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# Analysing the Interactions of Energy and climate policies in a broad Policy ‘optimality’ framework. The Italian case study<sup>\*</sup>

Davide Antonioli<sup>†</sup>      Simone Borghesi<sup>‡</sup>      Alessio D’Amato<sup>§</sup>  
Marianna Gilli<sup>\*\*</sup>      Massimiliano Mazzanti<sup>††</sup>      Francesco Nicoli<sup>\*\*</sup>

## Abstract

The paper investigates the effectiveness and efficiency of energy-environmental policy interactions in Italy, adopting a broad optimality perspective that includes policy feasibility and dynamic efficiency. The analysis highlights that though some complementarity among different policies exists, climate policies have been often undermined by energy and renewables policy. Nevertheless, some complementarities between policy landscapes are found, as in the case of the Kyoto Fund (climate policy) and of the incentives and funding towards thermal energy, both acting as a complementary tool to cover non EU-ETS sectors. Overall, renewables oriented policies bring about efficacy but this often occurs at the expenses of their efficiency, thus generating a trade-off between these two components of optimality. Finally, incentives remuneration of renewables and also Energy efficiency investments give a mixed signal to improve innovation and to stimulate the green sector. In conclusion, notwithstanding efficacy is present in some case, cost effectiveness and efficiency are far from being optimal, and It would be better to provide a clear and durable price signal using carbon taxation tools.

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<sup>†</sup> University of Ferrara, Italy.

<sup>‡</sup> University of Siena, Italy

<sup>§</sup> University of Tor Vergata, Roma, Italy

<sup>\*\*</sup> University of Ferrara, Italy.

<sup>††</sup> University of Ferrara, Italy.

<sup>\*\*</sup> CERIS-CNR Milano, Italy.

## 1. Introduction

The European commission roadmap toward a low-carbon economy set out ambitious target in terms of emission reduction to be reached by 2050. Socio economic, technology and policy issues are relevant to set a green economy pathway (EEA, 2014, 2013a), wherein climate change policy is of special relevance for the radical changes a low carbon economy needs. All main industrialised economy should cut their emission to 80% below the 1990 level in order to held global warming below the threshold of the 2°C rise in temperature with respect to pre-industrial times (COM/2011/0112). Similarly, the UN IPCC recommend a reduction by at least 50% by 2050 with respect to the 1990 levels, in order to limit the negative consequences of climate change (IPCC). A relevant role in this transition is played by the industrial sector, which emissions are prospected to increase by 74–91% by 2050 compared to 2007, the current scenario being unchanged (Napp et al., 2014). To achieve this transformation, the existing mix of climate and energy policies needs to evolve significantly and more attention has to be paid, by both researchers and policy makers to the optimality and the interactions among different instruments. An optimal policy portfolio, needs to be economically efficient, environmentally effective, and politically, legally and administrative feasible. Moreover, also the interactions across different instruments can play a crucial role, as these can reinforce each other, or on the contrary, inhibit reciprocally.

The objective of this work is to perform an initial ‘stock-take’ of the climate policy instrument for Italy, a big European country which account for about the 10,7% of EU GHG emissions, reduced by 5.8% over 1990-2011 (EEA, 2013a), but on a mixed pattern in the recent past if comparatively assessed (figures 1 and 2). Italy is a peculiar case study among others given it is a large - still industrial – country, which has based its historical environmental policy strongly on the ‘energy side’, with only recent (and possibly late) insertions of climate related policy. Its carbon dioxide emissions performances are not excellent, though the country historically presents structural high energy efficiency.

The climate change policy setting in Italy revolves around the EU ETS as in many countries. The country policy action for reducing GHG is composed of other pillars, the most important of which is the set of policies on energy efficiency and renewables that was introduced over the last decade. The introduction of a carbon tax on non – ETS sectors have been discussed. It is worth to notice as transversal policy scheme, the so called Kyoto fund that is in principle aimed at financing CO<sub>2</sub> reduction investments through low interest rates. The fund is possibly fuelled by the ETS auction revenue. The list of instruments for Italy, along with their landscapes classification may be seen in Table 1. More specifically, this article describes each instrument implemented at country level, and attempt to assess their individual ‘optimality’, based on the concept developed in section 2. Detailed descriptions of interactions between instruments within each landscape are also provided. The categories and methods of interaction are based on best practice in instrument interaction assessment, and are completed in pairs against a single key instrument, or when important interactions between non-key instruments are present. We believe these analysis present new and relevant results, which enrich the environmental policy debate from many perspectives. First, we provide the first assessment of the complex mix of environmental and energy policy for a big European Country like Italy; second, we propose a taxonomy to aggregate such wide array of policy instruments into a smaller set of policy landscapes; third we move a first step towards a definition of optimality of these instruments referring to their economic efficiency, environmental efficacy and political feasibility; lastly, we address the complex issue of interaction among the different instruments, which is fundamental in an overall assessment of a country policy mix.

The paper is organised as follow. Next section presents methodological issues; the third presents the analysis of the different policy tools and an assessment of their optimality; section four analyses the interactions among different instruments, and section five concludes.

## **2. Methodology: setting the policy landscapes<sup>1</sup>**

From a methodological perspective, we gathered all the available information on the implemented national and climate change policies in Italy (ending up with more than one hundred policy instruments in environmental and energy realms somewhat connected to carbon dioxide reductions aims), and summarised them in the taxonomy proposed below (see also table 1). Information on the different policies are mainly derived from the ministry of the environment website, and are integrated with the original legislator text of the bills<sup>2</sup>.

Policies are grouped in 4 policy landscapes<sup>3</sup>:

- (1) Carbon Pricing: this includes policies that price CO<sub>2</sub> emissions or otherwise change the relative prices of fuel use, depending on the carbon intensities of fuels. Apart from the obvious candidates (carbon taxes and emissions trading) this would include the reform or removal of fossil fuel subsidies;
- (2) Energy Efficiency and Energy Consumption: this includes measures targeted at either increasing the efficiency of the energy sector, including power generation / combustion processes, transmission of energy (heat, electricity) and end-use efficiency, or at reducing energy consumption (demand-side management, energy saving, sufficiency);
- (3) Promotion of Renewable Sources of Energy: this includes policies aimed at increasing the share of energy from renewable sources (solar, wind, hydro, biomass, geothermal);
- (4) Non-Carbon Dioxide Greenhouse Gases: this covers policies geared at reducing non-CO<sub>2</sub> greenhouse gas emissions, typically from sectors other than the energy sector. It may include emissions like methane emissions from landfills or animal husbandry, N<sub>2</sub>O emissions from agriculture, or greenhouse gas emissions from chemical industries (SF<sub>6</sub>, NF<sub>3</sub>, HFC etc.)

In order to create a feasible and manageable analysis, we reduced the high number of policies collected to 16 (table 1). By using expert's opinions<sup>4</sup> and explorative comparisons, we deleted instruments that shared strong similarities with others (overlapping) and were too marginal with respect to the overall framework (economically marginal, very sector specific, very regional specific)<sup>5</sup>.

After the definition of the policy landscapes and the sub set of tools, we address the 'optimality' of the different instruments according to the following three criteria. We refer in the text to

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<sup>1</sup> The Methodology is partly developed within the FP7 project CECILIA2050 ([www.cecilia2050.eu](http://www.cecilia2050.eu)).

<sup>2</sup> Available at the website [www.normattiva.it](http://www.normattiva.it).

<sup>3</sup> This means that the initial set of policies was simplified to a manageable set of instruments on which to analyse trade-offs and complementarities. Authors and interviews with experts (from Università Statale of Milan, National Bank of Italy Rome, ENEA Rome, LUISS University Rome, Ministry of the Environment Rome & OECD Paris. Names might be revealed in eventual final versions) were used to simplify the set of tools as shown in table 1. Experts were also interviewed to provide comments on the inter linkages between policies. The overall investigation outcome is thus a meta-analysis of author's knowledge about case studies and literature and complement expert's opinions and knowledge.

<sup>4</sup> An alternative option to ex ante and ex post 'modelling techniques', is to gather experts' opinions on future uncertain events (ex ante) or to assess complex ex post dynamics (Arnell et al 2005, Morgan and Keith 1995, Zubaryeva et al 2012, Varho and Tapio 2013; Mazzanti and Zoboli, 2006; Nordhaus 1994).

<sup>5</sup> The full set of instruments is available upon request.

previous academic literature and anecdotal evidence in order to assess the degree of optimality of the different instruments. Optimality is defined and assessed following a lax and extensive meaning, where efficiency, effectiveness and social feasibility are considered<sup>6</sup>.

- (i) Environmental effectiveness. Which reflect the capacity of the different policy instruments to achieve the expected results. ‘Results’ can be described as policy outputs (e.g. laws and regulations passed), policy outcomes (e.g. share of renewable energy or number of electric vehicles), or policy impacts (e.g. dangerous anthropogenic climate change avoided). The most important yardstick is whether the proposed policies can be expected to bring about the necessary emission reductions (in the order of 80% below 1990 levels by mid-century).
- (ii) Cost-effectiveness and efficiency. At what cost are the necessary emission reductions achieved – and does the instrument mix guarantee that they are met at least cost. This criterion is further spelled out in two sub-criteria:
  - Static efficiency. Achieved when all emission sources are covered by the set of policy instruments, and when all emitters face an equivalent incentive to reduce emissions – be it through a carbon price or some other (dis-)incentive (Baumol and Oates, 1988).
  - Dynamic efficiency. Entails an efficient level of innovation and diffusion of low-carbon technologies in order to lower abatement costs in the future. In this way, dynamic efficiency is a way of minimising the total cost of achieving climate targets over a given time period (Del Rio and Bleda, 2013). It links the dimension of carbon pricing to the dimensions of technology and behavioural change (Grubb, 2014), three pillars of a dynamic oriented economic policy towards climate change targets achievements.
- (iii) Feasibility. Describes the risk that the policy fails to be adopted and subsequently implemented as planned (outputs), and the risk that the instrument fails to deliver as expected (outcomes)<sup>7</sup>. This can be assessed at least in 3 dimensions<sup>8</sup>:

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<sup>6</sup> Even in the mainstream realm there are seminal pieces of work that create bridges between approaches and help addressing the ‘optimality conundrum’. As example, the Baumol and Oates (1988) ‘standard and charges approach, that approximate Pigouvian outcomes without requiring strict neoclassic assumption: «The charges or prices would be selected so as to achieve specific acceptability standards rather than attempting to base them on the unknown value of marginal net damages» and «In marked contrast to an attempt of optimisation, should iterative adjustments in tax rates prove desirable in a charges and standard approach. They require no data on costs and damage, only figures on current pollution». It is a «least cost method for the achievement of these targets». The validity of the least cost theorem does not require profit maximizer or perfect competition all that is necessary is that firms minimise cost or whatever output they select.

<sup>7</sup> As example, as argued by IPCC (2014), despite the attractive properties of market-based instruments, their feasibility is potentially low, because the cost of the emission reduction is more transparent than other climate policies. There is then a trade-off between feasibility and environmental effectiveness. Regulations that stimulate technology and behavioural change might be more costly (socially speaking) but more accepted by households and firms. Those trade-offs represent the usual clash between (long run) social welfare and (short/long run) welfare of societal parts.

<sup>8</sup> We define in this paper three dimensions that cover a large extent of the ‘feasibility’ realm. We refer to Mitchell et al. (2011), Del Rio et al. (2012) and IRENA (2014), Bosetti and Frenken (2014) for discussions and treatment of the feasibility issue. As example, Del Rio et al. (2009) framework is pretty similar in the treatment and coverage, since it includes effectiveness, cost effectiveness, dynamic efficiency, and socio-political feasibility and legal feasibility. Equity is also included. We address equity concerns within socio political feasibility, even though we are aware that equity more specifically pertains to access to resources (economic, technological), environmental distribution of effects and income distribution, which goes beyond un-feasibility intended as (excessive) costs on some part of societies spatially, temporally and Sectorally defined. Nevertheless, decreasing equity might increase the

- Social and Political feasibility<sup>9</sup>: acceptance or resistance of policies by the public at large (in their function as voters or as consumers), and support for climate policy by policy makers and stakeholders, who are willing to promote or to defend such initiatives.
- Legal feasibility: compatibility and coherence of climate policy instruments with existing EU legislation, as well as national legislation.
- Administrative feasibility: administrative burden for compliance and enforcement (including the monitoring, reporting and if necessary verification of emissions), covering both the transaction cost for regulated entities, and the administrative effort required by government agencies to effectively implement an instrument and ensure compliance.

### 3. Description and Evaluation of Policy Landscapes in the Light of the Concept of Optimality

#### 3.1 Carbon Pricing

Carbon pricing has been applied in Italy almost exclusively through the implementation of the **European Emission Trading System (EU-ETS)** and, to a lesser extent, through the complementarity action of the **the Kyoto Fund** mechanism.

The implementation of the EU-ETS largely reflects an *economic efficiency* criterion. It is well known that cap-and-trade systems theoretically allow achieving the necessary emission reductions at least cost. From an empirical investigation conducted on the EU-ETS Italian sectors (Borghesi et al. 2012), however, the EU-ETS seems to have satisfied mainly a static rather than a dynamic efficiency criterion. In fact, in the first phase of the EU-ETS, its implementation has had a limited impact on the innovation and diffusion of low-carbon technologies. This applies particularly to some specific EU-ETS sectors (i.e. cement) that seem to have mainly followed a “wait and see” policy so far: most of the firms in these sectors tended to keep their quotas and preferred not to sell them in front of future uncertainties on targets, mechanisms and prices. In any case, difficulties in data dissemination have been important in hindering a proper evaluation of both the static and dynamic efficiency of this instrument in Italy, while posing serious doubts on the transparency of its implementation. Such doubts seem to be further supported by some recent scandals (like the one involving the “Italcementi”, one of the major Italian cement companies) regarding installations that were not duly reported by some firms under the EU-ETS.

The relatively small ecological innovations induced by the EU-ETS so far also casts doubts on the *environmental effectiveness* of this instrument in Italy, as well as on its dynamic efficiency. The observed reduction of Italian carbon dioxide emissions in the last few years can be ascribed to the on-going deep economic crisis rather than to a drastic shift to renewable energy sources and/or to a new technological paradigm adopted in the country. If one looks at Italian

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unfeasibility of implementing and achieving climate policy (e.g. eventually reducing willingness to pay for the environment, enhancing trade-offs between environmental and economic policies).

<sup>9</sup> As example, Knopf et al (2013) compares 13 models which estimate carbon prices that range from €240/tCO<sub>2</sub> to €1127/tCO<sub>2</sub> in 2050. The median value is €521/tCO<sub>2</sub>. The majority of studies find a sudden increase of carbon prices after 2040. The high carbon price required to reduce emissions questions the political feasibility of this scenario. Very recently, Paul Krugman has commented on the Paulson proposal for an extended emission tax by stressing that more socially costly measures (technology support to industry) might be used due to low social acceptability of environmental taxes.

environmental performance, in fact, it can be easily noticed (cf. European Environment Agency, 2010) that when the crisis began in 2007, the emission level was well above the intermediate target needed to achieve the final Kyoto target established for our country (-6.5% by 2008-2012 with respect to the 1990 levels).

Finally, a proper evaluation of the EU-ETS in Italy cannot disregard a few implementation problems in terms of its *policy feasibility* as emerged in the first two phases. While some of these problems are common to most EU countries, others seem to be linked to specific features of the Italian economic and institutional framework. Firstly, the Italian National Allocation Plan allocated an excessively high number of emission permits that was inconsistent with the Kyoto target. This problem, that occurred both during the first and the second trading phase, was mainly due to political pressures on the government from interest groups who wanted to receive as many permits as possible. Although the centralization of the allocation system has eliminated this problem for the third phase, great effort has been placed in Italy on lobbying actions also in the new EU-ETS phase to be included in the 'free auction' share of firms. The Italian Industrial Association (*Confindustria*) has often criticised in its official newspaper (*Il Sole24ore*) the planned shift from the grandfathering to the auctioning system, due to the expected increase in firms' costs and the related risk of carbon leakage. On the other hand, it can be argued that the free allocation of permits according to a grandfathering criterion may have generated windfall profits for a few large firms in key sectors (e.g. energy companies), which may further reduce the relatively small competition level characterizing these sectors in Italy. While this problem is common to other EU member countries (cf. Ellerman and Joskow, 2008; Pearson, 2010), the high number of small-medium enterprises (SMEs) characterizing the Italian economic system makes this issue even more relevant in Italy. While the implementation of an auctioning system could certainly reduce windfall profits and increase the government revenues to be used for environmental purposes, it would not preserve/increase *per se* the competition in the EU-ETS sectors, unless it is properly designed. In this regard, recall the past Italian experience in other contexts, such as the auctioning of the UMTS (Universal Mobile Telecommunications System) licences. In that case limited market competition (and possibly collusion among participating firms) caused the auction price and the government revenues to be much lower than expected<sup>10</sup>.

The widespread presence of SMEs in the Italian economic context makes **the Kyoto fund mechanism** particularly attractive in our country. The Kyoto Fund (KF), established by the Financial Law in 2007, was conceived to finance the GHG emissions reduction intervention requested by the Kyoto Protocol.

The implementation of the KF, that was expected to take place in November 2008, was unfortunately delayed up to March 2012, when the first € 200 million of the overall € 600 million Fund were set free to start the programme. In the first phase most of the Fund (€130 mln euros) were earmarked to final uses (e.g. thermal insulation, cogeneration heating systems, geothermal systems etc...); € 35 mlns were committed to support widespread micro-cogeneration systems, € 10 mlns to renewables (wind and hydro power, solar thermal, installations of photovoltaic panels etc...) and € 35 mlns for other activities (e.g. replace electric engines, reduce N<sub>2</sub>O, support R&D on renewables, hydrogen and fuel cell).

The impressive number of submissions immediately received (605 requests in the first 2 hours and the exhaustion of almost all financial resources destined to the renewables in about 3 days) signals the difficulties that many SMEs often encounter in Italy accessing the financial support to perform eco-innovations. Moreover, it also suggests that the bureaucratic obstacles that have postponed the beginning of the programme by about 5 years have probably resulted in a serious slow down of the Italian eco-innovations over a crucial period that encompassed the on-going

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<sup>10</sup> Revenues per capita from UMTS auctions ranged from 20 Euros per capita (Switzerland) to 240 Euros per capita (Italy), up to 650 Euros per capita (UK). For an analysis of auction design and the impact it had on revenues in Italy and other countries, see, among others, Klemperer (2002).

economic crisis. This may have further enlarged the technological gap that Italy seems to suffer with respect to other countries in terms of eco-innovations, with an innovation rate that is currently much lower than that of Germany and Scandinavian countries (cf. Borghesi et al. 2012, Eurostat, 2012).

Although the KF can be seen primarily as a financial support mechanism to the other policy landscapes (especially renewables and energy efficiency), it is strictly linked to the carbon pricing policy landscape defined by the EU-ETS, as part of the entries obtained from the EU-ETS auction (first figures to be released by member states in October 2014) are going to be bound to the Kyoto Fund. On the other hand, by supporting renewable energy sources, energy efficiency and N<sub>2</sub>O abatement, the KF helps firms meeting their EU-ETS requirements, thus creating a strict interdependency between these two measures and the related policy landscapes.

Unfortunately, the lack of alternative carbon pricing policies beyond the EU-ETS in Italy, prevents us from identifying further possible interactions within this policy landscape. Summing up, the only true carbon pricing policy introduced in Italy so far has been implemented “from outside” (that is, following the EU Directive) with some application difficulties beyond those emerged at the overall EU level and there is still a significant gap in our country that remains to be filled in carbon pricing policies in the future.

### 3.2 Energy Efficiency and Energy Consumption

This landscape is the most substantial together with the renewable oriented landscape, if they are compared to carbon pricing, in terms of scope and number of instruments. This shows up that besides the EU-ETS, the Italian system is biased towards energy policies. This statement is noteworthy, since the analysis of interactions within and between policy landscapes derives from the lack of specific climate policies and fully integrated climate-energy strategies. As example among others, national energy and environmental taxation amounts at €40.7 Billions in 2010, of which only €491 millions pertain to environmental and resource taxes and €31.2 billions are energy taxes (Istat, 2012). This is possibly true over other EU countries as well, but it is more pronounced in Italy.

Among the instruments that were initially selected, we finally drew out 6 tools, some of which have been refined through time and others that are brand new:

1. the Kyoto fund (also in Carbon Pricing and Renewables landscapes)
2. White certificates
3. energy performance certificate for building
4. energy efficiency related tax and incentive for energy efficiency
5. incentives to purchase cleaner vehicles
6. Thermal accounting system (*Conto termico*)<sup>11</sup>

Some have economy wide effects; some are related to housing, consumers and buildings (e.g. 6). A key distinction with that respect is whether they support efficiency for electricity or thermal sources.

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<sup>11</sup> This is a relatively new instrument (from 2013) that envisages incentives for both private owners and public administrations that improve their building energy efficiency. The incentives are given on the basis of well detailed types of interventions, which need to be certified, and they are provided till the depletion of the annual budget. The interested reader can find additional information at [http://www.gse.it/en/Heating\\_Cooling/Pages/default.aspx](http://www.gse.it/en/Heating_Cooling/Pages/default.aspx).

The identified package is partially composed of tools that support energy efficiency through funding investment projects (1,4,5) and tools that operate through markets (e.g. 2). Tools based on proper 'pricing' rationale as such are absent, if we exclude the substantial, but far too general, energy taxation, which we decided to exclude from the specific set of tools.

Another general consideration is that uncertainty covers the future of subsidies and incentives which are funded by yearly financial bills, as well as renewable oriented incentives. This is shared with other countries given the current stagnation of the cycle and public finance issues. The weight of Italian debt adds constraints to expectations on the side of tools funded through the general fiscal pool.

The key and oldest instrument are the White certificates that were introduced in 2004. They provide the possibility to generate re-sellable allowances when energy efficiency investments are implemented. The measure unit is 100€/tonne of equivalent oil, the electricity consumption of a family in a year. Big players compulsory join the system, while other agents voluntary enter. Efficiency is related to electricity, natural gas, and fuels. Quota exchanges are on a bilateral basis or through institutional authorities. The market is monitored by the Agency for energy and electricity AEEG. National authorities determine the energy saving targets. Players can benefit from selling certificates in excess or for being compliant with the targets. Certificates originate both at the level of production or consumption through the selling of more efficient tools to consumers.

As far as **economic efficiency** is concerned, we can state that the key instrument of the bundle (white certificates) possess efficiency rationale, insofar it is framed in a tradable system and the reward is somewhat proportional to the value of the energy saving project. This is less true for tax deductions oriented at energy efficiency, which relevance is massively important. Those measures have been largely used to achieve development and energy goals, growth oriented goals related to the important construction sector in Italy. We nevertheless signal two interactions that might have undermined the white certificates and tax deductions performance through partial crowding out: first, energy saving oriented tax deductions might crowd out more efficient 'certificates' markets through overlapping: enjoying high tax deductions or incentives, e.g. for a building requalification and for the purchasing of cleaner vehicles respectively, may 'displace' a potentially more efficient use of White Certificates, which could be targeted to the same objectives (building requalification and diffusion of cleaner vehicles). Second, tax deductions themselves might be crowded out by 'general' (non energy oriented) renewal building tax deductions, that have been normally in place over the same periods of time. The various interactions affect efficiency, mostly through negative effects, and efficacy.

The last decade and the new deductions systems and markets introduced in 2012 further changed the picture and add cumulate incentives. Interactions are dealt with by the legislator through the avoidance of cumulativeness of different incentives. This partially mitigates crowding out effects and in some cases preserve efficiency.

Overall, efficiency contents, even in a broad sense, are mildly present. Proper pricing mechanisms are limited. Energy taxation is not aimed at achieving GHG and energy efficiency and 'taxation recycling' systems do not exist (e.g. using revenue to fund innovation or labor tax cuts).

We also observe that strong uncertainty exists in the Italian system in relation to the combination of different tax incentives and funding opportunities related to volatile expectations that can generate distortions in investments over time (peaks and bumps, waiting to see behaviour, etc..) and that are a key element in the analysis of the energy efficiency policy package.

An additional possible drawback of using different, cumulated and overlapping instruments is that this can hinder their evaluation: each instrument should be tested with a careful Cost

Benefit analysis. Its results could be used to establish a hierarchy among different instruments in terms of economic efficiency, social desirability, and environmental impact.

As far as effectiveness is concerned, we might claim that the achievement of **energy efficiency** is not reached in the medium-long run given that the macro figure (fig.1 and fig.2) shows that the country has stabilised its (high) energy efficiency, though the gap with other countries has diminished over time, with some (UK, Denmark), moving ahead of Italy. The motivations have to be found at a more meso/micro scale by looking at specific sectors dynamic along innovation and structural change directions (Gilli et al., 2013; Marin and Mazzanti, 2013).

Nevertheless, the overall package probably lacks ambitiousness and integration, namely research of complementarity between instruments and landscapes. Clearer pricing based rationales would probably help to re-structure relative prices within the economy. In a nut shell, a carbon-energy tax redefining prices and incentives could be more effective as key policy pillar compared to a jungle of energy efficiency and renewable oriented funding tools that interact in various ways, with complementarity but also relevant trade offs showing up.

Regarding **policy feasibility**, we should stress that transaction costs are present due to (i) the envisaged and commented interactions and to (ii) the various number of ministries and agencies involved in energy efficiency policies and monitoring actions. Moreover, in the specific case of White Certificates, it is even more likely to incur in transaction costs (Mundaca, 2007) due to the fulfilment of administrative requirements, measurement and verification of activities, search for information and other more. For the UK case study, Mundaca (2007) findings show that transaction costs are around 10% of the investment costs for the lighting segment and 30% for the insulation segment, but still the energy savings gained more than compensate the transaction costs, yielding to a positive net societal benefit.

Distributive issues are crucial as in all environmental policy schemes. In this landscape and in the renewable energy landscape, the way taxes and/or tariffs fund tax deductions and subsidies are a crucial issue.

Competitiveness is a major factor as well. Most tax deductions for energy saving investments and the broader tax deductions for renewing buildings are within the umbrella of actions aimed at increasing GDP. This depends upon the huge role of the construction sector in Italy. Whether those schemes should present 'economic development' as main aim is questionable and to be assessed on economic grounds. In fact, there may exist sectors presenting higher value added per employee to eventually support. Again a more radical and central scheme of energy/environmental taxation may function as a lever for new competitiveness sources within the transition towards a greener economy.

### 3.3 Promotion of Renewable Sources of Energy

In compliance with several EU laws and Directives devoted to the promotion of renewable energy sources - RES (Directive 2009/28/CE among others) and coherently with the 20-20-20 obligations, renewable energy has been subject to substantial intervention, mainly through the use of subsidies in the form of feed in tariffs or premiums, green markets in the form of green certificates and, to a more limited extent, tax exemptions or deductions. Heat production from renewables has benefited of tax rebates and, more recently, of a feed-in tariff system, similar to that related to other renewables: the so called *Conto Energia Termico* (see above). Finally, biofuel use in transport is promoted through an obligation to mix "traditional" fuels with a percentage of biofuels.

Under an **economic efficiency** point of view, two levels of considerations are needed:

- The overlapping with other instruments and policy realms (mainly energy efficiency and carbon pricing) with linked objectives (EU ETS, among others), might have led to efficiency losses. The issue of overlapping regulation is discussed in details in Section 4.
- The link between the costs of feed-in tariffs and other subsidies and the benefits from the reduction in damages due to fossil fuels related emissions is another crucial variable to be considered in assessing the **efficiency** of policy design and, specifically, of the renewable electricity subsidies' systems. So, for example, the average subsidy from *Conto Energia* to PV energy was, in 2011, equal to 0,37 €/kWh<sup>12</sup>; other examples: the price at which green certificates not sold on the market were bought back by Gestore del Sistema Elettrico (GSE) in 2011 was 82,12 €/MWh. PV electricity produced through plants with nominal power up to 1MW and sold through "Ritiro Dedicato" was granted in the same year (below certain thresholds) a "price" between 76,2 and 103,4 €/MWh. Though no easy way of aggregating these (and other relevant) cost figures exists, such costs should be compared with the estimates for external costs related to fossil fuels combustion in the production of electricity. An example in this respect is given by the estimates of the average EU external costs for electricity generation technologies reported by the European Environment Agency<sup>13</sup>, according to which the average EU external costs from fossil fuels electricity could reach, in 2005, over 0,25 €/kWh. Unfortunately there is no way, at the moment, to compare easily the costs and the benefits side, so that additional up to date research is needed in this field.

Hints on the **dynamic efficiency** of policies related to renewable energy can be obtained from the 2013 OECD Environmental Performance Review on Italy, namely from the patenting activities linked to renewable and non fossil energy technologies. Indeed, from year 2000, the number of such patents in Italy has increased at a fast pace. Also, in 2007-2009 renewable energy related patents accounted for more than 1/3 of all patents linked to environment and climate related technologies. Nonetheless, significant improvements are still needed, as testified by the small percentage (2.5%) of renewable and non fossil fuel energy Italian inventions as compared to OECD as a whole and by the poor performance of other policy instruments (e.g. EU ETS – see below) in terms of impact on overall eco-innovation performance (Borghesi et al., 2012).

Focusing on the **feasibility** of policies, the involvement of several levels of government, with potentially conflicting objectives is one of the most important shortcomings when focusing on renewable energy policies. Two examples can be reported in this respect. First of all, the significant incentives (though decreasing over time) have led to a huge increase in renewable energies. This has created significant bottlenecks during the decision processes of local authorities that were in charge of providing the needed permits, especially before a national guidance for such permits was issued (Ministry decree 10 september 2010). Secondly, the effectiveness of RES related subsidies has been to some extent affected by fiscal treatment of the related revenues and/or costs: for example, a preferential treatment for PV plants built in linkage with agricultural activities has led to a boost in these plants installations, implying a potential crowding out of other kinds of plants and also affecting agricultural activities. Another important point is related to the potential impact of regulatory uncertainty. Indeed, the attitude of the regulator(s) seems to have been, at least in some moments, that of "reacting" to existing

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<sup>12</sup> See, GSE reports on renewable energies for year 2011 at:

<http://approfondimenti.gse.it/approfondimenti/Simeri/fer/Pagine/default.aspx>

<sup>13</sup> See, for example, European Environment Agency, EN35, "External costs of electricity production": <http://www.eea.europa.eu/data-and-maps/indicators/en35-external-costs-of-electricity-production/en35>

evidence rather than to plan a long run strategy. A possible hint in this direction is given by the quick passage from the *Terzo* to the *Quarto Conto Energia*.

Notwithstanding these problems and decreasing subsidies over time (for example, the average PV related subsidy decreased from 0,435 €/kWh in 2009 to 0,37 €/kWh in 2011)<sup>14</sup> the subsidies regimes have been effective in boosting the installation of renewable energy plants, although additional progress is needed. More specifically, the 2012 statistical report for PV electricity (from GSE) shows how PV electricity production in the same year has reached 18.862 GWh, with an increase of 75% with respect to 2011 and 485-fold since 2007. Similar, though less pronounced, similar trends can be found in other sectors, such as wind and bioenergy.

Environmental effectiveness has shown an “average” performance for Italy so far. Indeed, the European Environment Agency<sup>15</sup> underlines that from 1990 to 2009, the share of renewable energy in total gross inland energy consumption increased from 4,2 to 9,5%, slightly above the 9% share in 2009 for the EU27. Yet, Italy has been judged (by the EEA) “well on track” to meet its 2020 renewable energy sources targets: indeed, in 2011 the share of renewable energy in final energy consumption was 11,5%, therefore larger than its indicative target trajectory under the Renewable Energy Directive (EEA, 2013b).

### 3.4 Non-carbon Dioxide Greenhouse Gases

Within the overall set of instruments, the instruments we focus on are the Italian landfill tax and the Waste management tariff (known as TIA, introduced in 1999<sup>16</sup>, currently under reform and substituted with the new TARES by the Bill 214 of 22 December 2011 n. 214). Though it's not based on proper evaluation of environmental external costs, the former has changed the relative price between waste management and disposal. The TIA provides some economic incentives and structurally funds the activity of separated collection of waste which grounds recycling and disposal forms as well. The other possible relevant tool that is included in the extended set of instruments is the pesticide tax which changes the relative price between organic and non organic agricultural systems and products. Overall speaking, the landfill tax is the key tool in this landscape.

The landfill tax helps reducing GHG through its impact on landfill diversion (EEA, 2009, ETC/SCP, 2013).

The landscape is relatively more relevant in Italy with respect to other countries given the share of agriculture based GHG emissions (30% in 2009 compared to 26.7% in the EU<sub>27</sub>) and the still important share of waste being landfilled, notwithstanding important achievements over the past, also attributable to the landfill tax (D'Amato et al., 2013 for various empirical evidence on Italy). On that basis, significant marginal reductions of CH<sub>4</sub> might be obtained by full compliance with the Landfill directive and the introduction of complementarity management and disposal oriented tools. The increase of landfill tax levels and diffusion is a potential key pathway. Policies help reducing waste being landfilled: the EU witnessed two significant

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<sup>14</sup> This information can again be derived from GSE reports on renewable energies for various years, available at: <http://approfondimenti.gse.it/approfondimenti/Simeri/fer/Pagine/default.aspx>.

<sup>15</sup> <http://www.eea.europa.eu/data-and-maps/indicators/renewable-primary-energy-consumption/renewable-primary-energy-consumption-assessment-7> (last accessed: 2013/02/07)

<sup>16</sup> The new ‘waste tariff’ regime (called TIA) was introduced by Italian Law No. 22/1997, and substitutes for the former waste management tax (called TARSU). The transition, however, has been gradual, and the old tax has been in force in many municipalities until 2012, because law 22/1997 provides for a transition phase that is quite gradual and slow. The tax was calculated on the size of household living spaces, while the tariff is based on principles of full-cost pricing for waste management services (Mazzanti et al., 2011).

structural break in the series, 2001 for EU<sub>27</sub> – which witnesses MSW landfilled per capita decreasing from 300kg per head in 1995 to 200 per head in 2008 - and 2002-2005 for EU<sub>15</sub> (ETC/SCP, 2013; EEA, 2014).

Within the aforementioned lack of environmental taxation landfill tax and pesticide tax represent key examples of ‘environmental taxation’ in the country.

The landfill tax is the most relevant environmental tax in Italy. Introduced in 1996, it has been not regularly adjusted by regions since then (ETC/SCP, 2012). Its revenue, due to the lack of regular adjustments, at least to inflation, and to the decrease in landfilled waste, has shrunk from €315 millions in 1996 to €186 millions in 2011 (€229 millions was the figure in 2007). In 1996 the landfill tax revenue was €315 millions, out of €434 millions of all environmental and resource taxes, in 2011 is €189 millions out of €490 millions (Nicolli et al., 2013).

Along similar lines, the waste management tariff TIA was introduced by a 1999 Bill which delegated the introduction to municipalities, which generated a non uniform implementation of the tariff. We highlight the general consideration that in ‘federal’ countries such as Italy the delegation of competencies to regions and beyond is associated to the benefits and costs of decentralisation of public good provision (Mazzanti and Zoboli, 2013).

Both the landfill tax and the waste tariffs obey to environmental federalism, namely they are effectively implemented at regional and provincial level. This comment applies to emission taxes as well. Climate policies obey to more centralised principle though it might happen that energy efficiency targets are delegated to regions, especially if they pertain specific sectors.

From the point of view of **efficiency**, both identified tools do not refer to efficiency as primary aim, neither in terms of market creation or links to accounted externality. The main rationale is to target a defined option (e.g., separate collection targets). The landfill tax should/could then fund sustainability investments, covering waste management fixed and variable costs. The TIA/TARES actually contains the possibility to abate the price paid through the application of composting (waste reduction).

Thus, they introduced a new economic rationale (e.g. the TIA turned over a general waste tax completely unrelated from waste systems feature and people’s behaviour), but related to effectiveness (not cost effectiveness) at a general level.

From the point of view of **environmental effectiveness**, we might affirm that they separately and jointly contributed to increasing the performance of the system, and then reducing GHG emissions (D’Amato et al., 2013; Mazzanti et al. 2011) through landfill diversion and support for recycling.

Finally, **policy feasibility** issues are critical with respect to the (i) non homogeneous diffusion of the two tolls over the territory, that might generate drawbacks in terms of average national achievements (Mazzanti and Montini, 2013), (ii) lack of adjustments of the landfill tax due to typical inertia and una tantum implementation. Distributional impacts and competitiveness are probably minor issues in this case, even if more homogeneous, more integrated use of the instruments and an increase of landfill taxes might spur waste related technologies as well, a source of double economic-environmental gain (Nicolli et al., 2013).

#### **4. An evaluation of the overall instrument mix**

The overall instrument mix is the result of an historical process that has progressively shifted its emphasis from command and control tools and taxes to market-based instruments such as tradable schemes. The possible implementation of a carbon energy tax, briefly introduced at the end of the 1990s and eliminated shortly afterwards, does not seem to turn up in

the political agenda today. Increasing attention has been devoted instead to the potential of trading instruments (e.g. white and green certificates, and the Emission Trading System).

As it emerged from previous sections, some key policy instruments can be identified in the context of the Italian environmental strategy; those are probably white and green certificates, the EU-ETS, the *Conto Termico*, the large use of tax incentives to increase energy efficiency (EE) and the adoption of renewable energy sources (RES).

Several cases of policy overlapping can be identified, both within and across policy landscapes.

As for the “within landscape” cases maybe the most visible is the one potentially arising between the national subsidies to electricity generation from RES, such as the solar feed-in tariff/premium (for example, the so called “Conto energia” for PV electricity, or “Tariffa omnicomprensiva” for other forms of electricity production etc.) and the green certificates (to the extent they induce an increase of RES electricity, such as wind power or electricity generation from biomass). The recent evolution of the RES related legislation is however phasing out the possibility to obtain green certificates, and this is likely to proceed in the direction of removing the possible overlapping.

A second, equally important, potential source of crowding out is linked to the fiscal rebates to improve the energy efficiency of buildings and for equipment refurbishing, that may have crowded-out white certificates. This issue has been suggested as potentially relevant in section 3, when discussing about energy efficiency related policies.

More significant potential cases of overlapping can be found concerning different policy realms and objectives. Among the main sources of such interactions, a significant role is played by the linkages between national policies and the EU ETS equilibrium price. In general, if a national policy overlaps to the EU ETS, then the environmental effectiveness and economic efficiency of the instruments mix might be affected.

More specifically, the promotion of RES and EE can possibly clash with the carbon pricing policies, as a significant amount of literature seems to suggest (Sorrell, 2009; Kolev and Riess, 2009; Borghesi, 2011; Convery et al., 2014). In particular, RES and EE policies contribute to reduce emissions if they are applied to sectors not covered by the ETS scheme, but may fail to do so if applied to the ETS sectors. In fact, without adjustments in the emissions cap, supporting these policies in the ETS sectors may end up with simply decreasing the demand of the emission permits and thus their price without generating additional emissions cut (cf. Thema et al., 2013, and the literature cited therein). This issue has been recognised also by the European Commission which pointed out the possible downward pressure of the Energy Efficiency Directive on carbon prices (EC, 2011a, b).<sup>17</sup> If this is the case, RES and EE policies set forth in the ETS sectors could be seen as a substitute rather than as a complement to the ETS. This problem, that has been extensively examined for specific countries (e.g. Fridolfsson and Tangerås, 2012, for Sweden and DIW, 2012, for Germany), applies also to the Italian case, in particular to national subsidies or incentives to electric RES generation, such as the solar feed-in tariff (*conto energia*, *tariff omnicomprensiva* etc.) and the green certificates.

Another potentially relevant case of interactions is expected to arise also between energy efficiency and renewable energy policies. Indeed, the promotion of RES in the heating sector (RES-H) can be expected to overlap with energy efficiency incentives, as they both cover mainly the residential sector.

An important caveat applies here: albeit several theoretical and empirical analyses seem to suggest that a significant loss in efficiency can be linked to the overlapping of instruments, there

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<sup>17</sup> Focusing on the EU electricity market, Thema et al. (2013) use a simulation model to assess the impact of the interactions between the EU-ETS and the EE-instruments on carbon price and emissions level. Similar estimations of the ETS-EE interactions are provided by Grubb (2012) and Öko-Institute (2012).

are also some possible justifications that theoretically found the presence of positive complementarity between instruments. An important contribution in this respect is Lehmann and Gawel (2013), who focus on the linkages between the EU ETS and renewable energy support schemes developed in EU countries and provide a very good survey of the related literature, albeit leaving the opportunity of a deployment of support schemes in addition to the EU ETS as an open question. For our purposes, the authors identify several possible rationales for adopting overlapping regulation: these are mostly linked to technology development and adoption (motivated by market failures and by the path dependency and lock in phenomena that affects involved sectors) and in terms of additional benefits related to renewable energy deployment (for example in terms of energy security improvements).

Also relevant for the analysis of potential justifications of overlapping policy instruments is the paper by Del Rio (2010), who focuses on the potential links between renewable energy support schemes and energy efficiency measures and underlines how such interactions can be expected to have limited consequences, mostly due to the different scopes and absence of direct interaction; on the other hand, the same author underlines that a crucial role is played by the specific policy design<sup>18</sup>.

With all these caveats in mind, we anyway deem the overlapping across instruments as a possible explanation of the critical aspects of the energy and environmental policy mix in terms of economic efficiency, environmental efficacy and policy feasibility.

Overlapping instruments, in fact, can generate some systemic inefficiencies increasing the overall costs for achieving the 2020 targets. In this regard, since the electricity sector is already subject to the ETS, it would be desirable to extend energy saving measures from the electric and ETS sectors to the non-ETS sectors. This would enhance the systemic effectiveness of the related market-based instruments (IEA, 2011). In general, differently from other countries (e.g. France), more than 70% of the EE measures have favoured a reduction of carbon emissions in sectors (such as the industry and power generation) already covered by the ETS, while only less than 30% of the energy saving has been achieved in the household, tertiary service and public administration thermal energy consumption. This has provoked a limited reduction of carbon emissions in the non-ETS sectors, where governments are financially liable for the compliance of the related target. In this regard, it should be pointed out that while Italian emissions in EU ETS sectors have been systematically lower than the assigned cap, generating a surplus of allowances that private sector can sell in the emissions trading market, non-ETS emissions have been higher than the related target (Clò, 2012), increasing public expenditure to purchase the required international credits needed to comply with the Kyoto target.

Beyond the economic inefficiency deriving from the lack of coordination among energy and climate market-based instrument, the current policy mix has had a limited environmental efficacy so far. The reduction of GHG with respect to the 1990 levels in Italy has been very low; most of the abatement has occurred after 2008 when the sharp fall in the production levels has drastically decreased also the correspondent emission level. While the Italian GHG reduction has been basically in line with other European countries (see fig.1), the reduction of energy intensity per unit of GDP has been remarkably low even in comparative terms (see fig. 2). This caused Italy to lose much of the initial advantage it used to have in terms of energy efficiency with respect to Spain, Germany and France, and to be overcome by the UK in the ranking of the most energy efficient EU countries.

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<sup>18</sup> A full literature review is outside the scope of this paper. For a review of the relevant literature and problems (focused on the links between renewable electricity and emissions trading) see Del Rio (2007) and Philibert (2011). For a very recent and rather extensive review of the issues in the analysis of instruments interactions see, among others, Howlett and Del Rio (2013).

Finally, several problems remain to be solved also in terms of the policy feasibility of the current instrument mix. As pointed out above (see section 3 before), the transparency on the actual functioning of some of the adopted measures seems rather limited. The same applies to the innovation impact of such measures. As shown by Pontoglio (2010) and Borghesi et al. (2012), for instance, the ETS has had a limited effect on eco-innovation in Italy in the early phases of its implementation, thus confirming similar results obtained by several studies conducted on other EU countries and different methodologies (e.g. Aghion et al., 2009; Hoffman, 2010; Rogge et al., 2011; Schmidt et al., 2012). Moreover, the number of agencies and institutions being involved (the Ministry of the environment, the Ministry of Finance, technical agencies (ISPRA and ENEA), the Energy Regulator (AEEG) and other entities (GSE, GME)) appears to be too high and the overlapping of their respective tasks too large at the moment, which generates credibility and coordination problems.

The unclear overlapping of different instruments and monitoring institutions and the lack of an economy-wide instrument are, in our opinion, the key problems to be faced in the future. Moreover, a remarkable feature of the Italian system is the lack of any carbon pricing policy (and almost of any carbon policy) apart from the Emission Trading System implemented to apply the EU Directives. Although a carbon price obviously cannot overcome all existing barriers to the introduction of low-carbon technologies, the ETS has shown to be particularly weak in promoting new environment-friendly technologies due to the high volatility and the sharp decline of the carbon price on the ETS market. For this reason, one may wonder whether the introduction of a sufficiently high carbon tax might perform better in terms of overall optimality than the ETS currently coupled with the many (partially conflicting) measures adopted so far. Though a carbon tax is a less flexible instrument than the ETS, it might provide a more reliable price signal to the economic agents, which is not affected by the desirable progressive increase of RES and EE.

Unfortunately, the problems described above do not seem to play a major role in the political debate and few initiatives have been taken so far to face and overcome them. In particular, while Italy had historically a prominent role in the discussion on the carbon tax (originally proposed in 1991 by the former European Environment Commissioner, Carlo Ripa di Meana), little/no attention has been devoted to its possible implementation as an alternative to overcome the shortcomings of the existing measures. More generally, neither the overlapping issue nor the optimality of the environmental policies have been the object of any discussion in the political forum in recent years.

A final note is deserved for the Kyoto Fund, which somehow crosses the diverse policy landscapes and is therefore expected to be complementary and help the effectiveness of policies aimed at boosting renewable energy and energy efficiency, although to a limited extent, due to delays in implementation as well as to the limited amount of available resources so far. Also, linkages with the carbon pricing policy landscape are evident, due to the commitment to direct (at least part of) the EU ETS related revenues accruing to the Public Administration to the Kyoto Fund.

## **5. Conclusions**

Besides the EU-ETS, the Italian policy package on climate change is biased towards energy policies. Italy has never presented a key carbon (pricing) policy. Environmental taxes – net of energy taxation- represent a negligible 0.03% of GDP (thus currently less than 1Billion €, source Istat, 2012), resource and waste taxes being the largest share of this amount. Energy taxes are historically high, but mainly driven by a revenue raising principle rather than by environmental externality considerations. It is in addition not clear if EE improvements are an

objective *per se* or also a strategy to reduce GHG and improve the economy's resilience to oil price shocks.

Overall, the policy package has so far privileged technology – broadly defined - specific pathways rather than market based pathways.

Climate change targets as well as EE goals are achieved by a policy package composed of different policy landscapes wherein major and minor instruments are implemented.

Some key interactions are found *within policy packages*: as example, a key issue is the potential crowding out of energy saving markets based on certificates determined by the overlapping with tax deductions schemes for building/housing, that present clear 'economic' aims. Moreover the promotion of RES-E and of EE has somehow influenced the EU-ETS ability to provide the right price signal amplifying the excess supply of allowances due to the crisis.

Main relevant interactions are emerging also *between policy landscapes*. Those 'wrong interactions' may deliver drawbacks in terms of crowding out effects that undermine the efficiency of any single instruments. A key interaction is the fact that linking the EU-ETS functioning to other schemes may have negatively affected the carbon price effect driven by the EU-ETS. Some positive complementarity is nevertheless highlighted, regarding the carbon pricing and non CO<sub>2</sub> landscapes. There is for example a strong potential with respect to emissions reduction from landfill diversion. The 'Kyoto fund' can in addition act as a complementary tool to cover non EU-ETS sectors, in relation to all landscapes, given its intrinsic flexibility as a lever of specific technology and behavioural change actions. The EU-ETS is finally complement to incentives and funding towards thermal energy saving not covered by the EU-ETS.

Overall, we might say that sector specific actions prevail over economy wide actions (e.g. labour tax cuts and /or innovation funding through environmental taxes). This 'fragmented' approach is not helped by the very decentralised nature of the Italian state, which delegates to Regions many environmental policy issues. This might generate 'macro-economic' deficiencies as well when we extend environmental policy to other realms: competitiveness and innovation objectives are not fully consistent with the renewable portfolio obligation. These renewables oriented policies bring about efficacy, but this often occurs at the expense of their efficiency, thus generating a trade-off between these two components of optimality. Incentives remuneration of renewables and also EE investments give a mixed signal to improve innovation and to stimulate the green sector<sup>19</sup>.

It would be probably being better to provide a clear and durable price signal using green taxation on the basis of 'double dividends' rationales. The proper revenue recycling of energy and ecological taxes, as well as of EU ETS auctions, is able to enhance coherence between carbon pricing and technology-specific and/or behavioural driven pathways. Feasibility is enhanced by recycling revenues of green taxes back to industry and households to support specific technologies and behavioural change, including information and education. This may introduce some efficiency costs<sup>20</sup>. For this purpose, it would be desirable to decide whether cutting labour taxes is better than funding some (eco) innovation and R&D taking the joint economic-environmental viewpoint properly into account.

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<sup>19</sup> This holds only if EE investment are technology specific, in which case they provide a return to producers whatever technology they use. This might be the case of specific subsidy for emerging technologies (Midttun et al., 2007). Broad EE investment, on the other side, letting the producer free to pick the preferred technology tends to stimulate more cost effective technologies (Popp, 2010).

<sup>20</sup> Namely the efficiency society could get by equalising carbon abatement costs across countries and sectors through a unique carbon pricing. This efficiency outcome depends upon the existence of an EU wide market and international agreement on CO<sub>2</sub> targets, a pretty optimal 'state of the world' among others we might face and consider.

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**Table 1 – List of selected instruments by policy landscape**

Policy Instrument	Policy Landscapes			
	Carbon Pricing	Energy Efficiency and Energy Consumption	Promotion of Renewable Sources of Energy	Non-Carbon Dioxide GHGs
ETS	✓	✓	✓	✓
KYOTO FUND <sup>21</sup>	✓	✓	✓	✓
ENERGY EFFICIENCY RELATED TAX INCENTIVE		✓		
ENERGY PERFORMANCE CERTIFICATE FOR BUILDINGS		✓		
INCENTIVES FOR THE PURCHASE OF VEHICLES		✓		
WHITE CERTIFICATES		✓		
ENERGY RELATED FEED IN TARIFF/ PREMIUM (CONTO TERMICO)		✓		
ALL INCLUSIVE TARIFF (TARIFFA OMNICOMPRESIVA)			✓	
CERTIFICATES OF RELEASE FOR BIOFUELS CONSUMPTION			✓	
FEED IN TARIFF/PREMIUM (CONTO ENERGIA) PHOTOVOLTAIC			✓	
GREEN CERTIFICATES			✓	
NEW FEED-IN PREMIUM FOR RENEWABLE ENERGY SOURCES OTHER THAN PHOTOVOLTAIC			✓	
REGIONAL OBJECTIVES FOR RENEWABLE ENERGY			✓	
LANDFILL TAX				✓
WASTE MANAGEMENT TARIFFS (TARIFFA IGIENE AMBIENTALE) AND NEW TARES (SINCE JANUARY 2013)				✓

<sup>21</sup> Though the fund is not properly a specific carbon pricing tool, it finances GHG abatement investments and is possibly fuelled in the future by ETS auction revenues.

Figure 1 - GHG trends (2002=100), source: EUROSTAT (March 2014)

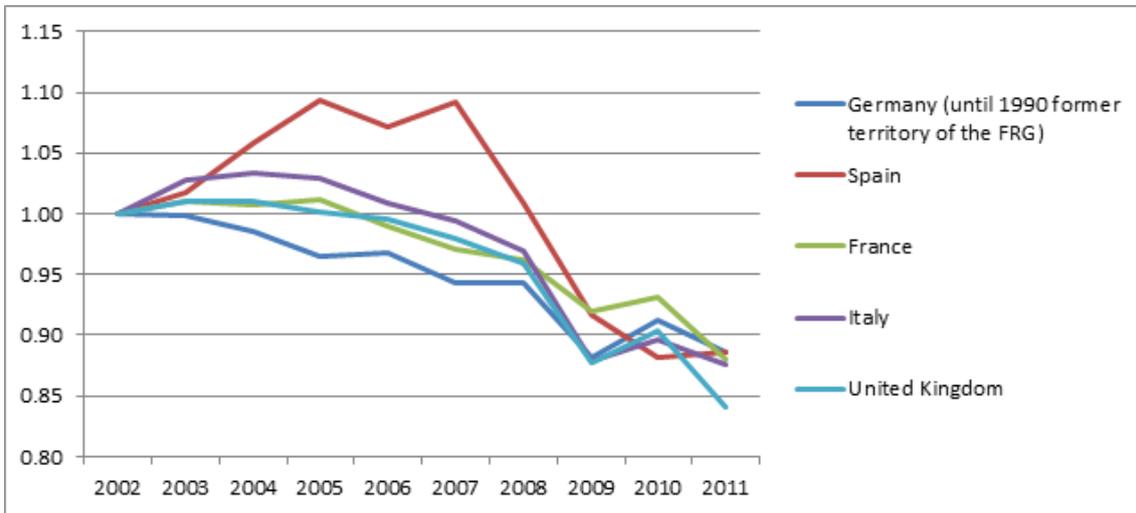


Figure 2 - Energy intensity of GDP, source: Eurostat (March 2014)

