


Review

# A Framework for the Analysis of the Sustainability of the Energy Retail Market

Simone Di Leo <sup>1</sup>, Marta Chicca <sup>2</sup>, Cinzia Daraio <sup>1,\*</sup> , Andrea Guerrini <sup>2</sup> and Stefano Scarcella <sup>2</sup>

<sup>1</sup> Department of Computer, Control and Management Engineering Antonio Ruberti, Sapienza University of Rome, 00185 Rome, Italy; dileo@diag.uniroma1.it

<sup>2</sup> Regulatory Authority for Energy, Networks and Environment (ARERA), 00187 Rome, Italy; mchicca@arera.it (M.C.); aguerrini@arera.it (A.G.); sscarcella@arera.it (S.S.)

\* Correspondence: daraio@diag.uniroma1.it

**Abstract:** This paper addresses the issue of assessing the sustainability of policy decisions of the Energy Retail Market, explicitly considering the retail energy market, unlike existing approaches in the literature that analyze the energy market as a whole. The sustainability assessment is treated as the process by which the sustainability implications of an initiative are assessed, where the initiative can be a proposed or existing policy, plan, program, project, piece of legislation, or current practice or activity. The paper provides a comprehensive overview of the state of the literature on the sustainability of policy decisions in the retail energy sector and formulates a conceptual framework for policy sustainability analysis in the retail energy sector. The systematic review is complemented by a quantitative bibliometric analysis on the 48 collected papers published from 1997 to 2022. The proposed framework allows for a balanced analysis of the sustainability of policy decisions by evaluating the technical, economic, and environmental impacts. It could be used to develop a list of indicators that can map the different impacts and their interactions. Critical analysis of the existing findings leads us to identify future research directions.

**Keywords:** deregulation; electricity retail market; energy retail market; liberalization; sustainability; systematic review



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## 1. Introduction

Liberalization and deregulation have dramatically changed the energy market over the past four decades. With the unbundling of the retail market from the rest of the energy supply chain, different kinds of regulations and transitions toward a free market have been introduced across the world. Despite this widespread transition, different countries have implemented different changes, from an initial level of transition to a completely free market.

The existing literature on energy sector liberalization and deregulation is extensive. Many studies analyze the United Kingdom (UK) and Californian cases, reporting discordant effects of deregulation policies, positive for the UK and negative for California (see e.g., [1,2]). Deregulation and restructuring of the USA electric industry, intended to produce cost efficiencies and price benefits for consumers, has been the subject of several studies reviewed in [3]. Despite numerous interventions, there is little reliable evidence that deregulation has had a positive effect on consumers in the United States electricity industry.

On the other hand, Ref. [4] examined the impact of liberalization on the technical innovation of the electricity supply and Ref. [5] claims that recent technological trends imply a major shift in the network economy, leading to possibilities for inter- and intra-grid competition. Ref. [6] argues that, compared to the USA, many of the European countries lack the power to legislate and regulate the market power of generators. Due to uncontested markets, and reduced transmission and generation capacity, deregulation can lead to higher prices and reduced investment unable to support competitive prices.

Recently Ref. [7], conducted a literature review of energy reforms implemented in the electricity sector to analyze the effects of deregulation on the energy market. The results showed a positive relationship between reform and market opening and price changes. Although the deregulation measures were designed to reduce the cost of electricity for consumers, changes in energy prices were only achievable over the long term, with the implementation of various measures (including disinvestment policies and rate cuts) to ensure that the deregulation achieved its primary goal of reducing energy prices. Although these studies are interesting, the results seem inconclusive, and the focus is not on the retail market but the energy market as a whole.

A relevant and related topic is the sustainability of policy decisions in the energy sector. The role of policy decisions in the transitions of sustainable energy systems has been explored in [8] which highlights the need to clarify policymaking while considering energy systems as sociotechnical, socioecological, and complex systems.

The sustainability of policy decisions has been addressed poorly in relation to liberalization and deregulation policies. In addition, there are few contributions in this area that analyze the retail energy market.

Moreover, achieving the Sustainable Development Goals (SDGs), adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity, are on the agenda of all policymakers (additional information can be found at <https://sdgs.un.org/goals> (accessed on 6 June 2022)). Sustainable development is a “... development that meets the needs of the present without compromising the ability of future generations to meet their own needs in particular the essential needs of the world’s poor, to which overriding priority should be given” ([9], p. 43).

In addition, the sustainability of decisions in the energy sector has recently become central again. The discussion has not been about whether to liberalize the market, but about *how* one can intervene in the market and what policies can be adopted in relation to the market environment. The sustainability decisions specifically targeted on retail in the energy market consequently need a vision that encompasses the possible effects throughout the energy chain. Policymakers need a flexible tool that they can contextualize to be able to assess the decisions to be made.

Ref. [10] addressed the topic of sustainable energy development as a complex and multidimensional issue, identifying four interconnected themes: (i) access to affordable modern energy services, (ii) energy supply, (iii) sustainable energy consumption, and (iv) energy security. Equitable access to modern, affordable, and reliable energy services is integral to sustainable development. A transformation of the current energy system is necessary but not possible unless it is economically viable through, for example, cost-competitive technologies and changes in energy prices that reflect the external costs of energy.

In this paper we address the issue of assessing the sustainability of policy decisions considering explicitly the retail energy market. Sustainability assessment, following [11], refers to the process by which the sustainability implications of an initiative are assessed, where the initiative can be a proposed or existing policy, plan, program, project, piece of legislation, or current practice or activity. This general definition encompasses very different processes referred to in the literature as sustainability assessments.

Sustainability is defined in different ways and often with definitions that cover different aspects such as environmental, social, and economic dimensions. In the literature, there are different notions of sustainability referring to the whole energy market.

Ref. [12] identified three main pillars of the energy market considered as a whole: competitiveness, environmental sustainability, and security of energy supply. These three pillars are commonly adopted by European countries. However, these pillars are general for the whole energy supply chain, and do not identify the role of the retail market in each pillar but consider the retail market only in the competitiveness pillar. However, the role of retail cannot be relegated to competitiveness alone because it plays a fundamental role in the three pillars proposed by the authors [12].

Two studies propose models to help assess the impacts of policy decisions. The first by [13] proposes a model of the possible impacts of competition on the retail market, identifying three main dimensions of impact: efficiency, differentiation, and equipment innovation. However, this model, derived from a survey of the literature, presents several critical issues. In particular, the proposed model does not delve into the dimension of efficiency and indirect gains on wholesale, transport, and distribution services. The second model, proposed by [14], highlights the multidimensional nature of impacts in the whole energy market (not only retail), identifying the following impacts: (i) Economic and price impact; (ii) social impact, distinguished by the impact on employment (also analyzed by [15]) and consumer interest (also highlighted by [13]); (iii) environmental impact, focusing on carbon dioxide (CO<sub>2</sub>) emissions; and (iv) technical impact, highlighting the distribution-seller-customer relationship. These models emphasize the multidimensionality and interconnectedness of the impacts that are present throughout the energy market.

Ref. [16] offers a categorization of sustainability assessment tools by distinguishing indicators, product-related assessment of the product, and integrated assessment tools, which also include monetary assessment tools. Ref. [17] introduces a model of 22 sustainable production indicators to increase firms' awareness and measure their progress toward sustainable production systems. Ref. [18] addresses the problem of effective sustainability assessments. Ref. [19] proposes a methodology to analyze the sustainability of electric generation considering the technical, socioeconomic, environmental, and technological factors of various alternatives to expand the sector.

Recently, Ref. [20] identified four challenges relevant to achieving the SDGs: (i) State-of-the-art renewable energy technologies; (ii) energy storage; (iii) energy modelling techniques; and (iv) climate and energy policy and impact analysis. Decision making for energy system transformation should consider the sustainability of the energy system in a broad sense, considering not only greenhouse gas emissions but also security of supply requirements, cost efficiency, and the additional environmental and socioeconomic impacts that energy systems induce [21].

We analyze the topic of sustainability of policy decisions in the energy sector contributing to addressing the challenge iv) about the impact analysis of energy policy identified in [20]. Unlike other existing studies, in this paper we address the sustainability of policy decisions to liberalize or regulate at the retail energy market level. We analyze the retail energy market because there is little literature focusing on it, and it is the market that affects consumers the most and is mainly observed by regulators in times of crisis and major changes such as those currently occurring.

The main objective of the study is to provide a comprehensive overview of the state of the literature on the sustainability of policy decisions in the retail energy sector and to formulate, based on this stock of knowledge, a conceptual framework for policy sustainability analysis in this market. To this end, we conduct a systematic review of the literature on the effects of liberalization on the sustainability of the retail electricity sector, complemented by a bibliometric analysis of selected papers.

The paper is structured as follows. Section 2 introduces the methodology and details the approaches used for the systematic review and bibliometric analysis. Section 3 reports the main results of the paper.

Section 4 formulates a general framework and discusses implications and further extensions. Section 5 concludes the paper and outlines directions for future research. The paper is completed with two appendices that provide technical details on the systematic review (Appendix A) and a table that summarizes the analyzed main characteristics of the studies (Appendix B).

## 2. Materials and Methods

The methodology used in this paper combines systematic review with bibliometric analysis. A systematic review is defined as "a systematic and explicit review of the evidence on a formulated question that uses systematic and explicit methods to identify, select, and

critically appraise relevant primary research, as well as to extract and analyze data from the studies included in the review” [22]. Ref. [23] showed the usefulness of systematic reviews of the literature in the management area to develop evidence-based decision support systems. Ref. [24] illustrates the specificities of systematic reviews applied in the social sciences including management. We adopt the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [25] for systematic reviews but, considering the topic of our investigation, we will appropriately adapt the PRISMA methodology to the typical characteristics of the topic of our analysis based on what has been proposed by [24].

In our survey, all journal articles, conference proceedings, and book chapters written in English were considered. The databases consulted were Scopus (<https://www.scopus.com/> (accessed on 10 December 2021)) and Web of Science (<https://www.webofknowledge.com> (accessed on 10 December 2021)). The last date of access for these sources was on 4 April 2022, after the first access on 10 December 2021. In line with the principle of reproducibility and transparency, we specify the complete search strategies for all databases, records, and websites used, including any filters and limits used. Details on the queries can be found in Appendix A.

The choice of keywords is crucial in a systematic review. The various keywords introduce biases that, together with the selection criteria of the papers, can influence the quality of the proposed work. To reduce this bias, we adapted to our context the Population Intervention Comparison Outcome (PICO) model [26], developed in the medical field, which proposes to highlight the main concepts and terms for the queries by organizing them into four main domains that are Population, Intervention, Comparison, and Outcome. Table 1 shows the free text terms or natural language terms selected as keywords in our analysis of the literature.

**Table 1.** Keywords used in the systematic search developed according to the PICO Model.

	Population	Intervention	Comparison	Outcome
Key concepts	electricity retail market	Impact	Not applicable	Evaluation
Free text terms/natural language terms	Energy OR Electricity OR Power	Liberalization OR “free market” OR Competition	-	Impact OR Evaluation OR Status
	Retailers OR retail	Deregulation OR restructured	-	

In our initial search strategy, the keyword ‘sustainability’ was also included, but the search result was reduced (specifically 14 for Scopus and 33 for Web of Science), as such, it was decided to eliminate this keyword to have a larger sample to analyze. Interestingly, studies that analyze “sustainability” are a sub-sample of those that address policy decisions in the energy retail market.

The following selection criteria were adopted for the selection of articles:

- Work available/accessible online;
- Work with a primary focus on the retail electricity market;
- Work that assessed the impact of regulatory reforms in the retail electricity market.

Any work that does not meet these conditions were excluded from this review. To verify which articles met the requirements, two screening steps were performed: abstract and title screening (for an initial reduction in the articles under review) and full paper screening. Because of the abstract screening process, it was possible to initially sort the papers, but it was not possible to find all the final papers only with this step. To be able to select the final papers, it was necessary to continue with a complete paper selection. We proceeded to the screening of titles and abstracts of the papers through Mendeley Desktop

Software [27], which in addition to the support of the screening phase, allowed us to detect possible duplicate papers not identified in the previous steps.

After the pre-selection phase was carried out through the screening of abstracts and titles, the remaining papers were downloaded (if available) and read carefully before being included in the review. After performing the searches and collecting the results derived from the queries (specifically, the results were downloaded in BIB and RIS formats), the various selected papers were downloaded in PDF format, and their main bibliometric information (such as DOI and Authors) were collected from the reference databases. The collection of the various identified items was conducted from the paper available online at the time of the queries (10 December 2021 and 4 April 2022). All data items extracted from the selected works were recorded in an Excel spreadsheet. The data used for the bibliometric analysis were taken from Scopus through a manual search of the selected papers, searching them on the platform using the Digital Object Identifier (DOI). Data for bibliometric analysis were collected on the 4 April 2022.

To further investigate the content of the articles selected through the systematic review, we performed a quantitative bibliometric analysis based on the Bibliometrix R package [28], which is an open-source software that is freely available and user-friendly. Using this tool, the following analyses were performed:

- Thematic Map, is a map based on co-word network analysis and clustering. The methodology used for the analysis is presented in [29]. The map starts with a network of co-occurrence keywords to plot in a two-dimensional chart the typological themes of a domain. The diagram in Figure 1 shows a summary of how to interpret the different areas of the map;

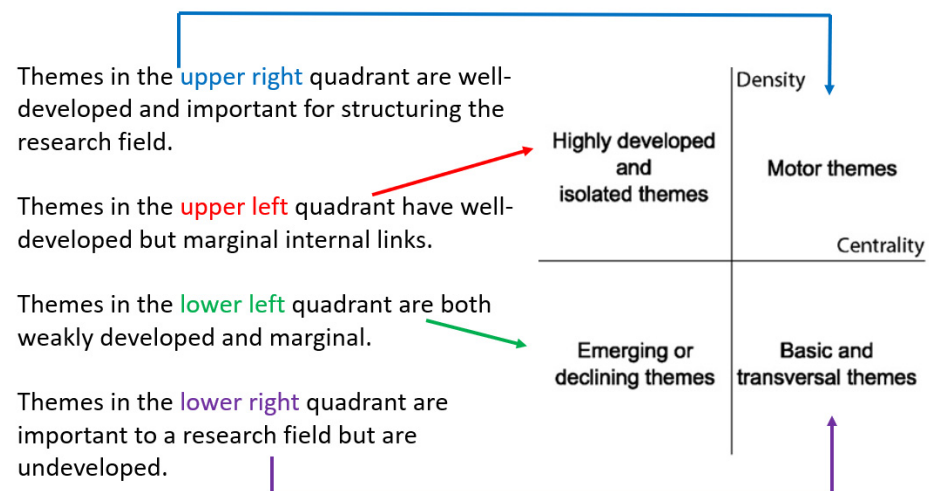


Figure 1. Thematic map structure. Adapted from Ref. [29].

- The coupling map is a two-dimensional plot in which the  $x$ -axis represents cluster centrality index), while the  $y$ -axis depicts cluster effect (as measured by the Mean Normalized Local Citation Score, whose acronym is MNLCS);
- Most frequent abstract words, which is useful for understanding the main topics covered in the selected documents based on the frequency of words (in our case the bigrams, i.e., word pairs);
- Most referenced work in the literature, useful for determining the trend of the most studied topics and for providing a potential chronological interpretation.

Through searches based on our criteria, whose queries are described in Tables A1 and A2 of Appendix A, 402 results were obtained from Scopus, of which 368 were in English and 507 from Web of Science, of which 499 were in English. The results were merged through the Mendeley desktop, eliminating the 214 duplicates. In the first selection round, the abstracts, and titles of 653 articles were analyzed. After this phase, 483 articles were removed, leaving

170 documents to be further investigated in the second screening phase. During the second phase of selection, it was not possible to obtain a complete manuscript for 28 articles. At the end of the selection process, we had discarded:

- 44 articles because the focus of the work was not the energy retail market;
- 8 articles because the focus of the work was not the electricity market;
- 37 articles because the effects of liberalization or deregulation on the electricity retail market had not been analyzed;
- 8 articles after a critical discussion on the quality of the work and the methods adopted.

At the end of this selection process, we obtained a set of 47 articles (see references [13–15,30–73]). After all the various operations of extracting and processing the information on these 47 articles, the queries were re-executed on 4 April 2022 for checking the updates, resulting in a new article [74] that was added to the previous 47, bringing the total number of selected papers to 48. The summary scheme of our review, according to the PRISMA principles (2020 version) [25] is reported in Figure A1 of Appendix A.

### 3. Results

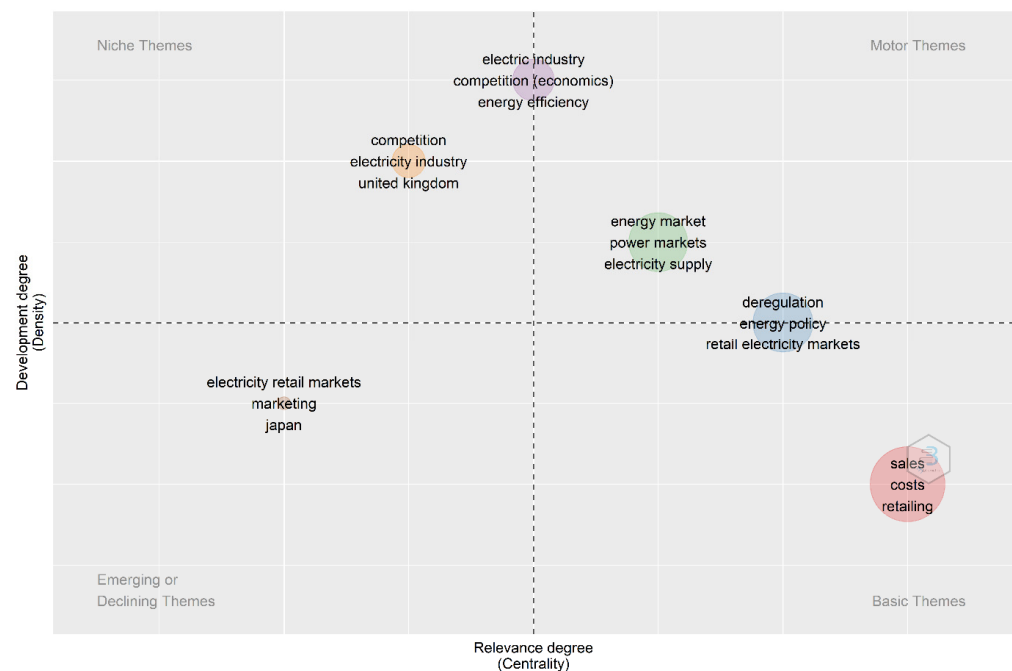
#### 3.1. Overview of the Analyzed Studies

The 48 collected papers were published from 1997 to 2022. The articles have been published in 28 different sources and have an average number of citations per article of 13.31, which is synonymous with a high academic interest in the topic. See Table 2. Although the articles focus on energy retail, the articles addressed it with different research questions and facets. Individual study characteristics such as main research questions and geographic and temporal contexts are presented in the summary table reported in Appendix B.

**Table 2.** Summary of bibliometric information of the selected studies.

Description	Results
Timespan	1997–2022
Sources (Journals, Books, etc)	28
Documents	48
Average years from publication	7.33
Average citations per document	13.31
Average citations per year per doc	1.491
References	1806
<i>Scopus document type</i>	
article	40
conference paper	5
review	3

Figure 2 shows the thematic mapping carried out on the 48 selected studies. The theme map uses keywords and fields which captures an article’s content with greater depth and variety. The upper right square shows the motor theme. They are characterized by high centrality and high quality and density. Among the “motor themes” that are the more developed in the literature, the main concern is competition in the electricity market and the relation with electricity supply. These topics are related to various concepts such as performance, consumer/retail relations, and energy consumption and production relations. Figure 2 shows a cluster between motor themes and high-density themes related to the electric industry, competition, and energy efficiency. These themes are related to how competition can stimulate consumers to be more energy-efficient, as we will discuss in the next section.

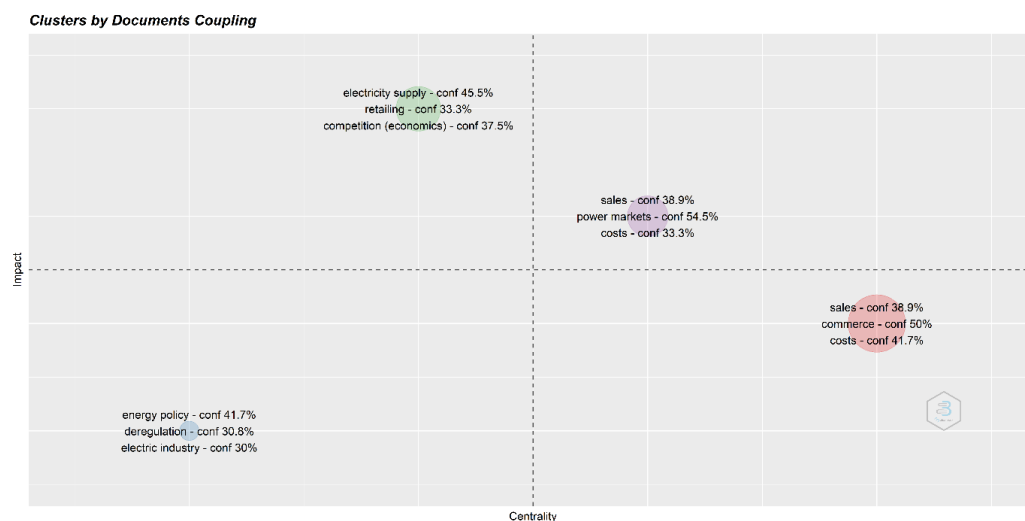


**Figure 2.** Thematic map of the 48 selected articles. Number of Words 250, min cluster size per thousand docs 6, field keyword plus.

In the upper left quadrant of Figure 2, there are themes related to competition, electricity, and the UK market (orange cluster). These themes are densely developed as the UK was one of the first countries to approach the liberalization of this sector and therefore to be analyzed (as already seen in [1,2]). In the lower-left quadrant, there are emerging or declining themes. Here there is the theme of electricity retail markets that relate to marketing. Japan (see [31,43,48,53,59,61]) and Australia [14,46,62,68] received increasing attention in the literature in recent years. Below this last quadrant, there is another cluster which includes the themes of deregulation and energy policy in retail electricity markets. Finally, the lower right quadrant of Figure 2 shows fundamental and transversal themes. In this area, the appearing themes are sales, cost, and retailing. These themes are very broad and apply to a wide range of fields; additionally, it should be noted that these words were frequently present in papers discarded during the selection process that did not always refer to the electric sales market, demonstrating how these themes are crosscutting across various research fields.

The coupling analysis differs from thematic analysis in several respects. Thematic analysis is based on co-word network analysis and clustering, while coupling analysis is based on coupling network and community detection results on a bi-dimensional map. This difference is evident in Figure 3. Figure 3 shows on the  $x$ -axis the centrality measure (as is Figure 2), but on the  $y$ -axis, it reports the impact (measured through the Mean Normalized Local Citation Score-MNLCS). Through the combined use of these two factors we can identify which themes (emerging, basic, motor or niche) have a high impact in our setting. The results of the coupling analysis highlight that the issues of “competition” and “electricity supply” in the retail market are central in our 48 articles and have an average impact (see the green ball in the top left quadrant of Figure 3). These themes are presented in Figure 2, and this underlines that this theme is not densely treated in the literature (i.e., it has a low degree of development) but has a significant impact in the literature. This result could suggest further development of research on these issues. Articles that deal with sales, costs, and power markets are central and have a high impact, emphasizing the high attention in the literature on these issues (see the violet ball in the top right quadrant of Figure 3). Another central theme, but with less impact, concerns the study of costs and sales in commerce (see the red ball in the bottom right quadrant of Figure 3) as we

have seen in the bottom right part of Figure 2. The small impact of these topics comes from a lack of attention in the past to the role of costs in sales markets which, in recent years, has led to an increased focus on business risk in the energy retail sector as well and which may see increasing attention in the future in the literature (not least because of the unstable situation currently prevailing in many countries concerning energy supplies). Despite the small impact in the literature, this is a basic theme according to the thematic analysis shown in Figure 2, highlighting another theme that could be further developed in future research. Finally, we observe a small impact of the themes of energy policy and deregulation in the electric industry which are also non-central themes (see the blue ball in the bottom left quadrant of Figure 3). This result contrasts with what is shown in Figure 2, highlighting how, despite the lack of centrality, we may see increasing attention in the future in the literature on these topics. Thanks to the union of the coupling map and thematic map results, we can consequently learn that the existing literature has rarely dealt with the problem of energy policy in the deregulated market as it is assumed in the cases of deregulated markets that the market will self-regulate itself.



**Figure 3.** Documents coupling measured by reference using local citation score such as impact measure. Number of Units 250, min cluster frequency 5. Labelled by keyword plus.

The analysis of the most frequent abstract words enables us to gain a deeper understanding of the structure of the main topics discussed. Figure 4 shows the bigram of the most cited works present in the abstracts of the 48 selected documents. Excluding the main field of interest and its synonyms (electricity market and retail market), the most frequent words are related to the price of electricity and retail prices, as also suggested by the results proposed earlier in our work. The second word most frequently used, business risk, is also the most important negative factor highlighted in the literature, which we will address in the next section. It is also very common to examine the topic of consumer switch-over, which is evaluated in the literature as a measure of market competition health. Another frequent word is natural gas, which is used as a bundled service in electricity sales. In conclusion, words related to market structure (i.e., market structure, vertical integrated/integration, and their synonyms) are less frequent. These topics are discussed in [39,44,62,64].

The first article [60] received a lot of attention from the literature (133 citations) because it attempts to assess the state of retail competition in the electricity market in 2008, a crucial moment for European markets that were at their initial stage of liberalization.



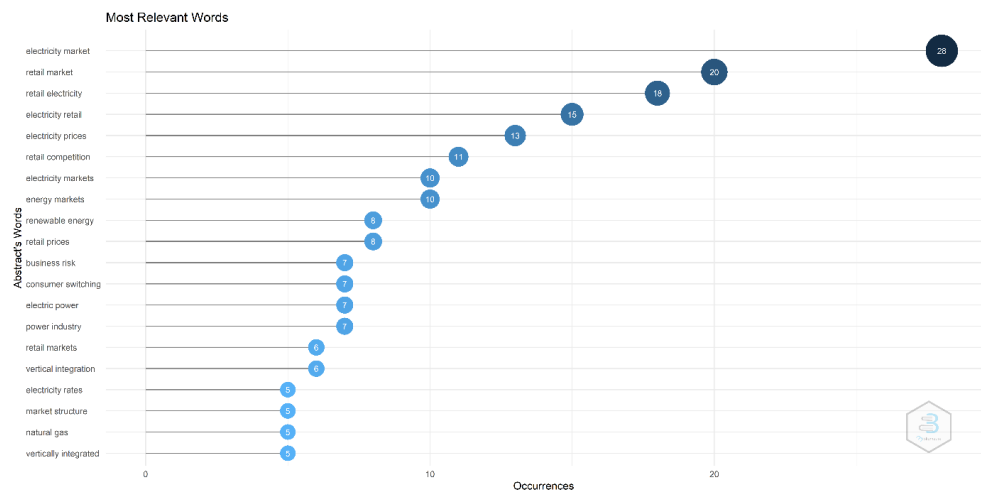


Figure 4. Bullet plot of the most relevant abstract bigram.

The most referenced works are useful for determining the trend of the most studied topics and for providing a potential chronological interpretation. Figure 5 shows the bullet plot of the most cited articles that are [14,37,41,53,60,62], respectively.

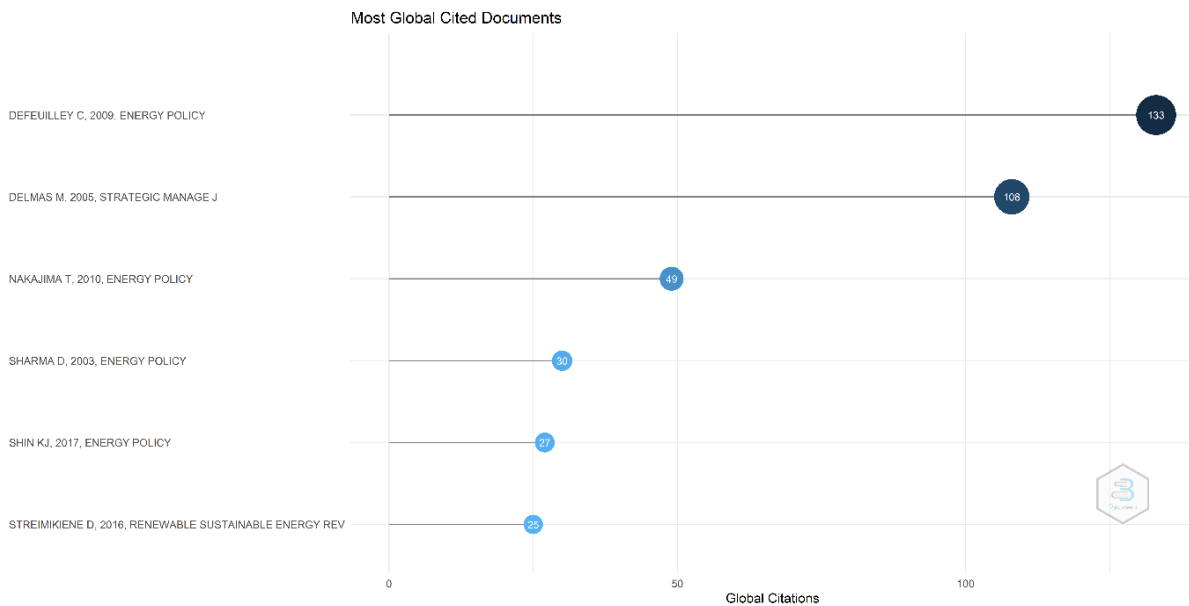


Figure 5. Bullet plot of the Top 6 most cited papers: Ref. [60], Ref. [41]. Ref. [37], Ref. [14], Ref. [53], Ref. [62].

The second article [41], with 108 citations, examines how the retail deregulation process impacts the relative efficiency of governance structures, which vary from fully vertically integrated institutions to market transactions. The third paper [37] has been cited 49 times and focuses on estimating the changes in price elasticity in the residential electricity market after the deregulation. The fourth article [14] seeks to assess the impact of the reform of the electricity market and enriches the literature by exposing market concerns about focusing only on the economic dimension of the problem. The fifth article [53] seeks to assess the impact of liberalization of retail electricity in relation to consumer satisfaction and household switching behavior in Japan. The interest in the literature of this article derives from the high interest in the analysis of consumers both on the consumer behavior side of the market (also treated in other selected works such as [63,71]) and on the consumer

switching side, an indicator also used in the policy making field to evaluate the degree of competitiveness of the country (this aspect will be explored in the next sections).

The last paper [62] analyzes the electricity market models of selected countries in the developed world. This article received 25 citations, despite being published relatively recently, in 2016. This work is influential in the literature as it asserts that the liberalization of the electricity market can help to achieve the key objectives of sustainable energy development. All these works highlight different aspects of liberalization or deregulation, synonymous with the fact that a one-dimensional focus (such as price) is not sufficient to assess the sustainability of policymakers' decisions in this area, and a broad-spectrum view is needed.

### 3.2. Towards the Formulation of a Framework: The Elements Extrapolated from the Existing Literature

After conducting an overview of the selected papers, in this section, we present the results of the analyses performed on the content of the selected papers. The table reported in Appendix B shows the articles selected by the systematic review reporting for each article including: the reference, its article classification according to the Scopus database, the type of market analyzed, the country analyzed, the reference year of the study, and the intervention (research question) analyzed.

To make the best use of the content of the 48 selected papers, we extracted from their texts any reference to potential policy impacts on the retail energy market by categorizing them into one of the three following effects: (i) effects on market structure and operators; (ii) effects on consumers and prices; and (iii) effects on the environment.

The elaborations focused on a careful classification of the results presented in the papers, considering the types of markets analyzed, contextualizing them so that the impact of the policies carried out could be accurately extrapolated. We classified the results of the papers according to the type of market structure they refer to, considering *deregulated market*, *liberalized market*, *market in transition*, *mixed market*, *restructuring market* and *theory market analysis*. A *Deregulated market* features grid operators that administer wholesale markets to ensure reliability on the grid and prevent blackouts. Multiple retail suppliers buy generators and sell electricity to end-users. *Liberalized market* refers to the liberalization of energy markets, (associated mainly but not exclusively with the electricity generation market), bringing greater competition to the electricity market in the interest of creating more competitive markets and price reductions through privatization. *Market in transition* relates to a market where progressive liberalization/deregulation is being considered or is in the early phase. *Mixed market* refers to cases where a market co-exists with different market structures (often reported in cross-national studies). *Restructuring Market* refers to a market where, after the implementation of market reforms, considerations of reimposing regulation are made. *Theory market analysis* refers to articles where the analysis of the market structure is carried out in theoretical work.

To avoid bias and distortion in the presentation of results, the categories assigned to each paper refer to the context that the authors attribute within the article. The only cases of deviation from this allocation principle relate to theoretical articles and the articles dealing with different countries and market structures, which we classified as a "*mixed market structure*".

Tables 3–5, described in the next section, provide a detailed list of all potential impacts extracted from the reviewed literature.

#### 3.2.1. Effects on Market Structure and Operators

A first set of relevant impacts analyzed in the literature consists of the effects of liberalization and deregulation policies on market structure and operators.

Table 3 summarizes the results (the effects on market structure and operators) according to the type of market and reports in the last column the reference to the papers that showed the considered effect. The results are very heterogeneous and varied.

The main aspects that emerge on the characteristics influencing operators' performance are: Size, as shown in [13,66]; characteristics of owners (ownership type), as proposed by [13,45–47,73]; diversification of offers as shown by [41,43]; horizontal integration, as evidenced by [15,49,51,60]; vertical integration, as supported by articles [13,40,44,64]; and the incumbent status of the operators, as reported by [38,60,70,71].

Other aspects related to the effects on market structure and operators, presented in the literature, are the impact of R&D expenditure [48], the status of competition in the market [50] (without investigating the causes), and operators' behavior [42,44,68].

**Table 3.** Summary of the results of the literature review: Effects on market structure and operators.

Type of Market	Effect on Market Structure and Operators	References
Deregulated market	Diversification impact on efficiency	[41]
	Financial issues for investor-owned utilities	[47]
	High negative impact on R&D expenditure	[48]
	Low Competition	[50]
	Ownership impact on efficiency	[45]
	Possible abuse of market power by retailers	[42]
	The RPS program was more influential than the electric prices	[51]
	Companies' size impact on market strategies	[66]
	externalities for small firms	[66]
	utilities could not recover their energy procurement	[47]
	Withdrawal of the cheapest offers from the market in case of a price cap	[68]
	Not analyzed	[46,51,58,61,67,73]
	Liberalized market	competitive advantage for horizontally integrated retailers
Difficulties for incumbents		[38,60]
Failure to prevent market concentration		[55]
Competitive advantage for vertically integrated retailers		[13]
Increased risk for small and non-integrated companies		[13]
Increased service costs for independent retailers		[38]
Negative correlation between price and market concentration of the largest retailer		[32]
Negative impact on retailers only (externalities)		[64]
Possible double margin for an incumbent		[70]
Service quality impacts information transparency		[57]
Supplier stimulated to be more efficient		[60]
unstable dynamics of energy prices		[69]
Not analyzed		[14,39,53,74]
Market in transition	Higher power charges	[59]
	Increase in operating costs	[35]
	Increase in the number of operators	[36]
	Increased business risk	[36]
	Low Competition	[30]
	New business opportunities	[43]
	Possible increase in total jobs but possible unemployment for pre-existing retailer workers	[15]
	Competitive advantage for vertically integrated retailers	[40]
	Reduced profit	[35]
	Advantages of incumbents and regional vendors	[71]

**Table 3.** *Cont.*

Type of Market	Effect on Market Structure and Operators	References
Mixed market	Electricity suppliers are incentivized to vertical integration.	[44]
	Income elasticity increased	[37]
	Possible higher sustainability after the retail creation	[62]
	Reduced Exit Barrier for Retailers	[49]
	suppliers transformed spot price rises and fall into profits	[44]
	Not analyzed	[33]
Restructuring Market	Increase in the number of operators	[65]
	Very high concentration in 3 major retailers	[65]
	No change	[72]
Theory market analysis	Utilities will separate their services into the four components of distribution, transmission, generation, and customer services.	[56]
	Not analyzed	[31,34,54]

### 3.2.2. Effects on Consumers and Price

The impacts of deregulation and liberalization policies on consumers and price levels are very different and vary according to the scenarios and contexts considered. Within the same contexts, contrasting evidence is also observed. Table 4 shows the heterogeneous results and demonstrates that they agree on the effects of liberalization and deregulation on price in different situations.

Some works suggest that the type of ownership may influence the final price, with public ownership, as claimed by [45,46,73], offering lower prices. This is a rather surprising result. In addition, new choices and commercial innovation in the market could lead to improvement in consumers. However, as pointed out by [13], innovation and new commercial choices are an effective advantage only for the so-called “active customers”.

**Table 4.** Summary of the results of the literature review: Effects on consumers and price.

Type of Market	Effect on Price and Customers	References
Deregulated market	The final regulated price leads to low consumer awareness by customers	[47]
	In some cases, higher price	[42]
	Lower Prices	[67]
	Not lower prices	[42,59]
	Not optimal outcomes for consumers.	[46]
	Ownership impact on the price	[45,46,73]
	Possible future lower price	[61]
	Possible higher <i>Base</i> price	[68]
	Small discount for new (Active) customers	[68]
	Transitory price reduction	[58]
	Impact of utility dimension impact on the price	[66]
	Not analyzed	[41,48,51]
Liberalized market	Impact of country heterogeneity impact on switching rate	[63]
	Increased switching rate	[39]
	information asymmetry	[13,32,74]
	Limited benefit for household customers in case of market concentration	[63]
	Limited Benefits for Small and residential consumers	[13]
	Limited effect on residential prices	[14]
Lower price for commercial and industrial sectors	[14]	

Table 4. Cont.

Type of Market	Effect on Price and Customers	References
Liberalized market	New choice opportunities	[53]
	New opportunities for active customers.	[60]
	No gain for passive customers	[60]
	welfare risks to vulnerable and low-income consumers	[55]
	Positive impacts on consumer engagement	[39]
	Possible higher price	[32]
	Possible increase in bundle gas + energy + district heating offers	[52]
	Possible optimization of consumption and costs with smart meters	[55]
	Scarce switching rate	[13]
	Crucial role of sales information in the market	[74]
Market in transition	Not analyzed	[38,64,69,70]
	Higher price under competition scenario	[35]
	Increase in eligible consumers with regulated price	[30]
	Low market opening ratio	[30]
	Lower prices	[59]
	Possible improve welfare	[15]
	The regulation of the price disincentivizes the switching rate	[30]
	information asymmetry	[71]
	Price restriction is a barrier to business innovation.	[71]
	Not analyzed	[36,40,43]
Mixed market	competition has benefited consumers	[33]
	Doubt about consumer benefits	[44]
	Lower price Residential customer transitory period	[49]
	lower prices	[33]
	Multimarket set to a collective market power at the expense of consumers	[44]
	Natural gas demand substitute for residential and commercial energy but complementary to industrial	[33]
	no benefit to commercial or industrial customers	[49]
	There are no significant differences in price elasticity between deregulated and not regulated countries	[37]
Restructuring Market	Not Analyzed	[62]
	Limited benefit	[72]
	Little influence of customers over electric rate	[72]
	No impact on prices	[72]
	Price restriction is a barrier to business innovation.	[65]
Theory market analysis	The price regulation of RETAILCOs would be greatly reduced or eliminated.	[56]
	Not analyzed	[31,34,54]

### 3.2.3. Effects on the Environment

Surprisingly, only a minority of the articles selected in the systematic review include an outcome related to the retail market decision and its effects on the environment. These articles are summarized in Table 5. Refs. [14,67] highlight a negative environmental effect of the various policies adopted, estimating an increase in CO<sub>2</sub>. Ref. [51], on the other hand, focuses attention on the relationship between final price and investment in renewable energy (highlighting an unclear relationship between these two parties) in the US deregulated market scenario.

**Table 5.** Summary of the results of the literature review: effects on the environment.

Type of Market	Environmental Effect	References
Deregulated market	Possible increase in CO <sub>2</sub> emissions in the presence of retail market	[67]
	renewable energy investments are affected by the state electric prices	[51]
Liberalized market	CO <sub>2</sub> emissions increased after electricity reforms	[14]
	Possible optimization of consumption and costs with smart meters	[55]
Market in transition	Possible stimulation in the establishment of smart communities and the proliferation of smart meters.	[43]
Mixed market	The opening of the retail market affects sustainability	[62]

Furthermore, Refs. [43,55] (and partially [62]) evaluate the introduction of smart meters or other forms of optimization of consumption (and consequent reduction in waste) which has a beneficial repercussion on CO<sub>2</sub> emissions. These articles, although few (only 6 out of 48, or 12.5% of the sample) do not agree on the environmental effects but show a relationship between the energy retail market (through consumption policies, additional services, and final price) and the environment.

#### 4. Discussion

##### 4.1. A Framework to Assess the Sustainability of Policy Decisions in Retail Energy Market

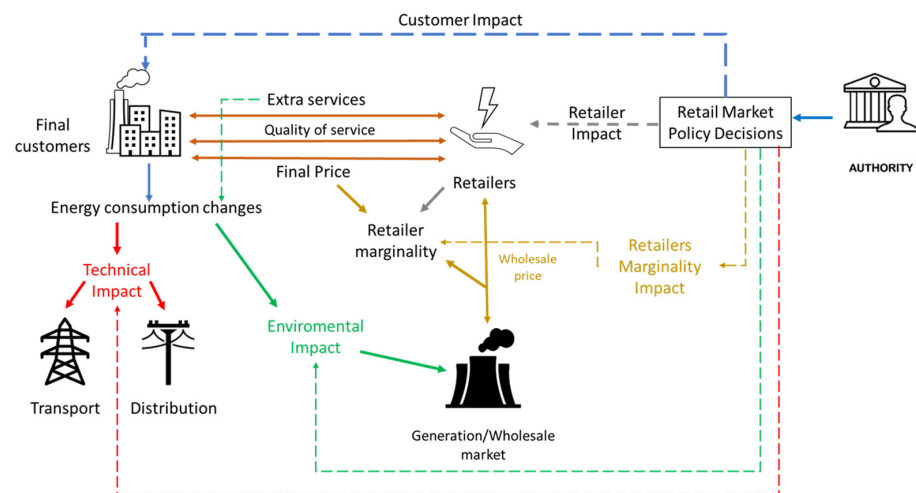
The analysis of impacts reviewed in the previous section shows that policy decisions in the retail energy market are characterized by multidimensionality and interconnectedness. The models described in the selected literature address partial and specific aspects of the impacts of policy decisions on the retail energy market. Our goal is to bring together the evidence of the literature, composing it into a single all-inclusive framework.

The different dimensions and impacts highlighted in the existing literature come together in our framework to assess one overall notion of sustainability. This sustainability, consequently, is the equilibrium of the different impacts involved in the energy retail market. The different dimensions are articulated in the relationships between the different market actors, given the multi-actor nature of the context.

Integrating the experiences gathered from the literature, we propose a framework for assessing the sustainability of policymaker decisions about the retail market, which seeks to highlight the aspects of multidimensionality and interconnectedness among the different actors in the market. The framework we proposed is organized into three main parts: the actors, the relationships between them and the potential impacts of policy decisions. Figure 6 shows an outline of the proposed framework.

The actors identified and involved in our framework are *policymakers*, *retailers*, *end-users*, *transport operators*, *distribution operators*, and *wholesale operators* (who generally coincide with generation operators).

A *policymaker* is an actor who has the power to elaborate and determine guidelines and strategies on the most relevant issues for the retail energy market. *Retailers* are actors involved in retail sales with the final customer. *End-users* are the final customers and energy users. In the proposed framework, for simplicity and without losing generality of analysis, no distinction is made between different customer segments (e.g., households, commercial enterprises, or companies). The *transport operator* is the actor responsible for transporting energy over long distances. They achieve this by using extra-high, high, and medium voltage cables.



**Figure 6.** A framework to evaluate the sustainability of the policy decision in the retail energy market.

The *distribution operator* is the actor in charge of transporting and delivering electricity to the end customer through the medium and low voltage distribution networks. In some cases, such as Turkey, the distributor can be also the retailer of a specific area. The *generation/wholesale operator* is the actor involved in the generation and wholesale of energy to retailers. In many cases, energy wholesale is carried out directly by the energy production companies, so we decided to merge these two aspects into one single actor. Whoever oversees the retail sale of energy to the end customer, also buys energy from the power exchange or producers, so it is important to consider this relation during the policy decision.

The potential impacts considered in our framework are: (i) impact on consumers; (ii) impact on sellers; (iii) impact on marginality; (iv) technical impacts; and (v) environmental impacts.

The first two impacts, impact on consumers and sellers, in the literature are often referred to as the switching rate of consumers. However, to better investigate in-depth of this relationship, the following dimensions are made explicit in our framework:

- *Extra services* refer to the dimension that identifies additional services such as smart meters or bundled sales of different services such as gas or district heating. This dimension relates to the innovation of market offers;
- *Quality of service* relates to the dimension comprising the quality of service to the consumer and the quality of information available to the consumer. This last dimension is very important to consider, otherwise, an asymmetry between the consumer and the retailer distorts consumer choice ([13,57,74]);
- *Final price* is a standard economic dimension. The impact on marginality is declined in the relationship between generation/wholesale with retailers. For this impact, the literature contains theoretical contributions that underline the importance of estimating margins for policy decisions and propose tools to support this estimate ([34]).

*The technical impact* declines in the relationship between consumers (or rather, their energy consumption) and distributors/transport. This dimension, which is not analyzed in the collected literature, will be increasingly important in the future with the spread of smart communities, smart grids, and prosumers. This type of scenario, as highlighted by [75,76], will lead to the next generation of retail electricity market decentralization in the future, which will bring several technical challenges to address in transmission and distribution systems.

*Environmental impact* is linked, in the retail sector, to policies to optimize consumption and reduce energy waste and to prosumer invention policies. Ref. [16] highlights the possible use of smart meters (also through offers from sellers that include them). The environmental impact relates consumers to the generation/wholesale market, highlight-

ing how decisions in the retail arena alone can affect CO<sub>2</sub> emissions [14,43,51,55,62,67]. Ref. [77] goes further and in their work analyzes the possible future scenario of large-scale deployment of smart meters. In their work, they highlight how CO<sub>2</sub> emissions could potentially be reduced (with a benefit to the environment) through the use of smart meters with a benefit for consumers as well. They also claim that distributors can benefit from this instruction by minimizing transmission and distribution losses. The diffusion of this technology should therefore also be taken into account by possible incentive/obligation policies that policymakers could impose on sellers (e.g., obligation to provide smart meters to domestic customers, incentives to distributed generation, obligation or incentive to have higher energy certifications for their appliances, etc.). The role of policymakers is also crucial in guiding national (or supranational) energy strategies in coordination with consumers and other actors in the market. Policymakers can act through the joint development of smart grids, incentives for distributed generation (including low capacity), and energy efficiency policies. A Smart Grid is an electricity network that can intelligently integrate the actions of all users connected to it—generators, consumers and those that do both—to efficiently deliver sustainable, economic, and secure electricity supplies [78]. Smart grids make intensive use of Information and Communication Technologies (ICT) and are a dramatic development in the industry. As stated by [79], ICT in smart grids enable a better connection and operation of generators of all sizes and technologies. ICT allows consumers to be involved in optimizing the operation of the system. ICT, in fact, provides consumers with greater information and choice of supply. ICT delivers enhanced levels of reliability and security of supply, provide a user-centric approach, and allows new services to enter into the market. In addition, ICT maintains the security of supply, ensures integration and interoperability, enables distributed generation and utilization of renewable energy sources (such as solar panels). Finally, ICT ensures the best use of central generation (and optimization of the consumption), enables demand-side participation, and enables real-time monitoring and easy data transmission to the authority/agency and policymakers.

There are some examples of policy decisions made with the above directions in consideration. The EU 2022 Repower package by the European Commission [80] is an example. This package places particular attention on diversification of energy sources, distributed generation, and contingency measures for supply interruption context. This is fundamental in the case of intensive renewable energy from non-continuous sources such as solar sources. Another example is the Italian 110% super bonus [81] that stimulates end consumers to energy efficiency and self-generation (in low capacity) of electricity through renewable sources. These examples show that policymakers must always be very careful in their decisions and adapt their strategies according to international scenarios and considering the contexts that may influence the energy market.

In the future, consumers will play a more important role in environmental impact as they will move from a 'weak' player to an actively involved player in the industry. This change will be particularly important with the spread and implementation of smart grids.

The analysis reported in Section 3 further supports what is set out in detail in the framework, namely the multidimensionality and interconnectedness of the different actors in the systems. In particular, the thematic analysis (see Figure 2) shows us the interaction between the issues of generation market, retail market, competition, and price. The coupling analysis illustrated in Figure 3 added further themes, highlighting the relationship between consumer switching and business risk in the market, which is not only related to the price proposed by retailers but also to the quality of service and the services offered. The word frequency analysis (see Figure 4) instead supports us in making explicit the dimension of retailer marginality that is linked to "vertical integration" and "business risks".

The various collected works, despite their heterogeneity, identify influential characteristics of the industrial structure of the operators that need to be evaluated in the policy making context.



To adopt the proposed framework, it is necessary to perform a context study to investigate the consumer and operator sides.

The main characteristics of existing operators to be analyzed in the industry include: (i) size ([13,66]); (ii) ownership type ([13,45–47,73]); (iii) the diversification of offers ([41,43]); (iv) horizontal integration ([13,52,63]); (v) vertical integration ([13,40,44,64]); and (vi) the incumbent status of the operators ([38,63,70,71]).

These operator characteristics must be carefully evaluated to gain insight into the industry structure and to prevent or avoid instances of concentration, which, as evidenced by [32,65], is an industry-wide characteristic that must be addressed. The reason is to avoid the impact on consumers of market concentration which creates market inefficiency [63].

Once the characteristics of the operators have been assessed, attention must be paid to the consumer side. The literature shows that the first fundamental characteristic to take into consideration for an effective welfare improvement concerns the division between passive and active customers [60,68]. In addition to the widespread division of consumers into commercial and industrial residential segments, the segmentation of consumers has allowed studies in the literature to highlight how, in some cases, there have been price increases or limited decreases only for certain segments, even if the literature does not agree on the effects of price increases or decreases attributable to policy decisions.

The existing literature has carefully underlined how to direct decisions on price (such as price restriction) which has a direct repercussions on the market. Refs. [65,71] highlight how this type of policy influences market innovation, while [47] highlights how there has been a disincentivizing effect on attention to energy wastage (with possible consequences in terms of avoidable CO<sub>2</sub> emissions).

The proposed framework, therefore, must be adapted according to its own context and the characteristics of the industrial context and consumers.

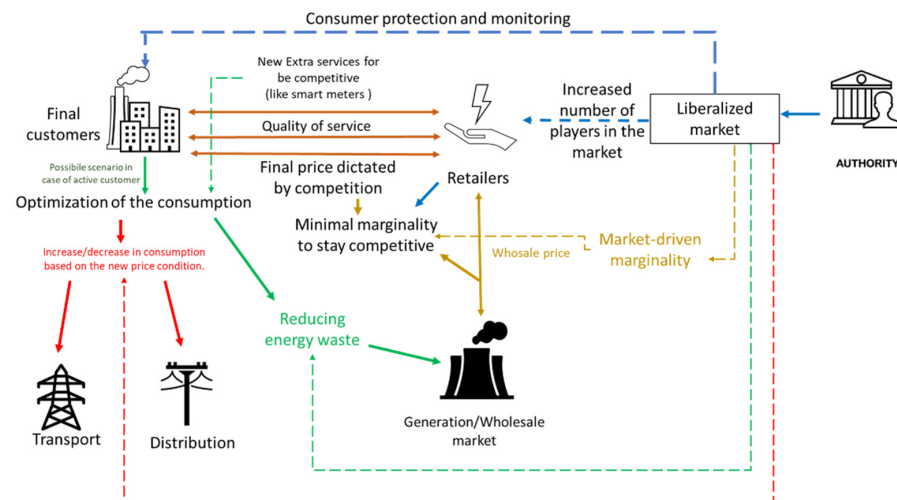
This contextualization of the framework also makes it possible to mitigate the bias of aggregation of information, which, as Ref. [42] states, can lead to the risk of over-interpretation of the existing studies.

An example of the application of this framework to a possible liberalized market scenario is illustrated in Figure 7. Thanks to the framework outlined in Figure 6, we can highlight the relevant relationships for the assessment of the impact of the sustainability of a liberalized market considering the possible impacts and changes that occur. In this example, we do not focus on the case of prosumer and distributed generation.

Specifically, we identify the consumer protection and monitoring activities by the authority (constituting the customer impact); a possible increase in retailers inside the market, defined in the proposed framework as retailer impact; a retailers marginality impact for sellers, because sales margins become, due to the “competitive” nature, market-driven, i.e., linked to the purchase price from the wholesale market and the final price determined by competition. Competition could also stimulate the provision of extra services by sellers, which could also be related to consumption optimization or real-time monitoring. Furthermore, competition between sellers would also stimulate a higher quality of service and transparency of information.

Consumers, in a possible active consumer scenario, can optimize their consumption (in our scenario thanks to smart meters provided by the seller) and increase or decrease consumption according to price conditions. Consumption optimization reduces energy waste, which consequently leads to less demand for “superfluous” energy on the generation side (environmental impact in our framework). The change in consumption behavior (price-driven increase or decrease) may have repercussions on the distribution or transport (technical impact in our framework). The deployment of distributed renewable energy generation directly on the ‘meter side’ could be another possible instance for active consumers. This scenario has a heavy environmental effect, at the expense of a considerable technical effort for a resilient distribution and transport network (high technical impact). This environmental impact can be partly mitigated by the deployment of smart grids, diffuse energy storage, and ICT diffusion in the grid. ICT in the smart grids context have a key

role in consumer engagement, in adapting the feedback from the customer into the service development and in close cooperation among stakeholders in the industry [82]. However, for an effective distributed of the generated energy, in addition to technical conditions, there is a need for appropriate market conditions, as indicated by [83]. One factor identified by the authors in [83] concerns market access conditions since, as the authors highlight, “liberalisation at the retail level is not a sufficient condition for non-discriminatory network access. Network operators that possess generation capacity also have an incentive to discriminate against distributed generation. The unbundling of the activities of transmission activities of generation and distribution is necessary to eliminate this incentive.”



**Figure 7.** An example of the application of the proposed framework to evaluate the sustainability of the liberalization in the retail energy market.

#### 4.2. Implications and Further Extensions

As our framework, described in the previous section, shows, the sustainability of policy decisions must include balancing different impacts. Focusing on just one of the impacts, perhaps the economic aspect, at the expense of the others can be counterproductive for the sustainability of the policy in the medium and long term. In-depth studies on social impacts that can contribute to a complete analysis of substitutability are still scarce in the literature.

For this purpose, it is important to consider that genuine sustainability, according to [84], integrates environmental, sociocultural, and economic sustainability understood as dimensions of a single, overarching sustainability that focuses on caring for nature and human well-being. In fact, environmental sustainability is a prerequisite for long-term sociocultural sustainability, and although economic sustainability is only a means of financing the ends of environmental and sociocultural sustainability, the latter two lead to economic sustainability, though not immediately, but rather in the long term. According to [78], sustainability is an absolute concept that is very difficult to achieve. On the contrary, sustainable development is a more feasible goal. Of course, we can have sustainability as a goal and work to improve sustainable development.

The energy environment is constantly changing. With our literature review, we explored the retail market and highlighted the different impacts analyzed in the literature. The most recent works ([10,20]) draw attention to the need to develop something new regarding the relationship between the energy retail market and the sustainability of the policies adopted.

The framework described in the previous section provides a solid foundation for discussing the various implications of policies in the retail energy sector by considering the different actors involved and the interactions between them. Our framework also

shows the importance to consider and balance the different impacts that can ensure policy sustainability in the medium and long term.

Ref. [85] highlighted the need to develop a robust and comprehensive set of indicators to monitor progress toward sustainable energy development and identified six evaluation criteria: transparency of indicator selection and application of indicators; conceptual framework; representativeness; linkages; and stakeholder engagement. Our framework, having explicitly developed a comprehensive conceptual structure that highlights the most relevant linkages between actors and potential impacts, can provide a basis for future analysis and development in the retail energy field. Indicators would need to be developed and contextualized according to the area in which they will be applied to ensure their relevance and policy usefulness. In the contextualization process, greater participation of different stakeholders and consideration of the perspective of the retail energy market, which is very close to consumers, can ensure a better balance between the different impacts that characterize sustainable development.

## 5. Conclusions

In this study, we investigated the topic of the assessment of the sustainability of policy decisions in the retail energy market. A systematic review and analysis of the existing literature allowed us to examine what has already been researched in the past. The identified 48 relevant works are highly heterogeneous but agree on the multidimensionality of the issue and the interconnection among the actors of the system. The systematic review was complemented by a bibliometric analysis that provided useful insights into conceptual relationships among the relevant keywords of the analyzed topic.

We conducted a critical analysis of existing findings in the literature on the sustainability of policy decisions in the retail energy sector. Too few papers still analyze the sustainability implications.

The added value of the paper is twofold. It consists of the creation of a detailed list of all potential impacts of deregulation and liberalization policies based on existing literature and the development of a comprehensive framework that relates the potential impacts to key players in the retail energy market. The multidimensional and multi-actor framework proposed can be useful for policymakers to evaluate all the aspects involved in the policy decision related to the sustainability in the retail electricity market. This framework may represent a major step forward for the existing literature. The framework consists of five main impacts to be assessed: impact on retailers; impact on consumers; impact on margins; environmental impacts; and technical impacts. These impacts are detailed through relationships between the different actors in the system. In this paper, we have analyzed liberalized, deregulated, transitional, and mixed markets. To use the proposed framework in practice, it is necessary to contextualize it with the characteristics of the analyzed market.

As emerged from our analysis, the evaluation of policy decisions in the retail energy market is of fundamental importance. Policy and policymaking are important to this discussion, but it is generally unclear what the policy mix should be to reach sustainable goals for the energy market.

Our systematic review helped us to identify different approaches to assess the impact of policy decisions in different contexts. This study provides the backbone for a new view of the retail market, highlighting its connection with other actors in the market and showing the relationships between them.

In the future, the framework may be expanded by highlighting the views of other markets (e.g., wholesale), a possible extension of the literature involved by snowballing references. A further extension could be to design and develop specific indicators to assess the relationships between the actors identified in the framework as described in the previous section.

The critical analysis of the findings in the existing literature leads us to identify future research directions. Based on the proposed framework of analysis, it would be interesting

to see further research on policymakers' influence on sustainability and what categories of impact are primarily considered by policymakers. Another interesting research to be conducted consists of the analysis of how sustainability supported by policymakers can be a source of competitive advantage for energy retail market players. A useful source of insight would be the analysis of situations where, in the absence of policymaker support, sustainability is not able to be a source of competitive advantage. Finally, the analysis of the ways in which sustainability impacts on market conditions and the new mechanisms and balances it brings about represents a further area of research to be pursued in future studies.

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**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A. Technical Details on the Systematic Review

The following tables contain the keywords and the queries used for searches in Scopus and Web of Science. Tables A1 and A2 show the queries carried out at the beginning of the work, on 10 December 2022. Tables A3 and A4 reports the queries conducted for updates on 4 April 2022.

**Table A1.** Scopus Query, conducted on 10 December 2021.

Query Scopus
(TITLE-ABS-KEY (energy OR electricity OR power) AND (TITLE-ABS-KEY (retailers OR retail)) AND TITLE-ABS-KEY (liberalization OR deregulation OR "free market" OR competition OR restructured)
AND TITLE-ABS-KEY (impact OR evaluation OR status)

**Table A2.** WOS Query, conducted on 10 December 2021.

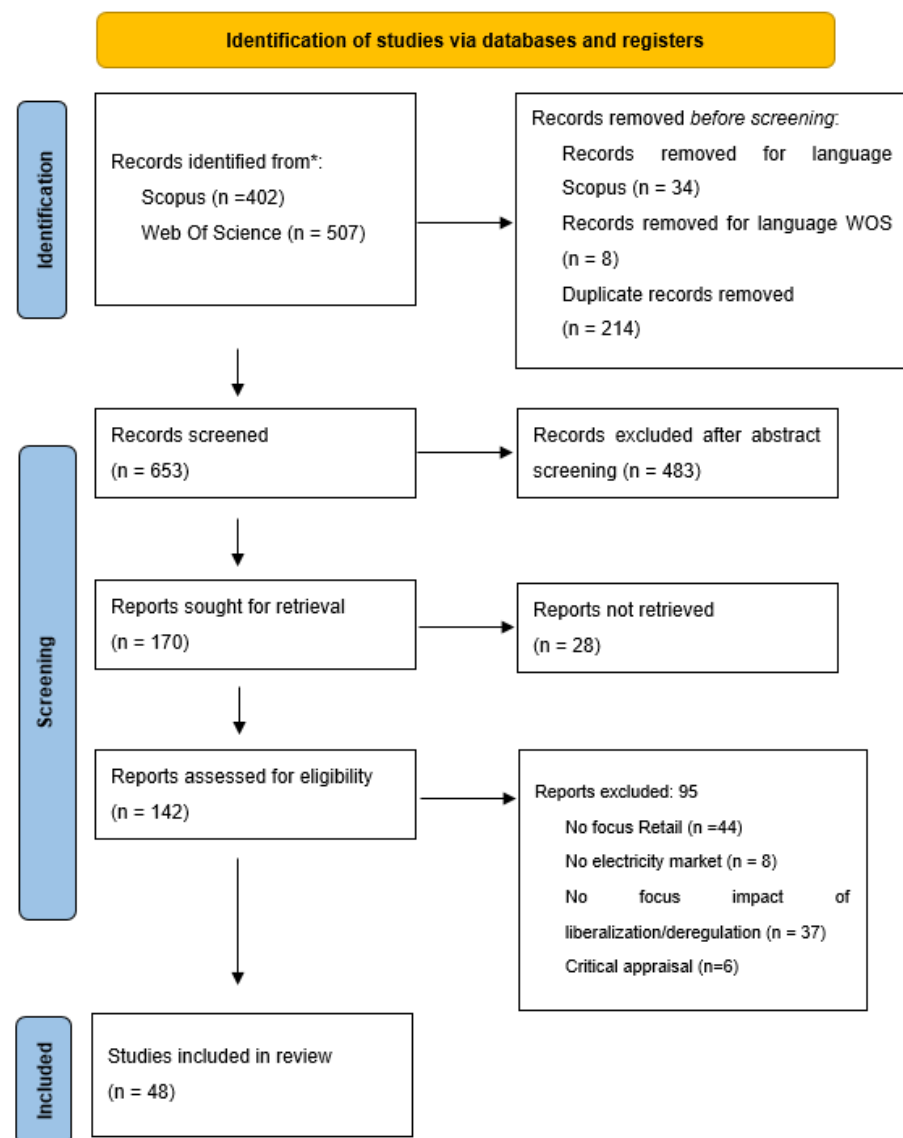
Query WOS
All Fields (energy OR electricity OR power) AND All Fields (retailers OR retail)
AND All Fields (liberalization OR deregulation OR "free market" OR competition OR restructured)
AND All Fields (impact OR evaluation OR status)

**Table A3.** Scopus Query, made for updates on 4 April 2022.

Query Scopus
TITLE-ABS-KEY (energy OR electricity OR power) TITLE-ABS-KEY (energy OR electricity OR power) AND TITLE-ABS-KEY (retailers OR retail)TITLE-ABS-KEY (energy OR electricity OR power) AND TITLE-ABS-KEY(retailers OR retail)
AND TITLE-ABS-KEY (liberalization OR deregulation OR “free market” OR competition OR restructured)
AND TITLE-ABS-KEY (impact OR evaluation OR status)
AND (LIMIT-TO (PUBYEAR, 2022) OR LIMIT-TO (PUBYEAR, english))

**Table A4.** WOS Query, made for updates on 4 April 2022.

Query WOS
ALL = (energy OR electricity OR power) AND ALL = (retailers OR retail)
AND ALL = (liberalization OR deregulation OR “free market” OR competition OR restructured)
AND ALL = (impact OR evaluation OR status)
AND Timespan: 2021-12-20 to 2022-04-04 (Publication Date)

**Figure A1.** PRISMA 2020 flow diagram. \* for each source searched.

## Appendix B. Summary of the Selected Papers

Table A5. Summary of the papers selected in the systematic review.

Reference	Scopus Article Classification	Type of Market	Country Analyzed	Reference Year of the Study	Intervention
					(Research Question)
[30]	Article	Market in transition	Turkey	2004	Evaluation of Turkish electricity reform
[31]	Article	Theory market analysis	Japan	2019	Impact of deregulation/liberalization on the market (theoretical implication)
[32]	Conference Paper	Liberalized market	Europe (28 EU members)	2008–2017	Retail prices against the degree of penetration of renewable energy sources (RES) and market liberalization in each country.
[33]	Article	Mixed market	USA	1972–2009	Impact of Retail Competition on Prices
[34]	Article	Theory market analysis	Singapore	2006–2016	Impact of liberalization on forecasting prices (theoretical implication)
[35]	Article	Market in transition	Israel	2007–2030	Possible evolution of the market after the deregulation and privatization
[36]	Article	Market in transition	China	2020	Business risk on the reformed electricity retail market
[37]	Article	Mixed market	USA	1993–2008	estimates changes in price elasticity in the residential electricity market after market deregulation.
[38]	Article	Liberalized market	Spain	2008–2009	Unintended effects of retail market liberalization
[39]	Article	Liberalized market	United Kingdom	2016–2019	Communication-based interventions to encourage consumer switching
[40]	Article	Market in transition	Ireland	2015	Impact of a fully integrated electricity market
[15]	Article	Market in transition	China	2007	impacts of deregulation of the electricity generation sector and retailing activities on other sectors, the macro-economy and electricity users
[41]	Article	Deregulated market	USA	1998–2001	how the process of retail deregulation affects the comparative efficiency of governance structures, which range on a continuum from fully vertically integrated structures to market transactions.
[42]	Review	Deregulated market	Ohio (USA)	2004–2015	price impacts of retail electric restructuring
[43]	Review	Market in transition	Japan	2009–2014	Impact of the Fukushima disaster and subsequent adjustment on Japanese energy market
[44]	Article	Mixed market	UK and Norway	UK 2003–2010, Norway 2003–2008	Comparison between two liberalized markets but with profound differences related to vertical integration and market concentration and impact of multi-business structure

Table A5. Cont.

Reference	Scopus Article Classification	Type of Market	Country Analyzed	Reference Year of the Study	Intervention
					(Research Question)
[45]	Article	Deregulated market	Finland	1997–2006	impact of the ownership structure on prices and the influence of low-cost electricity sources on retail prices
[46]	Article	Deregulated market	New Zealand and the Australian State of Queensland	2000–2011	Impact of deregulation and privatization on the electricity price
[47]	Article	Deregulated market	California (USA)	2012	California's electricity market deregulation process from a subsidy viewpoint
[48]	Conference Paper	Deregulated market	Japan	1978–2014	electricity deregulation affects R&D input of the incumbent electric utilities
[49]	Article	Mixed market	USA	1990–2011	impact of retail competition on prices
[50]	Article	Deregulated market	California (USA)	2001–2011	Impact of electricity deregulation
[51]	Conference Paper	Deregulated market	California (USA)	1990–2018	Impact of Electric Deregulation on Renewable Investments
[52]	Article	Liberalized market	Denmark	2004	Impact of Liberalization on the Electricity Market
[53]	Article	Liberalized market	Japan	2015–2016	impact of liberalization on consumer satisfaction by enabling consumers to choose an electricity provider
[13]	Article	Liberalized market	Europe (25 EU members)	2008–2014	Impact of Liberalization on the Electricity Market
[54]	Conference Paper	Theory market analysis	Theory market analysis	2019	Theory market analysis
[55]	Article	Liberalized market	United Kingdom	2013	critical evaluations of the EU need an internal market for electricity and gas
[56]	Article	Theory market analysis	USA	1998	Regulation impact on restructuring (theoretical implication)
[57]	Article	Liberalized market	China	2020	Impact of retail competition mechanism on information disclosure
[58]	Article	Deregulated market	Pennsylvania (USA)	2008–2010	Analysis of what characteristics of the residential customer and community impacted the decision of whether or not to switch to an alternative electricity provider and when to make the switch
[59]	Conference Paper	Market transition	Japan	2005–2006	Liberalization in the early stages: impact on all actors (companies, consumers and regulators)
[60]	Article	Liberalized market	Theory market analysis	2008	Evaluation of retail competition in electricity market (theoretical implication)

Table A5. Cont.

Reference	Scopus Article Classification	Type of Market	Country Analyzed	Reference Year of the Study	Intervention
					(Research Question)
[61]	Article	Deregulated market	Japan	2004–2006	impact of the reform on the retail power market in Japan
[62]	Review	Mixed market	Australia, USA, UK, Canada, Poland, Lithuania, Norway, New Zealand, France, Finland, Sweden, Germany	1990–2012	comparative assessment of electricity market models and evaluation of electricity market organization models based on sustainability criteria and proposal for evaluate the influence of electricity market models on sustainability
[63]	Article	Liberalized market	Italy	2014	local effects and market structure in determining the switching decision in retail electricity markets
[64]	Article	Liberalized market	United Kingdom	2010–2020	Impact of the new reform to inventive the presence of new retailers in UK
[65]	Article	Restructuring Market	Alberta (Canada)	2006–2017	Impacts of default regulated products and their design on the development of competitive retail markets and retailers' pricing decisions.
[66]	Article	Deregulated market	USA	1979–2015	effect of financial leverage on the competitive level and analyzes the strategic behavior of firms under the higher competitive conditions resulting from the U.S. electricity deregulation in the 1990s
[67]	Article	Deregulated market	USA	1990–2014	Impact of market deregulation on price, intensity, and CO <sub>2</sub> emissions (interrelationships between wholesale and retail electricity market reforms)
[68]	Article	Deregulated market	Australia	2019–2020	impacts of price regulation (cap) on price dispersion in Australia's retail electricity markets
[69]	Article	Liberalized market	Russia	2014	Impact of market liberalization
[14]	Article	Liberalized market	Australia	1986–1994–1998	Electricity market reform impact
[70]	Article	Liberalized market	France	Post 2011	NOME law impact
[71]	Article	Market in transition	Turkey	2019	Effects of various economic and psychological factors on the switching behavior of large scale electricity consumers. In addition, impact of possible future liberalization on consumers and retailers



Table A5. Cont.

Reference	Scopus Article Classification	Type of Market	Country Analyzed	Reference Year of the Study	Intervention
					(Research Question)
[72]	Article	Restructuring Market	Delaware (USA)	1995–2015	Experience after restructuring
[73]	Article	Deregulated market	Texas (USA)	1998–2008	Impact of market reform on retail rates
[74]	Article	Liberalized market	Australia	March 2020	Examine the relationship between vulnerable and low socioeconomic status customers and switching.

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