Environmental regulation and productivity growth: main policy challenges.

R. De Santis, P. Esposito and C. Jona Lasinio

17TH EUROFRAME CONFERENCE ON ECONOMIC POLICY ISSUES IN THE EUROPEAN UNION

Friday 17-18 June 2021

NIESR - London

Istat

Research question

- **What is the effect of environmental regulation on productivity?**

- **Environmental regulation is becoming more and more stringent**
- **What's up?**
- 37% of the RRF financial resources will be devoted to environmental issues plus 100% RRF " do not significant harm clause"
- The European Council approved a target of -55% GHGs by 2030
- By 2050 climate neutrality for EU countries (European Council Dec. 2019)
- SDGs Agenda 2030 (5 goals out of 17 on environmental issues)

Traditional versus «new» paradigm

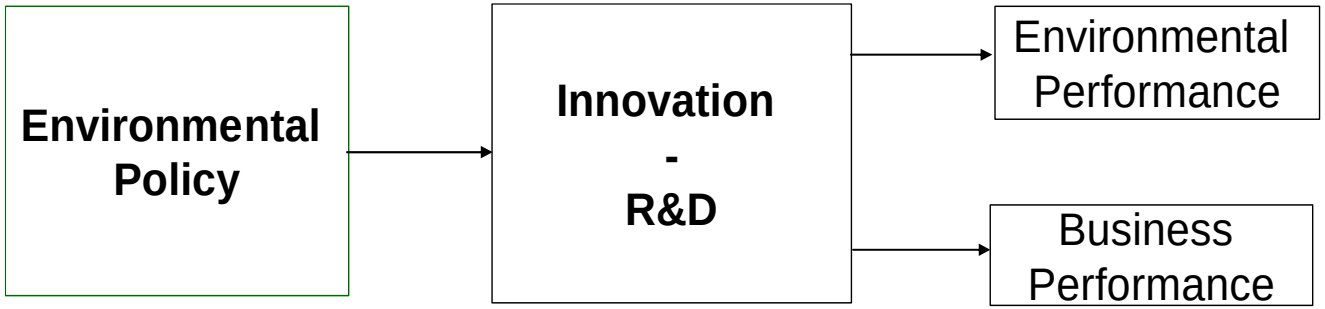
Environmental regulation is an additional cost for firms and damages productivity and competitiveness

Trade-off (TO)

Environmental regulation is an incentive for firms to innovate and improves productivity and competitiveness

Synergy (SYN) – Porter Hypothesis (1995)

The Porter hypothesis and its variants



Three variants of the PH (Jaffe et al, 2005):

- "***weak***": environmental regulation induces innovation, but the opportunity costs of additional innovation offsets productivity gains

- "***narrow***": market-based instruments are more likely to foster innovation and productivity growth compared to non-marked based instruments

- "***strong***": the benefits from higher innovation induced by environmental regulation overcome its costs eventually raising the overall productivity.

Literature slightly biased in favour of Porter strong hps

- Empirical findings are typically very context-specific, focused on diverse indicators of efficiency and innovation and hardly comparable.

- Few studies adopt a cross-country perspective. Empirical evidence is inconclusive (for a survey Martinez Zarzoso et al. 2019).

- At least in the short-run, higher compliance costs may negatively affect both international competitiveness and productivity growth (Ambec et al. 2013, Dechezleprêtre and Sato 2017).

Literature advancements related to a new indicator

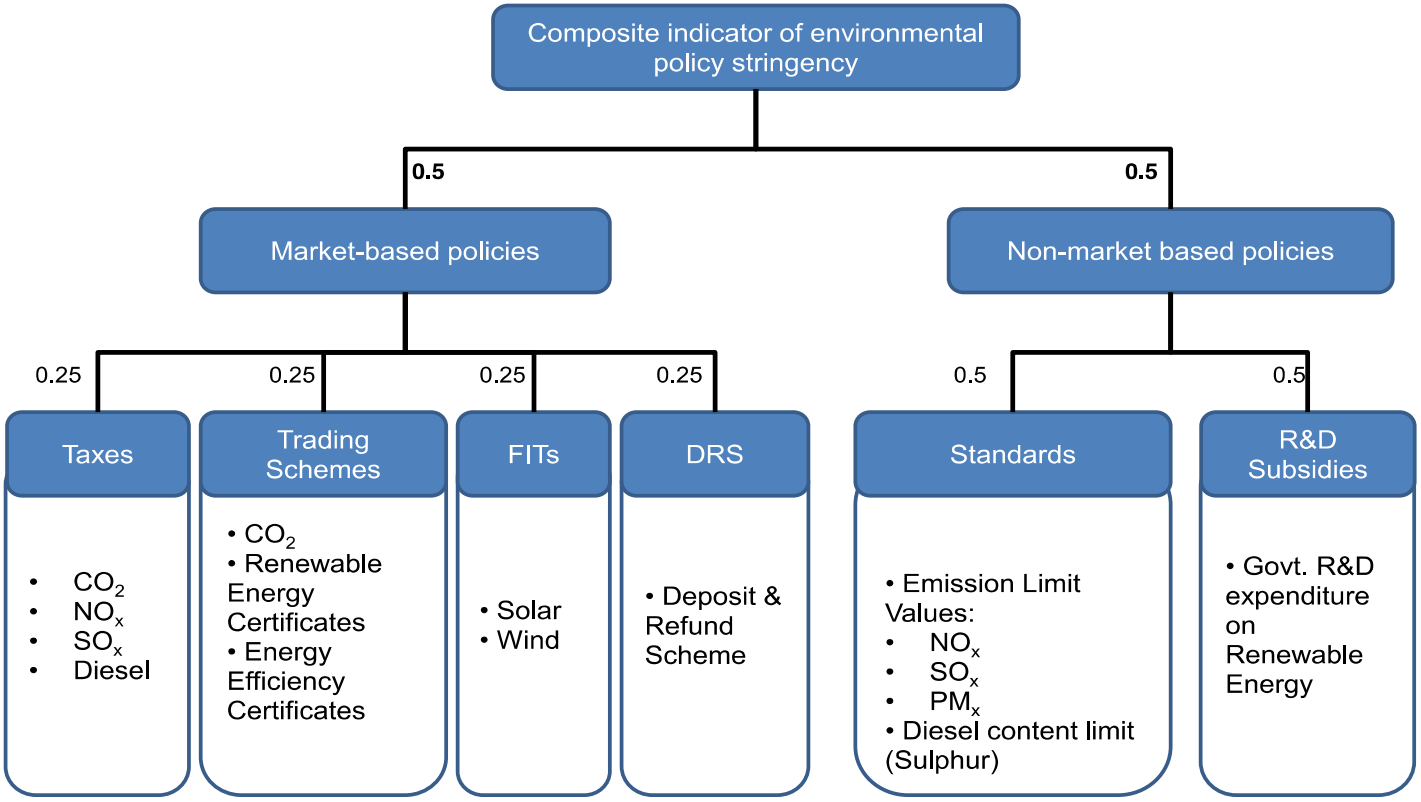
- Botta and Koźluk (2014), developed a composite indicator based on the aggregation of quantitative and qualitative information on selected environmental policy instruments into one comparable, country-specific proxy of Environmental Policy Stringency (EPS)

- De Santis and Jona Lasinio (2016), for European countries, found that market based environmental measures are the most suitable instruments to stimulate innovation and productivity growth

- Albrizio et al (2017) indicate that a tightening of environmental policy in the OECD countries is associated with a short-term increase in industry level productivity growth only in the most technologically advanced countries.

EPS indicator

Figure 1. Structure of the Environmental Policy Stringency (EPS) indicator



Source: Botta and Koźluk (2014)

EPS indicator in the 18 OECD sample countries

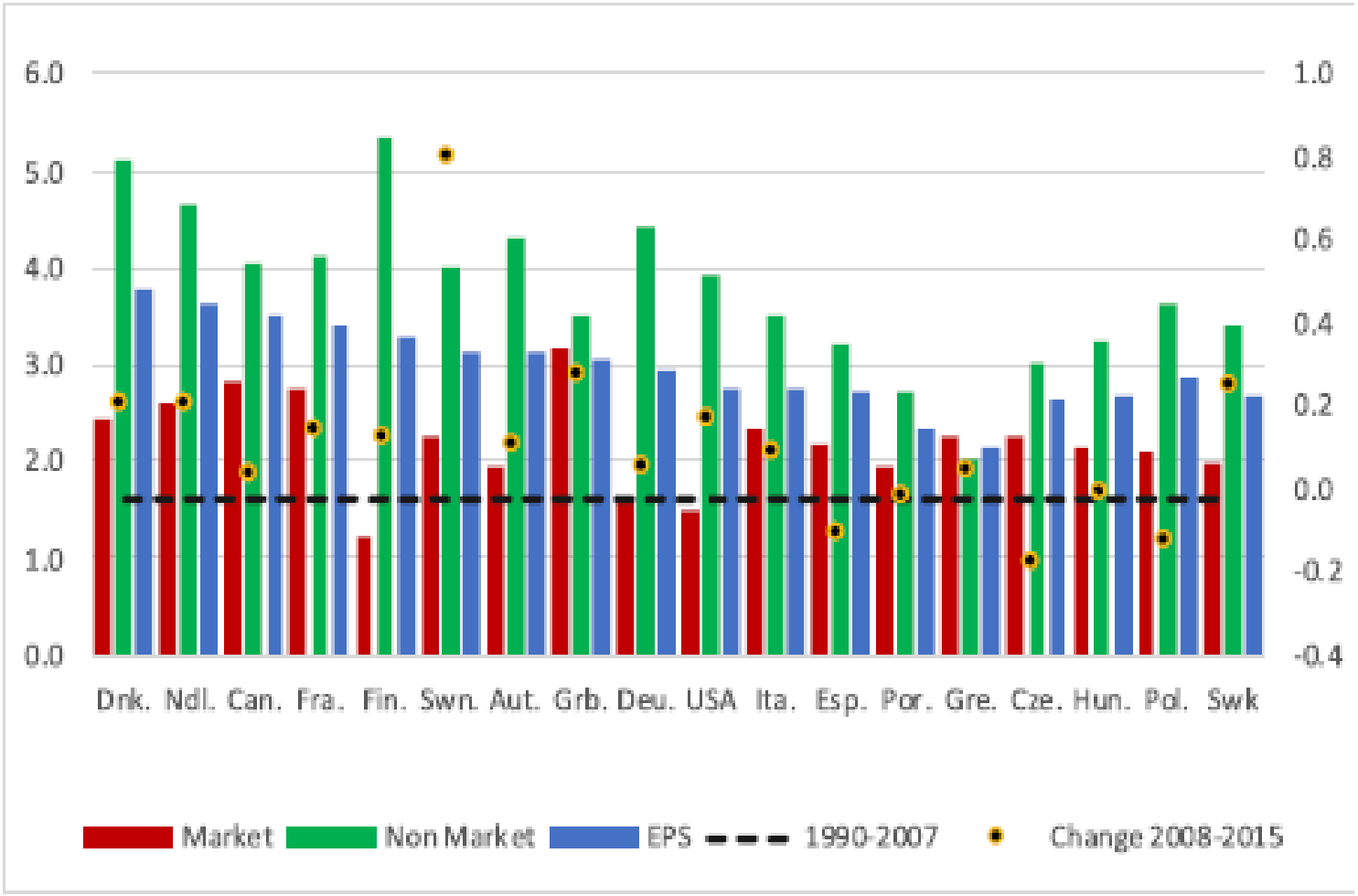


Fig. 1. Environmental policy index 2008–2015.
Source: OECD.Stat

Recent literature: De Santis, Esposito, J. Lasinio (2021)

- Test the Porter Hypotheses (PH), on environmentally adjusted productivity measures for a sample of 18 OECD countries between 1990 and 2015.

- Use a production function approach where hourly productivity is expressed as a function of ICT e non ICT capital intensity as well as the Environmental Policy Stringency Index (EPS).

- Distinguish market-based and non-market based policies and further assess the role of the existing technological levels by grouping countries according to the ICT intensity.

- Use as empirical strategy a Panel VAR (PVAR) consisting in system of equations where each variable is expressed as a function of the other variables.

Estimates results (i)

	Multifactor Productivity (MFP)				Hourly Labour Productivity (HLP)			
	1	2	3	4	5	6	7	8
$\Delta prod_{t-1}$	0.590***	0.622***	0.945***	0.570***	0.528***	0.614***	0.652***	0.491***
	[0.073]	[0.069]	[0.111]	[0.080]	[0.082]	[0.079]	[0.109]	[0.096]
$\Delta knoict_{t-1}$	0.236***	0.270***	0.024	0.255***	0.150***	0.186***	0.019	0.268***
	[0.050]	[0.050]	[0.077]	[0.061]	[0.037]	[0.035]	[0.051]	[0.055]
$\Delta kict_{t-1}$	0.019**	0.027**	0.019**	0.021**	0.014**	0.016**	0.005	0.004
	[0.007]	[0.009]	[0.008]	[0.009]	[0.007]	[0.006]	[0.007]	[0.010]
$\Delta EPSI_{t-1}$	0.013***				0.011**			
	[0.003]				[0.004]			
$\Delta EPSMKT_{t-1}$		0.009**	0.009**			0.007**	0.008**	
		[0.003]	[0.004]			[0.003]	[0.003]	
$\Delta EPSNMKT_{t-1}$		0.003		0.004**		0.003*		0.004**
		[0.002]		[0.002]		[0.002]		[0.002]
Hansen	59.5	82.8	17.5	49.4	53.6	80.9	12.6	45.1
pval	0.112	0.251	0.35	0.416	0.297	0.298	0.701	0.591
N	288	288	288	288	288	288	288	288

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. EPS = environmental protection stringency; averages; EPSMKT = market based EPS index; EPSNMKT = non-market based EPS index; kict = log-ICT capital per hour worked; knoict = log non-ICT capital per hour worked. Source: own estimates on OECD data.

- Strong PH confirmed
- Narrow PH confirmed

Estimates results (ii): ICT intensity matters!

	MFP			HLP		
	EPSI	EPSMKT	EPSNMKT	EPSI	EPSMKT	EPSNMKT
	1	2	3	4	5	6
$\Delta prod_{t-1}$	0.662***	0.595***	0.630***	0.629***	0.544***	0.586***
	[0.069]	[0.074]	[0.078]	[0.079]	[0.090]	[0.093]
$\Delta knoict_{t-1}$	0.260***	0.243***	0.168***	0.142***	0.123**	0.086**
	[0.045]	[0.057]	[0.045]	[0.036]	[0.041]	[0.038]
$\Delta kict_{t-1}$	0.024***	0.016*	0.013**	0.015**	0.011*	0.008
	[0.006]	[0.008]	[0.006]	[0.007]	[0.006]	[0.006]
$\Delta EPSIhi_{t-1}$	0.018***	0.011**	0.008**	0.017***	0.011**	0.007**
	[0.005]	[0.004]	[0.003]	[0.005]	[0.004]	[0.003]
$\Delta EPSIlow_{t-1}$	0.010**	0.008**	−0.003	0.003	0.002	−0.001
	[0.004]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Hansen J	61.8	57.6	47.2	55.2	57.1	46.8
p-value	0.122	0.258	0.584	0.284	0.261	0.615
N	288	288	288	288	288	288

* significant at 10% level; **significant at 5% level; ***significant at 1% level. EPS = environmental protection stringency; averages; EPSIhi = EPSI in ICT intensive countries; EPSIlow = EPS in low-ict intensive countries; kict = log-ICT capital per hour worked; knoict = log non-ICT capital per hour worked. Source: own estimates on OECD data.

- EPS more effective in high ICT countries
- Market-based intruments relatively more effective in high-ICT countries
- In high-ICT countries both type of intruments are effective
- High ICT capital countries exploit better than the others the innovations opportunities provided by environmental policies.

Istat

Estimates results (iii)

	MFP				
	1	2	3	4	5
$\Delta prod_{t-1}$	0.601***	0.519***	0.450***	0.732***	0.328***
	[0.070]	[0.071]	[0.081]	[0.066]	[0.052]
$\Delta knoict_{t-1}$	0.146***	0.143***	0.254***	0.154***	0.267***
	[0.042]	[0.043]	[0.056]	[0.042]	[0.056]
$\Delta kict_{t-1}$	0.021***	0.023	0.016*	0.024***	0.057***
	[0.005]	[0.017]	[0.008]	[0.006]	[0.016]
$\Delta TAXhi_{t-1}$	−0.009				
	[0.008]				
$\Delta TAXlow_{t-1}$	0.008*				
	[0.004]				
$\Delta FIThi_{t-1}$		0.003*			
		[0.002]			
$\Delta FITlow_{t-1}$		0.003			
		[0.002]			
$\Delta RDShi_{t-1}$			0.005**		
			[0.002]		
$\Delta RDSlow_{t-1}$			−0.002		
			[0.002]		
$\Delta STDhi_{t-1}$				0.005**	
				[0.002]	
$\Delta STDlow_{t-1}$				−0.001	
				[0.002]	
$\Delta TSChi_{t-1}$					0.004***
					[0.001]
$\Delta TRSlow_{t-1}$					0.004*
					[0.002]
Hansen J	88.4	88.2	80.5	83.2	80.9
p-value	0.137	0.141	0.312	0.243	0.303
N	288	288	288	288	288

Effects of the different policy instruments:

- In low-ICT contries green taxes and trading schemes are the most effective intruments.
- In high-ICT countries, trading schemes, R&D subsidies and standard all contribute to productivity growth➔complementarity between market and non-market instruments

Istat

Policy challenges (i)

Policies	Economic effects Porter hp holds	Challenges	Possible solutions
More ambitious targets on EU emissions/renewables/energy efficiency by 2030, EU climate neutral economy by 2050 **Phasing out the use of coal, natural gas and other fossil fuels.**	Increase in innovation and positive spillovers on productivity particularly in ICT intensive countries	Transition process very complex adverse redistributive effects. **Some countries/sectors damaged directly or indirectly**	**Consistency between increased environmental ambition and countries transition effort.** Just transition mechanism in Europe: €150 billion 2021-2027, Recovery plan: EUR 750bn for recovery, of which 37% to be spent on green transition.

Policy challenges (ii)

Policies	Economic effects Porter hp holds	Challenges	Possible solutions
Long term environmental policies	Long-term changes in productivity growth could occur if environmental policies provide permanent incentives to innovate more	More dynamic types of environmental policies, increasing in stringency .	**Emission caps, increasing environmental tax rates or performance standards with preannounced paths**.

Policy challenges (iii)

Policies	Economic effects Porter hp holds	Challenges	Possible solutions
Environmental SDGs: Clean water Climate action Clean energy Life below water Life on land	Environmental regulation incentive to innovate. Positive spillovers on productivity	Effectiveness of the «**moral suasion**»	**Comunication strategy** **Clear targets quantification**

Conclusions and policy remarks

- Porter hps holds in its strong and narrow versions: win win solution for environmental protection and economic growth
- To trigger the Porter hps mechanism ICT intensity matters
- From the policy point of view given that environmental protection is not anymore “optional” it is important to have:

i. Consistency between increased environmental ambition and countries transition effort: availability of financial resources

ii. More dynamic types of environmental policies both market and non market, increasing in stringency with preannounced path

iii. Effective communication strategy based on clear quantification of targets

Thank you for your attention

R. De Santis rdesantis@istat.it

References

- De Santis, R., Esposito, P. and Jona-Lasinio C. (2021) “Environmental regulation and productivity growth: main policy challenges”, International Economics Journal, Elsevier, 165, 264–277

- De Santis, R. and Jona Lasinio, C. (2016). ‘Environmental Policies, Innovation and Productivity in the EU’, The Global Economy Journal, 16(4), 615-635

- De Santis, R. (2012). "Impact of Environmental Regulations on Trade in the Main EU Countries: Conflict or Synergy?," The World Economy, Wiley Blackwell, vol. 35(7), 799-815, July.