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Pigovian Carbon Tax Rate: Can It Help to Achieve a Sustainability in the European Union?

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The project is funded by the European Union's Horizon 2020 research and innovation programme 2014-2018, grant agreement No FairTax 649439

Agenda

Problem statement and RQ

Fallacies of Pigovian rationale

Main Findings

Concluding remarks

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RQ

Can Pigovian taxation have a significant impact on environmental externalities?

If we rely solely on carbon taxation, what should be the expected outcome?

Do carbon taxes have an substantial environmental finality?

What additional measures should states implement to enhance environment protection?

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Key Concepts

Externality – is a cost or a benefit that involves a third party who is not part of a market transaction.

Private Costs + External Costs = Social Costs; If external costs > 0, then private costs < social costs

External costs are not reflected on firms' income statements or in consumers' decisions. External costs remain costs to society, regardless of who pays for them.

Social costs include both the private costs and any other external costs to society arising from the production or consumption of a good or service

Pigou's theory - to eliminate **negative externalities** proposes a tax equal to the social cost made by pollution unit, until the pollutant agent will fully internalize the costs of its economic activities

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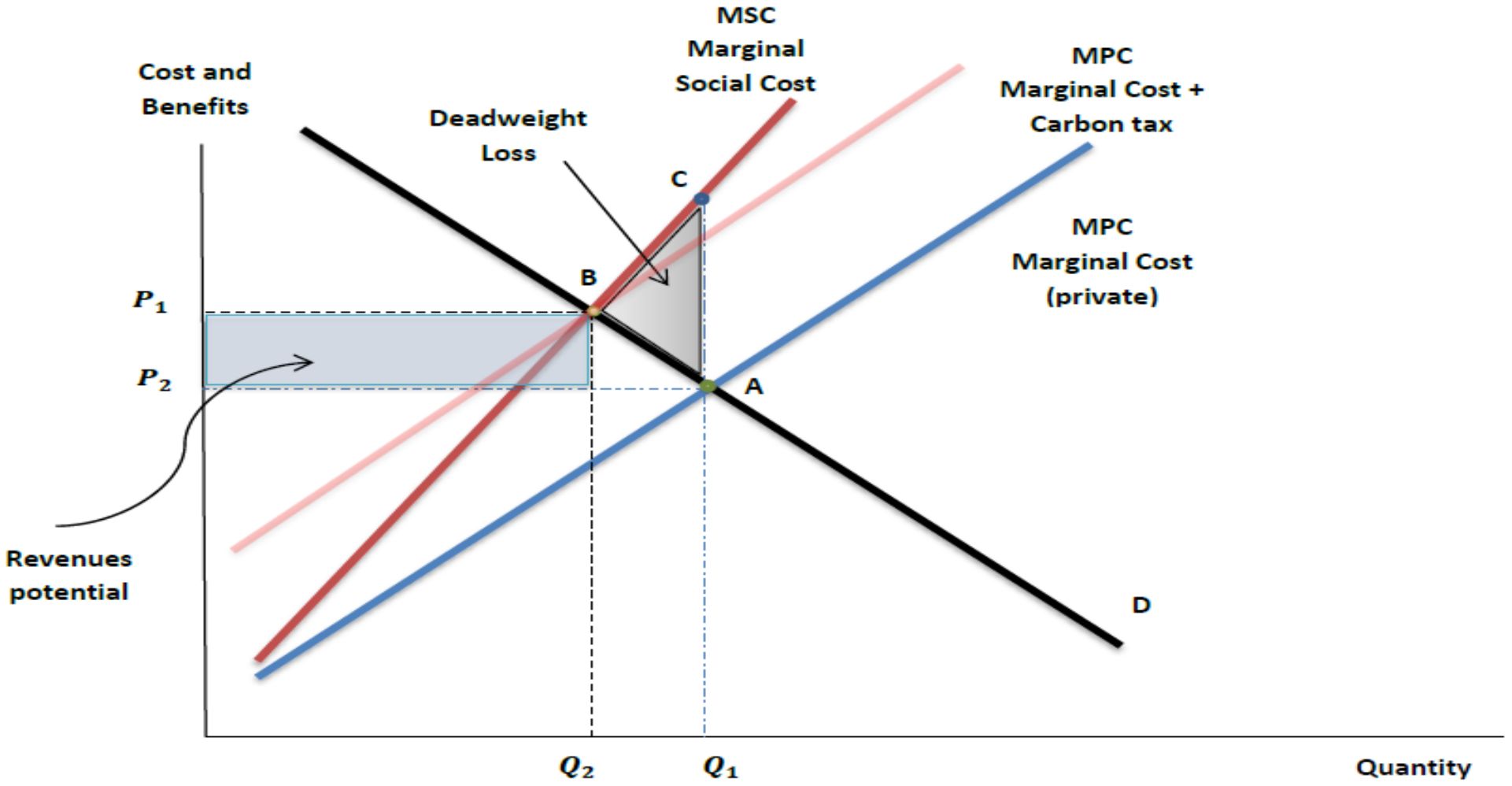
Pigovian Theory on negative externalities



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Pigovian Theory Assessment

Followers: - Tax interaction effect
- Revenue recycling effect;

Opponents: - Property rights, bargain (Coase Theorem, 1960);
- Uncertainty, double – burden upon pollutant agent,
- Cost of public policy abatement.

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Adjustments of Pigovian theory and its followers

Bovenberg and Goulder (1996) – the **optimal environmental tax** is **below Pigouvian tax rate**

Fullerton and Wolverton (1997) – propose an presumptive Pigouvian tax

Cremer et al. (1998) – the level of Pigouvian tax is diminished by additional property of the burden of already existent fiscal system

Cuervo and Ghandi (1998) and **Christiansen and Smithson** (2012) propose a proxy tax on pollution

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Adjustments of Pigovian theory and its followers

Meade (1952) – environment protection levies represent net additions to the society general fiscal burden.

Baumol (1972) difficulty of measuring social cost of pollution asks for a proxy tax

Sandmo (1975) – in a second-best framework, Pigouvian taxes have an additive property.

Oates (1995) - carbon taxes bear the double dividend advantage

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Unsettled Issues

Pigovian rationale tries to solve the uncompensated damages without assessing the context from which they originate

There is no regard to the moments from which negative externalities are produced, like production or consumption

The literature focuses insistently upon the loss of welfare of a non-consenting and non-compensated third party, without including the associated benefits

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Rules of handling Environmental externalities

Fossil fuel based productive activities inflict serious damages to the environment.

Non-renewable resources (fossil fuels) exhaustion exposes the process of production and consumption to unsecure and hazardous future.

Environmental externality is a cost of one's activities that lower the ability to produce and consume of other's, and in this case we all are involved.

It is a **global externality**, which spans on a **long term**, involving a considerable number of **risks** and **uncertainties** extended on a large scale.

In this case fixing just a simple market failure goes beyond what theory recommends us.

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Fallacies of Pigovian Theory

Uncertainty of pollution damages and difficulty of measuring social cost (firs-best solution issue)

Buchanan and Stubblebine (1972) – the double impact of environmental levies on the pollutant agent

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Main Findings

Hardin (1968) proposes the analysis of private and social cost in an aggregate manner

The myopic approach of social costs borne by third parties in case of Pigouvian taxation

One must understand that social costs are not affecting just third parties, but also the pollutant agent bears his share of social costs involuntary.

Even if we focus our attention upon producers as main source of pollution, we must analyze their productive activities in an aggregate framework

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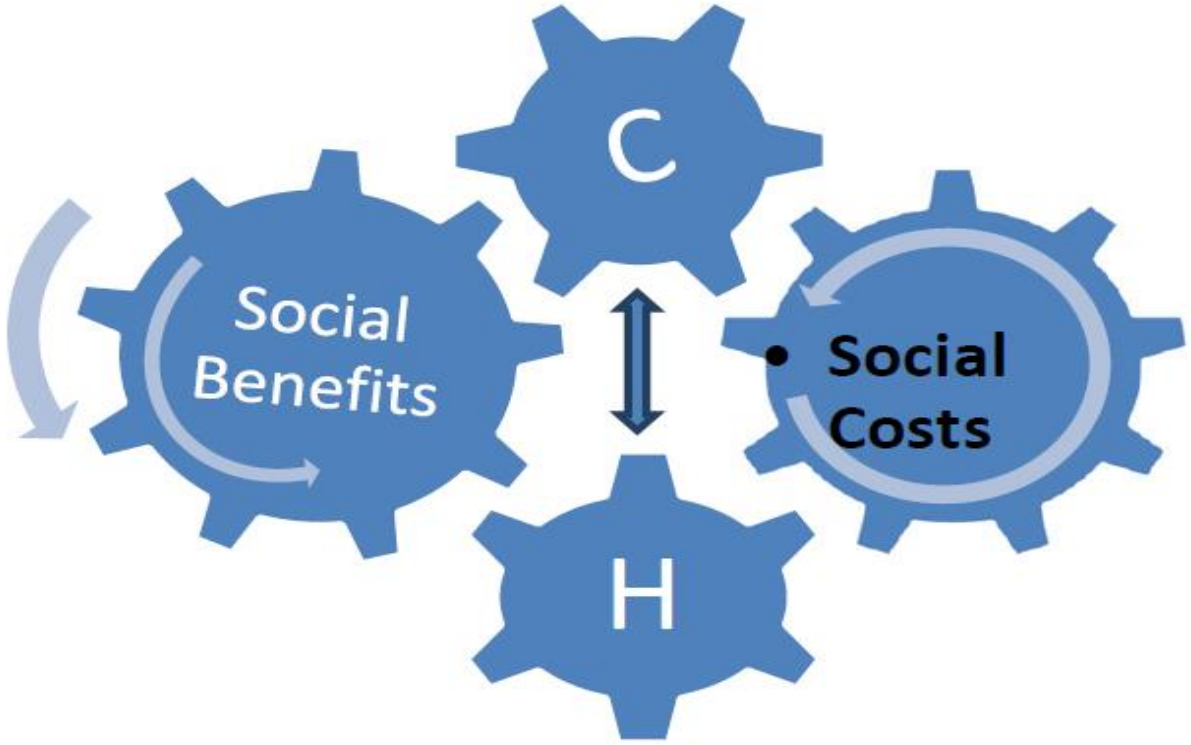
The interdependencies between private and social costs and benefits



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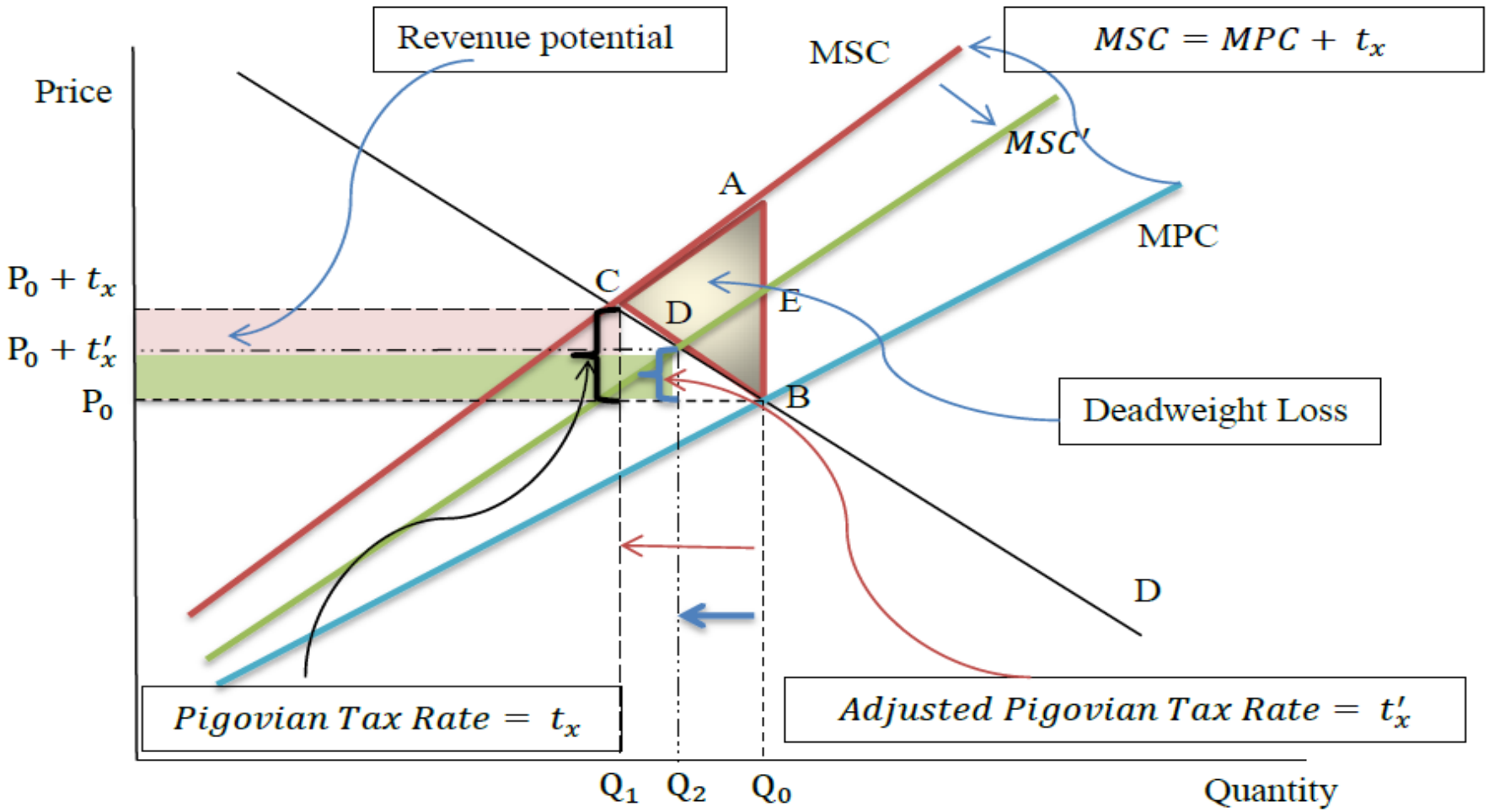
The Adjustment of Pigovian Tax Rate



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Empirical Analysis of carbon taxation efficiency

Correlation between public spending on environmental R&D, environmentally related taxes and green patents in OECD countries

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Correlation between public spending on environmental R&D, environmentally related taxes and green patents in OECD countries

State	Correlation results: Environmental tax and Green patents	Correlation results: Public spending for environmentally related R&D and Green patents
Australia	-0.755	0.589
Austria	0.252	-0.421
Belgium	-0.834	0.322
Denmark	-0.346	-0.660
Finland	-0.638	-0.642
France	-0.847	0.460
Germany	-0.201	-0.812
Italy	-0.827	0.666
Japan	-0.412	0.900
Netherlands	0.589	-0.817
Norway	-0.839	-0.690
Sweden	-0.454	-0.456
UK	-0.769	0.350
US	-0.892	-0.859

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Empirical Analysis of carbon taxation efficiency

Multiple variable regression which test the impact of public spending on environmentally related R&D on green innovation in 26 OECD countries

Regression equation

$$lnGreen_{i,t} = \beta_{0i,t} + \beta_1(lnPubs)_{i,t} + \beta_2(lnEnv)_{i,t} + \beta_3(Industry)_{i,t} + \beta_4(lnGDP)_{i,t} + \beta_5(lnPop)_{i,t} + \varepsilon_{i,t}$$

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The results of log-linear model estimates on green innovation

Dependent Variable: GREEN INNOVATION				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
C	8.168087	0.781273	10.45484	0
PUBS	-0.3697	0.189448	-1.95145	0.0522*
INDUSTRY	-0.02254	0.021017	-1.07264	0.2845
ENV	-1.52922	0.431106	-3.5472	0.0005*
POPULATION	0.003088	0.000971	3.181274	0.0017*
GDP	-4.3813	3.881437	-1.12878	0.2601
R-squared	0.125745	Mean dependent var		6.023102
Adjusted R-squared	0.107757	S.D. dependent var		1.64832
F-statistic	6.990214	Durbin-Watson stat		0.098795
Prob(F-statistic)	0.000004			

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Concluding remarks:

The design of an efficient carbon tax depends on the applicability of fundamental rationale

Pigouvian theory on externalities must overcome the **determination of social cost of pollution**

Carbon tax rate must be lower than Pigovian proposal, firstly, because a share of external costs of pollution it is born by its source and secondly because the levy enters an already distortionary fiscal system

In second-best framework, the efficiency of carbon taxation on pollution mitigation is significantly lowered, thus complementary measures like compensation are necessary.

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Than you for your attention!

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