A new Environmental Tax Reform with resource substitution

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Presentation structure

- Motivation
- The model
- Equilibrium features
- Sensitivity analysis
- Empirical results
- Conclusions

Motivation

- Assess the existence or not of a double dividend of an alternative type of Environmental Tax Reform (ETR)

- Tax on emissions revenues are used to finance a subsidy to Renewable Energy Sources (RES)

The model

Sectors

Households	• Utility increases with consumption and decreases with pollution $U(C, E) = \ln C_t - \ln E_t$
Final-goods sector	• Homogeneous good, perfect competition • Firms use (polluting) non-renewable resources and (non-polluting) renewable resources to produce $Y_{n,t} = \phi {R_{n,t}}^{\alpha} {F_{n,t}}^{1-\alpha}$
Resources sectors: • Renewable Resources (R) • Non-Renewable Resources (F)	• Monopolistic firm • Scarcity and pollution - F • First: extraction costs constant • Extended version: the firm invest in knowledge to reduce extraction costs
Government	• Two policy instruments: tax on emissions (paid by final good producers); direct subsidy to R extraction (received by the monopolistic firm)

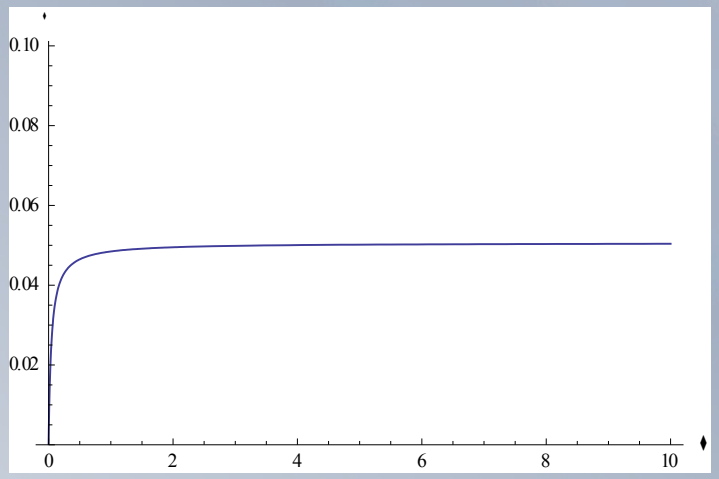
Equilibrium features

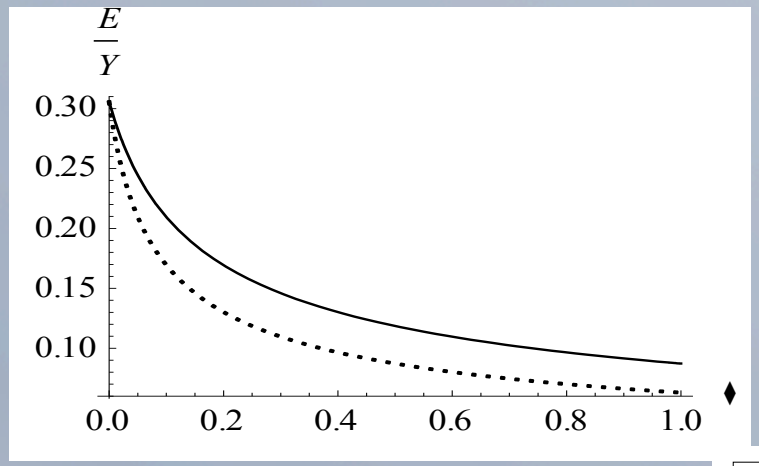
Renewable Resources	$p_R = \frac{c_R - \sigma}{\alpha}$; $R = \left(\frac{\alpha^2 \phi}{c_R - \sigma}\right)^{\frac{1}{1-\alpha}} F$
Non-Renewable Resources	$p_F = \frac{c_F + \lambda + \alpha\tau}{1-\alpha}$; $F = \left(\frac{(1-\alpha)^2 \phi}{c_F + \lambda + \tau}\right)^{\frac{1}{\alpha}} R$
Policy Interaction	$\sigma = \frac{(1-\alpha)^2 \tau c_R}{\alpha^2 (c_F + \lambda + \tau) + (1-\alpha)^2 \tau}$
Renewables intensity of production	$\frac{R}{F} = \left(\frac{\alpha}{1-\alpha}\right)^2 \left(\frac{c_F + \lambda + \tau}{c_R - \sigma}\right)$
Emissions per output	$\frac{E}{Y} = \frac{\psi}{\phi} \frac{(1-\alpha)^{2\alpha} (c_R - \sigma)^{\alpha}}{\alpha^{2\alpha} (c_F + \lambda + \tau)^{\alpha}}$
Utility	$U = \ln\left(\frac{\Lambda \phi}{\psi} \frac{\alpha^{2\alpha} (c_F + \lambda + \tau)^{\alpha}}{(1-\alpha)^{2\alpha} (c_R - \sigma)^{\alpha}}\right)$
Technical change	Plays a complementary role to the subsidy

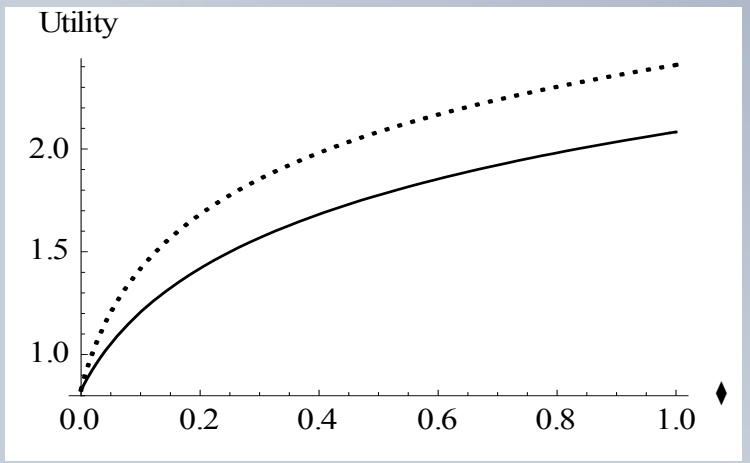
Sensitivity analysis

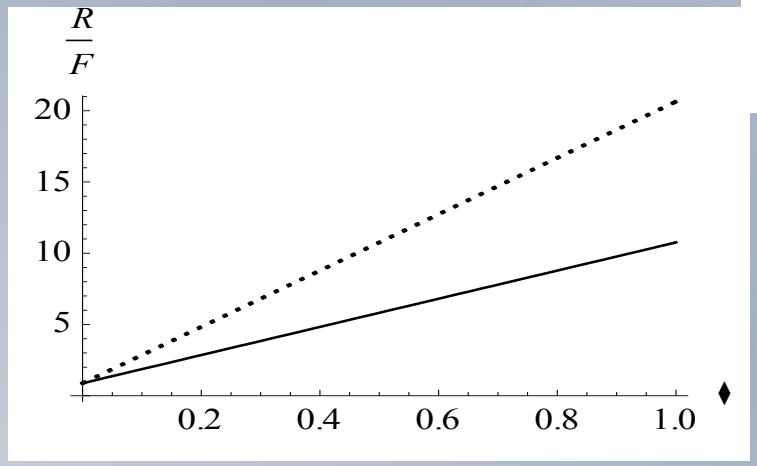
	$\Delta^+\tau$	$\Delta^+\sigma$	Δ^+Z_R	Final Effect
p_R	0	-	-	-
p_F	+	0	0	+
F	-	+	+	?
R	-	+	+	?
Y	-	+	+	?
E	-	+	+	?
$\frac{R}{F}$	+	+	+	+
$\frac{E}{Y}$	-	-	-	-
U	+	+	+	+

Empirical results









without ETR

with ETR

Conclusions

- The choice of the indicators for the first and second dividends is critical for the results
- If the first (environmental) dividend is measured by absolute emissions and the second (economic) is measured by output, the existence of a double dividend is uncertain
- If the first dividend is measured by the ratio of emissions *per* output, and the second is measured by utility, even the single instruments used alone provide a double dividend – environmental policy is preferable to the "laisser-faire" situation

Conclusions (cont.)

- But, for the same tax levels, when the ETR is implemented both dividends are stronger and are higher, the higher the policy levels

- These effects are achieved through a transformation of the production structure of the economy, which becomes more intensive in renewables use.


Thank you for your attention!