Public Policies and the Energy Mix in Italy: Where Do We Stand?

Rossella Bardazzi and Maria Grazia Pazienza

Abstract Given the almost complete energy dependency and the consequently high sensitiveness to energy security in Italy, energy efficiency and a significant renewable share in the national energy mix are key goals of energy policy. Although the energy intensity of the Italian economy is among the lowest in western countries, there is room for further improvements pursuing economic growth without increasing the energy use (decoupling). Indeed the high Italian energy efficiency has been stimulated by import dependence and relatively high energy prices, because the economic system proved to be very reactive to selective price incentives towards energy products. Notwithstanding these premises, the general coherence and efficacy of the current framework—a bundle of excise taxes, direct subsidies, feed-in tariffs and tax expenditure together with the launch of an auction-based ETS phase—is highly questionable. Therefore, a progressive evolution of support mechanisms for renewable and energy efficiency to a more cost-effective and market-based system is strongly encouraged. This chapter outlines the current complex incentive system, highlighting incoherencies and successes, and discusses a proposal for a general reform that includes, in accordance with the European Commission proposal, a carbon taxation.

1 Introduction

Given Italy's almost complete energy dependency and its consequent high sensitivity to energy security, energy efficiency and a significant share of renewable in the national energy mix are key goals of the national energy policy. Although the

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energy intensity of the Italian economy is among the lowest among western countries, there is room for further improvements to pursue economic growth without increasing energy use (decoupling). Electricity generation with renewable sources, on the other hand, has recently experienced a sharp increase, but solar and wind energy are still far from their potential.

Indeed, the Italian high energy efficiency has been stimulated by import dependence and relatively high energy prices. However, public policies have fluctuated among energy efficiency, climate protection, the geographical diversification of resources and measures to mitigate the adverse effects of high energy prices. These policy interventions have been overlapping in the past two decades. They have not been well coordinated and have been repeatedly changed with no clear economic rationale, also creating some uncertainty in the markets. As a result, the general coherence and efficacy of the current framework—a bundle of excise taxes, direct subsidies, feed-in tariffs and tax expenditure, together with the launch of an auction-based ETS phase—is highly questionable.

Moreover, within the European framework, member states need to examine their different national practices on energy policy levies and tax components with the objective of minimising negative consequences for energy prices. At the same time, a progressive evolution of support mechanisms for renewables to a more cost-effective and market-based system and more convergence of national support schemes is being strongly encouraged.

This chapter aims to outline the current complex policy framework in Italy, highlighting incoherencies and successes, and discusses a proposal for a general reform that includes, in accordance with the European Commission proposal, carbon taxation. After a discussion of the Italian position in terms of energy security and energy efficiency targets, we focus on measuring the performance of the national energy system using indicators related to the energy and carbon efficiency of users and sectors (Sect. 2). The effects of public policies on these trends are highlighted, together with their influence on fuel price dynamics. Section 3 focuses on an analysis of the main economic instruments and carbon price policies used at the national level to highlight the efficacy and the limits of the current structure of energy/environmental policy measures. The chapter concludes with a discussion of a future direction to reform this policy structure according to the international framework (Sect. 4).

2 Energy Security and Energy Efficiency in Italy

Energy security is concerned with risks arising from three broad sources: technical (linked to infrastructure failures), human (mainly demand fluctuations, but also geopolitical instability and the strategic management of supplies) and natural (resource depletion and intermittency) (Winzer 2012). Different conceptualizations of energy security result from variation in different stakeholders' perceptions of what security means, but, according to Månsson et al. (2014), two specific dimensions can be distinguished which are both related to energy security for consumers: a physical and an economic dimension. The first relates to the availability and accessibility of energy supply, while the second refers to price volatility and affordability: prices should give a signal to indicate a situation of scarcity or oversupply. Both dimensions are included in the EU Commission energy security strategy, and this in turn is defined as 'inseparable' from the 2030 Framework for climate and energy (EC 2014a), which aims to deliver a competitive and low-carbon economy by exploiting renewable and indigenous sources of energy. In May 2014, the European Commission approved the Communication on Energy Security (EC 2014b) to reduce EU energy dependence and to promote resilience to shocks and to energy supply disruptions. This communication has now been complemented by the EC Communication on Energy Union (February 2015), which is based on five integrated dimensions: energy security; the internal energy market; energy efficiency as a contribution to demand moderation; decarbonisation of the economic system through renewable energy; and research and innovation. Finally, regarding energy efficiency, several European Directives have been implemented since the early 1990s concerning labelling, the efficiency of buildings, and eco-design.

Within this European policy framework, Italy is committed to the implementation of energy efficiency measures and to all strategies for ensuring improving energy security through diversifying the energy mix and energy suppliers. According to the latest draft of the National Energy Strategy (2013), energy efficiency is one of the main priorities defined for the medium-long term: enhancing efficiency is a way to contribute to reducing energy costs for households and industries, to reducing polluting emissions and to improving supply security with a lower dependence on energy imports. On the other hand, security is mainly perceived in terms of security of supply because Italy is highly dependent on energy imports, and therefore households and industry are exposed to international price volatility and to geopolitical crises, as witnessed in recent years.

Italy, along with other EU member states, saw a peak in energy consumption in 2005 and then a decrease, probably driven by a combination of weak demand and improved energy efficiency (Fig. 1). Natural gas and oil cover almost the same share of demand—around 35 %—because of an above-average decline in oil consumption, at least partly due to refinery closures.[1] Renewables represent the third energy source, with a share of 15 %, which is approaching the target of 17 % set for Italy by the EU 20-20-20 strategy.

Italy's import dependence is among the highest in the EU. 87 % of the country's energy needs were covered by imports in 2012 and this rate has been fairly constant over the past ten years (Fig. 2).[2] The National Energy Strategy (NES) aims to reduce this rate to 67 %, thanks to increased renewable production, lower electricity imports, increased production of national resources and energy efficiency.

[1]Since 2011, 3 out of 15 refineries have been shut down in Italy. In 2014, the available refining capacity was around 91 million tons, with a drop of 15 % compared to 2011.

[2]The graph shows the contribution of different fuels to total energy import dependency. The sum of the relative shares of the net imports of the total demand represents the total import dependency.

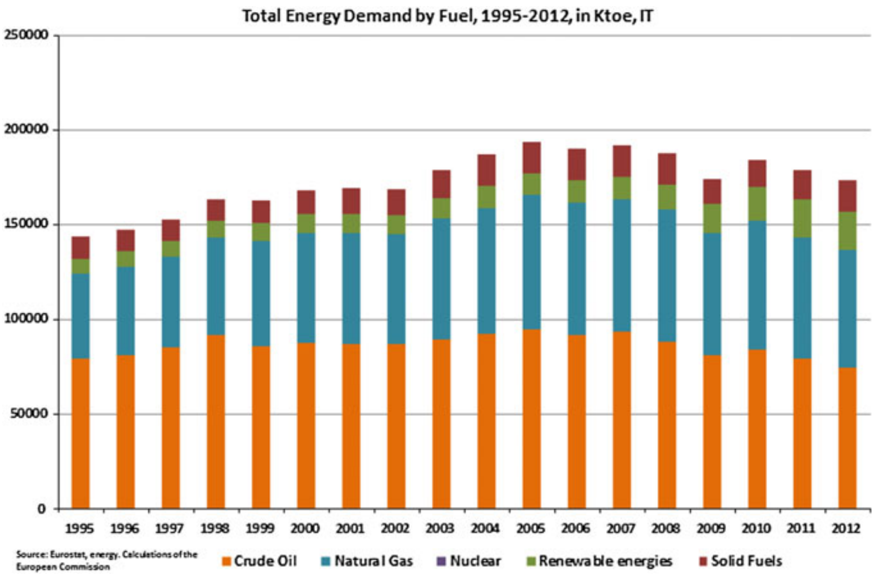


Fig. 1 Total Energy demand by fuel—Italy. *Source* EC Staff (2014)

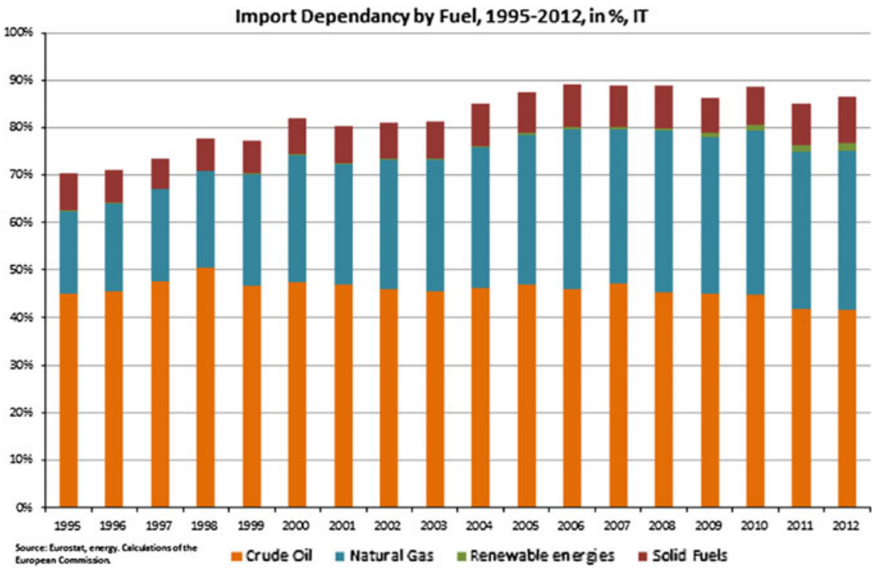
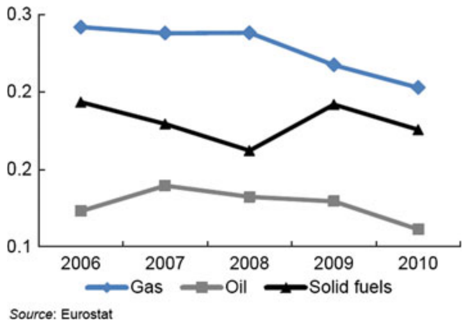


Fig. 2 Import dependency—Italy. *Source* EC Staff (2014)

Fig. 3 HHI index energy imports, Italy. *Source* EC (2013)



Despite this characteristic, the country enjoys a number of mitigating factors: a composite energy mix and a well-diversified range of trading partners. Indeed, the Herfindahl-Hirschmann Index (HHI), used to measure diversification, shows that the import sources are fairly diversified, particularly for gas (Fig. 3). In the case of oil, Italy relies mostly on non-European countries, such as Libya, Azerbaijan, Saudi Arabia, Russia and Iraq, among others. Therefore, geopolitical risks can generate price fluctuations, which could affect the economy. On the other hand, its gas supply mainly comes from two countries, Algeria and Russia, which account for more than 60 % of total imports, but also from intra-EU flows. The country-specific concentration index computed by the European Commission for natural gas ranks Italy in a very good position,[3] with a value of 16 out of 100, close to Germany (15.3) but worse than France (4.2). However, security of supply suffers from a lack of infrastructure, with only two regasification terminals and incomplete integration with the gas pipelines from the north of Europe. Therefore, most imported gas is still based on long-term 'take-or-pay' contracts, which still depend mainly on oil indexation and they are not yet aligned with spot market prices. Natural gas is of crucial importance for electricity generation. Indeed, the energy mix for electricity is based mainly on gas (38 % of net generation in 2013) and renewable (34 %) and it differs greatly from the average EU mix because of the absence of nuclear power and the low share of coal (14 %).[4] The rapid increase in installed renewable capacity happened in a few years. As shown in Table 1, the change was mainly due to the solar source: in 2013 the installed photovoltaic capacity was almost equal to that of traditional renewable hydro power, while the number of plants tripled (passing from 155,977 to 591,029). The strong growth of biogas (+173 %) and bioliquid (+73 %) explain the increase in the installed bioenergy capacity.

Italy also imports some of its power from other European member states—about 15 % in 2013, according to Terna (2013). However, a country-specific

[3]The country-specific supplier concentration index is computed as the sum of the squares of the ratio between the net positive imports from a partner and the gross inland consumption in the importing country (EC Staff 2014). The index takes values between 0 (no imports) and 100 (the entire supply of a fuel comes from a single supplier).

[4]Data are from the Italian electricity budget (2013). See Terna (2013).

Table 1 Renewable sources in Italy (2010–2013)

	Installed capacity (MW)				% variation 2013 versus 2010
	2010	2011	2012	2013	
Hydro	17,876	18,092	18,232	18,366	3
Wind	5,814	6,936	8,120	8,561	47
Photovoltaic	3,470	12,773	16,690	18,053	420
Geothermal	772	772	772	772	0
Biomasses and wastes	2,352	2,825	3,802	4,033	71

Source authors' calculation on GSE Statistical Report, various years

diversification index cannot be applied in this case because import flows between different markets can change direction more frequently than fossil fuels. From a supply security point of view, electricity generation can be investigated according to its production fuels, and from this perspective it is more sensitive to natural gas than to solid fuels, particularly in the Italian case. Indeed, import dependency is lower for coal in the EU than for natural gas and import sources are more diversified globally, meaning that power generation is more resilient to external coal supply disruptions than to natural gas shortages (EC Staff 2014).

Finally, solid fuels represent the fourth source of Italian energy consumption with a lower share (9 % in 2012) than the EU average (16 %). The country-specific supplier concentration index for solid fuels is relatively low (18), thus confirming that coal imports are much more diversified than other fossil fuels.

The main structural features of the Italian energy system are a high import dependence along with a wide range of trading partners and a fairly diversified mix of energy sources. As regards security of supply, the development of renewable sources and the appropriate infrastructure to diversify energy suppliers is of crucial importance. Indeed the NES has set these as primary goals, along with a reduction of energy prices to improve Italian industrial competitiveness and family budgets, and a reduction of carbon emissions. In order to reach these goals, energy efficiency plays a key role in meeting all the established targets.

2.1 Measuring Energy Efficiency and Italy's Performance

Energy efficiency is related to a better use of energy in energy-consuming devices. In general, end-use appliances are not very efficient, therefore implying losses, a higher demand for fuels, and environmental costs. Energy efficiency is defined in terms of energy services provided by unit of input. For instance, in the residential sector the indicator is energy input per square metre, for the transport sector energy input per kilometre is used, while for industrial activity energy input per unit of output is the common indicator. Energy intensity is also used as a measure of energy efficiency because it is readily available at the aggregate level as the ratio of the total primary energy supply (TPES) to the gross domestic product (GDP) of each country. However, energy intensity is not only determined by energy efficiency because it is affected by the structure of the economic system (industrial vs. service activities), by climate conditions and by the size of the country (especially for transport).[5] Therefore, energy efficiency can be measured through a set of additional disaggregated indicators to understand the key drivers of energy consumption and to provide policy-relevant analysis of how to influence these trends. Efficiency indicators have been published by IEA since 1997 according to a methodology as presented in IEA (2014). For the 28 European countries, information on the energy efficiency indicators is maintained in the ODYSSEE database provided by the Enerdata Research Service on behalf of all the EU Energy Agencies and the European Commission.[6]

In energy efficiency terms, Italy already performs very well compared to other European countries (Fig. 4). At the aggregate level, Italy has traditionally had a low final energy intensity, but while this indicator has constantly fallen at the EU level, progress in Italy has slowed down. This trend is simply due to the already low level of energy intensity which has been achieved at the aggregate economic level, although there is a potential for further improvement to be exploited through policy measures. This low energy intensity can be attributed to a number of factors, including the structure of economic activities, the share of energy-intensive sectors, specific public policies and high energy prices. In order to limit high energy vulnerability, the public authorities have tried to implement a wide and complex range of policies and programmes to diversify energy sources and energy partners, and to introduce financial incentives aimed at developing renewable sources and energy efficiency standards, and market-based instruments—more specifically taxes—to discourage energy-intensive devices (see Sect. 3).

ODEX is the index used by the ODYSSEE-MURE project to measure energy efficiency gains by sector (industry, transport, households) and for the whole economy (all final consumers). For each sector, the index is calculated as a weighted average of sub-sectoral indices of energy efficiency progress; the sub-sectors are industrial or service sectors or end-users for households and transport. The sub-sectoral indices are calculated from variations in unit energy consumption indicators, measured in physical units and selected to provide the best "proxy" for energy efficiency progress, from a policy evaluation viewpoint.[7] The ODEX index is represented in relation to the base year by weighting the energy efficiency gains of each sector between the year t and the year 2000 (Fig. 5). Over the period 1990–2012, final energy efficiency increased by 25 % in the EU28 countries at an annual average rate of 1.3 %. All sectors contributed to this

[5]Moreover, several issues related to its measurement may arise. See Bhattacharyya (2011), Chap. 3.

[6]See the website http://www.odyssee-mure.eu/.

[7]For instance for households kWh/appliance, koe/m2, toe/dwelling; for transport: toe/passenger for air transport, goe/passenger -km for rail, goe/t-km for the transport of goods by rail and water, toe per vehicle for motorcycles and buses. For the index specification of other sectors, see www.odyssee-mure.eu

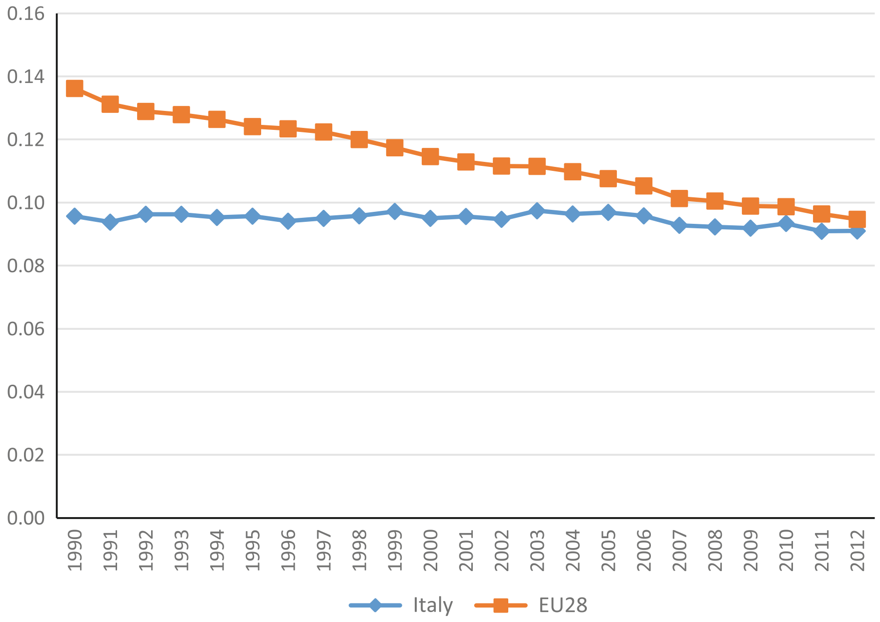


Fig. 4 Final energy intensity at purchasing power parities (ppp, koe/€2005p) with climatic corrections. *Source* Odyssee database

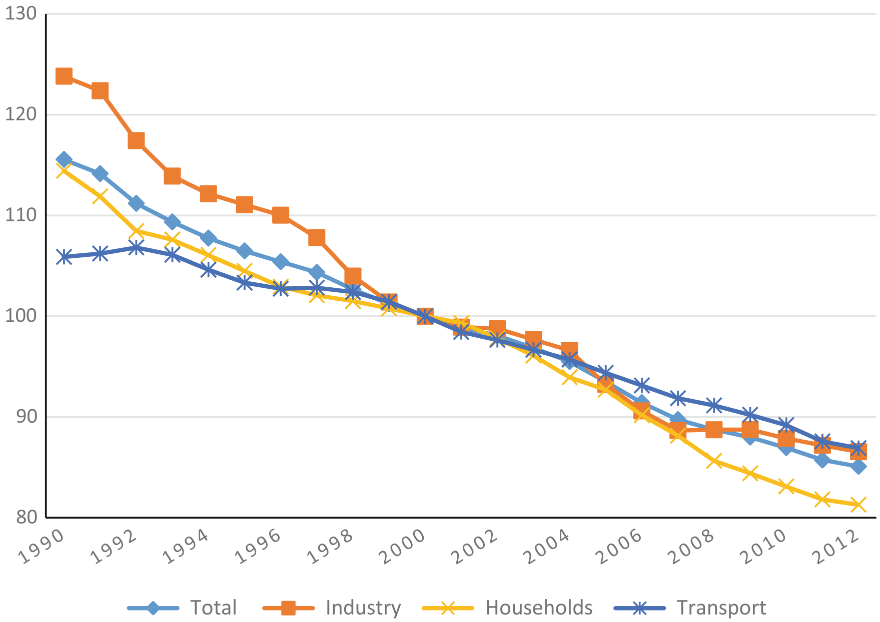


Fig. 5 Odyssee energy efficiency index (ODEX), EU28 (base 2000 = 100). *Source* Odyssee Database

improvement, particularly the industrial sector (1.7 % per year) and households (1.5 % per year).

In the manufacturing sector, the four most energy-intensive industries (chemicals, steel, paper and cement), which represented around 55 % of industrial energy consumption in 2012, reduced their energy consumption per unit of output until 2008—by around 2.1 % per year (chemicals and steel) and 0.7 (paper and cement)—while they increased their specific consumption during the crisis because firms were operating below full capacity so their energy efficiency index worsened. Most of the progress in the residential sector has been due to energy efficiency improvements in heating buildings (improvements both in construction and in heating appliances), which has been partially offset by an increase in the number of appliances and larger homes.

The extremely good energy efficiency of Italian final consumers further improved by 14 % over the period 1990–2012, against the 26 % EU average (Fig. 6). This relatively slow progress was due to the industry and transport sectors, while households improved their energy efficiency thanks to policy measures (subsidies for solar panel installation, substitution with high-efficiency appliances, new building requirements), but also to high energy prices, which induced energy savings (see Sect. 2.2). These high energy costs have also worsened the phenomenon of 'fuel poverty'—when a family cannot afford to keep adequately warm at a reasonable cost, given its disposable income. According to an indicator proposed by Faiella and Lavecchia (2014), 'low income high costs'—corrected to also include vulnerable households with zero heating expenditure—in the period 1997–2012 the share of Italian families constrained in energy consumption was around 8 %.

For transport, energy efficiency is differentiated by transport mode. While cars and rail have gained in efficiency, trucks and light vehicles have worsened their performance. According to the 2014 Scoreboard published by the American Council for an Energy-Efficient Economy (ACEEE),[8] the Italian transport sector ranked the highest among all the countries analysed. This result is largely due to advances in passenger vehicle energy efficiency: the national government has provided incentives to encourage consumers to replace old vehicles with new clean vehicles and has invested in the rail network both in terms of high-speed trains and improvements in goods transport.

Under the EU's Energy Efficiency Directive (2012/27/EU), Italy is committed to reducing national energy consumption by 15 megatonnes of oil equivalent by 2020. Indeed, energy efficiency measures have the potential to reduce energy consumption and the volumes imported. The most recent National Energy Efficiency Action Plan (NEEAP 2014) has a time horizon of 2016 set by EC Directive 2006/32, but it has set targets to 2020 which are consistent with the National Energy Strategy. This plan sets expected energy savings by 2020 for all sectors: the largest saving is expected from transport (−5.50 Mtoe per year), then from industry (−5.10), while households should contribute with savings of 3.67 Mtoe per year and the service sector with −1.23. This

[8] See Young et al. (2014).

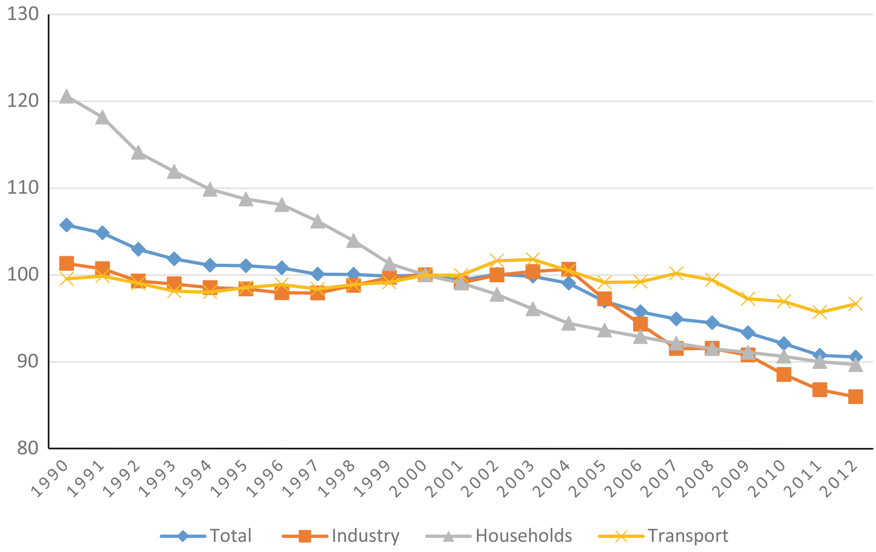


Fig. 6 ODEX, Italy (base 2000 = 100). *Source* Odyssee Database

energy efficiency improvement should be achieved with the implementation of policy measures already in place and new measures for promoting the energy efficiency of buildings—with new standards and tax rebates for the private residential sector and a special focus on public buildings, as required by EU directive 2012/27/UE.[9]

Another indicator to evaluate the trend of energy efficiency is the content of carbon emissions per unit of output, that is, carbon intensity (Fig. 7). This measure for the Italian economy is in line with the EU average and it has been stable since 2006. However, as is clear from the graph, carbon intensity has followed the same dynamics as energy intensity previously shown in Fig. 4. Italy's strategy for climate mitigation has relied heavily on promoting renewable through economic incentives, which in turn contributes to energy independence. These incentive support schemes have not been well coordinated and have been repeatedly changed, which has created some uncertainty in the markets, as will be explained in detail in Sect. 3.

When we look in more detail, some important insights can be collected. The left-hand graph of Fig. 8 shows CO_2 emissions for energy-intensive sectors. In Italy, carbon intensity per unit of output is lower than the European average for steel production, while some environmental improvements could be obtained for paper and cement production. Turning to the CO_2 intensity for private buildings (for lighting, heating and cooking), we notice that the household sector has performed well in terms of emissions per dwelling. However, despite the relatively good results the improvements have been slower than in the European Union overall.

[9]Article 5 of this directive establishes that the heating, lighting and thermal insulation of at least 3 % of total public buildings must be upgraded every year.

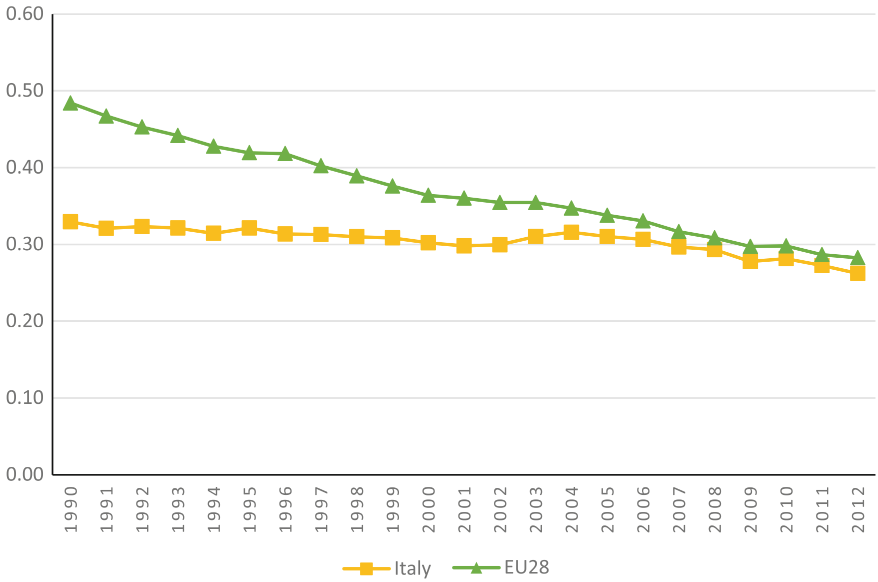


Fig. 7 CO_2 intensity 1990–2012 (including electricity and climatic corrections) (kCO2/€2005). *Source* Odyssee Database

2.2 *Energy Prices*

High energy prices have been a cost disadvantage for Italian companies and a significant burden for household consumption budgets. Italian gas prices are higher than the EU average, particularly for household consumers. This in turn also affects electricity prices because natural gas is the main fuel for thermal production. As shown in Fig. 9, prices are much higher for households than for industrial customers in all the major EU economies but the difference is larger in the Italian case, where the fiscal component of the price is particularly significant. Whereas electricity prices for Italian industrial firms are above the European average, gas prices are in line with other EU countries. This difference makes it worthwhile to switch from electricity to gas in industrial processes if there are no technological constraints.

Renewables cover an increasing share of total energy consumption in Italy and play a key role in electricity generation. In 2012 they accounted for 28 % of total production, with a jump to a share of 34 % in 2013 (Terna 2013).[10] A very complex mix of policy measures has supported this progress toward the EU 2020 target (see Sect. 3.3). The effect of this generous support scheme is twofold: on the one hand electricity prices are affected because charges are included in consumers' final bills;

[10]This increase is due to a growth in wind (+11 %), photovoltaic (+14.5 %), hydroelectric (+25 %) and biomass and waste (+36.9 %) electricity production.

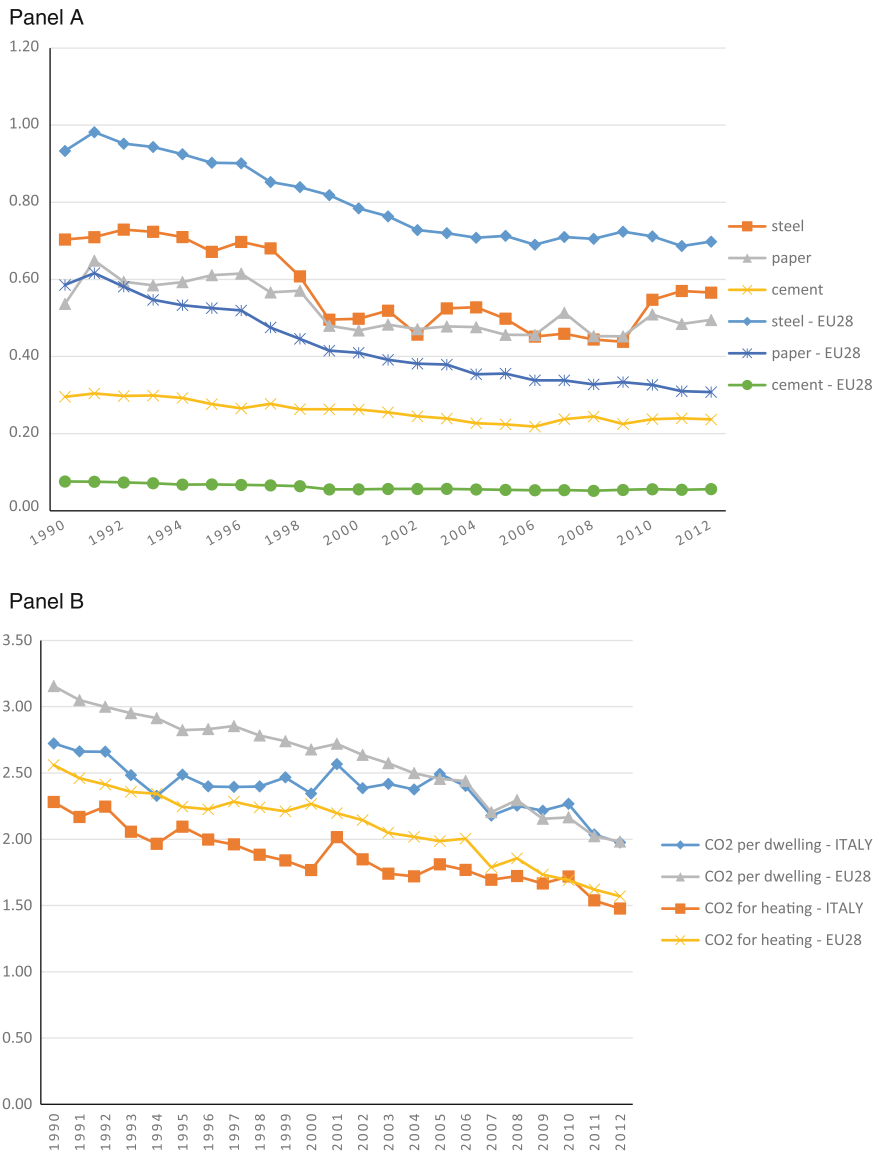


Fig. 8 CO_2 emissions for selected products (tCO_2/t) Panel A and for dwellings (tCO_2/dw) Panel B. *Source* Odyssee Database

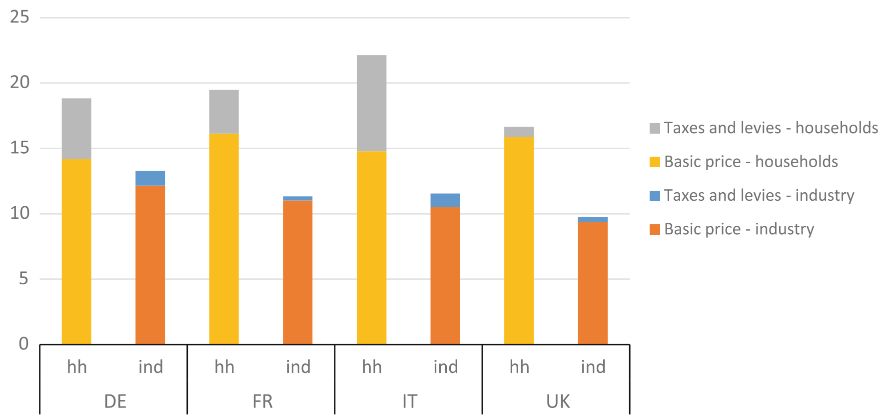


Fig. 9 Natural gas prices for selected EU countries, 2014 (Eur/GJ). *Source* Eurostat dataset

on the other, the increased supply has recently pushed down the basic price before tax. However, final electricity prices are higher than the EU average for both households and firms. In Table 2, electricity prices for domestic consumers are compared between the EU-28 and Italy.

It can be noticed that Italian unit prices are similar to the European average for low consumption levels (below 2,500 Kwh),[11] while they are higher and with a growing dynamic in the central brackets, where the bulk of electricity consumption volumes is located.

Electricity prices are also of paramount importance for international competitiveness. Indeed, in 2013 industrial companies absorbed about 40 % of the total electricity consumption, and electricity represented the second most-used fuel in industrial processes.[12] As shown in Fig. 10, Italy ranks only behind Cyprus and Malta in terms of electricity prices for industrial consumers, with a large component of the price represented by taxes (about 38 % of the price, while the fiscal component accounts for almost half of the price in Germany). This high cost hampers the competitiveness of Italian firms in international markets, as estimated interfuel elasticities show that the electricity demand of Italian manufacturing firms is less elastic to price changes compared to other energy sources, and substitution with other fuels is more limited.[13]

[11]The lowest bracket with very low consumption volumes covers second-home owners. This explains the higher unit price both in the EU and in Italy.

[12]According to the Italian Energy Balance (2013) published by the Ministry of Economic Development, the most important energy inputs for industrial firms are natural gas (43 % of total energy consumption), electricity (33 %), and oil and oil products (13 %). See http://dgerm.sviluppoeconomico.gov.it/dgerm/ben.asp.

[13]Bardazzi et al. (2015) estimate own and cross-price elasticities for energy sources for Italian manufacturing firms. The estimated parameters are lower for the two main energy inputs (−0.46 for electricity and −0.82 for natural gas) than for diesel (−0.90) and fuel oil (−1.44).

Table 2 Electricity prices for domestic consumers, taxes included (euro per Kwh) 2008–2014

	2008	2009	2010	2011	2012	2013	2014
Consumption < 1,000 kWh							
EU 28	0.249	0.249	0.264	0.272	0.277	0.299	0.315
Italy	0.276	0.294	0.283	0.265	0.257	0.279	0.294
1,000 kWh < Consumption < 2,500 kWh							
EU 28	0.169	0.174	0.179	0.191	0.201	0.213	0.219
Italy	0.158	0.171	0.163	0.164	0.186	0.196	0.211
2,500 kWh < Consumption < 5,000 kWh							
EU 28	0.158	0.164	0.167	0.180	0.188	0.199	0.205
Italy	0.203	0.210	0.197	0.199	0.213	0.229	0.245
5,000 kWh < Consumption < 15,000 kWh							
EU 28	0.149	0.157	0.160	0.171	0.179	0.191	0.196
Italy	0.231	0.261	0.249	0.243	0.264	0.285	0.301
Consumption > 15,000 kWh							
EU 28	0.141	0.153	0.154	0.165	0.172	0.182	0.186
Italy	0.217	0.293	0.280	0.287	0.295	0.320	0.328

Source Eurostat

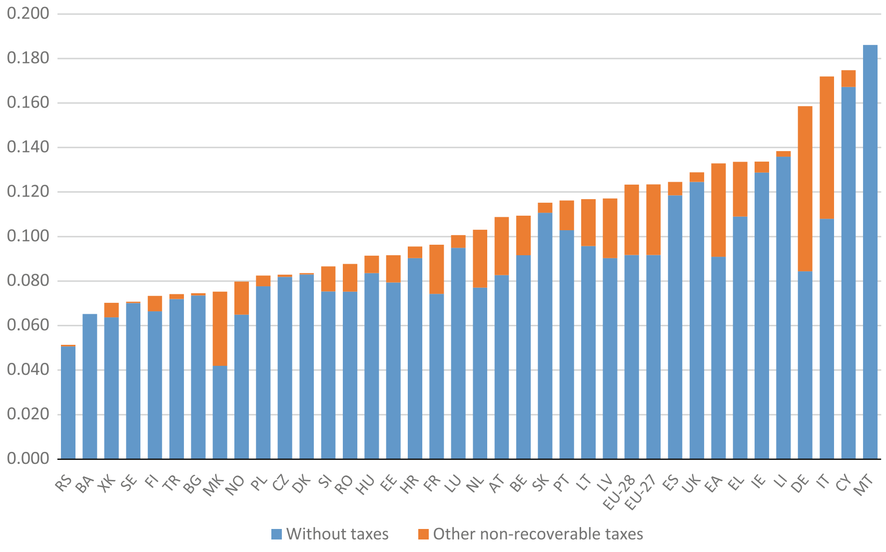


Fig. 10 Electricity prices for industrial consumers, 2014 (euro/kWh). *Source* Eurostat

Finally, the prices of petrol and other fuels affect commercial and private transport costs. As shown in Fig. 11, the consumer prices of petrol and diesel are higher in Italy than in the European Union generally, and this has always been the case in recent decades. The fiscal component is the main difference between the

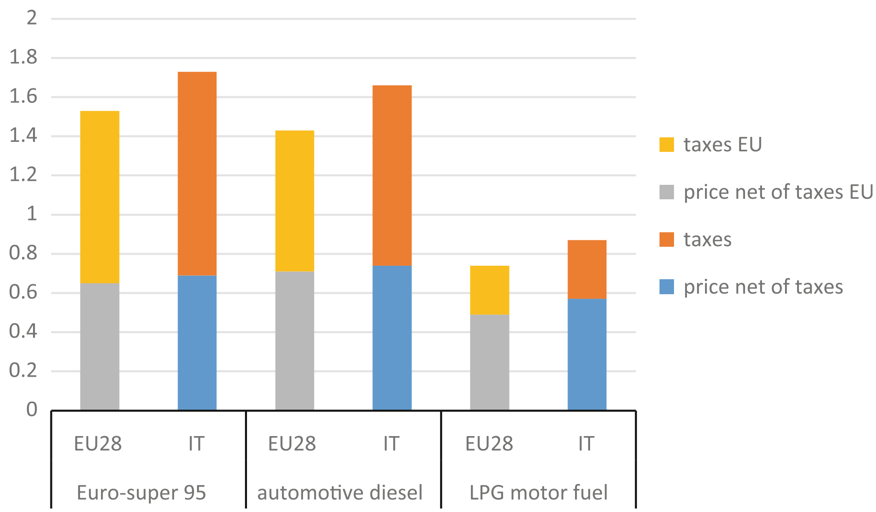


Fig. 11 Consumer prices of selected petroleum products 2013, (euros per litre). *Source* Oil Bulletin, Directorate-General for Energy, European Commission

national prices and the European average for all petroleum products. A study commissioned and reported in UPI (2014) assesses that fuel demand in Italy is highly elastic to fuel prices, particularly after the crisis that began in 2008. The rising taxes in the years 2011–2013 (+29 % for petrol, +46 % for diesel) increased pump prices and contributed to a collapse in fuel demand, especially along motorways. Obviously, the high incidence of excise taxes on petrol and diesel decreased the kilometres travelled per capita and improved efficiency.

3 Overview of Market-Based Instruments for Energy in Italy

The analysis of energy prices in the previous paragraph highlighted the role of the fiscal component in making Italian energy prices among the highest in the EU. Excise taxes on energy are one of the main pillars of market-based instruments, which the economic literature considers the most effective kind of instrument for reaching policy targets at the lowest cost, if properly designed. A very broad and well-known classification of policy instruments devoted to reducing energy intensity and to improving environment-related effects divides them into "market-based" and "command and control" (or non-market-based) instruments.[14] In the case of command and control (such as technology standards, non-marketable quotas, fixed

[14]On the characteristics of energy and environmental instruments, see Perman et al. (2013).

targets, prohibition or even moral suasion) the policy target is generally well specified and it is pursued by imposing mandatory obligations or restrictions on the behaviour of agents. On the contrary, market-based instruments (subsidies, taxes, fees, marketable quotas, liability systems) operate by creating incentives to change behaviour since they modify the relative prices that consumers and firms face, but do not specify how agents should behave to comply with the policy target. Market-based (or incentive-based) instruments are generally suggested as the main policy tool to be used, due to their cost-effectiveness (the optimal solution is reached at a minimum total cost) and to their higher degree of neutrality regarding agent choices.

This section presents an overview of energy taxation and other market-based instruments with the aim of assessing their role in Italian energy and environmental policies.

3.1 Taxes, Subsidies and Tax Expenditure in Italy

3.1.1 The Rationale of Energy Taxation

Taxation of energy products is a very popular policy in all countries, although it is implemented with different strengths and for different purposes. First of all, energy products are taxed because of their attractiveness from a general public revenue perspective. As energy is an essential product, the demand for which is relatively inelastic, the tax base and government revenue are stable and relatively easy to estimate.[15] In a very limited number of cases, energy taxes are earmarked[16] for specific use (i.e. fuel taxes for road maintenance) and can be levied as a user charge. Moreover, energy security and climate change goals call for an ever-increasing efficient use of resources, and the price signal embedded in energy taxes is deemed to be one of the best policy instruments. Both energy security and climate change imply market failures, because they can be considered public goods, and because they both imply an externality issue.[17] The use of Pigouvian taxes is, therefore, highly recommended in the literature. Thus, fossil fuels are often taxed in order to internalize some of the damage caused by their use (emissions, but also other social costs imposed by vehicles, such as congestion and traffic accidents).

Due to this list of potentially conflicting goals (revenue and externalities), it is very difficult to assess an optimal tax rate level. It is evident that for the revenue-raising objective the quantity consumed should ideally be constant,

[15]Moreover, the low demand elasticity of energy products minimizes the excess burden and makes this policy instrument consistent with the so-called Ramsey rule for optimal commodity taxation.

[16]Earmarking conflicts with the principle of universality in public budgeting (total revenue in the budget must cover total expenditure). However, part of the economic literature stresses that earmarking enhances the public acceptability of taxes, and in particular of environmental taxes. On this topic, see OECD (2012) and Kallbekken and Sælen (2011).

[17]For a discussion of energy security and market failures, see Goldthau (2011).

whereas for energy security and climate change purposes an increase in energy efficiency—and therefore a reduction in energy consumed—is the key target. Even if pricing externalities were the only objective of taxation, it would be very difficult in practice to assess the marginal level of externality to be used as the optimal level for the tax rate, especially if climate is taken into account.

That said, energy taxes have significant income and welfare impacts, and the impact of rising energy prices on income distribution and firm competitiveness is a cause of great concern—especially in Italy, where energy tax rates are among the highest in the world.

Current Energy Taxes in Italy

Energy taxes have historically been a very important source of public funds in Italy, because the revenue-raising goal is absolutely in line with the aim of increasing energy security. Energy taxes have always constituted more than 2 % of GDP and accounted for over 75 % of all environmental taxes.

Figure 12 shows the implicit tax rate at nominal and deflated values for selected European countries. Looking at the histograms, it can be noticed that energy taxes in Italy were above 300 euros per ton of oil equivalent in 2012, a level among the highest in Europe in nominal values (blue bars). Indeed, Italy ranks in second place, after Denmark. Considering deflated values, however, Italy drops behind the United Kingdom. The difference between nominal and deflated values testifies to the difficulties in managing energy excises: excises are unit taxes, for which the tax base is a quantity and the tax rate is a money value, not directly influenced by price levels.

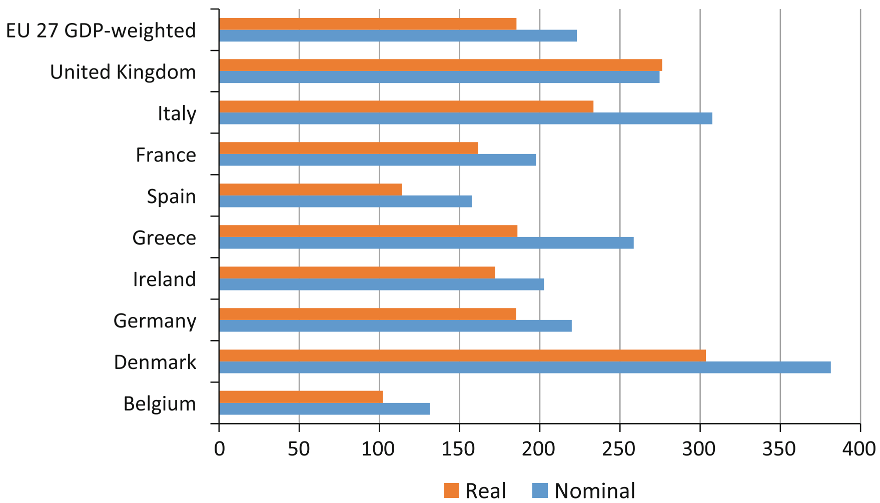


Fig. 12 Implicit tax rates on energy for selected EU countries (2012). The implicit tax rate is computed as energy taxes in euros per ton of oil equivalent (TOE). The real values are deflated (2000 = 100). *Source* Eurostat (2015)

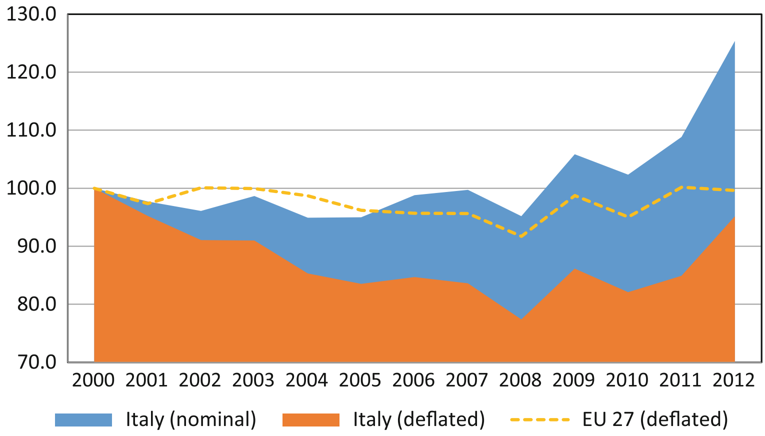


Fig. 13 Implicit tax rates on energy in Italy (indexed 2000 = 100). The implicit tax rate is computed as energy taxes in euros per ton of oil equivalent (TOE). *Source* Eurostat (2015)

Therefore, in order to obtain a steady real tax burden, policy makers should annually update nominal tax rates for inflation, but this updating process raises political costs and it is not performed as regularly as is theoretically needed.

In more detail, Fig. 13 shows how the difference between nominal and deflated values increased during the first part of the 2000s in Italy. The public budget problems which became evident in the aftermath of the financial crisis led to a manoeuvre on energy tax rates, as shown by the sharp rise in 2011–2012. Only after this last increase did the deflated value of the implicit tax rates approach the level reached in 2000. On the contrary, the deflated index for the EU exhibits a more stable path: the implicit tax rate fluctuates around the level reached in 2000 (100) throughout the period.

Households in Italy as well as in most European countries pay about 50 % of the total energy taxes (Fig. 14). The service sector accounts for a third of energy-related revenue, whereas industry reaches a share of 11 %. It is worth noting that industry has a smaller share of energy taxes than would be expected considering its role in the Italian economy. As discussed later, this is an indication of a large use of tax rebates to protect Italian industry against the adverse effects of market-based instruments.

A snapshot of the effective tax rates, classified according to fuel and energy use, is shown in Table 3. The effective tax rates have been computed by considering energy and CO_2 emission values in order to have a common basis for tax rates usually referring to different physical units (e.g. litres for car fuels, kwh for electricity). Being part of the European Union, Italy is constrained in regulating its energy tax rates by the minimum levels set by the EU Energy Taxation Directive (2003/96/EC), which were fixed without reference to the carbon content. However, not having been revised for more than a decade, the current tax rates on the main energy products in Italy have almost doubled the minimum Directive levels. Moreover, the table highlights that the energy tax rates are very far from

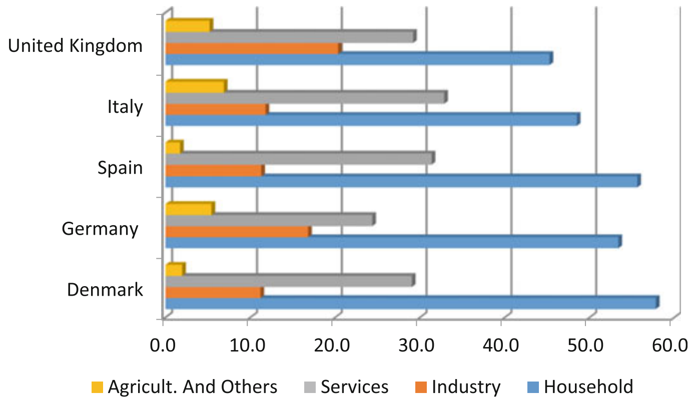


Fig. 14 Sector contributions to total energy tax revenue in selected countries (2011). *Source* Eurostat database

homogeneous when the energy content and carbon content of energy products are considered, and at the same time that Italian energy taxation is heavily concentrated on transport use, if compared to average OECD values.[18]

Although not shown in the table, it is important to stress that only road transport fuels are highly taxed, whereas the tax rates for aviation and marine use are much lower. This means that the highest share of the burden of energy taxation is directly on household shoulders, as previously shown in Fig. 14. The tax preference for non-household agents has also been historically evident in the difference between petrol and diesel tax rates, a characteristic common to the majority of OECD countries. Until the last decade, petrol consumption was prevalent in developed countries: private cars mainly used petrol whereas the commercial and industrial vehicle fuel was diesel. As a way to foster competitiveness, in Italy as in almost all developed countries the diesel tax rate was set at a lower level than the petrol one. The tax advantage—together with the higher energy efficiency of diesel vehicles—caused a noticeable shift towards diesel vehicles and subsequently an increase in the relative industrial price of diesel, which is now very close to the petrol price. Unfortunately, diesel fuel also has a higher CO_2 content and this means that the preferential tax treatment has encouraged more diesel use and relatively higher CO_2 emissions. Moreover, the current preferential tax treatment lacks a clear economic rationale because it is no longer clearly targeted at competitiveness protection. More generally, a clear rationale cannot be identified for Italian energy tax rates because it is the result of several ad hoc manoeuvres, almost completely caused by revenue-raising needs. A link between the tax rate and the energy content or the value of the externality caused by energy use is completely absent. However, in the

[18]The IEA data, used by the OECD to compute effective tax rates, collect all kinds of transportation under Transport Use, thus also including household energy use for private transport. Residential and commercial uses are therefore mainly energy use for heating purposes.

Table 3 Effective tax rates per fuel and energy use in Italy and OECD[a]

	Oil products	Coal and pet coke	Natural gas	Biofuels and waste	Renew. and nuclear	All fuels	OECD all fuels
EUR per GJ							
Transport use	16.8	0.0	0.1	21.5	0.0	16.7	11.5
Residential and commercial	8.1	0.0	0.1	0.0	0.0	1.2	1.2
Industrial and energy transformation	1.7	0.1	0.3	0.0	0.0	0.9	0.8
Electricity production	0.0	1.0	1.2	1.9	1.9	1.2	0.9
All uses	11.1	0.9	0.6	4.4	1.8	5.0	3.3
EUR per tonne CO2							
Transport use	232.5	0.0	1.5	303.8	–	231.8	161.0
Residential and commercial	116.0	0.0	1.9	0.0	–	20.2	17.0
Industrial and energy transformation	22.5	0.8	5.4	0.0	–	12.8	10.0
Electricity production	0.5	12.4	21.1	18.6	–	15.0	13.0
All uses	152.4	10.2	9.8	44.6	–	75.9	52.0

[a]OECD tax rates computed as simple averages
Source OECD (2013a)

late nineties, Italy tried to introduce an Environmental Tax Reform, with an attempt to redesign the tax system according to the climate protection goal, on the lines of a general carbon tax reform. This tax reform, which came into force in 1998 (law 448/98), is a clear example of the weakness of environmental policy in Italy. The policy started with a general and coherent design setting new tax rates to be annually increased, but was halted after only two years when a spike in international oil prices raised objections and protests from households and firms.[19]

3.1.2 Subsidies

According to economic theory, Pigouvian subsidies—like Pigouvian taxes—can be employed to encourage the use of energy-saving technologies or to discourage the use of fuels or appliances harming the environment. Unfortunately, as energy is a strategic input factor and a basic consumer need, subsidies are frequently set to

[19]For an appraisal of the effect of the full reform on the competitiveness of manufacturing firms, see Bardazzi et al. (2004).

target too many goals, leading to a system which encourages wasteful energy consumption and thus makes energy efficiency and climate policies ineffective. In the last decade this inconsistency has been highlighted by scholars and international organizations and the distinction between "good subsidies" (related to the development and deployment of renewable energy) and "bad subsidies" (directed at fossil fuels or at the general aim of lowering energy prices) is becoming more and more crucial. Phasing out fossil fuel subsidies has become one of the main policy lines to combat climate change.

In spite of their importance in the public debate and the international political agenda,[20] there is not yet a common agreed definition of what a "subsidy" is, particularly in the case of energy. Nonetheless, it is accepted that the definition should not only include potential direct financial transfers, but also "any government action that lowers the cost of energy production, raises the revenue of energy producers or lowers the price paid by energy consumers".[21] Based on this general characterization, subsidies can be classified as **on-budget subsidies**, covering measures affecting the general government budget, and **off-budget subsidies**, i.e. those measures not featuring in the public budget (tax expenditure or benefits originating from market regulation are the main categories).

On-budget Subsidies

A rough estimation at the European level of on-budget measures can be based on Eurostat's General government expenditure by function, which distinguishes among "Direct financial transfers," "Energy-related services provided directly"[22] and "Government energy related R&D Appropriations." The shares of GDP of overall on-budget energy-related expenditure for the EU 27 in 2008 are shown in Fig. 15. Although the role of on-budget subsidies is relatively small in the EU (on average 0.2 % of GDP or 0.5 % of total expenditure), the graph shows that several countries prefer the use of direct financial transfers rather than providing

[20]In the 2009 and 2013 G20 summits, a resolution to "rationalize and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption" was agreed.

[21]See the IEA, OECD and World Bank report prepared for the 2010 G20, and OECD (2013a, b). Although difficult to estimate, other aspects such as the limitation of civil liability for nuclear accidents or a lack of measures aimed at internalizing external costs caused by producers should be taken into account.

[22]Using "*General government expenditure by function*", the entries '*Subsidies*' (D.3) and '*Capital Transfers*' (D.9) have been employed to estimate direct financial transfers from general government, while the entries '*Intermediate Consumption*' (P.2), '*Gross Capital Formation*' (P.5) and '*Compensation of Employees*' (D.1) have been utilized to estimate appropriations by general government to undertake energy-related services. For each of the entries above, only the (second level) entry '*Fuel and energy*' (04.3) under Economic Affairs (04) has been taken into account. R&D expenditure comes from the dataset "*Government Budget Appropriations or Outlays on R&D*" (*gba_nabsfin07*), entry '*Energy*' (05) in NABS (Nomenclature for the Analysis and Comparison of Scientific programmes and Budget).

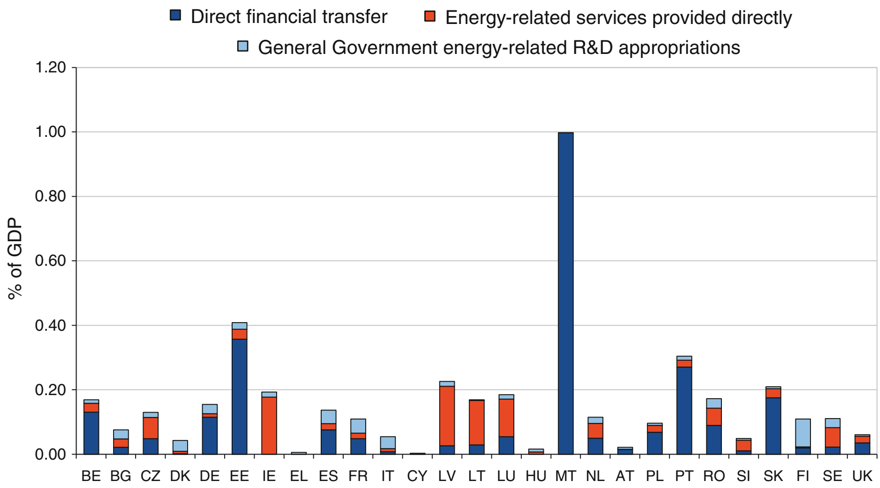


Fig. 15 Energy-related public expenditure (percentage of GDP). *Source* Eurostat database

energy-related services. Direct financial transfers are mainly concentrated on coal, currently the most important energy product recipient. On the contrary, an absence of primary energy resources reduces the level of direct support in highly energy-dependent economies like Italy. With the exception of the UK, data for R&D shows a higher correlation with the size of the economy, especially for the largest countries, which actually account for about the 90 % of the EU-27 expenditure on energy sector R&D. The negligible role of energy-related on-budget subsidies at EU level is obviously partially due to the general EU policy framework, which discourages the use of any subsidies considered harmful to the common market (state aid) and has committed member countries to very ambitious environmental goals. However, it is worth stressing that on-budget subsidies constitute only a part of public intervention in the energy sector, and relevant and generally non-transparent subsidies do not directly involve the general government budget.

Table 4 presents some further details on Italian energy-related public expenditure. The table shows a declining trend in this kind of expenditure—because of public budget stress—with the exception of "Other current Transfers".[23]

The dataset we have chosen does not allow us to identify the specific energy sector the support is addressed to (i.e. coal, oil, or nuclear energy decommissioning). In order to estimate these quotas, it is necessary to rely on findings from other studies, such as EEA (2004) or Ecofys (2014).

It is worth mentioning that outside the EU, on-budget subsidies are much more relevant: fossil fuel subsidies, which are usually consumer subsidies, are significant

[23]This item, appearing in the general government public budget but not in the central government budget, is the cost paid by electricity consumers to finance renewable subsidies. See Sect. 3.3 below.

Table 4 Energy-related public expenditure in Italy, general government (in million euros)

	Direct financial transfer	*Capital transfers, consolidated*	*Subsidies*	*Other current transfers, consolidated*	*General government energy-related R&D appropriations*
2000	**274.0**	*214.0*	*60.0*	*0.0*	**n.a.**
2005	**168.0**	*120.0*	*48.0*	*0.0*	**381.9**
2008	**170.0**	*139.0*	*29.0*	*2.0*	**589.3**
2010	**190.0**	*142.0*	*38.0*	*10.0*	**347.3**
2012	**180.0**	*141.0*	*26.0*	*13.0*	**327.3**

Source Authors' calculation on Eurostat database

as a percentage of GDP in Central Asia, South America and the Middle East. It has been estimated that maintaining diesel and petrol consumer prices below international levels implies a total fuel subsidy bill of around 10 % of GDP and leads to considerable public budget stress.[24]

Off-budget (Tax Expenditure)

As previously discussed, a relevant share of energy-related subsidies does not explicitly appear as public expenditure (off-budget). The great majority of this kind of intervention can be defined as tax expenditure, i.e. revenue foregone by the budget due to a reduction in the tax liabilities of particular household groups or sectors of activity. Indeed tax expenditure can be considered a deviation from the ordinary tax benchmark and it may take the form of tax exemptions, investment tax credits or preferential tax rates.

Regardless of the tax basis—energy content or pollutants—governments have often introduced exclusions or preferences to mitigate potentially adverse impacts of higher energy prices on household distribution or industrial competitiveness. It is increasingly recognized, however, that such preferences change the relative prices in the economy in ways that can harm the efficacy of the overall energy and environmental policy, or energy taxation in general. The use of tax subsidies has been widespread among oil and gas producer countries (such as Venezuela, Mexico and Iran) as a way of distributing to consumers and firms a sort of "dividend" from the export of these resources. Recently, the majority of producer countries have reconsidered this energy subsidy policy[25] because a number of analyses have shown a link between energy subsidies and inefficient energy uses, and particularly because producer country governments have realized how big the share of foregone revenue caused by energy subsidies is.

Needless to say, an exhaustive estimation of off-budget subsidies is particularly problematic. The IMF (2013) estimates them at 1.5 trillion dollars at world level,

[24]For a summary of the international organization estimates, see Overseas Development Institute (2013).

[25]In recent years, relevant fossil fuel tax expenditure reforms have been realized in Indonesia, Malaysia and Iran.

Table 5 Oil and natural gas related tax expenditure in Italy (in million euros)

Fossil fuel support to petroleum products and natural gas	2005	2008	2009	2010	2011p
Oil products					
Fuel-tax reduction for rail transport	10	5	1	1	2
Tax relief for trucking companies	69	148	144	144	346
Tax relief for public transport	24	14	14	16	25
Energy tax breaks for agriculture	860	807	816	817	908
Tax relief for ambulances	4	2	2	2	5
Fuel-tax exemption for shipping	570	548	488	492	547
Tax relief for users living in disadvantaged areas	62	62	233	231	231
Natural gas					
Tax relief for industrial users of natural gas	89	60	60	60	60

Source OECD (2013b)

more than 1.5 % of total GDP. The OECD has published a detailed inventory of energy-related tax expenditure (OECD 2013b), but the specific measures are so heterogeneous that averaging or comparing estimates among countries is very complicated. As a general finding, it can be noticed that the majority of fuel tax expenditure is devoted to oil and natural gas and this structure is also confirmed for Italy, as detailed in Table 5. The table shows that the most important recipient sectors are transport (all means of transport) and agriculture.

Several European countries set a reduced rate of VAT on the consumption of energy products. The difference between the standard rate and the special rate applied for certain specific uses and users (mainly households and agriculture) gives the magnitude of the implicit subsidy. In Italy too a reduced VAT rate (10 % instead of 22 %) is applied to selected electricity and natural gas users, but several other tax expenditure policies are also in force. As regards renewable, investments benefit from a rebate on VAT, and a general exemption from the payment of excise duties is established for green electricity produced and consumed directly by the producer. Moreover, a special tax regime is available for farmers producing and selling renewable energy: income coming from the renewable energy production is considered agricultural income and therefore taxed on a preferential lump-sum basis.[26] Finally, two tax rebates are provided for environmentally related investments and research and development activities. Law no. 296/06 grants a tax credit as a contribution to enterprises which carry out research and development activities (10 % of investment and innovation costs), whereas law no. 388/2000 (known as the Tremonti environment law) provides a tax allowance for investment in environment-related activities exceeding the average investment of the preceding

[26]More than 17,000 farmers registered renewable equipment in 2010, and around 3000 agricultural firms declared income from solar energy production. See the Istat Agricultural Census at www.istat.it.

five years. Italy has also used property taxes at the local level to promote green electricity: municipalities may establish lower rates for taxpayers installing a renewable energy plant to produce electricity.

3.2 Emission Trading Scheme

The European Emission Trading Scheme (EU ETS), introduced in 2003, is a cap-and-trade system set up to limit greenhouse emissions by selected large industrial installations in the EU.[27] Cap-and-trade systems involve the issuance of a limited number of allowances corresponding to the target size of CO_2 emissions. Typically, the cap decreases progressively from one period to another in order to reach a specific environmental target at a certain time horizon (e.g. in the current EU ETS the target is set to cut emissions by 20 % in 2020). After a trial phase, this market entered into force in 2008 together with the Kyoto protocol. Member States allocated allowances to the firms in the scheme (mainly for free, i.e. 'grandfathering') and these allowances were traded between market participants. After the end of the Kyoto protocol (December 2012), the ETS scheme run into a third phase in which the EU tried to introduce an amendment aiming to improve market stability: new economic activities were put under the ETS scheme and the grandfathering allocation, to a large extent, was replaced by auctioning.[28] From a theoretical point of view, Pigouvian taxes and ETS operate in the same way by sending a signal to the market: the true carbon price. If the marginal social costs are correctly estimated and the overall pollution target is optimally set, the permit price of a cap-and-trade system will equal the Pigouvian tax rate and both instruments will contribute to achieving the same environmental target, at the least total cost of abatement. However, in the real world these costs and the target are very difficult to estimate and the two instruments differ in efficacy and transaction and implementation costs. Indeed, building a new "artificial" market for CO_2 emissions proved to be harder than expected and the functioning of the market has almost always been unsatisfactory. In particular, since the surge of the financial crisis a surplus of allowances with respect to emissions has been observed (a surplus of over 2 billion allowances is estimated for 2014) and the market price, which represents the carbon signal, has plummeted below 5 euros per tonne. Apart from the policy initiatives

[27]The ETS sector includes power and heat generation, combustion plants, oil refineries, coke ovens, iron and steel plants, cement, glass, lime, bricks and ceramics.

[28]Although theoretically there is no difference between allocation by auction or grandfathering (provided that no market imperfections exist), they have different impacts on the budget: grandfathering of permits represents a transfer from society to polluters (foregone revenues), whereas auctioning represents revenue paid by polluters to society.

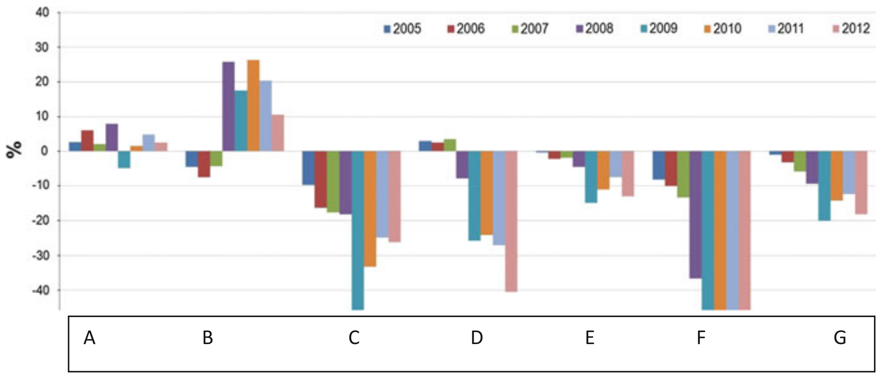


Fig. 16 Difference between emission permits and verified emission in Italy. *A* Power and Heat, *B* Refineries; *C* Iron & Steel, *D* Cement, *E* Glass, *F* Ceramic, *G* Pulp & Paper. *Source* Ispra database

currently taken by the EU commission to contrast this trend,[29] the general situation is inefficient because the carbon price signal from the ETS (principally directed towards energy-intensive sectors) is very different from that implicit in energy product taxation (for all sectors and consumers using energy products).

Italy has implemented the EU ETS regulation according to the EU legislation framework, but without a clear national *imprinting* or a real attempt to coordinate the EU ETS with the other instruments in force in Italy. Like many other member countries, in the first two phases Italy allocated more allowances than necessary. Obviously, this "national defensive choice" contributed to the aforementioned total surplus formation and weakened the signal to encourage firms to make more energy- and carbon-saving choices. Figure 16 illustrates the sectoral difference between allowances and verified emission during the first two phases of the EU ETS. With the partial exception of the power and refineries sectors, all the other sectors covered by the ETS framework exhibited a relevant surplus.

With the start of the third phase, auctioning replaced grandfathering (allocation for free) and the revenue collected in 2013 reached 386 million euros, more than 10 % of the total revenue at EU level (3625 million euros).[30]

[29]The EU commission is preparing a structural reform to improve the effectiveness of the market. A market stability reserve and a limitation on the use of international offsetting credits are the key elements of the proposed reform. See "Proposal for Decision Of The European Parliament and of The Council concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC", COM(2014) 20/2.

[30]The Italian government has declared that 50 % of this sum will be used for climate- and energy-related purposes, as set by the EU regulation.

3.3 Feed-in Tariffs

As discussed above, when defining subsidies all government policies which can alter market prices should be included, even those cases in which the government only sets a general regulation and revenue and expenditure are accrued and incurred by other agents. The most well-known example of such mandated transfers is the feed-in tariff (FIT), a fixed[31] payment made to households or businesses generating electricity from renewable energy sources (RES-E) proportional to the amount of power generated and implying a price higher than the market electricity price.[32] This premium on the market price is intended as compensation for the higher costs of the immature technology and must be financed. Although FIT schemes can be financed in a number of ways, the cost of this renewable incentive policy will ultimately be borne by consumers and firms. Italy, like the vast majority of EU member states supporting RES-E, finances the FIT scheme through a surcharge paid by electricity customers via their electricity bills (the so-called A3 component). This surcharge can be classified as a non-tax levy (or quasi-tax) because it is set annually and collected by national electricity regulators and does not feature in the budget of the central government.[33]

The Italian support system for RES-E is very complex because it is differentiated by source (wind and photovoltaic technologies, for example, are financed by different schemes) and because it has been repeatedly reformed and revised.[34] Nonetheless, it has proved to be one of the most generous in the world. Figure 17 shows that the average level of support in Italy—32 euros per MWh—is higher than in all other European countries.

However, this average level conceals a level of support highly differentiated according to technology: since the start of the new century, Italy has experienced a solar investment boom triggered by incentives much higher than the average (Table 6).[35]

Besides the investment boom, the generous Italian RES-E support scheme caused a rapid rise in support payments and, as a consequence, a considerable growth in the "A3 component" of electricity bills. This increase in electricity payments has progressively raised concerns about the distributional and competitiveness impacts on

[31]These contracts typically last between 15 and 20 years.

[32]In addition to FITs, there are also other mechanisms through which renewable energy sources are supported, for example, renewable energy certificates (Green Certificates), and other similar support schemes.

[33]In addition, a "priority access" to the power grid is generally granted to renewable electricity generators. This clause obviously imposes costs on some segments of the energy sector while conferring benefits on others.

[34]"CIP 6/92", Green Certificates, "Conto Energia" (with five different sub-regimes) and "Tariffa Onnicomprensiva" are the main support schemes that came in one after the other.

[35]Between 2000 and 2013 electricity power generation by RES more than doubled (from 50,990 to 112,008 GWh). 35 % of this increase is from solar installations.

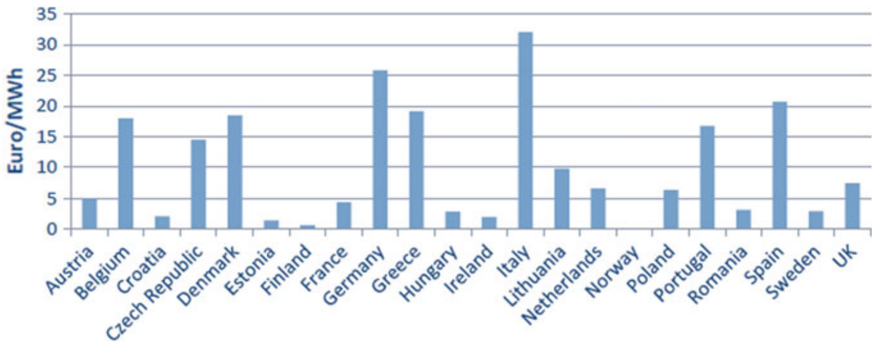


Fig. 17 RES-E support per unit of gross electricity produced in EU countries (2012). *Source* CEER (2015)

Table 6 Weighted average support level by technology (Euro per MWh 2012)

	Bio-energy	Geothermal	Hydro	Solar	Wind (on shore)	Total
Italy support	126.1	76.7	87.6	335.6	79.0	180.0
Minimum across 22 countries	14.5	8.0	3.5	14.5	7.0	13.5
Maximum across 22 countries	138.1	175.7	96.4	462.1	86.3	219.5
Weighted average across 22 countries						107.2

Source CEER (2015)

households and firms, as the revenue from the “A3 component” more than tripled between 2009 and 2013, reaching 12 billion in 2013.[36]

The Italian government has been forced to intervene to control this explosive trend, first by stopping the RES-E-related FIT schemes and, more recently, by introducing significant retroactive cuts to the guaranteed feed-in tariffs (FIT) and new taxes on self-consumed RES electricity.[37] Although the incentive system previously in force was too generous and therefore clearly unsustainable in the medium run, it is questionable whether the retroactive cuts are compatible with the Italian and European constitutional frameworks. After a decade of generous but unstable policy support schemes, the investment boom allowed early achievement

[36]A representative residential user is currently paying more than 20 % of the electricity price per Kwh to finance the A3 component. See Pazienza and Verde (2013) for further details.

[37]PV producers, which were granted incentives for a period of 20 years under the “Conto Energia” mechanism, now have to choose between three options that in any case result in a cut in the previously guaranteed FIT. See decree law 91/2014.

of the target set by the EU and national plans.[38] However, there are currently no incentives for new solar installations and very few in force for other technologies. Moreover, no clear policy scenario for the near future is available.

4 Which Direction for Energy and Climate Security Policy?

Important changes in the energy and climate framework at the national, European and world levels have characterized the last decade. Several geo-political tensions have increased the vulnerability of the energy-dependent European economies and exposed consumers and firms to abrupt increases in energy prices. This vulnerability called for an increase in the diversification of supplies and new energy-trading relations and pipeline projects have been planned. In the meanwhile, when the Kyoto Protocol became effective in 2005, the EU environmental policy gained new force in terms of energy-saving renewable and de-carbonization policies. A long phase of increasing oil and gas prices led to the US shale gas revolution.[39] This, together with the growing importance of LNG[40] and the renewable boom experienced in many countries, has lately driven oil and gas prices down.

This phase of increasing diversification of supplies and low fossil fuel prices can generally be considered positive from an energy security point of view; however low energy prices can also divert attention from energy-saving policies, causing a general "rebound effect" with adverse consequences for the decarbonisation goals. This is even more important in Italy, whose energy policy has frequently been driven more by urgencies than by sound long-term design.

In our opinion, this period of a relatively low national energy bill appears the appropriate time for a general reorganization of the field. After a very long gestation,[41] the National Energy Strategy set goals and programmes in coherence with the general European framework but the incongruity between extremely unstable energy markets (with profound changes in technology and infrastructure needs) and the very long period needed to write a policy strategy is evident. Not surprisingly, between the policy design and implementation phases various contradictions emerge. As discussed before, although Italy is one of the most energy-efficient countries, enhancing energy efficiency is still the first priority of the National

[38]The RES share of electricity consumption for 2013 is much higher than the level set by the National Action Plan for both 2013 and 2020. See GSE (2015) for further details.

[39]For a discussion of the US shale gas revolution, see Meade and Faiella Di Nino in this volume.

[40]The growing supply of LNG from the Middle East area pushes the natural gas price down as a result of increased competition, especially in those countries where regasification infrastructure is available.

[41]The National Energy Strategy was first sketched by the Prodi government, then formulated under the Berlusconi government, and finalized by the Monti government in March 2013. The Renzi government confirmed the Strategy in 2014.

Energy Strategy, as several sectors need to improve their performance. The aforementioned national plan for energy efficiency (NEEAP*)* is comprehensive and well structured. However, public funds needed to improve energy efficiency in public and private dwellings appear totally insufficient. At the same time, the recent decree law "*Sblocca Italia*" substantially encourages fossil fuel extraction, making drilling for oil and gas easier, especially in the Adriatic Sea and the south of Italy (Basilicata), where some of the largest unexploited Italian reserves are deemed to be located. Although it is evident that an increase in domestic fossil fuel supplies can be beneficial for energy security, it is also clear that focusing attention and monetary resources on oil and gas reserves—which in any case are estimated to be limited—can divert attention from long-term goals. Enhancing renewables and energy efficiency appears to be a much more reliable contribution to reducing the national energy bill.[42]

The main weakness of Italy's energy/environmental policy is, in other words, a lack of an integrated vision, which should build on national strengths and take into account diversification needs and new technology scenarios. It is beyond the aim of this chapter to discuss how the Italian energy strategy should prioritize its goals. However, we consider that a reliable use of market-based instruments based on a unique price signal as a basis for all sectoral implementation can help attain the maximum level of energy efficiency and, at the same time, the minimum level of carbon intensity.

As is widely known, carbon pricing policies are characterized by cost effectiveness because the price signal—if really unique—helps consumers and firms to choose goods, investments and technologies with the least carbon content. To reach the least carbon content, agents make both energy-saving and substitution choices, and consequently both goals can be reached. This view is coherent with the Commission proposal for a revision of the Energy Taxation Directive, which promotes the design of two separate components in common energy minimum tax rates: an energy content component and a carbon content component. In other words, taxing energy products can help in reaching the two goals.[43]

Although the price signal cannot be considered the only driver of environment-friendly behaviour, Italian consumers and firms have proven to be very reactive after energy price changes. A shift from leaded to unleaded petrol incentivized by different excise taxes and, more recently, an increasing use of natural gas and hybrid fuelled cars are notable examples of a very effective reaction by Italian households, which can contribute to explaining Italy's current historically low energy intensity (see Fig. 7). Regarding business, non-negligible own and cross-price elasticities attest to an overall flexibility in energy- and fuel-related

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[42]This renewed opening towards fossil fuel extraction has also been challenged from environmental and landscape conservation perspectives. Several regions have gone to the Constitutional Court over the government decree.

[43]The Commission proposal, launched in 2011, is still under discussion because of strong resistance from some member countries.

choices.[44] However, the recent boom in photovoltaic and wind power investment, led by a very generous price signal (the FIT scheme), also shows that this kind of instrument can have many adverse effects if not embedded in a general strategy.[45]

The case of electricity taxation can constitute a good example of the lack of a coherent strategy in Italy. At least three different and uncoordinated policy signals affect the final electricity price, which, as shown before, is one of the highest both in Europe and the world. Excise taxes are levied both on energy products used to produce electricity and on electricity consumed by households and firms. Excises on energy inputs are levied with special tax rates (because of the double taxation) and are therefore different to those applied to other energy uses. In the consumption phase excise taxes and the aforementioned A3 component devoted to financing renewable subsidies (a quasi-tax) are levied. In addition, electricity producers are constrained by the EU Emission Trading Scheme and they currently have to buy allowances by auction. Unfortunately, there is no coordination mechanism between excise rates, subsidies and ETS prices because excises and subsidies have been frequently set more with the aim of balancing the public budget than of pursuing an energy or climate strategy. At the same time, the ETS market has proved to be very unstable and was deeply affected by the economic downturn. The ETS allowance price has varied between 30 and 1 euro since its implementation, making the signal absolutely unreliable and adding non-negligible compliance cost for firms. The overall result of these different signals is very high electricity prices, distributional and competitiveness concerns, no renewable support and different policy signals, apart from a general disincentive to consume electricity.

In our view, this fuzzy situation could be at least partially improved with the introduction of energy/carbon taxation able to produce a coherent price signal to economic agents by implementing the general rationale of the EU Commission proposal for amending the Energy Taxation Directive. All energy tax rates could be set according to an implicit cost of carbon, which could mirror either an internationally estimated cost or the EU ETS allowance price target, and to an energy content component, set to enhance energy-saving behaviour. As previously discussed, the current level of energy-related tax rates is among the highest internationally. This leaves enough room for tax rate reshaping without increasing the tax burden and with a likely relief of distributional and competitiveness concerns.

In this tax reorganization, preferential tax treatments, tax rebates and double taxation should be phased out, so firms constrained by the EU ETS should not pay excise taxes on energy products.[46] This tax revision could also be extended to

[44]As discussed in the previous paragraphs, the gas-electricity price differential has determined an important shift from electricity to gas use in industrial processes.

[45]This abrupt growth in the supply of renewable cannot show all the potential benefits because of the inadequacy of the Italian transmission network in absorbing this kind of supply. As discussed in Sect. 3.3, the incentive scheme led to high profits for renewable producers and a high burden on electricity consumers, both households and firms, thus forcing the Italian government to stop the programme.

[46]The need for an energy tax reorganization has also been identified by the OECD (2015).

complementary tax bases: transport taxes—for example—could also be reorganized to coherently reinforce the carbon and energy saving goals or to take other externalities into account, avoiding the pure double taxation of carbon or energy content tax bases. This appears even more important when considering that the Italian Action Plan for Energy Efficiency has assigned the most ambitious saving target (−5.50 out of 15 Mtoe) to the transport sector, which is highly heterogeneous in energy and carbon efficiency according to the mode of transport. If progress were made towards removing all the current discrepancies and overlapping between instruments, the effect would not necessarily be to achieve economic efficiency with environmental improvements at the cost of lower fiscal revenue; empirical studies (Vivid Economics 2012) have shown that carbon fiscal measures also have a potential role for fiscal consolidation in European countries.

References

Bardazzi R, Oropallo F, Pazienza MG (2004) Accise energetiche e competitività delle imprese: un'applicazione sull'esperimento della carbon tax, *Economia delle fonti di energia e dell'ambiente* 3, 121–164

Bardazzi R, Oropallo F, Pazienza MG (2015) Do manufacturing firms react to energy prices? Evidence from Italy. Energy Econ 49, 168–181

Bhattacharyya SC (2011) Energy economics: concepts, issues, markets and governance. Springer, Berlin

CEER (2015) Status review of renewable and energy efficiency support schemes in Europe in 2012 and 2013. Council of European Energy Regulators, Brussels

Ecofys (2014) Subsidies and costs of EU energy, Final Report, Study commissioned by the European Commission

European Commission (2013) Member States' energy dependence: an indicator-based assessment. Eur Econ. Occasional Papers 145

European Commission (2014a) A policy framework for climate and energy in the period from 2020 to 2030, COM(2014) 15 final

European Commission (2014b) European energy security strategy, COM (2014) 330 final

European Commission Staff (2014) "In-depth study of European Energy Security", SWD (2014) 330, Commission Staff Working Document accompanying the document "European Energy Security Strategy"

European Environmental Agency (2004) Energy subsidies, EEA

Faiella I, Lavecchia L (2014) Energy poverty in Italy. Occasional Paper 240, Bank of Italy

Gestore dei Servizi Elettrici (2015) Rapporto Statistico. Energia da Fonti Rinnovabili in Italia, GSE

Goldthau A (2011) The public policy dimension of energy security. In: Sovacool B (ed) The Routledge handbook of energy security, Routledge

IEA (2014) Energy efficiency indicators: essentials for policy making. IEA, Paris

IMF (2013) Energy subsidy reform: lessons and implications. IMF, Washington

Kallbekken S, Sælen H (2011) Public acceptance for environmental taxes: self-interest, environmental and distributional concerns. Energy Policy 39:2966–2973

Månsson A, Johansson B, Nilsson LJ (2014) Assessing energy security: an overview of commonly used methodologies. Energy 73:1–14

OECD (2013a) Taxing energy use: a graphical analysis. OECD, Paris

OECD (2013b) Inventory of estimated budgetary support and tax expenditures for fossil fuels. OECD, Paris
OECD (2015) OECD economic surveys: Italy. OECD, Paris
Overseas Development Institute (2013) Time to change the game. Fossil fuel subsidies and climate, London
Pazienza MG, Verde S (2013) Cost recovery of RES-E support in Italy: a new case for a carbon tax, EUI Working Paper RSCAS 2013/72
Perman R, Ma Y, McGilvray J, Commonet M (2013) Natural resource and environmental economics, 4th edn. Addison Wesley, boston
Terna (2013) Dati Statistici sull'energia elettrica in Italia 2013. Nota di Sintesi, Rome
UPI (2014) Annual report 2014. Unione Petrolifera, Rome
Vivid Economics (2012) Carbon taxation and fiscal consolidation: the potential of carbon pricing to reduce Europe's fiscal deficits, May, available at http://www.vivideconomics.com/wpcontent/uploads/2015/03/Carbon_taxation_and_fiscal_consolidation_Full_report.pdf
Winzer C (2012) Conceptualizing energy security. Energy Policy 46:36–48
Young R, Hayes S, Kelly M, Vaidyanathan S, Kwatra S, Cluett R, Herndon G (2014) The 2014 International Energy Efficiency Scorecard, Report no. E1402, American Council for an Energy-Efficient Economy, Washington