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Review

Energy Efficiency Policies for Small and Medium-Sized Enterprises: A Review

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Abstract: The importance of small- and medium-sized enterprises (SMEs) from economic, social, and environmental point of views and the crucial role of energy efficiency are widely recognized. However, the development of effective policies and their analysis are still challenging topics, for which research is relatively scarce. The main reasons for this are the high heterogeneity of SMEs, their low energy impact compared with energy-intensive enterprises, the lack of quantitative in-formation on the energy consumption of SMEs, and the low awareness of SMEs on energy topics. The structural paradigm change in the energy markets has underlined the importance of EE in SMEs. Several studies have been devoted to analyzing EE policies, using different methods and targets, not necessarily with a focus on SMEs or quantitative figures. This study presents a scoping review aimed at mapping the scientific literature on this topic, assessing its volume, nature, characteristics, type of evidence available, key concepts, and possible gaps. The existing contributions were systematized on three assessment levels regarding the EE policies for SMEs: general framework for their classification; comprehensive analysis of contributions providing qualitative information; in-depth analysis of evaluation studies including quantitative information. This study highlights the need for a good balance between economic and supportive mechanisms and the crucial role of energy audits. The analyzed contributions show that despite SMEs' efforts to develop EE policies, there are still important barriers to be addressed. Moreover, there is an important lack of quantitative analyses, which are necessary for the development a harmonized policy evaluation approach. Based on a synthesis of the review findings, key learnings for the better design, implementation, and evaluation of EE policies for SMEs are provided.

Keywords: energy efficiency; energy efficiency policies; SMEs; energy audit; policy evaluation

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1. Introduction

The crucial importance of energy efficiency in SMEs is recognized worldwide. An overview of the importance of SMEs at the global level, presented in [1], estimates that 99% of companies overall are SMEs, which represent 60% of employment and 50% of added value. The global energy demand of SMEs is estimated to be more the 13% of the total (74 EJ), and the implementation of cost-efficient measures could save 30% of the consumption (22 EJ) [1]. The SME sector addresses multiple challenges due to its heterogeneity (in terms of economic activity, size, geographical scale, legal and business requirements, etc.), and it is generally considered "hard-to-reach" and "data-poor" [2].

SMEs are the backbone of the EU economy, totaling 25 million enterprises and representing 99% of the total [3]. In Europe, 100 million people are employed in SMEs [3], about two out of every three jobs, and they produce more than half of European gross domestic product. Moreover, almost a quarter of European SMEs offer green products or services, thus facilitating the energy transition [4]. Hence, due to the high societal impact of

SMEs, increasing their energy efficiency covers multiple dimensions not only related to UN Sustainable Development Goal 7 (Affordable and clean energy) but also to Goal 8 (Decent work and economic growth), Goal 9 (Industry, innovation and infrastructure), and Goal 12 (Responsible consumption and production).

The potential for increasing the energy efficiency of SMEs is extensive, but despite the magnitude of this potential, its full implementation is still prevented by numerous technical and economic barriers [5]. The same barriers also often prevent SMEs from easy access to the energy services market. The growing attention on environmental challenges in recent decades has triggered a process of change in business models, resulting in a positive impact on the sustainability of enterprises. This process is part of the clean energy transition, and it needs to be strengthened in the years to come to allow long-term environmental targets to be reached. As highlighted [6], to ensure progress in reaching the 17 Sustainable Development Goals (SDGs) and an in Environment Social Governance (ESG) scoring, the agreements reached by world leaders in United Nation Conference of Parties needs to be combined with new metrics at the firm, sector, regional, and national levels, designed to influence institutional investors. In a similar perspective, researchers [7] investigated the business models adopted in Polish pharmaceutical sector on a sample basis, showing a significant trend toward a higher level of sustainable development, mainly driven by innovation and managerial effectiveness. The authors also assessed the correlation of business performance with the sustainability of companies, finding a positive link and highlighting the role played by capital availability. How sustainability should be assessed depends on the characteristics of production activity, such as the energy management and the role of renewables, the reduction in resource intensity and improvement in production parameters, and the development of green technologies to reduce toxic emissions and discharges. Multiple public policies have been developed in recent years to encourage and support SMEs in filling the energy efficiency gap [8] as well as to consolidate and support the development and adoption of business models with increased sustainability.

Energy efficiency can be enhanced though the implementation of energy-efficient technologies [9], operational improvements [10], and energy-oriented maintenance [11,12]. Despite the strong connection between these aspects, they are usually researched separately. Our analysis focused on the public policies supporting EE in SMEs, independent of the role of specific technologies or sectors (i.e., iron and steel [13]). The policies analyzed in this study are intended as public programs to support private actions and investments on energy efficiency.

This paper presents a scoping review (ScR) [14] of contributions analyzing the main energy efficiency policies and measures involving SMEs. Considering the relevance of SMEs and the difficulties in exploiting their energy efficiency potential, the mapping of the available scientific literature on the topic, providing an up-to-date literature review appears to be useful and of interest to identify key concepts and possible gaps. Studies presenting specific data and results for the SME sector are still relatively scarce since researchers have mainly focused on the impact of specific national energy efficiency policies or on policies for the productive sector (general industry). Notable reviews on industrial energy efficiency have focused on (1) the difference between stand-alone audit programs for SMEs compared with integrated energy assessment programs for large companies (22 policies from 16 countries) [15]; (2) industrial EE policies involving SMEs (31 policies from six countries) [16]; (3) the design of policies for industrial SMEs (33 policies) [17]; and (4) quantification of the impact of programs for SMEs (the impact of four programs were quantified) [18].

The main objectives of this study were to provide an update on the studies providing a comprehensive overview of the policies developed for EE in SMEs (based on the taxonomy proposed by Tanaka [19])' to provide an update on and extend previous works to nonindustrial SMEs, providing an outline of the complexity of addressing EE in SMEs (including an analysis of barriers, drivers and tools); broaden the qualitative analysis of policies (64 policies from 21 countries); and deepen the quantitative analysis of the policies

(14 policies from 10 countries). Hence, the research questions (RQs) addressed in this study were:

- RQ1—What are the energy efficiency policies for small- and medium-sized enterprises reported in the open literature?
- RQ2—What is the quantitative and qualitative information available in terms of policy analysis?

This study (based on more than 400 documents analyzed) underlines the use of voluntary policies to promote EE in SMEs, the need for a good balance between economic and supportive mechanisms, and the crucial role of energy audits as a first step in encouraging SMEs to develop EE actions. Despite the efforts to develop policies for EE in SMEs, there are still important barriers to be addressed. Moreover, there is an important lack of quantitative impact of the policies, which are necessary to develop a harmonized approach for the evaluation of EE policies for SMEs.

After this Introduction (Section 1), this paper is structured as follows: Section 2 presents the methodology adopted. Section 3 is devoted to a bibliometric analysis of the most relevant authors and sources used. Section 4 provides a classification of the main studies related to energy efficiency policies in enterprises (Section 4.1), with a focus on SMEs (Section 4.2) and the related barriers and drivers (Section 4.3). Section 5 is dedicated to an in-depth analysis of both qualitative and quantitative contributions on measures and policies related to energy efficiency for SMEs. Finally, Section 6 presents a concluding discussion summarizing the main findings of this review.

2. Materials and Methodology

The collection and subsequent analysis of public information were performed according to the PRISMA procedure for new systematic reviews, which included searches of databases, registers, and other sources [20]. The presented methodology was a scoping review based on Scopus, with an additional "backward snowballing" approach in order to include secondary and tertiary sources external to scientific literature databases, namely, "grey literature" (e.g., books, national and international policy reports, project reports, etc.) [21].

Despite the importance of SMEs in the economy, the research and policy activities related to SMEs have been relative scarce until 2010s. The first step of this ScR bibliographic research was to carry out an analysis of scientific contributions in Scopus database using three different search strings:

- "Energy Efficiency SMEs": "energy" AND "efficiency" AND ("smes" OR "sme");
- "Energy Efficiency Policy SMEs": "energy" AND "efficiency" AND ("smes" OR "sme") AND ("policy" OR "policies");
- "Energy Efficiency Audit SMEs": "energy" AND "efficiency" AND ("smes" OR "sme") AND "audits".

The "Energy Efficiency SMEs", "Energy Efficiency Policy SMEs", and "Energy Efficiency Audits SMEs" search strings produced 779, 127, and 65 results up to 2022. These results were subsequently refined via title and abstract analysis in order to exclude non-research papers and erroneous results due to the use of acronyms. The number of papers was reduced to 335, 110, and 60. The full papers obtained through the three string searches were merged and analyzed individually (351 papers), and all duplications were removed. Finally, 129 records presented relevant information about the core topic of this study: energy efficiency policies for SMEs.

In addition to the ScR procedure, a "backward snowball" analysis was carried out in order to identify 45 additional relevant records. This approach included (1) the complete analysis of references included in the scientific reviews analyzed in the ScR, (2) the analysis of deliverables of relevant EU-funded projects, and (3) consulting experts within the framework of European-funded projects and forums. Mostly of the grey literature was formed by 28 policy reports from international and national organizations. Specifically,

17 documents from international organizations such as European Commission (EC), Organization for Economic Co-operation and Development countries (OECD), or International Energy Agency (IEA) were included due to the importance to the topic. Another 11 reports analyzed national policies. The grey literature also included four project deliverables, three books, and one nonindexed conference proceeding. Lastly, 6 databases were additionally included in order to identify additional information to papers and reports (see Table 1): ODYSEE MURE, IEA, European Statistical Office (Eurostat), OECD, and two national databases (Italy and the USA). ODYSEE MURE [22] are two complementary databases on (1) energy efficiency indicators and energy consumption by end users and their underlying drivers and (2) energy efficiency policies and measures: both by country and in industry, transport, and buildings. These databases have been funded for more than a decade by the EC through different framework programs for research, coordinating all the EU energy agencies. The IEA Policies Database [23,24] collects more than 7000 government policies and measures implemented from 1999 onward to reduce GHG emissions, enhance energy efficiency, and support renewables and other clean energy technologies. Additionally, the annual "Taxing Energy Use" series (the 2011, 2015, and 2019 reports were analyzed) present a comprehensive overview of the taxation policies for energy uses (as well as energy efficiency) in the OECD [25–27]. Finally, Eurostat presents extensive information on energy and environment statistics (this work focused particularly on the Eurostat national energy balances and the energy efficiency statistics) [28].

Therefore, a review was conducted of these 396 documents. Relevant was extracted from 174 references. A detailed overview of the role and importance of energy efficiency in SMEs was based on 105 references that cover the taxonomy of the policies, measures, and tools, as well as the barriers and drivers (Section 4). It is important to note that due to their heterogeneity, SMEs present substantially different approaches compared with large or public companies.

The SME policies for energy efficiency were analyzed from 82 records. For Section 5.1, 45 papers with 64 different policies from 21 countries were analyzed in detail. A subsequent quantitative evaluation of the impact of the policies was performed using 20 of the references (Section 5.2). The mandatory eligibility criteria for inclusion in Sections 5.1 and 5.2 were (1) one or more EE policy should be described and analyzed; (2) SMEs must be explicitly cited as policy target; (3) policy evaluation should be qualitative or quantitative. The policy papers not fulfilling these three criteria are mentioned in the introduction to Section 5. A summary of the bibliography and its distribution is presented in Figure 1.

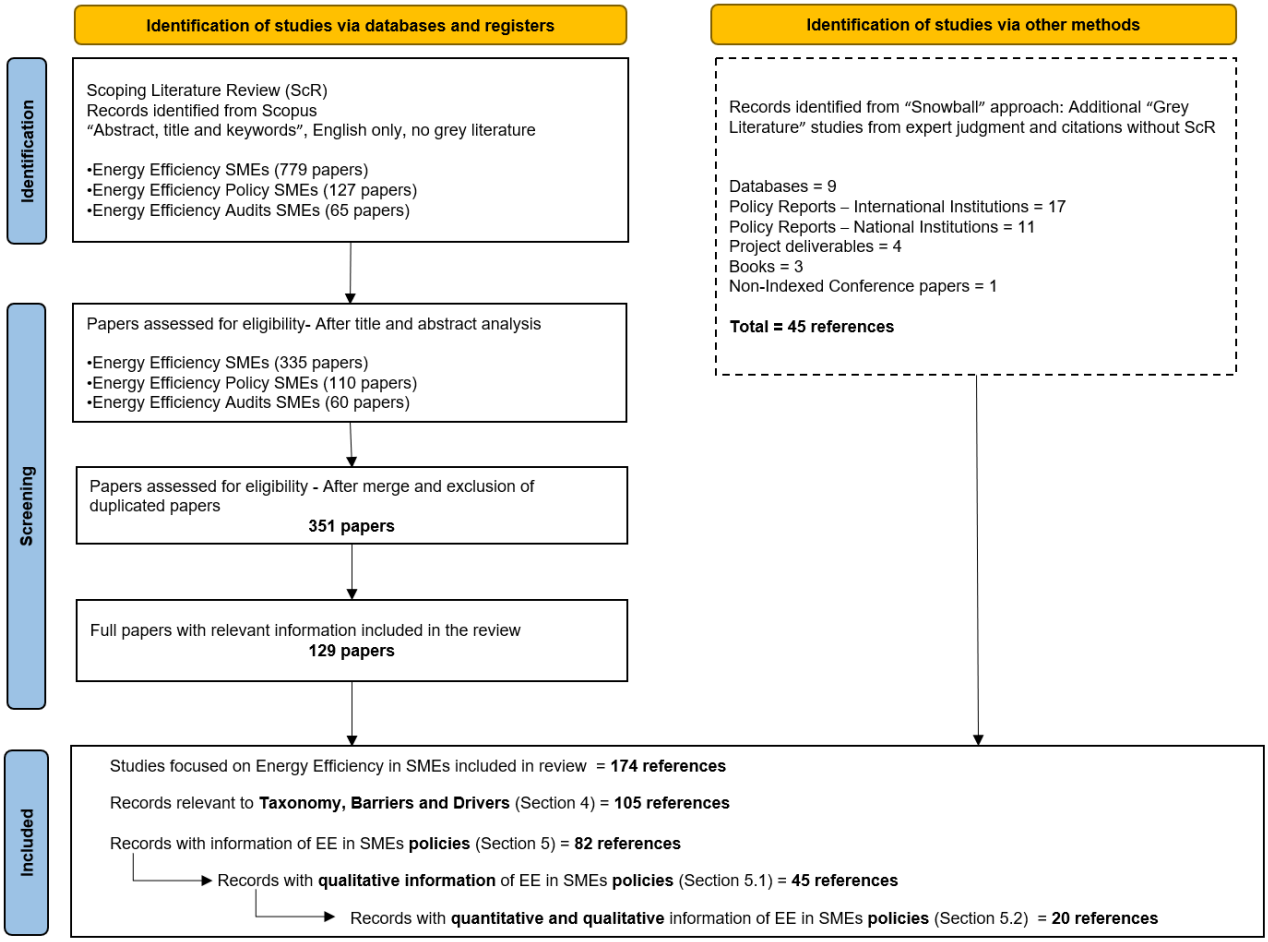

Figure 1. Overview of bibliography search and data analysis. The identification and screening of Scopus documents (left) reduced the documents up 129. An additional 45 documents were added through a "backward snowball" approach after expert judgment. Another 8 references included in the review related to methodology, methods, and tools were excluded from this scheme.

3. Bibliometric Analysis

A first analysis of the bibliography sources was carried out with VOSviewer (https://www.vosviewer.com/ (accessed on 21 December 2022)) [29]. Figure 2a presents the network from the 335 papers obtained from Scopus through the "Energy Efficiency SMEs" search, covering a broad range of subtopics. It is possible to observe different clusters that generally correspond to analysis by country. Notably, the most relevant authors are P. Thollander and co-authors from Linköping University (Sweden) (20 papers, 870 citations) and E. Cagno/A. Trianni and co-authors from Politecnico di Milano (Italy)/University of Technology Sidney (Australia) (16 papers, 1124 citations), who have mainly analyzed the Swedish and Italian EE in SMEs and have cooperated to study third countries. Other countries studied are Japan (O. Kimura et al., six papers), Germany (T. Fleiter et al., six papers), Belgium (E. Cornelis et al., four papers), and Portugal (P.D. Nunes et al., four papers).

In a subsequent refinement of the research on "Energy Efficiency Audits SMEs" (Figure 2b) and "Energy Efficiency Policy SMEs" (Figure 2c), we noted the prominent work of Thollander et al. (16 papers) on the development and analysis of public policies for energy audits in SMEs (mainly in Sweden) and Cagno/Trianni et al. (nine and six papers for audits and policy) in the development of supporting tools for promoting and measuring the role of energy audit policies in the EE of SMEs. Additionally, it is important to note the work of E. Worrell from Utrecht University (the Netherlands) (five papers) in the definition of the taxonomy of energy efficiency for SMEs, on the tailoring of policies for targets groups and in the transfer the experiences from Italy to German industrial ecosystems.

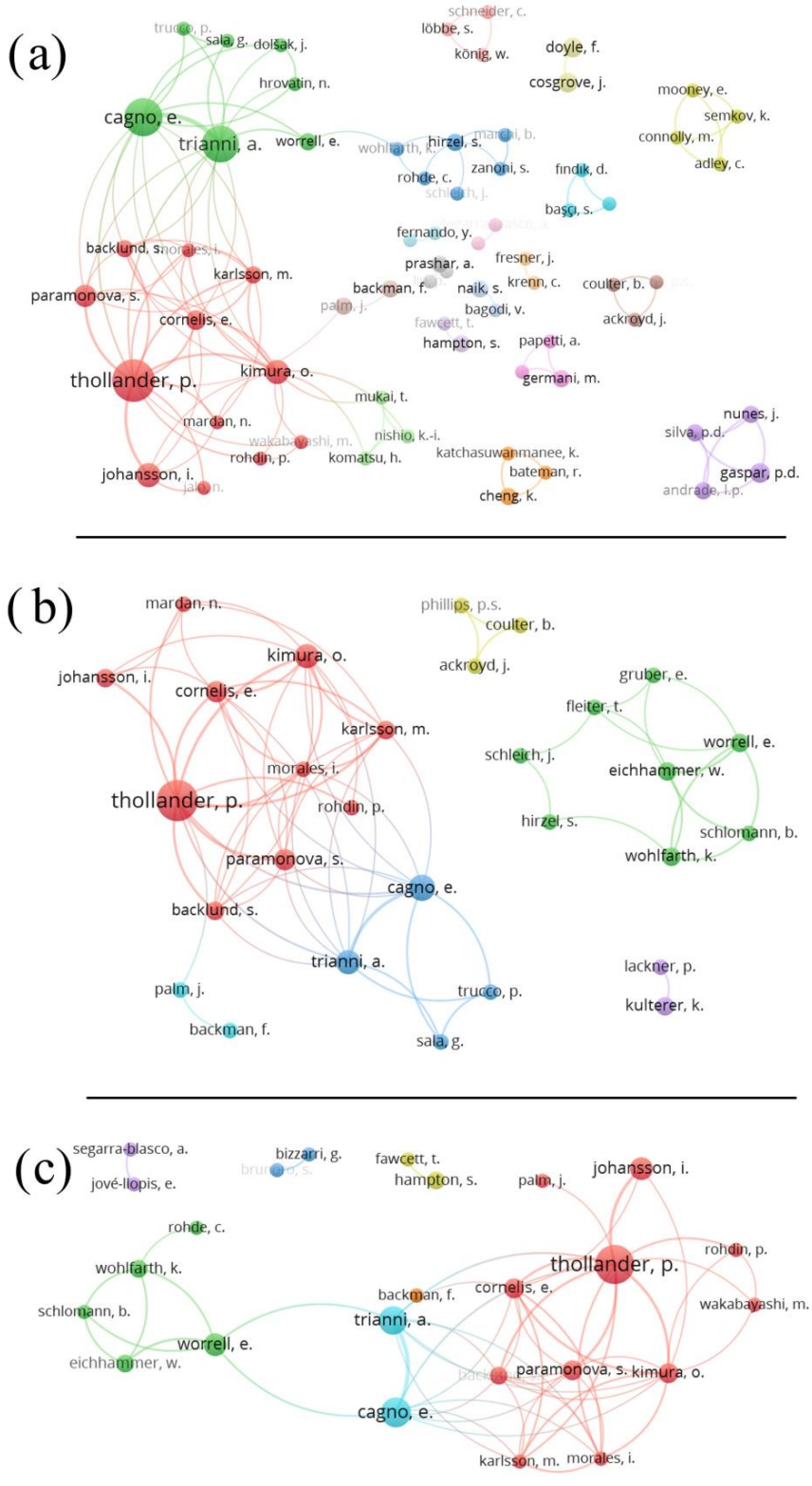

Figure 2. Author cooperation network for (**a**) "Energy Efficiency SMEs", (**b**) "Energy Efficiency Audits SMEs" and (**c**) "Energy Efficiency Policy SMEs" search strings. Size of circle is proportional to the number of publications in Scopus database. Cluster color by co-author collaboration automatically generated using VOSviewer 1.6.18.

Figure 3 presents the distribution of the papers analyzed that were published in Scopus. The search corresponded to the three "Energy Efficiency SMEs", "Energy Efficiency Policy SMEs", and "Energy Efficiency Audits SMEs" search strings. Three-quarters of the total documents have been published in the last ten years. A significant increase in contributions devoted to EE in SMEs can be observed from 2012 (probably linked to the publication of European Energy Efficiency Directive) to 2016, and then the number of publications stabilized.

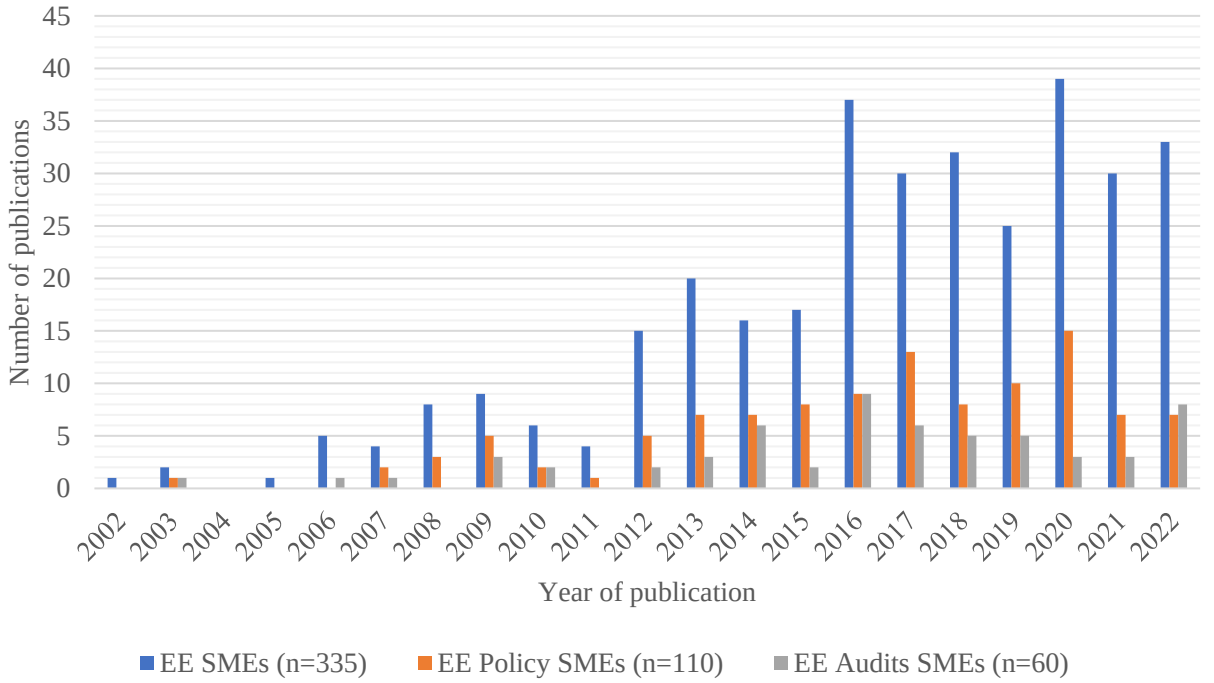

Figure 3. Number of publications (all documents) on energy efficiency and policies for SMEs in Scopus database from 2002 to 2022. EE SMEs (blue) corresponds to "Energy Efficiency SMEs" search string ("energy" AND "efficiency" AND ("smes" OR "sme")) EE Policy SMEs (orange) corresponds to "Energy Efficiency Policy SMEs" search ("energy" AND "efficiency" AND ("smes" OR "sme") AND ("policy" OR "policies")); and EE Audits SMEs (grey) corresponds to "Energy Efficiency Audit SMEs" search string ("energy" AND "efficiency" AND ("smes" OR "sme") AND "audits").

In this review, we included 189 references divided by type into 126 scientific journal articles (including 23 reviews), 32 policy reports, 18 conference papers, 3 book chapters, and 10 references to databases, websites, standards, and legislation. The main journals cited were *Journal of Cleaner Production* (26 articles), *Energy Policy* (22 articles), *Renewable and Sustainable Energy Reviews* (13 articles), *Energy Efficiency* (11 articles), and *Energy* (8 papers). Other important sources included the IEA/OECD (11 reports/databases), ECEEE Conference Proceedings (14 articles), and the Publications Office of the European Union (10 reports).

A total of 49 countries presented at least one policy or good practice for EE in SMEs (Figure 4). The policies of 21 countries were qualitatively assessed: Australia—4 references, Austria—1, Belgium—3, Bulgaria—1, Denmark—3, Finland—1, Germany—7, Ireland—1, Italy—5, Japan—5, Latvia—1, Lithuania—1, Mexico—1, the Netherlands—3, Norway—1, Portugal—1, South Korea—2, Spain—2, Sweden—13, the United Kingdom—2, and the United States—5.

Despite the high number of publications analyzed, it was possible to obtain quantitative information on 14 policies only (6 energy audits stand-alone policies, 4 energy efficiency programs for SMEs, 2 energy-intensive industries, and 2 energy efficiency networks) from 10 countries.

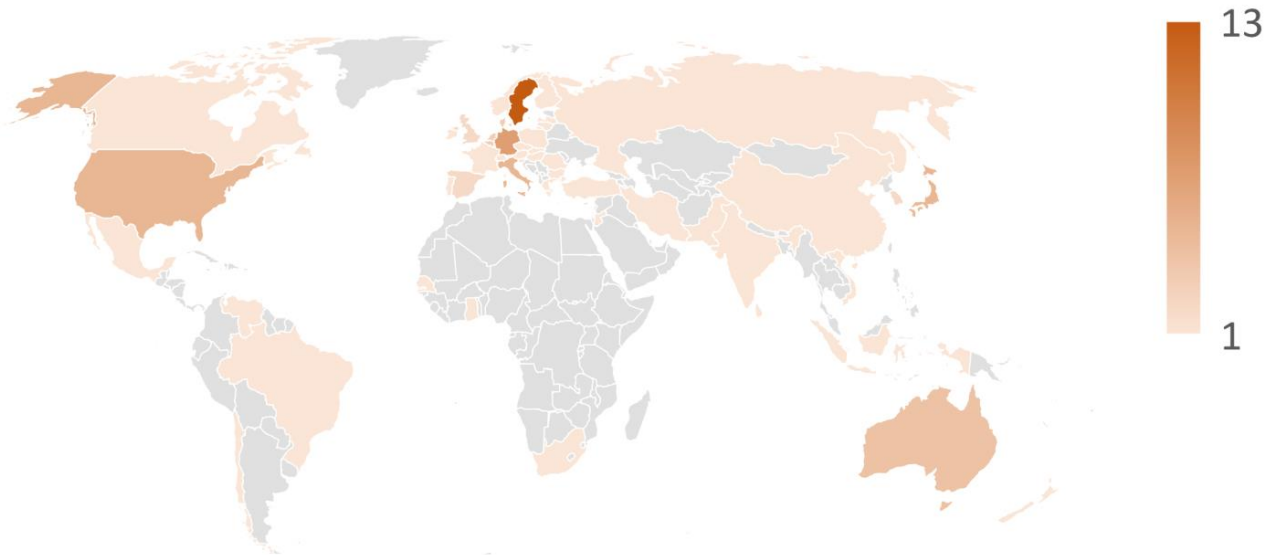

Figure 4. Countries involved in this study and number of publications related to each of them. The red scale indicates the number of publications from 1 to 13. The countries without analyzed publications are presented in grey.

4. Energy Efficiency Taxonomy

4.1. Framework for the Classification of Energy Efficiency Policies of Enterprises

Given the variety of existing policy solutions, this review of the contributions necessarily started by the definition of a reference framework to classify them. In this section, a framework is introduced and applied to policies for the production sector. The novelty of this review lies in applying this framework to classify SMEs' energy efficiency policies examined through an extensive literature analysis.

The classification framework is defined according to the approach developed by Tanaka [19], who conducted an extensive review of energy efficiency policies, referring to three main policy categories:

1. Prescriptive policies, orienting the behavior of companies with different modulations and stringencies; this category includes regulations, mandates and agreements.
2. Economic policies, adjusting price signals and influencing cost effectiveness of energy efficiency actions; they are represented by tax reliefs, direct financial support, cap and-trade systems, and incentivized energy prices.
3. Supportive policies, reinforcing the information basis for decision making and improving competences; these are tools for identifying energy efficiency opportunities, cooperation programs, capacity building, and information and technical assistance.

Different policy categories, or different combinations of policies, may be effective in specific contexts [30,31], reflecting that energy efficiency drivers differ by country and industry. In some sectors, energy efficiency could be partly driven by high energy prices, whereas, in other sectors, access to capital could be a major limitation [32].

In this section, the classification of [19] is provided and updated with further contributions. Contributions available by country were updated, using the IEA [23,24], ODYSEE MURE [22], and OECD [25–27] databases. In Table 1, key references on energy efficiency national measures and barriers, both general and specific for SMEs, are provided. The taxonomy classifies policy by type and not by the technology they apply to. Nevertheless, it can be observed that the energy-oriented maintenance domain is not explicitly covered by the policy examples classified, although it could be significant for improving energy efficiency, especially for SMEs.

Analyzing prescriptive policies, regulations on energy management do not prescribe specific energy efficiency interventions (also known as energy performance improvement actions (EPIAs)) but set rules for adopting energy management systems that help companies

identify the most suitable solutions to implement. The relevance of energy management systems in improving knowledge of firms' consumption profiles and identifying EPIAs has been widely recognized; for example, Refs. [33,34] can be consulted for recent reviews. The adoption of energy management systems using ISO 50001 [35] can also be incentivized financially, for example, under the Germany Energy Tax Act, showing another case of the successful combination of different policy categories [36].

A different approach is represented by negotiated agreements, which differ for various degrees of policy-induced incentives for action, which could be absent (completely voluntary agreements) or represented, for example, by penalties, exemptions from existing measures, or threats of future regulation. Several studies have highlighted the positive effects of this policy tool [37–40]; other studies found mixed results [41] or showed such measures would need some modifications to ensure the achievement of 2020 targets [42,43]. The great diversity in terms of motivational power and coverage affects their effectiveness, as shown in [44], comparing China, Finland, Japan, the Netherlands, and the UK, and investigating the potential of such a policy tool for ASEAN countries [45,46]. The Swedish and German experiences with voluntary agreements (for industrial SMEs) demonstrate the possibility of applying for a rebate on energy tax if companies develop an energy audit or introduce energy management systems, which proved to be successful [47,48].

Economic policies can adjust price signals in two ways: applying energy and CO_2 taxes or emissions cap-and-trade programs and introducing direct tax reduction or other financial incentives. Examining the first group of policies, energy use is taxed in many countries [25–27], and this could be an incentive to use energy in an efficient way, according to the share of energy cost and the energy saving potential for each industrial sector [49]. Cap-and-trade mechanisms, more often applied to CO_2 emissions than energy efficiency [50], have generally more limited coverage and provide more volatile price signals, which are influenced by the quota allocation method and level of the target. For a comparison of taxes and cap-and-trade mechanisms, see, for example [51]: this study shows that carbon taxes, or cap-and-trade mechanisms combined with taxes, help prevent price volatility and minimize the policy errors associated with uncertainties and risks due to interactions with other climate policies. According to [19], when taxes and cap and trade are applied to energy efficiency, the effectiveness could be considered high, while the quantifiability of results is medium–low, as is the acceleration effect on R&D. For example, the Italian White Certificates mechanism is an obligation scheme that creates a market to trade certificates associated with energy saving projects: it has been considered a best practice in energy efficiency policies [30], and it has promoted investments in many industrial sectors [52].

A different approach is represented by two policy categories: favorable tax treatment under specific conditions and non-tax financial incentives, such as subsidies, preferential loans, and R&D funds. Tax reductions are included in the first category as stand-alone measures or in the context of negotiated agreements; also, tax deductions for energy efficiency investments, which can be deducted from the company taxable amount as in the Italian Ecobonus scheme, are included here. In terms of non-tax financial incentives, accelerated depreciation schedules for energy efficiency investments are another example of this category; for example, they proved to be effective in Ireland [53].

To promote energy efficiency in industry, subsidies are used in a wide range of countries, as shown in Table 1 They stimulate investments by reducing the financial risk and easing barriers such as access to credit and long pay-back periods. Subsidies could be targeted not only to fund EPIAs but also to provide a contribution toward the realization of an energy audit and the achievement of an EnMS certification, as in the Program for Improving Energy Efficiency in Energy Intensive Industries, operating between 2005 and 2014 in Sweden [54]. Energy audits (EAs) can be supported as stand-alone schemes, as in Sweden, or as part of a more comprehensive program, e.g., in the form of voluntary agreements or the implementation of energy management systems, such as in Germany [15]. Ref. [42] examined the energy efficiency policies in Sweden and Japan and found that, from a governmental point of view, subsidies for energy audit programs prove to be the

most cost-effective policy. Green loans for retrofit residential building are relatively common, whereas examples of loans for industrial sectors can be found in fewer countries, for example, the UK [19], China [55], and France [56].

Supportive policies, in the classification adopted by [19], refer to the identification of energy-saving opportunities; capacity building through counselling, training, and information sharing; public dissemination of energy efficiency; and cooperative measures in which the government works with industry to promote their energy-saving efforts. Providing sectoral guidelines, such as for example the Energy Star methodology in the USA [57] or the Italian guidelines to conduct energy audits [58–61], is an example of capacity-building measures. Another example is the Italian information campaign to promote energy efficiency focused on the benefits of energy audits [62]. In this campaign, the Italian Energy Agency worked together with business associations to provide companies with guidelines and targeted technical advice [62]. This could prove to be effective in increasing the implementation rate of EPIAs identified in the audit, as shown by [63] for the Dutch-negotiated agreement, in general by [64], and in spreading the use of the energy audit tool by not-obliged companies. Ref. [65] highlights the importance of the Korean government providing technical support to companies, particularly SMEs, to improve their ability to comply with mandatory regulations on industrial energy efficiency. Few studies have quantified the energy savings of this policy type: a recent attempt is represented by the Italian EED Annual Report [66].

4.2. Policies for Energy Efficiency of SMEs

The IEA investigated the adoption of EPIAs in SMEs, identifying key critical factors for providing policy support and improving SME competitiveness and national energy security [1]. In this study, the characterization of the importance of SMEs in energy terms was followed by suggestions for implementing EE policies specifically for SMEs through a plan–implement–monitor–evaluate pathway. The planning phase should be tailored to meet specific contexts and requirements for specific SME sectors, including an analysis of barriers, coordinating different programs, and involving the main stakeholders. A successful implementation step should include the targeting of SME groups, the identification of all benefits, the combination of schemes to provide information, expertise, and financing, and the exploitation of existing policies and programs. The monitoring phase consists of developing specific indicators useful to both policy makers and SMES. The evaluation step must focused on program results, impacts, and success factors, as well as on the assessment of cost effectiveness and the overall effectiveness of instruments used. Several good case studies are presented in [1] at the worldwide level.

Table 1. Energy efficiency policies in industry by country (x: policies implemented, e: policies concluded/superseded, p: policies planned).

	Prescriptive Policies				Economic Policies				Supportive Policies				
	Regulation on Equipment Process	Regulation on Energy Management	Negotiated Agreements	Energy Taxes	Energy Tax Reductions	Financial Incentives—Loans	Financial Incentives—Subsidies	Cap and Trade Scheme	Identification Opportunity	Cooperative Measures	Capacity Building	Publicity	Additional References
Australia	X	e			x		e	p	x	x	x	x	[67–71]
Austria	X			x			x	x	x	x	x		[30,31,72]
Belgium	X		x	x	x		x	x	x	x	x		[30,31,41,73–76]
Brazil	x			x	x				x	x	x		
Canada	x	x		x	x	x	x	p	x	x	x	x	[50,77]
Chile				x	x	x				x		x	
China	x		x	x			x		x		x		[45,50,55,78–80]
Czech Republic	x			x	x	x	x	x	x	e			[30,31]
Denmark	x		x	x	x		x	x	x				[30,31,41,76,81]
Finland	x	x	e	x	x		x	x	x	x	x		[30,31,44,81]
France	x	e	x	x	x	x	x	x	x	x	x		[30,31,56]
Germany	x	x	x	x	x	x	x	x	x	x	x		[18,30,31,47,70,82–86]
Greece	x	x	x	x	x		x	x	x				[30,31]
Hungary	x	x		x		x	x	x	x	x			[30,31]
India	x	x		x			x		x	e	x	x	
Indonesia	x	x									x	x	
Ireland	x	x	x	x	x		x	x	x	x	x		[30,31,41,53,87]
Italy	x	x	x	x	x	x	x	x	x	x	x		[30,31,52,58,62,88–97]
Japan		x	x	x	x	x	x	x	x	x			[39,42,45,75,76,98]
Latvia	x	x	x	x		x	x						[30,31,43]
Lithuania	e	x	e	x		x							[30,31,99,100]
Luxembourg	x		x	x			x	x	x				[30,31]
Mexico			x	x	x				x	x			[101]
Netherlands	x	x	x	x	x		x	x	x	x	x		[30,31,38,41,64]
New Zealand			x				x	x	x		x		[50]
Norway			x	x		e	x	x	x	x	e		
Poland	x			x		x		x	x		x		[30,31,81]
Portugal	x	x		x	x		x	x	x		x		[30,31,102,103]

Table 1. *Cont.*

	Prescriptive Policies			Economic Policies					Supportive Policies				
	Regulation on Equipment Process	Regulation on Energy Management	Negotiated Agreements	Energy Taxes	Energy Tax Reductions	Financial Incentives—Loans	Financial Incentives—Subsidies	Cap and Trade Scheme	Identification Opportunity	Cooperative Measures	Capacity Building	Publicity	Additional References
Republic of Korea			x	x		x	x	p	x	x			[40,50,65]
Russia			x	x			x		x				
Slovak Republic	x	x	x	x			x	x	x	x	x		[30,31]
South Africa	x	x	x	x					x	x	x		
Spain	x	x	x	x		x	x	x	x	x	x		[30,31,41,75]
Sweden	x	x	x	x	x		e	x	x	x	x		[31,54,76,104–110]
Switzerland			x	x	x	x	x	x			e		[50]
Turkey		x		x	x		x		x	x	x		
UK	x		x	x	x	x	x	x	x	x	x		[30,31,37,88,111–113]
USA		x	x			x	x	p	x	x	x	x	[50,57,70,114–118]

Authors elaborated from Tanaka [19], and IEA energy efficiency policies and measures database, Mure database, OECD taxing energy use publications [22–27]. Additional references are explicitly cited. The list of contributions is not intended to be exhaustive.

The comprehensive review by Johansson et al. [17] shows that the scientific publications in the field are heterogeneous in scope and origin, but the majority are related to barriers to and drivers of energy efficiency. The works on energy policies primarily put the focus on energy audit programs and show that the major energy efficiency measures from industrial SMEs are found in auxiliary and general processes (more than in production processes). The review reveals that the most-used method has been quantitative (based on questionnaires or interviews). This work presents two methods to de-sign public energy efficiency policy programs for industrial SMEs: to assess national governmental reports and findings, and to analyze the available scientific literature in the field. According to the second option, the major steps for designing policies for SMEs should be: 1. deciding the primary target sector group; 2. mapping the annual energy; 3. reviewing the current energy policies; 4. making an energy efficiency potential estimation; 5. reviewing the barriers to and drivers of energy efficiency; 6. suggesting appropriate policy; 7. evaluating the impact of the policy program.

An analysis of the national implementation of Article 8 of EED in the EU-28 was commissioned in 2015 by EC [119]. This study was conducted from a policy-making perspective, illustrating the main features and outcomes at both Member States and the aggregate level, covering both large enterprises and SMEs. The main findings of this study for SMEs indicated that Member States apply numerous approaches for the development of energy audits and the implementation of EPIAs. This mix is formed by regulatory, information, and financial instruments as well as voluntary agreements. Generally, support programs partly cover the costs of carrying out energy audits or implementing EPIAs; they usually also include low-cost loans for companies. Several countries have also developed guidelines to assist in the implementation process.

According to [119], the main recommendations include supplying easily accessible information to companies, increasing the activities on non-energy benefits, and to ensure regular information between countries with the concluded national transpositions. The main recommendations to SMEs are divided into three groups: energy audits (EAs), energy management systems (EnMSs). and exchange of information mechanisms.

- Energy audits (EAs) focus on energy-intensive companies; development of support schemes for the implementation of EE measures included in EAs; availability of low-interest capital for investments in EPIAs; creation of one-stop shops also with the cooperation of key institutions.
- Energy management systems (EnMSs) involve step-by-step implementation support; advice and first certification support; specific sectoral guidance.
- Exchange of information involves the creation of regular structures for common exchange and follow-up for SMEs; increasing institutional support; using a mix of approaches to cover a broad range of SMEs.

Many studies have focused on energy audits, highlighting that they can be considered as the first step in implementing energy efficiency in enterprises. They are a useful tool for overcoming information barriers and promoting EE investments by SMEs [120]. A comprehensive guide for EA program developers was developed in [121], where twelve basic elements for developing effective EA programs were identified, represented by the definition of legislative frameworks, the identification of key players, and the training of auditors. Moreover, Ref. [121] highlights that the progress and results of a program should be continuously controlled and periodically evaluated and should provide quantitative information about the pioneer Finnish program of EAs (not focused on SMEs). Moreover, energy management systems have also demonstrated considerable potential to unlock energy-efficiency investments [122]). Article 8 establishes the obligation for non-SMEs to carry out high-quality, cost-effective energy audits every four years and, moreover, states that "Member States shall develop programs to encourage SMEs to undergo energy audits and the subsequent implementation of the recommendations from these audits". Hence, specific schemes and voluntary agreements to support the development of energy audits in SMEs have been developed in several EU countries, for example, the Swedish Energy

Audit Program [123]. Firstly, the implementation of these policy programs is heterogeneous among countries, and their harmonization, in terms of EPIAs and energy use, would be useful [70]. Secondly, the SMEs present limited financial and human resources for investing in energy audits (and in EPIAs) [124]. Therefore, national schemes usually co-finance the development of energy audits for SMEs [88]. Thirdly, several efforts have been focused on identifying no-cost EE interventions and own risk investments [125] also by means of self-assessment tools [126]. Lastly, due to the voluntary nature of energy auditing in SMEs, the enterprises involved are generally self-motivated; if all the supply chain companies are involved in the auditing process, voluntary practices could become the norm [68]. The effective implementation of the energy audit programs for SMEs usually is most effective when local authority consultants, regional energy agencies, and business associations are engaged [104,127]. One successful strategy for increasing the energy services for SMEs could be the creation of public ESCOs [76].

Energy management systems are not yet widespread among EU SMEs [128]. Some reviews cover the implementation of EnMS in SMEs at the global level [16,34,129], highlighting that energy management standards (mainly ISO 50001) are often too complex for a cost-effective implementation at the SME level (for non-energy-intensive companies [130]) and alternative tools for energy management should be tailored to SMEs (i.e., networks [109], in-house tools [131], plan–do–check–act cycle tools [132], integrated decision support systems tools [133], or external support [134]). Hence, their implementation in SMEs in simplified forms should be taken into consideration by policymakers.

Energy efficiency is generally analyzed through the direct benefits associated with the reduction in costs, end-use consumption, and energy price volatility. However, in recent years, the attention paid to the nonenergy (or multiple) benefits of energy efficiency has growth [135]. The full range of multiple benefits include job creation, increased productivity, health and wellbeing, air quality, energy access for all, increase in assets value, etc. [136]. Many studies have examined the wide range of multiple energy efficiency benefits in general terms [135,137–140] or relative to specific countries and measures [63,79,141,142]. Analyses and the quantification of the multiple benefits of energy efficiency in SMEs are still scarce [137] but a broad introduction can be found in [143].

4.3. Barriers to and Drivers of Energy Efficiency in SMEs

A comprehensive review of energy efficiency policy programs for industrial SMEs [17] showed that the research in the field is heterogeneous in both scope and basis, but the majority of studies are related to barriers to and drivers of energy efficiency. The review revealed that the methods most used in these studies were questionnaires or interviews.

The likelihood of a company investing in energy efficiency is a function of energy intensity, the size of the company, and investment profitability. EPIA implementation is also directly linked to the effectiveness of policy-making strategies [144]. In other words, policies have an effect of the marginal cost curves of different technologies [145], affecting the marketability of each technology and the corresponding payback time.

The European Union has supported the market uptake of EPIAs in industry and services through more than 40 projects (under Intelligent Energy Europe Programme II and H2020 Energy Efficiency projects, 2007–2020) [146], addressing three main general barriers: the lack of financing, the long pay-back time for some EPIAs, and the lack of regulations on energy audits for SMEs; the lack of expertise, knowledge, practical experience, and time; and the poor recognition of the comprehensive value of energy efficiency.

Removing these barriers would help SMEs to exploit their energy efficiency potential. The first two types of barriers are typically associated with the need for public policies that support EE investments, while the last one can be seen as a perceived internal barrier in the companies that do not implement cost-effective EE investments. In the literature, this issue is called the "energy efficiency gap", which is the gap between potential and implemented cost-effective EPIAs and has been investigated in several scientific publications [147–151]. This gap is due to the existence of barriers to energy efficiency dissemination. An energy

efficiency barrier, as defined by Sorrell [149], is "a postulated mechanism that inhibits investments in technologies that are both energy efficient and (at least apparently) economically efficient". Significant differences exist across industrial sectors, but many EPIAs with high potential and relatively low pay-back time are not implemented; although energy management could help with identifying these options, an extended energy efficiency gap remains [8].

A first categorization of barriers for organizations, both private and public, was proposed by Sorrell et al. [149], with further modification and application in [144,152]. In their approach, single barriers are classified according to three main theoretical backgrounds: economical, organizational, and behavioral, developing a taxonomy consisting of the following six broad categories of barriers: "imperfect information, hidden costs, risk, access to capital, split incentives, and bounded rationality" [153].

These barriers, which could be also differently classified [154,155], are likely to co-exist and they help explain the need for public intervention to boost EPIAs, as described in the previous sections. For example, clearer price signals with economic measures may help to solve imperfect information issues, whereas enhanced access to finance favoring access to capital or improved information basis and skills faces bounded rationality constraints.

Barriers to policy effectiveness may be inside the policy measures themselves [156]; a framework needs to be provided to analyze the adoption of EPIAs under different dimensions, in particular in terms of measured characteristics addressing the relative advantage, technical, and information contexts.

De Canio [147] stated that companies often set internal hurdle rates for energy efficiency investments that are higher than the cost of capital for the company due to information and control problems. A well-managed corporation may still have profitable opportunities available that it finds difficult to realize. In [148], the "energy efficiency" paradox was statistically investigated. In [150], different types of barriers, investigated through a series of interviews, were identified, and approaches for overcoming these barriers were examined, with the authors also proposing some criteria for evaluating them. The study focused on the identification of the right size of the energy-efficiency gap, investigating market and non-market needs for the gradual diffusion of energy-efficient technologies.

Cagno et al. [155], focusing more specifically on the industrial sector, proposed a new approach that also considers the interactions between the different barriers. In the proposed novel taxonomy, barriers are classified according to the responsible actor from which they originate. This actor could be external (such as the market, politics, energy suppliers, etc.) or internal (enterprise organization, behavior, etc.) to the enterprise. In their article, they also point out that the structure of the enterprise can have an impact on actual barriers. For SMEs, the purely organizational barriers are often not relevant since decisions are often made by a single person. Trianni et al. [97] focused their analysis on SMEs' energy efficiency barriers, conducting an empirical investigation on 48 Italian manufacturing SMEs. The decision-making process was investigated by evaluating the importance of real and particularly important perceived barriers. The major perceived barriers identified for SMEs that emerged from the study were economic and information barriers. An important aspect highlighted was the need to distinguish between small and medium enterprises in the evaluation of barriers impact since their organizational and productive structures can be completely different [97].

A systematic identification of the relevant perceived barriers and drivers to EPIAs implementation in manufacturing SMEs is presented in [5]. 220 Slovenian manufacturing SMEs have been investigated to examinate the relevance of barriers and drivers for implemented and planned EPIAs. Empirical results of the study show that economic incentives are the key drivers and the lack of economic resources, experienced staff and low management priority given to energy efficiency represent the main barriers [5].

The study in [84] is based on a 2010 survey of SMEs participating in the German energy audit program. High initial investment costs were identified by the authors as a main barrier to the implementation of EPIAs [84]. The low quality of energy audits is a further obstacle to the adoption of EPIAs.

In [104], a case study of Swedish non-energy-intensive manufacturing companies is presented, identifying "cost of production disruption/hassle/inconvenience and lack of time" as major barriers to energy efficiency. In [87], the Irish mechanical engineering industry was analyzed, identifying "access to capital" has the most pervasive barrier.

In [112], a literature review and an exploration of the connection between energy efficiency opportunities offered by industry and the factors influencing the adoption of energy efficiency and industry-focused business models in the UK are presented. Other interesting insights for specific sectors can be found in [105] for the Swedish pulp and paper industry; in [106] for the Swedish foundry industry; for the Belgian ceramic, cement, and lime sectors in [74]; and for the Italian metals manufacturing SMEs in [96]. Other pertinent studies on energy efficiency drivers and barriers focused on SMEs are presented in [67,77,78,102].

5. Review of Qualitative and Quantitative Studies on Energy Efficiency Policies for SMEs

The information available regarding the implementation of energy efficiency policies for SMEs at the national level is very variable. It is possible to find information about general policies on SMEs (or with a partial focus on SMEs' general energy efficiency policies) in some countries such as Sweden [107], Japan [42], Portugal [102], Bulgaria [157], China [78], the U.S. [114,115], Germany [84,158], the Netherlands [159], Lithuania [99], and Vietnam [160], and at regional level [161]. In addition, the analyses have focused on macro-sectors (generally, manufacturing SMEs in Italy [93], Slovenia [162], Belgium [73], Spain [75], or Turkey [163]) or on specific sectors from a comprehensive environmental perspective (the UK [111], Mexico [101], Romania [133,164], Venezuela [165], Sri Lanka [166], Jordan [167], Iran [168], Pakistan [169], Vietnam [170], Ghana, and Senegal [171]).

Due to the heterogeneity of SMEs, the potential for the implementation of EPIAs is variable. A common approach involves developing specific sectoral policies as a function of the efficiency potential. The first step is prioritizing the sectors according to the potential in terms of number of SMEs, economic indicators, their size and energy consumption, the improvement potential [81], the energy intensity of the production [82], the cost of energy relatively to total production costs [172], or other environmental issues [173]. Hence, the specific scheme must be tailored for each sector. Some examples of manufacturing sectoral analyses of energy efficiency in SMEs include those for the textile [174], bakery [175], foundries [176], tourism [177], food and drink [178,179], wood [179,180], primary metals [94,179], plastics [95], ceramic [103], and horticultural [181] industries. However, contributions regarding energy efficiency in the SMEs in the services sectors are scarce [89].

5.1. Qualitative Studies on Energy Efficiency Policies for SMEs

Table 2 shows 45 studies that analyzed 64 specific policies for the EE of SMEs. References are shown by country and policy type, and information is provided on topic and quantitative figures, namely, numbers of SMEs involved, savings, program cost effectiveness, and barriers/drivers assessed. The included studies analyzed the policies of 16 European countries and 5 non-EU countries. Considering Tanaka's classification, 47% of the studies focused on the evaluation of a specific policy, of which were 18% economic, 22% were prescriptive, and 5% were supportive. The remaining 53% of the studies analyzed, evaluated, and reviewed different types of policies in one or more countries. About half of the studies conducted policy reviews, while 45% were policy evaluations, and 5% of them were case studies on energy audits programs in SMEs.

The countries of focus of most of the studies are analyzed in-depth in the following paragraphs.

Australia

One contribution [71] was devoted to the Commonwealth Government's Enterprise Energy Audit Program (EEAP), a financial support measure offering a 50% subsidy to both large enterprises and SMEs to undertake an energy audit, including investment assessments. The adoption rate of EEAP recommendations by the more than 1000 participants firms was around 80%, a figure higher than expected. This result could be linked to the existence of undiscovered opportunities and in general to reductions in the costs and risks associated with investing in new technologies owing to the EEAP; specific characteristics of the program could also influence this result, for example, in terms of the relatively low number of interventions described in quantitative terms. The study concluded that the promotion of the EEAP process could be a successful policy strategy, focusing on the opportunity for a company to take a company-wide view of energy efficiency. Ref. [67] investigated the supportive measures represented by the Queensland Climate Smart Business Cluster Program, aimed at forming business clusters to help SMEs undertake the sustainability program in small groups with the help of a leader. The main program results showed that an adaptive management approach, investigating both barriers and motivators and including regular reviews, could be useful to increase the adoption rates of EPIAs in SMEs [67].

Ref. [68] conducted a case study investigating a program for SMEs aimed at environmental management improvement, providing free, local, and in situ energy audits. The main results showed that the common reasons for the disengagement of SMEs in addressing their environmental impacts were the lack of resources, environmental knowledge, and know-how.

Germany

The German energy audit program for SMEs, established in 2008 and still operating, has been extensively evaluated by researchers. The program offers grants to SMEs that voluntary conduct energy audits. Gruber et al. [85] and Fleiter et al. [18] organized surveys of the audited companies, consultants, and "regional partners" involved in the program; on this basis, they were enabled to assess the outcomes for the period 2008–2010. The study by Gruber et al. [85] focused on the quality of the audit, the implementation of the proposed measures, the associated investments, the corresponding barriers, and energy and CO_2 savings. The program appeared to be successful, indicated by a high rate of implementation of the audit recommendations. Fleiter et al. [18] presented an ex post evaluation of the German energy audit program, assessing its outcomes in terms of energy and CO_2 savings as well as its cost effectiveness. A successive evaluation of the program, referring to the period 2008–2013, is presented in [86], where the effectiveness of the program on the adoption of four cross-cutting measures by small businesses from manufacturing and non-manufacturing sectors was investigated. The study also analyzed whether audit effectiveness varies with the size of the organization. The results of the study demonstrated that audit effectiveness, although depending on the type of energy performance improvement action (EPIA) included, decreases with organization size. Barriers to the adoption of energy efficiency measures in SMEs were investigated [84]. Fleiter et al. investigated the factors affecting the adoption of EPIAs in German SMEs using survey data, obtained from the SMEs involved in the German energy audit program in 2010. Their results suggested that a distinction exists between technical and financial risks, acting as different barriers to the adoption of EPIAs.

Regarding the analysis of support measures in Germany, the work of Wohlfarth [82] focused on the evaluation and comparison of two programs, the Learning Energy Efficiency Networks (LEEN), focusing on large (LE) and SMEs, and the KfW program "Energieberatung Mittelstand" (energy consulting SME), focusing more on microcompanies (MCs). Additionally, Rohde et al. [83] conducted a deeper analysis of the status of German LEEN, with a comprehensive review of EENs at the international level and a quantitative analysis of the impact of German networks.

Japan

Voluntary business activities in Japan have been reviewed [39,98]. Wakabayashi in [98], by means of interviews with business organizations and a literature review, analyzed three case studies (standby power reduction by Japan Electronics and Information Technology Industries Association, perfluorocompounds gas emission reduction by the global semiconductor industry, and voluntary action plans of Japanese industrial associations) in which voluntary activities played a key role in mitigating climate change. In [98], Wakabayashi highlighted that industrial associations are key actors in the success of voluntary activities, and the flexibility in staggering the measures is an important advantage of voluntary activities. The influence of industry voluntary action plans, implemented by 114 Japanese business associations from 1997 to 2012, on firms' environmental behavior was investigated in [39]. Using a survey of about 1000 companies, this study found that SMEs belonging to industries with voluntary action plans were two to four times more likely to meet their carbon emission targets than companies belonging to industry associations without voluntary action plans, confirming that voluntary action plans are effective in removing information barriers for SMEs. Researchers [182] analyzed the Japanese experience of EnMS regulation under Energy Conservation Law (ECL), involving 12,000 energy intensive companies in industrial and commercial sectors, 30% of which were SMEs. Another study [182] enriched the literature review with a survey of regulated firms and a case study on a manufacturing SME: the regulation certainly helped with establishing EnMSs, but, in many cases, the implementation of EE activities was scarce, only associated with complication with the regulation. Firms need to be supported in using their EnMSs, and this can be achieved with a more informational approach, such as energy audits and customized advice [182].

Italy

A general overview of Italian (and British) energy efficiency policies was recently published by Malinauskaite et al. [88]. Additionally, some specific Italian programs, not only focused on SMEs, have been extensively analyzed, i.e., White Certificates [92] and the Italian information campaign to promote energy efficiency [91]. Extensive literature on the drivers of and barriers to the implementation of EPIAs in SMEs is available [93,97,155,183]. However, aggregated information about energy efficiency policies' impact on the SMEs in Italy is still lacking. A review of existing SME-targeted energy efficiency policies in Italy is presented in [90], where a more specific disaggregation of the main policy results in terms of firm size is proposed. Regarding prescriptive measures, Ref. [89] investigated the link between EnMSs (specifically ISO 50001) and EAs in EED Article 8 implementation in two industrial and two tertiary sectors, highlighting the role that company size, energy monitoring systems, and EnMSs play in planning and/or implementing EPIAs.

The Netherlands

Regarding the Dutch energy efficiency policies for SMEs, evaluation studies have focused mainly on voluntary agreement programs. Bressers et al. [64] reviewed the Dutch-negotiated agreements on energy savings in industry (MJAs), analyzing specific implementation's aspects in the period of 2002–2010 with no specific focus on SMEs. Abeleen et al. [38] analyzed energy efficiency plans submitted from companies involved in the Dutch voluntary agreement, called the Long-Term Agreement on Energy Efficiency 2001–2020 (LTA3). According to their findings, despite LTA3 focusing on large, energy-intensive companies, most of the companies could be defined as SMEs. A study [38] described the attitude of companies toward planning and implementing energy efficiency investments, noting significant differences between the two activities, coupled with a high variation in the expected and experienced payback periods.

Table 2. Research on energy efficiency policies for SMEs in each country.

Country	Policy/Program	Type	Evaluation Period	Ref	Topic	#SMEs	Savings	Sector	Public CE	Barriers/ Drivers
Australia	Queensland Climate Smart Business Cluster Program	S	2009–2011	[67]	PE	Y	N	All sectors	N	Y
	EEAP—Enterprise Energy Audit Program	E	1991–1997	[70]	PR	Y	N	Industry	N	Y
	EEAP—Enterprise Energy Audit Program	E	1991–1997	[71]	PE	N	N	Industry	N	Y
	No specific policy	O	2012	[68]	CS	Y	N [a]	Mainly services	N [a]	Y
Austria	Klimaaktiv	S	2008–2017	[72]	PR	Y	Y	All sectors	N	N
Belgium	Different SME policies	V	2008–2015	[75]	PE	N	Y	All sectors	N	N
	Policies to stimulate ESCO market	V	2001–2015	[76]	PR	N	N	Industry	N	N
	Various voluntary agreements	P	2002–2020	[41]	PR	N	Y	Industry	N	Y
Bulgaria	OPIC—SME support scheme in Bulgaria	E	2014–2020	[157]	PE	Y	Y	All sectors	Y	Y
Denmark	Policies to stimulate ESCO market	V	2001–2015	[76]	PR	N	N	Industry	N	N
	Several policies	V	2010–2014	[81]	PR	N	Y	All sectors	N	Y
	Agreement on industrial energy efficiency	P	1993–2019	[41]	PR	N	Y	EII	N	Y
Finland	Several policies	V	1992–2011	[81]	PR	N	Y	All sectors	N	Y
Germany	LEEN and energy audit program for SMEs	S	2009–2014	[82]	PR	Y	N	Manufacturing	N	Y
	LEEN—Learning Energy Efficiency Networks	S	2009–2014	[83]	PR	Y	Y	Manufacturing	N	Y
	Energy audit program for SMEs	E	2008–2016	[84]	CS	Y	N	All sectors	N	Y
	Energy audit program for SMEs	E	2008–2017	[70]	PR	Y	Y	All sectors	Y	Y
	Energy audit program for SMEs	E	2008–2012	[18]	PE	Y	Y	All sectors	Y	Y
	Energy audit program for SMEs	E	2008–2011	[85]	PE	Y	Y	All sectors	Y	N
	Energy audit program for SMEs	E	2008–2012	[86]	PE	Y	Y	All sectors	Y	N
Ireland	Energy Agreements Program	P	2006–2019	[41]	PR	N	Y	EII	N	Y
Italy	National energy efficiency action plan 2017	V	2014–2020	[88]	PR	N	Y	Mainly industry	Y	N
	EED Art 8 Mandatory EAs	P	2019	[89]	PE	Y	Y	All sectors	N	N
	Different SMEs policies	V	2005–2021	[90]	PR	N	N	All sectors	N	Y
	National energy efficiency campaign "Italy in Class A"	S	2015–2021	[91]	PE	N	N	All sectors	N	N
	White Certificates	E	2006–2015	[92]	PE	N	N	All sectors	N	N
Japan	Policies to stimulate ESCO market	V	2001–2015	[76]	PR	N	N	Industry	N	N
	Voluntary Agreement Program Climate	P	2001–2003	[98]	PR	Y	N	Industry	N	N
	VAP 114 Business associations	P	1997–2012	[39]	PR	Y	N	All sectors	N	N
	Several policies	V	1990–2014	[42]	PR	N	Y	Mainly industry	Y	N
	Different SME policies	V	2005–2015	[75]	PE	N	N	All sectors	Y	N
	EnMS regulation under the Energy Conservation Law (ECL)	P	2009–2010	[182]	PE	Y	N	Mainly industry	N	Y
Latvia	Latvian Energy Efficiency Obligation Scheme (EEOS)	E	2017–2020	[43]	PE	N	N	All sectors	Y	N
Lithuania	Auditas pramonei LT	E	2015–2018	[99]	CS	Y	Y	Manufacturing	N	N

Table 2. *Cont.*

Country	Policy/Program	Type	Evaluation Period	Ref	Topic	#SMEs	Savings	Sector	Public CE	Barriers/ Drivers
Mexico	MSSP—Mexican Sustainable Supply Program	E + S	2005–2013	[101]	PE	Y	Y	All sectors	Y	N
Netherlands	Dutch voluntary agreements on energy efficiency	P	2009–2012	[38]	PR	Y	N	All sectors	N	N
	MJAs—Dutch negotiated agreements on energy saving in industry	P	2002–2012	[64]	PR	N	N	All sectors	Y	Y
	Various voluntary agreements	P	1991–2020	[41]	PR	N	Y	All sectors	N	Y
Norway	Several policies	V	2012	[81]	PR	N	Y	All sectors	N	Y
Portugal	EFINERG Project—EE in SMEs (250–500 toe)	O	2012	[102]	PE	Y	N	Manufacturing	N	Y
South Korea	Voluntary agreements	P	1999–2010	[40]	PR	N	N	Industry	N	N
	Target management scheme	V	2008–2013	[65]	PR	Y	N	Energy Intensive	N	N
Spain	Different SMEs policies	V	2008–2015	[75]	PE	N	Y	All sectors	Y	N
	Policies to stimulate ESCO market	V	2001–2015	[41]	PR	N	N	Industry	N	N
Sweden	Several policies	V	1990–2014	[42]	PE	Y	Y	Mainly industry	Y	N
	Different SMEs policies	V	1990–2011	[75]	PE	N	N	EII	N	N
	Several policies	V	2004–2014	[81]	PR	N	Y	All sectors	Y	Y
	Highland + PFE	E	2003–2008	[104]	PE	Y	Y	Industry	Y	Y
	SEAP—Swedish Energy Audit Program	E	2010–2014	[123]	PE	Y	Y	All sectors	Y	Y
	Several policies	V	1990–2020	[108]	PE	N	Y	Industry	Y	N
	PFE—Program for Energy Efficiency in Energy-Intensive Industries	P	2005–2014	[54]	PE	N	Y	All sectors	N	N
	Regional EEN policy program—ENERGIG	S	2014–2019	[109]	PR	Y	N	Industry	N	Y
	Regional EEN policy program—ENERGIG	S	2015–2018	[110]	PR	Y	Y	Industry	Y	Y
	Regional EEN policy program—ENERGIG	S	2011–2016	[184]	PE	Y	N [a]	Industry	N	Y
	Long-term agreements for SMEs	P	-	[107]	PE	Y	Y	EII	Y	N
	Policies to stimulate ESCO market	V	2001–2015	[76]	PR	N	N	Industry	N	N
	SEAP—Swedish Energy Audit Program	E	2010–2014	[185]	PE	Y	Y	All sectors	Y	N
	Highland + SEAP	E	2006–2014	[70]	PR	Y	Y	Manufacturing	Y	Y
United Kingdom	National energy efficiency action plan 2017	V	2014–2020	[88]	PR	N	N	Mainly industry	N	N
	Climate change agreements (CCAs) and climate change levy (CCL)	E + P	1999–2010 [b]	[37]	PE	N	Y	All sectors	N	N
United States	IAC—Industrial Assessment Centers	E + S	1981–2000	[70]	PR	Y	Y	Industry	N	N
	IAC + 30 U.S. State and Regional Climate Policy actions of EPA	E + S	1984–2011	[114]	PE	Y	N	Industry	N	Y
	Information program and support scheme	E + S	1976–2004	[117]	CS	Y	Y	All sectors	N	Y
	IAC—Industrial Assessment Centers	E + S	1981–2009	[118]	PE	Y	Y	Industry	Y	N
	IAC—Industrial Assessment Centers	E + S	1981–2009	[186]	PE	Y	Y	Industry	Y	Y

PE: policy evaluation, PR: policy review, CS: case study on EAs; E: economic, O: other, P: prescriptive, S: supportive; V: various; [a] available only at firm level; [b] scenario.

South Korea

Seok et al. [40] analyzed the corporate adoption of the voluntary agreement for energy efficiency and greenhouse gas (VA) reduction in South Korea. The participation of enterprises in VA varied depending on several specific conditions at the enterprise level, such as the amount of energy consumption, ownership regime, socioeconomic conditions, and skills in environmental management. The factors determining industrial energy-saving practices in South Korea were investigated [65] by means of a questionnaire to SMEs energy-intensive SMEs (about 66 business sites were used for the analysis). The interviewed SMEs showed a good awareness level of energy efficiency and expressed a strong willingness to save energy. In practice, they preferred managerial interventions, while technological interventions, characterized by higher investments and stronger barriers, were associated with lower adoption rates. Regulatory lag and the weakness of industrial associations characterized the socioeconomic context; companies' internal motivations were the strongest driver of energy saving practices.

Sweden

Twelve studies examined energy efficiency policies for SMEs in Sweden. Some of them were devoted to a set of countries; for this reason, they are analyzed separately.

Several contributions [107,123,185] have evaluated the Swedish Energy Audit Program (SEAP), which was publicly financed to support energy audits of SMEs. The program has minor LTA elements, such as the need to report audit results, to present a plan for the implementation of measures, and, after three years, the implemented measures are presented. An ex ante evaluation of SEAP was performed [107], providing data on estimated cost effectiveness and annual savings. After 3 years of implementation, Ref. [185] focused on the identified and implemented EPIAs from the energy audits of 241 companies. The average annual energy efficiency improvement potential is provided, as well as the implementation rate of the suggested measures (53%) and the overall investment. The cost efficiency of the program was also investigated, looking at the different costs of the program and computing the average cost for managing each application (EUR 1660). An ex post evaluation was conducted by [123], including a process and impact assessment. The net annual savings was 6% of the energy end use of the 713 participant companies. The implementation rate is consistent with that in [185]. The public cost of one implemented measure was also computed (EUR 700), as well as the annual cost effectiveness of the program. Multiple company visits were also conducted, allowing the researchers to address additional effects as well as the quality of the audits. The results showed that although SEAP resulted in lower energy savings than expected, it could be considered cost effective.

The local energy program Highland, in force in the period of 2003–2008, was examined by different researchers [70,104,123]. It financed two-day energy audits and involved local/regional intermediaries like authorities, energy consultants, and energy agencies. According to [104], the adoption rate of the program was 40%, considering both already-implemented measures and planned ones, showing that the information provided in the energy audits has in general been accepted by the firms. Highland was described as an effective program in terms of achieved savings and related public and private investments compared with programs in Sweden and other countries. Survey data on Highland program showed that energy audits helped to overcome the barriers to energy efficiency, such as the lack of knowledge, lack of interest from top management, lack of time, and lack of access to capital [123].

Two contributions [54,104] evaluated the Program for Improving Energy Efficiency in Energy-Intensive Industries (PFE), an LTA introduced in 2005 for electricity-intensive industries. Ref. [104] highlights the low priority of energy issues in SMEs, which need to be targeted by public policy, which would be better if by a set of policies including different approaches. Comparing PFE with Highland in terms of the cost effectiveness of the implemented measures (private money spent in relation to energy saved), the result was approximately the same. By contrast, Highland appeared to be more efficient in terms of the cost effectiveness of the program (public money spent in relation to energy saved).

It should be considered that extending the PFE monitoring from electricity only to other energy carriers would likely increase its cost effectiveness. Ref. [54] provides an overall picture of the program, showing that PFE has exceeded the estimated impact of a minimum tax and can thus be considered successful.

Refs. [109,110,184] have explored the role of the regional energy efficiency network ENERGIG. The first contribution investigated how to overcome the barriers identified from research, the second focused on the evaluation of the program, and the last one provides a general overview. The evaluation carried out in [110] showed that the energy audit was the network feature most appreciated by participants, followed by training on energy efficiency issues, consultancy with experts in the field, presentations of case studies, and network meetings for sharing experiences. Finally, ref. [108] evaluated the Swedish policy mix to fulfil the EU 2020 primary energy target for Swedish industry. The results showed that current policies were not sufficient to reach the target, and further policy measures were suggested, such as the inclusion of all energy carriers, not only electricity, in the PFE program and the creation of networks.

UK

Malinauskaite et al. [88], analyzing the UK (and Italian) energy efficiency policies, pointed out that in the UK, different reporting schemes and mechanisms can impose unnecessary burdens on industries and that constant rule changes lead to regulatory unpredictability and can affect industries' investment opportunities, especially since the necessary energy efficiency improvements are a long-term process. Ref. [37] conducted a scenario analysis concerning the climate change agreements (CCAs) in the UK, negotiated with large companies and SMEs in several energy-intensive industrial sectors. The agreement provided for a reduction in the climate change levy (CCL) rate, provided the negotiated energy efficiency targets were met. According to the study, an awareness effect exists: industry executives were generally uninformed of cost-effective energy efficiency improvements before negotiating CCAs but became aware of them during this process. This effect implied overall environmental benefits beyond those associated with an alternative scenario with the obligation of a flat-rate CCL.

USA

Several studies [70,114,117,118,186] have focused on the USA's Department of Energy's Industrial Assessment Centers (IAC) program, which has been providing free energy assessments to small- and medium-sized manufacturers since 1976. In our classification, this measure is both economic and supportive. Evaluation studies in this field are important since, despite the role that information programs play in policy plans, relatively little is known about the response of participants. Ref. [118] assessed the impacts of the "Industrial Technologies Program", operating under the guidance of the U.S. Department of Energy's Office. IAC is among the initiatives covered: twenty-six IACs located within engineering departments conducted energy assessments for SMEs and trained the future workforce of energy engineers. Savings were evaluated based on four sources: the IAC energy assessments, the assessments performed by IAC student alumni, replication assessments within companies served by the IAC, and energy savings linked to the IAC website. The IAC database covers more than 20,000 assessments, nearly 150,000 pieces of savings advice, and the average recommended yearly savings is USD 138,418 [187]; a student registry also exists, as well as evaluations of the longer-term effects of the program.

Based on the IAC database, the barriers for not adopting measures were examined in [117], distinguishing economic, financial, and institutional barriers. The results indicated that non-financial project-specific factors (e.g., the duration of projects, unmeasured costs and benefits, or the complexity and risks associated with the project) influenced the investment decision. Plant size, instead, had no measurable effect on the adoption decision. In general, firms are more responsive to changes in investment costs than to energy savings, suggesting that cost-cutting policies may be more effective than measures to increase energy prices [114,117]. Moreover, the greater the benefits associated with the energy efficiency recommendation, the higher the probability that it will be realized [114,117,186].

It can also be noted that the probability of the measure being implemented decreases as its implementation cost increases. Ref. [114] shows that, in the IAC program, the payback time and the savings associated with the investments are key determinants for SMEs investment decisions.

Comparative studies

In addition to country-specific studies, many works in the scientific literature and technical reports have compared, analyzed, and evaluated similar energy efficiency policies, also focusing on SMEs, among different European and non-European countries. Andersson et al. [70] reviewed five studies evaluating different energy audit programs in Australia, Germany, Sweden, and the USA. According to the review, the comparability among programs is limited due to differences in the evaluation studies and results. Performing an energy audit implies changes in the categorization of measures and energy use: if such categorization is introduced before the energy audits, policy evaluation studies could use common categories. A study [42] examined a policy instrument for industrial energy efficiency in Japan and Sweden, with a focus on the period of 1990 to 2014 and on SMEs. The report published by the IEA in 2014 [75] presents an overview of the main policies and programs implemented for industrial SMEs in Spain, Japan, Sweden, and Belgium. The report also analyzes the results achieved by the policies in terms of the difficulties encountered during the implementation of the program/policy and includes quantitative results in terms of cost effectiveness, namely, comparing energy saved with the public funding of the program. Energy services and business models for industrial SMEs in Sweden, Denmark, Belgium, Japan, and Spain were investigated by the IEA in 2015 [76]. The IEA report analyzes the ESCO market and policies to stimulate it on a country-by-country basis and shows that the main barriers were mistrust on the demand side, e.g., in Belgium, Japan, and Sweden, together with high transaction costs. Successful actions to sustain an emerging energy services market include the creation competence centers, e.g., in Belgium and Denmark, or of knowledge exchange associations, e.g., in Belgium, Japan, and Spain.

A comprehensive review of voluntary agreements programs since 1991 on industrial energy efficiency is presented in [41], with a focus on Sweden, Denmark, Belgium, Japan, and Spain. The study is based on a review of both existing literature and contacts with administrators, showing that voluntary agreements can still make a significant contribution to improving industrial energy efficiency in the future [41]. Information- and competence-related barriers, particularly significant for smaller companies, can be successfully addressed with voluntary agreements. Results indicated that smaller companies could achieve higher relative energy savings than larger companies [41]. Since financial measures are usually connected to the energy consumption level and not to potential savings, smaller companies may be discouraged, although they have a high energy efficiency potential [41]. The authors suggested expanding the focus of existing national agreements toward decarbonization and the creation of local agreements that especially support SMEs in implementing energy saving measures through knowledge sharing [41].

Ref. [81] analyzed the policy mix for energy efficiency in SMEs adopted in Nordic countries, including a mix of voluntary agreements, financial incentive, and supporting measures. In general, energy management and targeted information could have a key role in ensuring that SMEs implement EPIAs. Specific policy recommendations are also provided, for example, developing a joint Nordic database for energy audit data and providing benchmarks on energy consumption levels and savings potential.

5.2. Quantitative Studies on Energy Efficiency Policies for SMEs

In Table 3 are presented the quantitative information on public programs that involve the implementation of energy audits in SMEs:

- Six stand-alone programs from five countries (two from Sweden).
- Four programs include energy audits as part of more general schemes for energy efficiency in SMEs.

- Two policies are focused on tax levies for energy-intensive industries (including both SMEs and large companies). Access to these programs requires the completion of energy audits.
- Finally, two energy efficiency networks are presented as examples of good practices for the implementation of energy efficiency policies in SMEs. In these cases, the EAs are not mandatory (or at least not certified).

The most successful policies in terms of SMEs involved are the stand-alone U.S. IAC (14,800 SMEs from 1981 to 2009) and the German energy audit program (24,300 SMEs from 2008 to 2013).

The number of implemented measures by EA is variable. Some programs present the implementation of only one EPIA by audit, and other implemented more than 10 (Swedish PFE and ENERGIG). Usually, the number of EPIAs implemented was lower in the stand-alone schemes (from 1.0 to 9.2, mean 3.6) than in other more comprehensive policies that included the partial funding of EPIA implementation (from 1.0 to 14.0, mean 6.6). In most cases, the implementation rate varied from 40% to 53%. Hence, of the policies evaluated, about one-half of the proposed measures were implemented. The implementation ratio value decreased with the maturity of the policies (for example, the IAC program presented an implementation rate of 60% in 1985 and 45% in 2008) [114].

The cost of the mechanism is obviously lower in the stand-alone scheme (which only covers partially or fully the cost of the energy audits) than in other schemes that support the implementation of EPIAs. The cost of the stand-alone programs varied from 0.6 to 10 million EUR/year, supporting thousands of companies. Moreover, the more comprehensive policies with budgets that cover tens of millions of euros each year only cover hundreds of companies. The cost of the energy audits is generally evaluated only in the stand-alone policies. The cost for each SME audit varied from EUR 900 to 9000.

The saving reported are proportional to the number of companies involved. In the case of countries with strong industrial sectors (Germany, the U.S., or Japan), the induced annual savings were above 1 TWh/year in the stand-alone EAs policies, corresponding to an induced saving of 0.66 GWh/year for each SME that carried out an energy audit. The average savings by SMEs increased up to 4.5 GWh/y (spreading from 0.46 GWh/y/SME in the Italian *Energivori* program up to 14.3 GWh/y/SME in the Swedish PFE) in more comprehensive policies that include the implementation of EPIAs. In any case, it is important to note the lack of information on the calculation method for energy savings (notably exception is [123]).

The cost effectiveness of the implementation of the EPIAs has been variable (from 5 to 625 EUR/MWh) as well as the simple payback time (from 0.8 to 7.6 years) due to the intrinsic heterogeneity of technical solutions and the SME sector, and the different industrial structure among countries. However, the cost effectiveness of the EA stand-alone policies presented an excellent ratio and a relative low dispersion (from 0.5 to 10 EUR/MWh, mean 3.4 EUR/MWh), confirming energy audits as a key action to promote energy efficiency in SMEs.

Table 3. Quantitative analysis of energy efficiency policies involving energy audits for SMEs in each country.

Type of Policy	Country	Policy	Reference Years	#SMEs [d]	Impl. EPIAs per EA	Impl. Rate (%)	Prog. Cost [M EUR]	Cost Energy Audit [EUR]	Savings [GWh/y]	Pot. Savings [GWh/y]	Public CE [EUR/MWh]	CE EPIAs [EUR/MWh]	PP [j] [y]	Ref
Energy Audits for SMEs	AU	EEAP	1991–1997	1200 (100)	4.7	81%			4166				1.3	[18,70,123]
	DE	German energy audit program for SMEs [c]	2008–2010	542	1.4	40%						225–625		[84]
			2008–2010	9292	1.6	43%	17.7		953	1653	1–1.3		6.1	[18,70,123]
			2008–2010	10,400 (542)	2.8	53%	18.9	900–4000	1921	38,000	0.5–0.7	5–23	6.1	[85]
			2008–2013	24,300 (1471)				1200–4800		10–20% [i]			6	[86]
	JP	ECCJ audit program	2004–2007	2409			7.7		2380		3.2			[42]
	SE	Highland Project	2003–2008	139 (47)	1.0	22%			7	16				[18,70,123]
			2003–2008	340	3.0	50%	0.6	2000	40	75	5–10			[104]
		SEAP	Ex-ante	900			3.5			700–1400	2.5–5.0			[107]
			2010–2013	241	9.2	53%	1.5	9160	110–160	207–306	0.7–1.3	125–265		[185]
			2010–2014	713	4.5	53%	3.5	4540	340	589	7		7.6	[123]
	US	IAC	1981–2009	14,800	3.8	50% [e]	7–10/y [f]	7000	18,833				1.1	[18,70,117,123]
Energy Efficiency for SMEs [a]	BE	Flanders–Audit Covenant	2005–2013	229					1166					[75]
	BG	OPIC	2014–2020	426	1.0		154 [g]		356			434	5.9	[157]
	MX	MSSP	2005–2012	972	2		156 [g]						0.8	[101]
	ES	PAE4+	2008–2012	260			2.85	14,600	2360		1.2	115		[75]
Energy Intensive Industries [a,b]	IT	EII "Energivori"	2014–2018	2546					1186			119		[88,90]
	SE	PFE	2005–2007	98			70 [h]							[104]
			2005–2012	101	12.5	43%	88 [h]		1450		6.5	9.3–16	1.5	[54]
EE Networks [a]	DE	LEEN	2009–2014	948	3.7				6208					[82,83]
	SE	ENERGIG	2015–2018	44 (15)	14.0	50%				5,5	5.8			[110]

[a] Programs including energy audits. Both SMEs and large enterprises participate; [b] tax levy programs; [c] 'Sonderfonds Energieeffiezienz in KMU'2008–2010, 'Energieberatung Mittelstand' 2010–2012; [d] in parentheses, number of evaluated companies; [e] implementation rate decreased from 60% (1985) to 45% (2008); [f] out of the program's current federal outlay of about USD 7 million per year, each school received about USD 180,000 annually, or about USD 7000 per assessment; [g] includes the audit program but the incentives to implement EPIAs; [h] includes the tax deductions associated to the program; [i] includes only four types of EPIAs: lighting, Insulation, Heating, Operations. Savings related to these specific processes: [j] mean simple payback period of implemented EPIAs.

6. Concluding Discussion

This paper presents a scoping review of the scientific and technical literature on the energy efficiency policies in SMEs, providing detailed qualitative and quantitative information for developing and analyzing effective policies and programs. Starting from a broad literature review on the topics of energy efficiency policies and programs for enterprises, a deeper analysis was carried out from quantitative and qualitative points of view on SMEs.

A broad literature review of the programs for enterprises was conducted considering the consolidated taxonomy classifying policies as economic, supportive, or prescriptive. Starting from an existing classification framework that was applied to the productive sector, the novelty of this study is the application of this framework to review the studies and reports examining energy efficiency policies for SMEs. In this way, the review provides an updated picture of existing contributions, distinguishing them by policy type and country analyzed.

There is extensive research on the barriers to SMEs implementing energy performance improvement actions and on the characterization of EPIAs. The existing contributions on the involvement of SMEs in energy efficiency has largely focused on demonstrating obstacles to the adoption of EPIAs. Lack of capital, lack of information, and prioritizing the most pressing trade issues are among the most common barriers. However, due to the intrinsic heterogeneity of the SME sector, designing EE policies specifically for SMEs remains a difficult task.

Although there are many studies on both EE policies and SMEs, the novelty of this review lies in their systematization at different levels: general frameworks for the classification of EE policies for SMEs; comprehensive analyses of contributions providing qualitative information on EE policies for SMEs; in-depth analyses of studies including quantitative information on EE policies for SMEs.

The energy efficiency taxonomy shows that the policy support for EE in SMEs is usually based on voluntary agreements, which limit the economic and administrative burden. Hence, SMEs are generally excluded from prescriptive policies, which are based on binding measures. Recent studies demonstrate that the most successful approaches are (1) the development of energy audits, (2) balancing of economic and supportive policies, (3) the implementation of energy efficiency networks as cost-effective actions for industrial SMEs, and (4) targeting interventions through strategic segmentation (usually focusing on Energy Intensive Industrial SMEs).

Sixty-four references on specific policies for EE in SMEs in 21 European and non-European countries were analyzed. Distinguished by country and policy type, an assessment of the quantitative figures included was conducted in terms of number of SMEs involved, savings, program cost effectiveness, and barriers/drivers. About half of the studies conducted policy reviews, 45% were policy evaluations, and 5% of them were case studies on energy audits programs in SMEs. The countries on which most of the studies focused were analyzed in depth.

Among the policy evaluation studies, it was possible to extrapolate quantitative results on 14 programs from 10 countries: 6 stand-alone energy audit programs, 4 mechanisms including the energy audits as part of more general schemes for energy efficiency in SMEs, 2 policies for energy-intensive industries (including both SMEs and large companies), and 2 for energy efficiency networks. An in-depth analysis of evaluation studies was performed, referring to the number of SMEs, number of implemented EPIAs per EA, program cost, achieved and potential savings, public and EPIAs cost effectiveness, and payback period. The range of the analyzed data depended on the type of policy and presented high variability. The most successful mechanism in terms of the involvement of SMEs and public cost effectiveness is the stand-alone EAs policy, confirming the crucial role of energy audits to encourage energy efficiency in SMEs.

From the presented scoping review, some common insights were drawn:

- To allow for a better understanding of policy performance and to compare different policy mechanisms, a harmonized approach for the evaluation of EE policies for SMEs is needed, including specific methodologies and indicators.
- Quantitative studies on the topic are still scarce in terms of the policies and countries analyzed as well as the number of SMEs covered; moreover, their effective comparison has been limited due to the high heterogeneity of the adopted approaches and/or the lack of information about them.
- All evaluation studies reporting quantitative information (Table 3) have focused on policies including the adoption of EA. In this sense, EA seems to be a pre-condition for performing quantitative evaluations of the savings and cost effectiveness of a program.
- According to some policy schemes, EA certification is mandatory. However, due to the complexity of the implementation of certified energy audits and energy management systems in non-energy-intensive SMEs, the implementation of simplified forms should be taken into consideration by policymakers.
- Targeted policies and tools, tailored as function of the size, sector and energy intensity of the company, appear to be a successful approach to overcome barriers for EE in SMEs.
- A more integrated approach combining different economic and supportive instruments may help SMEs with improving the EPIA implementation rate, starting from no-cost EE and low-risk interventions.
- The most successful strategies include the engagement of local or regional associations instead of national governments, due to the more common territorial context of SME activities.
- Capacity-building programs and learning networks (which are well received by SMEs), as part of a broader range of support, can help ensure the longevity of the policy, as SMEs develop their own skills that help them undertake energy audits and implement EPIAs.

The findings presented in this review provide key elements for policymakers to conduct more effective quantitative assessments and help policy evaluators and researchers to better address the topic, providing a methodology of future studies. The main results of this literature review are aligned with the results obtained by the LEAP4SME international [188] and national [189] observatories, involving policymakers, energy efficiency experts, academics, business associations, and other relevant stakeholders.

Further research devoted to reviewing energy efficiency policies and/or evaluating them on a quantitative basis could also concentrate on the technologies covered and incentivized, considering a wide range of technological interventions, from energy-oriented maintenance to highly innovative measures and digitalization. The connection between policies and these fields could be an interesting topic to be addressed in future research based on the significant work already conducted. Focusing on technologies could usefully be complemented and made more effective by targeting research efforts to specific sectors, reviewing the policies and their impact on production activities and business models. Such efforts would be helpful for policymakers to provide a framework for monitoring existing policies and learning from best practices when planning new policy interventions.

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