

**Building Community Around Avoiding Waste:
Investigating the Emergence of Repair Cafes in the
Netherlands**

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Abstract

This thesis investigated the socio-economic and demographic factors associated with the emergence of repair cafes in Dutch municipalities from 2011-2023. Repair cafes are grassroots social innovations that promote the ‘repair’ retention loop of the circular economy by encouraging the repair of household items. Four key dimensions that influence the emergence of repair café were identified; *environmental awareness*, *cost-saving incentive*, *education*, and *social capital*. Data from 342 Dutch municipalities was analyzed using negative binomial regression in this longitudinal study. Findings indicate that *Environmental Awareness*, specifically through active pro-environmental behavior is important for promoting repair café emergence, although *Green Votes* showed a negative correlation. The *cost-saving incentive* dimension revealed that *Poverty* positively correlated with repair café emergence, while *Income* showed a contradictory positive correlation, suggesting a nuanced relationships between economic factors and repair café emergence. *Education Level* predicted an increase in *Repair Café Emergence*, aligning with previous studies. Presence of educational institutions did not significantly impact emergence, suggesting that education is more important at an individual than institutional level. *Social capital* in the form of bonding and bridging social capital, plays a crucial but complex role in the emergence of repair cafes. Tightly knit communities may have less need for formal repair initiatives, whereas more diverse sub-communities positively correlated with repair café emergence.

Findings emphasize the role of local socio-economic and demographic factors in the emergence of repair cafes. Future research should explore factors influencing the longevity of repair cafes, impact on local communities, and the interplay between various forms of social capital. In conclusion, this thesis underscores the significance of *environmental awareness*, *cost-saving incentive*, *education*, and *social capital* as key dimensions for the emergence of repair cafes. Repair cafes can play a vital role in the advancement of the circular economy and promotion of sustainable consumption by fostering a culture of repair and sustainability.

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1. Introduction

While the literature on the circular economy has expanded throughout the years, it has predominantly focused on the reuse and recycling value retention loops. As a result, less attention has been paid to repair as a strategy for reducing environmental impact and avoiding waste. This has gained some criticism, with researchers calling for more diverse research that includes repair and refurbish strategies, shorter retention loops that require less energy (Reike et al., 2018). By focusing on the longer retention loops paradigms of economic growth and consumption are perpetuated through promises of profit and employment opportunities, whereas narratives of a circular economy where growth and consumption are limited are overlooked (Kirchherr et al., 2017; Korhonen et al., 2018; Temesgen et al., 2021). Therefore, it is important to bring a greater focus on repair strategies as a value retention strategy into the circular economy discourse.

It has proven difficult to operationalize these shorter retention loops, however. Despite consumers' willingness to participate in circular activities like reuse and repair, actual participation levels are low, likely due to the barriers encountered when trying to get products repaired (López Dávila et al., 2021). Two types of barriers are identified in the literature. Firstly, consumers encounter behavioral barriers. One determining factor for consumers is that they experience that replacing a product is often easier than getting it repaired. Several elements determine this ease of replacement, such as financial considerations, time constraints, and novelty seeking behavior. Financially, consumers have either experienced or believe that it will be cheaper to replace an item to replace it (Jaeger-Erben et al., 2021; Rogers et al., 2021; Sabbaghi et al., 2017; Terzioğlu, 2021). A study by Bovea et al. (2017) found that this bias may be true, finding that despite the environmental benefits, repairing household electronic devices may not have financial benefits. Next to the financial cost, consumers also factor in time constraints when deciding to repair or replace an item (Jaeger-Erben et al., 2021; McCollough, 2019; Terzioğlu, 2021). Consumers often consider the time they need to take out of their day to travel to a repair shop, the time it takes for the repair to be completed, and the inconvenience of missing the product during the repair too costly. Finally, novelty seeking behavior inhibits repair when consumers believe that the replacement product will

perform its function better than the repaired older product, which is exacerbated by the experience that devices are not designed to last long, such as in the case of mobile phones (Jaeger-Erben et al., 2021; Terzioğlu et al., 2015).

The second type of barrier consumers experience is physical. There is a shortage of repair infrastructure, which increases the time, effort, and money it takes to get a product repaired (Jaeger-Erben et al., 2021; McCollough, 2019). Repair infrastructure includes several dimensions such as the location to perform a repair, the availability of spare parts and repair manuals, and the knowledge and skills required for the repair (Lefebvre et al., 2018; Rogers et al., 2021; Sabbaghi et al., 2017). Repair agents, including repair shops and repair cafes are a critical resource for bolstering repair behavior by acting as the nexus for repair infrastructure (Hernandez et al., 2020) Another major shortcoming in repair infrastructure is the availability of spare parts, as it is not a common practice for manufacturers to supply these, making many repairs more time consuming or even impossible (Laitala et al., 2021; Mashhadi et al., 2016; Terzioğlu, 2021; Terzioğlu et al., 2015). Moreover, as products develop and become more reliable, the skills and knowledge needed to diagnose problems and fix them has decreased and maintenance and repair take a backstage role (Graham & Thrift, 2007). In an example from an investigation into the replacement cycles of mobile phones, Wieser & Tröger (2016) observed that the belief that repair was not possible contributed to the finding that many consumers did not even attempt to repair their broken devices. A final dimension in repair infrastructure is found in the design of products. Many modern products use innovations such as glue-based joint mechanisms, chip integration and a miniaturized design, making it so that repair either requires a higher level of skill to perform, or even becomes impossible (Mashhadi et al., 2016; Terzioğlu et al., 2015).

Repair cafes are a grassroots social innovation that address several of the major barriers to repair that consumers experience and generate more attention for repair as a value retention strategy. Repair cafes are social gatherings, often held in neighborhood centers, with a focus on repairing broken household items, most commonly clothing, coffee machines, lamps, and vacuum cleaners (Moalem & Mosgaard, 2021; Van der Velden, 2021). Repair cafes are run by volunteers who are often motivated by the ability to provide a valuable service to their community (Charter & Keiller, 2014). During the repair cafes, visitors from the community can bring in their broken household objects and

have them repaired free of charge or for a voluntary donation. Spaces for community repair are important for the community, as they ensure that citizens engage with their right and ability to repair products, as well as empower them to participate in the circular economy (Bradley & Persson, 2022; Van der Velden, 2021). Previous research on repair cafes has focused on the motivations that visitors and volunteers had for participating (Charter & Keiller, 2014; Meißner, 2021). Other research has investigated the role of repair cafes in the circular economy (Moalem & Mosgaard, 2021; Van der Velden, 2021). With Moalem & Mosgaard (2021) performing a comprehensive literature review on the background of repair cafes and their potential and challenges in addressing sustainability related issues.

This thesis contributes to the current literature on repair cafes and social innovations in two ways. Firstly, the investigation of repair café emergence in the socio-economic and demographic data builds on previous studies that investigated the motivations and characteristics of consumers that engage with the repair economy and repair cafes (Charter & Keiller, 2014; Lefebvre et al., 2018; McCollough, 2019). This approach also offers new insights into the growth and diffusion of repair cafes throughout the Netherlands by analyzing municipal conditions that may support the emergence of repair cafes. Secondly, this thesis contributes to the literature on bottom-up citizen initiatives and social innovation. By investigating how environmental factors and municipal characteristics influence the patterns of repair café emergence, this thesis contributes to the understanding of the role that local contexts play in the adoption and adaptation of social innovations (Rabadjieva & Butzin, 2020). Moreover, this thesis addresses a gap in the literature by investigating how user collectives that promote social innovations emerge and in which contexts this emergence occurs (Köhler et al., 2019).

The findings of this thesis may provide actionable insights that can inform how policymaking and community development strategies can promote sustainability through repair cafes. Using socio-economic and demographic data to investigate the patterns of emergence and geographical distribution of repair cafes in the Netherlands, the following research question will be investigated:

What socio-economic and demographic factors are associated with the emergence of repair cafes in Dutch municipalities?

This thesis is organized into several key sections. The following sections will first delve into the theoretical framework, discussing the literature on grassroots social initiatives and social innovation, as well as give background on repair cafes. Using this theoretical framework, four key dimensions of repair cafes were identified. In the methodology section, these four dimensions were used to construct variables for a negative binomial regression, which are discussed in this section. In the results section an empirical analysis of the models for negative binomial regression are presented. In the discussion section, these results will be interpreted in the context of the theoretical framework. The final section will conclude this thesis by summarizing the main findings, discuss their implications for policy and practice.

2. Theoretical Framework

2.1. Social Innovations

This study investigates repair cafes as a type of grassroots social initiative. Grassroots social initiatives emerge from the bottom-up through individual or community action, motivated by social needs or ideology rather than profit (Seyfang & Smith, 2007). Other examples of grassroots social initiatives are ecovillages, which promote sustainable living practices, and community energy cooperatives to generate and manage renewable energy. Grassroots social initiatives are mainly focused on social innovation (Pesch et al., 2019; Seyfang & Smith, 2007). Social innovations have a type of social phenomenon as its object as innovation and can be defined as a process in which social relations are challenged and transformed through new ways of doing, organizing, framing, and knowing (Avelino et al., 2019; Haxeltine et al., 2015; Pel et al., 2020). At the level of the community, social innovation can operate through grassroots initiatives, where they address problems that persist in social systems and work towards alternative solutions (Avelino et al., 2019). Social innovations are studied as a method for behavioral change through the development of new forms of social organization and cooperation between civil society and government, as well as creating a social value (Van der Have & Rubalcaba, 2016). Social innovations are expected to have the capacity to address a multitude of societal challenges, such as poverty, social exclusion, and sustainability (Van der Have & Rubalcaba, 2016). van der Have & Rubalcaba (2016) highlight how an interplay of various disciplines in the study of social innovation. This paper mentions that to investigate the diffusion of repair cafes it is important to examine how these initiatives create social value and embed new social practices within communities.

Diffusion of grassroots innovations.

The diffusion of grassroots initiatives and social innovation can be studied through various frameworks. This thesis synthesizes three frameworks to develop a comprehensive understanding of the dynamics of repair café emergence.

Rabadjieva & Butzin (2020) suggest that the diffusion of social innovation goes through practice fields, defined by the replication of social practices and the promotion of specific elements in the forms of material, competence, meaning. These elements are recontextualized in new settings in order to establish new practices, which leads to the

diffusion of social innovations. Roysen et al. (2024) developed an embedding framework to study the diffusion of grassroots initiatives. The key dynamics they identified were: (1) *expansion* through the relations with external actors, (2) *reframing* through the cultural impact of the initiative, (3) *circulation of knowledge*, (4) *shifting of material arrangements*, and (5) *replication* through recruitment or reproduction of the initiative in new contexts. Finally, the Transformative Social Innovation (TSI) framework places social innovation as one of four shades of change that challenge, alter, or replace dominant institutions in specific socio-material contexts through their interactions and coevolution (Avelino et al., 2019; Pel et al., 2020). The other shades of change in this framework are system innovation, game changers, and narratives of change (Avelino et al., 2019).

Significant points of overlap between these frameworks are their emphasis on the role of altering existing systems and cultural contexts. All three frameworks highlight the importance of changing physical and institutional contexts. Rabadjieva & Butzin (2020) call these practice fields. The embedding framework by Roysen et al. (2024) discuss *expansion* and *shifting material arrangements*. *Expansion* occurs through the interactions between members of the initiative and external actors and includes efforts to create collaborations with these outside actors to gain social and institutional support. The *shifting of material arrangements*, such as through making a physical space available or providing access to tools, influences transitions by making sustainable practices more accessible for people from within and outside the initiative. These dimensions relate to system innovation as a shade of change in TSI framework. System innovation involves the transformation of societal sub-systems through institutional change and creating new patterns of interaction (Avelino et al., 2019). All three frameworks mention highlight the importance of altering existing systems and institutions for the diffusion of a social initiative.

The alteration of cultural contexts refers to the symbolic work performed by social initiatives is another point of overlap between these frameworks. Rabadjieva & Butzin (2020) mention this work as the creation of meaning and engagement in a social innovation. In Roysen et al. (2024), changing of cultural contexts is referred to as *reframing*. This dynamic focuses on the cultural impact of an initiative and how they challenge dominant norms and ways of acting. Reframing is closely related with the 'narratives of changes' mentioned in Avelino et al (2019). Narratives of change are the

discourses and story lines used to argue for societal change that provide legitimization and guidance in the process of change (Avelino et al., 2017; Wittmayer et al., 2015). Through the alteration of cultural contexts social innovations change how a social issue or phenomenon is perceived and understood.

Previous research has examined the geographical distribution of various grassroots and social innovations, such as renewable energy cooperatives, and garden shows (Karic & Losacker, 2023; Nicolosi et al., 2018; Punt et al., 2021). These studies highlighted that such initiatives are unevenly distributed, investigating these patterns of distributions along dimensions of local activism, regulatory environments, and economic factors. Repair cafes represent a unique case among research on the emergence of grassroots sustainability initiatives as they touch upon dimension beyond sustainability, such as social cohesion, knowledge sharing, and challenging throwaway culture (Pesch et al., 2019). By investigating these aspects, repair cafes touch upon different dimensions than previous research on grassroots social initiatives.

2.2. Repair Cafes

The first repair café was organized in 2009 by the Dutch journalist Martine Postma. Her goal was to create an initiative that would help people avoid waste and live more sustainably. Since then, the movement has grown to over 3000 repair cafes in over 35 countries. Repair cafes fulfill two entangled functions. The first function is to promote the material aspect of repair, which involves making repair more accessible by spreading repair knowledge and skills, and the second is a social function of community and its members (Van der Velden, 2021)

The material function of repair is concerned with making repair more accessible for consumers. This function begins at repairing the products but extends to changing the interaction between people with these objects and how they experience repair in general. As a physical space, the repair café offers people access to the resources they need to perform repairs. These resources can be physical, such as tools, spare parts and repair manuals, but are also intangible, in the form of an online community and the interactions between visitors and repairers at the café (Moalem & Mosgaard, 2021; Spekkink et al., 2022). These interactions also support knowledge sharing and involving the visitor in the repair process. Unlike in repair shops, repair cafes encourage or even require

participation from visitors. A key practice in repair cafes is that rather than just dropping off a product and picking it up when the repair is completed, visitors stay in the repair café to observe and help in the repair process (Meißner, 2021; Spekkink et al., 2022; Van der Velden, 2021). Involving the visitor in the repair process leads to conversations about the product and its use and volunteers can transmit information on the repair, such as the internal workings of a product and the cause of the breakdown (Masclat et al., 2023; Meißner, 2021). Through these conversations, the focus of the visit shifts from only being about the repair of the object to the relationships between people and objects (Van der Velden, 2021) Through participation, consumers' understanding of products and their attachment to them is changed and the consumer may gain the confidence to perform repairs in the future (Van der Velden, 2021).

The social function of repair cafes is manifested in their role in community development. In a repair café a community gains a physical space where people can get together and participate in social life (Charter & Keiller, 2014; Meißner, 2021). Opportunities for re-participating in society can be especially important for community members that have lost their connections and live in isolation from their community, such as older people (Meißner, 2021). The ability to contribute to their communities in meaningful ways is also one of the key motivations for volunteers at repair cafes (Charter & Keiller, 2014). In addition, repair cafes are a hub for community members with shared values. Participants in repair cafes report a shared interest in creating awareness for social problems and the role of the initiative to create a better future, values that the repair café actively foster (Meißner, 2021; Spekkink et al., 2022) In repair cafes, a community is built around the issues of consumerism, sustainability, and learning together, creating new understandings around the design, durability, and repairability of products. Participants of repair cafes feel that the initiative addresses social and environmental local issues that in their experience would otherwise go unaddressed (Meißner, 2021).

Repair cafes also have a translocal dimension. The Repair Café International Foundation (RCIF) was founded in 2011 and is an organization that offers professional support for repair cafes and lobbies for greater institutional support for repair cafes. the RCIF acts as an overarching community that provides the people interested in founding a repair café with the resources they need to start (Spekkink et al., 2022). Through the RCIF

and its institutional support such as political lobbying and campaigning for better repair practices, repair cafes are part of a greater community of repair, making participants experience that they are part of a larger movement beyond the single repair café (Charter & Keiller, 2014).

2.3. Four dimensions of repair cafes

The following section elaborates on four key dimensions related to the emergence of repair cafes, *environmental awareness*, *cost-saving incentive*, *education*, and *social capital*. These dimensions were identified from the literature on grassroots social innovations and their diffusion and the literature on repair cafes as drivers for the emergence and operating of a repair cafe. These four dimensions were used to construct the hypotheses for this thesis.

Environmental Awareness

Concern for the environment is a key dimension related to the social function of repair cafes. Rogers et al. (2021) identified that participants in the repair economy tend to be environmentally conscious and value the environmental impact of their purchases and behavior. Other studies have also found that environmental values are key drivers for the decision to repair rather than to replace (Charter & Keiller, 2014; Fachbach et al., 2022; Meißner, 2021; Rogers et al., 2021; Terzioğlu, 2021; Terzioğlu et al., 2015). Volunteers at repair cafes are strongly motivated by reducing waste and living more sustainably (Charter & Keiller, 2014; Meißner, 2021; Rogers et al., 2021; Spekkink et al., 2022). In the context of social innovations, the environmental awareness dimension of repair cafes reframes the role of the consumer in the circular economy by encourage people to go from being a consumer in the repair economy to actively participating in it, (Hobson, 2020; Meißner, 2021). This encourages participants to adopt new values and ways of doing in their daily life. Places with a population that is highly concerned about environmental issues may therefore be more likely to found or participate in a repair café, leading to the hypothesis:

H1: *Repair cafes are more likely to emerge in municipalities with a stronger orientation towards 'green issues'.*

Cost-Saving Incentive

Next to environmental concerns, cost-saving is another key dimension in altering existing systems of repair and the social function of repair cafes. Volunteers at repair cafes identify that helping members of their community to save money through repair as an important value (Charter & Keiller, 2014). Cost saving is also an important driver for repair as a general practice. When faced with the decision to repair or replace an item, saving money is an important consideration for consumers (McNeill et al., 2020; Terzioğlu et al., 2015). This consideration can work both as a driver and as a barrier. On one hand, as income rises, consumers become less willing to get an item repaired, but rather choose to replace it (McCollough, 2019). On the other hand, a study investigating how income influences repair behavior, found that participants in income groups below national average, were significantly more likely to get household objects repaired rather than replacing it (McCollough, 2019). Income and poverty are therefore important dimensions to investigate in the study of repair café emergence. This leads to the following hypotheses:

H2: Repair cafes are more likely to emerge in municipalities where a higher cost-saving incentive is present.

Education

Education makes up a third key dimension of repair cafes. Education promotes the diffusion of repair cafes as a social innovation by altering the cultural context in which the social innovation operates. This dimension is manifested as education level and the role that educational institutions play in the diffusion of repair cafes as a practice. Firstly, studies on repair behavior found that consumers that completed higher level of secondary education were more likely to make the decision to repair rather than replace an item (Fachbach et al., 2022; McCollough, 2009). Moreover, investigating the profile of participants in repair cafes Charter & Keiller (2014) found that many participants in repair cafes, both as volunteers and visitors, have a bachelor's or post graduate degree. These findings indicate that people that have completed a higher level of education are more likely to participate in repair cafes, leading to the following hypothesis.

H3a: Repair cafes are more likely to emerge in municipalities where more people have completed higher education.

Secondly, next to education on the individual citizen level, repair cafes might also be influenced by the local presence of educational institutions. Moalem & Mosgaard (2021) found that there is a connection between repair cafes and educational institutions. They found that repair cafes have been hosted or organized on university campuses, and university teachers and staff are important actors in repair cafes as organizers and volunteers. Therefore, the following hypothesis was constructed to investigate the role of educational institutions on repair café emergence.

H3b: Repair cafes are more likely to emerge in municipalities where higher education institutions are present.

Social Capital

The final dimension of repair cafes is social capital. Social capital is an important concept in explaining the social function of repair cafes, as well as its diffusion as a social innovation in the form of altering and changing the cultural context in which the practice of repair manifests.

Social capital can be defined as a type of resource that is based on and inherent to relationships and social networks (Nahapiet & Ghoshal, 1998). Research on other types of collective community action, such as energy cooperatives, has found that social capital is an important resource for the emergence and development of grassroots initiatives (Broska, 2021; Lode et al., 2022; Marradi & Mulder, 2022). Social capital can be divided into three categories: bonding, bridging, and linking. Bonding social capital describes social connections within closely related groups, such as family or friends, of high similarity in demographic characteristics and attitudes, bridging social capital is a form of social capital between more loosely connected people from different social groups, and linking social capital describes the vertical links between people and overarching organizations (Aldrich & Meyer, 2015). This thesis will use bridging and bonding social capital, as they are concerned with the community level of social innovations.

Bonding social capital occurs at the level of the community in which a repair café operates and is fostered through tight-knit community networks (Aldrich & Meyer, 2015). This form of social capital provides the foundation for the operating of repair cafes, such as relying on volunteers to run them while offering participants the opportunities to

strengthen local ties. Volunteers are often motivated by bonding social capital. For many volunteers at repair cafes, the ability to provide a valuable service to their communities and being able to meet people from their local community (Charter & Keiller, 2014). Repair cafes also actively build bonding social capital through their goal of creating shared values around sustainability, consumerism, and learning together (Van der Velden, 2021). As a physical space for bringing community members together repair cafes facilitate the creation and reinforcement of bonding social capital within the community (Meißner, 2021). To investigate the role of bonding social capital, the following hypothesis was proposed:

H4a: Repair cafes are more likely to emerge in municipalities with stronger bonding social capital.

Bridging social capital is the type of social capital that is present between members of different communities. Bridging social capital occurs at the level of repair cafes as an overarching translocal initiative. The RCIF therefore plays an important role in creating bridging social capital between repair cafes by creating a shared identity for participants. The organization and operation of repair cafes are to some extent standardized and homogenous (Rabadjieva & Butzin, 2020; Spekkink et al., 2022). Bridging social capital in the form of diverse social networks that contain members from outside an individual's community, increases an exchange of ideas and experiences, such as the concept of a repair café, influencing the incentive for starting a repair café in their own community (Leonard, 2004) To investigate the role of bridging social capital in the emergence of repair cafes, the following hypothesis was proposed:

H4b: Repair cafes are more likely to emerge in municipalities with stronger bridging social capital.

3. Methodology

The research was performed on a macro-level, taking individual municipalities as its unit of analysis. A longitudinal research design was used, as this allowed for an investigation into the geographical patterns of the emergence of repair cafes combined with their development over the years, allowing for more explanatory power into the causal relationships of repair café emergence.

This study investigated the emergence of repair cafes between 2011 and 2023. Even though the repair café initiative was founded in 2009, this time frame was the most appropriate due to data availability. By excluding the years 2009 and 2010, 5 repair cafes were excluded from the analysis. Moreover, because Dutch municipalities merge annually for administrative or financial reasons, all variables were adjusted to the municipal division of January 2024. For these municipalities the data was either added or the averages were combined. This left the final dataset with 342 municipalities.

The following section will outline how the variables were constructed and how a regression method was chosen. An overview of the variables and their data sources can be found in Table 1.

3.1. Dependent variable

The dependent variable of this study was *Repair Café Emergence*. This variable indicated the number of repair cafes that were founded in a municipality over the course of a year. The data for *Repair Café Emergence* was collected from the repaircafe.org website of the Repair Café International Foundation (repaircafe.org, n.d.). This database is the most complete collection of repair cafes available and contains a world map that can be searched for the location of repair cafes. A search was conducted for each municipality using the name of the municipality complemented by a search of the names of any villages or relevant subdivisions within that municipality. However, because the information in this database was limited to the location of a repair café, its location, and a short description of the repair café including links to their social media pages an alternative data collection method was needed to identify in which year the repair café was founded. Through sources such as the webpages of the repair café, local newspaper articles, Facebook pages, and in some cases the description in the repair café database, the starting years could be identified. Figure 1 shows the growth of the number of repair

cafes between 2011 and 2023. Figure 2 shows the number of repair cafes that emerged each year for the same period. From these figures it becomes clear that the highest emergence of repair cafes occurred between 2013 and 2016, with another spike in 2023. Figure 3 shows how repair cafes are spread throughout the Netherlands. This map shows that repair cafes seem to be relatively evenly distributed throughout the country, with a slightly higher concentrations in the provinces Utrecht and Noord-Holland and a lower concentration in the provinces Zeeland, Limburg, and Friesland.

Figure 1

The growth of the number of repair cafes in the Netherlands for the period 2011-2023.

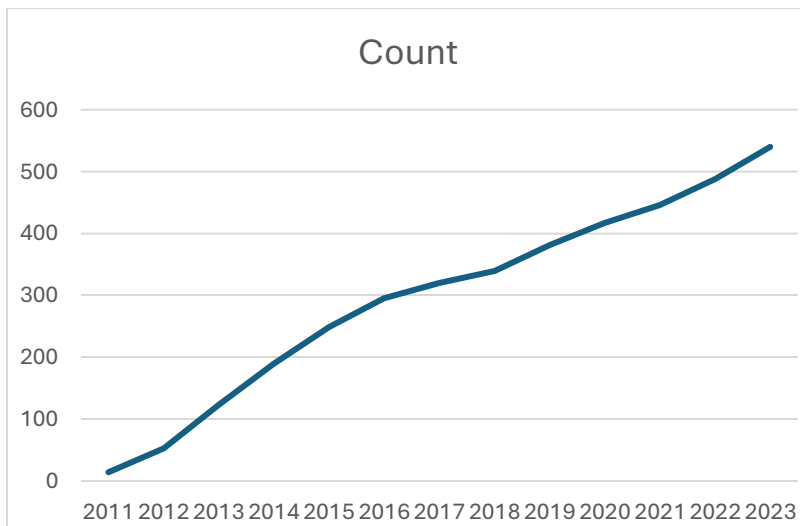


Figure 2

The number of repair café that were founded in the period 2011-2023.

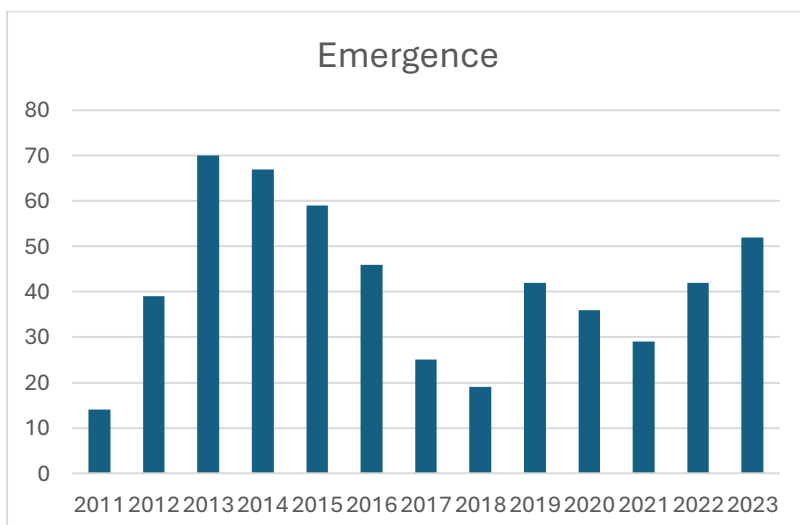
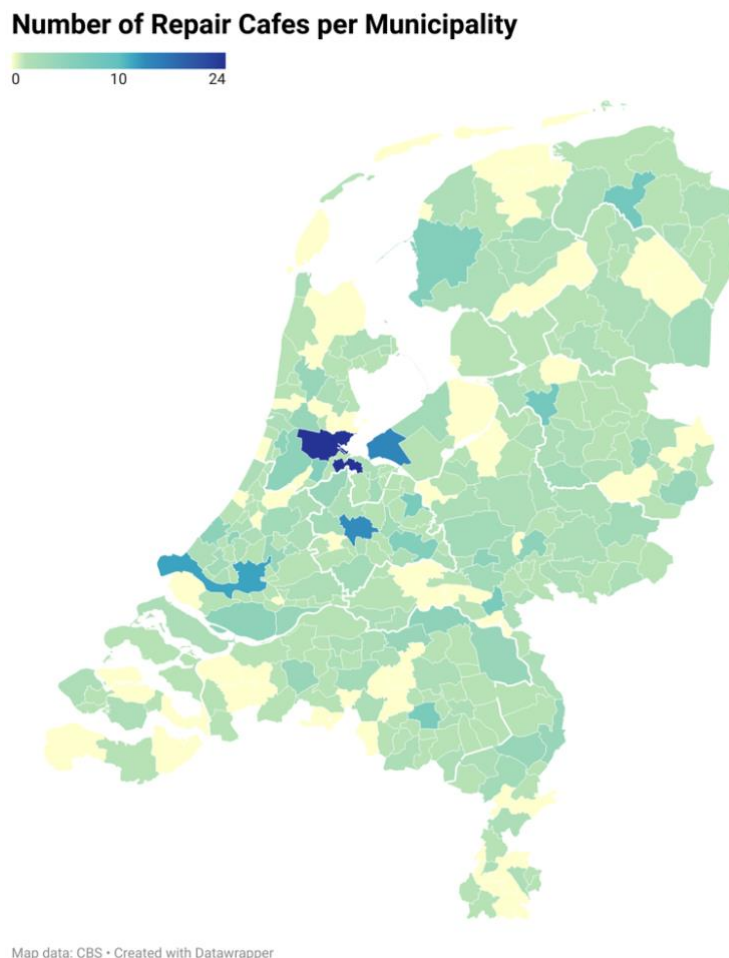


Figure 3

Spatial distribution of repair cafes in the Netherlands for the year 2023.



3.2. Independent variables

Environmental awareness

Two variables were used to capture the effect of environmental awareness of repair café emergence. Firstly, one way of operationalizing environmental awareness is by investigating voting behavior (Liu & Guenther, 2024; Punt et al., 2021). A study by Witzke & Urfei (2001) found that environmentally friendly attitudes correlate with voting behavior for ‘green’ political parties. Therefore, the variable *Green Votes* represented the percentage of votes for one of the top three ‘Green Parties’ in the national elections (D66, GroenLinks, PvdD). These parties emphasize their identification and concern for green issues and environmentalism and is therefore a good proxy for environmental awareness

(Allan & McIntyre, 2017). This data was obtained from the Kiesraad, a Dutch governmental institution that collects statistics for every political election in the Netherlands (Kiesraad, n.d.). National elections were held in the years 2010, 2012, 2017, 2021, and 2023. Results from these elections were replicated to fill in the years between elections.

The second variable was *Installed Solar Capacity*. This variable was made up to the amount of installed solar energy capacity in a municipality per 100.000 kilowatts. Data for this variable was collected from the CBS for the years 2012 to 2019 and 2021 to 2023 (Centraal Bureau voor Statistiek, n.d.). The installation of solar capacity requires up-front costs, indicating that a higher *Installed Solar Capacity* represents a tangible commitment to the adoption of green technologies and reduction of greenhouse gas emissions. Findings by Allan & McIntyre (2017) indicate that pro-environmental behavior in the form of recycling correlates with the adoption of solar photovoltaic technology.

Cost-Saving Incentive

To investigate the cost-saving dimension of repair cafes, two variables were used. First, *Income* measured the average income of households within a municipality. Data from the years 2011 to 2022 were collected from the CBS (Centraal Bureau voor Statistiek, n.d.). Secondly, *Poverty* measured the percentage of households in a municipality that lives in poverty. A household is considered to live in poverty if their income has been below that of the official low-income threshold for more than a year. The low-income threshold is a legally determined number that is adjusted each year and varies depending on the characteristics of a household, such as marital status and the number of children. Data for this variable was collected from the CBS for the years 2011 to 2022 (Centraal Bureau voor Statistiek, n.d.).

Education

The educational dimension of repair cafes was represented by two variables. Firstly, *Education Level* was constructed from the percentage of the population within a municipality that completed higher education, which are the Dutch HBO (University of Applied Sciences) and WO (University) level. The data to construct this variable was collected from the CBS for the years 2013 to 2021 (Centraal Bureau voor Statistiek, n.d.). Secondly, *Educational Institutions* represented the number of post-secondary

educational institutions per municipality to capture the influence of these institutions on the emergence of repair cafes. This variable was constructed using data collected from Studielink (Centraal Bureau voor Statistiek, n.d.). No variation over the years was included in this variable, as the number of educational institutions is relatively stable.

Social Capital

The variables for measuring social capital were taken from a database developed by Norbutas & Corten (2018). This database is based on social media data from previous research conducted by Corten (2012) which used a snapshot of the Dutch social media platform 'Hyves' taken in 2010 when the service had over 10.4 million users and investigated the structure of the social network and demographics of its users. The database consists of four variables, *Social Capital Density*, *Social Capital Louvain*, *Social Capital Diversity*, and *Social Capital Distance*, each assigned with a score between 0 and 1 (Norbutas & Corten, 2018). The mathematical construction of these four variables can be found in Appendix A.

Bonding social capital

To capture the influence of bonding social capital on the emergence of repair cafes, the variables *Social Capital Density* and *Social Capital Louvain* were used. *Social Capital Density* or Network density indicates the level of bonding social capital and connectedness within a municipality. This is done by taking the number of network ties within a municipality and dividing this number with the maximum possible number of ties based on the number of users within the municipality. A higher score for network density represents a more densely connected network within a municipality, indicating stronger bonding social capital.

Bridging social capital

To capture the influence of bridging social capital, the variables *Social Capital Louvain*, *Social Capital Diversity* and *Social Capital Distance* were used. *Social Capital Louvain* shows the strength of the division of the network into sub-communities based on a Louvain algorithm. A higher score for this measure indicates a strongly fragmented network, whereas a lower score indicates there is a single, highly connected community. Greater subdivision into communities indicates that in municipalities with a higher score,

more bridging social capital is present as there is more interaction between different communities.

Social Capital Diversity measures the degree to which individuals' friendships are distributed evenly throughout different municipalities rather than being located within their own municipalities. A higher network diversity means that networks are spread out equally throughout other municipalities, whereas a lower score indicates that more ties of an individual lie within the same municipality. *Social Capital Diversity* or network diversity represents bridging capital, as a higher score could influence the incentive for individuals to start a repair café in their own municipality based on external experiences from other municipalities and external entrepreneurial experiences (Aldrich & Meyer, 2015).

Finally, *Social Capital Distance* reflects the geographical closeness of network neighbors within the undirected network. A lower score for *Social Capital Distance* indicates that the contacts within an individual's network are geographically close, whereas a higher score reflect greater distance between an individual and the connections in their network. For this research, the average node distance for individuals in a municipality was used.

3.3. Control variables

Several control variables were included. *Repair Café Count* measured the number of repair cafes present within a focal municipality. This variable tested whether there are spillover effects from the operation of one repair café in a community to the creation of new repair cafes. The *Repair Café Count* variable was then constructed using the *Repair Café Emergence* data, signifying the amount of repair cafes that are operational in a municipality at the start of each year. Secondly, *Population Density*, *Municipal Area*, and an approximation of the percentage of retirees living within a municipality. The *Retirees* variable indicated the percentage of the population that is over the age of 65 since a high percentage of the volunteers in repair cafes are within this age range (Charter & Keiller, 2014; Parajuly et al., 2023). The data to construct these control variables were collected from the CBS (Centraal Bureau voor Statistiek, n.d.).

3.4. Regression

Because the dependent variable in this regression is made up of count data, Poisson regression and negative binomial regression were considered. A dispersion test suggested that overdispersion, which occurs when the variance exceeds the mean, was present in the data, therefore the negative binomial regression was a better choice. Overdispersion violates the assumptions of the Poisson model and can lead to underestimated standard errors and overstated statistical significance. This choice was confirmed by a log-likelihood test that yielded a p-value close to zero, indicating that the Negative Binomial model significantly improves the fit over the Poisson model by effectively accounting for overdispersion in the data. Regression was performed in the R software package. Each hypothesis was tested sequentially with the independent variables before being tested as a complete model to avoid interference from other variables.

Finally, two models were performed as a robustness check. One contained a dummy variable for the provinces of the Netherlands and tested whether there was a significant difference between urban and rural provinces. The other contained the voting variable without the GroenLinks party. This party was excluded due to potentially confounding effects from the merging between this party and another, which had significantly increased their share of votes.

Table 1

An overview of the dependent and independent variables used in the regression.

Variable	Description	Data Source
<i>Repair Café Emergence</i>	The number of repair cafes that were founded in a year.	(Repair Cafe International Foundation, n.d.)
<i>Repair Café Count</i>	Number of repair cafes present in a municipality in that year.	(Repair Cafe International Foundation, n.d.)
<i>Population Density</i>	As 100 citizens per km ² .	(Centraal Bureau voor Statistiek, n.d.)
<i>Municipal Area</i>	Official area in of the municipality in km ² .	(Centraal Bureau voor Statistiek, n.d.)

<i>Retirees</i>	Percentage of the population within the municipality that is above the legal retirement age.	(Centraal Bureau voor Statistiek, n.d.)
<i>Income</i>	Indicates the adjusted average income per household within the municipality in 1000 Euro.	(Centraal Bureau voor Statistiek, n.d.)
<i>Poverty</i>	The percentage of households that has lived under the poverty line for at least 1 year.	(Centraal Bureau voor Statistiek, n.d.)
<i>Education</i>	Percentage of the population that has finished higher education (HBO, WO).	(Centraal Bureau voor Statistiek, n.d.)
<i>Educational institutions</i>	Number of educational institutions for higher education present within the municipality (MBO, HBO, and University level)	(Centraal Bureau voor Statistiek, n.d.)
<i>Green Votes</i>	Percentage of votes in the national elections for one of the top three parties with green environmental policy (GroenLinks, D66, Partij voor de Dieren).	(Kiesraad, n.d.)
<i>Installed Solar Capacity</i>	Installed solar capacity in a municipality in 100.000 kW.	(Centraal Bureau voor Statistiek, n.d.)
<i>Social Capital Density</i>	Social capital indicator for network density	(Corten, 2012; Norbutas & Corten, 2018)
<i>Social Capital Louvain</i>	Social capital indicator for the strength of division into sub-communities of a municipality.	(Corten, 2012; Norbutas & Corten, 2018)
<i>Social Capital Diversity</i>	Social capital indicator for diversity of friendships located outside individuals' own municipality.	(Corten, 2012; Norbutas & Corten, 2018)

4. Results

4.1. Descriptive statistics

Table 2 shows the descriptive statistics and the correlations of the data. The mean emergence of repair cafes was 0.12 with a standard deviation of 0,4. The highest number of repair café emergences was in 4. The mean count of repair cafes was 0.77, with a standard deviation of 1.4, indicating a significant variation in the number of repair cafes per municipality. This finding indicates that while there is a presence of repair cafes in the Netherlands, their distribution is relatively sparse. The highest amount of repair cafes in a municipality was 23 in Amsterdam.

Turning to the correlations in Table 2, *Income* was positively correlated with *Education Level* ($r = 0.59$) and negatively correlated with *Poverty* ($r = -0.51$), suggesting that higher income areas tend to have higher education levels and lower poverty rates. *Poverty* was positively correlated with *Population Density* ($r = 0.44$), indicating that more densely populated areas experience higher poverty rates. *Education Level* was positively correlated to income ($r = 0.59$) and negatively correlated with *Municipal Area* ($r = -0.27$). *Educational Institutions* showed weak correlation with most variables, indicating that their spread throughout the Netherlands has little explanatory power. For the social capital indicators, a negative correlation is present between *Social Capital Density* and *Population Density* ($r = -0.40$), suggesting that more densely populated areas exhibit a lower level of bonding social capital.

Finally, *Social Capital Diversity* and *Social Capital Distance* exhibit a strong correlation with each other ($r = 0.79$). This high correlation raises concerns that multicollinearity might occur in the regression analysis. Therefore, *Social Capital Distance* was removed from the regression model to improve the interpretability and reliability of the remaining variables' effects on the dependent variable.

Table 2

Descriptive statistics and correlations

	Variable	Mean	SD	Min	Max	Correlation														
						(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1)	Repair Cafe Emergence	0.12	0.40	0.00	4.00	1														
(2)	Repair Cafe Count	0.77	1.40	0.00	23.00	0.18	1													
(3)	Population Density	8.92	10.43	0.21	68.27	0.14	0.27	1												
(4)	Municipal Area	120.00	129.87	7.84	907.87	0.04	0.09	-0.34	1											
(5)	Retirees	20.10	3.66	7.60	33.40	-0.13	-0.08	-0.30	0.04	1										
(6)	Income	31.37	5.30	13.95	78.80	-0.02	0.19	-0.01	-0.19	0.39	1									
(7)	Poverty	4.51	1.88	1.00	15.90	0.17	0.14	0.44	0.08	-0.27	-0.51	1								
(8)	Education	26.45	7.88	8.86	57.91	0.11	0.32	0.35	-0.27	0.14	0.59	-0.02	1							
(9)	Educational Institutions	0.32	1.17	0.00	10.00	-0.02	-0.03	0.01	-0.01	-0.05	-0.03	-0.01	-0.02	1						
(10)	Green Votes	16.00	7.64	0.47	51.20	0.07	0.43	0.33	-0.10	0.22	0.46	0.03	0.69	-0.03	1					
(11)	Solar Capacity	1.93	0.33	0.00	3.33	0.09	0.45	0.00	0.27	0.14	0.28	-0.15	0.11	-0.03	0.31	1				
(12)	SC Density	0.01	0.01	0.00	0.06	-0.11	-0.22	-0.40	0.12	0.17	0.00	-0.31	-0.32	0.00	-0.19	-0.14	1			
(13)	SC Louvain	0.44	0.05	0.26	0.58	0.09	0.13	0.05	0.04	0.00	0.16	0.01	0.32	-0.01	0.20	0.09	-0.42	1		
(14)	SC Diversity	0.31	0.02	0.17	0.37	-0.03	-0.06	-0.03	-0.14	0.03	0.20	-0.22	0.25	0.00	0.16	-0.12	0.14	0.20	1	
(15)	SC Distance	0.65	0.08	0.32	0.89	-0.05	-0.08	0.04	-0.24	0.20	0.39	-0.23	0.46	0.00	0.25	-0.19	0.06	0.30	0.79	1

4.2. Regression

Table 3 shows the results of the negative binomial regression models. Model 1 tested the control variables. Repair Café Count showed a positive and significant correlation with *Repair Café Emergence*. *Population Density* and *Municipal Area* both also showed a positive and significant correlation, indicating repair cafes are more likely to emerge in municipalities that larger and more densely populated. This finding could mean that repair cafés are more likely to emerge in more urbanized municipalities. The results for *Retirees* were unexpected. Contrary to findings in the literature that identified that many volunteers at repair cafes were retired, *Retirees* showed a negative and significant correlation to *Repair Café Emergence*. The coefficient for *Repair Café Count*, *Municipal Area*, and *Retirees* were stable throughout all further models. These variables were also found to significantly influence *Repair Café Emergence*. The results for *Population Density* were not significant in Model 3, which measured cost-saving incentive, and Model 6, where all variables were assessed together.

In Model 2, the variables for *environmental awareness* were added to the control variables. In this model, *Green Votes* exhibited a negative effect on *Repair Café Emergence*, although this result was not significant. This finding was unexpected. The *Green Votes* was expected to be positive since a higher percentage of green votes was expected to indicate that there would be a higher presence of pro-environmental values. In Model 6 a negative correlation was also observed, in this model the finding was significant. The variable *Installed Solar Capacity* was found to have a positive and significant effect on repair café emergence in Models 2 and 6, which was in line with the expectation. Because only *Installed Solar Capacity* aligned with the assumptions of Hypothesis 1, the hypothesis could only partially be confirmed.

Model 3 assessed the variables for *cost-saving incentive*. Both *Income* and *Poverty* were found to have a positive and significant effect on *Repair Café Emergence*. The findings for *Income* were not robust in Model 6, however. The coefficient of this variable is contrary to the expectation, as it was expected that in municipalities with a higher average income, there is less motivation for a community to participate in a repair café. Hypothesis 2a was therefore rejected.

The findings for *Poverty* were expected and correspond with the findings of McCollough, (2019), who found that groups with an income below the national average were more likely to make the decision to repair a product. Hypothesis 2b was therefore confirmed.

In Model 4, the variables for *education* were assessed. *Education Level* was found to have a positive and significant effect. This finding was expected, as earlier studies have identified that the people participating in repair cafes are likely to have completed higher education (Charter & Keiller, 2014). It is also in line with findings on the correlation between an individual's education level and the likelihood that they will choose a repair option over replacement (Fachbach et al., 2022; McCollough, 2009; Rogers et al., 2021) Therefore, hypothesis 3a was confirmed. *Educational Institutions* were observed to have a negative correlation, a finding that was not significant. This finding may be explained through the low number of educational institutions. Hypothesis 3b was therefore rejected.

In Model 5, the variables for *social capital* were assessed. Significant effects were observed in the variables *Social Capital Density* and *Social Capital Louvain*. *Social Capital Density* was used to test hypothesis 4a. A negative and significant correlation was found for *Social Capital Density*. This negative correlation may indicate that a high level of bonding social capital, represented by the high density of social networks, decreases the need for a repair café, as community members may have an acquaintance with the proper repair skills in their social network.

Testing Hypothesis 4b, the positive and significant impact of *Social Capital Louvain* indicates that repair cafes are more likely to emerge within municipalities with a stronger subdivision into communities. This finding could imply that in municipalities with a higher number distinct communities, communities may found multiple separate repair cafes. *Social Capital Diversity* was negatively correlated with *Repair Café Emergence*, although this finding was not significant. The finding that *Social Capital Diversity* did not significantly impact *Repair Café Emergence* corresponds with a study by Rabadjieva & Butzin (2020), which found that the diffusion of various social innovations, including repair cafes, can occur without interaction between actors of different initiatives.

In Model 6 all variables were assessed together. The results of this model differed from previous models. Unlike in model 2, voting was found to have a significant effect in

this model. Moreover, the control variables repair café count and population density were no longer found to be significant. *Income*, *Social Capital Louvain*, and *Social Capital Diversity* were also no longer significant.

Table 3
Negative binomial regression models of repair café emergence.

Regression Results						
Dependent variable:						
	Repair Café Emergence					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Repair Café Count</i>	0.097*** (0.022)	0.065** (0.027)	0.074*** (0.023)	0.058** (0.023)	0.077*** (0.022)	0.046* (0.027)
<i>Population Density</i>	0.019*** (0.004)	0.020*** (0.004)	0.002 (0.005)	0.012*** (0.004)	0.011** (0.005)	-0.002 (0.005)
<i>Municipal Area</i>	0.001*** (0.0003)	0.001*** (0.0003)	0.001** (0.0004)	0.002*** (0.0003)	0.001*** (0.0003)	0.001* (0.0004)
<i>Retirees</i>	-0.071*** (0.014)	-0.076*** (0.014)	-0.075*** (0.015)	-0.083*** (0.014)	-0.063*** (0.014)	-0.054*** (0.015)
<i>Voting</i>		-0.001 (0.007)				-0.046*** (0.010)
<i>Installed Solar Capacity</i>		0.324** (0.134)				0.577*** (0.133)
<i>Income</i>			0.042*** (0.011)			0.006 (0.014)
<i>Poverty</i>			0.177*** (0.027)			0.155*** (0.031)
<i>Education</i>				0.029*** (0.006)		0.053*** (0.011)
<i>Educational Institutions</i>				-0.068 (0.048)		-0.062 (0.048)
<i>Social Capital Density</i>					-49.721*** (15.491)	-29.332* (16.048)
<i>Social Capital Louvain</i>					2.575** (1.091)	1.356 (1.133)
<i>Social Capital Diversity</i>					-0.120 (2.055)	0.233 (2.300)
<i>Constant</i>	-1.207*** (0.291)	-1.106*** (0.295)	-3.069*** (0.425)	-1.673*** (0.310)	-2.069*** (0.756)	-3.446*** (0.919)
Observations	4,446	4,446	4,446	4,409	4,420	4,396
Dummy Variable	No	No	No	No	No	No
Log Likelihood	-1,633.867	-1,631.123	-1,614.491	-1,612.098	-1,618.919	-1,574.570
theta	1.006*** (0.247)	1.028*** (0.256)	1.255*** (0.347)	1.175*** (0.317)	1.158*** (0.305)	1.552*** (0.471)
Akaike Inf. Crit.	3,277.733	3,276.246	3,242.983	3,238.196	3,253.837	3,177.140

Note:

*p<0.1; **p<0.05; ***p<0.01

4.3. Robustness check

As a robustness check, a province dummy variable to account for regional differences between provinces in the Netherlands was constructed in Models 7 and 8. Incorporating the dummy variables into the regression analysis enhances the robustness of the overall findings by accounting for the potential regional differences in *Repair Café Emergence*. This variable gave an indication of whether there is a difference in repair café emergence between the provinces of the Netherlands. By adding a dummy, this model tries to control for potential unobserved variety at the province level. This dummy was added both by using the province with the most repair cafes (Noord-Holland) and the province with the fewest repair cafes (Friesland) as reference categories in Models 7 and 8 respectively, which can be found in Table 4. As these models show, the results from these regressions suggest that the emergence of repair cafes varies across the Netherlands, with Friesland and Zeeland having significantly lower levels of emergence compared to Noord-Holland, and Noord-Holland, Gelderland, and Utrecht having significantly higher levels of emergence compared to Friesland. Most importantly, no significant differences in the relationships between *Repair Café Emergence* and the independent variables were observed, indicating that the findings of this study were robust.

Another robustness check was performed in Models 9 and 10, removing votes for the GroenLinks party from the variable because the GroenLinks party merged with a different party in the last election, they experienced a major growth in votes, which may confound the variable. In Model 9, which tested only the variables for *environmental awareness* a positive correlation was observed, though this finding was not significant. Model 10 all variables were tested together and found a negative and significant correlation. This robustness check indicated that the finding that *Green Votes* is negatively correlated with *Repair Café Emergence* was robust. Therefore, the finding that Hypothesis 1 can only partially be confirmed still stands.

Table 4

Robustness check of negative binomial regression of repair café emergence.

Regression Results Additional				
	<i>Dependent variable:</i>			
	<i>Repair Café Emergence</i>			
	(7)	(8)	(9)	(10)
<i>Repair Café Count</i>	0.045 (0.028)	0.045 (0.028)	0.058** (0.027)	0.035 (0.027)
<i>Population Density</i>	-0.002 (0.007)	-0.002 (0.007)	0.018*** (0.004)	-0.004 (0.005)
<i>Municipal Area</i>	0.001*** (0.0005)	0.001*** (0.0005)	0.001*** (0.0003)	0.001* (0.0004)
<i>Retirees</i>	-0.045** (0.018)	-0.045** (0.018)	-0.080*** (0.014)	-0.058*** (0.015)
<i>Income</i>	0.002 (0.016)	0.002 (0.016)		0.009 (0.014)
<i>Poverty</i>	0.169*** (0.032)	0.169*** (0.032)		0.160*** (0.031)
<i>Education Level</i>	0.051*** (0.011)	0.051*** (0.011)		0.042*** (0.010)
<i>Educational Institutions</i>	-0.062 (0.049)	-0.062 (0.049)		-0.068 (0.048)
<i>Voting</i>	-0.047*** (0.010)	-0.047*** (0.010)		
<i>Voting Adjusted</i>			0.008 (0.010)	-0.046*** (0.013)
<i>Installed Solar Capacity</i>	0.621*** (0.142)	0.621*** (0.142)	0.307** (0.132)	0.415*** (0.132)
<i>Social Capital Density</i>	-28.128* (16.999)	-28.128* (16.999)		-29.760* (15.963)
<i>Social Capital Louvain</i>	1.037 (1.205)	1.037 (1.205)		1.315 (1.135)
<i>Social Capital Diversity</i>	-0.148 (2.573)	-0.148 (2.573)		0.256 (2.301)
<i>Constant</i>	-3.255*** (1.041)	-3.734*** (1.058)	-1.127*** (0.295)	-3.325*** (0.923)
Observations	4,396	4,396	4,446	4,396
Dummy Variable	Yes	Yes	No	No
Log Likelihood	-1,568.297	-1,568.297	-1,630.819	-1,580.555
theta	1.582*** (0.480)	1.582*** (0.480)	1.042*** (0.262)	1.544*** (0.475)
Akaike Inf. Crit.	3,186.595	3,186.595	3,275.639	3,189.110

Note:

*p<0.1; **p<0.05; ***p<0.01

5. Discussion

5.1 Key findings

This study investigated the socio-economic and demographic factors associated with the emergence of repair cafes in Dutch municipalities. Four key dimensions of repair cafes were used, constructed from the social and material functions that repair cafes perform, as well social innovation research: *environmental awareness*, *cost-saving incentive*, *education*, and *social capital*.

Environmental awareness

The *environmental awareness* dimension was studied in two ways. *Green Votes* represented passive environmental attitudes. The negative correlation to *Repair Café Emergence* that was found in this study corresponds with a finding in Lefebvre et al. (2018), whose study found that self-reported environmental concerns did not correlate to repair propensity. *Installed Solar Capacity* on the other hand measured pro-environmental attitudes through past behavior. Studies by Carfora et al. (2017) and Whitmarsh & O'Neill (2010) confirm that previous pro-environmental behavior is likely to translate into future actions, particularly when moderated by a strong pro-environmental self-identity. This highlights that past behavior such as the adoption of green technologies may predict the emergence of social innovations.

Cost saving incentive

Cost-saving incentive was assumed to be a driver of repair café emergence due to the role of income in determining consumers' choice to repair or replace an item. This thesis could not fully confirm the hypothesis that cost-saving incentive would positively correlate with repair café emergence. While this study could not investigate the specific characteristics of communities where repair cafes emerged, there are several potential explanations for the lack of a clear correlation between *cost-saving incentive* and *Repair Café Emergence*. Further research could investigate other economic factors, such as income inequality. Repair cafes may for instance be more likely to emerge in areas with higher income inequality, where lower-income residents may be driven by cost-saving incentive and more affluent residents may be motivated by one of the other three dimensions of repair cafes. Additionally, repair cafes could be more common in rural or

suburban areas with a stronger sense of community or tradition of repairing objects themselves.

Education

The *education* dimension of repair cafes was found to have a positive correlation with *Repair Café Emergence*. Findings differed between education at the individual and institutional level. *Education Level* was found to be a significant factor in the emergence of repair cafes, which is in line with other studies that investigated education level as a factor in repair behavior (Fachbach et al., 2022; McCollough, 2009). The finding that *Educational Institutions* did not significantly predict Repair Café Emergence could be explained by the action fields in which Repair Cafes operate. Social innovations such as repair cafes may rely more strongly on community-based initiatives, collaborative structures, and cultural ties, rather than incumbent actors like educational institutions (Pel et al., 2020).

Social capital

The results for bonding social capital indicate that higher bonding social capital in the form of *Social Capital Density* negatively correlates with a higher likelihood that repair cafes will emerge. Other research has indicated that participants are highly motivated by the social opportunities of the repair cafe (Charter & Keiller, 2014; Vandenabeele & Decuypere, 2022). As the density of social networks increase a community may have less need for starting a repair café for its social function. Aldrich & Meyer (2015) argue that the presence of strong bonding social capital increases the likelihood that social action will occur in response to the needs of a community level, rather than them seeking out institutional aid. individual's likelihood of seeking formal aid from organizations but increases the likelihood that social action will emerge in respond to this individual's need.

The findings for bridging social capital indicate that the strength of subdivision of communities plays a role in the diffusion of repair cafes as a concept. Aldrich & Meyer (2014) noted that connections between diverse groups in the form of bridging social capital is crucial for community resilience. Stronger subdivision into communities may therefore increase the exchange of experiences and information between communities,

which is a key factor in the diffusion and scaling of social innovations (Lode et al., 2022; Marradi & Mulder, 2022).

The findings for bridging social capital were in line with other findings that stressed the importance of bridging social capital in the emergence of social innovations (Aldrich & Meyer, 2015; Spekkink et al., 2022). The findings of Rabadjieva & Butzin (2020) also indicate that there is an important role for overarching organizations in building bridging social capital. They found that as a social innovation, repair cafes have homogenous characteristics such as their social values and practices. Diffusion of these types of social innovations not only occurs through interaction with actors in other initiatives, but also through media and education (Rabadjieva & Butzin, 2020). Translocal organizations such as the RCIF are therefore likely to play a key role in the diffusion of repair cafes, playing a major role in the communication of the initiative to potential founders.

5.2. Theoretical implications

Grassroots social innovation literature

The findings of this thesis contribute to the social innovation literature through the investigation of local socio-economic and demographic as predictors for repair café emergence. The studies by Vandenabeele and Decuyper (2022) and Pesch et al. (2019) provide valuable insights into the role of social innovations and community engagement in fostering sustainable practices. Vandenabeele and Decuyper (2022) focus on educational inclusion and the transformative potential in community based initiatives. Pesch et al. (2019) highlighted the importance of individual motivations, such as the desire to create institutional change or create a space to act outside dominant institutional contexts, in the diffusion of social innovations. Similarly, this thesis found that individual characteristics, such as education level and past pro-environmental behavior, had a greater influence on *Repair Café Emergence* than institutions. This aligns with the findings that diffusion of social innovations depends on needs perceived by actors at certain places and the capacities of the actors to absorb and link elements related to social innovation in order to establish new initiatives (Rabadjieva & Butzin, 2020).

Moreover, the finding that previous pro-environmental behavior positively influenced repair café emergence highlights an interaction between repair cafes and the adoption of

green technologies on a municipal level, indicating that individuals willing to adopt green technologies are also more inclined to engage with system innovations in the form of changes of patterns of consumption (Avelino et al., 2019). Pesch et al. (2019) highlighted the importance of citizen participation in enhancing the legitimacy and effectiveness of sustainability initiatives. This is supported by the findings of this thesis, which show that higher education levels and social capital in municipalities increase repair café emergence. These factors indicate a higher level of interactions between people, increasing their visibility and *reframing* people's perceptions of the initiative and fostering broader societal change (Roysen et al., 2024).

Repair café literature

This thesis contributes to the understanding of the material and social functions of repair cafes. Interestingly, the findings of this study expand on earlier assumptions in the *environmental awareness* dimension of repair cafes. Earlier studies identified that pro-environmental values are a key motivation for repair café founding and participation (Charter & Keiller, 2014; Moalem & Mosgaard, 2021). This thesis found a distinction between environmental awareness through passive or active pro-environmental behavior was identified, contributing to previous findings by Carfora et al. (2017) and Whitmarsh & O'Neill (2010). Past pro-environmental behavior in the form of installing solar panels was more likely to lead to *Repair Café Emergence* than passive behavior in the form of voting for 'green' political parties was. Furthermore, the influence of individual characteristics in the form of income and education level on *Repair Café Emergence* highlight the social function of these initiatives. Repair cafes bring together community members that share values around repair and their role in the circular economy (Meißner, 2021; Spekkink et al., 2022).

This thesis underscores the complex role of social capital in the emergence of repair cafes. The finding that high levels of bonding social capital may reduce the need for formal repair initiatives challenges a finding by Meißner (2021), that repair cafes offer a way for citizens to 'care for community'.

Societal impact

The understanding of what drives repair café emergence can guide efforts to shift societal norms and institutions away from the throwaway culture and towards more sustainable

consumption. This thesis found that the diffusion of repair cafes is in many ways influenced by individual rather than institutional contexts. This could help inform policies and initiatives that aim to create or foster cultures of community repair within municipalities.

5.3. Limitations and recommendations for future research

Several research limitations should be addressed. Firstly, the quantitative approach of this thesis did not allow for the measuring the impact that repair cafes have on their communities. During the data collection process, a wealth of qualitative data was encountered, such as the location that the repair café was organized in. These locations were commonly community centers and elderly homes but were in some cases also privately organized or associated with labor reintegration efforts. This suggests that the social context and organizational structure in which a repair café operates may be important to their emergence and operation. Future research could adopt a qualitative approach to delve into the motivations and characteristics of repair café founders to determine if these are factors that influence the emergence and operation of repair cafes.

Secondly, the variable for RC emergence could be confounded by the inclusion of non-active repair cafes. This could lead to an overestimation of the number of repair cafes active in certain municipalities. These overrepresented municipalities may skew the results. Future research should investigate the factors that influence not only the emergence but also the longevity of repair cafes to create a more comprehensive understanding of the dynamics of repair café activity.

Another potential avenue of investigation are the ways that repair cafes communicate with the communities they operate in and how they gather new volunteers and participants. This can serve as a steppingstone for research into the impact that repair cafes have on their respective communities. Additionally, this could shed a light on the discrepancy between pro-environmental attitudes and repair café emergence. Further research could investigate the self-reported identities of repair café participants to gain more insight into the role that environmental awareness plays as a motivation for participation in or the emergence of repair cafes in a way that quantitative data cannot.

6. Conclusion

This thesis investigated the emergence of repair cafes in Dutch municipalities, focusing on four key dimensions that influence repair café emergence were identified; *environmental awareness, cost-saving incentive, education, and social capital.*

Hypothesis 1: *Repair cafes are more likely to emerge in municipalities with a stronger orientation towards 'green issues',* was only partially supported. Investigation of the presence of solar PV found a positive correlation, whereas voting behavior negatively correlated with *Repair Café Emergence.* Suggesting that environmental values do not always translate into practical actions like founding or participating in a repair café.

Hypothesis 2: *Repair cafes are more likely to emerge in municipalities where a higher cost-saving incentive is present.* Was only partially confirmed. This hypothesis was supported by findings for the variable *Poverty.* However, the positive correlation with *Income* contradicted the hypothesis, indicating a nuanced relationship between economic factors and repair café emergence, which could be explored in future research.

Two hypotheses were constructed in the *education* dimension. *H3a: Repair cafes are more likely to emerge in municipalities where more people have completed higher education,* was confirmed by the findings of this study. *H3b: Repair cafes are more likely to emerge in municipalities where higher education institutions are present,* was rejected. These findings indicated that education may predict repair café emergence on a personal level whereas the role of educational institutions is limited.

Finally, for the social capital dimension of repair cafes, the following hypotheses were constructed. *H4a: Repair cafes are more likely to emerge in municipalities with stronger bonding social capital.* This hypothesis was supported by the findings of this study. *H4b: Repair cafes are more likely to emerge in municipalities with stronger bridging social capital,* could not be completely confirmed by this study. These findings highlight the complex role of social capital in the emergence of repair cafes. Future research could investigate the interplay between different types of social capital on the diffusion of social innovations.

This thesis also found that the quantitative approach may not allow for an in-depth understanding of the motivations and characteristics of repair café founders and participants. This thesis did not adjust for non-active repair cafes, which potentially

skewed the results. Further studies should investigate non-active repair cafes, which may give more insight into factors that influence the longevity and staying power of repair cafes. Moreover, future research should investigate the long-term impact of repair cafes on community sustainability and resilience and explore how repair cafes attract volunteers and participants.

In conclusion, this study underscores the significance of *environmental awareness*, *cost-saving incentive*, *education*, and *social capital* as key dimension in the emergence and diffusion of repair cafes. By fostering and promoting a culture of repair and sustainability, repair cafes can contribute to the circular economy by increasing its visibility and promoting sustainable consumption. However, the findings also highlight the need for a more nuanced understanding of the factors driving repair café emergence and the complex interplay between socio-economic and demographic factors. Policymakers and organizations such as the RCIF can use these insights to design more targeted interventions to promote repair cafes as part of broader sustainability strategies.

7. References

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Appendix

The mathematical buildup of the social capital indicators used in the regression analysis are further elaborated in the following paragraphs. The data source originates from earlier research conducted by Corten (2012) and comes from the social media network Hyves. The social capital indicators were further developed by Norbutas & Corten (2018).

Social Capital Density

The variable network density was calculated by dividing the number of existing ties within a municipality network by the maximum number of possible ties within that municipality given the number of registered Hyves users. Network density is represented by a range between 0 and 1, with a 0 indicating a completely unconnected network and a 1 a network that is completely connected. The resulting variable was highly skewed, and therefore the researchers used a log-transformation.

Social Capital Distance

The measure of node locality was constructed to take geographical distance into account, representing the geographical closeness of the network neighbors of an individual in an undirected network. The value was calculated with the following formula:

$$NL_i = \frac{1}{k_i} \sum_{j \in \tau_i} e^{l_{ij}}$$

Equation 1. Mathematical equation for calculating the indicator: Social capital – node locality (Norbutas & Corten, 2018).

The node locality NL_i is calculated by considering the node i with a certain geographical position. Then, using a set of neighbors τ_i , a number of these neighbors k_i and geographical distance l_{ij} between node i and its neighbour j , using equation 1.

Social Capital Diversity

Network diversity indicates bridging social capital, reflecting to what extent individuals' friendships are diversely spread throughout multiple municipalities opposed to concentration within their own municipality.

The indicator assigns high value only if the ties are not located in several municipalities, considering multiple bridges with the same municipality to reduce the level of diversity, reflecting the concept of redundant bridges (Norbutas & Corten, 2018).

The diversity variable D for each individual was calculated with the following formula:

$$D_i = \frac{-\sum_a^A p_{ia} \log(p_{ia})}{\log(A)}$$

Equation 2. Mathematical equation for the indicator: Social capital – network diversity (Norbutas & Corten, 2018).

In this equation, the variable p_{ia} indicates the proportion of individual i network ties that there are with individuals living in a of total A municipalities, measured in a range between 0 and 1. A value of 0 indicates all the ties of an individual are located within the same municipality, while 1 indicates that ties are spread out equally across municipalities. The measure is calculated on ties between people *within* and *outside* of an ego network's municipality. Individual scores for network diversity are then averaged for each municipality.

Social Capital Louvain (Network Modularity)

The *network fragmentation* indicator, referred to in this thesis as *Louvain*, was constructed using the Louvain algorithm of community detection. The algorithm detects community structures within large networks of up to 100 million nodes and is a multi-level method based on the optimization of modularity. Modularity is defined as the strength of division into sub-communities within networks. Norbutas & Corten (2018) describe the following steps in the procedure of calculating network modularity: *“In the first step, the algorithm detects small sub-communities within a network in which members are more densely connected with each other than with all other members of the network. In latter steps, it builds a new network where nodes are the newly identified sub-communities and repeats the analysis of their interconnectedness. This algorithm is then repeated until the modularity is maximized and the best possible partition of a network into communities.”*