

# Environmental Tax Reforms: Rationale, Benefits and Pitfalls

Fiscal Reforms for Low Carbon Growth in the Mediterranean

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# Basis for Environmental Taxes

- Internalize external costs
- Ensure that prices reflect social costs of production including environmental costs
- Early discussion of such taxes was based on
  - Setting taxes at marginal damages caused
  - Assuming certain knowledge about costs of abatement and damages
  - Ignoring what happened to the revenue
  - Ignoring issues of competitiveness

## More Recent Literature on Ecotaxes

- Recognize that we cannot set tax at marginal damage for all polluters. Nevertheless comparing 'approximate' eco-taxes to 'approximate' command and control researchers have found that eco-taxes can often be more efficient. Much of this work, however, is 'simulation' based.

## More Recent Literature on Ecotaxes Uncertainty About Costs/Damages

- When consequences of being wrong about damages is critical (e.g. serious health effects) it is better to go for quantitative controls
- When consequences of being wrong about costs is critical (e.g. unemployment) it is better to go for tax based systems.
- More generally the choice depends on how sensitive marginal costs and damages are to emissions.

# More Recent Literature on Ecotaxes

## What Happens to Revenues?

- Revenues from eco-taxes are 'good' in the sense that government raises them largely without causing distortions in the economy.
- But should taxes go to budget or be earmarked for environmental programs?
  - Pro 'earmarking' argument is that it makes tax more acceptable by all parties and can reduce impacts on competitiveness
  - Main anti 'earmarking' arguments are: (a) environmental expenditures should not depend on environmental revenues (b) it makes application of unified public expenditure principles more difficult and reduces macroeconomic flexibility

## More Recent Literature on Ecotaxes

### The Double Dividend

- Because eco tax revenues are benign, it has been suggested that they can be used to reduce other taxes such as employment taxes, thus creating a 'double dividend' – reduced pollution and improved economic welfare. This double dividend has been studied in some depth.
- The claim that using eco taxes to reduce other taxes will increase welfare is not shown to be generally true. This depends on how distorted the existing tax system is. It is worth distinguishing between an 'employment double dividend' and an 'economic welfare' double dividend.

## More Recent Literature on Ecotaxes

### Double Dividend

- An economic welfare double dividend states that the eco tax results in an increase in welfare excluding the gains from the reduction in pollution. This is generally very difficult to establish.
- An employment double dividend claims a reduction in employment if payroll and similar taxes are reduced. This depends on how distorted the existing tax system is. In countries with high payroll taxes such a double dividend is more likely.
- It is also likely when there is a large informal sector

# How/When A Carbon Tax Can Create Employment

- Firms switch away from energy to labor
  - Effect is greater when elasticity of substitution between energy and labor is high
  - And when elasticity of substitution between energy and capital is low
- The carbon tax is recycled through a reduction in other taxes.
  - Effect is greater when present taxes are distorted
  - And when the recycling is via reductions in high labor taxes.
  - Reducing labor taxes can give incentives to switch out of the informal sector.

# How/When A Carbon Tax Can Create Employment

- The economy has unemployment in the first place.
  - Effect is greater when reduced labor taxes, which increase demand for labour are not offset by increased wage demands
  - The unemployment is not 'structural' and the labor market can respond to increased demand.
- The economy may not have unemployment but labor supply may be responsive to increased real wages.

# How/When A Carbon Tax Can Create Employment

- The employment effect will be greater when:
  - Capital is not very mobile internationally (if it is mobile, the carbon tax cannot be absorbed by capital and has to be borne by labor, reducing employment effect)
  - Non-working households are significant in number, so carbon tax can be passed on to them and less is borne by workers
  - The country has enough international market power to raise prices of carbon intensive goods without causing a fall in production and therefore a fall in labor demand.

## Results from Previous Studies of ETF

- 1992 tax proposal of carbon/energy tax @ \$3->\$10 over 7 years recycled via reduced social security payments.
- In 2018 prices these tax rates would be \$5.4 to \$18/tCO<sub>2</sub>
- Results showed employment increase of 0.1% to 2.2% in first year, going up to 0.4% to 3.2% in year 10.
- 2002 energy directive which raised taxes on a range of fossil fuels was analysed with similar reductions in social security payments.
- The modelling showed a gain in employment across EU15 of 0.11% to 0.33% (190,000 to 450,000 jobs).

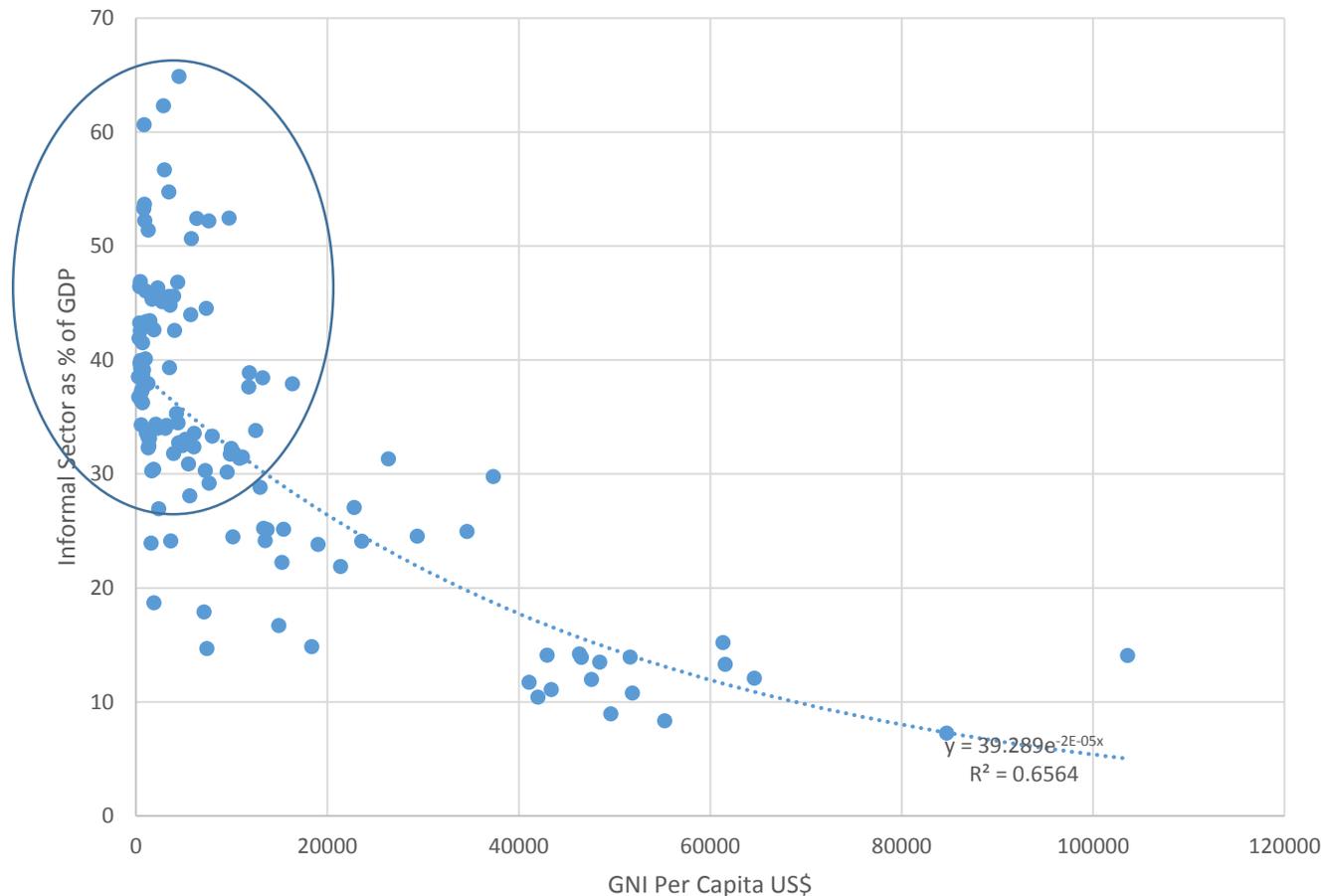
# **Impact of the Informal Sector**

# Why the Informal Sector is Important

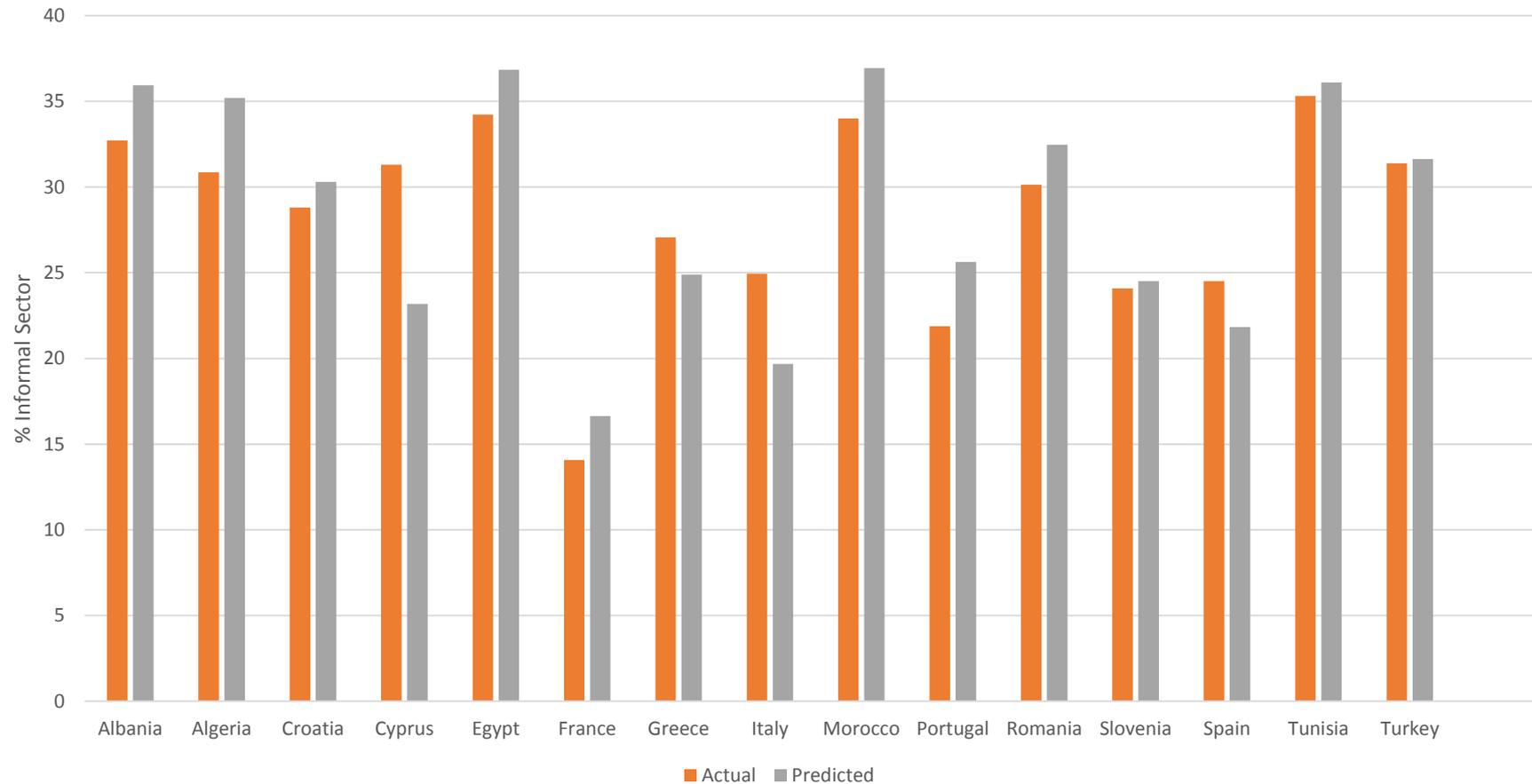
- A large informal sector reduces government revenues and also makes control of the environment more difficult.
- A major factor in keeping economic activity outside the formal sector is the presence of employment and social security taxes.
- If environmental tax reforms reduce such taxes they reduce the incentive to be outside the formal sector.
- The size of the informal sector as percent of GDP varies considerably. Although it is greater in less developed countries there is a large variation within such countries. (See next slide).
- A case study was carried out of ETF in Spain taking account of the informal sector.

# Informal Sector as % of GDP Per Capita GDP

Data Source: <https://www.imf.org/en/Publications/WP/Issues/2018/01/25/Shadow-Economies-Around-the-World-What-Did-We-Learn-Over-the-Last-20-Years-45583>



# Mediterranean Countries are Mostly Close to Predicted Informal Sectors



# ETF Case Study of Spanish Economy

- Traditionally high unemployment relative to trading partners and other EU member states.
  - The current level of around 15%, while high, is similar to that experienced from 1984 to 1998. The low levels of 1998-2006 were exceptional for the country. From
- Large informal sector.
  - Arrazola et al. (2010) estimate the size of the shadow economy following different methodologies. They conclude that for the period 2005-08 the shadow economy represented 21.5% of GDP, with a loss of revenue for the government of 7% of GDP. This shadow economy engages 4.3 million shadow jobs. **The IMF global estimate shown gives a slightly higher figure (24.5%).**

# Markandya, Gonzalez and Escapa (MGE)

- Main features of the model similar to the previous studies.
  - Static CGE model with unemployment modeled via a wage curve
  - Single household
  - Nested CES production and utility functions to allow for substitution between different fossil fuels; between fossil fuels in producing electricity; and between K-L and an energy aggregate.
- Difference with previous models are:
  - Include an informal sector for labour
  - Use the 2005 I-O data
  - Account for benefits of reductions in local pollutants.

# MGE Model: labor market

- Unemployment is modelled through a 'wage curve', which represents the results of collective bargaining in the labour market and in which the real wage is a declining function of the rate of unemployment.
- This function is commonly written as:

$$\frac{W_F}{P} = u^{-\theta}$$

- where  $u$  is the unemployment rate,  $\theta$  is an elasticity parameter the sensitivity of the real wage rate to the unemployment rate and  $W/P$  is the real wage
- Estimation of  $\theta$  for countries (Blanchflower and Oswald, 1995, 2005).

# MGE Model: labor market II

- Formal and informal labour are substitutes in a CES function. There is a parameter ( $\sigma$ ) that controls the level of substitutability between both production factors.
- Wages in the two sectors are in equilibrium when the expected wage in the formal sector is equal to the wage in the informal sector.
  - $W_I = W_F (1 - u)$
- Thus when demand in the formal sector increases the expected wage goes up for two reasons and this causes a shift from the informal to the formal sector. In equilibrium both wage rise but the rise in the formal wage depends on the wage curve elasticity.
- The baseline combinations of informal and formal labor vary by sector, with data from a Danish study (Hvidtfeldt (2011)).

# MGE Model – Simulations and Calibrations

- We model different reductions in emissions (the model can cope with reductions of up to 40%).
- Tax rates needed to achieve a 15% reduction are in the range of US\$42-62/tCO<sub>2</sub>
- Three types of recycling are considered: via a lump sum tax (LST), via a reduction in capital taxes (K) and via a reduction in labor taxes (L).
- Elasticities of substitution between energy types and between K-L and energy are taken from the values of Spain in the MIT global model of Babiker et al.
- Emissions of local pollutants by sector are taken from INE data, with values of damages from Markandya et al, (2010).

# MGE Model Results

- With flexibility in the wage curve and in the formal and informal labour markets there is a gain in welfare (EV) of around 3%.
- Welfare effects are strongly dependent on the assumed elasticities of wage curve and substitutability between formal and informal labour. The lower the wage curve elasticity the greater the welfare gains of an L reform. And the higher the elasticity of substitution between formal and informal labour the greater is the welfare gain.
- Unemployment fall is significant with the “default” values of the two elasticities (around 3.5%).

# MGE Model Results

% Changes	Alternative Tax Recycling		
	Lump Sum T	Tax K	Tax L
Welfare	-0.91	-0.91	2.89
Shadow Economy (Base = 20%)	20.9	20.9	14.5
Unemployment (Base = 20%)	21.4	21.4	16.5
CO2 Tax US\$/tCO2	45.8	45.7	62.4
CO2 Emissions	-15.0	-15.0	-15.0

# MGE Model Results

- Taking the best guess values of the parameters we get, with a labour tax recycling scheme, a reduction in unemployment of 3.5%.
  - If there is no flexibility between formal and informal labour (the two are used in fixed proportions) the reduction in unemployment is smaller – 3.0%.
  - So introducing an informal sector contributes about 0.5% to the estimated reduction in unemployment with the proposed tax shifts. (However there is also a reduction of the shadow economy)
- If we have flexibility between formal and informal labour in production but the unemployment-wage relationship is rigid, unemployment still falls a little (by 1.5%), because workers from the informal sector are brought into the formal sector and this reduces the measured level of unemployment

# MGE Model Results: Local Pollutants

- Traditional measures of the benefits of ETR do not account for the gains in terms of lower emissions of local pollutants.
- We consider SO<sub>2</sub>, NO<sub>x</sub>, Non-Metallic Volatile Organic Compounds, methane, carbon-monoxide, nitrous oxides, ammonia and particulate matter.
- Coefficients of emissions per unit of output by sector from the National Statistical Office of Spain (INE 2009b).
- Damage from pollutants: estimates for Spain from CASES Project (Markandya et al 2010) (€/tonne): SO<sub>2</sub> (4,518), NO<sub>x</sub> (3,229), NMVOC(740), ammonia (4,936) and PPM(825).
- Damage from CO<sub>2</sub>-eq: lower bound of €17.2/tonne and a higher bound of €32 from European Commission (2008)

# MGE Model Results

- Damages avoided in total with the L reform are around one billion euros.
- Damages avoided with other reforms (LST and K) are higher because the L reform induces an increase in output which increases emissions.
- The value of the reduction in damages are between 0.3 and 1% of GDP.
- Most the benefits come from the reduction in CO<sub>2</sub>. Other pollutants account for only a very small part of the total on the L reform (but a bigger part with the LST and K reforms).

# Conclusions on ETR in Spain

- The study shows that replacing part of the labor taxes with a carbon tax of US\$50-60 t/CO<sub>2</sub> will have the benefit of a reduction in unemployment and either a small loss of welfare or a small gain (as measured by the equivalent variation (EV)).
- Our latest analysis shows that if these are included together with the shadow economy the environmental tax reform results in a notable increase in welfare (around 3%).
- The reduction in unemployment is higher than in previous models, partly because we have included the informal sector in the analysis.

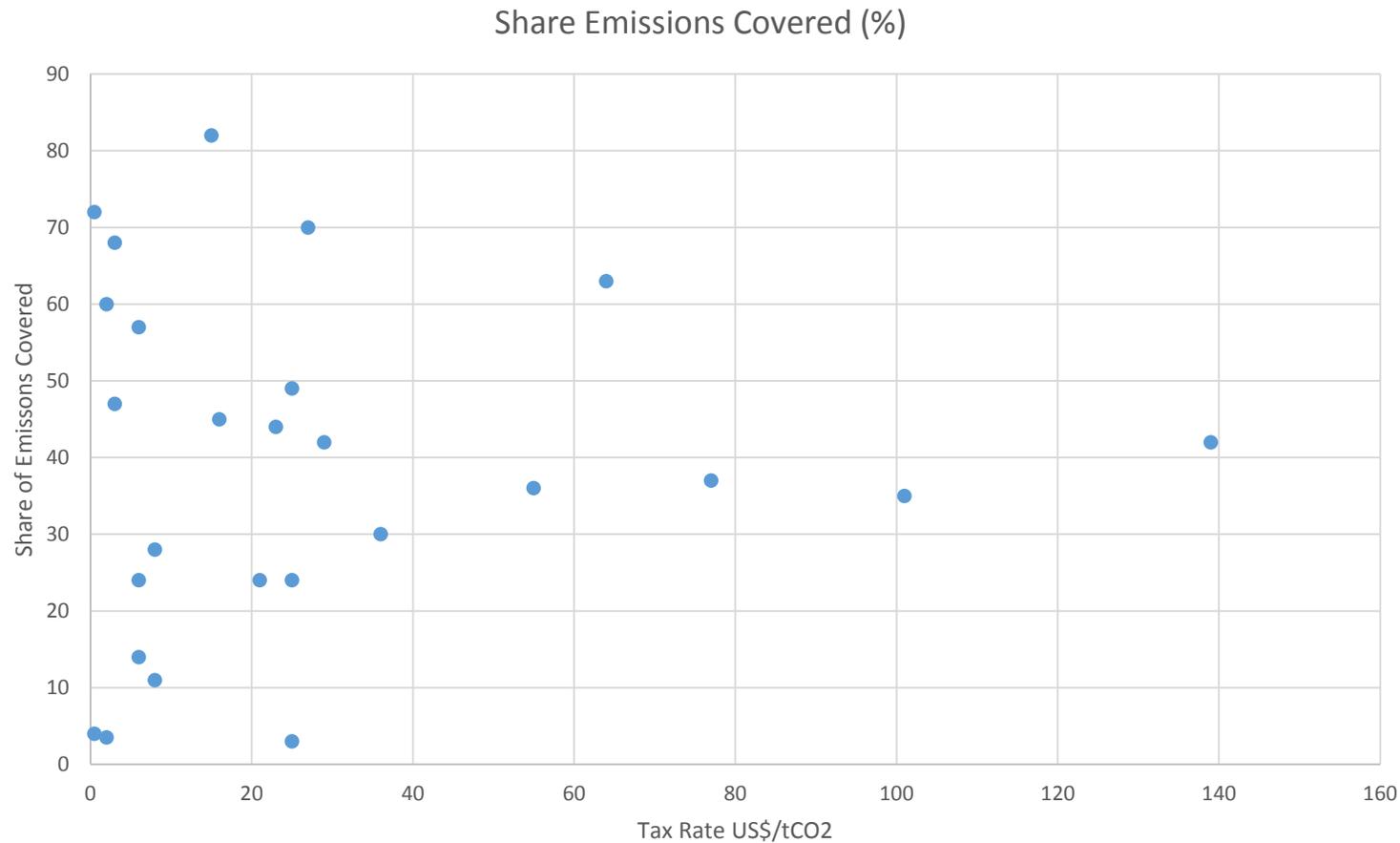
# Some Qualifications

- The models are highly stylized and take no account of dynamic effects. Hence we could not expect a tax reform to generate the changes in one period, but rather to take place over a number of quarters.
- Trade impacts are muted in the models. Hence a reform of this kind would need to be pan-European to avoid major impacts.
- We need to better understand the distributional effects.
- Nevertheless we would conclude that the case for an environmental tax reform involving recycling via a labour tax reduction is strong for Spain.

# Some Conclusions and Lessons for Emerging Economies

- Results of the analysis point to small possible employment effects of a carbon tax, when accompanied by recycling of revenues.
- For the energy directive, the likely effect is an increase of around 0.1-0.4%.
- In developing countries the effect may be at the upper end of this range.  
Why?
  - There is possibly more surplus labor
  - The elasticity of substitution between energy and labor is likely to be fairly high in the short run (hiring middle skilled level workers to improve energy efficiency).
- But for schemes to work the carbon taxes will have to be significant and cover a major part of the emissions sources. This is not the case at present.
- One possibility is to reduce fossil fuel energy subsidies and use the savings to reduce employment taxes in the formal sector in developing countries. This may generate a similar double dividend to the one shown here.

# 2018 Data on Carbon Taxes and Share of Emissions Taxed



Shares are mostly below 40%.  
Taxes rarely above \$30/tCO<sub>2</sub>

# **Carbon Taxes, and Competitiveness**

# Carbon Taxes and Competitiveness

- If one country has carbon taxes and another country does not then trade will be affected and liberalizing trade will not necessarily increase welfare in the country without taxes. This affects tax policy in WTO context.
- The main issue for most countries is competitiveness – do taxes provide a ‘level playing field’? This issue is under much discussion now.

# General Findings on Competitiveness

- Within the EU, competitiveness effects of environmental measures have mostly been small
  - A lot of trade is between countries affected by same measures
  - Relocation of industry to lower level environmental standard countries has been relatively rare (although some evidence for this)

## Effects of Carbon Tax on Competitiveness

- Relocation and shifting of production to lower carbon regulated countries is called “Carbon Leakage”. While models show this can be significant (e.g. shift to countries like India and China), empirical evidence is still limited.
- In general macroeconomic models based on econometric analysis find lower competitiveness effects or even negligible effects when revenues are recycled via reduction in other taxes. (OECD, 1997).

## Effects of Carbon Tax on Competitiveness

- Econometric models show losses from environmental regulations to be around 1% of GDP
- But carbon leakage effects are relatively large in some models. Depends on how much capital mobility is assumed and how much substitution in demand there is between domestic and imported goods.

## Effects of Carbon Tax on Competitiveness

- OECD analyzed carbon tax of \$100/tonne introduced only in OECD. Although overall findings are for small effects:
  - Situation in individual countries can vary significantly from average
  - Inflation and other macro effects not captured
  - Models do not allow for full adjustments to process
  - Models do not allow for possible energy efficiency improvements

# Limitations of Above Studies

- Studies are of a 'macro' nature. Don't take account of:
  - real costs of environmental zoning,
  - delays and uncertainties in the permitting process,
  - administrative costs of identifying and complying with environmental regulations, which can also affect competitive performance.
- Recent World Bank work shows standards to have a bigger effect on trade flows than taxes.

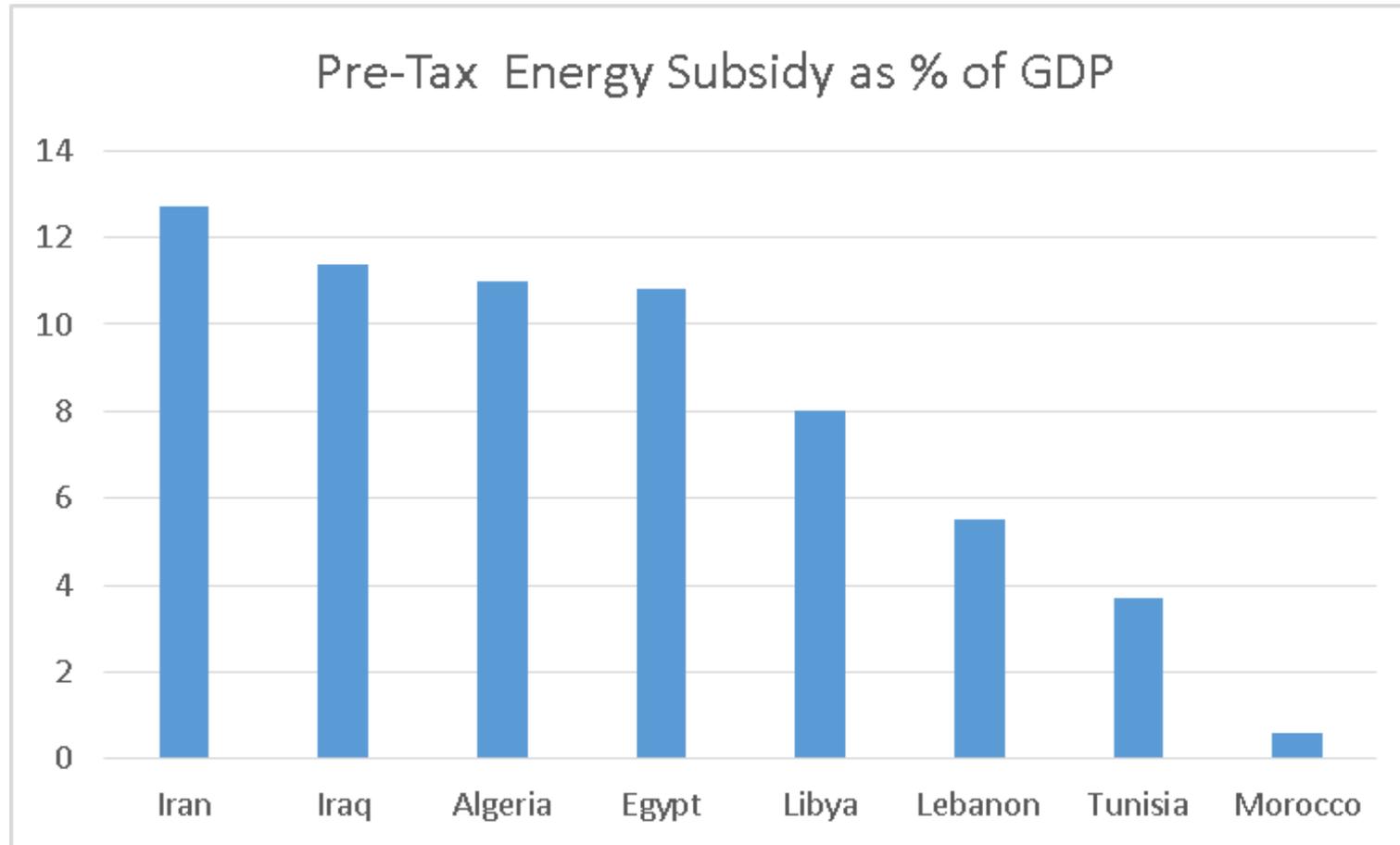
# Conclusions

- There is some scope in Europe for a double dividend from a carbon/energy tax being used to replace a payroll tax.
- But the more important benefits of carbon/energy taxation will be to reduce energy use, reduce local pollutants and make our economies less dependent on fossil fuels.
- In developing countries the scope will depend on how high the carbon tax can go and what employment taxes are being imposed. With a high carbon tax that replaces significant employment taxes the potential for employment gains and environmental gains could be considerable.

# Policy Implications for Emerging Economies

- Really worth looking at ETR as a source of
  - Revenues for environmental protection
  - Reductions in employment taxes in the formal sector
- What kind of ETRs?
  - Reductions in fossil fuel energy subsidies.
  - Carbon taxes
  - Charges for waste disposal services to reflect cost
  - Charges for water supply and sewerage to reflect cost

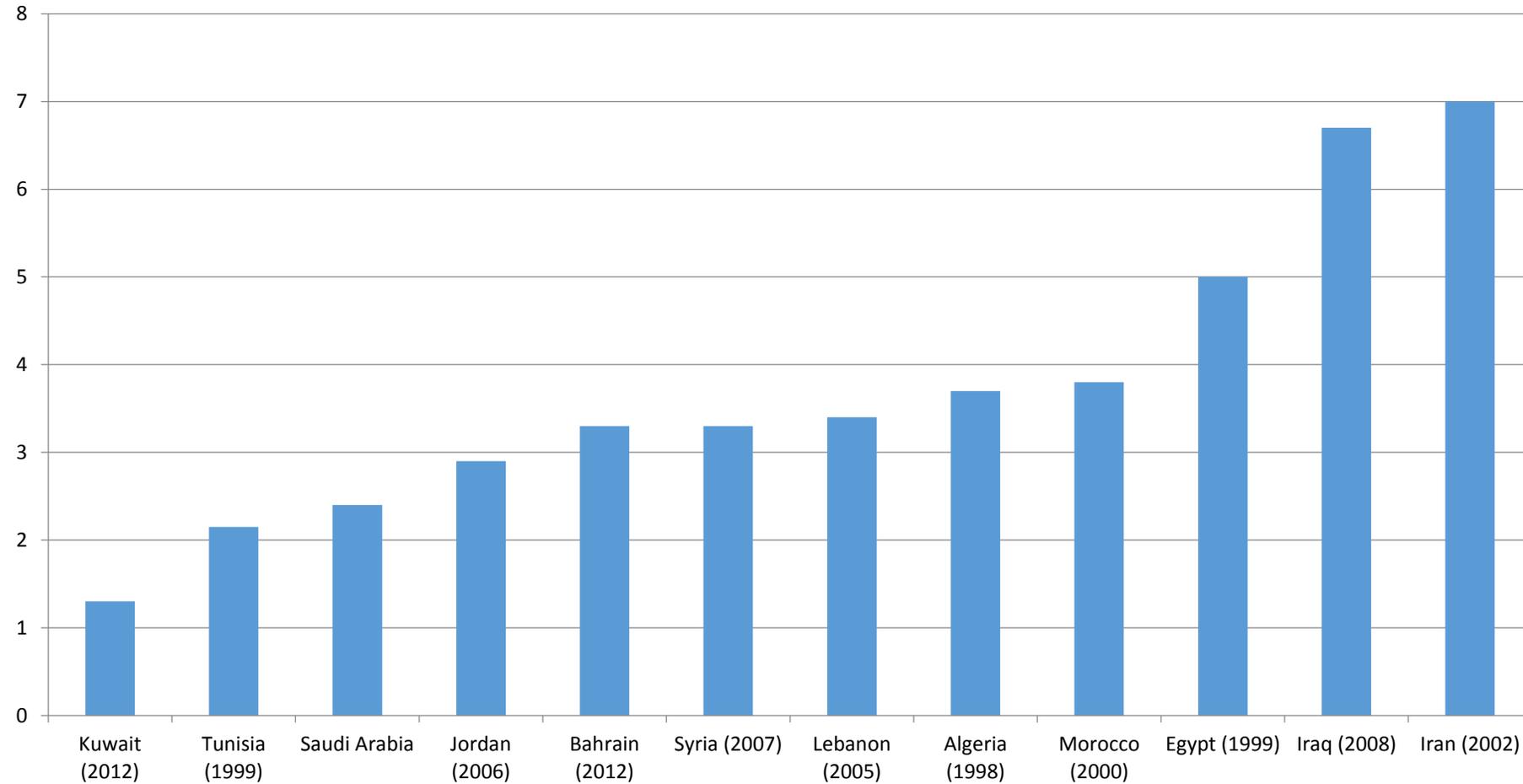
# Energy Subsidies in Selected MENA States



Subsidies to fossil fuels & nuclear in EU28 in 2012 was about 0.13% of GDP, [https://ec.europa.eu/energy/sites/ener/files/documents/EC\\_OFYS%202014%20Subsidies%20and%20costs%20of%20EU%20energy\\_11\\_Nov.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/EC_OFYS%202014%20Subsidies%20and%20costs%20of%20EU%20energy_11_Nov.pdf).

Source: <https://www.imf.org/external/np/fad/subsidies/pdf/menanote.pdf>.

# Costs of Environmental Degradation in MENA



Thank You

Merci

شكرا لكم