income from electricity tariffs - costs paid by the electricity system

Introduction (II)

- Feed-in tariffs for renewable energy cut to reduce the tariff deficit
  - Conflict between policies to contain the tariff deficit and climate change policy
- Proposal: “green cent”
  - Surcharge on the tax on hydrocarbons earmarked to financing RES
- How to address the relationship between climate change policy and the fear of inflation in Spain?

Financing of renewable energies

- RES benefit society as a whole
  - Their costs should not be financed only by electricity consumers
  - Neither by liquid fuels consumers ("green cent")
- Earmarking ("green cent") is inefficient
- Solution: RES feed-in tariffs to the Public Budget
- Public revenues can be increased with a carbon tax

A carbon tax (I)

- Why?
  - Best fiscal instrument for climate change policy
- Problem:
  - 1/2 CO_2 emissions subject to the EU ETS
- Solutions:
  - Full exemption
  - Deduction of purchase of EU ETS allowances
  - Exemption if $p > t$, but tax = $t - p$ if $t > p$
  - Reduced rates and/or tax exemption emission limits

A carbon tax (II)

- Taxable event: making use of fossil fuels
  - Most energy intensive sectors, exposed to international competition, could be exempted (subject only to the EU ETS)
- Tax base: weight of the carbon in the fuel
- Tax rate:
  - Marginal damage caused by CO_2 emissions
    - Tol (2005): 103 estimates from 28 studies: median = 4 €/ton CO_2, average = 25 €/ton CO_2
    - Watkiss & Downing (2008): from 0 to more than 300 €/ton CO_2

A carbon tax (III)

- Tax rate:
  - EU ETS price of CO_2 as a reference:
    - Since 2008: between 3.5 and 27 €/ton CO_2
    - The EC (2012) projects that carbon prices will be in the range of 10 to 25 €/ton CO_2 in 2020
  - Other countries as a reference:
    - Nordic countries: 13 to 42 €/ton CO_2
  - Time schedule
    - To facilitate acceptance and to limit potential negative effects, it is desirable that tax rates are initially low but increasing according to a preannounced schedule (OECD, 2001)

A carbon tax (IV)

- Proposed tax rate:
  - Year of introduction: 5 €/ton CO_2
  - Increased each year by 2 €/ton CO_2
  - After 10 years: 25 €/ton CO_2

Table 1: Average carbon tax rates by fuel (in euros per gigajoule)

Type of fuel	CO_2 emission factors (t/TJ)	Tax rates (€/GJ)	
		Minimum rate	Maximum rate
Liquid fuels	73,37	0,37	1,83
Solid fuels	98,78	0,49	2,47
Gaseous fuels	56,19	0,28	1,40

Source: Ministerio de Medio Ambiente (2008) and own calculations.

A carbon tax (V)

- Proposed tax rate:

Table 2: Carbon tax rates by fuel type (euros per physical unit)

Fuel type	CO_2 emission factors (t/TJ)	Physical unit	GJ_{LHV}/ unit	CO_2 emission factors (t/unit)	Tax rates (€/unit)	
					Minimum rate	Maximum rate
Natural gas	56,00	m^3N	0,03849	0,00215544	0,01077720	0,05388600
Fuel oil	76,00	Kg	0,04018	0,00305368	0,01526840	0,07634200
Gasoil	73,00	Kg	0,04240	0,00309520	0,01547600	0,07738000
Generic LPG	65,00	Kg	0,04550	0,00295750	0,01478750	0,07393750
Propane	63,60	Kg	0,04620	0,00293832	0,01469160	0,07345800
Butane	66,20	Kg	0,04478	0,00296444	0,01482218	0,07411090
Coal	98,78	Kg	0,03000	0,00296342	0,01481712	0,07408558

Source: Ministerio de Medio Ambiente (2008) and own calculations.

A carbon tax (VI)

- Potential tax revenue:
  - 1,300 million euros in the year of introduction
    - 800 if the electricity sector is exempted
  - 6,600 million after the 10-year transition period
    - 4,000 if the electricity sector is exempted
    - Positive environmental effects not considered: overestimation
- Proposed deductions:
  - From tax liability: EU ETS rights, if not exempt
  - From tax base: carbon not emitted from non-energy uses of fuels

Effects on sectoral prices (I)

- Hypothesis: moderate impact on inflation, even ignoring that the tax contributes to reducing the consumption of fossil fuels
  - Overestimation of the inflationary impact
- Methodology: dual, price version of Leontief's input-output model, with disaggregation of value added and imports
- Statistical sources: Symmetric Input Output Table 2005, which has 73 industries

Effects on sectoral prices (II)

- Problems:
  - No I-O data on energy sectors in physical units
    - Rates converted into purely monetary terms
  - Limited sectoral breakdown of the I-O table in relation to fuels
    - Only calculate the tax rates for the categories of liquid, solid, and gaseous fuels
  - Last available I-O table is from 2005
    - For data consistency, we use the data from the 2005 official inventory of Spanish GHG emissions

Effects on sectoral prices (III)

Table 3: Percentage increase in taxes on domestic production and import prices as a result of the introduction of the carbon tax, by fuel type

Fuel type	Percentage increase	
	Applying the minimum rate	Applying the maximum rate
Liquid fuels	4%	20%
Solid fuels	9%	45%
Gaseous fuels	3%	15%

Source: Own calculations.

Effects on sectoral prices (IV)

Table 4: Sectors whose supply at basic prices is assumed to be the fuels taxed by the carbon tax

Sectors	Fuel type
Extraction of coal, lignite, and peat	Solid fuels
Extraction of crude petroleum and natural gas. Extraction of uranium and thorium	Liquid fuels
Manufacture of coke, refined petroleum products, and nuclear fuel	Liquid fuels
Production and distribution of gas	Gaseous fuels

Source: Own construction.

Effects on sectoral prices (V)

- Final steps
  - The % increases in Table 3 are added to the tax coefficients of the sectors in Table 4 in the matrix of added value coefficients
  - The same % of Table 3 are applied to increase the import prices of the sectors in Table 4, adding them in the vector of sectoral import prices
  - Having modified the I-O model in this way, we can solve for the two considered tax rates, obtaining the results for the 73 industries

Effects on sectoral prices (VI)

Table 5: Sectors with the highest price increases caused by the introduction of the carbon tax

Sectors	Price increase applying	
	Minimum rate	Maximum rate
Extraction of coal, lignite, and peat	9,44%	47,21%
Manufacture of coke, refined petroleum products, and nuclear fuel	7,15%	35,76%
Production and distribution of gas	5,77%	28,85%
Extraction of crude petroleum and natural gas. Extraction of uranium and thorium	4,79%	23,93%
Production and distribution of electricity	1,90%	9,51%
Air and space transport	0,98%	4,91%
Maritime transport	0,76%	3,79%
Chemical industry	0,72%	3,58%
Land transport and pipeline transport	0,64%	3,18%
Extraction of non-metallic minerals	0,62%	3,11%
Ceramic industries	0,48%	2,41%
Extraction of metallic minerals	0,43%	2,14%
Manufacture of cement, lime, and plaster	0,42%	2,10%
Manufacture of glass, and glass products	0,42%	2,10%

Source: Own calculations.

Conclusions (I)

- The potential maximum tax revenues (6,600 million euros) are close to the total cost of premiums and incentives for RES and cogeneration from October 2013 to September 2014 (6,400 million euros)
- Simulation:
  - No major inflationary effects beyond the direct impact on fuel prices,
  - except for the sector of production and distribution of electricity

Conclusions (II)

- This effect would be offset if RES premiums cease to be a cost for the electricity system
  - These premiums represent today a % of total electricity costs larger than the maximum price increase that we have estimated
  - Hence, the combined effect of the tax and of transferring RES premiums to the Public Budget could actually reduce the price of electricity
- Alternatively, part of the revenue could be used to reduce other taxes on businesses
  - The effect on sectoral prices would be largely mitigated, as well as any negative effect on Spanish competitiveness

Conclusions (III)

- Sources of overestimation of the effect on prices:
  - Our simulation does not allow taking into account the proposed exemptions
  - The I-O tables for 2005 reflect a production structure that is more intensive in energy use and CO_2 emissions than the current one
    - The greatest development of RES in Spain occurred after 2005
  - We should expect that the gradual introduction of the tax will push firms to increase their energy efficiency before tax rates reach their peak
- Finally, inflation is currently at historic low levels, and there even exists concerns of deflation
  - Best opportunity ever for introducing a carbon tax