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Economic sustainability of local food producers: a mixed methods study

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Introduction: This study investigates local food producers' economic sustainability by examining the impact of six variables: external and internal barriers, the number of economic operators, the imbalance of power, the number of distribution options, and waste.

Methods: The investigation uses mixed methods of questionnaires and interviews. The data was collected using a self-completed questionnaire, which was answered by 57 local food producers across Norway, and four semi-structured interviews with professionals in the food industry. The quantitative data was analyzed with the use of partial least squares structural equation modeling (PLS-SEM), and the qualitative data was analyzed using a thematic analysis.

Results: The study has statistically confirmed three out of eight hypotheses. The three hypotheses show that when the number of economic operators in the supply chain increases and also imbalances in the sales channels increase. Additionally, the imbalance of power in the sales channels has a negative effect on economic sustainability, and external barriers have a negative effect on the imbalance of power in the sales channels. The interviews supported seven of the hypotheses, although four of them were not supported.

Discussion: The empirical evidence presented in this study indicates that the lack of balance within the supply chain exerts a substantial influence on the economic sustainability of local food producers. By adopting a comprehensive approach, this research demonstrates that a more holistic perspective leads to enhanced economic sustainability. Additionally, it elucidates the diverse ways in which various factors impact the economic sustainability of local food produce.

KEYWORDS

local food producers, short food supply chain, economic sustainability, imbalance of power, internal and external barriers

1 Introduction

In Norway, local food sales have increased from 11.2 billion NOK in 2021 to 11.5 billion NOK in 2022 (Government, 2022b), which can be an indicator of an increased interest in locally produced food. According to the Agricultural Policy Monitoring report (Organisation For Economic Co-Operation And Development, 2020), the contribution of Norwegian local food chains to the country's Gross Domestic Product (GDP) currently stands at less than 1%. Nevertheless, it is anticipated that this figure will experience a notable rise in the near future. Consequently, the Norwegian government has shifted its attention toward fostering the production of local food in order to meet this objective.

Furthermore, according to a report from the Norwegian Food Authority (2021), the large retailers have also increased their interest in locally produced food. In the Norwegian market, the

governmental food policies cover the entire supply chain (SC), and their main objective is to supply with high quality food by making the supply chains as safe, sufficient, and reasonable as possible (Government, 2022a). However, the retailers who sell the finished food products to end consumers often have the highest profits. Norway stands out from other countries in Europe because of the high concentration of power in the grocery industry, and in recent years retailers have increased the vertical integration in the sector by "forcing" cooperation in the wholesaler sector (Norwegian Farmer Organization, 2022).

Over the last decades, the global food system has been considered unsustainable due to food waste and environmental damages through overuse and increased waste and because of a skewed and unfair allocation of received value among the different actors through the supply chain (Mancini et al., 2019). Several studies discuss the local food supply chain under different names, but often from the perspective of short food supply chains (SFSCs; e.g., Abate-Kassa and Peterson, 2011; Mancini et al., 2019; Campos et al., 2021; Doernberg et al., 2022). SFSCs focus on reducing economic operators in the total supply chain of locally produced food (Malak-Rawlikowska et al., 2019), which in turn, through studies, has been found to improve the economic sustainability of local food producers (Renkema and Hilletofth, 2022). Furthermore, recent events such as the Covid-19 pandemic and the war between Russia and Ukraine have increased the discussions and realizations about the importance of local food production (Hobbs, 2020; Alsetoohy et al., 2021; Ben Hassen and El Bilali, 2022; Jones et al., 2022). Nonetheless, little research exists on how factors such as SFSCs, imbalances of power, and internal and external barriers together impact local food producers' economic sustainability. The concept of power imbalance is frequently discussed in the supply chain literature as a significant factor that influences both current and future interorganizational relationships (Heide, 1994; Kumar et al., 1995; Essabbar et al., 2020). This power imbalance can lead to opportunistic behavior (Williamson, 1981) and compel suppliers to make specific investments and adjustments in their relationships (Ramsay, 1996; Cox et al., 2007). In the context of supply chain sustainability, understanding power imbalance becomes crucial in explaining why supply chain actors adopt and implement sustainability practices (Touboulic et al., 2014; Schutte et al., 2022; Rivera-Valle and Silva, 2024) and how sustainability goals are established (Pagell et al., 2010). To conclude, the examination of power and dependence in sustainable supply chains is not a new topic. However, recent research in sustainable food supply chains (Rivera-Valle and Silva, 2024) highlights the lack of studies that investigate the impact of power imbalance on supply chain sustainability. To address this research gap, our study explores how factors such as short-food supply chains, power imbalances, and internal and external barriers collectively affect the economic sustainability of local food producers. This paper aims to provide knowledge in this field by investigating the following three research questions:

> *RQ1*: Does an imbalance of power impact local producers' economic sustainability?
>
> *RQ2*: What is the impact of local producers' external barriers on their economic sustainability?
>
> *RQ3*: What is the impact of local producers' waste on their economic sustainability?

Initially, a comprehensive questionnaire was formulated and administered to a cohort of 57 individuals actively involved in agricultural pursuits, specifically farmers. These respondents are chosen as they represent a diverse group of local food producers operating within 11 geographically distinct regions in Norway. The farmers under investigation primarily engage in conventional farming practices, such as the production of meat, eggs, non-alcoholic beverages, fruits and vegetables, cheese, and other related products. Second, interviews have been conducted (four interviewees). To analyze questionnaire data, we use partial least squares structural equation modeling (PLS-SEM). Interviews are analyzed by using a thematic analysis. The hypotheses for PLS-SEM are based on previous research literature. We respond to calls for researching the impact of power imbalance on SC sustainability (Rivera-Valle and Silva, 2024). To answer these research questions, this study uses mixed methods (Creswell and Creswell, 2018). By using both a questionnaire and an interview, we gather different types of data that complement each other. Questionnaires provide standardized responses, allowing for quantitative statistical analysis. Interviews offer more in-depth and qualitative insights, capturing nuances and personal experiences that may not be captured in a questionnaire. By combining both, we gain a comprehensive understanding of the research topic.

2 Literature review and hypotheses

Marsden et al. (2000) coined the term SFSCs and divided them into three types: face-to-face, spatial proximity, and spatially extended. Ilbery and Maye (2005) found that the key characteristics of all three groups are that all food products reach the end consumer after passing through a SC, containing valuable information about the mode of production, the origin of the product, and the unique quality assets of the food product. Furthermore, Loconto et al. (2018) state that SFSCs can either be seen in physical distance or through cognitive distance and based it on the total number of actors (i.e., economic operators) from production to the consumer. The literature indicates that both direct and short chains for local food are often used as synonyms that merge both direct- and mediate sales (i.e., sales through restaurants, stores, and similar; Rogers and Fraszczak, 2014; Renkema and Hilletofth, 2022).

Since local food supply chains are mainly researched through SFSCs and the term "local food supply chain" is usually used to describe the supply chain of local food products (Abate-Kassa and Peterson, 2011; Campos et al., 2021), SFSCs are defined by Mancini et al. (2019, p. 1) as "(…) involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors and consumers."

Several previous studies have found both drawbacks and advantages for local producers regarding the choice of sales channels (i.e., marketing channels; Milford et al., 2021). Kim et al. (2014) compared the risk and return factors of selling through farmers markets versus selling through what are referred to as wholesale market channels in the US (i.e., what Milford et al., 2021 refer to as mainstream wholesalers). In Milford et al. (2021) study, they found that local producers often chose to sell through a mainstream wholesaler because of transparent pricing. Furthermore, a study by Hardesty and Leff (2010) showed that producers had lower marketing costs when they sold through wholesalers. Moreover, LeRoux et al. (2010) found that producers selling through farmers markets had the possibility of gaining a higher net sales income than those selling through wholesalers. The findings

of these studies indicate that there are both drawbacks and advantages to all types of sales channels (i.e., sales market) depending on the producers and their opportunities, goals, knowledge, and more.

Between the 1980s and 1990s, a large restructuring of the retail section occurred in Norway. According to Kjuus (2010), this restructuring resulted in a larger concentration of power in the food chains, which made it more difficult for the producers to gain access to the retailers' store shelves (Richards et al., 2013). Although these studies are more than 10 years old and the industry changes continuously, it is known that the Norwegian retail market is still concentrated around just a few retail chains. Additionally, producers can choose from only a limited number of distribution channels (Amilien, 2011). This means that although there are many different transportation companies, the producers have three main options: distribute through wholesalers that are owned by the umbrella chains, arrange their own distribution, or use some of the smaller distributors. Additionally, the more distribution channels producers could choose between, the more options there were for SFSCs. Some of the channels might have more convenient pick-up services or be less expensive. Furthermore, the composition of the distribution providers used by producers may also have a positive impact on pricing.

In the supply chain literature, it has been argued that the increased imbalance of power has led local food producers into an "arm lock," where producers are potentially forced out from key sales channels (e.g., larger retailers). This arm lock may have occurred because of the governing of the large chains by keeping high private standards in addition to a rationalization of the biases in the industry (Amilien, 2011; Richards et al., 2013).

Based upon this assumption, we propose the three following hypotheses:

> *H1*: The number of economic operators in downstream supply chain is positively associated with the local producers' imbalance of power in the sales channels.
>
> *H2*: The imbalance of power has a negative effect on local producers' economic sustainability.
>
> *H3*: The number of distribution options strengthens the negative effect of the imbalance of power on local producers' economic sustainability.

2.1 Economic sustainability and barriers

Economic sustainability in the context of food supply chains concerns the viability and competitiveness of the actors in the SC and relates to the increased opportunities for improved income for all actors involved as well as the job creations that lead to increased value creation in society (Muhammad Kaleem et al., 2022; Vittersø et al., 2022). One could therefore claim that economic sustainability concerns the viability of different local food producers. Additionally, within the context of SFSC's economic sustainability, producers may be able to increase the value of their product through limited numbers of economic operators (i.e., intermediaries; Renkema and Hilletofth, 2022).

There are challenges within the SC that affect the extent to which local food producers can achieve economic sustainability. According to Laurett and do Paço (2018), barriers can be seen as problems and/or situations that prevent an activity or action from being carried out. Local food producers might be exposed to internal and/or external barriers. External barriers that local food producers may be exposed to can be categorized into groups such as too little knowledge about technology, problems with infrastructure, legislative problems, and a lack of support policies. Additionally, producers may face external barriers regarding market access, such as difficulties selling their products to grocers who could offer lower prices to smaller businesses (Nave and Do Paço, 2021; Balcom et al., 2023). As such, the two hypotheses follow:

> *H4*: Local producers' external barriers are negatively associated with the imbalance of power in the sales channels.
>
> *H5*: Local producers' external barriers are negatively associated with producers' economic sustainability.

Local food producers do not only face external barriers (barriers from outside the company); there are several internal barriers that the company could be exposed to. Nave and Do Paço (2021) found that a lack of both material and human resources, a lack of knowledge and information, financial constraints, and difficulties with company change were common internal barriers faced by producers. An example of internal barriers can be the situation when producers selling their own products through their own sales channels (e.g., farmers markets) and face challenges regarding the initial setup costs and finding suitable storage and locations for their products (Balcom et al., 2023). This point has led to us making the following hypothesis:

> *H6*: Internal barriers for local food producers have a positive effect on the imbalance of power in the sales channels.

Furthermore, another internal barrier to economic sustainability could be the waste in production (i.e., raw materials and finished products). In a study by Bayir et al. (2022), food waste is considered, among other things, an economic sustainability challenge. This is because food products that are either thrown away due to, for example, expiration dates, poor quality, or the remains of the ingredients not being used further in the production, are a potential loss of revenue for the company. The claim that food waste is considered an economic sustainability challenge has led to us making two hypotheses:

> *H7*: Producers' waste in production has a negative effect on producers' economic sustainability.
>
> *H8*: The internal barriers have negative effect on waste in production.

3 Research settings

Across Norway, approximately 516 local food producers are registered in 2023, with a valid self-audit and have confirmed through the self-audit that the production is according to Norwegian

regulations for safe food (Norwegian Food Foundation, 2023). In this study, the main target respondents were Norwegian local food producers.

In the last few years, local food producers in Norway have had major challenges associated with price increases, increasing cross-border trade, and the closure of society during Covid, but nonetheless, sales of locally produced products have increased from 11.2 billion NOK in 2021 to 11.5 billion NOK in 2022 (Government, 2022b). This study's targeted respondents are local food producers in Norway. Additionally, we have included four respondents that are knowledgeable about the local food industry. To facilitate the acquisition of data, our research endeavors were supported by Salgslaget. This organization operates as a collective of proficient collaborators possessing extensive expertise and experience across the entire value chain for local food. Consequently, Salgslagets functions as a proficient and harmonized "all-in-one" network, offering commercial services to producers of regional food and beverage specialties. Each partner in the network comprehensive knowledge of both the challenges and opportunities prevalent in the market. The principal objective of Salgslaget is to provide guidance and facilitate connections among local farmers.

The data was collected between the 22nd February and the 13th March 2023. Salgslaget AS distributed the questionnaire to the targeted respondents of the study to obtain a relevant sampling (Sikt, 2023). 57 responses to the questionnaire have been received. Additionally, through the contacts from Salgslaget AS, we found four interviewees who were relevant for the interviews. These interviewees were from The Norwegian food authorities, retail sector, network of experts for local food, and local sales channel. The selection of interviewees was based on their respective positions within the supply chain and their extensive knowledge pertaining to local food supply chains. This deliberate choice was made with the intention of acquiring a comprehensive understanding of the outcomes derived from the quantitative analysis. The interviews were conducted between the 23rd February and the 2nd March 2023 through Microsoft Teams and lasted for approximately 1 to 1.5 h.

3.1 Operationalization of constructs for the quantitative analysis

To operationalize the constructs of the model, we have used questions from the following sections of the questionnaire: production, transport/distribution/wholesaler, sales channels, and barriers (both internal and external). Indicators for the following constructs were measured using 7-point Likert scale (Taherdoost, 2019): external barriers, internal barriers, imbalance of power in sales channels, and waste at production. The construct "number of economic operators in the SC" is measured as the sum of the number of operators in their supply chain. The range is between one operator to seven. The construct "number of distribution options" is measured as the sum of distributions channels in the supply chain, which varies from 1 to 3. The economic sustainability construct is a categorical variable, divided in six groups, measured as profitability in percentage. The operationalization of the individual constructs is explained below.

External barriers (7-point Likert scale). In the conceptual model, the construct of external barriers is used as an independent variable (see Figure 1). In this study, it is defined as barriers outside the company that have the potential to hinder local food producers' ability to be economically sustainable in the long run. Because of the wording used in the four indicators (see Table 1), the indicators were reversed. Originally, the questionnaire had five questions in this category. However, following the rules of Hair et al. (2017), an indicator should be considered removed from the construct if the removal leads to an increase in either the composite reliability or the average variance extracted (AVE). The construct is named EXTBAR and is measured by four indicators (i.e., one indicator was removed from the construct).

Internal barriers (7-point Likert scale). The construct of internal barriers is an independent variable in the conceptual model. Operationally, this variable is defined as barriers that could occur inside the producers' company and potentially be a hindrance for either growth or economic sustainability in the long run. The construct is named INTBAR and is measured by four indicators.

Number of economic operators in SC. In the conceptual model, the number of economic operators in SC is an independent variable. The variable is defined as the sum of economic operators used in the SC, from producers to end consumers. This construct is measured by a single indicator. Bergkvist and Rossiter (2007) found that the use of single-item measures works best if the object of the attribute is concreated and uniformly imagined. This construct is named ECOP.

Imbalance of power in sales channels (7-point Likert scale). For the conceptual model in this study, imbalance of power in sales channels is a mediating variable. We have defined this variable as the local food producers' position relative to the imbalance of power in the sales channels. Originally, the questionnaire had five questions in this category that were measured using the Likert scale. However, like with the construct *external barriers*, Hair et al. (2017) rules were followed. As such, the construct is measured by three indicators (i.e., two indicators were removed from the conceptual model). This construct is named IMBALANCE.

Producers' economic sustainability. This is the dependent variable of the conceptual model. Straightforwardly, it is defined as the economic sustainability of local food producers. This is also similar to the construct *number of economic operators in SC*, which is a single-item construct (Bergkvist and Rossiter, 2007) and is therefore measured with the use of one indicator. This construct targets the profitability of the respondent's company, and the construct is named ECOSUS.

Number of distribution options. This refers to the sum of different distribution options that are used by each production company. There are three options: using large wholesaler companies, using small wholesale companies, or managing their own distribution in house. The construct is named SUMDIST and has been used as a moderating construct for the constructs IMBALANCE and ECOSUS.

Waste at production (7-point Likert scale). For the conceptual model, this is another mediating variable, and it is defined as the scale of waste from both raw materials and finished products for local food producers. These indicators stem from the section on production in the questionnaire. Because of the wording in the two indicators, the indicators were reversed in Excel (i.e., rankings 1–7 were changed to 7–1). This construct is measured by the two indicators about waste and is named WASTE.

4 Hypothesis testing

The quantitative data is analyzed using PLS-SEM and the software SmartPLS 4 (SmartPLS4, 2023). PLS-SEM is used because it allows to analyze complex relationships between latent variables, particularly in

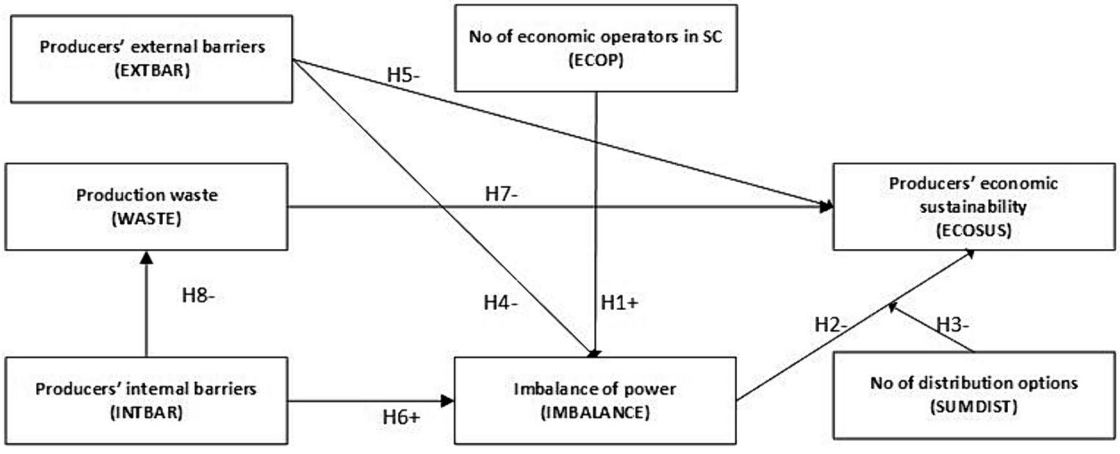

FIGURE 1
Constructs and hypothesis.

research contexts with small sample sizes, non-normal data, or complex models. It provides flexibility in model specification, accommodates formative indicators, and does not rely on distributional assumptions. It is particularly useful when the sample size is small, and the model is highly complex (Hair et al., 2021). According to Wong (2013), the minimum sample size required to use PLS-SEM is 52. The quantitative section of this study holds a sample size of 57, thus satisfying the minimum requirement for observations. In this study, the constructs are composite in the sense that the character of each construct is represented by its indicators, meaning that PLS-SEM is suitable for this analysis (Hair et al., 2011; Richter et al., 2016). Additionally, the sample size fits the 10-fold larger requirement (see Hair et al., 2011, p. 144).

4.1 Assessment of the measurement model

In this study, we have used a reflective measurement model. When using these kinds of models, one must thoroughly examine both their reliability and validity (Haenlein and Kaplan, 2004; Wong, 2013).

4.1.1 Internal consistency reliability and convergent validity

Internal consistency reliability is a measure used for the assessment of the reliability of the scores of the PLS constructs, and the recommended measure is rho_A (PA; Dijkstra and Henseler, 2015; Henseler et al., 2016). Additionally, the recommended criterion for this measure is rho_A > 0.7. However, values between 0.6 and 0.7 are considered acceptable (Hair et al., 2011, 2017). To check the convergent validity (i.e., to see to what degree one measure correlates positively with the other alternative measures of the specific construct; Hair et al., 2017), AVE is used, where AVE has the recommended measure of AVE > 0.5 (Hair et al., 2011, 2017; Henseler et al., 2016). Furthermore, the indicator reliability (i.e., the outer loadings of each construct) should be >0.708. However, in research, indicators have often been below this. Instead of automatically eliminating all indicators that are below the recommended threshold, one should consider them for removal depending on if the removal gives an increased AVE and/or composite reliability (Hair et al., 2017).

For the model in this study, rho_A > 0.7 with one exception. However, since rho_A > 0.6 is acceptable, the values of the constructs are above the recommended measures. This also counts for AVE, as the values are all higher than 0.5. Lastly, the outer loadings of each construct in the model are higher than 0.707, with the exception of two: EXTBAR 4 and INTBAR3. However, since removing these two items from the constructs did not lead to an increase in either AVE or composite reliability and it is >0.4, it was kept in the conceptual model (Hair et al., 2017). In summary, internal consistency, reliability, and convergent validity are adequate in the structural model. Table 2 presents the measurements in the model.

4.1.2 Discriminant validity

Discriminant validity is the degree to which a specific construct is legitimately different from the other constructs according to empirical standards (Hair et al., 2017). This means that checking the discriminant validity of the model is important, as it checks that each single construct is empirically distinctive and is not represented by any of the other constructs in the model (Mwesiumo et al., 2021). To assess discriminant validity, Fornell-Larcker criterion and checking "cross loadings" have often been used (Hair et al., 2017; Mwesiumo et al., 2021). However, Hair et al. (2017) argue that neither the Fornell-Larcker criterion nor the cross-loadings reliably identify issues with validity. As such, the heterotrait-monotrait (HTMT) ratio of correlations developed by Henseler et al. (2015) has been proposed as a remedy (Hair et al., 2017). A HTMT >0.90 indicates a lack of discriminant validity, although it is found that when the different constructs in the model are conceptually different, a HTMT >0.85 is justified (Hair et al., 2017). The HTMT for this conceptual model can be found in Table 3 and shows that all HTMT values are less than 0.90 and 0.85. As such, the HTMT in this model is adequate.

4.2 Hypotheses testing of structural model

To start the hypothesis testing, we first created a bootstrapping sample so that we could gather standard errors for the hypothesis testing (Hair et al., 2011). Using a PLS-SEM analysis, one must

TABLE 1 Operationalization of constructs.

Constructs	Labels	Indicators
External barriers (EXTBAR)	EXTBAR1	The regulations in the retail chains makes it difficult for us as a local producer to get shelf positions that we are satisfied with.
	EXTBAR2	It is difficult for us as a local producer to get ahead with the marketing of locally produced products because it is too costly.
	EXTBAR3	The food chains and their own product brands have a lower price, which makes it difficult for us as a local producer to compete with.
	EXTBAR4	We compete on "green" food products that get a higher price than other products. This results in us not being able to sell our products in the retail stores.
Internal barriers (INTBAR)	INTBAR1	The challenge lies in being able to produce on a large scale, because we do not have the production capacity in terms of equipment and/or physical space.
	INTBAR2	We do not have storage capacity internally to be able to store the products while waiting for transportation.
	INTBAR3	We do not have enough resources (personnel) to be able to produce on a large enough scale as the retail chains want.
	INTBAR4	Our knowledge of the supply chain is too low for us as a producer to manage the distribution ourselves.
Number of economic operators in SC (ECOP)	ECOP1	How many economic operators are there in your supply chain (from producer to consumer)?
Imbalance of power in sales channels (IMBALANCE)	IMBALANCE1	There is a skewed distribution of power in the industry's sales channels.
	IMBALANCE2	It is difficult to get space in the sales channels that we want.
	IMBALANCE3	We are not satisfied with where the company is today.
Producers' economic sustainability (ECOSUS)	ECOSUS1	How much profit do you have?
Number of distribution options (SUMDIST)	SUMDIST1	SUM DISTRIBUTION (summarized in Excel from three indicators) Q: How are your products distributed? 1. Through large wholesale businesses (e.g., REMA distribution, ASKO, or Coop Norge) 2. Manages own distribution 3. Through smaller wholesale businesses
Waste at production (WASTE)	WASTE1	We have little wastage of raw materials.
	WASTE2	We have little wastage of finished products at the production site.

10.3389/fsufs.2024.1342373

TABLE 2 Internal consistency, reliability, and convergent validity of the measurement model.

Item	Outer loading	Cronbach's α	Rho_A	Rho_C	AVE
EXTBAR1	0.746	0.788	0.819	0.863	0.613
EXTBAR2	0.811				
EXTBAR3	0.87				
EXTBAR4	0.692				
INTBAR1	0.707	0.816	1.128	0.854	0.596
INTBAR2	0.77				
INTBAR3	0.699				
INTBAR4	0.895				
IMBALANCE1	0.756	0.625	0.628	0.8	0.572
IMBALANCE2	0.796				
IMBALANCE3	0.714				
WASTE1	0.878	0.812	0.917	0.911	0.836
WASTE2	0.95				

TABLE 3 Assessment of discriminant validity (HTMT).

	ECOP	ECOSUS	EXTBAR	IMBALANCE	INTBAR	SUMDIST	WASTE
ECOP							
ECOSUS	0.363						
EXTBAR	0.199	0.175					
IMBALANCE	0.525	0.431	0.794				
INTBAR	0.224	0.515	0.464	0.446			
SUMDIST	0.002	0.032	0.165	0.318	0.081		
WASTE	0.303	0.208	0.354	0.554	0.204	0.162	
SUMDIST x IMBALANCE	0.098	0.179	0.191	0.197	0.184	0.22	0.099

consider that this analysis does not assume that the data is normally distributed. As a result, PLS uses nonparametric bootstrapping to gather the standard errors (Hair et al., 2011). In this study, we ran the model using a 500 bootstrap because of the smaller sample size, and the model was evaluated using the coefficient of determination (R2) and the adjusted coefficient of determination (R2Adj).

5 Results

5.1 Results from estimating the structural model

Figure 2 shows the path coefficient's absolute values range from −0.368 to 0.497. The coefficient of determination (R2) ranges from 0.029 to 0.443, and the adjusted R2 ranges from 0.011 to 0.412. As such, the highest R2 and R2Adj is for the construct IMBALANCE 0.443 and 0.412, respectively. In research, values of 0.25, 0.50, and 0.75 are considered weak, moderate, and substantial (Hair et al., 2017), meaning that the degree of variance explained through the model is appropriate. The hypothesis was tested by determining the significance of the path coefficients in the structural model (Figure 2), which shows the causal connections between the focus variables.

The first hypothesis (H1) proposed that the number of ECOPs used in the supply chain from production to end consumer is positively associated with the imbalance of power in the sales channels (IMBALANCE). H1 is confirmed since the corresponding path coefficient is positive at 0.347 and significant at $p < 0.05$. The second hypothesis (H2) in this study proposed that the imbalance of power in the sales channels (IMBALANCE) negatively affects the producer's profit (ECOSUS). The corresponding path coefficient is negative at −0.368 and significant at $p < 0.05$, meaning that H2 is confirmed (Table 4).

The third hypothesis (H3) proposed that the number of distribution options used in the SC (SUMDIST) strengthens negative effect of imbalance in the sales channels (IMBALANCE) on producers' economic sustainability (ECOSUS). The results show that there is a negative path coefficient (−0.156) but that there is no significant effect.

The fourth hypothesis (H4) proposes that the external barriers (EXTBAR) are negatively associated with producers' positions due to the imbalance of power in the sales channels (IMBALANCE). This hypothesis is significant at $p < 0.05$ and has a negative path coefficient of −0.497. Hypothesis five (H5) proposes that producers' external barriers (EXTBAR) are negatively associated with their economic sustainability (ECOSUS). The results show that the path coefficient is negative with −0.075 but that there is no significant effect.

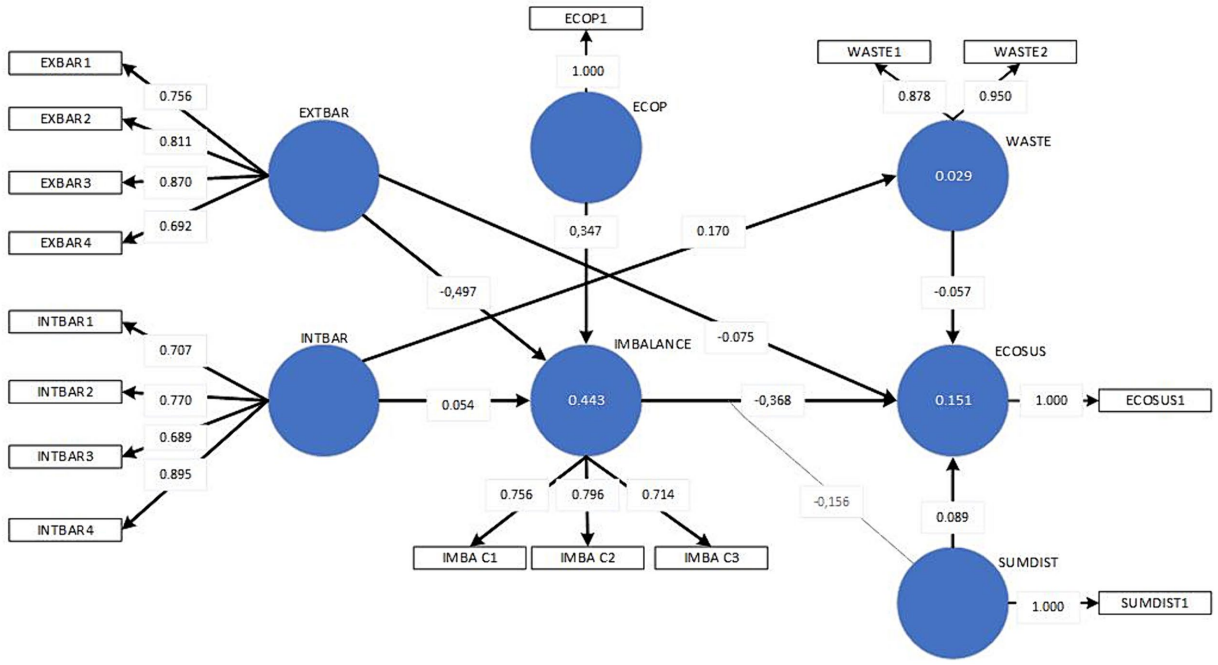

FIGURE 2
Structural model.

TABLE 4 Results from the structural model analysis ($n = 57$).

	Path coefficient	Sample mean	Standard deviation	T-statistics	*p*-values
ECOP- > IMBALANCE	0.347	0.341	0.108	3.211	0.001*
EXTBAR- > ECOSUS	−0.075	−0.071	0.151	0.498	0.619
EXTBAR- > IMBALANCE	−0.497	−0.494	0.097	5.122	0.000*
IMBALANCE- > ECOSUS	−0.368	−0.370	0.142	2.583	0.010*
INTBAR- > IMBALANCE	0.054	0.070	0.142	0.365	0.716
INTBAR- > WASTE	0.170	0.203	0.149	1.145	0.253
WASTE- > ECOSUS	−0.057	−0.070	0.143	0.398	0.691
SUMDIST x IMBALANCE- > ECOSUS	−0.156	−0.157	0.125	1.254	0.211
	R^2	ADJ. R^2			
ECOSUS	0.151	0.068			
IMBALANCE	0.443	0.412			
WASTE	0.029	0.011			

Results from the structural model analysis ($n = 57$), two-tailed test (significance): *significant at $p \leq 0.05$.

The sixth hypothesis (H6) of the study proposed that the internal barriers (INTBAR) have a positive effect on imbalance of power in the sales channels (IMBALANCE H6 is rejected, hence the effect of INTBAR on producer's position is not statistically significant). The seventh hypothesis (H7) proposes that the economic aspect of waste from both raw materials and finished goods of production (WASTE) has a negative effect on producers' economic sustainability (ECOSUS). The result shows a negative path coefficient (−0.057), but there is no significant effect. The last hypothesis (H8) proposed that producers' internal barriers (INTBAR) affect the economic aspect of waste in their production in terms of both raw materials and finished produce (WASTE). The results show that the path coefficient is positive at 0.170 and that there is no significant effect.

As previously mentioned, the structural model includes mediating constructs. When mediating effects are included in the structural models, direct and indirect effects should be examined to assess the essence of mediation and/or non-mediation (Zhao et al., 2010; Mwesiumo et al., 2021). This study includes multiple mediators (Smartpls, 2023a,b). As such, total indirect effects have been used here. According to the results, the total indirect effects of ECOP on ECOSUS are negative (−0.127) and significant at $p < 0.1$. EXTBAR to ECOSUS is positive (0.183) and significant at $p < 0.05$. INTBAR to ECOSUS is negative (−0.029), but there is no significant effect (see

Table 5). Based upon Zhao et al. (2010) research, ECOP to ECOSUS exhibits competitive mediation (i.e., partial mediation). EXTBAR to ECOSUS exhibits only direct mediation (i.e., no mediation). Lastly, INTBAR to ECOSUS exhibits no effect of mediation (no direct or indirect effect).

5.2 Result from the interviews

This section of the study contains the results obtained from the four interviews, with the focus being on the main subjects for this study. These findings are then connected to which hypotheses are confirmed or not confirmed through these interview results. The interviews in this study have been analyzed using the thematical analysis method, following the steps in the framework by Castleberry and Nolen (2018, pp. 808–12): (1) transcribe, (2) code the transcripts, (3) reassemble the data using a matrices setup, (4) interpret the data, and (5) conclude.

The Norwegian food authorities = (1), retail sector = (2), network of experts for local food = (3), and local sales channel = (4).

5.2.1 Production

Regarding production, several of the interviewees found that the efficiency of production should never exceed the quality of the products. For instance, one of the interviewees stated that:

> (2): "Local producer's unit costs won't be able to compete with the large industries. So, for them, it is really about value optimization, as the production efficiency should not affect the quality of the products."

This means that the production of local food cannot be compared with that of large industries and that neither efficiency in production nor scaling up production should affect the quality of the product(s). Additionally, one of the participants mentioned that there is normally less waste of raw materials in the production compared to larger industry producers, which was explained by the fact that many local producers are craftsmen first and foremost, resulting in them finding other ways to use the raw materials that otherwise would be considered waste.

Hypotheses 7 and 8 propose that waste in production will generally have a negative impact on producers' economic sustainability and that internal barriers affect the waste in production. However, the interviewee confirmed that they often only have a small amount of waste, which means that the variable for H7 should have a weak but negative impact on the economic sustainability. H8 is supported by the interview and should have a positive impact on waste, although none of the hypotheses are statistically confirmed.

5.2.2 Transportation/distribution/wholesalers

Regarding the section "transportation/distribution/wholesaler," one participant claimed that since there are many trucks on the roads, the decisive factor is not transport from A to B but rather the sales and how to get the producers products on the shelves. Another participant stated that "distribution depends on how the producers sell their products, which, which means a direct sale in local food market has an "easy" distribution since the local food producers are bringing their product themselves, while selling to a retailer may involve many actors in the distribution. Furthermore, one interviewee divided the local food producers into small, medium, and large production companies:

> (3): "We distinguish between those who are very small and who are responsible for the distribution themselves. (…) Then you have the large local food producers, who are large enough to be interesting for the large wholesalers to pick up goods at producers' locations."

For larger producers, it is easier to get access to larger wholesalers. This means that the size of the producers has an impact on their access, supporting the idea that there is an imbalance in the SC and thus the sales channels. This supports both hypotheses 2 and 4, where both are statistically confirmed. Furthermore, the interviewee continued:

> (3): "(…) But there is a large group in between as well. They are too big to handle the distribution themselves, because then they have to have a large sales force, more cars, etc. But they are too small to be interesting enough for the big chains to join their distribution system."

This means that local food producers that can be seen as medium-sized companies resulting in a potential increase in costs for distributing their products. Thus, this supports both H1 and H3, although H3 is not statistically confirmed.

5.2.3 Imbalance of power (sales channels)

With respect to the disparity of power within sales channels, the interviewees concurred that the challenges faced by local food producers in achieving economic sustainability are not only attributable to this power imbalance. The challenge lies in comprehending the strategies employed to influence consumers' product selection, as for example in marketing.

Furthermore, they also agreed that the imbalance of power plays a vital role as a barrier to the producer's economic sustainability for some producers. One of the interviewees stated the following:

> (4): "There are gatekeepers in many of the sales channels here. (…) Also, it is one thing to be allowed shelf access in stores, but others

TABLE 5 Descriptive statistics for the total indirect effects (mediating constructs).

	Path coefficient	Sample mean	Standard deviation	T-statistics	*p*-values
ECOP- > ECOSUS	−0.127	−0.129	0.069	1.854	0.064**
EXTBAR- > ECOSUS	0.183	−0.181	0.077	2.368	0.018*
INTBAR- > ECOSUS	−0.029	−0.032	0.069	0.426	0.670

Descriptive statistics for the total indirect effects (mediating constructs), two-tailed test (significance): *significant at $p \leq 0.05$; **significant at $p \leq 0.10$.

> in the industry say that getting the products off the shelves and to the consumer is where the producers themselves must do the marketing and everything that builds around the sale of the product. "

The interviewee continued to describe the imbalance of power in the sales channels by stating that:

> (4): "(…) the three chains not only control the food selection for their own stores, but they also very much control what is sold to large households because a lot is done through purchase agreements, and the large household chains want to have as much input as possible from one channel. The system is somewhat based on "the winner takes it all" in many fronts."

H2 is also supported in this statement, as the hypothesis proposes that the imbalance of power in the sales channels negatively affects the producer's economic sustainability.

5.2.4 Barriers

In all four interviews, several barriers were identified that could hinder and/or complicate the path toward economic sustainability for the local food producers. The four participants mentioned, for example, rules and regulations, additional and expensive intermediaries (i.e., economic operators) in the SC, not enough production expertise, and a lack of suitable sales channels (i.e., marketplaces) for local food. They also mentioned a lack of suitable strategic choices and knowledge of how to sell and that production is often dependent on factors that cannot be easily managed, such as climate and animal health.

5.2.5 The cost in the supply chain is another barrier

One of the interviewees stated the following:

> (1): "The medium-sized producers often end up having an extra link between them—another wholesaler. (…) But it often costs relatively much because the distributor they use doesn't get paid per kilo they transport; they get paid per percentage of what the product costs, and this means that local food often becomes unnecessarily expensive."

This statement indicates that being a medium-sized producer comes with difficulties and could be among the most expensive distribution channels, as the use of "extra links" increases producers cost in distribution. This point was backed up by another interviewee:

> (4): "(…) a distribution or wholesale distribution which often causes you to lose profits along the way."

On the one hand, H5 proposed that the external barriers are negatively associated with the producer's economic sustainability. The interviewees confirmed several external barriers that could be challenging for producers regarding their economic sustainability. Nonetheless, the hypothesis was not statistically confirmed. On the other hand, H6 proposed that the internal barriers have a positive effect on producers' positions about the imbalance of power in the sales channels. However, the interviewees statements have not specifically supported this hypothesis, and H6 has also not been statistically confirmed.

6 Discussion

This study has sought to examine economic sustainability for local food producers and the impact of the six variables we have used in this paper. Economic sustainability has been discussed in context with SFSCs in several previous studies, although it is also often considered in the context of social, environmental (e.g., Malak-Rawlikowska et al., 2019; Mancini et al., 2019; Jarzębowski et al., 2020; Campos et al., 2021; Doernberg et al., 2022; Stein and Santini, 2022). In contrast to previous research, this paper investigated economic sustainability and the impact of external and internal barriers, SFSCs, imbalances of power, the number of distribution options, and waste using a mixed-methods approach. The PLS-SEM model only supported three of the eight hypotheses, the low number of statistically accepted hypothesis may be explained by the small number of respondents in the study. The interviews gave more in-depth information and supported seven out of eight hypotheses, four of which were not statistically confirmed. These results are discussed in the section below.

The literature shows that a reduced number of economic operators in SFSCs could improve economic sustainability (Malak-Rawlikowska et al., 2019; Mancini et al., 2019). Other researchers have investigated imbalances in the sales channels (Richards et al., 2013). In contrast to these authors, this paper investigated if the number of economic operators in the SC can be associated with imbalances in the sales channels. Instead of investigating separately relationships, this article examined the relationship between these factors using a more holistic model.

The results of this study show a positive effect (path coefficient) between the constructs of *number of economic operators* and *imbalance of power* (H1). This means that when the number of economic operators increases, producers power in the SC is strengthen. This finding can be explained further by data from the interviews, which revealed that mid-sized local food producers frequently require an "extra link" (i.e., economic operator) for the distribution of their products to the retail sector. This means that in contrast to smaller producers who can arrange distribution themselves (e.g., selling through farmers market), mid-sized producers could be subjected to the private standards of retail chains, which was mentioned by Richards et al. (2013). For instance, if the local producers outsource and thus increase the number of economic operators, which again lowers their potential profits, which is influenced by the imbalance of power as the umbrella chains own several of the wholesale companies as well (Milford et al., 2021). Furthermore, the findings from the interviews suggest that the medium-sized producers would have the most difficulties gaining shelf space in the retail chains. Additionally, producers selling through sales channels such as farmers markets or directly from the farm have few or no intermediaries in their SC (Enthoven and Van Den Broeck, 2021), especially if all the activities in the value chain (e.g., marketing) are handled in house.

The results from this study confirm that the imbalance of power throughout the sales channels has a negative impact on the profitability of the producers and therefore a negative impact on their economic sustainability (H2). This hypothesis was elaborated on and supported

in the interviews, where one participant stated that the system is largely based upon the idea that "the winner takes it all," where it would not be unreasonable to argue that the so-called "winners" in the statement of the participant are to be known as the large umbrella chains. Furthermore, through the interviews, it was also found that the mid-sized producers are often "forced" to have an extra link (i.e., a distributor), since they do not have any formal distribution network.

Additionally, the mediating effect of the number of distribution options on the relationship between the imbalance of power and economic sustainability was statistically significant and showed a negative effect. This means that the expansion of distribution choices leads to a diminished position for producers, as the power dynamics within sales channels become imbalanced. Consequently, this imbalance has adverse effects on the economic viability of producers.

The literature refers to several barriers to economic sustainability (Pehrsson, 2009). However, as far as we know, no studies currently exist that link the relationship between producers' external barriers and the imbalance of power in the sales channels. According to the results of this study, there is a negative effect (path coefficient) between producers' external barriers and the imbalance of power in the sales channels (H4), and the hypothesis showed a significant effect. This means that the external barriers such as, for instance, the difficulty of market access (Balcom et al., 2023) negatively impact the producers' positions in the sales channels. This may be explained as the higher external barriers result in producers having increased problems expanding into larger sales channels. This could again be seen together with the literature about too few suitable sales channels for both this type of product and producers, and it has also been confirmed through the interviews held in this study, where one of the barriers found was a lack of suitable sales channels since the industry is more or less adapted to the large industry.

Furthermore, the study tested if the number of distribution options used in the SC strengthens the effect of the imbalance in the sales channels on producers' economic sustainability, however this hypothesis (H3) was not confirmed. This may be explained as to by the fact that a producer uses all three distribution alternatives (i.e., their own distribution, large companies, and smaller companies). This might imply that they are large enough to not be affected by an imbalance of power.

Moreover, this study aimed to discover how external barriers affect economic sustainability (H5). Nave and Do Paço (2021) found that a lack of support policies is a contributing external barrier. This point was supported in the interviews, where one participant claimed that there are many so-called "helpers" in the industry for local producers who are more concerned with their own interests and gains than with what is best for the producers. H5 hypothesis estimated a weak negative effect (path coefficient) of −0.075 between the external barriers and economic sustainability, but the hypothesis was not statistically significant. The non-support for this hypothesis may be explained by the small sample size (57 respondents).

Balcom et al. (2023) found that, among other things, the storage of products is related to the difficulties with market access. Two possible explanations for this might be that producers either need to expand production when selling to larger chain stores (like the umbrella chains), which implies the need for extra storage, or face challenges with storing in house when selling through, for example, farmers markets. Therefore, this study tested if the internal barriers corresponded with the producers' positioning in relation to the imbalance of power (H6). The results show a nonsignificant effect for the hypothesis. However, the results of the hypothesis also show a weak positive effect (path coefficient) between the two constructs (0.054). This weak positive effect could be due to the smaller sample size in the study, meaning that there is a weak but positive effect. This indicates that although the hypothesis is not confirmed, an increase in the internal barriers leads to a stronger position on the imbalance of power. Another possible explanation for the weak effect could be that the producers do not feel strongly about the internal barriers included as indicators for the construct in this study. The structural model could have included an additional hypothesis that tested how the internal barriers are associated with economic sustainability. However, due to the low number of respondents (57) and the total number of hypotheses in the study (8), the complexity of the structural model had to be limited. Therefore, in this study, we prioritized testing the relationship between internal barriers and producers' positions regarding the imbalance of power in the sales channel. However, the study tested the mediating effect of the producers' position on the imbalance of power in the sales channels between internal barriers and economic sustainability, but there was no significant effect.

Another aspect for discussion is food waste in production, which is a well-known issue within the food sector (Nicastro and Carillo, 2021). This study found a weak but negative effect (path coefficient) of −0.057 between waste and economic sustainability for the producers, but H7 was not statistically confirmed. Data from the interviews indicates that local producers do not tend to waste much of the raw materials, which can explain the weak negative effect. However, although local food producers are found to commonly have less waste than larger industry producers, some waste is inevitable. Additionally, Bayir et al. (2022) considered waste as an economic sustainability challenge for SFSCs. However, the weak negative effect could also be a result of the smaller sample size used in this study.

Lastly, this study found that there is a positive effect (path coefficient) between the internal barriers and waste in production (H8). However, the hypothesis was not statistically confirmed. This could be explained by the fact that internal barriers could prevent producers' companies from growing or selling more products; hence, the fewer products produced, the less waste of raw materials or finished goods at the production site. Additionally, the finding from the interviews that producers do not tend to waste much of the raw materials can contribute to explaining this positive effect.

7 Conclusion

The presented study aimed to examine local food producers' economic sustainability and sought to determine how imbalance of power in the SC and internal and external factors affect their profitability (and thus their economic sustainability). The paper used a more holistic model compared with previous research, where factors were often researched separately (e.g., an imbalance of power in the sales channels; Richards et al., 2013 or economic sustainability in SFSCs; e.g., Malak-Rawlikowska et al., 2019). To investigate the problem, we used a mixed-methods approach of PLS-SEM and interviews.

The results indicate that the number of economic operators in SFSCs positively affects producers' power in the supply chain (H1). The interviews conducted in this study support this finding, revealing that mid-sized local food producers often rely on additional economic

operators for distribution to the retail sector. However, this reliance on external distributors exposes them to the private standards of retail chains, which can potentially undermine their power and profitability. Furthermore, mid-sized producers may encounter difficulties in securing shelf space in retail chains, exacerbating the power imbalance. Conversely, producers who sell directly or through channels like farmers markets have fewer intermediaries and greater control over their distribution, contributing to their economic sustainability.

The study also finds that the power imbalance within sales channels has a negative impact on producers' profitability and economic sustainability (H2). This power imbalance limits the bargaining power and profitability of producers, thereby affecting their economic sustainability.

Moreover, the study examines the relationship between external barriers and the power imbalance in sales channels (H4). The results indicate a negative effect, suggesting that external barriers, such as difficulties in market access, negatively impact producers' positions within the sales channels. This finding aligns with existing literature, which emphasizes the lack of suitable sales channels for local food products and producers. The interviews further support this, identifying a lack of suitable sales channels adapted to the needs of local producers.

Interestingly, the study finds that external barriers such as regulations in the supply chains, high marketing costs, and high costs of producing "green" products do not have a negative effect on economic sustainability. This result highlights the importance of managing power-dependency structures in local food supply chains. According to the model testing results, producers' external barriers put economic sustainability at risk if no actions are taken to address the power imbalance by local food producers.

Although the study examines the relationship between internal barriers and the power imbalance, the results are not statistically significant (H6). This finding may be attributed to the smaller sample size and the possibility that producers may not strongly perceive the included internal barriers as hindrances to their operations.

Lastly, the study identifies a positive effect between internal barriers and waste in production (H8). Although this hypothesis is not statistically confirmed, it is plausible that internal barriers may limit producers' ability to grow and sell more products, resulting in less waste. However, the interviews support this hypothesis, suggesting that producers do not tend to waste significant amounts of raw materials.

Overall, this study contributes to the understanding of economic sustainability for local food producers by examining the impact of various variables. The findings underscore the importance of addressing power imbalances within sales channels, as well as the significance of suitable distribution options and the reduction of external barriers. Additionally, the study emphasizes the need to consider internal barriers to enhance economic sustainability.

7.1 Limitation of the study and further research

The research setting for this study was limited to Norway and the main level of analysis was Norwegian local food producers. Furthermore, although the sample size was within the minimum limit set by Wong (2013), the quantitative analysis nonetheless consisted of a relatively small sample size (57). Therefore, the structural model could have gained more accurate results if a larger sample size had been obtained and thus a 5,000 bootstrap sample could have been run, which is the recommended bootstrap by Hair et al. (2017).

Further research could test the relationship between local food producers' internal barriers and economic sustainability. Additionally, it could be interesting to see how the distribution could be improved for the medium-sized producers that fall between.

Data availability statement

The datasets presented in this article are not readily available because according to the consent from the respondents, the data should not be used by others than the researchers in the project. Requests to access the datasets should be directed to berit.i.helgheim@himolde.no.

Ethics statement

Written informed consent was obtained from the individual(s), and minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this article.

Author contributions

BH: Conceptualization, Formal analysis, Investigation, Methodology, Software, Supervision, Writing – review & editing. NL: Conceptualization, Data curation, Formal analysis, Investigation, Project administration, Software, Writing – original draft. ST: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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