

Article

Evaluating the Impact of Public Information and Training Campaigns to Improve Energy Efficiency: Findings from the Italian Industry

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Abstract: Energy efficiency is a pillar for the energy system transition and for reaching the Sustainable Development Goals. In the light of the “energy efficiency first!” principle, European member states enforce policies to spread energy saving throughout the whole energy chain involving both citizens and industries. In this context, information and training campaigns arise as valuable support tools to disseminate energy efficiency and, therefore, for reducing energy consumption. Although various studies have evaluated the impact of information campaigns targeted to citizens, there is a lack of investigations that assess the impact of campaigns dedicated to industry sectors. This study discusses the results of a survey targeted at energy-intensive Italian companies, with a sample of 300 responses. Starting from the analysis of drivers that trigger the implementation of energy efficiency measures, the paper proposes an approach to evaluate the amount of energy savings linked to the Italian information and training program targeted to industries carried out by the Italian Energy Efficiency Agency. Results show that although information campaigns are not a crucial driver for companies, they are recognized as a factor that contributes to the implementation of energy efficiency practices. Findings show that roughly 1.4% of energy savings noted by interviewed companies to the Italian Energy Efficiency Agency are a direct effect of the information and training program. This outcome has significant implications, especially for decision-makers, giving evidence of the efficacy of information campaigns on industries, which have great potential for the transition to low carbon production systems.

Keywords: information and training campaign; energy savings assessment; energy efficiency policy; industry; industrial energy efficiency



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1. Introduction

Among the main global challenges to be tackled over the coming decades, energy represents one of the major issues to ensure a sustainable economy and society. The United Nations 2030 Agenda for Sustainable Development underlines the importance of guaranteeing to all “access to affordable, reliable, sustainable and modern energy” with a dedicated Sustainable Development Goal [1]. A shift toward a more sustainable energy system is also necessary to meet the ambitious climate goals of the Paris Agreement of keeping a global temperature rise this century well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 °C [2].

Decarbonization arises as a strategic priority for all sectors, from industry [3] to urban areas [4], with the goal of reaching nearly zero emissions by 2050 [5,6]. This process requires the engagement of all levels of society, embracing a wide range of stakeholders who may have and require different approaches for the implementation of deep decarbonization [7]. To achieve a zero-emission economy, inter-organizational cooperation is needed as well as

cross-border partnerships, especially among European Union member states [8]. Currently, the development of knowledge and technologies has paved the way to a possible decarbonization without undermining the ability of the economic system to grow and prosper through the improvement of energy efficiency and a zero-emission clean energy supply replacing fossil fuels. However, this transition to low-carbon technologies is a great policy challenge, as the measures implemented must maintain their cost-effectiveness [9]. In this race to a net-zero carbon economy, together with the diffusion of renewable energy sources, energy efficiency has a crucial role [10], representing the first goal for the energy transition and a crucial pillar for reaching Sustainable Development Goals [11]. To respond to this global challenge, the European Union has launched the Clean Energy for all Europeans package, a comprehensive assessment of its energy policy framework. In order to achieve the 2050 long-term climate neutrality strategy, the package sets ambitious energy and climate target for 2030 with a reduction of energy use of at least 32.5%. It also introduces the principle of “energy efficiency first!”, identifying energy efficiency as the key objective of the European Union.

Indeed, energy savings are the most accessible way of saving money for consumers and reducing greenhouse gases emissions [12,13]. Moderation of energy demand should be achieved throughout the whole energy chain, involving both citizens and companies. According to the European Union Directive on Energy Efficiency (Directive 2012/27/EU), member states should play an active role in informing and engaging households and businesses in adopting technical and behavioral energy savings measures [14,15]. Considering this aspect, information and training campaigns arise as an enabling factor available to the member states for the dissemination of energy efficiency awareness and, therefore, for the achievement of European energy savings targets. These programs may contribute to mitigate the energy efficiency gap [16], as awareness campaigns contribute to reduce the issue of imperfect information in markets, guiding interested parties to a more efficient allocation of energy efficiency actions and investments [17–19]. Also in the industry sector, information and training campaigns can be considered as a supportive policy measure, promoting and stimulating a favorable environment for the implementation of energy saving practices, helping to improve industry’s access to information that is considered a relevant barrier to energy efficiency measures [20,21].

Previous experiences have pointed out that one of the most critical aspects for industry is the ability to identify efficiency measures that are both energy-efficient and cost-effective [22]. A cost-effective energy efficiency measure is defined as an investment that lowers the use of energy and is considered cost-effective according to the company’s investment criteria [23]. This issue is known as the efficiency gap and is a relevant barrier toward the process of decarbonization of the sector. This is often due to a lack of knowledge and information and represents a major market failure to implement cost-effective energy-saving practices [22]. The European Green Paper on Energy Efficiency (COM (2005) 265 final) underlines that information and training are two under-used tools that provide clear information on how to make cost-effective energy savings and can be effective in changing perceptions and encouraging industry action. Authors over the years have debated over the effectiveness of information and training campaigns: whereas some consider them as not effective, others argue that if properly delivered they can be effective and actively reduce the efficiency gap [18,24]. For instance, Thollander [23] highlights that information and training campaigns help to reduce market failures or market imperfections, reducing the risk that industry does not take the most cost-effective energy-saving measures, compromising the sector’s potential to actively participate in the process of decarbonization [25].

Once the information campaigns have been implemented, the next crucial step is the evaluation of their efficacy in terms of their impact on energy savings. Nevertheless, for national institutions, a punctual assessment of the reduction of energy uses ascribable to information campaigns still remains a big challenge [26]. Although various studies evaluated the impact of information campaigns targeted to citizens, there is a lack of

investigations that assess the impact of campaigns dedicated to non-residential sectors, e.g., [27,28]. Thus, the aim of this work is to illustrate the approach that the Italian national authorities have adopted to assess and quantify the energy savings resulting from the implementation of the national information and training program dedicated to industries. Through a survey dedicated to those companies, identified as the target of the Italian program, the study has two main purposes. The first is to quantify energy savings achieved by industries as an effect of the information and training campaign carried out by the public competent authorities to support the implementation of energy savings practices. The second purpose relates to the identification of the main drivers that led industries to realize energy efficiency interventions, in order to evaluate if the information campaign plays a significant role in activating those drivers.

The paper is structured as follows: first, it introduces the regulatory and the national context with respect to the information and training campaigns for energy efficiency. Next, it explores previous investigations that analyzed the drivers and enabling factors behind the implementation of energy efficiency measures in industry, trying to identify if information campaigns have played a significant role. Once presented the context and findings from previous studies, the survey was developed to evaluate the results is described. The presentation of the results and their discussion follows. Finally, limitations of the study and future lines of research are illustrated.

2. European and National Context

The European Union framework on energy efficiency is drawn by Directive 2012/27 (EED) and its recast by Directive 2018/2002 that set up new energy savings targets to be accomplished by 2030. According to the EED, instead of energy efficiency obligation schemes, member states may implement alternative policy measures to achieve their targets. These alternative measures include training and information campaigns that can positively contribute to the diffusion of technologies, techniques, or behaviors for the reduction of energy consumption (Art.7 EED). Article 17 (information and training) stresses the importance of member states in ensuring that information on energy efficiency is disseminated to all relevant stakeholders. Given the great energy-saving potential of information in spreading energy efficiency, the Directive also underlines the importance of public institutions in supporting firms in the implementation of energy efficiency measures by providing technical assistance and targeted information (EED whereas clause n.41).

Italy adopted the prescriptions of the EED with the National Decree n.104/2012. Specifically, Article 13 assigns to the Italian Agency for Energy Efficiency the implementation of a three-year information and training program with the aim of promoting the efficient use of energy among both households and companies. With respect to the latter category, the goals are to support and encourage the implementation of energy audits and then, through subsequent interventions, the diffusion of energy-efficient technologies and awareness on energy efficiency measures in the industry. The program was carried out between 2015 and 2019, and primary activities related to the establishment of permanent technical panels of experts with the main industrial associations; the organization of seminars and conferences; the formulation of standardized reporting models for energy audit data processing; and the preparation of sectoral guidelines for energy audits and energy efficiency interventions [29].

According to the legislative framework of the European Union, member states shall deliver a National Energy Efficiency Action Plan (NEEAP). Additionally, annually member states shall publish a progress report of all energy efficiency improvement measures that deliver energy savings [15]. Some member states over the last several years have reported in the NEEAPs and in the annual progress reports the measures implemented through information and training campaigns [30]. Those measures mainly target citizens' behaviors, whereas fewer efforts have been addressed to improve companies' awareness of energy efficiency. According to the European Joint Research Centre, a critical aspect that member states should further develop is related to the assessment of the efficacy of these measures implemented by member states. In fact, it remains still a challenge establishing a common

and shared framework to evaluate the impact of information and training campaigns in terms of energy saved from citizens and from companies [26].

3. Energy Conservation Drivers in the Industry: Analysis of the Literature

Industry barriers to the implementation of energy efficiency measures have been extensively analyzed mainly through surveys and case studies from a variety of perspectives such as financial/economic, organizational, and behavioral [31–33]. In general, the analysis and categorization of barriers is a result of the theoretical approach followed to investigate the phenomenon, for instance, the behavioral perspective relies on theories like the transaction cost economy and the economic perspective of the neoclassic theories [34]. Barriers have been studied also on the basis of their internal or external origin [35].

Other scholars differentiate between barriers dealing with the technical system and technological regime, and the socio-technical regime [36]. A multi-level categorization in micro-meso-macro barriers was proposed as well [37]. Given the industry process-related peculiarities, on several occasions scholars analyzed barriers from a specific industry perspective [25,38–42] or based on firm size [13,32,43–45]. These different analysis points reflect the peculiarities of the various industrial processes, also determining barriers whose level of intensity varies significantly depending on the sector under analysis.

Whereas barriers to energy efficiency practices have been widely studied, less research has been carried out on the driving forces behind energy-saving practices in the industry [31,32]. According to Cagno and Trianni [32], drivers for energy efficiency practices adoption were “factors facilitating the adoption of both energy-efficient technologies and practices, thus going beyond the view of investments and including the promotion of an energy-efficient culture and awareness”. Over the years authors have classified drivers into several categories, adapting them to the aim of the study and the context in which the investigations were conducted [38]. Thus, studies differ in relation to the theoretical approach, the industry sector, and the country in which the analysis was conducted.

Most studies identified in the review of the literature investigated energy-intensive sectors. The Swedish foundry industry was investigated by Rohdin et al. [42]. According to the results of that study, the most powerful drivers for energy savings were people with real ambitions and companies’ long-term strategies. A study conducted in 2013 analyzed driving forces for energy efficiency in 65 foundry industries in six European countries [25]. In that case, the most important forces to drive energy-saving practices related to financial aspects (rising energy prices and beneficial loans) and to organizational factors, such as companies’ environmental profile and long-term strategies. The Swedish iron and steel sector was studied by Brunke et al. [38]. Authors found out that the top management commitment was ranked as the highest, followed by the opportunity to reduce operational costs. Again in the Swedish context, Thollander and Ottosson [41] analyzed driving forces in the pulp and paper industry. The main drivers were cost reduction resulting from a reduced energy consumption, ambition, and companies’ long-term strategy for sustainability. Considering energy-intensive sectors, the Belgian cement sector was investigated by Venmans [39]. Starting from a selection of 53 energy efficiency projects, companies identified increasing energy prices as the main motivation that triggers energy efficiency measures, followed by the top-management commitment and the sustainable image of the companies in relation to customers. Hasanbeigi et al. [22] investigated drivers in the Thai cement industry. Results showed that reducing energy-related costs was the most significant force. Together, in second place, both improvement of product quality and enhancing staff health and safety were considered relevant drivers.

Another part of the literature studied energy-saving drivers in the manufacturing industries. Through a multiple case-study approach, Cagno and Trianni [32] investigated 71 Italian manufacturing small and medium enterprises (SMEs). The most meaningful drivers for implementing energy-saving measures were the allowances of public funding, external pressures, and long-term benefits. In contrast, increasing internal competencies and responding to customers’ requirements were not considered as important forces.

A similar analysis was conducted in Italy targeting 222 Italian manufacturing SMEs in 2016 [13]. In order of importance, economic and regulatory aspects (both internal and external) were the most significant. In the Netherlands, Cagno et al. [46] investigated manufacturing companies participating in the Dutch voluntary agreements for energy efficiency. Companies ranked first long-term strategy, clarity of information, and cost reduction from the reduced energy use as the crucial forces for interventions, whereas technological appeal and education and training programs were the least relevant.

Considering the Asian continent, a study was conducted in Korea [47] and one in Japan [48]. According to results, determinant factors for companies to practice energy-saving activities were in both cases internal, related to individual business strategies and energy savings motivation. Companies revealed that a major driver might be the promotion of energy efficiency in SMEs through government subsidies.

Other authors have tried to analyze energy efficiency drivers for industries with a theory-based approach, in several cases extending the scope of the institutional theory [31,47–49]. In China, 299 manufacturing companies were surveyed on the drivers and barriers about energy efficiency practices. According to results, coercive drivers did not significantly motivate companies, whereas normative and mimetic drivers had a positive influence on energy-saving practices implementation [49]. Zhang et al. [50] developed a conceptual model to better understand the formation of companies' energy savings practices integrating Institutional Theory. Findings showed that managers' environmental concern was significant in linking companies' energy-saving practices and the external pressure for energy conservation. Specifically, market-based tools (normative and mimetic pressure) were more effective than coercive pressure to drive companies toward energy use reduction. Similarly, Zhang et al. [31], starting from the institutional theory, showed that top management significantly linked external pressure and companies' energy efficiency practices. Results from the Chinese companies highlighted that coercive, mimetic, and normative pressure were important drivers for energy-saving measures implementation.

Taking into account energy efficiency drivers linked to information campaigns, Cagno et al. [46] found out that education and training programs were not considered by Netherlands' SMEs as relevant drivers, as none of the companies evaluated them as important or very important. In the Italian context, training and informative drivers were also evaluated to have low power [13].

4. Aim of Study, Research Process, and Data Collection

4.1. Aim and Scope of the Investigation

The analysis of the literature has shown, in the context of energy efficiency measures in the industry, that there is no consensus on the approach to evaluating if and to what extent the information and training campaigns are effective in stimulating the implementation of measures to reduce energy consumption. A starting point is to understand and recognize the most effective drivers for energy efficiency that are crucial for the information campaigns to deliver an effective message that could stimulate companies' action toward energy use reduction. Additionally, from the literature it has emerged that an approach to evaluate the significance of the energy savings arising from campaigns carried out by third-party institutions is still not available. From the analysis, two main research questions arise. The first one relates to the drivers that push industries to implement energy efficiency measures and the role of information and training campaigns. The second concerns the evaluation of the energy savings that can be attributed to the activities carried out by the institutions aimed at increasing awareness of possible applicable energy efficiency measures.

RQ1: What are the main drivers for the implementation of energy efficiency measures in the industry?

RQ2: How much energy savings achieved by industry is attributable to information and training activities carried out by third-party institutions?

4.2. Research Process

According to the Art.7 of Italian National Decree 104/2012, companies subject to mandatory energy audit requirements should notify the Italian Energy Efficiency Agency on the energy savings achieved each year, additional to those that already benefited from the White Certificates scheme (energy efficiency obligation scheme) or other incentive mechanisms. Therefore, this specific group of companies was employed for the subsequent analysis. The companies' communications of energy savings are the baseline to estimate energy savings during the years (2015–2019) in which the Italian information and training program was conducted.

In order to answer the research questions, the first step was to identify the energy savings communicated by the selected group of companies. Next, through a survey targeted at the same companies, drivers for energy-saving measures implementation were evaluated to estimate the amount of energy savings that can be linked to the Italian information and training campaign.

The questionnaire is organized into three main parts. To obtain a clear picture of the responding population, in the first part of the questionnaire companies were asked to indicate their main economic activity according to The European Classification of Economic Activities (NACE rev.2—Regulation (EC) n.1893/2006). Given that the main goal of information campaign is to stimulate companies to take action, the section explores what the most relevant drivers are for the implementation of energy efficiency measures.

The second part of the questionnaire aims to identify (1) how much of the energy savings are due to measures implemented to comply with the legislation and to remedy design errors and (2) how much savings are due to interventions for which state incentives have been obtained (see Figure 1, STEP 1). In the view of the annual report to the European Commission about EDD article 7, the identification of these groups is necessary to avoid double counting when evaluating the savings obtained by the country through several energy efficiency policies.

Once we identified the companies that did not implement interventions for (1) and (2), we selected from the questionnaire responses those companies that considered the increased awareness on energy efficiency had played a significant role in the decision to implemented energy reduction measures (STEP 2). The final part explores the significance of awareness factors for implementing energy efficiency measures and companies' evaluation of the importance of acquiring information and training to stimulate the energy efficiency interventions. In particular, the percentage of companies that considered the information and training activities carried out by the Italian Energy Efficiency Agency as "very important" in the decision to carry out energy efficiency interventions was considered. In more detail, companies were asked to indicate the relevance of the list of awareness factors in contributing to a greater awareness of energy efficiency and, thus, implementing energy efficiency measures. The awareness factors identified are external consultants; internal energy manager; mandatory energy audit; technical discussion tables organized by the Italian Energy Efficiency Agency; Italian Energy Efficiency Agency Road Show; Italian Energy Efficiency Agency commentary in meeting and seminars; Italian Energy Efficiency Agency interviews on TV/Web (STEP 3).

Once we identified this percentage of companies, the final step of the process was to multiply the obtained percentage for the energy savings communicated. The result gave a quantification of the energy savings directly associated with the information and training campaign carried out by Italian Energy Efficiency Agency (STEP 4).

Finally, the quantified energy savings associated with the information and training program was considered to be the 20% of the energy savings declared by this percentage of companies (correction factor). This choice was because, although the information campaign is considered to be very important for energy efficiency interventions, there are the other four awareness factors that simultaneously contribute to this choice (STEP 5).

Figure 1 summarizes the evaluation process used to quantify the energy savings directly associated with the information campaign carried out by the Italian Energy Efficiency Agency.

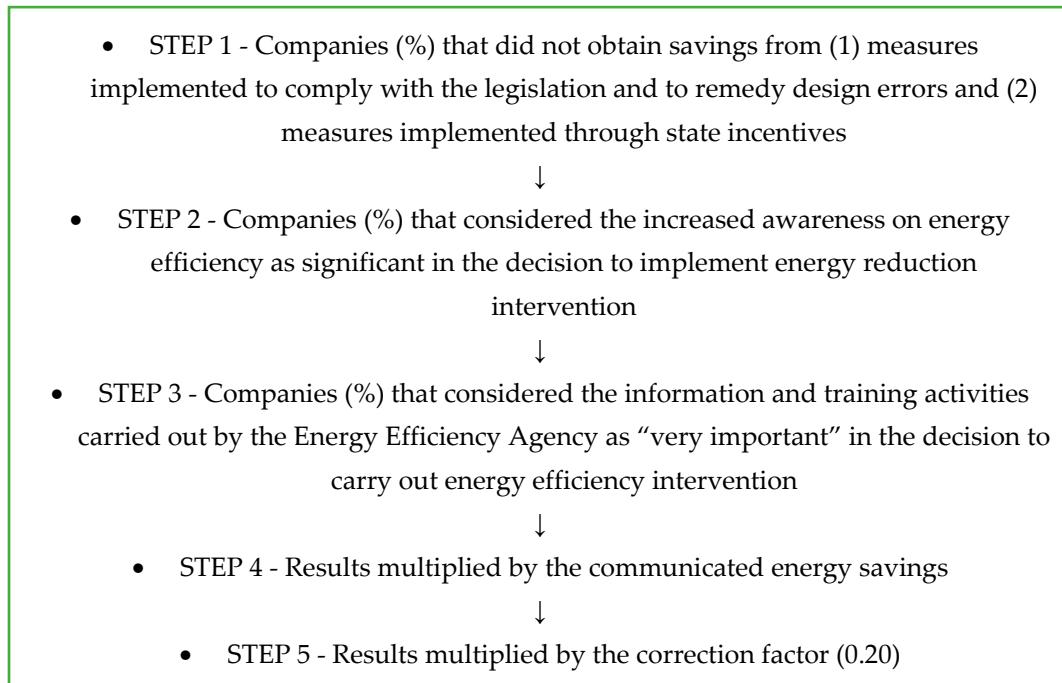


Figure 1. Evaluation process of energy savings from the Italian information and training programme in industry.

4.3. Data Collection

As described in Section 5.1, data on the additional energy savings were collected through the communications made by companies according to Art.7 of National Decree 2004/2012. This list of companies was then used to send the email invitation to participate in the survey. Respondents are those who have responsibility for energy management for the selected companies (the selected companies are among those subject to mandatory energy audits) and who are responsible for communicating to relevant authorities the additional energy savings. Therefore, the interviewees are individuals fully aware of the energy-related processes within the target companies and have the role of supporting business strategies for more efficient energy management. The survey consisted of a questionnaire with multiple-choice questions with a Likert scale ranging from 1 to 4, with 1 corresponding to not important and four to very important. We decided not to have a mid-point or neutral score on the scale to stimulate a definite answer by respondents and, thus, to reduce uncertainty [51]. The investigation was carried out with an online survey tool. Eventually, 300 responses to the questionnaire were collected, with a response rate of 38.02% (the questionnaire was submitted to 789 companies).

5. Results

The section presents the main output of the survey. In addition to the analysis of the main sectors of activity of respondents' companies and drivers for energy-saving measures, the section illustrates the results following the process as described in Figure 1.

5.1. Sector of Activities

To contextualize and have a better viewpoint of respondent companies, they were asked to indicate their main economic activity following the NACE classification of economic activities. The main activity sectors are provided in Table 1. Only those sectors with

more than five responses are displayed, representing 78% of the respondents. Two sectors represent each over 10% of the total, namely “Manufacture of rubber and plastics” (12.2%) and “Manufacture of machinery and equipment” (10.8%). Other representative sectors with a share over 5% are “Manufacture of fabricated metal products, except machinery and equipment” (8.0%), “Manufacture of food products” (6.3%), “Manufacture of basic metals” (6.3%), and “Manufacture of chemicals and chemical products” (5.6%).

Table 1. NACE economic activities of respondents with a share of more than five companies.

NACE Code	Description	Number of Companies	Percent of Total
22	Manufacture of rubber and plastic products	35	11.7
28	Manufacture of machinery and equipment n.e.c	31	10.3
25	Manufacture of fabricated metal products, except machinery and equipment	23	7.7
10	Manufacture of food products	18	6.0
24	Manufacture of basic metals	18	6.0
20	Manufacture of chemicals and chemical products	16	5.3
23	Manufacture of other non-metallic mineral products	14	4.7
17	Manufacture of paper and paper products	12	4.0
13	Manufacture of textiles	10	3.3
27	Manufacture of electrical equipment	10	3.3
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	8	2.7
52	Warehousing and support activities for transportation	7	2.3
46	Wholesale trade, except of motor vehicles and motorcycles	6	2.0
47	Retail trade, except of motor vehicles and motorcycles	6	2.0
26	Manufacture of computer, Electronic, and optical products	5	1.7
30	Manufacture of other transport equipment	5	1.7
32	Other manufacturing	5	1.7
36	Water collection, treatment and supply	5	1.7
	Other sectors of activities	66	22.0

5.2. Drivers for Energy Efficiency Measures Implementation

Next, the questionnaire investigates companies’ perceptions with respect to the drivers for energy efficiency. Companies were asked to indicate the importance of four categories of drivers for the implementation of energy efficiency measures. Respondents evaluated the potential saving in operating costs as the most important reason for enforcing measures, which was considered “very important” by roughly 70% of companies and “important” by 23.9% of them. In addition, the opportunity of improving the relationship with customer and supply chain partners is considered as a significant driver for investing in energy efficiency; over 60% of companies considered this driver as “very important” (20.82%) or “important” (40.27%). Similarly, actions implemented as part of the Corporate Social Responsibility strategy are considered as relevant in roughly 58% of cases (“very important” 19.45%; “important” 38.23%). In contrast, the chance to obtain public incentives from energy efficiency interventions is irrelevant for the majority of companies. Almost half of respondents (43%) state that public incentives are “not important”, and 33.45% consider this driver as “slightly important”. Only in 3.75% of cases is this driver is “very important”. Figure 2 shows companies’ evaluation for each driver category.

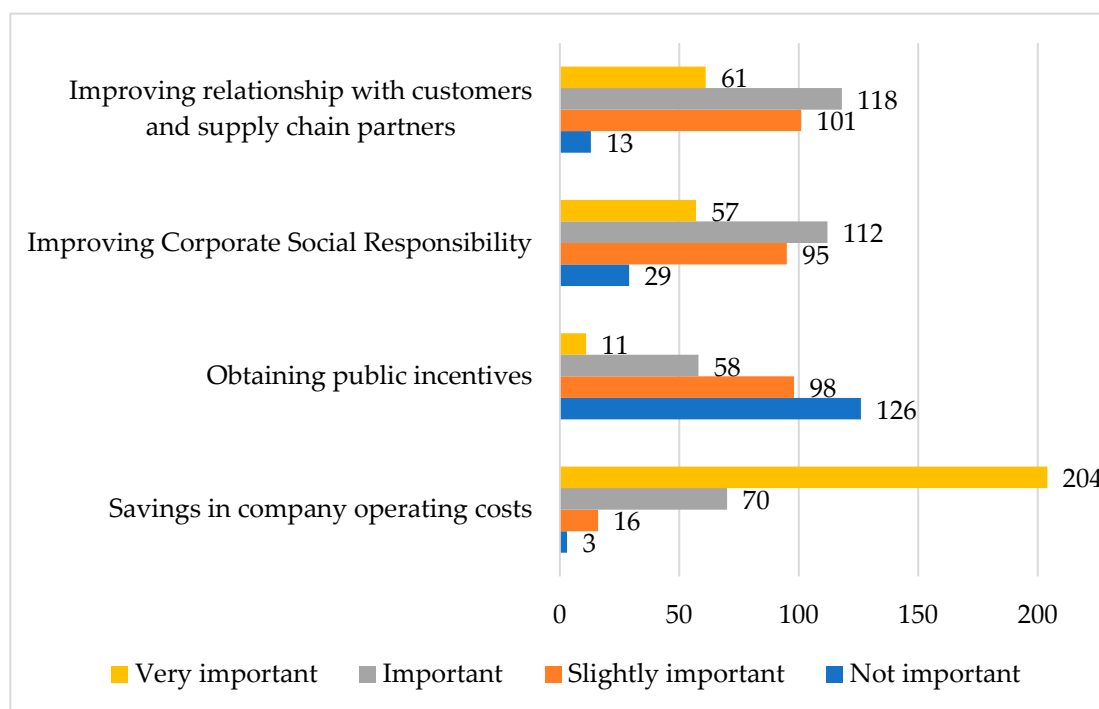


Figure 2. Companies' evaluation of the drivers for implementing energy efficiency measures.

5.3. Evaluation of Information Campaign Impact

Results of the survey show that 190 companies (63.33%) declared that they did not obtain energy savings from measures implemented to comply with the legislation and to remedy design errors or through state incentives (STEP 1). STEP 2 identified those companies that considered the information and training activities carried out by the National Energy Efficiency Agency (Italian National Energy Efficiency Agency: on behalf of the Ministry of Economic Development, the role of National Energy Efficiency Agency is assigned to ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development). <https://www.enea.it/en> (accessed 30 May 2021)) as “very important” in the decision to carry out energy efficiency interventions. This group consisted of 36 companies (12.00%). Next, STEP 3 showed that 93.67% (281) of respondents consider the increased awareness of energy efficiency as significant in the decision to implement energy reduction intervention. Table 2 summarizes the results of the first three steps of the evaluation process.

Table 2. Number of companies and associated percentage on the total of respondents identified in the first three steps (STEP 1–STEP 2–STEP 3) of the evaluation process.

Step of the Evaluation Process		Number of Companies	Percentage on the Total Respondents
STEP 1	Companies that did not obtain savings from (1) measures implemented to comply with the legislation and to remedy design errors and (2) measures implemented through state incentives	190	63.33%
STEP 2	Companies that considered the increased awareness on energy efficiency as significant in the decision to implement energy reduction intervention	281	93.67%
STEP 3	Companies that considered the information and training activities carried out by the National Energy Efficiency Agency as “very important” in the decision to carry out energy efficiency interventions	36	12.00%

Figure 3 illustrates how companies have evaluated the factors that contribute to stimulating their decision to apply energy-saving measures. The most significant factor is a consequence of the companies' obligation to perform the energy audit (“important”

or “very important” for 65.33% of the sample), followed by the influence of the external consultants (“important” or “very important” for 52.66% of the sample) and the internal energy manager (“important” or “very important” for 42.33% of the sample). Even though the information and training activities carried out by the public competent body were considered less powerful, respondents have recognized the role of the activities proposed by the National Energy Efficiency Agency in disseminating the energy efficiency culture.

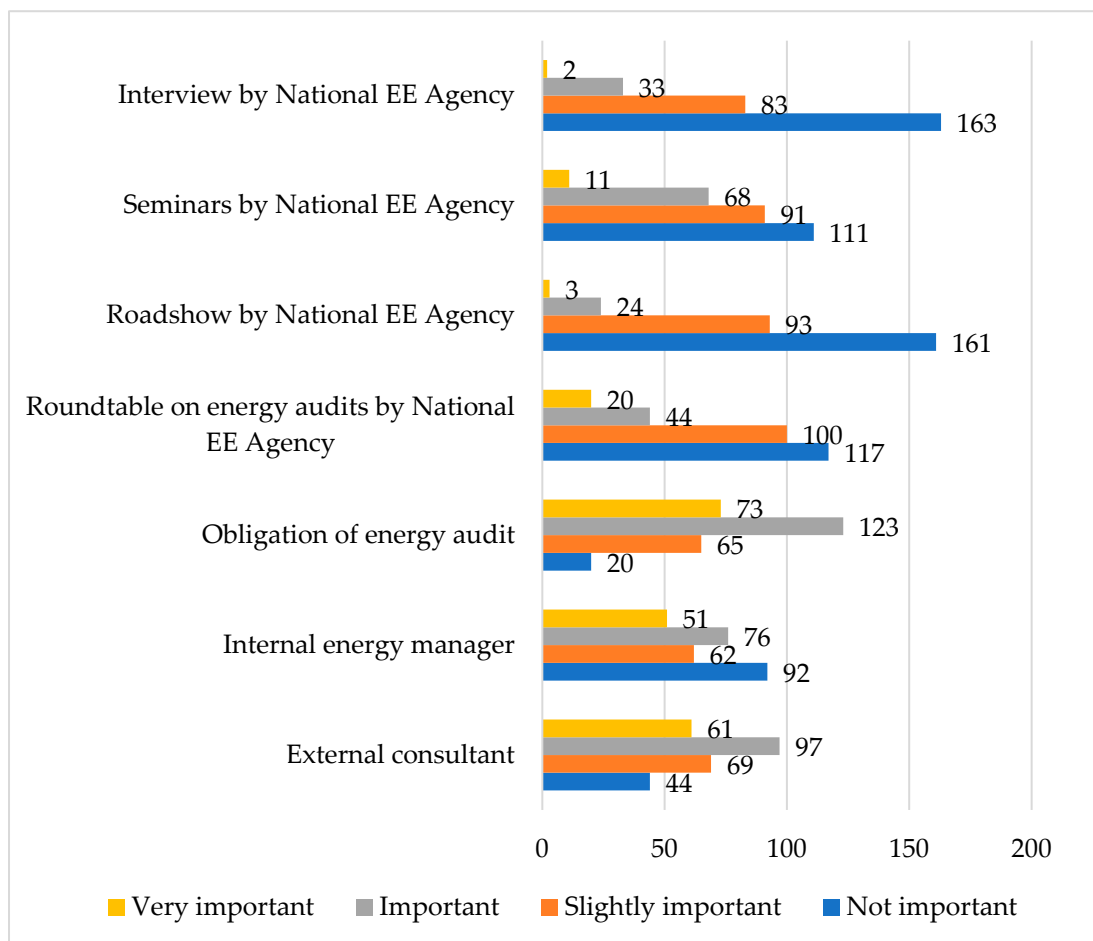


Figure 3. Importance of factors in contributing to the decision to implement energy efficiency measures.

Table 3 illustrates the energy savings communicated by companies to the Italian competent authority in 2015, 2016, 2017, 2018, 2019 and the cumulative savings for the same years.

Table 3. For the years 2015–2019, energy savings (ktoe) communicated to the Italian competent authority by companies’ subject to energy audit obligation.

Energy Savings (ktoe)						
Year	2015	2016	2017	2018	2019	Total
2015	1046	1046	1046	1046	1046	5230
2016		790	790	790	790	3160
2017			1482	1482	1482	4446
2018				314	314	628
2019					431	431
Cumulative savings						13,896

Step 4 was to multiply the additional savings communicated by companies by the percentages obtained in Steps 1-2-3, and by the correction factor of 0.2 (STEP 5) (Table 4).

Table 4. Final energy savings (ktoe) for the years 2015–2019 associated with the information and training program carried out by the National Energy Efficiency Agency.

Energy Savings (ktoe)						
Year	2015	2016	2017	2018	2019	Total
2015	14.89	14.89	14.89	14.89	14.89	74.46
2016		11.25	11.25	11.25	11.25	44.99
2017			21.10	21.10	21.10	63.30
2018				4.47	4.47	8.94
2019					6.14	6.14
Cumulative savings						197.83

Eventually, the process has allowed quantifying the amount of energy savings that can be directly linked to the positive influence of the information campaign. Specifically, the cumulative savings for the period 2015–2019 amount to 197.83 ktoe.

6. Discussion and Conclusions

The first research question the study has tried to answer is related to the identification of drivers and factors that push companies to implement energy-saving measures. Results of the survey show that the reduction of energy use and the subsequent monetary savings is by far the most powerful force that pushes companies to invest in energy efficiency. Findings are consistent with other studies that identify energy-saving practices to be highly linked with companies' financial aspects and the reduction of operational costs [22,25,32,38,39,41]. Similar findings have been also identified in the Italian context, where the economic drivers were identified with the highest relevance by companies together with companies' long-term strategy [13]. In contrast, results do not confirm the findings by Suk et al. [47], and Cagno and Trianni [32] that identified access to public funding as one of the main drivers for energy efficiency measures. The study also corroborates previous findings that showed that the long-term strategy for sustainability is a significant driver for energy-saving practices [25,32,39,41,42]. Interviewed companies recognize that increasing the awareness of energy efficiency is significant in the decision to implement energy reduction intervention. This result corroborates other studies that highlight the importance of information for disseminating energy efficiency culture in industries [52]. Nevertheless, when specifically considering the information and training campaign in comparison with other driving factors, companies do not evaluate them as a key factor in the decision to put into practice energy-saving activities. This result is in line with other studies in which information campaigns are not considered a top-ranking driver for companies [13,47] (Figures 2 and 3).

Considering the second research question "How much energy savings achieved by industry is attributable to information and training activities carried out by third-party institutions?", the study tries to reduce the gap identified in the literature. The process presented in the paper has allowed us to quantify the amount of energy savings that can be considered as the outcome of the information and training campaign targeted to Italian companies. Specifically, the cumulative savings for the period 2015–2019 amount to 197.83 ktoe, corresponding to the 1.42% of the energy savings communicated by companies that are subject to the obligation to notify energy savings to the national authority. Due to the lack of literature on this specific field of research Rivas et al. [26], it has not been possible to compare findings with other previous studies. However, companies recognize the role of the Italian information and training program carried out by the National Energy Efficiency Agency. Nevertheless, vocational training emerges as especially crucial to remove barriers

affecting companies' awareness of energy efficiency [13]. In the study of Suk et al. [47] information and training support for energy-saving practices and providing information for the implementation of an internal energy management system was recognized as of significant importance for Korean companies. Even the survey conducted by Liu et al. [52] highlighted that employees' training would improve companies' willingness to implement energy-saving measures, suggesting that the Chinese government should organize energy efficiency information and training for companies.

The approach described and the associated results have significant implications both for practitioners and scholars. For the national authorities in charge of developing information and training campaigns, it represents a support for the decision-making process. It provides a way to evaluate the effects of the public investment made to spread the energy efficiency culture to the most energy-intensive industries. Additionally, it supports national authorities in considering how information and training programs directly contribute to the country's target in terms of reduction of energy consumption, especially for EU member states that have binding targets with at least 32.5% of improvement in energy efficiency at 2030 [14]. Findings of the research are also valuable to the academic world, as they pave the way toward a possible approach to assess energy savings deriving from this specific policy measure.

However, the evaluation process has some limitations. In order to isolate and calculate those energy savings directly linked to information and training programs, it has been necessary to make some assumptions to simplify the evaluation process directly connecting the answer from the questionnaire to the energy savings communicated by the companies. Another aspect not considered in the present study is the evaluation of the cost-effectiveness of the information and training campaign. When assessing the effectiveness of the campaign, it would be useful and significant to include an assessment of the return on the investment made by the Italian public authorities. This could be developed by comparing the financial capital invested in the campaign with the monetary value of the energy savings associated with the energy efficiency measures adopted by the target industries and induced by the campaign itself. Another drawback relates to the scope of the survey, which addresses a small sample size and a convenient sample choice. The survey was addressed only to companies that are bound to notify the national authority of the energy savings made, not considering all the companies that had taken part in the information and training activities carried out during the 2015–2019 period.

The evolution of the impact of information and training campaigns remains a challenge for both scholars and practitioners. Although several authors have successfully approximated the energy savings from campaigns targeted to citizens, the effects of campaigns on companies still remain relatively unexplored. Therefore, both practitioners and academics should approach the assessment of energy savings deriving from information and training campaigns targeted to energy-intensive industries, which still maintain a great potential to contribute to the energy transition required for a sustainable society [5] and to reach the Paris Agreement objectives [53]. A further step of the investigation may assess cost-benefits of energy efficiency information and training campaigns, to evaluate if the ratio between the expenditure incurred and energy saved is better or worse than other policy instruments set to reduce energy consumption.

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