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IS THE CURRENT EU CLIMATE INSTRUMENT MIX ADEQUATE?

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Key Points

- *The EU is on track to meet the 2020 targets for greenhouse gas emissions reduction and renewable energy. However, climate policies have not been the main drivers of emission reductions but the economic crisis.*
- *The price signal of the EU ETS is not in line with the expected role of the scheme in the transition to a low-carbon economy. However, it is the only relevant interregional instrument in the world to reduce CO2 emissions.*
- *Energy efficiency polices are far from meeting their 2020 targets.*
- *The current instrument mix has been successful in increasing the share of renewables. However, renewables support schemes have generally generated very high abatement costs in the short term.*
- *The cost-effectiveness of the current instrument mix is low. The policy mix has not succeeded in generating a uniform carbon price across sectors and emitters.*
- *The feasibility of deeper emission reductions will depend crucially on the public acceptance and design of more stringent climate policies.*

1-Introduction.

In 2008 the European Union (EU) adopted its first package of climate and energy measures. Although the EU is on track to meet the 2020 targets for greenhouse gas emissions reduction and renewable energy, the performance of the existing instrument mix is questionable. Now that the EU is discussing the climate policy pathway to 2030, it is useful to assess this performance. This policy briefing is focused on the EU27 itself, and on a representative set of eight EU Member States: the Czech Republic, France, Germany, Italy, the Netherlands, Poland, Spain and the UK.

The instrument mix is assessed according to three dimensions: environmental effectiveness, cost-effectiveness and feasibility. Environmental effectiveness evaluates whether the instrument mix has brought about the necessary emission reduction. Cost-effectiveness measures the cost associated with the emission reduction. This criteria includes the capacity to reduce emissions at least cost now (static efficiency) and over time (dynamic efficiency). The feasibility criterion indicates the risk that the policy fails to be adopted as planned and/or to deliver as expected, due policy and public opposition.

More details about the study can be found in the full report (see Rey et al 2014) for the European Commission[1] in the context of the CECILIA 2050 FP7 project.

2. Environmental effectiveness

The EU Emissions Trading System (EU ETS) is the main climate policy instrument of the EU. It covers power and heat generation, energy-intensive industries and, since 2013, commercial aviation. In total, these sectors account for around 45% of total EU emissions. The EU ETS is a 'cap and trade' system which ensures a certain emission reduction[2], but not a carbon price level. In the period 2005-2012, the emissions of ETS sectors have been reduced by 11% in the EU27. However, it is not straightforward to distinguish the impact of the EU ETS from other factors. The European Commission states that the carbon price signal of the EU ETS has contributed to reduce emissions since the start of the second trading period, but that the economic crisis has been the major cause of the emission reduction (EC, 2012). The empirical evidence also shows that other instruments on the promotion of the renewables and energy efficiency have also had an effect on emissions of the ETS sectors.

The interaction of the EU ETS and other policy instruments may be beneficial in improving the design of the scheme, while also correcting for market failures and meeting other policy instruments. RES-E support schemes, for instance, have been the major incentive to deploy renewables in electricity generation. Moreover, some instruments, such as the feed-in tariff, have had a positive impact on innovation, particularly in the less mature technologies. In the promotion of energy efficiency measures, the carbon price of the EU ETS may not encourage the adoption of cost-effective measures due to market failures (e.g. principal-agent problem, capital market imperfections). Non-market based instruments (e.g. energy efficiency standards) are more likely to result in measures being implemented with an abatement cost lower than the carbon price of the EU ETS.

On the other hand, the interaction of the EU ETS with other instruments is affecting the functioning of the scheme. When overlapping instruments are implemented, they introduce an element of uncertainty because their relative contributions cannot be established due to mutually supportive or

1. CECILIA 2050 FP7 project funded by the European Commission (grant number 308680). See www.cecilia2050.eu

2. The EU ETS establishes an annual linear reduction of 1.74% which should be reviewed no later than 2025.

counteracting mechanisms. The achievements of other instruments functioning in the ETS domain do not result in lower emissions, but in a lower EU ETS price.

Through the promotion of renewable sources of energy, the current instrument mix has been successful in increasing the share of renewables[3]. The carbon price generated by the EU ETS was not high enough to promote renewable sources of energy in electricity generation (del Río, 2009) and, therefore, RES-E support schemes were the major incentive to spur renewables in the EU[4], especially feed-in tariff schemes (e.g. Spain, Germany), which have been more effective than quota obligations (e.g. UK). In 2011, the share of renewable energy in gross final energy consumption was 13%, which is above the EU interim target for 2011/2012 (10.7%).

The EU has launched also several directives to reduce energy consumption and improve energy efficiency (e.g. the Directives on End-use Energy Efficiency and Energy Services (ESD) and the Energy Efficiency Directive (EED)) and Plans (e.g. the Energy Efficiency Action Plan 2006 and the Energy Efficiency Plan 2011), which represent the main pillar for the instruments at the national level. The instruments have mainly focused on the building and transport sectors. Over the period 2005-2010 primary energy consumption decreased by 3.6% in the EU, which implies energy savings of 5.4% [5]. EC (2011) estimates that under the current scenario, which includes those policies implemented by December 2009, the reduction in the energy consumption (with respect to the baseline scenario) would be only about 8.9% in 2020. Further efforts therefore will be necessary, particularly in the transport sector, which accounts for around 20% of total GHG emissions and where, unlike other sectors, emissions have not decreased since 1990. The current instrument mix has been successful in improving the efficiency of vehicles (e.g. efficiency standards for new cars, energy labelling, CO2-based vehicle registration tax), but the potential for additional energy savings is still significant, especially in the modal shift, which current policy mix has failed to improve.

Energy efficiency has also improved in buildings, where direct GHG emissions declined by 15.7% from 2000 to 2011. As in the transport sector, energy efficiency gains might not lead to proportional energy reductions, because of rebound effects. Energy efficiency can lead to lower costs and thus to lower energy prices, resulting in price and income effects. This causes an increase in energy demand again. Rebound effects are larger when energy prices are not high enough. Hence, this could be particularly important in countries such as the Czech Republic, Poland, Spain and the UK, where the taxes on electricity and natural gas for households are zero or nearly zero.

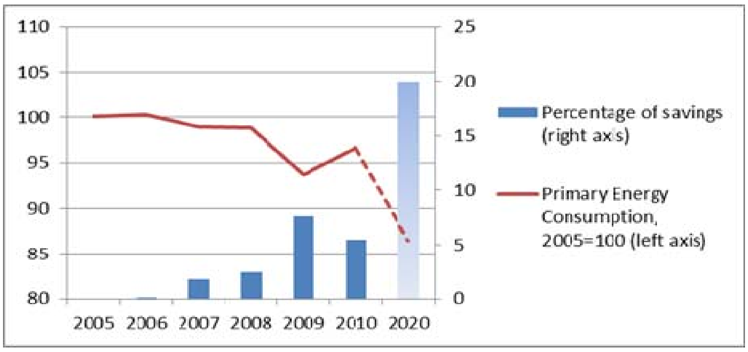

Figure 1. Energy Consumption and Savings (EU 2020 target) Source: Eurostat

In relation to non-CO2 emissions, the current instrument mix has been more successful in reducing emissions in waste and industry than in agriculture. Some instruments such as landfill taxes and the ban of landfilling untreated waste have been effective in reducing CH4 emissions. In agriculture, there is evidence that shows that the decline of non-CO2 emissions have been caused by the reallocation of agricultural production, the increase in animal productivity and the lower use of organic and mineral nitrogen fertilizers. Despite the decline in emissions, generally non-CO2 GHG emissions receive little attention by the current instrument mix.

3- Cost-effectiveness

Static efficiency is a concept used by economists to measure if an objective (in this case, GHG emissions reduction) is achieved at least cost. Technically speaking, this is obtained when marginal abatement costs are equalised across sectors and emitters, so that reductions take place where they are cheapest to obtain. One way of achieving this is an instrument mix that sets a uniform carbon price (explicit or implicit) for different sectors and fuel types.

In addition to the carbon price generated in the EU ETS (figure 2), we calculate the implicit carbon price from energy taxation (table 1) and the implied abatement costs of the promotion of renewables in power generation (table 2). The details of the methodology and data used can be finding in the full report (see Rey et al 2014)

The implicit carbon prices for energy products are presented in Table 1. These values should be put into perspective. The majority of energy taxes were not implemented with the aim to limit GHG emissions. For example, gasoline and diesel excise taxes are often considered to be road-user charges or general taxation and, in most countries, GHG emissions reduction was only a minor motivation for their introduction. In many countries, excise duties on transport fuels were introduced several decades ago, long before climate policy ever became an issue. It is therefore practically impossible to decide which share of these taxes should be considered as climate-related, and share part as serving other objectives. However, irrespective of their motivation, such excise duties on fuels also have an impact on emissions and are economically equivalent to a carbon tax on transport fuels. Hence they have been included in this analysis.

3 The EU aims to get 20% of its energy from renewable sources by 2020.

4. t can be argued that RES-E support schemes reduced the demand of the emission permits and thus their price. This may have avoided generating high enough carbon prices to incentive the promotion of renewables.

5. Energy savings are accounted as the difference between actual energy consumption and projected consumption.

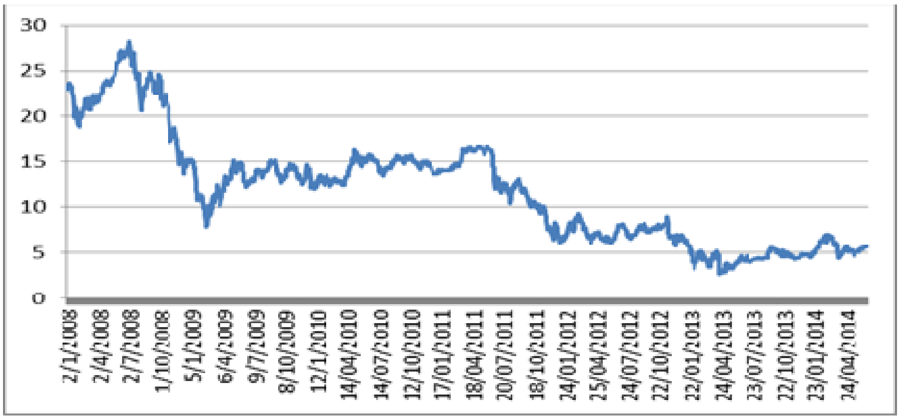

Figure 2. Evolution of the carbon price of the EU ETS. Source: SENDECO2

The results show that the implicit carbon prices for energy products vary widely. The differences are present not only across countries but also across energy products. When expressed per tonne of carbon, fuels for transport (diesel and gasoline) are taxed at a much higher level than any other energy product. In the Netherlands, Italy and the UK, the implicit carbon price for unleaded gasoline is above €300 per ton of CO2, and, on the other hand, in Poland and Spain is around €200. Given that taxes on transport fuels include other objectives, the comparison with other energy products may not be valid. However, some useful information can be drawn from the comparison between transport fuels. In all Member States, the implicit carbon price for diesel is lower than for gasoline, although the carbon content of diesel is higher than of gasoline. In the Netherlands, for instance, the implicit carbon price of diesel is half of that for gasoline.

Another important result is that the implicit carbon price for natural gas is very low in most countries. In the Czech Republic, Poland, Spain and the UK natural gas is not taxed in households, and the implicit carbon price for the industry is not more than €6.

Table 1. Implicit carbon price for energy products (€/tCO2) (2012).Own source

	Electricity		Natural gas		Diesel	Unleaded gasoline	Light fuel oil	LPG
	Industry	Households	Industry	Households				
Czech Republic	1.91	2.03	6.03	0.00	163.61	222.40	9.86	53.10
France	212.41	299.49	7.23	5.50	151.10	248.71	20.86	37.09
Germany	72.67	160.52	19.95	27.23	175.71	270.36	22.94	56.87
Italy	196.11	152.04	21.79	:::	230.74	316.01	151.28	90.87
Netherlands	30.84	18.77	13.37	84.42	162.02	318.20	:::	58.11
Poland	6.12	6.12	0.00	0.00	129.19	175.54	20.73	68.25
Spain	21.85	36.76	0.00	0.00	133.26	191.20	31.20	19.78
United Kingdom	7.55	0.00	4.40	0.00	263.54	312.09	50.62	:::

Table 2 shows the CO2 abatement costs implied by the financial support for the promotion of renewables in the generation of electricity. The cost of abating one tonne of CO2 emissions varies according to the technology and the Member State (MS). Abatement costs not only depend on the financial support by technology but also on the current electricity mix. In those MS where electricity is produced already with low carbon intensity, the abatement costs are higher. This is because it is assumed that renewables crowd out electricity from all existing technologies, and not only the most carbon intensive ones. Avoided emissions are the average CO2 emissions from the current electricity mix in the respective MS, excluding renewable energy sources Thus, in France, where nuclear power accounts for the lion's share of the electricity, it is more costly to reduce CO2 emissions from electricity generation than in any other country. Table 2 shows how far the EU is from a unified abatement cost across countries and technologies. The financial support for the photovoltaic is the highest among all technologies. This implies that the abatement of CO2 emissions is more costly when this technology is promoted. On the other hand, the abatement cost implied by the promotion of hydro and wind energy is lowest.

From the dynamic efficiency perspective, the existing literature suggests that the EU ETS has not been able to spur innovation in new low-carbon technologies by itself (del Río, 2009). The low and uncertain carbon price did not provide a sufficiently strong signal to invest in clean technology. There is evidence that the implementation of non-market based instruments (e.g. feed-in tariff) in the promotion of RES-E has had a positive impact on innovation, particularly in the less mature technologies. Similarly, in the industrial and transport sector, the empirical evidence shows that those MS with higher energy taxes encourage more innovation in energy-efficient technologies. In buildings, it seems that energy prices have not been high enough to promote innovation and, thus, energy efficiency standards (e.g. Energy Performance of Buildings Directive) have been the main drivers of innovation. The literature also suggests that public R&D financing plays an important role in innovation as compensation for underinvestment in the private sector.

4. Feasibility

Table 2. Abatement costs implied by the promotion of renewables in 2010 (€/tCO_2).Own source

	Hydro	Wind	Biomass	Biogas	PV	Geo-thermal	Waste
Czech Republic	83.2	21.1	59.3	166.2	790.4	::	::
France	133.2	385.2	536.8	420.7	5381.0	::	::
Germany	67.4	77.6	228.6	::	733.8	294.5	::
Italy	149.9	142.1	224.8	::	759.5	153.8	::
Netherlands	224.9	185.4	171.0	::	890.2	::	111.3
Poland	::	::	::	::	::	::	::
Spain	124.8	129.2	219.8	::	1134.3	::	84.5
United Kingdom	131.0	145.4	129.5	127.6	416.7	::	::

The feasibility of the current instrument mix is generally high. Although the EU ETS has been criticized because of the 'windfall profits' and the 'over-allocation' problems, there is little political or public resistance to this instrument. There is no empirical evidence that the EU ETS led businesses to reduce their competitiveness and transfer production to other countries ('carbon leakage'), a finding that is partly the result of the low carbon price of the EU ETS. The economic recession has reminded us of the fact that an ETS controls absolute quantities, and is not designed to deliver a certain price. The EU ETS is not flexible enough to alter the intra-phase emission cap and keep carbon price high under a new economic scenario or lower abatement costs. This is not necessary a failure of the scheme, which has been designed to deliver a pre-defined amount of absolute emissions in a given year, not to deliver a certain minimum carbon price. On the one hand, the countercyclical effect of the EU ETS relieves the burden on companies in a time of crisis. On the other hand, as mentioned above, a low carbon price is not in line with the expected role of the EU ETS in the transition to a low-carbon economy.The public acceptance of energy taxes appears to be lower than that of other instruments considered. While energy-intensive industries are generally exempted, a small share of the total energy consumption has to bear the majority of the cost burden, and might generate a disproportionate burden on low income households. The subsidies to improve energy efficiency and reduce energy consumption (e.g. financial support for refurbishment of buildings and financial support for replacing inefficient cars) are more accepted by both consumers and producers. They may achieve cost reductions in the energy bill for some consumers and have a positive impact on the economic activity of some sectors . These instruments are, however, subject to a constant uncertainty about the amount of available public funding. The rise of public debts and the increasing burden on taxpayers may reduce their feasibility. The support for renewable sources of energy by the general public is also high. The promotion of renewables has contributed to reduce energy dependence, the development of a highly dynamic sector, job creation and the improvement in local air quality. However, there is an increasing debate about the costs. In Spain and Germany, where the financial support for the RES-E has been high, electricity consumers are facing a rise in their final price. This can gradually reduce the support by the general public for renewable energy. Finally, in most Member States, non-CO2 GHG emissions receive little attention, especially in the agriculture sector. Probably this is not due to a low public acceptance, but to the high transaction costs related to their compliance and enforcement, which increase the administrative burden.

5. Conclusion

Our analysis of the optimality of the current climate policy instrument mix in the European Union and different member stated shows that, from the effectiveness point of view, the targets for 2020 are on track and very possibly they will be achieved. The only concern is the Energy Efficiency targets and if what will be the emissions trends when the economic recovers from the recession. However, our estimations also show that the cost-efficiency of the current mix is low. Ideally, a uniform carbon price for all sectors and all countries would achieve the targets at the least cost, and the existing dispersion in the carbon price (implicit and explicit) indicates that there and has a lot improvement and harmonization. Finally, and although the current acceptability of policies is high, the increase in the electricity bills in some countries have increase the opposition to renewable support. The feasibility of further emission reductions for 2030 and beyond will depend crucially on the public acceptance and policy design of future climate policies.

REFERENCES

del Rio, P. (2009). Interactions between climate and energy policies: the case of Spain. Climate Policy, 9, 119-138.

European Commission (EC) (2012). The state of the European carbon market in 2012. Report from the Commission to the European Parliament and the Council. Available at: http://ec.europa.eu/clima/policies/ets/reform/docs/com_2012_652_en.pdf

Rey, L, Markandya , A. González-Eguino, M., Görlach, B., Huppes, G. (2014). Assessing the 'optimality' of the current instrument mix in the EU. CECILIA D1.3, Brussels.

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