Inclusiveness of Energy Communities in Europe's Energy Transition: A Gender Specific Analysis

A Study on the Applicability of Membership Incentives Using Sociedades Laborales as a Benchmark

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ABSTRACT

Energy Communities (ECs) are an important part of European energy legislation due to their positive influences on the energy transition (incentivising energy-efficient behaviour, generating private capital, increasing the acceptance of renewable energy in the population). They fundamentally contribute to the energy transition by transforming energy consumers into prosumers, collectively active participants in the energy market that produce the energy they consume. As a result, the Clean Energy for all Europeans Package (CEP) has explicitly placed citizens at the centre of the energy market. Nevertheless, since its implementation women remain largely underrepresented in EC projects. Consequently, the full potential of the benefits of the energy transition remain unrealised. This thesis therefore examines the barriers that women face in joining Renewable Energy Communities (RECs) and the factors that facilitate increased female participation. Based on an in-depth literature review of existing research on RECs and women's roles in this context, four hypotheses are postulated. These predict that targeted subsidies, increased visibility, and a progressive and supportive policy environment will positively influence women's participation in RECs. Due to the lack of available data in the field of RECs, however, the hypotheses were tested using data on Sociedades Laborales, a Spanish business concept sharing a similar governance model and boasting an already extensive database. An inferential statistical analysis of the data sets was conducted, revealing that subsidies, in particular, had a major influence on women's participation and that this significantly differed from the influence on men. Of the subsidies analysed, those for training and promotion especially stood out. Furthermore, the positive effects of increased visibility and a supportive political environment could be proven.

RÉSUMÉ

Les communautés énergétiques constituent une partie importante de la législation européenne en matière d'énergie étant donné leurs influences positives sur la transition énergétique (incitation à un comportement économe en énergie, génération de capitaux privés, augmentation de l'acceptation des énergies renouvelables dans la population). Elles contribuent fondamentalement à la transition énergétique en transformant les consommateurs d'énergie en prosommateurs, c'est-à-dire des participants collectivement actifs sur le marché de l'énergie qui produisent l'énergie qu'ils consomment. Ainsi, le paquet "Une énergie propre pour tous les Européens" a explicitement placé les citoyens au centre du marché de l'énergie. Néanmoins, depuis sa mise en œuvre, les femmes restent largement sous-représentées dans les projets énergétiques communautaires. Par conséquent, le plein potentiel des avantages de la transition énergétique reste inexploité. Cette thèse examine donc les obstacles auxquels les femmes sont confrontées lorsqu'elles rejoignent un modèle d'énergie communautaire, les Communautés d'énergie renouvelable (CER), et les facteurs qui facilitent une participation accrue des femmes. Sur la base d'une analyse de la recherche existante sur les CER et le rôle des femmes dans ce contexte, quatre hypothèses sont formulées. Celles-ci prévoient que des subventions ciblées, une visibilité accrue et un environnement politique progressiste et favorable influenceront positivement la participation des femmes aux CER. En raison du manque de données disponibles dans le domaine des CER, les hypothèses ont été testées à l'aide de données sur les Sociedades Laborales, un concept entrepreneurial espagnol partageant un modèle de gouvernance similaire et disposant d'une base de données déjà étendue. Une analyse statistique inférentielle des ensembles de données a été réalisée, révélant que les subventions, en particulier, avaient une influence majeure sur la participation des femmes et que cette influence différait sensiblement de celle des hommes. Parmi les subventions analysées, celles destinées à la formation et à la promotion sont particulièrement remarquables. En outre, les effets positifs d'une visibilité accrue et d'un environnement politique favorable ont pu être prouvés.

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LIST OF ABBREVIATIONS

ASLE	Asociación empresarial sin ánimo de lucro
CEC	Citizen Energy Community
CEP	Clean Energy for all Europeans Package
DIW	German Institute for Economic Research
EC	Energy Community
EED	Energy Efficiency Directive
EIGE	European Institute on Gender Equality
IEMD	Internal Electricity Market Directive
IEMR	Internal Electricity Market Regulation
ICA	International Cooperative Alliance
ILO	International Labour Organization
IRENA	International Renewable Energy Agency
MITES	Ministerio de Trabajo y Economía Social
NECP	National Energy and Climate Plan
RE	Renewable energies
REC	Renewable Energy Community
RED II	Renewable Energy Directive II
STEM	Science, technology, engineering, and mathematics subject fields
SL	Sociedad Labloral
SEPE	State Public Employment Service
SDG	Sustainable Development Goals

1. INTRODUCTION

Combating the climate crisis is one of the most challenging tasks of this century. Yet although the 1.5-degree target appears unrealistic, the rapid expansion of renewable energies remains one of the most essential targets for the European quest towards climate neutrality. Renewable energies (RE) are of particular importance in light of the ongoing decarbonisation process in the European Union, since almost all production chains are to be electrified in the future and the gradual phasing out of coal, nuclear energy, and gas will create a large gap in energy supply. Yet the energy transition and complying with climate targets are inextricably linked to a transition towards decentralised RE provisions (Lowitzsch & Hanke, 2019). Decentralised energy supplies have especially been gaining institutional recognition since the release of the Clean Energy for all Europeans Package (CEP) in 2016. This included the revision of the Renewable Energy Directive (RED II) and the Internal Electricity Market Directive (IEMD), which outlined the principles and scope of action for decentralised energy supply and particularly emphasised the role of consumers. In the CEP, the consumer is placed at the "heart" of the European energy transition (Friends of the Earth Europe et al., 2018; Lowitzsch, 2019; Lowitzsch et al., 2020; REScoop.eu, 2017).

Energy Communities (ECs) and consumers collectively financing renewable energy installations and gaining decision power in exchange, have particularly captured the attention of European legislators. EC provide a fundamental contribution to the energy transition by turning energy consumers into prosumers, collectively active participants in the energy market that produce the energy they consume in a local and thus decentralised setting. These prosumers purchase (renewable) energy installations together, produce energy for self-consumption, and potentially sell the surplus. European law offers beneficial conditions to such communities if they meet certain criteria, which will be elaborated upon in the literature review. There are two existing models supported by recent European Energy Policies, each differing in their level of rigour to these criteria: Citizen Energy Communities (CECs) and Renewable Energy Communities (RECs). Due to the RECs slightly more demanding legislative criteria, this thesis will primarily focus on this model. RECs are also favoured by the EU because they contribute to several of its energy transition aspirations. In addition to generating more RE production capacity, they allow for an increase in awareness of energy

use and energy saving in society, as prosumers have a financial incentive for energy-saving behaviour (Hoicka et al., 2021). This reduces energy costs, increases energy-efficient investments in private households, and thus leads to a desirable behavioural change in the population. RECs additionally contribute to another key aspect of the energy transition, as they increase the acceptance of RE installations, as stipulated by the RED II (recital 70). They also promote the democratisation of the energy sector by providing an institutional framework that allows citizens to be involved in the political, social, and financial aspects of renewable energy deployment (Yildiz et al., 2015).

Similarly, the impact and further development potential of ECs may not be underestimated. In their study from 2020, Doračić et al. concluded that by 2050, especially in the residential sector, up to 89% of the energy used could be generated by prosumption[1] installations. However, this still depends on how far storage capacities develop by that time (Gährs et al., 2020). Most studies are nevertheless optimistic and estimate that ECs will make a substantial contribution. This is also the case with the much-cited study by CE Delft, which suggests that 45 percent of the EU's electricity demand could be generated by around 264 million "energy citizens" by 2050 (Heinrich-Böll-Stiftung et al., 2019; REScoop.eu, 2017).

This new form of energy production and involvement of a broad range of the population also brings advantages on a socio-political level and can consequently address important challenges in this area. The RED II, as well as the IEMD, consider this instrument as a lever to fight energy poverty, as it could create easier and more affordable access to energy supply for vulnerable consumers (RED II, Recital 67; IEMD, Recital 43). However, this important goal is still missed (Guyet et al., 2021; Hanke & Lowitzsch, 2020; Heinrich Böll Foundation et al., 2019). This observation is also supported by the fact that it is mostly privileged male citizens which become members in RECs (Fraune, 2016; Hoicka et al., 2021; Łapniewska, 2019; Yildiz et al., 2015). Indeed, this fundamental problem is often found in energy efficiency policies and is referred to as "the so-called 'Matthew effect' of (the) energy transition: those who can

[1] The generation and (co)-production of goods or services (in this case energy) by individual citizens or enterprises which consume them themselves (Lowitzsch, 2019a). The artificial term was introduced by Toffler (1980) "people consumed what they themselves produced. They were neither producers nor consumers in the usual sense. They were instead what might be called "prosumers." " (p.283)

afford to invest in energy efficiency benefit from such policies, whereas the poor stay in energy poverty" (Clancy & Feenstra, 2019, p. 32).

Thus, RECs, as a valuable instrument of the Energy Transition, currently miss many of its promising key objectives. The previously mentioned benefits clearly diminish if merely a small, privileged stratum of society participates in this democratic model. Women are most affected by this imbalance, where studies show that they merely represent between 28% and up to as little as 20% of the membership distribution (Łapniewska, 2019; Yildiz et al., 2015). This underrepresentation affects them in multiple ways. Given that women are also more vulnerable to energy poverty than men, as it is strongly linked to the feminisation of poverty, they should, in particular, be significantly more involved in RECs (Standal et al., 2018). Their underrepresentation in EC, prevents the energy transition from becoming more equitable. Not only is the opportunity to increase energy-efficient behaviour and acceptance of RE in the entire population lost due to the lack of involvement of women, but the problem of energy poverty can also not be addressed effectively with the instrument of RECs whilst failing to involve women. Consequently, the underlying inequality in energy use and access is not being properly addressed. Unfortunately, there is no analysis of the problem that energy poverty and limited access to energy have an undeniable "gender face", as Feenstra (2021) puts it. As a result, the need for this group to be particularly involved in RECs is hardly given the necessary attention.

If RECs truly endeavour to democratise the energy sector and be a citizen-centred and participatory instrument that catalyses the energy transition in Europe, it is imperative that they deliberately engage a broader audience beyond their current scope. This would not only be in line with egalitarian democratic principles of RECs, but also with the Sustainable Development Goals (SDGs) and the gender equality goals of the EU (European Commission, n.d.-b; UN Women, n.d.). An equally important fact is that women greatly contribute to the development and improvement of RECs, as they bring different perspectives, problem solving approaches, and skills to the talent pool (IRENA, 2019; Moodley et al., 2016). A gender-sensitive perspective on the purpose and development potential of RECs thus suggests that women would be very beneficial to these communities on various levels. Regrettably, this differentiated approach, which considers gender, remains seldom at the core of constructing such policies and instruments.

This is an underlying problem of current energy policies in the EU as a whole, and thus jeopardises their effectiveness. As long as gender differences that exist throughout the consumption, access, and production energy-chains are not profoundly included in the analysis and design of energy policies, they risk losing their effectiveness. With the looming consequence of climate change, any deficiency in the effectiveness of energy laws could be lethal. Nevertheless, in their 2019 report for the EU Parliament on the state of gender equality in the European energy transition, Clancy and Feenstra come to a desolating conclusion: the European Union's energy policies are gender blind to the core. Standal et al. also conclude that Energy politics "either assume gender relations to be irrelevant or conflate them to a rhetorical/strategic focus on women to engage actions or as enablers of producing economic growth" (2018, p. 208). Many researchers also attribute this problem to the fact that in addition to a lack of awareness of the complex interconnectedness of gender and energy, there is little targeted gathering of gender disaggregated data in this area. This reinforces the blindness to the problem and ultimately stands in the way of finding solutions (Cannon & Chu, 2021; J. Clancy et al., 2017; J. Clancy & Feenstra, 2019; EIGE, 2016b; IRENA, 2019).

Equally, gender disaggregated data collection is lacking in the still relatively young model of RECs (Fraune, 2016; Łapniewska, 2019). Furthermore, a far-reaching analysis of the exact obstacles and causes that result in the exclusion of women in this auspicious instrument is also insufficient. Limitations in access to new members clearly impede the effectiveness of RECs and their socio-political benefits. Activating the membership of a hitherto unreached female demographic adds crucial value and plays a key role in the future development of RECs. Therefore, this work will be dedicated to exploring the challenges of how to make membership in RECs more attractive to women and identifying which conditions are conducive to this. In doing so, the research gap in terms of gender disaggregated data and a gender perspective of the energy transition will be addressed. A data-based analysis will clarify the central research question of this thesis, how RECs can exploit their full potential and which factors enhance women's membership.

However, since the data from the REC sector is currently too scarce to draw conclusions on gender differences, data must be sourced from elsewhere to bridge this deficit. A model that is widespread in Spain, the Sociedades Laborales (SLs), i.e., companies in which the workers are capital owners, is used here for comparison because of its structural similarity to RECs in

particular with regard to the governance model. SLs have been statistically recorded for a long time and the Spanish Ministry of Labour and Social Economy (Ministerio de Trabajo y Economía Social - MITES) and other national and local authorities have provided various data sets documenting women's membership in SLs. Using partial correlations and multiple hierarchical regressions, the data is statically analysed to test the research hypotheses. Based on this quantitative analysis, this thesis draws conclusions about factors that favour women's participation in these investments. These findings are used to explore gender-specific barriers and possible incentives for membership in RECs.

For a comprehensive exploration of this research question, various concepts, such as RECs and gender, need to be defined precisely in the literature review (Section 2). The current state of research on the nexus between energy policies and gender is outlined in this section, together with the role of women in RECs. Moreover, RECs are compared with SLs in the Spanish context. Drawing on the literature review, four research hypotheses are formulated. In Section 3, the data sets and selected statistical methods are defined in detail, of which the results of the descriptive and inferential statistical analyses are outlined in Section 4 thereafter. Finally, a critical discussion of the methodology and results with respect to the general research question, and to each of the formulated hypotheses together with conclusions are presented in Section 5; this includes discussing the extent to which these findings can be applied to the field of RECs and which steps could be undertaken to promote the participation of women as members. Along with the implications for the energy policy frameworks of RECs, the limitations of this work are also highlighted in this regard. A summary of all the findings of the thesis is given in the last Chapter 6.

2. Literature Review

In the following, the theoretical foundations as well as the current state of research are elaborated. First, the legal basis for RECs in the European Union is explored in order to understand their preconditions and then the advantages and disadvantages of cooperatives. The next step is to explain why women should be particularly considered in energy policy and the need to pay more attention to the gender aspects of energy poverty. This is followed by an explanation of the positive impacts that women could have on RECs, helping to understand why this focus is of such great, if, as already mentioned, neglected, importance. Another

instrument that slips into the focus of analysis is the SLs, which are defined in more detail and placed in their national context in a final section. This is preceded by a selective comparison of existing national policies with regard to equality and the consideration of renewable energies in national legislation.

This theoretical classification is of crucial importance since it helps to contextualise the hypotheses that are tested and to integrate existing research into the elaboration. The available data is analysed with the help of statistical methods and should shed light on the question of whether RECs are a useful instrument for a more equitable energy policy. The results of the data from SLs are applied to the model of RECs and the implications and opportunities highlighted in the discussion section.

2.1. Energy Communities and the Renewable Energy Community Model

ECs have a lot of potential to contribute to the energy transition in Europe and is therefore supported by the European Commission through the Clean Energy for all Europeans Package (CEP) (European Commission & Directorate-General for Energy, 2019). Typically, ECs are characterised by region and organisational structure, that is, participants within a defined area jointly acquire energy production facilities and are entitled to participate in decision processes (Lowitzsch, 2019a). Ownership structures and business models stemming from ECs vary, however, the predominant corporate model appears to be that of a cooperative.

The importance of ECs and of RECs and CECs as specific types of them must be emphasized in light of the aforementioned energy legislation initiated by the Commission as part of its CEP. In the context of this legislative Package, the Renewable Energy Directive II (RED II) was revised, and the Internal Electricity Market Directive (IEMD) and Regulation (IEMR) were introduced, which are essential for a Europe-wide governance model for ECs (Lowitzsch et al., 2020; REScoop.eu, 2021d). Whilst decentralised (renewable) energy projects and communities already existed prior to the CEP, it is this legislation that reinforces decentralised RE production and consumption deliberately, enabling more prosumption and participation of smaller actors (Frieden et al., 2020; REScoop.eu, 2021c). For RECs and CECs the concept of energy democracy is of particular importance, with individual citizens at the centre as opposed to monopolies of large corporations (Friends of the Earth Europe et al., 2018; Lowitzsch & Hanke, 2019). Indeed, various environmental NGOs too find this idea attractive.

They see the underlying potential of breaking up large fossil fuel monopolies and thus enabling the decentralisation of sustainable energy production methods through community projects, which were initially not very competitive on the European energy market (Friends of the Earth Europe et al., 2018). The innovations in the CEP are particularly interesting in this context, since they allow all ECs to qualify as RECs or CECs, provided they meet certain requirements. RECs and CECs thus form distinctive configurations of ECs. Those communities that comply with the EU legislation and qualify as one of the two configurations in exchange benefit from favourable conditions and in doing so, gain a competitive edge as a player in the energy market.

Although EU legislation does not specify a legal corporate form for RECs and CECs, however, some aspects of cooperativism are included in the respective laws for qualification (as further explained in section 2.1.2.). RECs, in particular, are very often cooperatives and many of them are committed to the principles of the International Cooperative Alliance (ICA). For this reason, the structural model of cooperatives is elaborated in a preliminary step.

2.1.1. The Cooperative Model

Most RECs are cooperatives and as such a special form of production community, owned and financed by their users themselves rather than by external investors (Huybrechts & Mertens, 2014). This implicates that they are simultaneously social and economic enterprises and strive for the economic, social, and cultural wellbeing of their members. To this extent, they do not merely follow profit maximisation (Yildiz et al., 2015). However, some of the same rights apply as in company law, such as limited liability for members and priority for liquidation protection. The major difference is that cooperatives must ascribe a purpose to their activity, this definition includes financial and organisational aspects (Lowitzsch & Hanke, 2019). According to the ICA Guidance Notes (2015), the key principles of cooperatives are: Voluntary and Open Membership; Democratic Member Control; Member Economic Participation[2] ; Autonomy and Independence; Education, Training and Information; Cooperation among Cooperatives;

[2] The REScoop.eu charter chooses a slightly different term for the 4th principal: Economic Participation through Direct Ownership (REScoop.eu, n.d.)

Concern for Community. Yildiz and Radtke (2015) described the fundamental social form of cooperatives as follows:

i) Actors involved make fundamental operational decisions jointly.
ii) Members' resources and qualifications are pooled and thus advantages can be generated from extended market shares, transfer of competencies, and sharing of scarce resources.
iii) Involving multiple actors offers a possibility to sharing the risk.

2.1.1.1. Advantages of Cooperatives

Sharing the risk of investment, as well as knowledge and skills, are only two of the many positive aspects of the cooperative business structure. They have fewer transaction costs with investors, external funders', and other stakeholders, as most are directly involved in the process as members (Huybrechts & Mertens, 2014). Decisions are not only made collectively, but furthermore are taken in a one-member-one-vote approach. Consequently, individual members with more capital are prevented from influencing decisions in their interest and thus singular interests are not overrepresented (Huybrechts & Mertens, 2014; Lowitzsch & Hanke, 2019; Yildiz, 2014). The organisational structure provides direct control and democratic structures and thus is restricting external influence and opportunistic behaviour. This facilitates the protection and representation of members' interests (Lowitzsch & Hanke, 2019). As a result, all members are actively involved in decisions and can and should participate within all processes (Lowitzsch & Hanke, 2019).

Beyond these democratic foundations, participation in cooperatives and thus RECs and CECs that decided for this form is principally open to all citizens, which makes cooperative structures particularly attractive for society-wide and sustainable concerns (Yildiz et al., 2015). These cooperative structures are therefore ideal for a democratic, citizen-oriented, and sustainable energy transition, which makes the construct of RECs an important subject for analysis in the context of the energy transition.

2.1.1.2. Disadvantages of Cooperatives

Notwithstanding, these structures bear disadvantages that require equal attention. The intensive involvement of all members, whilst fundamentally ensuring member equality and

democratic control, as discussed earlier, comes at a price. It requires individual members to invest a lot of energy in understanding the processes to enable them to participate effectively and thus truly represent their interests. Moreover, the internal organisational costs are relatively high, whilst decision-making processes are slow and inefficient (Huybrechts & Mertens, 2014; Lowitzsch & Hanke, 2019).

Another obstacle is that cooperatives have a competitive disadvantage in the market, as they are not purely profit-oriented and scalability is not possible (Alaton & Tounquet, 2020; REScoop.eu, 2021c). Huybrechts and Mertens (2014) identify the second fundamental problem for the entry of cooperatives also in the difficulty to raising sufficient capital, especially in capital-intensive sectors (which is the case in the RE sector). Companies that are not owned by investors are genuinely less attractive to investors seeking maximum returns. Additionally, besides the problem of generating enough investment, this form of investment can seem too risky and hence discouraging for potential members due to the lower return and the anticipated risk of investing in small projects (Lowitzsch & Hanke, 2019). These two barriers not only hinder the growth of cooperative RECs and CECs themselves, moreover, they result in underrepresentation of people with lower incomes and less time.

2.1.2. The Energy Policy Framework of the EUs Legislation for RECs

The legal framework for RECs and CECs, utilising some elements of cooperatives, is explained in the following. For CECs, the IEMD stipulates that they:

i) must be based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises;

ii) have to, for their primary purpose, provide environmental, economic, or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits;

iii) and may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders (IEMD, 2019 Art. 2(11))

The model for RECs defines even stricter requirements for ECs to qualify. They are credited for their many positive influences on the energy market and as such, RECs can help to reduce the influence of major energy players and their market concentration (Huybrechts & Mertens, 2014). Although CECs also make important contributions to the energy transition, this work will focus on RECs. Thus, the precise conditions that they must fulfil are presented in detail in the following.

2.1.2.1. Benefits Outlined in the RED II for the Energy Transition

The significance that the European Union ascribes to the RECs is evident in the RED II. Similarly, the recent initiatives of the EU Commission to revise and improve the Union's existing climate and energy legislation as part of the Fit for 55 program demonstrate that they remain supportive of RECs as an important tool. For example, the EU Commission's proposal for the revision of the Energy Efficiency Directive (EED) includes clear references to the importance of RECs for energy efficiency in Europe (REScoop.eu, 2021b).

Throughout these directives, EU institutions refer to various positive effects that RECs could trigger, thereby advancing the energy transition:

i) RECs can contribute to increasing energy efficiency in households (Directive (EU) 2019/944, Recital 43; COM/2021/558 Final, 2021 Recital 43 (92) & Art. 8 (3)). Especially the revision of the EED shows the importance of RECs in this area: "In designing such policy measures [energy efficiency obligation schemes], alternative policy measures, Member States shall consider and promote the role of renewable energy communities and citizen energy communities in the contribution to the implementation towards these policy measures" (COM/2021/558 Final, 2021, Art. 8 (3)). In addition, it is intended that these should be especially directed at people who are affected by energy poverty.

ii) Which points to the second intended effect: RECs are expected to have a positive impact on reducing energy poverty in the EU (RED II, Recital 67; IEMD, Recital 43). RECs can potentially reduce energy consumption and make tariffs cheaper, which is particularly important for people experiencing energy poverty (REScoop.eu, 2021a). Here, the amendments published in the Commission's proposal for the EED in July 2021 are also noteworthy. The 2018 EED Directive, which is still in force,

merely emphasised in Article 7 (11) that energy efficiency should reach people experiencing energy poverty. The Commission's amendments now explicitly emphasise the link between tackling energy poverty through increased energy efficiency and the role RECs can play in this (COM/2021/558 Final, 2021, Art 8 (3)).

iii) A third anticipated positive effect of these communities is that they can contribute to an increased uptake of renewable energy and related infrastructure. The RED II also states that this "added value in terms of local acceptance of renewable energy and access to additional private capital [...] results in local investment, more choice for consumers and greater participation by citizens in the energy transition." (RED II, Recital 70).

In Article 65, the IEMD provides the same rights for CECs that other actors in the European energy market already benefit from. The RED II, for its part, provides the definition for RECs on which this thesis will focus. Lowitzsch et al. (2020) emphasise that the framework for CECs under the IEMD is primarily a regulatory one, whilst that of the RED II is rather enforcing. In this regard, the RED II aims "to promote and facilitate the development of RECs" (RED II, Art. 22 para. 4, sentence 1), which includes preferential conditions or incentives. Consequently, the structural and legal framework for RECs outlined in the RED II will be elaborated on in further detail.

2.1.2.2. Prerequisites for Qualification as a REC – the Opt-In Model

The RED II is the most important legal framework for RECs, as it establishes a governance model for them and allows the generation, storage, and sharing of energy within the community (Hoicka et al., 2021; Lowitzsch et al., 2020). This legislative text of 2018 was the first to define RECs in the EU. However, as mentioned above the legislation does not explicitly define a specific legal form to which a REC or a CEC must conform.

The exact conditions for qualifying as a REC are set out in Article 2 recital 16 of the RED II, which establishes the new governance model for RECs (Lowitzsch et al., 2020). One of the most important requirements is that both RECs and a CECs must possess a separate and

distinct legal personality in order to qualify as a such[3] .Furthermore, it is stipulated that only natural persons, small and mid-size enterprises (SMEs), or local authorities, which implies municipalities, are eligible as shareholders or members of a REC (RED II, Art. 2, (16) b). They must also be "located in the proximity of the renewable energy projects that are owned and developed by that legal entity" (RED II, Art. 2 (16) a). The proximity is supposed to ensure that members can exercise effective control over their cooperative according to the RED II. Effective control is not directly defined in the CEP, as the Commission leaves it up to member states to adapt this to their national statutes on corporate governance. However, it implies that members share decision-making power rather than individual investors (REScoop.eu & ClientEarth, 2020).

Another key criterion is that of autonomy, which states that a REC must remain independent from individual members/shareholders (RED II, Art. 2 (16) a; RED II, 71). No member or investor should be able to exert disproportionate influence on decisions (Alaton & Tounquet, 2020). In practice this translates in a cap of 33% of shares for single shareholder, which however depends on whether the ownership structure is disperse or not (Lowitzsch 2019a).[4] A DG Energy report also stresses that the interest of the community must be protected through this autonomy and the fundamental democratic governance models. This reveals the influence of the cooperative structure incorporated in the RED II principles. Even though it does not specify a concrete legal form for RECs, it is clear that they are based on the cooperative model by limiting the influence of individual investors.

The RED II outlines further principles derived from those of cooperatives (cf. 2.1.1). An example of this is the voluntary nature of membership and that it should be equally open to all members of the community who are in the local geographical vicinity of the REC (RED II, Art. 2 (16)). Openness is further defined in Recital 71 and explicitly associated with "non-discriminatory", "objective", and "transparent" conditions of membership. It is also stated that the purpose of a REC is not primarily to make financial profits but to "provide

[3] An interesting exception is Italy, where unregistered associations (Associazioni non riconosciute) have experienced a strong upswing, although almost all legal requirements are missing (Informazione Fiscale, 2020). In Italy, they are accepted as RECs even though they do not have their own legal entity.

[4] This is reflected by the large variation of the control premium in business corporations which is again determined by the ownership structure (Dragotă et al., 2013).

environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates" (RED II, Art. 2 (16) c).

Accordingly, there are clear characteristics of cooperative principles with respect to the ICA Guidance Notes (2015). Nevertheless, this orientation of the EU legislation did not lead to a requirement of the cooperative corporate form for RECs. There are various forms of companies in the national laws of the Member States that are used to produce RE in EC projects. These include cooperatives, different forms of partnerships, companies with a community interest, foundations, non-profit customer-owned enterprises, or corporations. The RED II leaves the exact specification of the eligible legal vehicles up to the Member States. In this way, the Directive includes an opt-in mechanism, which allows existing ECs to choose whether they want to continue to exist as, for example, a corporation without complying with the prerequisites of the RED II or whether they want to qualify as RECs (or CECs) and accept the above-mentioned conditions, which are largely based on cooperative principles. This is open to them at any stage, however, if they decide to do so at a later stage, they can qualify by meeting the conditions outlined above (Hoicka et al., 2021). The advantage that ECs gain from qualifying as RECs is that they benefit from the preferential and specific conditions that the EU legislation provides for RECs in the so called “enabling framework”, given that they comply to the rules outlined in the RED II.

Table 1 shows the details as well as the differences between the models of RECs and CECs. Additionally, and in this context, they are also compared with the SLs, which will later be used as a benchmark for comparison. From this, it becomes clear that SLs have a very similar governance model. Analogous to the legislative framework of RECs, Spanish corporations too have the possibility to fulfil the requirements listed here at any time and in doing so, obtain SL status. Moreover, if this is no longer appropriate at a later point in time, they can simply leave this model, as can corporations with REC status. Table 1 also shows another similarity between RECs and SLs, such that both governance models exhibit features of the cooperative system and limit the influence of individual shareholders.

Table 1

Comparison of REC, CEC, and SL models

Criteria	RE Communities	Citizen Energy Communities	Sociedades Laborales

Eligibility for shareholders	• natural persons
	• local authorities (including municipalities,)
	• small and medium sized enterprises
		• natural persons
		• local authorities (including municipalities,)
		• small enterprises
			• natural persons,
			  ○ min. three owners
			  ○ min. number of working partners is two
			• public organisations

Primary Purpose	"provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits"		complete business model of worker participation in the capital of firms
Membership	• voluntary and open participation • non-discriminatory criteria • must be located in the proximity of the RE projects	• voluntary and open participation • non-discriminatory criteria	• hours worked by permanent non-owner workers may not exceed those worked by worker-owners by > 49%
Governance & Ownership	• effectively controlled by shareholders or members that are in the vicinity of the RE project • is autonomous • no individual shareholder may own more than 33 per cent of the stock)	• effectively controlled by shareholders or members of the project • limitation for firms included in shareholders controlling entity to of small and micro size (not medium) • shareholders engaged in large scale commercial activity & for which energy constitutes primary area of activity excluded from control	• majority-owned (>50 per cent of company shares) by its permanent employees; • no partner may own more than 33 per cent of the firms' stock • public organisations may own up to 49 per cent

Note: based on IEMD, 2019 Art. 2(11); Lowitzsch et al., 2017; RED II Art. 2 (16)

Regarding RECs, this approach has interesting implications for the target group of investors. By avoiding a specification of a certain corporate form, the legislator ensures that the REC model is also attractive for commercial investors, who are partly deterred by the aspects of the cooperative model. In return to complying with the REC governance model, they are granted certain privileges, which are described in the next section.

2.1.2.3. Rights and Obligations of RECs in the RED II

The rights and preferential conditions that EU law grants to RECs are set out in Article 22, while Article 21 defines the "renewable self-consumers" in more detail. Both actors are afforded the right to produce, store, and share energy, as outlined in the respective articles (RED II, Art. 21, para. 2 (a); Art. 22, para. 2 (a)). The energy which is produced may too be sold to the grid. Furthermore, Member States are encouraged to provide equal access to the

market for RECs and Regional Security Coordinators (RSCs), and to identify and remove possible or existing barriers (RED II, Art. 22, para. 2, (c); Art. 22 para. 3). The law also calls for another potentially privileged arrangement, as it obliges the Member States to provide "enabling frameworks" to remove these barriers with the aim of "promoting and facilitating the development of renewable energy communities" (RED II, Art. 22, para. 4). These enabling frameworks should ensure, among other things, that:

- unjustified regulatory and administrative barriers to renewable energy communities are removed
- renewable energy communities are not subject to discriminatory treatment with regard to their activities, rights and obligations as final customers, producers, suppliers, distribution system operators, or as other market participants
- the participation in the renewable energy communities is accessible to all consumers, including those in low-income or vulnerable households
- tools to facilitate access to finance and information are available
- rules to secure the equal and non-discriminatory treatment of consumers that participate in the renewable energy community are in place

(RED II, 2018 Art. 22 (4))

It is evident that the political institutions of the EU are giving RECs a significant role in the Energy Transition and are pushing for their promotion and expansion. These enabling frameworks should have been transposed into national law by the Member States by June 2021 (Hoicka et al., 2021; Lowitzsch et al., 2020). Since the current EU legislation is regrettably rather vague about the contents of the enabling frameworks, this transposition could help establish precise specifications of the associated instruments and measures and thus truly create preferential conditions for RECs in comparison to normal ECs. A lack of concretisation and scope of the enabling frameworks has been criticised on many sides, especially with regard to the integration of vulnerable consumers (Guyet et al., 2021; Hanke & Lowitzsch, 2020; REScoop.eu, 2017). This is particularly important because it is these enabling frameworks that set the basis for making the REC model attractive with its specific and partly restrictive conditions. Without real incentives and good conditions provided in the frameworks, the REC model will not be able to compete and survive in the market.

In wake of Ursula von der Leyen's new ambitions to set the EU's net greenhouse gas emissions to zero by 2050 and the revision of various EU climate and energy directives as part of the Fit

for 55 Package (European Commission, n.d.-a, n.d.-c), RED II was too subject to revision. The Commission's new legislative proposal was published on 14 July (COM(2021) 557 Final, 2021). The Commission's proposal for the renewal of Renewable Energy Directive (COM(2021) 557 Final, 2021) following the Green Deal nevertheless does not foresee any modifications to Article 22, which defines RECs in a substantial manner. Thus, the wording and specification on the enabling framework will not change to provide a stronger and more precises base for the Members States to work with. This implies that the competitiveness of the REC model is decided at the level of the Member States, as they set the incentives themselves by stipulating them in their respective enabling frameworks. Thus, regarding the integration of vulnerable consumers, there will be varying degrees of vigour to truly integrate them into the model at the national level. Always depending on the extent to which the enabling frameworks prescribed integration of vulnerable consumers and women at the Member State level.

Nevertheless, RECs are being mentioned in some parts of this amendment proposal as well. For example, they are considered to have expertise that will be needed in the future in this field and to be consulted for this competence (COM(2021) 557 Final, 2021 Recital 12). The new Article 15 (a) *Mainstreaming renewable energy in buildings*, which shall be inserted in the RED II, provides for:

> "Member States [to] introduce measures in their building regulations […] to increase the share of electricity and heating and cooling from renewable sources in the building stock, including national measures relating to substantial increases in renewables self-consumption, renewable energy communities and local energy storage" (COM(2021) 557 Final, 2021).

Although basic articles (e.g. RED II, Art. 22) regarding RECs will remain unchanged in RED II, their importance for the energy transition remains nonetheless evident.

2.1.3. The Inclusion of Gender and Energy Poverty Aspects in these Structures

The inclusion of vulnerable consumers in RECs, as mentioned above, is an important prerequisite to alleviate energy poverty through the CEP. RECs in particular are seen as an important instrument in the CEP to better integrate vulnerable consumers into the energy market. They are explicitly mentioned in various passages in RED II, but also in the other laws under the CEP (Bouzarovski et al., 2020; Filippidou et al., 2019; Hanke & Lowitzsch, 2020).Yet

various studies and papers state that this unfortunately often remains an empty promise, as a large proportion of members are male and financially privileged, and vulnerable consumers are accordingly not reached at all (Bouzarovski et al., 2020; J. Clancy & Feenstra, 2019; Guyet et al., 2021; Hanke & Lowitzsch, 2020; Hoicka et al., 2021; Łapniewska, 2019). Even considering the fact that the concrete features of the enabling frameworks have not been defined by the EU Commission and that the issue of the integration of vulnerable consumers has not been firmly anchored, it seems that their integration is not a priority for legislators. Guyet et al. (2021) confirm that only a minority of RECs can truly address energy poverty. They found that RECs show difficulties understanding the concept accurately and are consequently unable to identify the vulnerable individuals, that ought to be targeted. Furthermore, a recent analysis of operating RECs showed that tracking problems of energy poverty is still problematic (REScoop.eu & Heinrich-Böll-Stiftung, 2021).

Given that an important objective of RECs and the CEP is at risk of being missed and that equality of all EU citizens is an important principle of the Union, this phenomenon requires considerable attention. This thesis will focus particularly on the aspect of gender equality and women as an underrepresented group in RECs. Hereafter, the relevance of this issue shall be explained in more detail.

2.2. The Energy-Gender Nexus

Contrary to the frequent assumption, energy policy is by no means a gender-neutral issue. In the European Union - and arguably in most of the world - neutral language within energy policy, such as "household" or "citizen", paints the illusion that it affects all genders equally (J. Clancy & Feenstra, 2019; Standal et al., 2018; Strengers, 2014). Feenstra and Özerol (2021) try to define a guideline for energy justice. They firstly highlight the following points of a gender-equitable energy policy: they stress that such a policy must recognise the different energy dynamics, which implies, for example, the different use of energy in the household and the influence of gender stereotyped roles on it. Secondly, the authors emphasise that differences in access to energy and technological needs should also be acknowledged. Thirdly, both genders should have the right and equal access to energy, and the necessary conditions should be provided by the (geo-political) environment. While bodies such as the Committee

on Women's Rights and Gender Equality are increasingly interested and aware of the issue[5], the wording of the law currently does not differentiate in this policy area. Yet, this gender-neutral energy policy leads to camouflaging the gender-differentiated nature of obtaining access to energy and deciding on, and benefiting from, electricity uses (Standal et al., 2018). Acknowledging and being sensitive to gender differences would be crucial for an effective and successful energy policy, as gender differences influence consumption patterns, energy access and demand (Feenstra & Özerol, 2021; Kaminara, 2015; Khamati-Njenga & Clancy, 2002; Standal et al., 2018).

2.2.1. Definition of Gender

In order to understand these influences and the structural power dynamics that coincide with a particular gender in society, the term *gender* needs to be defined properly. In gender research, a differentiation was made between biological sex and social gender. Not only is this differentiation highly controversial nowadays, moreover, a deep excursus would exceed the scope of this thesis. For this reason, a simplified definition will have to suffice, although it is far from being able to reflect all the important aspects of the current state of research. Likewise, a differentiated critique of the binary gender system would go too far, which is why this work must limit itself to a shortened distinction between the male and female gender. It is therefore necessary to deliberately refrain from labelling other gender identities in writing. Moreover, the data to be analysed does not distinguish beyond gender groups outside of male and female, either.

Simplified, *gender* describes the cultural and psychological influence of a person by their environment (Oakley, 2015). It can be defined as a "system of socially defined roles, privileges, attributes and relationships between men and women which are learned and not biologically determined" (Khamati-Njenga & Clancy, 2002, p. 6). In the scope of this thesis, gender is also primarily understood as a social construct that is shaped by the respective society. The associated gender roles have a significant influence on the socially accepted and anticipated behaviour of an individual (Khamati-Njenga & Clancy, 2002). Unfortunately, they are also

[5] E.g. the following studies: „Women, Gender Equality and the Energy Transition in the EU“ (Clancy & Feenstra, 2019) and „Gender perspective on access to energy in the EU“ (Clancy et al., 2017)

associated with inequality of opportunities between men and women and lead to women having an inferior role in society (Butler, 1990; Khamati-Njenga & Clancy, 2002; Lloyd, 2007).

2.2.2. The Problem of Ungendered Energy Policies

These differences equally affect the behaviour of individuals in relation to energy policy. For example, a study in Sweden showed that incentives such as replacing oil heating with technical solutions or installing photovoltaic (PV) panels were not adopted by women for aesthetic reasons. Other studies in European countries confirmed that women felt less competent in the field of solar technology, and it appeared that advertisements for renewable energy were less targeted at them and as a result appealed less to them (Standal et al., 2018). Strengers (2014) criticises such practices and claims that by focusing solely on energy, one risks losing an understanding of the dynamic practices of consumption. The efficient energy user of our time is, in her depiction, a *resource man* (Strengers 2014). However, women not only have different preferences and expectations for energy efficient technology, which should be addressed in a more targeted way to truly involve all people in the energy transition, but their whole energy consumption pattern significantly differs to the male one too. Due to different gender roles in the society and in the workforce, women consume less energy and differently (Clancy & Feenstra, 2019; Feenstra, 2021). A 2009 study found that women in Sweden consumed 22% less energy than men and women in Greece consumed 39% less than men, respectively (Räty & Carlsson-Kanyama, 2010). In light of these differences, it becomes increasingly clear that most instruments of energy efficiency and conservation are not gender neutral at all, rather oriented towards a male perspective and thus overlook the specific energy demand and consumption of half of the population. "Gender in the politics of energy has thus largely produced narratives that provide limited imaginaries of women's agency in and relevance to the (everyday) politics of energy in their lives" (Standal et al., 2018, p. 208). While it is assumed by legislative institutions that both genders benefit equally from energy policies, in their report for the FEMM[6] Committee,

[6] Committee of the European Parliament on Women's Rights and Gender Equality

Clancy and Feenstra refer to gender-blind rather than gender-neutral energy policies (Clancy & Feenstra, 2019).

This blindness can have severe implications for policy responses to social problems. If gender plays a central component in these policies, attention should be given to this dimension. Taking a closer look at the issue of energy poverty in Europe, which is supposed to be mitigated by instruments including RECs, the impacts of gender inequalities can also be found (Clancy et al., 2002; Feenstra, 2021). As the phenomenon is already difficult to address, due to its definitional imprecision and difficulties in measurement (Heinrich-Böll-Stiftung et al., 2019; REScoop.eu & Heinrich-Böll-Stiftung, 2021), it seems crucial to clearly analyse the mediating factors.

2.2.2.1. Energy Poverty in the EU

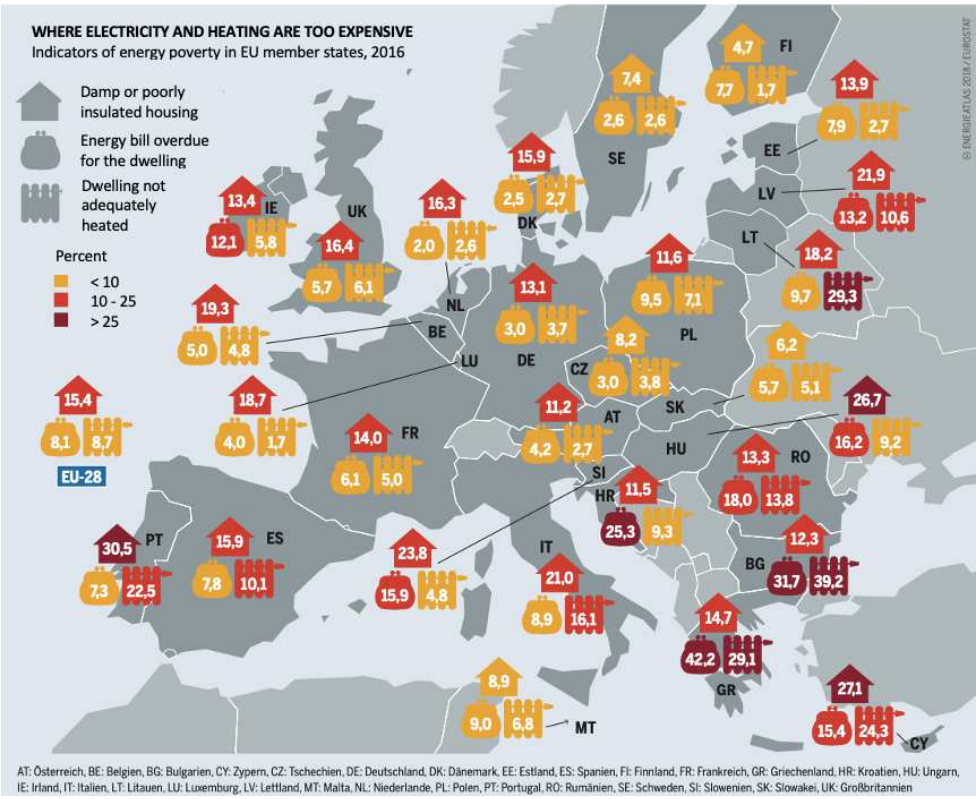
The most common definition referred to in the literature is that of Pye et al.: "Energy poverty, often defined as a situation where individuals or households are not able to adequately heat or provide other required energy services in their homes at affordable cost" (2015, p. 5). Within the EU, no uniform definition[7] exists to date and only a few countries of the Union even have a definition in their legal texts or refer to vulnerable consumers within their laws. Summing up the various definitions of the EU and the literature, two aspects emerge: on the one hand, people may have to spend a very high proportion of their income on energy expenses. On the other hand, people are affected by energy poverty when they are forced to reduce their energy consumption due to financial circumstances (Filippidou et al., 2019; Trinomics B.V., 2016). It is a complex and multi-dimensional problem that can be empirically measured in different ways (Bouzarovski et al., 2020).[8]

[7] Some countries, such as Scotland, Wales, and Norfolk, also speak of fuel poverty.

[8] For a more detailed breakdown of the measurement methodology, the report commissioned by DG Energy on this topic should be consulted. *„Selecting Indicators to Measure Energy Poverty“* (Trinomics B.V., 2016)

Figure 1

Energy Poverty in the EU



Note: own translation of energy poverty distribution figure from Heinrich Böll Foundation et al., 2019, p. 21

In 2018, the EU Commission estimated that approximately 50 million households in the Union are affected by this reality (EED, 2018, Recital 24). The geographical dispersion across the different Member States is visualised in Figure 1. This clearly shows that especially southern, eastern, and south-eastern European countries have a large proportion of people affected by energy poverty. In 2016, 39.2% of the population in Bulgaria and roughly 29% in Lithuania and Greece, respectively, were unable to heat their homes adequately. In Greece, almost half of the population (42.2%) had outstanding debts on their energy bills. Nearly a third of the population in Portugal lives in poor or insufficiently insulated dwellings. In 2020, 8.2% of households across Europe were unable to heat their homes adequately (Eurostat, 2021b). Energy poverty is therefore not a marginal problem and will not become less urgent, especially in view of the current increase in oil and gas prices throughout Europe.

2.2.2.2. Feminisation of Energy Poverty

Energy poverty is not synonymous with poverty. Nevertheless, there are links between this problem and factors influencing poverty, including the aspect of gender (Clancy et al., 2002). Since income is an important indicator of energy poverty and income disparities between men and women persist in the EU, a consideration of the relationship between gender and energy poverty is highly relevant.

In 2019 the gender pay gap in the Union was reportedly at 14.1 % (Eurostat, 2021a). Besides earning less, women are more affected by poverty and face various risk factors of falling into poverty (Gunnarsson et al., 2017).This is clearly demonstrated by global poverty figures, where according to Clancy et al. (2002), 70 % of people in poverty are female. Due to lower wages and more time in care work (12%)[9] and part-time jobs (25,5%)[10], they receive less pension (29%)[11] and are therefore more at risk of poverty in old age. It is in later life that the difference between men and women in the risk of falling into poverty is even more dramatic than at any other point in life (European Commission, 2018). Furthermore, women may face an additional financial burden when having children and are left to bring them up alone, a task that is still taken care of by the mother in most cases. Gender disaggregation of existing data related to energy poverty confirmed that these risk factors are also reflected in women's exposure to energy poverty. Thus, older women, lone women, and lone female-headed households were found to be more at risk of energy poverty than men (Clancy & Feenstra, 2019; EIGE, 2016; Filippidou et al., 2019; Trinomics B.V., 2016). This highlights the fact that energy poverty is multidimensional, and that many factors can influence it. Ideally, an intersectional analysis of this problem should be carried out in order to do justice to all these facets and better understand the depth of inequality. Nevertheless, it is worth highlighting gender from all these factors, as it has an additional effect across a variety of influencing

[9] In the EU 37% of women and 25% of men, respectively, are caring for and educating their children or grandchildren, elderly, or people with disabilities on a daily basis (EIGE, 2022b)

[10] In 2019, 35,7% percent of women were in part-time employment in the EU(27) in comparison to 10,2 % of men, respectively (Eurostat, 2021e). In the same year, 33% of men and 23,5 % of women in the EU (27) were involuntary in part-time employment (Eurostat, 2021d).

[11] 29% in the EU in 2019 (Eurostat, 2021c)

factors. Feenstra (2021) justifies that a focus on this particular aspect deserves attention, describing it as a cross-cutting factor.

"The situation that there is gendered energy poverty throughout the European Union is an indicator that energy policy is not gender neutral - it is gender blind. "(Clancy & Feenstra, 2019, p. 47). On top of that, not only is energy poverty more prevalent among women, but it can also widen existing gender inequalities in aspects of energy justice. RECs, provided they could reach more women, are an important tool to counteract this development (Hoicka et al., 2021). By focusing explicitly on the involvement of women, they can achieve their goal of combating energy poverty in a targeted way, such that they reach a group that is particularly vulnerable to energy poverty. However, the fundamental problem in this regard is that the strong feminisation of energy poverty only becomes visible when specific sex disaggregated data is collected, which is rarely the case (Clancy & Feenstra, 2019; EIGE, 2016; Feenstra, 2021). The lack of this contributes to the fact that energy policies will continue to ignore the essential differences between men and women.

This implies that there should be a shift in focus towards gender disaggregated data in the field of renewable energy, a shortcoming that this thesis will address with regard to RECs. This explicit focus on the role of women in RECs is based on the one hand on the evidence that women are a particularly affected group of vulnerable consumers and that current EU legislation, which is trying to reach and address them, has failed so far. On the other hand, it has been shown that RECs are vital for the energy transition and research suggests that women could play an essential role in the expansion of this instrument, which will be discussed hereafter.

2.3. Women in RECs

Women are grossly underrepresented in RECs. Not only are they underrepresented, but in practise they also have less shares when participating in RECs (Fraune, 2016; Łapniewska, 2019). In his study in Germany in 2015, Yildiz found that the vast majority of members (80%) were male (Yildiz et al., 2015). Łapniewska (2019) identified a similar distribution, of which women constitute 28% of the members in the sample. She also investigated gender justice within European RECs in her pilot study. The results showed that the majority of the

cooperatives did not take gender equality into account, neither in their statutes and principles, nor in their actions. Although some ECs like GoiEner in the Basque Country specifically try to target women and are making a considerable effort to reach them, this remains an exception. Women are moreover generally underrepresented in the energy sector in the EU, with men making up 77.9% of the workforce and women only 22.1% (EIGE, 2016b). This is also true for the renewable energy sector (Clancy & Feenstra, 2019; ILO, 2011). Yet an ILO study on cooperatives in general found that women's membership had a positive effect on poverty reduction, they worked more and more productively and earned more. In addition, women reported that this membership had an impact on care work and decision-making in their own households and that these aspects were shared more fairly (ILO, 2015). Arguably, a higher proportion of women in RECs could also benefit various downstream effects. Moreover, it would meet the EU's fundamental aspirations to ensure equal rights and equal participation in political and economic life for every citizen. However, it is not only motives of compensatory fairness, equality, and specific vulnerability that put women at the centre of this thesis. Women would undoubtedly make important contributions to the expansion and improvement of RECs and could thus positively contribute to the energy transition, given the opportunities within RECs.

2.3.1. Benefits Women Bring into RECs

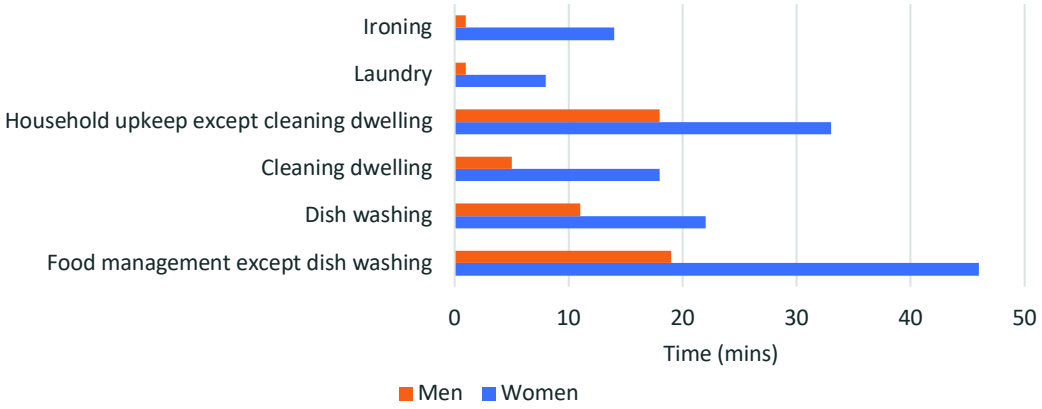
The first point to consider in this regard is that for RECs to make their contribution to the energy transition and to attract more people to energy-efficient behaviour and renewable technologies, they endeavour to reach the widest possible demographic. Not reaching a significant part of the population is a hindrance to this goal. Furthermore, many studies show that women, in contrast to men, are more environmentally friendly and have a greater interest in sustainable and "green" products (Clancy et al., 2017; EIGE, 2016; IRENA, 2019). This is also seen within household decision-making processes (Clancy & Feenstra, 2019). For example, women were found to be more motivated than men to change their behaviour in order to be more sustainable and energy efficient (EIGE, 2016b). This suggests that it should be relatively easier to attract women to become members of RECs, which to the contrary is not yet reflected in the actual number of female members. Apart from the fact that they could be very interested members, it can also be assumed that they would be committed to the expansion of the cooperative once they become members, as they show high interest in the

cause. All of this indicates that there is a high level of untapped activism potential within women.

Furthermore, women would be very valuable members for RECs, as they are predominantly responsible for energy consumption in the household, where a large part of energy use by families and individuals takes place. Figure 2 shows that women spend significantly more time than men on various household tasks, all of which are linked to energy consumption.

Figure 2

Time spent on household activities



Note: own elaboration of statistics from Eurostat, 2018

Adding up these different activities, women spend 141 minutes of their day on average on energy consuming tasks, whilst men only spend 55 minutes. Moreover, and as explained above, women consume energy differently (Clancy & Feenstra, 2019; Räty & Carlsson-Kanyama, 2010). Their preferences, practices and routines are different from those of men and are shaped by social norms of expectation (Fraune, 2016). Given that the concept of RECs is also based on energy conservation and demand flexibility, a direct involvement of these primary consumers in the household would be crucial. This would enable practices within RECs to adapt to and be positively influenced by female consumers and their consumption patterns. Attracting more female members is thus of great importance.

More women and more gender balance can generate positive effects at the organisational and management level within an EC itself. For instance, studies have shown that an increase in the number of qualified women in the leadership of an organisation leads to a better overall

performance (Noland et al., 2016; Skonieczna & Castellano, 2020). They also contribute to better risk assessment. At the same time, women bring new perspectives and approaches to their work and contribute to a cooperative and fair collaboration (Moodley et al., 2016). In addition, a whole new pool of talent becomes accessible to RECs, which can lead to more perspectives, innovation and creativity (Profeta, 2017).

Women, however, are not strictly limited to contributing to improving an organisations' productivity and work atmosphere. Rather, Łapniewska's results suggest that women within renewable energy cooperatives better address their own networks and thus strongly contribute to raising the interest and commitment of other women. Furthermore, the research showed that women had advantages in peer learning and were better than men at advising other women on energy efficiency (Clancy & Feenstra, 2019). This is significant, since RECs are particularly important due to their contribution to the acceptance and popularisation of renewable energies. Thus, the more women involved, the sooner this part of society can be fully activated and involved in the energy transition.

Conclusively, there are many supporting arguments that assert that female members would bring many promising improvements and benefits to RECs. They contribute to a greater network effect, more productivity, and a better work atmosphere. Additionally, they show a greater willingness to adapt their behaviour to sustainable standards and seem to have ideal motivational prerequisites. The question remains as to why this is not more clearly reflected in the membership composition and how women are so heavily underrepresented?

2.3.2. Barriers Women Face

The reasons that hinder women from entering RECs are likely to be similar to those which keep them from entering the renewable energy workforce in general. The European Institute on Gender Equality (EIGE) identified four core problems that women face in the energy sector (EIGE, 2016, p.6):

i. Lack of appropriate skills due to the gender gaps in energy-related education.
ii. The perception of the energy sector as a male domain and persisting gender stereotypes.
iii. The difficulty of achieving a work-family life balance which discourages women from taking on jobs that involve unpredictable work schedules or emergency travel.

iv. Insufficient career promotion opportunities and mentoring programmes for women.

Further research confirms in particular the aspect of perceptions of gender roles or cultural and social expectations of the different genders (Clancy et al., 2017; Feenstra, 2021; ILO, 2015; IRENA, 2019; Khamati-Njenga & Clancy, 2002). The ILO concluded in a study (2015) that 65% of respondents considered cultural issues to be the greatest obstacle to gender equality in cooperatives. These have a fundamental influence on self-perception, what people believe to be within their capabilities and which decisions stem from this. Especially interest in technical fields and STEM (Science, technology, engineering, and mathematics subject fields), which is relevant for RECs, is already influenced in early childhood by gender stereotypes. This results in girls losing interest much faster in adolescence than boys (Skonieczna & Castellano, 2020). Low interest, knowledge, and self-confidence in STEM subject fields may well prevent investment in this area, regardless of the fact that the goals pursued by RECs are very attractive to women.

Nevertheless, the overall field of investing is largely dominated by males. Financial factors play a major role in this regard. Not surprisingly, it turns out that mostly financially successful people participate in RECs (Lowitzsch & Hanke, 2019). On average, women have less money than men. As stated in section 2.1.2.2, investments in RECs as decentralised and rather small organisations are perceived to be risky. Research further indicates that women take fewer risks in their investment decisions (Benjamin et al., 2010; Nelson, 2015; Palvia et al., 2015). However, the DIW (German Institute for Economic Research) shows that this long-held presumption is especially true when women have less money than men (Badunenko et al., 2010). The basic conditions of this investment may, however, be less attractive for women. This said, for women investing in fields such as STEM, to which they may feel less acquainted with, attaining information and knowledge are the essence of its success. Moreover, not only in this specific area, but as investors in general, women feel more uncertain than men and assess their entrepreneurial skills and experience less favourably to those of men (Skonieczna & Castellano, 2020).

Having access to this knowledge about RECs and their functions thus goes hand in hand with being able to make good investment decisions. (Hanke & Lowitzsch, 2020; Lowitzsch & Hanke, 2019). Yet this naturally requires another scarce resource: time. Thus, in order for women to

participate in RECs, they must not only be able to financially afford such an investment, but also the time for the commitments involved. As such, they must find the time to inform themselves thoroughly as well as to participate in the lengthy democratic decision-making processes, which are essential in RECs. Since women earn less, are more at risk of poverty, and also do a lot of the care and household work, it seems obvious that they do not have the necessary capacity and time.

Due to their limited financial and time capacities, they have less access to RECs. The aforementioned ILO study, which surveyed 581 respondents, also shows that participants see a great responsibility for governments to act in this regard. For example, 88% reported that the state plays a central role in gender equality in society (ILO, 2015). For this reason, various EU Member States will be analysed below regarding their gender equality policies in relation to the energy transitions and RECs.

2.4. Comparison of the Legal and Economic Background in the EU

Since the analysis of data in this thesis is based on Sociedades Laborales in Spain, the aim here is to elaborate why Spain, and the Basque Country in particular, have an interesting approach to the integration of women in companies and thus also in RECs. For this purpose, the socio-economic background, and certain laws relevant to this context, will be compared with other Member States to identify specific similarities in their socio-economical structures to Spain. To still ensure a broad range and thus representative sample across the European Union, Italy, France, Germany, Bulgaria, and the Czech Republic will be used for comparison. The Scandinavian countries were excluded from the comparison because, although they are very progressive in the field of gender equality, their social model has little in common with that of Spain and would therefore be difficult to compare. Firstly, basic parameters of gender equality will be compared between the six countries.

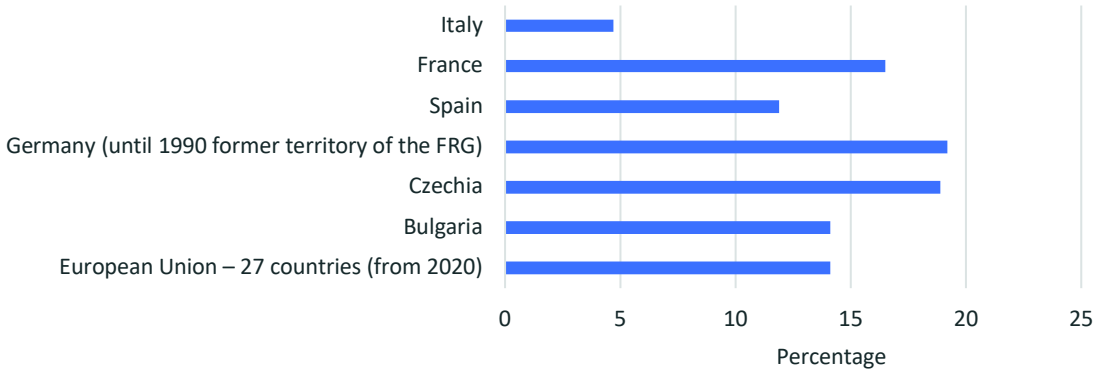
2.4.1. Comparison of Gender Equality Parameters.

The gender pay gap is the most common and known indicator in the field of gender equality. It measures the income difference between the sexes and compares the “average gross hourly earnings of male paid employees and of female paid employees as a percentage of average gross hourly earnings of male paid employees” (Eurostat, 2021a). Figure 3 shows that

Germany has the highest gender pay gap of the six countries at 19.2 %, while Spain has the second lowest value at 11.9 %, thus falling below the EU average (14.1 %). An overview in Annex 1, which also covers the past years, further indicates that Spain was always below the EU average from 2014 to 2019.

Figure 3

Gender pay-gap comparison 2019



Note: own elaboration of statistics from Eurostat, 2021a.

Another interesting indicator, which addresses the issue in a more multifaceted and differentiated manner, is the Gender Equality Index of the European Institute for Gender Equality (EIGE). The findings for 2021 are displayed in Figure 4, which shows the overall equality index and selected categories, which are of specific importance for the participation of women in RECs. These categories are "*work*"[12], "*care activity*"[13], and "*power*"[14] including the three subcategories "*political power*", "*economic power*" and "*social power*", respectively.

[12] "The domain of work measures the extent to which women and men can benefit from equal access to employment and good working conditions. " (EIGE, 2022c)

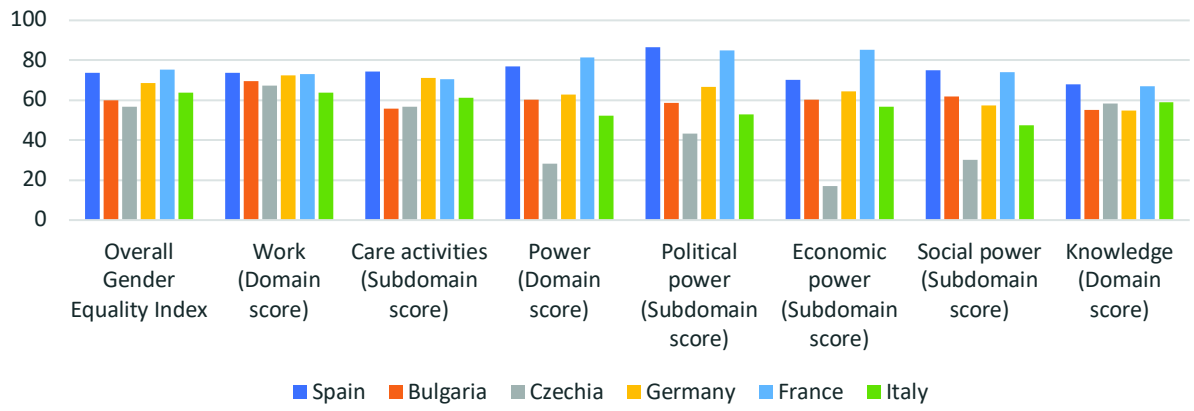
[13] This domain care measures "activities, gender gaps in involvement of women and men in caring for and educating their children or grandchildren, older and disabled people, as well as their involvement in cooking and housework". (EIGE, 2022b)

[14] "The domain of power measures gender equality in decision-making positions across the political, economic, and social spheres. The sub-domain of political power examines the representation of women and men in national parliaments, government, and regional/local assemblies. The sub-domain of gender-balance in economic decision-making is measured by the proportion of women and men on corporate boards of the largest nationally registered companies listed on stock exchanges and national central banks. The Gender Equality Index for the first time presents data in the sub-domain of social power, which includes data on decision-making in research-funding organisations, media, and sports. " (EIGE, 2022a)

These categories were selected as they are related to the barriers for women to participate in RECs (see 2.3.2). An overview of all categories and EU countries can be found in Annex 2. The higher the score generated by the index, the better the country's performance in terms of gender equality in this area. Figure 4 shows that Spain performs very well in all categories in comparison to the other five countries. With an overall score of 73.7, Spain is in second position, only slightly behind France. It scores best with regards to equal availability to work, with an index of 73.7, as well as to the distribution of care work and in the areas of social and political power.

Figure 4

EIGE Equality Index 2021 for the five countries



Note: own elaboration of statistics from EIGE, 2021

After analysing the current state of gender equality in the six countries, it is apparent that Spain is very progressive in comparison. Moreover, many factors that are necessary for the inclusion of women in RECs are both present and favourable (from a statistical perspective) in Spain.

2.4.2. Transposition of the EU Directive into National Law

The second step is to compare the implementation of the policy basis of the EU legislation regarding RECs in the selected countries. The enabling frameworks, as outlined in the RED II, should have been transposed into national law by June 2021 (Hoicka et al., 2021; Lowitzsch et al., 2020). Important parameters in this regard are going to be compared in the following. For example, REScoop.eu compares countries within the Union and uses their 'transposition

tracker' tool to evaluate the extent to which RECs and CECs have been transposed into the law of the member states so far (REScoop.eu, 2022a). This will help outline which parameters within different frameworks have (and have not) been transposed and thus highlight any similarities and differences between the selected countries.

The transposition tracker differentiates between five evaluation categories: *Bad transposition, Substantial deficiencies, Average progress, Good practice* and *Best practice*. Spain received the category *Average progress*, whereby it should be mentioned that no country falls into the best category. Although a one-to-one adoption of the EU definition, it is considered positive that Spain introduced a definition of RECs with Royal Decree-Law 23/2020. Nevertheless, it is criticised that the legal entities that can function as RECs have not been clearly defined within this framework. It is furthermore critiqued that there is still no institution to regulate the communities and that the participation of citizens is not really guaranteed (REScoop.eu, 2022b).

Nevertheless, when considering aspects that are equally important to the implementation and impact of RECs, Spain takes a pacesetting role. The government approved a National Strategy against Energy Poverty 2019–2024 and are trying to address this problem in a comprehensive way, whereby a definition of vulnerable consumers and energy poverty is already included (Barrella, 2021). This is also outlined in their National Energy and Climate Plan (NECP) (Bouzarovski et al., 2020). The clear definition of both vulnerable consumers and energy poverty is particularly important for RECs to truly target this group of people that they have so far failed to address. In the NECP, Spain further cross-references RECs several times as an instrument to mitigate energy poverty (Bouzarovski et al., 2020).

In the REScoop rating France is able to keep up with Spain and also receives the rating "Average progress". They have extended the Code de l'énergie with the Ordonnance N° 2021-236 by a Tirte IX, which regulates the conditions of individual and collective prosumption in RECs and CECs. The definition, however, also differs little from that of the EU and was not specified. Italy polls behind France and Spain, being allocated the rating: "Substantial deficiencies", whilst Germany and Bulgaria received the poorest rating: "Bad Transposition", from REScoop.eu (REScoop.eu, 2022a).

In the sections below, fiscal, and financial instruments in France and Spain are examined in more detail, as these two countries performed best in terms of gender equality and transpositions in relative terms.

2.4.3. Fiscal and Tax Incentives to Join RECs in Spain and France

In both countries, legislation can be found that favours membership in RECs for vulnerable consumers and women. In France, a law exists to facilitate access to RECs for less wealthy people. In the Loi N° 2019-1147 relative à l'énergie et au climat, article 41 stipulates that the code de l'énergie will receive the new article L. 315-2-1. This states that tenants of habitations à loyer modéré (low-cost housing) are automatically members if the landlord has opted for RE installations for collective self-consumption. They can opt out of this membership, but the default option is that they participate in this collective energy production. The country also launched the loan system *Garantie EGALITE Femme* to support the funding for women who want to become entrepreneurs (Hallef, n.d.).

In Spain, a direct tax incentive is in place for women to participate in entrepreneurship and, accordingly, RECs. Typically, men and women are taxed equally across the board, although many aspects of this affect the genders differently (Gunnarsson & Spangenberg, 2019). Research on income tax concludes that women are more responsive to changes in net income than men (Bettio & Verashchagina, 2009). This was particularly evident among married couples, as taxation and other allowances paid to couples or families together affect work motivation among lower-earning second earners (Bettio & Verashchagina, 2009; De Villota, 2007; Gunnarsson & Spangenberg, 2019; Rastrigina & Verashchagina, 2015). This research suggests that women may also be more responsive to incentives and subsidies in the renewable energy sector.

Even though advocates of gender-based taxation have also made advances to tax women less than men, it has always been heavily opposed due to objections of both equity and efficiency (Bettio & Verashchagina, 2009). Bearing this in mind, the Norma Foral 6/2016 law enacted in 2016 in the Basque Country is particularly progressive, as it introduces different tax rates for women and men. It aims to combat gender inequality in companies and strengthen female entrepreneurship (Algaba, 2016; Diputación Foral de Gipuzkoa, 2016). It provides tax deductions as an incentive to promote entrepreneurial activity, with higher percentages for

women. For example, women receive a 20% deduction for amounts used to invest in employer companies, whilst men receive only 15% (Norma Foral 6/2016, 2016 Art. 89,1). The maximum amount of the reduction per year is capped at 2000 euros for women and 1500 for men, and the cumulative amount is 8000 and 6000 euros, respectively (Art. 89, 3 Norma Foral 6/2016, 2016). The Basque Country also appeared as a pioneer in terms of women's economic equality, being the first in Spain (together with Andalusia) to start gender budgeting analysis, although the national Spanish institutions were not yet interested in it (De Villota, 2016). Additionally, they started early to facilitate access to support services for women by making it less bureaucratic (Azua Eceolaza, 2003). They also began integrating important new concepts, such as violence against women, into their General Equality Law (2005) at an early stage (Pizarro Pacheco et al., 2011). Also worth mentioning is the study on the analysis of public policies from a gender perspective, carried out in the Basque Country by Emakunde, the Women's Institute of the Basque Government, between 1999 and 2002. This study became a prototype and was cited much more frequently than the one carried out by the national government in 2005 (De Villota et al., 2009). Due to these highly progressive approaches to gender equity, a particular focus of the data analysis will be on this autonomous region of Spain, which will be compared with developments in the rest of the country. Thus, the impact of government regulations and tax instruments on women's participation in enterprises, cooperatives or corporations can be analysed.

National and local circumstances can have an important influence on the participation of women in RECs, and thus the prosperity and inclusiveness thereof. In the comparison of the six countries, it became evident that Spain and France have the most progressive conditions for women's equality. The importance of women in RECs and the analysis of a gender component in energy policies has now been extensively presented and demonstrated. Nevertheless, it has also been previously discussed that women and vulnerable consumers are underrepresented in RECs and that gender-disaggregated data is severely lacking in this area (Guyet et al., 2021; Hanke & Lowitzsch, 2020; Hoicka et al., 2021; Łapniewska, 2019; Lowitzsch & Hanke, 2019; Yildiz et al., 2015). As a result, the barriers could not be directly and conclusively inferred from data on RECs and thus requires the use of additional literature on women in STEM and cooperatives in general.

The relevant EU regulations from 2018 are still rather new and a full transposition into national legislation and subsequent development in this area will take some time. For this reason, there is little long-term data available on RECs that relate to gender differences. Hence, this thesis must resort to available data that indeed does capture differences between men and women in cooperative structures over a longer period of time. The SLs which have existed in Spain since the 1970s, have been capturing a diverse criterion of statistics by national institutes for some time, making them the perfect candidate. The partial transferability of data from SLs to RECs will be justified in the next section.

2.5. Sociedades Laborales

SL are joint stock companies or limited liability companies in which the employees themselves own the largest share of the company - a type of collective self-employment (Ley 44/2015, 2015) - typically found as small and medium-sized enterprises. Interestingly, jobseekers can capitalise their unemployment benefits as a lump sum to start a new SL or increase the capital of an existing one (Lowitzsch et al., 2017). This contributes a lot to the reintegration of the unemployed into the labour market.

Among them, there are two forms, Sociedades Anónimas (S.A.L.) and Sociedades de Responsabilidad Limitada (S.L.L.) (Ministerio de Trabajo y Economía Social, n.d.-c). SLs are characterised primarily by the fact that permanent workers must own more than 50% of the shares, with no single individual owning more than 33%. Exceptions exist only for public entities, institutions with majority public participation, non-profit institutions or social economy institutions which may own up to 49% (Ministerio de Trabajo y Economía Social, n.d.-a). The two forms of shares are: i) worker shares (acciones de clase laboral) reserved for permanent employees, and ii) general shares (acciones de clase general) (Lowitzsch et al., 2017). Three groups of people can form part of a SL (Ministerio de Trabajo y Economía Social, n.d.-a):

i. socios trabajadores: employees and shareholders
ii. socios no trabajadores: strictly shareholders
iii. trabajadores asalariados: strictly employees

The Law Ley 44/2015 de Sociedades Laborales y Participadas sets the current governance model.

The Spanish government offers subsidies to support this form of collective self-employment (Orden ESS/739/2017, 2017; Extracto de La Resolución de 30 de Junio de 2020, 2020). They support the recruitment of new working partners - the integration of formerly unemployed people is of particular interest in this respect. The governments reports that there is also financial support for promotion and training. On top of that they record subsides to help with technical assistance, subsides for the loans and subsides for other investment in fixed assets.

2.5.1. The Comparison with RECs

There are many structural similarities between SLs and RECs, even though the governance model of SLs is slightly looser. Despite the more capital-oriented nature of SLs, whereas RECs are legally intended to focus on non-economic aspects of fruition too, there are many analogies in the governance models (cf. table 1). In both cases, capital must be shared proportionately, as no shareholder may own more than 33% and the workers or members of the REC must own at least 51% of the shares. Both display a democratic decision-making style: in RECs, each member usually has only one vote (Alaton & Tounquet, 2020), whilst in the SLs shareholders should have an equal nominal value, including equal rights, and in any case the right to vote (Lowitzsch et al., 2017). SLs, like RECs, have two forms of investment opportunities. In a REC there is the possibility of having members, who live in the local vicinity of the REC and thus have voting rights, as well as investors, who do not fulfil this condition of RED II and therefore have no right to membership and thus voting. SLs, on the other hand, allocate more than half of their shares to its workers, and the rest for external investors.

Moreover, both types of company share the disadvantage of being quite unattractive for investors due to their governance model and the associated limitations for investors to impose influence (Lowitzsch et al., 2017; Lowitzsch & Hanke, 2019). This strict governance model, which both models adhere to, can also lead to unintentional disqualification. The more successful a SL or REC becomes, the more difficult it can be to keep up with the requirements of the share structure. It can happen that shares become too expensive and only a few buyers can afford them. However, RECs and SLs must not disregard the 33% rule. The disqualification

of SLs over time showed that this did not indicate failure, but rather that many successful SLs dropped out of the model (Lowitzsch et al., 2017). The more these two models grow, the more difficult it becomes to keep up with the rules - a counterproductive effect that should be considered.

2.5.2. Sociedades Laborales as a Good Benchmark to Explore the Vulnerability Context

Beyond this, the data on SLs can provide meaningful insights into potential REC opportunities that are currently not yet feasible. Hanke and Lowitzsch (2020) see them as an ideal model to demonstrate the vulnerability context that this work is also interested in. As SLs enable the collective empowerment of a socially marginalised group (the unemployed), they offer a promising practical example. They provide an outlet for the unemployed and enable a space free of discrimination. (Hanke & Lowitzsch, 2020). Furthermore, SLs have documented experiences with a variety of social supports and subsidies, which may also be of interest for RECs.

This is already reflected in Spanish legislation. In order to prevent the exclusion of unprivileged groups in society and especially in the workforce, the Spanish government has made a clear commitment to a social economy: "This is why, in recent years, support for the different Social Economy formulas has been clear and, in addition to measures such as the capitalisation of unemployment benefits and the flat rate for the self-employed, whose aim is to facilitate entrepreneurship, other measures have been incorporated, which are aimed at encouraging the growth of Social Economy entities, including the implementation of new incentives for the incorporation of worker-members or the implementation of incentives for cooperatives and worker-owned companies to hire workers on an indefinite-term basis." (Ley 31/2015, 2015 Preámulo (I), own translation). It is evident that these different forms of support are available to SLs and their effects traceable due to the national data collection on SLs and state subsidies. The wording of the law also implies that cooperatives can use the same forms of support schemes. Consequently, it is evident that the effects that these subsidies had on women in SLs can have similar implications for RECs. Given that the lack of financial resources was previously identified as a significant barrier for women's participation in RECs, such subsidies could help counteract this.

In addition, SLs offer a space for social exchange and the exchange of expertise, skills, and qualifications, which can bridge gaps and reduce existing inequalities. In this respect, the experience of SLs may also be transferable to RECs. If measures such as capitalising unemployment benefits or other subsidies are shown to have a positive effect on the proportion of women, this could be promising for RECs. The capitalisation of energy subsidies could create access for economically disadvantaged women. Trainings could also reduce existing knowledge gaps on technical issues or have a positive effect on self-perception of not being competent in the energy sector.

Subsequently, the influence of the capitalisation of unemployment benefits and other subsidies for the integration of new workers on the one hand, and training and advertising on the other, on the percentage of women in SLs will be analysed below. A comparison will be made with the influence of these two factors on men. Furthermore, differences between the Basque Country and the rest of Spain will also be examined, as the Basque Country has particularly progressive gender policies.

2.6. Hypotheses

Due to the obstacles and exclusion mechanisms for women outlined in section 2.3, various underlying premises are to be tested on the basis of the data from the SLs.

2.6.1. Hypothesis 1

Since it has been shown that women feel more insecure about investments and that they are better able to activate their own network, it can be assumed that women are more likely to become active in SLs where other women are also present.

2.6.2. Hypothesis 2

It has been discussed in detail that women on average are more likely to be poor and have less money at their disposal. In addition, research shows that women are more responsive to tax incentives. It is likely that women also respond differently to financial incentives in the form of subsidies in SL. Therefore, the second hypothesis states that women react stronger to subsides. In this assumption, the hypothesis has two sub-hypotheses.

2.6.2.1. Hypothesis 2.1

Sub-hypothesis 2.1 states that subsidies have a positive impact on the percentage of women in SLs.

2.6.2.2. Hypothesis 2.2

Sub-hypothesis 2.2 assumes that individual subsidies have a greater effect on women than on men.

2.6.3. Hypothesis 3

Another form of financial incentive is the possibility to capitalise unemployment benefits, which is possible in Spain. Here, hypothesis 3 predicts that the use of this has a stronger effect on the shares of women in SLs than on men.

2.6.4. Hypothesis 4

The special role of the Basque Country compared to the rest of Spain in terms of gender equality and the special tax incentives for women in entrepreneurship introduced by the Norma Foral suggest that this is a particularly prosperous environment for women in SLs. Hypothesis four therefore suggests that the percentage of women in SLs has developed better in the Basque Country than in Spain in general.

3. METHODOLOGY

This section outlines the data collection process, as well as the various selected descriptive and inferential statistical methods used for hypothesis testing.

3.1. Data Collection

The data used to test the four hypotheses stems from various official government statistics from the Spanish national government and the Basque regional government. A large part of the data was obtained from statistics from the Ministerio de Trabajo y Economía Social (MITES). Additionally, a smaller part was provided by the Asociación empresarial sin ánimo de lucro (ASLE), a non-profit business association with a framework of action in the Basque Autonomous Community. Likewise, some of the data was provided by the State Public

Employment Service (SEPE), an autonomous agency attached to the Ministry of Labour and Social Economy.

3.1.1. Data on Membership in Spain and the Basque Country

Membership data form an elementary basis for hypothesis testing. The number of new partners joining SLs is reported annually by MITES (Ministerio de Trabajo y Economía Social, n.d.-d) and made publicly available. Moreover, MITES statistics distinguish between working partners and investing partners[15], to which both categories are further broken down by gender for newly founded SLs. The data for the period from 2005 to 2020 was taken from this database and is reported in Table 2 below. In addition, the MITES reports statistics for individual regions of the country, allowing for an analogous list of SLs founded within the Basque Country to be produced.

Table 2

Working partners in SLs in Spain and the Basque Country

Year	Spain		Basque Country	
	Working Partners Female	Working Partners Male	Working Partners Female	Working Partners Male
2005	2.677	6.305	87	216
2006	1.849	4.641	59	178
2007	1.685	4.302	32	213
2008	1.293	2.875	33	115
2009	1077	2449	54	163
2010	1100	2282	24	87
2011	1038	2255	17	108
2012	802	2299	41	222
2013	726	2021	56	130
2014	642	1.604	41	122
2015	471	1.038	39	147
2016	374	785	21	71
2017	338	552	19	50
2018	371	598	16	32
2019	277	464	11	24
2020	171	379	10	18

Note: own elaboration from *MITES* data (2006 - 2021)

In addition, data specifically from the Basque Country is consulted, which provides more detailed information about the composition of the SLs. These were provided by the Basque

[15] The focus of this thesis is on working partners, hence investing partners are not further investigated.

Provincial Government, which records information on all newly founded SLs including the total partners, working partners, and investment partners. They also provide information on the exact gender distribution at the time of founding. Both forms of SLs - the S.L.L. and S.A.L. - were considered over the period from 2003 to 2013.

3.1.2. Financial Policy Instruments

Data on the various subsidies paid by the Spanish state were also attained from official MITES data. The MITES documents subsidies to promote employment in cooperatives and SLs under the term "Apoyo a la Creación de Empleo" (ACE), or "support for job creation". Although these are also differentiated by region, figures for the Basque Country are not included within these national statistics, as they do not receive national funds according to the decree TMS//425/2019 of 8 April 2009. (Ministerio de Trabajo y Economía Social, n.d.-b). Consequently, no specific analysis of the effect of subsidies on the inclusion and participation of women in SL start-ups can be made for the Basque region.

The five subsidies examined in this thesis over the period from 2005 to 2020 are as follows:

i) Subsidies for recruitment of working partners;
ii) Subsidies for promotion, dissemination, and training;
iii) Subsidies for technical assistance;
iv) Subsidies for investment in fixed assets;
v) Subsidies for loan interest.

In addition, the sum of all five subsidies and their impact on new business formation will also be considered.

Furthermore, data obtained from Spain's statistical database, specifically regarding money generated from governmental social support systems, will be examined. In Spain, it is possible for affected persons to capitalise (i.e. invest) their unemployment benefits. This explicit connection is of great interest for this work, however, such data was difficult to find. Accordingly, the data used in this paper represents a rather short period of time from 2006 to 2013. This data was released directly to Prof. Lowitzsch from SEPE (Lowitzsch et al., 2017) and details the capitalisation of unemployment benefits specifically used for SLs in Spain and

the Basque Country for the abovementioned time period. In both cases, gender disaggregated data is available.

3.2. Analysis

To test the hypotheses of this thesis, descriptive and inferential statistical methods are used to analyse and interpret the data. In the descriptive analysis, the collected data is processed and summarised into characteristic attributes, such as the mean, standard deviation, variance, etc., of the sample. Inferential statistics serve the purpose of determining statistical correlations and testing hypotheses. Strictly speaking, only inferential statistics may confirm hypotheses, but since the data collected is not very extensive, not all five hypotheses can be examined in this way. Thus, descriptive statistics must too be drawn upon to answer some of the research questions. Nevertheless, the results thereof must be sufficient in individual cases to draw valid conclusions. As such, these cannot be generalised without restriction.

Furthermore, the data obtained does not comply with usual specifications for parametric statistical analysis, since the sample sizes are very small and the datasets not normally distributed. This, however, poses no significant threat to the credibility of the results and the data can instead be analysed in its original form, without the need for transformation or manipulation. This approach is based on the findings of Norman (2010), in which he reviewed empirical papers dating back almost 80 years and found that even divergent data with unequal variances, small samples, and with non-normal distributions do not produce erroneous results. On the contrary, he assumes that: “One of the beauties of statistical methods is that, although they often involve heroic assumptions about the data, it seems to matter very little even when these are violated.” (2010, p.626). Due to the small amount of data that was moreover collected from various sources, it is subsequently not advisable to change the data even further for the purpose of this research.

3.2.1. Descriptive Data Analysis

Data gathered from the Basque Country, which reports the composition of each of the newly founded SLs over the past 10 years, is examined to test the first hypothesis. The aim is to descriptively explore how SLs in the Basque region are distributed and to what extent a preference for women’s membership can be inferred by the number of other women involved.

The existing MITES data sets on the founding partners of SLs in Spain and in the Basque Country will be examined for common parameters such as distribution, minimums and maximums, as well as mean values. Founding partners of SLs consist of working partners, who also work in the company, and investing partners, who solely contribute capital. The distribution and development of the investing partners and their underlying incentives can unfortunately not be conclusively clarified within the limitations of this study. Since the explanatory power of the data is relatively limited, the inferential statistical analysis will refer exclusively to the working partners. Nevertheless, data on investing partners is still examined and reported in the descriptive statistical analysis. The same applies to the data on the five subsidies and the capitalised unemployment benefits. In addition, the correlation between the variables available for the period from 2005 to 2020 is determined by means of a multiple correlation. This allows variables that have a major influence on the distribution of female founders in SLs to be determined. In a subsequent partial correlation, overly strong influencing factors will be filtered out.

The correlation coefficient *r* always indicates the strength of the correlation between the two variables. The strength of effects is often interpreted in the literature using Cohen measures. This measure defines a small effect, i.e. a weak correlation, for *r* values of 0.10, a moderate correlation for *r* values of 0.30, and a strong correlation from $r = 0.50$ onwards (Cohen, 1988). Meanwhile, Gignac and Szodorai (2016), after their in-depth analysis of various effect sizes of correlations, criticise Cohen's standards for being too onerous and emphasise that only 3 % of the cases they examined had an $r > 0.50$ and recommend speaking of a strong effect from 0.30 onwards.

3.2.2. Inferential Statistical Data Analysis

Hypothesis 2.1 is tested using multiple regression. The influence of the different subsidies and the year are examined as predictors. A regression states how high the influence of each of these predictors is on the criterion. In this case, the percentage change in the share of women in newly founded SLs is the chosen criterion. This allows us to determine which predictors significantly influence the change in the share of women. In a second step, hypothesis 2.2 is tested with the help of partial correlation. Since the number of new SLs is constantly decreasing, as shown in Table 1, the control variable time is disregarded from the calculation.

By doing so, the correlation between the absolute number of new male and female SL founders with each of the five variables can now be determined. The correlation coefficients for the respective variable can then be compared between the group of men and women for their strength. Whether these differences are at a statistically significant level is then determined by the Fisher Z test.

Hypothesis 3 is tested using one of two hierarchical linear regressions. The reason for this is that the *time* variable must be factored out due to its strong influence. First, the influence of the *number of men who capitalise unemployment benefits* variable, which is taken as a predictor, on the *number of new male SL founders* criterion variable, is determined. The second regression similarly examines the influence of the predictor *women who capitalise unemployment benefits* on the criterion *women who start SLs*. The effect sizes of the regressions can then be compared to see how the influence on women differs from that on men. Since this data is also available separately for the Basque region, the same two comparative hierarchical linear regressions is also applied to this data.

To be able to test the fourth hypothesis, the proportion of female SL founders in Spain as a whole will be compared with the Basque Country. It is assumed that the conditions in the Basque Country have a positive influence on female entrepreneurs and thus also on female SL founders due to particularly progressive gender policies. In two regressions, the influence of the predictor time on the respective absolute numbers of female founders is compared as a criterion. The same is compared with the influence on the respective male SL founders as a control to determine the extent to which this is a gender-specific relationship in the Basque Country and how the founding of new SLs in general differs across both genders from that in the country as a whole.

4. RESULTS

The results of the hypothesis testing are reported chronologically. First, the results of the descriptive analysis of the available data are presented.

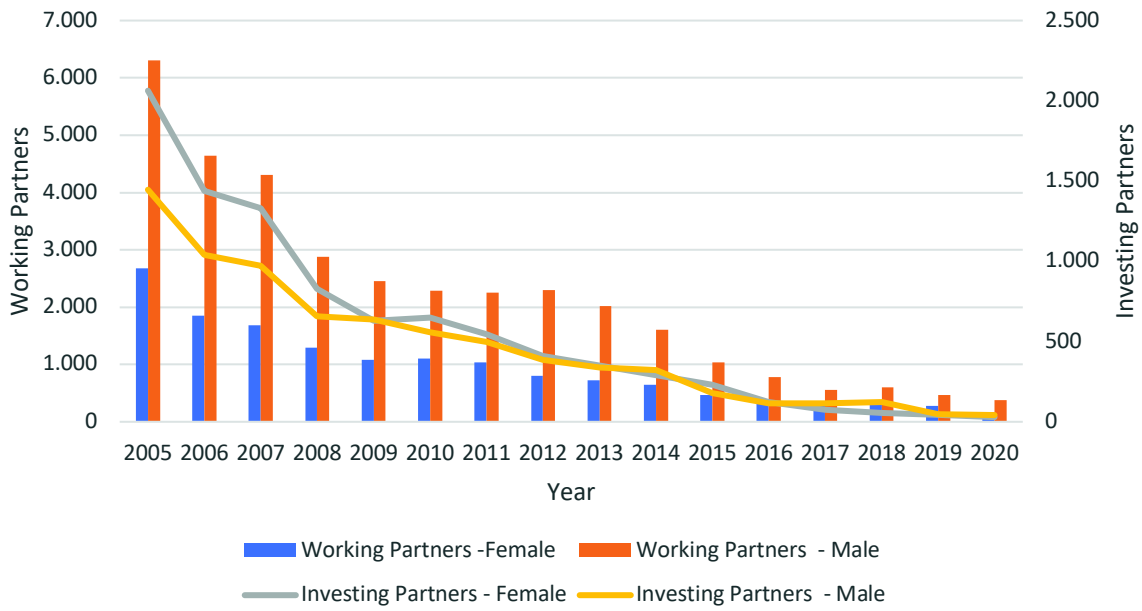
4.1. Descriptive Analysis of the Datasets

Initially, all relevant data for the hypotheses are presented graphically in their distribution and development. The first and most important set of data to be analysed is that of MITES,

which records the number of people who start new SLs each year. Between the years 2005 and 2020, there is a clear and continuous decline in the number of newly registered SLs and the corresponding number of working and investing partners in Spain for both genders (see Figure 5).

Figure 5

New partners SLs (Spain)

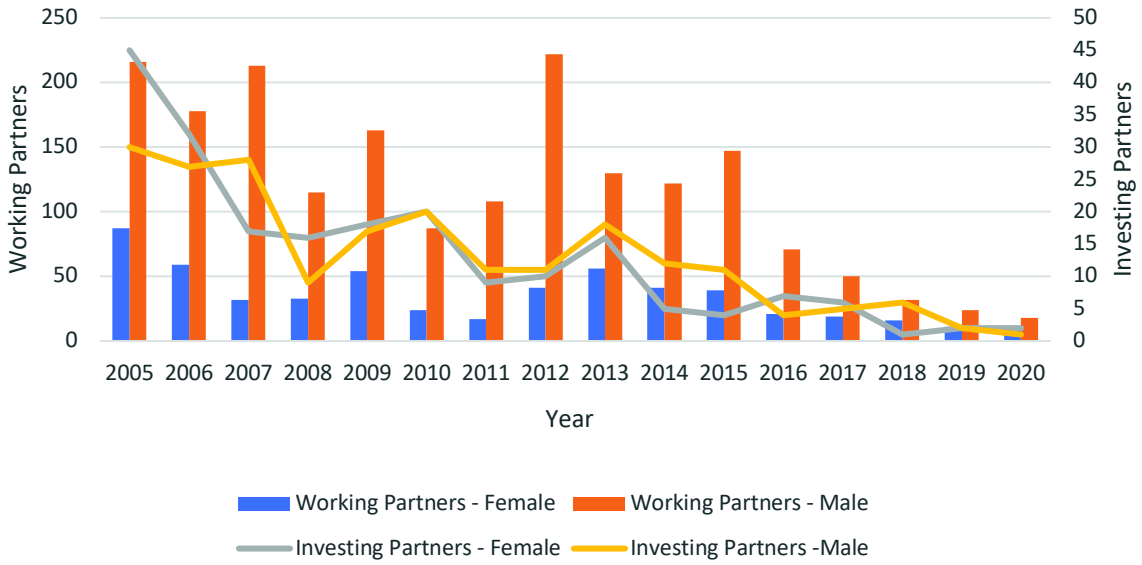


Note: own elaboration from *MITES* data (2006 - 2021)

Cumulatively, there were 14,891 new female working partners and about two and a half times as many, namely 34,849 new male working partners, over the course of the entire period. The investing partners are more balanced across both genders, with a total of 9,092 women and 7,472 men registered as founding members of a new SL during the entire period.

Figure 6

New partners SLs (Basque Country)



Note: own elaboration from *MITES* data (2006 - 2021)

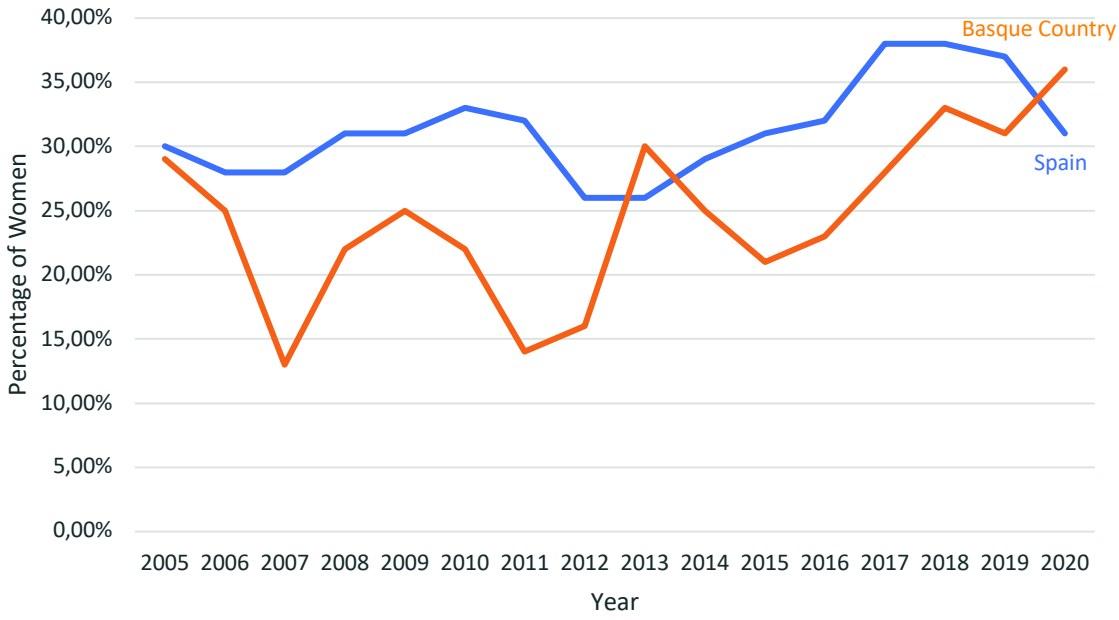
The situation in the Basque Country is considerably more volatile, as can be seen in Figure 6. However, this is due to the generally very low number of new start-ups towards the end of the period under review (which can also be seen in Table 1). Altogether, there were 560 new female working partners and 1,896 male working partners in these 16 years. The distribution of cumulative partners is therefore slightly different from that in Spain as a whole, however the distribution is less favourable in the Basque region. As for the ratio between male and female investing partners, it is quite similar to the Spanish ratio, although slightly less favourable again. In the Basque Country, 210 women and 212 men were registered as new investing partners over the 16-year period.

It is striking, however, that between 2012 and 2016, the cumulative number of new female and male SL entrepreneurs in the Basque region sharply surged, to then flatten out again thereafter. A similar spike in the share of female founders can too be seen around this period, which is illustrated in Figure 7. The percentage of women doubled in the short three-year period from 2011 to 2013, to then return to a general rising trend in 2015/2016. Over the entire 16-year period, the average percentage of women among new working partners in the

Basque region was 24.5%, with a minimum of 13% and a maximum of 36%. Remarkably, the value tends to increase from 2015 onwards and the three highest percentage values measured for the sample unit fall within this timeframe. When comparing this with the development of the percentage of female working partners who founded new SLs in Spain, a more stable value becomes noticeable (see Figure 7). The minimum in this case was 26% and the maximum 38%, with a mean value of 31.3%.

Figure 7

Percentage of women within initial working partners

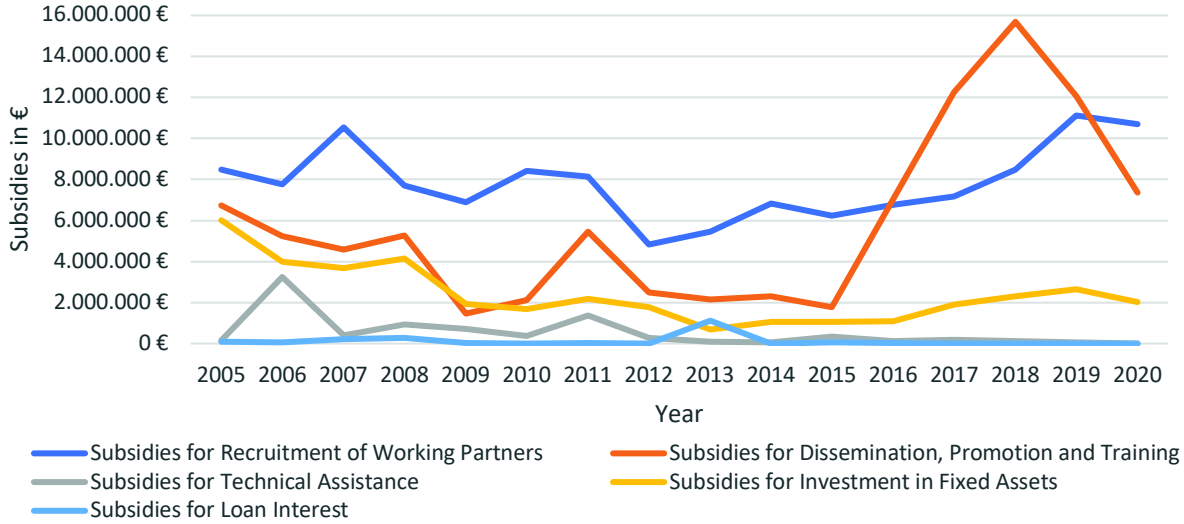


Note: own elaboration from *MITES* data (2006 - 2021)

The subsidies paid by the Spanish state are an important influencing factor. A breakdown of these subsidies from 2005 to 2020 can be found in Figure 8. On average, the most money was allocated to the subsidy for the recruitment of working partners (*M* = € 7,844,425.40). The second largest subsidy is for dissemination, promotion and training (*M*= € 5,877,971.60). An average of € 2,384,280.86 was spent on investment in fixed assets over the 16 years and a mean of € 531,435.76 was invested in subsidies for technical assistance. Loan interest was subsidised the least on average (*M*= 120.709,14 €).

Figure 8

Subsidies for SLs and Coops in Spain

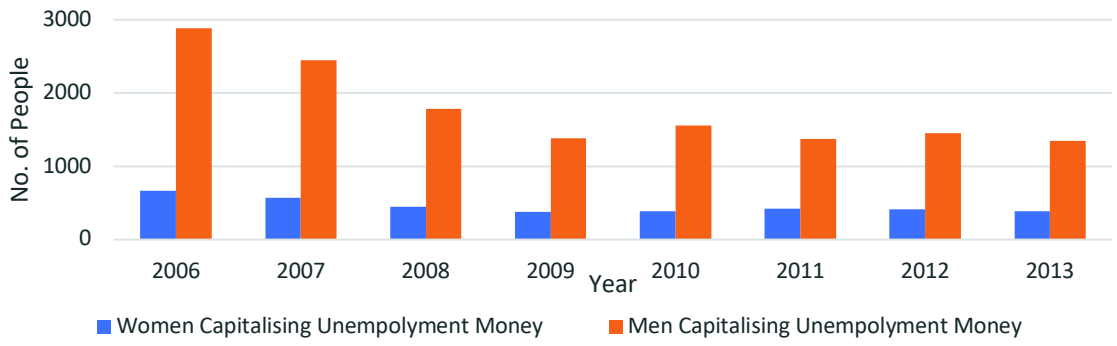


Note: own elaboration from *MITES* data (2006 - 2021)

Another form of financial incentive examined in this thesis is the mechanism of capitalisation of unemployment benefits. The development in the entire country for the observed period from 2006 to 2013 is visualised in Figure 9. Here, the number of men and women who use these unemployment benefits to start a new SL is indicated. A sharp drop in the number of people investing unemployment money into SLs is particularly pronounced in the first half of the period. The number of persons approximately halved from 2006 to 2009. The highest values for both men and women were recorded in 2006, with 2,887 men and 664 women, respectively. The average share of women that used this benefit over the time period was 20.86 %, with a low of 18.70 % in 2006 and a high of 23.50 % in 2011, respectively.

Figure 9

Capitalisation of unemployment benefit in SLs (Spain)



Note: own elaboration from *SEPE* data (2006 - 2013)

More fluctuations over time occur in the Basque Country, as Figure 10 demonstrates. This is rather unsurprising in analogy to the fluctuations in the number of new SLs founded over time. The maximum number of men was recorded in 2007, with 219 investors, whilst the largest group of female investors was first recorded at the end of the eight-year period in 2013. In that year, the share of women using this mechanism was found to be the highest as well, at 27.44%. Moreover, as a percentage, this lies significantly above the mean value of 18.09% for the percentage of women capitalising unemployment money in SLs.

Figure 10

Capitalisation of unemployment benefit in SLs (Basque Country)

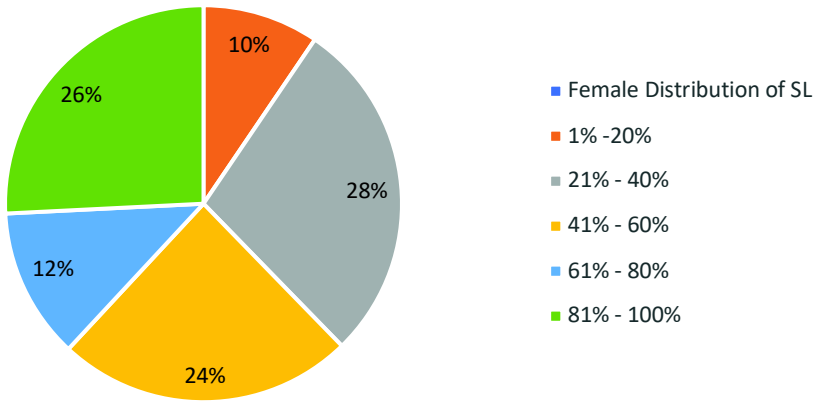
Note: own elaboration from *SEPE* data (2006 - 2013)

4.2. Evaluation of Hypothesis 1

Hypothesis 1 suggests that women prefer to be in SLs when other women are also involved. This was analysed using data on the founding members and the breakdown of each SL into the composition of its members. The research focused solely on SLs in which women were at all involved as working partners. SLs that were founded with only male partners are vastly represented in the data, yet, due to the focus of women in this paper, are disregarded in the analysis. In the composition of the individual SLs, the proportion of women in newly founded SLs was examined. The results are shown in Figure 11.

Figure 11

Share of female working partners with respect to gender distribution of SLs



Note: in the final range of female composition of SLs, the data strictly represents 100% female participation, i.e., no men are involved as founding working partners.

Interestingly, it became clear that of the 822 women registered in this sample, a quarter (26%) were in SLs that were 100% formed by women as working partners. A further 12% of women were in SLs where the female share of working partners ranged from 61% to 80% and 199 of the women (24%) were founding members in SLs that had a relatively egalitarian distribution (41% - 60% female share) of working partners. At 62%, the majority of women thus preferred to found a SL as a working partner if the proportion of women was at least equal, if not predominantly female. This suggests that women are more likely to be involved in SLs if men are not more strongly represented relative to women. Since a quarter are women-only SL foundations, the data suggests that the presence of women has a positive impact on women's

participation. However, as the data only captures the composition at the moment of foundation and many of the SLs consist of very few founding members, it is difficult to make a generalised statement. The results may also be due to a methodological artefact.

4.3. Evaluation of Hypothesis 2

In order to find out to what extent women are more responsive to subsidies, the two sub-hypotheses of hypothesis 2 were statistically evaluated. For this purpose, the data first had to be examined and correlations between all the individual variables were determined. Since the subsidies were unfortunately not recorded for the Basque Country, the data relating to this region had to be excluded from the correlation. The results are presented in Table 3 below.

Table 3

Pearson-Correlation table

		Year	Working Partners in SL -Women	Working Partners in SL - Men	Subsidy 1	Subsidy 2	Subsidy 3	Subsidy 4	Subsidy 5	Total Subsidies	Percentage Women
Year	Pearson-Correlation	-									
	Sig. (2-sided)										
	N										
Working Partners in SL Women	Pearson-Correlation	-,927**	-								
	Sig. (2-sided)	<,001									
	N	16									
Working Partners in SL Men	Pearson-Correlation	-,929**	,991**	-							
	Sig. (2-sided)	<,001	<,001								
	N	16	16								
Subsidy 1	Pearson-Correlation	0,133	0,07	0,027	-						
	Sig. (2-sided)	0,624	0,797	0,921							
	N	16	16	16							
Subsidy 2	Pearson-Correlation	,513*	-0,29	-0,34	0,468	-					
	Sig. (2-sided)	0,042	0,276	0,197	0,067						
	N	16	16	16	16						
Subsidy 3	Pearson-Correlation	-,535*	0,447	0,454	-0,038	-0,158	-				
	Sig. (2-sided)	0,033	0,083	0,077	0,889	0,56					
	N	16	16	16	16	16					
Subsidy 4	Pearson-Correlation	-,623**	,812**	,778**	0,426	0,202	0,347	-			
	Sig. (2-sided)	0,01	<,001	<,001	0,1	0,454	0,187				
	N	16	16	16	16	16	16				
Subsidy 5	Pearson-Correlation	-0,148	0,085	0,139	-0,286	-0,273	-0,077	-0,13	-		
	Sig. (2-sided)	0,585	0,754	0,607	0,283	0,306	0,776	0,631			
	N	16	16	16	16	16	16	16			
Total Subsidies	Pearson-Correlation	,811**	-,617*	-,643**	,526*	,793**	-0,357	-0,131	-0,28	-	
	Sig. (2-sided)	<,001	0,011	0,007	0,036	<,001	0,174	0,629	0,294		
	N	16	16	16	16	16	16	16	16		
Percentage Women	Pearson-Correlation	,567*	-0,446	-,537*	0,406	,829**	-0,23	-0,04	-0,417	,707**	-
	Sig. (2-sided)	0,022	0,083	0,032	0,119	<,001	0,391	0,884	0,108	0,002	
	N	16	16	16	16	16	16	16	16	16	

Note: ** The correlation is significant at the 0.01 level (2-sided).
* The correlation is significant at the 0.05 level (2-sided).

The results of the Pearson Correlation analysis indicate that the year is strongly correlated with almost all other variables. As such, a strong negative association between the year and

the male ($r(16) = -.929$, $p < .001$) and female working partners ($r(16) = -.927$, $p < .001$) was found. In both cases the *r* value is above 0.9 and thus almost at one, which indicates a very strong relation. The correlation is particularly strong, given that Cohen refers to a large effect as of 0.5 and other researchers even as of 0.3. The values 1 and -1 would indicate a perfect linear relationship between the variables, representing an upward and downward facing trend, respectively. The year furthermore shows a strong, positive correlation with the percentage of women ($r(16) = .5$, $p = .02$). Similarly, the total subsides too correlates significantly with the year. Subsidies 3 and 4 both show strong negative associations with the year, whilst subsidy 2 boasts a strong positive correlation. It becomes evident, that the year is strongly interconnected with many of the analysed variables. The extreme (negative) influence of the year on the number of new working partners, especially, is demonstrably of such magnitude that it must be withdrawn from the analysis and instead considered as a control variable.

4.3.1. Evaluation of Hypothesis 2.1

The sub-hypothesis 2.1 could be evaluated after the data was properly examined. For this evaluation a hierarchical multiple regression was performed, which controls for the influence of the predictor *year*, which has proven to be very influential and thus had to be excluded. In doing this, the influence of the other predictors on the dependent variable (percentage of women) can be better examined. The influence of each subsidy can thus be determined beyond the variable time. As an additional predictor, the influence of the five subsidies on the dependent variable is tested.

The results of the regression indicate that in model 1, the year alone already explains a significant proportion of variance with 32% ($F(1,14) = 6{,}646$, $p = .022$, $R^2 = .32$). In model 2[16], which tests the additional effect of the subsidies on top of the variable year, it becomes clear that the variance improves when the five subsidies are included as independent variables. In this case, the combined effect of the year with the other independent variables (the five subsides) explain a 48% improvement of the variance in the dependent variable - the

[16] This model tests the complementary effect of subsidies on the percentage of women and examines how much variance they can explain beyond the variance explained by the predictor time.

percentage of women as new founders (R^2 change: .483). Including all variables in this second model, a collective significant effect between year each subsidy as an independent variable was found (F(6,9), p = .009, R^2= .801).

When controlling for the influences of the year as the independent variable, the regression coefficient of subsidies 1 (β = .336, t=1.596, p =.134), 2 (β= .730, t=4.229, p < .001), 3 (β = .103, t =.348, p = .707) and 4 (β = .513, t =2.011, p = .066) show a tendency to have a positive effect on the ratio of women. Subsidy 5, on the other hand, indicates a negative tendency (β= -.341, t= - 1.619, p = .129). However, only the second variable, namely the subsidy for dissemination, promotion, and training predicted the percentage of women as new founders to a significant level (p < .001). This indicates that with each additional euro of subsidy 2, the percentage of women in the new founders increase by 0,73 percent approximately. The other independent variable that reached a statistically significant level (p < 0.1) is the subsidy for investment in fixed assets. This suggests that with each additional euro for the fourth subsidy, the percentage of women as new founders within SLs increases by the equivalent of approximately 0,51 percent.

4.3.2. Evaluation of Hypothesis 2.2

To further compare the influence of the different variables on the development of the absolute numbers of men and women among themselves, a partial correlation was carried out, which took the year as a control variable. The results of the partial correlation are presented in Table 4.

Table 4

Partial correlation table

Contol Variable			Working Partners in SL Women	Working Partners in SL Men	Subsidy 1	Subsidy 2	Subsidy 3	Subsidy 4	Subsidy 5	Total Subsidies	Percentage Women
Year	Working Partners in SL Women	Correlation	-								
		Sig. (2-sided)									
		df									
	Working Partners in SL Men	Correlation	0,938	-							
		Sig. (2-sided)	<,001								
		df	13								
	Subsidy 1	Correlation	0,521	0,41	-						
		Sig. (2-sided)	0,047	0,129							
		df	13	13							
	Subsidy 2	Correlation	0,577	0,428	0,471	-					
		Sig. (2-sided)	0,024	0,112	0,077						
		df	13	13	13						
	Subsidy 3	Correlation	-0,157	-0,138	0,039	0,161	-				
		Sig. (2-sided)	0,577	0,623	0,889	0,567					
		df	13	13	13	13					
	Subsidy 4	Correlation	0,802	0,69	0,656	0,775	0,021	-			
		Sig. (2-sided)	<,001	0,004	0,008	<,001	0,94				
		df	13	13	13	13	13				
	Subsidy 5	Correlation	-0,14	0,006	-0,272	-0,233	-0,187	-0,287	-		
		Sig. (2-sided)	0,62	0,983	0,327	0,404	0,504	0,3			
		df	13	13	13	13	13	13			
	Total Subsidies	Correlation	0,618	0,513	0,722	0,751	0,155	0,818	-0,277	-	
		Sig. (2-sided)	0,014	0,051	0,002	0,001	0,58	<,001	0,318		
		df	13	13	13	13	13	13	13		
	Percentage Women	Correlation	0,261	-0,031	0,405	0,761	0,106	0,487	-0,41	0,512	-
		Sig. (2-sided)	0,348	0,912	0,134	<,001	0,707	0,066	0,129	0,051	
		df	13	13	13	13	13	13	13	13	

Subsidies 1 and 2 are found to have strong positive correlations with the number of female working partners at the $p < .05$ level. The same subsidies show weaker relationships with male partners and furthermore, do not reach a statistically significant level. Subsidy 4 (investment in fixed assets) is strongly positively correlated with the number of women who have founded an SL as a working partner ($r(13)= .802$, $p < .001$). However, the same holds true for this form of subsidy for men founding a SL, too ($r(16)= .69$, $p = .004$). Whilst the subsidy 4 correlation is slightly larger for women than for men, these two correlations do not differ at a statistically significant level according to the Fisher Z test ($z= .639$, $p = .261$). Similarly, total subsidies are positively related to the number of new female and male working partners, both to which are at a statistically significant level. The difference between these two strong correlations, which both the number of new male female working partners have with the total subsidies, is not significant according to Fisher's test. Accordingly, total subsidies do not correlate stronger with women as new founders of SLs than with men.

Hypothesis 2.2 must therefore be rejected for the entire subsidies, as well as for subsidy 4, which also showed a strong correlation with both groups, and subsidy 5, which did not show a significant correlation with either the number of new female or new male partners. Conversely, for subsidy 1 (the integration of new workers) and subsidy 2 (dissemination, promotion, and training), hypothesis 2.2 can be accepted.

4.4. Evaluation of Hypothesis 3

To approach the question whether women react stronger to the incentive of capitalising unemployment money for founding an SL, a hierarchical linear regression was conducted to evaluate how well the number of new female partners from the number of women using unemployment benefit for SLs could be predicted. The result of hierarchical linear regression revealed a statistically significant prediction (F(2,5), $p < .001$, $R^2 = .983$). Taking the year as a control variable, the regression coefficient ($\beta = .412$, t=4.41, $p = .007$) associated with the number of women using their unemployment benefit suggests that with each additional woman making use of their unemployment benefit, the number of new female partners increases approximately by 0.412.

To identify whether the effect of unemployment benefits is particularly relevant for women, the same test was conducted for new male partners in SLs. Thus, another hierarchical linear regression was generated to evaluate how well the number of new male partners from the number of men using unemployment benefit for founding a SL as a working partner could be predicted. The analysis revealed a statistically significant result (F(2,5), $p < .001$, $R^2 = .975$). When controlling for the influences of the year as an independent variable, the regression coefficient ($\beta = .851$, t=6.438, $p = .001$) for the number of men capitalising unemployment money as the independent variable indicates that with each additional man investing their unemployment benefits in SLs, the number of new male partners increase by approximately 0.851. As can be seen, the regression coefficient is significantly larger by men and thus the positive effect of capitalising on new partners exists for both genders. The results do not suggest that this is particularly incentivising for women to found new SLs. Rather the opposite is apparent, as the coefficient is much larger for the male partners. To prove this hypothesis, however, the analysis would have to be structured differently. The results of this analysis lead to the rejection of the hypothesis that the unemployment benefit is a stronger incentive for women to start an SL than for men.

The same research design was tested for the data from the Basque country. However, none of the two hierarchical linear regressions showed a statistically significant result for the use of unemployment benefits to predict the number of women as new working partners (F(2, 5), p= 1.019, R^2 = .29) or men as new working partner F(2, 5), p= .820, R^2 = .028). The hypothesis that the use of this money has a stronger effect on women founding SLs must therefore be rejected for this region.

4.5. Evaluation of Hypothesis 4

The fourth hypothesis assumes that progressive policies have a positive influence on the percentage of women in SLs. To test this hypothesis, the influence of progressive policies in the Basque Country were compared to the influence of the Spanish political environment on percentage of women founding SLs.

A progressive environment was defined as the independent variable for this purpose and the influence on the dependent variable, the percentage of women, was determined using a linear regression. The factor 'progressive gender politics' was operationalised by using the year as the independent variable. Since it can be assumed that the positive aspects of progressive gender policies unfold differently over the years in both Spain (with less progressive influences) and the Basque Country, a change in the gender ratio in SLs over time should be due to the political circumstances. Most of the influencing variables that exist beyond that should be stable and rather similar in the two regions.

For this purpose, a simple linear regression analysis was used to test whether the time significantly predicted the percentage of women in SLs in Spain. The results of the regression indicated the predictor explained 32% of the variance (R^2=.32, F(1,14)= 6.646, p = .022). Furthermore, it was found that the year significantly predicted the percentage of women (β = .567, t = 2.578 p =.022). In order to compare this effect to the assumably more progressive Basque country, the same module was run to see if the effect of the year would be stronger there. The overall regression was statistically significant as well. Yet the predictor explained only 26,6 % of the variance in the dependant variable (R^2= .266, F(1,14)= 5.07, p = .041). It was further found that the regression coefficient was slightly smaller (β = .516, t = 2.252 p = .041) than that found in Spain. As such, Hypothesis 4 can be rejected as the neither the overall regression nor the regression coefficient indicates a stronger effect in the Basque Country.

However, the particularly progressive Norma Foral 6/2016 only entered into force in 2016 and is presumably having a significant effect on female entrepreneurship in the Basque region. Hence, hypothesis 4 was further investigated, however this time for a much shorter period of time, from shortly before the law was enacted until today. As such, a linear regression was once again run to test if the shorter time period (2015-2021) significantly predicted the percentage of women in SLs in Spain. The regression was found not to be significant (R^2=.052, $F(1,4)$= 0.22, p = .663). Resultantly, the regression coefficient does not indicate a significant prediction for the year on the percentage of female SL founders in Spain (β = .228, t = 0.496 p =.663). Similarly, a newly defined regression was analysed in the Basque Region, however, revealed a statistically significant relationship. The results of the regression indicated the predictors explained a high percentage of 91,2% of the variance (R^2=.912, $F(1,4)$= 41.662, p = .003). Moreover, it was found that the time variable significantly predicted the percentage of women founding SLs in the Basque Country (β = .955, t = 6.455 p =.003).

In a next step, it had to be tested to what extent this considerable difference in the influence on gender ratio could be attributed to a substantially different development of the SLs in the two regions. It was therefore necessary to correlate the year factor with other membership variables (absolute number of men and women in both regions) to see whether significant differences could be found here as well. The results are displayed in the correlation table (Table 5). Although the correlations differ to a certain extent, the differences between the correlation coefficients of the female partners in the Basque Country and in Spain were not significant according to the Fisher Z test conducted. The same applies to the difference between the correlation of the time and the male partners in both regions. Thus, the only statistically significant difference was found within the effect of the time on the percentage of female founders in SLs in both regions. Despite the initial rejection of hypothesis 4 for the (initial) entire period, it can nevertheless be accepted for the reduced observation period from 2015 to 2020. Due to the very restricted sample size, however, the results must be treated with scepticism.

Table 5

Correlation table Hypothesis 4

		Year	female working partner (Spain)	male working partner (Spain)	female working partner (Basque Country)	male working partner (Basque Country)
Year	Pearson-Correlation	-				
	Sig. (2-sided)					
	df	.				
female working partner (Spain)	Pearson-Correlation	-,925**	-			
	Sig. (2-sided)	0,008	.			
	df	6				
male working partner (Spain)	Pearson-Correlation	-,938**	,911*	-		
	Sig. (2-sided)	0,006	0,012	.		
	df	6	6			
female working partner (Basque Country)	Pearson-Correlation	-,901*	,864*	,958**	-	
	Sig. (2-sided)	0,014	0,026	0,003	.	
	df	6	6	6		
male working partner (Basque Country)	Pearson-Correlation	-,893*	,826*	,961**	,991**	-
	Sig. (2-sided)	0,017	0,043	0,002	<,001	.
	df	6	6	6	6	

Notes: ** The correlation is significant at the 0.01 level (2-sided).
* The correlation is significant at the 0.05 level (2-sided).

5. Discussion

The analysis focused on the question of how RECs can unfold their full potential and gain more appeal across the population, thus expanding their previously limited demographic. While this is of great interest for the energy transition, it is equally important for combating energy poverty, an issue that is becoming considerably problematic in view of the current sharp rise in prices in Europe. The "transformative effect on women of access to affordable, reliable and sustainable modern energy is well known (IRENA, 2019, p. 14). Tapping into a larger proportion of female participation in RECs has therefore been the focal point of current research. A higher proportion of women in the membership of RECs would bring diverse benefits at the organisational and production levels and engage the yet under-activated female networks.

Based on the repeatedly proven fact that there is a large overabundance of middle-class men among the members of RECs, it was investigated how the membership could in turn become more attractive for women and which favourable conditions are required for this. To this end,

various potential influencing factors from the structurally similar context of SLs in Spain were examined. The results of the static analysis presented in the previous section allow some conclusions to be drawn about facilitating factors for women's integration into SLs. These findings can, to a certain extent, be extrapolated and applied to the field of RECs. In the following, the various findings are therefore transferred to the field of RECs and presented in numerical order with respect to the hypotheses. Subsequently, the larger implications of these findings are elaborated, providing insights for the future interplay of the gender-energy nexus. The limitations of the study as well as an outlook on the field of research are too presented and discussed in the closing of this section.

5.1. Interpretation of the Statistical Findings

The statistical results must firstly be summarised and reasonably classified. Therefore, the findings on the individual hypotheses are interpreted against the background of the barriers for women presented in section 2.3.2.

5.1.1. The Influence of Gender Ratio

The first hypothesis states that women are more likely to become active in SLs when other women are also involved. This hypothesis was supported by a descriptive analysis of the composition of SLs founded in the Basque Country between 2003 and 2012. The analysis revealed that women prefer to join SLs whose investor structure is characterised by gender equality or with a female majority. This is especially reflected in the low participation of female new working partners in SLs which have a very low proportion of women. Only 10% of the women who founded SLs as working partners did so in companies with a female share of up to 20%. In contrast, a full quarter invested in all-female SLs as working members. Similarly, the majority of women (62%) entered either egalitarian or predominantly female working partner investor compositions. This indicates that women prefer other women to be in their environment as co-founders as opposed to predominantly male compositions. In this respect, it should be noted that the figures only cover the founding moment and the composition of founders who are working partners and investing partners.

The start-up of a company represents a moment that carries an increased perceived risk of investment in comparison to joining an existing SL later. It has been widely reported that women tend to be risk averse in their investment decisions, especially when they do have

limited resources at their disposal (Benjamin et al., 2010; Nelson, 2015; Palvia et al., 2015). Thus, the findings are pertinent to the circumstances under which women make risky financial decisions.

The involvement of women in a project can encourage the interest of other women in various regards. It can provide more security and give the investment a less risky appearance. On the one hand, female investors can exchange with and encourage each other. A form of female empowerment can thus emerge, which lowers the individual inhibition threshold to invest and leads to the exchange of knowledge and capacities among women. On the other hand, an equally weighted composition of women contributes to breaking down male perceptions of this field, thus helping women find the field more accessible and approachable through other women. This is particularly important when considering the findings that women on average perceive themselves as less competent in the field of investment (Skonieczna & Castellano, 2020). Female role models, to whom potential investors could identify with, could be an advantage in this respect, such that the domain of investment ceases to appear male dominated and something requiring specialised skills. This process of deconstructing the stereotypical perception of this field is crucial for the sustainable and ongoing inclusion of women. It implies that the effort to attract more women as investors and thus increase their compositional proportion of this group automatically creates a more attractive environment for other women. Another important contributing factor is the proven activation of social capital within female networks (Łapniewska, 2019). This functions similarly to positive feedback loop mechanisms, such that more female participation leads to an increase in networking (especially in female groups), which consequently leads to more female participation.

However, in order to accurately pursue and verify this assumption, which is highly interesting for RECs, it would be necessary to collect long-term data that captures the development of female membership. Only long-term data can fully evaluate whether women are more likely to invest in female networks and organisations. Unfortunately, the data from the Basque Country used to test the first hypothesis, as well as the MITES data, only refer to the time of foundation. Furthermore, the motivation of the people to found SLs in the Basque region was not surveyed, so that no further conclusions can be drawn.

5.1.2. The Influence of Subsidies on Women's Investments in SL

The second hypothesis states that subsidies have a positive impact on the percentage of women in SLs. This hypothesis could be accepted for some of the subsidies. The subsidies which, after isolating the strong influence of the year, significantly increased the percentage of women working partners were subsidies 2 and 4, for promotion, dissemination, and training, and for investment in fixed assets, respectively.

Training and education offers are an essential component for the promotion of women. Ideally, they should be adapted to the specific needs of the participants, however, the exact design of the trainings is not apparent from the MITES data. Training and learning of supposedly lacking skills is seen as a central aspect of gender mainstreaming in the EIGE evaluation (EIGE, 2016c, 2016a). For instance, it is an essential part of many empowerment programmes in the field of electrification in the Global South (Winther et al., 2020). Subsidies for education and training may contribute to saving time and resources that women would otherwise have to spend to inform themselves sufficiently about the investment.

Subsidy 4, for investment in fixed assets, almost also reached a significant level. In addition, the subsidies for the recruitment of working partners and technical assistance also tended to have a positive effect on the increase in the percentage of women among new working partners. When comparing the correlation of the five subsidies with the absolute numbers of male and female working partners, it was noticed that more subsidies correlated positively with the number of female new partners than with the male ones. Thus, it can be concluded that subsidies in general are an important indicator and promoter of female participation in SL start-ups.

Due to their lower income combined with greater risk aversion, it is not surprising that government support in the form of financial assistance has a greater effect on this group than on men. The greater sensitivity to tax incentives has already been scientifically proven (Bettio & Verashchagina, 2009). The subsidies counteract the structural gender inequalities that clearly exist at the financial level. However, recent research on subsidies in the Global South also shows that not all subsidies are equally effective in empowering women (Feenstra, 2021; Khamati-Njenga & Clancy, 2002). In the future, it would therefore be necessary to examine

and identify which forms of subsidies actually make a significant contribution to gender equality with respect to membership distribution of RECs.

5.1.2.1. The Influence of Other Financial Incentives

It appeared that the capitalisation of unemployment benefits was not particularly decisive for the establishment of SLs. Hypothesis 3 therefore had to be rejected. The possibility to capitalise unemployment benefits did not show a strong effect on women, rather the hierarchical linear regression showed a larger effect on men, although not tested for statistical significance. The effect size was large for both genders, yet these benefits have a less gender-specific effect than the subsidies, whose effects on women were significantly larger.

One reason for this may be that this form of financial support does not necessarily eliminate the financial burden for people (especially women) receiving such benefits when it comes to investing. Even though this socio-economic instrument is quite valuable and provides poorer people with important access to building up property and investments, it was less powerful for the integration of women into this form of investment than the direct subsidies were. It neither reduces the economic nor the knowledge gap between men and women to the same extent as subsidies do. Based on these results, it can be assumed that financial support aimed at empowering women in investment must have certain characteristics and be conceptually aligned. Thus, the comparison of monetary subsidies and the capitalisation of unemployment benefits shows that support should have a financial added value and serve the goal of easing the burden. As such, structural inequalities must be targeted or addressed at important vulnerable points, as the subsidies for training do, for example.

Yet, it is also important to avoid interpreting the results of this analysis in an overly definite way. It is important to note that the data collection period for the capitalisation of unemployment benefits was rather short due to the limited amount of data gathered and thus available. The effects, or in this case lack of significant effects, may also be due to these circumstances. The same applies to the non-significant results for the Basque Country. It is likely that the rejection of hypothesis 3 is due to statistical shortcomings.

5.1.3. The Influence of Gender Responsive Policies on Female Investments

The last hypothesis tested states that policies targeting equal opportunities for women have a positive impact on the percentage of female investors. This hypothesis is plausible for a very limited period (2015-2020), however must be rejected for the entire period from 2005 to 2020. The comparative correlation between the influence of time on the percentage of new female entrepreneurs in Spain as a whole and in the Basque Country aimed to see to what extent the progressive laws of the Basque region have a measurable influence. Time as a predictor is considered a variable that implies policy development and the impact of legislation, as its influences are difficult to measure otherwise. Certainly, other temporary political or social events can also have an impact and influence over time. Economic crises, for example, are one such factor; a decline in new members can also be seen in Figures 5 and 6 in both regions around 2008. However, major economic or political developments would in most cases affect both Spain and the Spanish autonomous region of the Basque Country, so differences between the two geographical points of interest are nevertheless to some extent due to different gender policies. Namely, the difference between the regions lies in the focus on gender equality, which is present in many areas in the Basque region. The progressive region attracts attention with laws such as the Norma Foral 6/2016, and as pioneers in gender budgeting or with its ground-breaking analysis of the integration of gender in public policies (De Villota, 2016; De Villota et al., 2009).

That said, the statistical analysis showed no significant differences in the percentage of female new working partners between the two observed regions for the entire 16-year period. However, since the Norma Foral 6/2016 was only introduced in 2016, which is undoubtedly very influential for women's participation in SLs due to the tax advantages in entrepreneurial investments, the period from 2015 was once again considered separately. Yet it must be kept in mind that this significantly reduces the already limited data base. It is therefore more surprising that even with such a small data base, the predictive effect of time on the percentage of women in the Basque Country who start new SLs as working partners is found to be very strong and statistically significant. The same model showed no significant effects for the country as a whole. Moreover, comparing the relationship between the year and the total number of partners (male and female) in both geographical observation areas showed no notable difference. In both cases, men were affected to the same extent The possibility of

the total number of new entrepreneurs being favourable in the Basque Country can be ruled out. Similarly, other major influences that affect entrepreneurship in general can be negated due to this comparison with the total number of male partners in both regions. Evidently, the effect was exclusively reflected in the percentage of women in the Basque Country. For the period between 2015 and 2020, there is a very clear effect of the socio-political circumstances in the Basque Country, which had a strong positive effect on the proportion of women as new founders. Due to the limited data available, however, this result should be treated with circumspection. Further studies with more recorded (gender disaggregated) variables should be able to shed light on this in the future. The findings of this study, however, might serve as a first step and motivation for future research.

Nevertheless, this result is of great interest for the research question. In particular, the preferential tax treatment of women is controversial among experts, a concept the Norma Foral 6/2016 introduces (Bettio & Verashchagina, 2009). Data analysis indicates that tax incentives and progressive gender policies have a major impact on activating female entrepreneurship. Implementation of gender budgeting and gender-sensitive distribution of public funds is also considered an important element of the gender mainstreaming plan developed by the EIGE (EIGE, 2016c). Consequently, the broader policy contexts are very important in creating an enabling environment for female investors. Targeted and gender-specific instruments ultimately have a greater impact than broad-based subsidies. If empowerment and activation of a female clientele is desired, these measures have been shown to be remarkably effective.

5.2. Implications of the Findings for RECs

The findings from the statistical data analysis on founding members in SLs in Spain and the conditions that have been identified as facilitating women's participation are now explored for their implications in the context of RECs. While this transferability may not be completely assumed, the structural similarities and the lack of better data has already been highlighted. Nevertheless, in the following it should be highlighted once again that the political context is different, and that SLs are worker owned companies with no direct focus on renewable energies and remain capital-incentivised in nature. Despite this, some conclusions can be drawn about the activation of female members and meaningful measures in this regard. Among the main findings are:

i) RECs should promote more visibility of women;

ii) they should prioritise women's empowerment by conceptualising and offering specific technical and gender-sensitive trainings;

iii) RECs must also provide financial incentives to female members to make membership more attractive to women.

5.2.1. The Contribution of Visibility and Networking to Counteract Stereotypical Perceptions in STEM

A problem that is of great consequence for participation in RECs is that renewable energy installations belong to a very technical field. Thus, wind turbine or PV installations fall into the STEM knowledge domain which is stereotypically perceived as a male field of expertise (Clancy & Feenstra, 2019; EIGE, 2016b; IRENA, 2019).Women are less likely to work in the energy sector due largely to the stereotyped perceptions of the field (Feenstra, 2021; Skonieczna & Castellano, 2020). The SL data implies that the presence of women on the founding team makes it more attractive for other women to start SLs. As such, RECs should also aim to greatly increase the visibility of women. For the STEM sector in particular, women's visibility has been identified as an important catalyst for other women's interest (Clancy & Feenstra, 2019; EIGE, 2016b). This could be essential to better reach this group as investors in RECs and to get more women involved in these cooperatives. On the basis of the foregoing research analysis, three approaches for increasing the visibility are recommended: 1. marketing, 2. networking, 3. mentoring.

For one, visibility can be increased through marketing and external representation. By promoting the visibility of women as workers and members of RECs, it conveys a message to the outside world that normalises their involvement and in doing so, deconstructs the norms of a traditionally male dominated industry. This also corresponds to the recommendations of the gender mainstreaming toolkit, whereby the working output should visibly contribute to gender equality (EIGE, 2016c). Various other institutions also recommend this targeted approach to women, such as the Division for Gender Equality within the UNESCO (2011) and various researchers. GoiEner, a REC that is particularly active and successful in their inclusion of female members in the Basque Country, can be mentioned as a positive example in this respect. They pursue a very feminist and egalitarian outward representation in gendered

texts and illustrations (GoiEner, n.d.). As a result, they are very attractive to women and have a very balanced membership. Nevertheless, this may be due to other circumstances that cannot be further examined here.

Furthermore, RECs could use their existing female members and their female networks as a way to promote the effect that women can better motivate other women to get involved in cooperatives (Łapniewska, 2019). There are two ways to do this: externally and internally. On the one hand, women should be present as contact persons and give presentations at events that advertise to the outside world (IRENA, 2019). Since women are better than men in advising fellow women on energy efficiency, they should too do so in external promotion (Clancy & Feenstra, 2019). Internal networking between women could be enhanced, for example, through peer-to-peer exchanges. Considering the existing prejudices and resulting thresholds in this sector, these might be both more appealing to women and more frequented. The benefits of cooperative structures, as emphasised by Yildiz and Radtke (2015), such as pooling knowledge and skills and passing them on between members, would be made more accessible to women through peer-to-peer exchanges. Likewise, mentoring programmes could be introduced, which could be offered by existing female members to new female members. In its analysis of barriers for women in the energy sector, the EIGE identifies the absence of such an offer as a major problem (EIGE, 2016b). Similarly, IRENA's large-scale study in the energy sector found that networking and mentoring opportunities were rated by 68% of respondents as the most important tool for achieving gender equality in their sector (IRENA, 2019). "There is an urgent need to level the playing field by improving women's access to such information and peer support."(IRENA, 2019, p. 44). This has also been confirmed for the REC sector. Access to information on the functioning of these communities is equally important in this field as access to knowledge about investments (Hanke & Lowitzsch, 2020; Lowitzsch & Hanke, 2019).

Visibility and the resulting peer support in the form of networking and mentoring opportunities are a crucial part of bringing more women into RECs, as they significantly contribute to breaking down socially and culturally entrenched stereotyped perceptions (Clancy et al., 2017; IRENA, 2019) and in doing so, increases the attractiveness of RECs for women. At the same time, networks and female mentoring programmes facilitate access to

essential knowledge that could help women enter RECs. Lessons can be learned from other fields with strong female networking, mentoring, and increasingly public speaking.

5.2.2. The Role of Training in Women's Empowerment

In addition to networking and mentoring, the IRENA report showed that training was assessed as very important by the respondents. RECs should also adopt peer-to-peer approaches to education and training, as these are seen as particularly incentivising and an essential gateway to increasing women's involvement in the energy sector (Clancy & Feenstra, 2019). The results from the analysis on women's participation in SLs confirms the importance of access to training for achieving greater gender equality. The previous analysis showed that subsidies for training and promotion had a significant effect on the percentage of women in the founding team. Building on these findings, RECs should also focus explicitly on this aspect, as training can address potential knowledge gaps in the energy sector and/or in investing. This is particularly relevant due to the interest and knowledge gap between men and women in the STEM sector, which is created by cultural and social norms, as well as by gender gaps in energy-related education (EIGE, 2016b; IRENA, 2019; Skonieczna & Castellano, 2020). Training and education on the technical aspects of renewable energy and investments would therefore give women the necessary tools to become more confident and active in RECs.

In the context of the electrification in the Global South, trainings have already proven to be a very effective means of building new capacities and promoting women's empowerment (Clancy et al., 2002; IRENA, 2019; Khamati-Njenga & Clancy, 2002; Moodley et al., 2016; UN Women, 2015). Whilst the experiences of the Global South cannot be identically transposed, it is important to recognise that there are inequalities in access and use of energy in the Global North as well (Clancy et al., 2017; Feenstra, 2021; Standal et al., 2018). To this end, trainings in the experiential field of electrification projects in the Global South have not only imparted technical knowledge but have also given women more strength and self-confidence to engage in other areas of female inequality and rights (Feenstra, 2021). This aligns with the EIGE's concept of full gender mainstreaming, which includes education in building sensitivity to gender inequalities.

From this it can be concluded that training in the context of RECs should ideally take both aspects into account: they should teach necessary technical skills and pass on economic

knowledge, which is important to compensate for possible inequalities in background circumstances. However, training in RECs should also sensitise people to gender differences and train them to deal with discriminatory structures. This is of particular importance in RECs, which follow a very democratic approach in their decision-making processes. They are characterised by the autonomous control from the members themselves, and have the goal of ensuring that everyone is equally involved in decision-making processes. By doing so, it is possible to guarantee that all approaches and ideas are heard equally and are actually incorporated into the processes (Huybrechts & Mertens, 2014; Lowitzsch & Hanke, 2019; Yildiz & Radtke, 2015). In order for this to be truly successful, an equal level of knowledge with regard to technical aspects, and the equal acceptance and status of all with regard to the inter-member discourses are an important prerequisite. Specific trainings could help to create a level playing field between the genders.

5.2.3. The Importance of Financial Subsidies

Economically empowering (supporting) women and providing them with more financial resources is also an integral part of women's empowerment (UN Women, 2015). Within the European context, this is also highly relevant, as women are still disadvantaged and have less money to spend due to part-time work and lower pay (European Commission, 2018; Eurostat, 2021a, 2021d). Entrepreneurship subsidies specifically for women exist in some countries and are having an impact (Hallef, n.d.).

Evidence from the analysis of data on SLs shows that subsidies generally showed to be favourable for the share of women as new entrepreneurs. Such findings should be taken into account by legislators at the European and national or local levels. Subsidies and financial instruments thus play a major role in the integration of women as investors. However, the analysis of subsidies compared to the prospect of capitalising unemployment benefits (see results from section 4.4) also revealed that not all financial incentives have the same impact. While subsidies had an effect, the possibility to use unemployment benefits, although conducive to investments per se, did not produce a difference between the genders.

According to the IRENA report, targeted financial instruments are essential for women to play an active role in the renewable energy value chain. Financial instruments and support for women investing in RECs should therefore analyse the challenges in advance to ensure that

they are targeted and meet women's needs. Such tools should consider the multiple resource constraints (financial and time) of women and provide relief at one of these levels, as various burdens hinder women's engagement in the RE sector and thus also in RECs (Clancy et al., 2002; EIGE, 2016b; Hooper et al., 2021; IRENA, 2019). This is why subsidies are particularly important for RECs. These cooperatives are characterised by being equally open to all persons within close proximity of RE projects, as postulated by Art. 2(16) of RED II. Financial support for women would hence create equal access for them and as such, contribute to more equitable access conditions for everyone within the vicinity of the RE installation.

5.2.4. The Roll of Gender Policies

Another aspect that needs to be addressed is gender policy, which is a particularly important factor that can make meaningful contributions to the integration of women in RECs. These policies lay the foundations and preconditions for female entrepreneurship to thrive in RECs. The comparison between the development of the share of female investors in the Basque Country and in Spain shows that legal policies have an enormous effect on women's participation. Although the analysis is based on a small data set and can therefore only be interpreted to a limited extent, the tendency showed a strong effect of progressive local legislation in the Basque Country. This region is striking for its strong feminist policies and explicit focus on women's empowerment. The progressive, specific tax cuts aimed at financial support and relief for women should also be mentioned here.

Based on these findings, it can be concluded that explicit support mechanisms and a positive policy environment for women's participation should also be built into REC legislation. The new Article 41 stipulates of the code de l'énergie can be taken as a good example as it implements explicit mechanisms for the integration of poorer people in RECs. Women and vulnerable groups require more consideration in the national implementation of the RED II, which sets the basis for the design of RECs. Such groups should receive special attention and be explicitly targeted. This would first require specific collection of gender disaggregated data to make the discrepancy measurable. These are lacking in both the REC field and in the general energy sector (Cannon & Chu, 2021; Łapniewska, 2019; Winther et al., 2020). Nonetheless, it is also the task of the EU institutions to determine concrete key points and to provide clearer definitions of vulnerable consumers and/or explicit inclusion. A

standardisation of these definitions has been lacking so far, as many have criticised (Bouzarovski et al., 2020; Filippidou et al., 2019; Pye et al., 2015). Definitional clarity and a broad data set are essential prerequisites to ensure just and gender-sensitive laws that enable RECs to maximise their potential and reach a broader demographic.

Gender-specific laws or subsidies can thus only be effectively designed and carefully chosen on the basis of these principles. They must address the structural marginalisation of certain dynamics and needs that women, in particular, have due to their role in society. At the same time, scholars warn against categorising too broadly and inconsiderately applying these categories as a simple "add-on" to the design of energy policies (Cannon & Chu, 2021; Standal et al., 2018). Doing so risks a simplistic view of the role of women as needy, oppressed, and vulnerable.[17] The conception of gender must not be overexaggerated and a dichotomous division of society must be avoided and must not be grossly overemphasised (Arora-Jonsson, 2011; Listo, 2018; MacGregor, 2010). Listo, in fact, refers to the creation of gender myths that are instrumentalised to commercialise certain technology without really making a difference to equality. The narrow path lies in the art of creating energy policies that deconstruct gender inequalities in the access to and use of energy, and to conceive them in holistic approaches that are truly fair to all people. Yet these laws and policies must not propagate supposed gender neutrality, as quickly happens in Nordic and very egalitarian societies. Ultimately, it is about empowering women in their access to energy and creating equitable energy policies. This applies equally to policies written for RECs.

5.3. Women's Empowerment at the Meso and Macro Levels of Energy Policy Legislation

As a final point, reflections will be made as to how the entire decision-making structure needs to be revised to ensure that energy policy discourses are gender responsive. Thereby, important basic structures for RECs will be discussed that guarantee sustainable gender equality. Feenstra and Özerol (2021) see women’s empowerment as one of three central levers to advancing the engendering of energy policy discourses. Empowerment, as a core element of feminist theories, describes the process by which people who have structurally less power empower themselves by acquiring new positions and skills and by making their

[17] The same applies to an artificial amplification of the North-South vulnerability gradient, if one considers the global context (Arora-Jonsson, 2011)

voices heard. The aforementioned aspects, which were elicited based on the results of the statistical analysis, all constitute important components of empowerment as well. Increased visibility, mentoring, networking, training, direct and targeted financial support, and targeted gender policies are all essential to the empowerment of women in RECs. Each of these aspects facilitate the necessary concepts and competencies for female empowerment.

Another principle of empowerment, which goes beyond the data analysis above, is of great importance for more gender equality in RECs. It entails people being consulted on socio-political issues and working out a new standing for themselves (Mosedale, 2005). This participatory component is an indispensable basis for empowerment. As such it is the necessary impetus for processes that create a gender just policy, which acknowledge the needs of both women and men, ultimately leading to a gender-just policy impact based on universal human rights (Feenstra and Özerol, 2021). For that purpose, both the fundamentally egalitarian conceptualisation and decision-making processes are crucial. When structures are designed in the community and all actors have the necessary agency to truly shape them, then one can speak of an egalitarian structure (Hooper et al., 2021).

This principle aligns with the RECs' basic concept at the local organisational level, as they strongly advocate and demand the participation of all members. However, at the level of RECs' management and policy-making processes, unfortunately, much is still driven by structural inequalities and exclusion mechanisms, such that women and other marginalised groups hardly have any voice and agency (Hooper et al., 2021). Women are still underrepresented at all levels of EU institutions and member states (Clancy & Feenstra, 2019). Due to a lack of diversity at the leadership level, there is little gender-specific action in this policy field and thus the gendered nature of energy poverty remains unrecognised. Gender-sensitive policies in both the renewable energy sector and in RECs, remain absent to date. Moreover, this tendency is mirrored at the leadership level of RECs. Here, a strong imbalance is likewise emerging, and women are still heavily underrepresented in senior management positions (Feenstra, 2021; Łapniewska, 2019).

The existing and possibly growing gender inequalities could be balanced by women’s inclusion in policy formulation and supply chain (Standal et al., 2018). Engendering the energy policy framework and RECs helps to counteract this gender-neutral approach (Cannon & Chu, 2021).

In this context, especially women have the potential to act as important change agents to address gender inequality in energy access. Moreover, a rise in diversity in the renewable energy sector fosters more energy democracy and equity (Hoicka et al., 2021).

Responding to these shortcomings requires greater representation of women both in the macro and the meso levels. This implies more women politicly participating in drafting energy legislation at both the European and national levels, as well as on the meso level of municipalities and at the management level of RECs. In the latter, for example, women could have a deeper involvement in the creation, design, and development direction of RECs. A key step towards this would be to ensure that women are better represented at all levels of decision-making. In this regard, quotas would be one approach, which GoiEner, for example, is also pursuing. Clearly, RECs should strive to integrate more diversity at all levels to enhance their productivity as well as political success. Further efforts should start with European legislation, whereby gender targets should be included in their energy polices. Especially, the national implementation of the RED II and the enabling frameworks should take this aspect into account, so that RECs in their countries can develop their full potential and activate untapped member potential in the female demographic of their population.

5.4. Limitations

The findings from the SL sector are highly valuable for identifying the exemplary practices they are setting for RECs and how they can mitigate barriers for women. However, there are several limitations regarding the transferability and generalisability of the findings that need to be considered. In particular, time emerged as a major influencing factor on the prosperity of SLs. The founding of new SLs as well as the number of existing SLs decreased almost continuously. This factor cannot be neglected, although a justification for this could not be addressed in this thesis. However, these underlying influences may have a confounding influence on the measured dependent variables: proportion of women among new entrepreneurs and the absolute numbers of new female and male entrepreneurs.

Further impairments of the analysis' results can be based on the limited data available. Because of this, some of the hypotheses were tested with a very small sample size, of which the results were (carefully) interpreted as significant. However, and especially in the case of non-significant results, this may also be due to the small sample size. Additionally, the data

was analysed in its original state and not transformed. Since not all data was normally distributed, this may also have caused analytical inaccuracies and thus misleading conclusions.

A further aspect to be considered in terms of transferability, is that the field of renewable energies in which the RECs operate presents some particular obstacles for women. This is because it is dually associated with male roles. Not only is there the barrier of the male dominated field of investing, which RECs share with SLs, but also obstacles within the stereotypically gender polarised STEM sector, which can be less enticing for female investors. Even though the example of training can equally be applied to specific STEM knowledge, the specific context of this problem is not completely captured in the data from SLs. Even beyond this, the transferability of the results is limited, as the contexts differ in their content orientation.

5.5. Prospective Research Interests

Consequently, it is crucial for future research to collect data in the field of RECs and to record them segregated by gender[18]. Hence, the lack of sex-disaggregated data, which also steered the focus of analysis of this paper towards a different model, should be resolutely addressed in the future. Only then can the question of how RECs can appeal to a wider audience, particularly women, be conclusively addressed.

A survey of motivational factors and a greater differentiation between subsidies and identifying who uses them and to what extent would also be of interest to better analyse the barriers and motivations for women to join RECs. Tracking the evolution of membership composition over time would additionally be of interest to find out at which stages of the cooperatives' development women may lose interest, or whether they only develop interest in joining at later stages.

While this thesis has focused on the facilitators of women's participation, it has emerged that other non-privileged groups in society do not participate proportionately in these communities either. Thus, an intersectional analysis of the various exclusion mechanisms that

[18] Optimally according to even more possibilities than the binary gender system

already exist in European societies could provide more clarity on deeper exclusion processes and delineate to what extent a lack of capital is a dominant factor and what role subsidies could play in this larger context.

6. CONCLUSION

The objective of this thesis is to uncover the underlying barriers women face in accessing RECs and which mechanisms exist to counteract this. This is particularly important since RECs are promising instruments of the energy transition which can unfold their potential, above all, if they are both reaching and appealing to the widest possible demographic. Solely in this way can they truly achieve their inherent benefits. Among these are generating more private capital for the energy transition, inducing energy-efficient behaviour in a broader section of the population, promoting greater acceptance for the energy transition, and democratising the energy sector. Yet, recent research has shown that notably women are broadly underrepresented, highlighting the importance of this thesis' research question for the further development of RECs. The findings contribute to the optimisation and more effective design of this important instrument of the energy transition.

In order to analyse the enabling conditions that can promote women's participation in REC investment, and due to the limited data available, membership data of SLs was analysed as a proximate reference. Based on the data analysis, it can be concluded that at the organisational level of SLs, certain factors stood out as particularly positive for the percentage of women. As such, an increased visibility of women plays an important role in promoting women's involvement in SLs. Similarly, it can be concluded from the research that training and education played an important role in women's empowerment. The third key enabling factor is the use of targeted financial subsidies. In particular, subsidies showed a strong statistical correlation with the share of female investors. These three main facilitators that were empirically shown can be extrapolated, albeit with certain limitations, from the SL context to the integration of more women as members in RECs. Another crucial point, however, aiming at conditions at a more abstract level, include gender sensitive policies. These policies have a positive influence on the proportion of women in SLs, as shown in the empirical comparison between Spain and the Basque Country.

The underlying research question of how RECs can realise their full potential and specifically, which conditions could activate the underrepresented group of women as members, can be comprehensively answered on the basis of these statistical findings. The three key factors that provide a favourable environment for RECs to increase female membership at the organisational level are visibility of women, targeted training on REC installations and investment, as well as targeted subsidies. These could explicitly contribute to the better exploitation of the potential of RECs and furthermore, address the yet to be sufficiently activated female share of the population in its development. Conversely, the political landscape should also integrate gender targets into the legal framework of RECs (such as RED II, IEMD; EED) and focus on female participation from the very outset. By identifying these valid and effective factors, the core objective of identifying mechanisms to increase women's participation in RECs can be achieved. In addition, a fundamental contribution must be made in closing the existing empirical gap in gender mainstreaming in the energy sector.

Interestingly, the first three factors identified are directly in line with current recommendations from institutions dedicated to gender and equality (e.g. EIGE, 2016b; Clancy & Feenstra 2021). Moreover, these principles already resonate with other areas in the implementation of energy empowerment programmes (e.g. electrification projects for women in the Global South). A direct alignment of future gender targets and policies in the field of RECs must be based on the elaborated approaches of, for instance, EIEG. Alongside the enabling factors for a broader representation of women in RECs, the important contributions women make to the expansion and progression of RECs should also be highlighted; this was discussed in depth in the literature review, however, should be complemented with direct data from RECs in the future.

This thesis is furthermore intended to highlight deficiencies in the broader context of energy policy. Thus, the aim was to work towards bringing the unequal impact of energy policy on the different genders, due to the strongly marked division of gender roles in society, into the spotlight and by doing so, drawing the necessary political attention. It has thus been a core concern to emphasise the need for a paradigm shift in energy policy. Ultimately, this will result in the establishment of better and more gender-equitable framework conditions for RECs. Moreover, it aligns with the demands of those scholars who have been deploring the neglect of gender in the energy field for several years and have been working towards

conducting more gender-specific analyses thereof. This change is to be achieved, among other things, through the increased collection of gender-disaggregated data sets. This is a challenge that this paper has attempted to meet by referring to similar data sets that capture the aspect of gender.

In the future, however, the active and deliberate collection of gender disaggregated data should be of particular focus, especially in the energy sector. This is exactly where future research should provide more clarity and collect long-term data. Exemplary RECs, such as GoiEner, could be compared in terms of their productivity, as well as their motives and preconditions that drive women to join RECs. Moreover, GoiEner should be further examined within the REC context, as it provides unparalleled data on the potential of RECs with a favourable political framework. A comprehensive data base that includes gender differences as an integrative focus of analysis, and that permeates the embedded interplay of gender and energy, is crucial to conclusively exploring the preconditions for greater female participation. Such efforts should not be spared in order for RECs to expand their scope of interested persons sustainably and in the long-term.

A gender-sensitive analysis of the environment is invariably of additional value. On the one hand, this applies to the implementation level of energy policy instruments such as RECs, which can only fully unfold their potential if they address all genders equally and can integrate their needs, consumption patterns, and requirements. This holds equally true for other energy polices, however, which can never be truly effective without a gender-equitable approach. Energy policy principles and instruments risk failing to achieve their objectives and jeopardising their effectiveness if they are not ultimately based on a profoundly just approach, thereby particularly taking gender differences into account.

REFERENCES

Alaton, C., & Tounquet, F. (2020). *Energy Communities in the Clean Energy Package: Best Practices and Recommendations for Implementation*. European Commission, Directorate-General for Energy. https://www.apren.pt/contents/publicationsothers/eu-energy-communities-in-the-clean-energy-package.pdf

Algaba, A. (2016, May 11). *La Hacienda foral impulsará la participación de las mujeres en las empresas*. El Diario Vasco. https://www.diariovasco.com/economia/201605/11/hacienda-foral-impulsara-participacion-20160511124633.html?ref=https:%2F%2Fwww.google.com%2F&voctag=dvasco

Arora-Jonsson, S. (2011). Virtue and vulnerability: Discourses on women, gender and climate change. *Global Environmental Change*, *21*(2), 744–751. https://doi.org/10.1016/j.gloenvcha.2011.01.005

Badunenko, O., Barasinska, N., & Schäfer, D. (2010). *Investments: Women Are More Cautious than Men because They Have Less Financial Resources at Their Disposal* (Text No. 1/2010). German Institute for Economic Research. https://www.diw.de/de/diw_01.c.454137.de/publikationen/weekly_reports/2010_01/investments__women_are_more_cautious_than_men_because_they_have_less_financial_resources_at_their_disposal.html

Barrella, R. (2021). *National Strategy against Energy Poverty 2019-2024 in Spain*. ENGAGER COST Action. https://www.eppedia.eu/article/national-strategy-against-energy-poverty-2019-2024-spain

Benjamin, D. J., Choi, J. J., & Strickland, A. J. (2010). Social Identity and Preferences. *American Economic Review*, *100*(4), 1913–1928. https://doi.org/10.1257/aer.100.4.1913

Bettio, F., & Verashchagina, A. (2009). *Fiscal system and female employment in Europe* (VC/2007/0221). EU Expert Group on Gender and Employment (EGGE). https://ec.europa.eu/social/BlobServlet?docId=5545

Bouzarovski, S., Thomson, H., Cornelis, M., Varo, A., & Guyet, R. (2020). *Towards an inclusive energy transition in the European Union: Confronting energy poverty amidst a global crisis*.

Publications Office of the European Union. https://data.europa.eu/doi/10.2833/103649

Butler, J. (1990). *Gender trouble: Feminism and the subversion of identity*. Routledge.

Cannon, C. E. B., & Chu, E. K. (2021). Gender, sexuality, and feminist critiques in energy research: A review and call for transversal thinking. *Energy Research & Social Science*, *75*.

Clancy, J., Daskalova, V., Feenstra, M., Franceschelli, N., & Sanz, M. (2017). *Gender perspective on access to energy in the EU*. European Union, FEMM Comittee. https://www.europarl.europa.eu/RegData/etudes/STUD/2017/596816/IPOL_STU(2017)596816_EN.pdf

Clancy, J., & Feenstra, M. (2019). *Women, Gender Equality and the Energy Transition in the EU* . Policy Department for Citizens' Rights and Constitutional Affairs. https://www.europarl.europa.eu/RegData/etudes/STUD/2019/608867/IPOL_STU(2019)608867_EN.pdf

Clancy, J. S., Skutsch, M., & Batchelor, S. (2002). *The Gender—Energy- Poverty Nexus Finding the energy to address gender concerns in development* (Project Report No. CNTR998521). UK Department for International Development (DFID). https://esmap.org/sites/default/files/resources-document/The%20Gender%20Energy%20Poverty%20Nexus.pdf

Code de l'énergie, République Francaise (2022). https://codes.droit.org/PDF/Code%20de%20l%27%C3%A9nergie.pdf

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Routledge. https://doi.org/10.4324/9780203771587

De Azua Eceolaza, N. R. (2003). *Indicadores de Pobreza y Exclusión. Una propuesta desde una perspectiva de género* (No. 2; Observatorio de La Igualdad). Instituto de la Mujer, Ministerio de Igualdad. https://www.inmujeres.gob.es/observatorios/observIgualdad/estudiosInformes/docs/002-informes.pdf

De Villota, P. (2007). Análisis de un retroceso desde la perspec- tiva de género en la política fiscal española: Ley 35/2006, de 28 de noviembre. *Revista jurídica de igualdad de*

oportunidades entre mujeres y hombres, *12*, 47–55.

De Villota, P. (2016). The Spanish Central Government Budget—Comments on recent experiences. In J. Campbell & M. Gillespie (Eds.), *Feminist Economics and Public Policy* (pp. 71–79). Routledge.

De Villota, P., Jubeto, Y., & Ferrari, I. (2009). *Estrategias para la integración de la perspectiva de género en los presupuestos públicos* (No. 17; Observatorio de La Igualdad). Instituto de la Mujer, Ministerio de Igualdad. https://www.inmujeres.gob.es/observatorios/observIgualdad/estudiosInformes/docs/017-estrategia.pdf

Diputación Foral de Gipuzkoa. (2016, May 10). *Hacienda busca amarrar los centros de decisión fomentando la participación de las personas trabajadoras en la empresa—Artikulua—Gipuzkoa ETORKIZUNA ORAIN*. https://www.gipuzkoa.eus/es/-/enpresen-erabakiguneak-gipuzkoan-errotu-nahi-ditu-foru-ogasunak-langileen-partaidetzaren-sustapenaren-bitartez

Norma Foral 6/2016, de 15 de diciembre, de modificación de las Normas Forales del Impuesto sobre la Renta de las Personas Físicas y del Impuesto sobre Sucesiones y Donaciones, para incentivar la participación de las personas trabajadoras en la empresa., 241 Boletín Oficial de Gipuzkoa. https://noticias.juridicas.com/base_datos/CCAA/587470-norma-foral-6-2016-de-15-dic-gipuzkoa-modificacion-de-las-normas-forales.html

Division for Gender Equality, Office of the Director-General, & UNESCO Publications Board. (2011). *Priority Gender Equality Guidelines*. UNESCO Publications Board. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/BSP/GENDER/GE%20Guidelines%20December%202_FINAL.pdf

Doračić, B., Knoefel, J., & Naber, N. (2020). *Prosumers for the Energy Union: Mainstreaming active participation of citizens in the energy transition—Report on local, national and EU scenarios* (Deliverable D5.2; PROSEU - Prosumers for the Energy Union: Mainstreaming Active Participation of Citizens in the Energy Transition). https://www.ioew.de/fileadmin/user_upload/BILDER_und_Downloaddateien/Publikationen/2020/Doracic_et_al._-_Prosumer_for_the_Enery_Union.pdf

Dragotă, V., Lipară, C., & Ciobanu, R. (2013). Agency Problems and Synergistic Effects in

Romania: The Determinants of the Control Premium. *Finance a Uver*, *63*(2), 197–219.

EIGE. (2016a). *EIGE's methods and tools*. European Institute for Gender Equality (EIGE). https://eige.europa.eu/sites/default/files/documents/ti_pubpdf_mh0216879enn_pdfweb_20170111105738.pdf

EIGE. (2016b). *Gender and energy*. European Institute for Gender Equality (EIGE). https://eige.europa.eu/sites/default/files/documents/ti_pubpdf_mh0116288enn_pdfweb_20170113163501.pdf

EIGE. (2016c). *Institutional Transformation Gender Mainstreaming Toolkits*. European Institute for Gender Equality (EIGE). https://eige.europa.eu/publications/institutional-transformation-gender-mainstreaming-toolkit

EIGE. (2022a). *Gender Equality Index | 2021 | Power | European Union*. European Institute for Gender Equality. Retrieved December 22, 2021, from https://eige.europa.eu/gender-equality-index/2021/domain/power

EIGE. (2022b). *Gender Equality Index | 2021 | Time | European Union*. European Institute for Gender Equality. Retrieved December 22, 2021, from https://eige.europa.eu/gender-equality-index/2021/domain/time

EIGE. (2022c). *Gender Equality Index | 2021 | Work | European Union*. European Institute for Gender Equality. Retrieved December 22, 2021, from https://eige.europa.eu/gender-equality-index/2021/domain/work

European Commission. (n.d.-a). *Europäischer Grüner Deal*. European Commission. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_de

European Commission. (n.d.-b). *Gender equality strategy* . European Commission. https://ec.europa.eu/info/policies/justice-and-fundamental-rights/gender-equality/gender-equality-strategy_en

European Commission. (n.d.-c). *Umsetzung des europäischen Grünen Deals*. European Commission. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_de

European Commission. (2018). *2018 Report on equality between women and men in the EU*

(No. 2443–5288). European Commission. https://ec.europa.eu/info/sites/default/files/aid_development_cooperation_fundamental_rights/annual_report_ge_2018_en.pdf

European Commission & Directorate-General for Energy. (2019). *Clean energy for all Europeans*. Publications Office of the European Union. https://data.europa.eu/doi/10.2833/21366

Directive (EU) 2018/2001. *The promotion of the use of energy from renewable sources*. Pub. L. No. OJ L 328/82, 82 European Parliament, Council of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG

Directive (EU) 2018/2002. *Amending Directive 2012/27/EU on energy efficiency*. Pub. L. No. OJ L 328. European Parliament, Council of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018L2002

Directive (EU) 2019/944. *Common rules for the internal market for electricity and amending Directive 2012/27/EU (recast)*. Pub. L. No. OJ L 158. European Parliament, Council of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019L0944

Eurostat. (2021a). *Gender pay gap statistics*. Eurostat. Retrieved January 3, 2022, from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Gender_pay_gap_statistics

Eurostat. (2021b). *Inability to keep home adequately warm—EU-SILC survey*. Eurostat. Retrieved January 9, 2022, from https://ec.europa.eu/eurostat/databrowser/view/ILC_MDES01__custom_137816/bookmark/bar?lang=en&bookmarkId=f4f90944-6627-4c6b-8035-f966532e2036

Eurostat. (2021c). *Closing the gender pension gap?* Eurostat. Retrieved January 3, 2022, from https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210203-1

Eurostat. (2021d). *Involuntary part-time employment as percentage of the total part-time employment, by sex and age (%) [lfsa_eppgai]*. Eurostat. Retrieved January 9, 2022, from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsa_eppgai&lang=en

Eurostat. (2021e). *Part-time employment as percentage of the total employment, by sex, age and country of birth (%)*. Eurostat. http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

Feenstra, M. (2021). *Gender Just Energy Policy: Engendering the energy transition in Europe*. [Doctoral dissertation, Universiteit Twente].

Feenstra, M., & Özerol, G. (2021). Energy justice as a search light for gender-energy nexus: Towards a conceptual framework. *Renewable and Sustainable Energy Reviews*, *138*. https://doi.org/10.1016/j.rser.2020.110668

Filippidou, F., Kottari, M., Politis, S., & Papapostolou, C. (2019). *Mapping energy poverty in the EU: policies, metrics and data.* Eceee. https://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2019/7-make-buildings-policies-great-again/mapping-energy-poverty-in-the-eu-policies-metrics-and-data/

Fraune, C. (2016). The politics of speeches, votes, and deliberations: Gendered legislating and energy policy-making in Germany and the United States. *Elsevier Science*. https://doi.org/10.1016/j.erss.2016.06.007

Frieden, D., Tuerk, A., Neumann, C., d'Herbemont, S., Roberts, J., & REScoop.eu. (2020). *Collective self-consumption and energy communities: Trends and challenges in the transposition of the EU framework*. https://www.rescoop.eu/uploads/rescoop/downloads/Collective-self-consumption-and-energy-communities.-Trends-and-challenges-in-the-transposition-of-the-EU-framework.pdf

Friends of the Earth Europe, Greenpeace EU, REScoop.eu, & Energy Cities. (2018). *Unleashing the Power of Community Renewable Energy*. Friends of the Earth Europe. https://friendsoftheearth.eu/wp-content/uploads/2019/01/community_energy_booklet_final.pdf

Gährs, S., Pfeifer, L., Naber, N., Doračić, B., Knoefel, J., Hinsch, A., Assalini, S., van der Veen, R., Ljubas, D., & Lulić, Z. (2020). *Prosumers for the Energy Union: Mainstreaming active participation of citizens in the energy transition—Key technical findings and recommendations for prosumer communities* (N°5.3; PROSEU - Prosumers for the Energy Union: Mainstreaming

Active Participation of Citizens in the Energy Transition). https://zenodo.org/record/3999321#.YcDP9CwxlhA

Gignac, G. E., & Szodorai, E. T. (2016). Effect size guidelines for individual differences researchers. *Personality and Individual Differences*, *102*, 74–78. https://doi.org/10.1016/j.paid.2016.06.069

GoiEner. (n.d.). *Noticias* [Cooperativa de generación y consumo de energía renovable]. GoiEner. https://www.goiener.com/es/noticias/

Gunnarsson, Å., Schratzenstaller, M., & Spangenberg, U. (2017). *Gender equality and taxation in the European Union*. FEMM Committee, European Parliament. https://www.europarl.europa.eu/RegData/etudes/STUD/2017/583138/IPOL_STU(2017)583138_EN.pdf

Gunnarsson, Å., & Spangenberg, U. (2019). Gender Equality and Taxation Policies in the EU. *Intereconomics*, *2019*(3), 141–146.

Guyet, R., Hanke, F., & Feenstra, M. (2021). *Energy communities and energy poverty: Moving towards a new social and ecological contract?* (Policy Brief No. 3; European Energy Poverty - Agenda Co-Creation and Knowledge Innovation (ENGAGER 2017-2021)). ENGAGER- Energy Poverty Action. https://www.researchgate.net/publication/354219250_Engager_Working_group_4_Policy_brief_no_3_Energy_communities_and_energy_poverty_Moving_towards_a_new_social_and_ecological_contract

Hallef, J. (n.d.). *10 Aides financières pour créer votre entreprise*. Aide-Sociale.fr. Retrieved February 6, 2022, from https://www.aide-sociale.fr/aides-emploi/aides-creation-entreprise/

Hanke, F., & Lowitzsch, J. (2020). Empowering Vulnerable Consumers to Join Renewable Energy Communities—Towards an Inclusive Design of the Clean Energy Package. *Energies*, *13*(7). https://doi.org/10.3390/en13071615

Heinrich-Böll-Stiftung, Green European Foundation, European Renewable Energies Federation, & Le Monde diplomatique. (2019). *Energieatlas 2018*. Heinrich-Böll-Stiftung. https://www.boell.de/de/energieatlas-erneuerbaren-energien-in-europa

Hoicka, C. E., Lowitzsch, J., Brisbois, M. C., Kumar, A., & Camargo, L. R. (2021). Implementing a just renewable energy transition: Policy advice for transposing the new European rules for renewable energy communities. *Energy Policy*, *156*. https://doi.org/DOI: 10.1016/j.enpol.2021.112435

Hooper, K., Fellingham, L., Clancy, J., Newell, P., & Petrova, S. (2021). *Gender, Race and Social Inclusion – Net Zero Transitions: A Review of the Literature* (No. 2021/060; BEIS Research Paper). Department of Business, Energy and Industrial Strategy. https://de.scribd.com/document/533925849/Net-Zero-Transitions-Gender-Race-Social-Inclusion

Huybrechts, B., & Mertens, S. (2014). The relevance of the cooperative model in the field of renewable energy. *Annals of Public and Cooperative Economics*, *85*(2), 193–212.

ILO. (2011). *Investment in renewable energy generates jobs. Supply of skilled workforce needs to catch up*. International Labour Organization.http://www.ilo.org/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_168354.pdf

ILO. (2015). *Advancing gender equality: The co-operative way*. International Labour Office Enterprises Dept. https://public.ebookcentral.proquest.com/choice/publicfullrecord.aspx?p=4432352

Informazione Fiscale. (2020, October 21). *Associazioni riconosciute e non riconosciute: Qual è la differenza?* informazionefiscale.it. https://www.informazionefiscale.it/differenza-associazioni-riconosciute-e-non-riconosciute

International Cooperative Alliance. (2015). *Guidance Notes to the Cooperative Principles*. https://www.ica.coop/sites/default/files/2021-11/ICA%20Guidance%20Notes%20EN.pdf

IRENA. (2019). *Renewable Energy: A Gender Perspective*. International Renewable Energy Agency. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Gender_perspective_2019.pdf

Ley 31/2015, de 9 de septiembre. L*a que se modifica y actualiza la normativa en materia de autoempleo y se adoptan medidas de fomento y promoción del trabajo autónomo y de la*

Economía Social. Pub. L. No. Ley 31/2015, BOE-A-2015-9735 79824 (2015). https://www.boe.es/eli/es/l/2015/09/09/31

Ley 44/2015, de 14 de octubre. *Sociedades Laborales y Participadas*. Pub. L. No. BOE-A-2015-11071, 247 BOE 95747 (2015). https://www.boe.es/buscar/doc.php?id=BOE-A-2015-11071

Kaminara, A. (2015, April 28). *The Gender Dimensions of Energy Policy.* Capacity4dev. https://europa.eu/capacity4dev/public-energy/discussions/gender-dimensions-energy-policy

Khamati-Njenga, B., & Clancy, J. S. (2002). Concepts and issues in gender and energy. *Energia*, 83.

Łapniewska, Z. (2019). Energy, equality and sustainability? European electricity cooperatives from T a gender perspective. *Energy Research & Social Science*, *57*. https://doi.org/10.1016/j.erss.2019.101247

Loi n° 2019-1147. *Loi relative à l'énergie et au climat* (1), TREX1911204L. https://www.legifrance.gouv.fr/loda/id/JORFTEXT000039355955/

Listo, R. (2018). Gender myths in energy poverty literature: A Critical Discourse Analysis—ScienceDirect. *Energy Research & Social Science*, *38*, 9–18.

Lloyd, M. (2007). *Judith Butler—From Norms To Poltics*. Polity Press.

Lowitzsch, J. (2019a). Investing in a Renewable Future – Renewable Energy Communities, Consumer (Co-)Ownership and Energy Sharing in the Clean Energy Package. *RELP*, *9*(3).

Lowitzsch, J. (2019b). The Consumer at the Heart of the Energy Markets? In J. Lowitzsch: (Ed.), *Energy Transition Financing Consumer Co-Ownership in Renewables* (pp. 59–78). Palgrave Macmillan.

Lowitzsch, J., Dunsch, S., & Hashi, I. (2017). *Spanish Sociedades Laborales: Activating the Unemployed -A Potential New EU Active Labour Market Policy Instrument*. Palgrave Macmillan.

Lowitzsch, J., & Hanke, F. (2019). Renewable Energy Cooperatives. In J. Lowitzsch: (Ed.), *Energy Transition Financing Consumer Co-Ownership in Renewables* (pp. 139–162). Palgrave

Macmillan.

Lowitzsch, J., Hoicka, C. E., & van Tulder, F. J. (2020). Renewable energy communities under the 2019 European Clean Energy Package – Governance model for the energy clusters of the future? *Renewable and Sustainable Energy Reviews*, *122*. https://doi.org/10.1016/j.rser.2019.109489

MacGregor, S. (2010). 'Gender and climate change': From impacts to discourses. *Journal of the Indian Ocean Region*, *6*(2), 223.

Ordonnance n° 2021-236. *Transposition de diverses dispositions de la directive (UE) 2018/2001 du Parlement européen et du Conseil du 11 décembre 2018 relative à la promotion de l'utilisation de l'énergie produite à partir de sources renouvelables et de la directive (UE) 2019/944 du Parlement européen et du Conseil du 5 juin 2019 concernant des règles communes pour le marché intérieur de l'électricité*. TRER2100130R. https://www.legifrance.gouv.fr/eli/ordonnance/2021/3/3/TRER2100130R/jo/texte

Orden ESS/739/2017. *Las bases reguladoras de la concesión de subvenciones a las actividades de promoción del trabajo autónomo, de la economía social y de la responsabilidad social de las empresas y para sufragar los gastos de funcionamiento de las asociaciones de trabajadores autónomos, de cooperativas, de sociedades laborales, de empresas de inserción y de otros entes representativos de la economía social de ámbito estatal.* Pub. L. No. Orden ESS/739/2017, BOE-A-2017-9211 75206. https://www.boe.es/eli/es/o/2017/07/26/ess739

Extracto de la Resolución de 30 de junio de 2020. *La Dirección General del Trabajo Autónomo, de la Economía Social y de la Responsabilidad Social de las Empresas, por la que se aprueba la convocatoria para la concesión de subvenciones a las actividades de promoción del trabajo autónomo, de la economía social y de la responsabilidad social de las empresas y para sufragar los gastos de funcionamiento, para el año 2020*. Pub. L. No. BOE-B-2020-22491 (2020). https://www.boe.es/diario_boe/txt.php?id=BOE-B-2020-22491

Ministerio de Trabajo y Economía Social. (n.d.-a). *7.4. Sociedades Laborales*. Ministerio de Trabajo y Economía Social. https://www.mites.gob.es/es/Guia/texto/guia_2/contenidos/guia_2_7_4.htm

Ministerio de Trabajo y Economía Social. (n.d.-b). *Apoyo al Empleo (ACE)*. Ministerio de

Trabajo y Economía Social. Retrieved November 13, 2021, from https://www.mites.gob.es/ficheros/ministerio/estadisticas/anuarios/2019/ACE/ACE.pdf

Ministerio de Trabajo y Economía Social. (n.d.-c). *Ministerio de Trabajo y Economía Social*. Ministerio de Trabajo y Economía Social. https://www.mites.gob.es/es/Guia/texto/guia_2/contenidos/guia_2_7_4.htm

Ministerio de Trabajo y Economía Social. (n.d.-d). *Página principal de Anuarios. Ministerio de Trabajo y Economía Social*. Ministerio de Trabajo y Economía Social. Retrieved February 7, 2022, from https://www.mites.gob.es/es/estadisticas/contenidos/anuario.htm

Moodley, L., Holt, T., Leke, A., & Desvaux, G. (2016). *Women Matter Africa*. McKinsey & Company.

Mosedale, S. (2005). Assessing women's empowerment: Towards a conceptual framework. *Journal of International Development*, *17*(2), 243–257. https://doi.org/10.1002/jid.1212

Nelson, J. A. (2015). Are Women Really More Risk-Averse Than Men? A Re-Analysis of the Literature Using Expanded Methods. *Journal of Economic Surveys*, *29*(3), 566–585. https://doi.org/10.1111/joes.12069

Noland, M., Moran, T., & Kotschwar, B. (2016). *Is Gender Diversity Profitable? Evidence from a Global Survey*. Peterson Institute for International Economics. https://www.piie.com/publications/working-papers/gender-diversity-profitable-evidence-global-survey

Norman, G. (2010). Likert scales, levels of measurement and the "laws" of statistics. *Advances in Health Sciences Education*, *15*(5), 625–632. https://doi.org/10.1007/s10459-010-9222-y

Oakley, A. (2015). *Sex, gender and society*. Ashgate Publishing.

Palvia, A., Vähämaa, E., & Vähämaa, S. (2015). Are Female CEOs and Chairwomen More Conservative and Risk Averse? Evidence from the Banking Industry During the Financial Crisis. *Journal of Business Ethics*, *131*(3), 577–594. https://doi.org/10.1007/s10551-014-2288-3

Pizarro Pacheco, M., Arnoso Martínez, A., Larrañaga Hernández, I., & Gómez Hernández, L. (2011). *Seguimiento del cumplimiento, desarrollo y aplicación de la ley 4/2005, de 18 de febrero, para la igualdad de mujeres y hombres*. EMAKUNDE Instituto vasco de la mujer.

https://www.emakunde.euskadi.eus/u72-20010/es/contenidos/informacion/u72_ley_igualdad/es_ley_igua/adjuntos/evaluacion-final-2005-2010_es.pdf

Profeta, P. (2017). Gender Equality in Decision-Making Positions: The Efficiency Gains. *Intereconomics*, *52*(1), 34–37.

COM(2021) 557 final (2021). *Proposal for a Directive of the European Parliament and of the Council amending Directive (EU) 2018/2001 of the European Parliament and of the Council, Regulation (EU) 2018/1999 of the European Parliament and of the Council and Directive 98/70/EC of the European Parliament and of the Council as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652, 557*, European Commission.

COM/2021/558 Final. *Proposal For A Directive Of The European Parliament And Of The Council On Energy Efficiency (Recast) Com/2021/558 Final*, European Commission,. https://eur-lex.europa.eu/resource.html?uri=cellar:a214c850-e574-11eb-a1a5-01aa75ed71a1.0001.02/DOC_1&format=PDF

Pye, S., Dobbins, A., Baffert, C., Brajković, J., Grgurev, I., De Miglio, R., & Deane, P. (2015). *Energy poverty and vulnerable consumers in the energy sector across the EU: analysis of policies and measures*. European Commission, Directorate-General for Energy. https://energy.ec.europa.eu/system/files/2015-07/INSIGHT_E_Energy%2520Poverty-Main%2520Report_0.pdf

Rastrigina, O., & Verashchagina, A. (2015). *Secondary earners and fiscal policies in Europe*. European Commission, Directorate- General for Justice and Consumers. https://eige.europa.eu/docs/3086_150511_secondary_earners_en.pdf

Räty, R., & Carlsson-Kanyama, A. (2010). Energy consumption by gender in some European countries. *Energy Policy*, *38*.

REScoop.eu. (n.d.). *The REScoop Model—REScoop*. REScoop.eu. https://www.rescoop.eu/the-rescoop-model

REScoop.eu. (2017). *Local Energy Communities: A way to bring 'all Europeans' along in the*

energy transition. REScoop.eu.

REScoop.eu. (2021a). *A supportive EU legal framework for energy communities in energy efficiency*. REScoop.eu. https://www.rescoop.eu/toolbox/a-supportive-eu-legal-framework-for-energy-communities-in-energy-efficiency

REScoop.eu. (2021b). *The EED: supporting energy communities to deliver energy savings* REScoop.eu. https://www.rescoop.eu/toolbox/the-eed-supporting-energy-communities-to-deliver-energy-savings

REScoop.eu. (2021c). *The GBER: establishing a supportive State aid framework for renewable energy communities*. REScoop.eu. https://www.rescoop.eu/toolbox/the-gber-establishing-a-supportive-state-aid-framework-for-renewable-energy-communities

REScoop.eu. (2021d). *The REDII: strengthening the role of RECs to support increased ambition on renewable energy*. REScoop.eu. https://www.rescoop.eu/toolbox/the-redii-strengthening-the-role-of-recs-to-support-increased-ambition-on-renewable-energy

REScoop.eu. (2022a). *Policy—REScoop*. REScoop.eu. https://www.rescoop.eu/policy

REScoop.eu. (2022b). *Spain—REC/CEC definitions—REScoop*. REScoop.eu. https://www.rescoop.eu/policy/spain-rec-cec-definitions

REScoop.eu & ClientEarth. (2020). *Energy Communities under the Clean Energy Package: Transposition Guidance*. REScoop.eu. https://www.rescoop.eu/toolbox/how-can-eu-member-states-support-energy-communities

REScoop.eu & Heinrich-Böll-Stiftung. (2021). *Mapping the Social Impact of Energy Communities—REScoop*. REScoop.eu. https://www.rescoop.eu/toolbox/mapping-the-social-impact-of-energy-communities

Skonieczna, A., & Castellano, L. (2020). *Gender Smart Financing Investing In & With Women: Opportunities for Europe* (No. 129; European Economy Discussion Papers). European Commission's Directorate-General for Economic and Financial Affairs.

Standal, K., Winther, T., & Danielsen, K. (2018). Energy Politics and Gender. In K. J. Hancock & J. E. Allison (Eds.)*, The Oxford Handbook of Energy Politics* (pp. 197–215). Oxford University Press.

Strengers, Y. (2014). Smart energy in everyday life: Are you designing for Resource Man? *ACM Interactions*, *1072–5520*, 24–31. https://doi.org/10.1145/2621931

Toffler, A. (1980). *The Third Wave* (1st ed.). William Morrow and Company.

Trinomics B.V. (2016). *Selecting Indicators to Measure Energy Poverty* (p. 130). European Commission, DG Energy. https://ec.europa.eu/energy/sites/ener/files/documents/Selecting%20Indicators%20to%20Measure%20Energy%20Poverty.pdf

UN Women. (n.d.). *SDG 5: Achieve gender equality and empower all women and girls*. UN Women – Headquarters. https://www.unwomen.org/en/news/in-focus/women-and-the-sdgs/sdg-5-gender-equality

UN Women. (2015). *Monitoring gender quality and the empowerment of women and girls in the 2030 Agenda for Sustainable Development: Opportunities and challenges for Latin America and the Caribbean*. UN Women, United Nations Entity for Gender Equality and the Empowerment of Women. https://lac.unwomen.org/sites/default/files/Field%20Office%20Americas/Documentos/Publicaciones/monitoring%20genderEq%2014oct.pdf

Winther, T., Ulsrud, K., Matinga, M., Govindan, B., Gill, A., Saini, D., Brahmachari, D., Palit, D., & Murali, R. (2020). In the light of what we cannot see: Exploring the interconnections between gender and electricity access. *Energy Research and Social Science*, *60*, 1–18.

Yildiz, Ö. (2014). Financing renewable energy infrastructures via financial citi- zen participation – The case of Germany. *Renewable Energy*, *68*, 677–685. https://doi.org/10.1016/j.renene.2014.02.038

Yildiz, Ö., & Radtke, J. (2015). Energy cooperatives as a form of workplace democracy? A theoretical assessment. *Max Planck Institute for the Study of Societies (MPIfG)*, *16*(3), 17–24.

Yildiz, Ö., Rommel, J., Debor, S., Holstenkamp, L., Mey, F., Müller, J. R., Radtke, J., & Rognli, J. (2015). Renewable Energy Cooperatives as Gatekeepers or Facilitators? Recent Developments in Germany and a Multidisciplinary Research Agenda. *Energy Research & Social Science*, *6*.

ANNEX 1 GENDER PAY GAP

YEAR	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
European Union – 27 countries (from 2020)	-	15,8	16,2	16,4	16	15,7	15,5	15,1	14,6	14,4	14,1
Bulgaria	13,3	13	13,2	15,1	14,1	14,2	15,5	14,6	14,3	13,9	14,1
Czech Republic	25,9	21,6	22,6	22,5	22,3	22,5	22,5	21,5	21,1	20,1	18,9
Germany	22,6	22,3	22,4	22,7	22,1	22,3	21,8	21,1	20,4	20,1	19,2
Spain	16,7	16,2	17,6	18,7	17,8	14,9	14,1	14,8	13,5	11,9	11,9
France	15,2	15,6	15,7	15,6	15,5	15,5	15,6	15,9	16,3	16,7	16,5
Italy	5,5	5,3	5,7	6,5	7	6,1	5,5	5,3	5	5,5	4,7

Note: Pay gap values represented as percentages.

Own elaboration based on Eurostat, 2021a

ANNEX 2 EIGE EQUALITY INDEX

Geographic Region	Overall Gender Equality Index	Work (Domain score)	Money (Domain score)	Knowledge (Domain score)	Time (Domain score)	Power (Domain score)	Health (Domain score)
Austria	68	76,8	87,7	64,3	61,2	48,2	91,9
Belgium	72,7	74,9	89,9	70,8	65,3	61	86,3
Bulgaria	59,9	69,6	64,5	55,2	42,7	60,2	77,2
Croatia	59,2	70,1	74	51,8	51	45,3	83,8
Cyprus	57	70,6	82,6	56	51,3	30	87,9
Czechia	56,7	67,4	78,9	58,5	57,3	28,1	86,3
Denmark	77,8	79,4	89,1	71	83,1	66,8	89,5
Estonia	61,6	72,5	73,2	57,3	74,7	36,6	82,2
EU	68	71,6	82,4	62,7	64,9	55	87,8
Finland	75,3	75,5	87,9	61,9	77,4	74,3	89,5
France	75,5	73,2	86,3	67	67,3	81,4	87,4
Germany	68,6	72,4	86	54,7	65	62,8	90,7
Greece	52,5	65,3	73,7	54,9	44,7	27	84,3
Hungary	53,4	68	73,3	57,2	54,3	22,9	86,7
Ireland	73,1	76,5	87,8	67,4	74,2	58,4	91,3
Italy	63,8	63,7	79,4	59	59,3	52,2	88,4
Latvia	62,1	74,3	68,7	50,9	65,8	50,4	79,3
Lithuania	58,4	74,2	69,9	56,1	50,6	39,3	80,3
Luxembourg	72,4	76,3	92,4	70,8	69,1	53,4	89,9
Malta	65	76,8	84,2	65,2	64,2	37,5	92,3
Netherlands	75,9	78,3	87	67,4	83,9	64	90,2
Poland	56,6	67,2	76,7	57,6	52,5	31,5	83,3
Portugal	62,2	73,2	73,6	56,5	47,5	53,6	84,8
Romania	54,5	67,5	69,1	52,8	50,3	34,7	71,3
Slovakia	56	66,8	75,1	61,6	46,3	30,7	85,5
Slovenia	67,6	73	83,7	56,6	72,9	53	87,8
Spain	73,7	73,7	78,4	67,9	64	76,9	90,3
Sweden	83,9	83,1	85,4	75,2	90,1	84,5	94,6

Note: Values represented as scores out of 100.

Own elaboration based on EIGE, 2021