Article

Online and On-Site Interactions within Alternative Food Networks: Sustainability Impact of Knowledge-Sharing Practices

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Abstract: The sustainability debate in the food sector has exposed the current food system to critics, encouraging the significant growth of Alternative Food Networks (AFNs), new ways of food production, distribution and consumption that aim to shorten the food chain. Our study is focused on Food Assembly (FA), a special kind of AFN combining the culture of social entrepreneurship and digital innovation to achieve sustainability and a high social impact. The coexistence of a digital platform and a weekly farmers' market triggers, within this network, mechanisms of knowledge sharing and self-organisation. To date, however, few studies have focused simultaneously on online and on-site interactions within AFNs, especially with quantitative studies. Our paper aims to test the hypothesis that online and on-site knowledge sharing affects the success of a FA measured by customer sustainable behaviour change. To do so, we developed a quantitative analysis based on a regression model. We collected data via a questionnaire submitted to 8497 Italian FA customers, of which 2115 responses were included in our analysis. The results show that online knowledge sharing significantly affects customer change towards more sustainable purchasing and consumption behaviours, while on-site knowledge sharing positively affects sustainable purchasing behaviours.

1. Introduction

In recent years, concerns over sustainability issues have led to the adoption of new and alternative approaches to consumption [1–3]. The 17 Sustainable Development Goals (SDGs), at the heart of the 2030 Agenda for Sustainable Development, adopted by all Member States of the United Nations in 2015 [4], point out that the pursuit of sustainable development requires the adoption of a systemic approach based on the cooperation between the various subjects belonging to the value chain, from producers to final consumers. In particular, the SDG N. 12—Responsible consumption and production—highlights the central role of consumers and encourages the promotion of educational and informative processes capable of increasing their awareness. The growing sensitivity towards these issues has greatly contributed to the enhancement of the so-called Alternative Food Networks (AFNs), which are novel forms of food production, distribution and consumption [5,6] that call into question the current industrial food system—characterized by a centralized, dependent, competitive and dominating nature—by proposing a decentralized, independent, community-focused and sustainable business model [7]. AFNs base their business model on a short food supply chain (SFSC) [8,9] and can be seen as participative and self-organising communities where sustainable practices are triggered by their members [1,10–14]. AFNs have given rise to cross-sectional research streams, mainly

focusing on qualitative studies [8,11]. However, the knowledge represented by the current literature needs to be expanded [6] through the adoption of quantitative approaches that focus on the complex system of relationships and knowledge sharing created throughout AFNs. Moreover, to the best of our knowledge, few studies have focused simultaneously on online and on-site interactions within innovative food networks. Our paper aims to fill this gap by analysing Food Assembly (FA), a type of AFN and social and collaborative enterprise that started in France in 2010 and spread through Europe, with almost 1300 entities at the end of 2018. FA differs from other AFNs in its hybrid nature: products are ordered online and then picked up at a weekly farmers' market. According to the social capital theory [15,16] and the knowledge-based view [17,18], the FA organisational architecture, based on local scale, SFSC and on-site and online interactions [1,19], builds relationships that increase social capital [20]. Social ties, shared goals and trust are the social infrastructure needed for knowledge sharing to take place within AFNs [21] and are often seen as the hallmark and comparative advantage of business models based on the SFSC [12,20,22,23]. Based on these arguments, we decided to test the impact of online and on-site knowledge sharing on customers' self-reported sustainable behaviour changes. To do so we submitted a questionnaire to 8497 Italian FA customers, receiving 2115 valid answers (a 25% return rate). The data collected were then analysed through an ordered probit regression. The results show that online knowledge sharing affects sustainable behaviour changes both in terms of purchasing and consumption practices, while on-site knowledge sharing has a positive impact only on purchasing behaviour. We also investigated customer sensitivity towards five sustainability factors (i.e., environment, ethical awareness, label, local and organic) in order to understand which play a significant role in triggering more sustainable food purchasing and consumption behaviours.

This study contributes to social capital theory and a knowledge-based view by applying these two well-known theories to a new field such as that of FAs. Furthermore, due to the scarce number of quantitative studies investigating AFNs, our findings expand the literature by providing insight regarding knowledge-sharing practices for AFNs and self-organising communities [24–26]. These results may also be useful for practitioners, since they suggest that a digital platform, slightly different from traditional physical channels, plays a significant role in shaping customer behaviour [8,27,28]. Shared information in fact spreads more rapidly through digital platforms, affecting culture and triggering mechanisms of idea-shaping. Traditional AFNs may adopt digital technology to further enhance the engagement of their customers.

The remainder of this paper is structured as follows. In Section 2 we give an overview of studies on AFNs, especially FA, through the lens of social capital theory and knowledge-based view in order to develop the hypotheses. In Section 3 we describe the research design, explaining the set of methods and procedures used in collecting and analysing data. Section 4 is dedicated to the results of the study, while in Section 5 we discuss the major findings, the main conclusions and the limitations, providing suggestions for further research.

2. Background Review and Hypotheses Development

2.1. AFNs as a Self-Organising Community: The New Role Played by Customers

Increasing distrust of the conventional global food system [7,27,29] has led customers to adopt a more critical and aware approach to consumption [1,2,23,30–34], strongly oriented towards transparency, trust, safety and sustainability [12,22,27]. AFN members are, in fact, frequently characterised by some concerns such as human health and food safety, environmental consequences of globalised and industrialised agriculture and the consequent support to local agriculture and economy, farm animal welfare and fair trade [11,35–38]. According to [22], the AFN business model gives customers the opportunity to perceive themselves (and be perceived by producers) as actively involved in value co-creation processes. Their analysis of AFNs has given empirical evidence of four ways through which members can deploy their consumption choices: (i) exerting their freedom of choice in a

radical way; (ii) reconfiguring the way food is embodied into socio-technical practices; (iii) participating in food movements; and (iv) co-producing new systems of food provision, together with producers and other actors. Social embeddedness, trust and sense of togetherness have been found to be central components of SFSC [11,39–42], contributing to an understanding of AFNs as a community-based self-organising group that can lead, through dynamic interactions, to sustainable transformation of societies [12,24–26,43,44]. One of the main aims of AFNs is in fact to foster connectedness and community social cohesion [7], boosting greater feelings of self-realization, sense of belonging and sharedness among their members.

2.2. Social Capital and Knowledge Sharing within AFNs

According to the definition given by [45] (p. 243), social capital can be defined as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit." This concept is used in organisation and community research to explain the role of relational resources embedded in dyadic or network relationships involving resource exchange and knowledge management activities [46].

Social capital can be categorised into three clusters: relational, cognitive and structural [45]. The main features of each cluster have been found to be social trust, shared goals and network ties [47]. Trust is the most frequent factor related to the relational dimension and it is often mentioned in the literature as a facilitator of knowledge sharing [15,46,48]; when two parties begin to trust each other, they reduce the negative effect of perceived costs on sharing [49] and diminish the probability of opportunism. An important cognitive factor is the presence in an organisation of shared goals that facilitate mutual perception and exchange of ideas within a network [47].

Finally, the main element belonging to the structural cluster is the network ties, which can be seen as the strength of the relationships, the amount of time spent and the communication frequency among members of virtual communities leading to individual knowledge integration and exchange [50]. According to the literature, some features such as local scale, SFSC and direct interactions are described as important benefits of AFNs and enabler of social capital factors [20]; social ties, shared goals and trust form the social infrastructure needed for knowledge sharing to take place within AFNs [21] and they are often seen as the hallmark and the comparative advantage of business models based on the SFSC [12,20,22].

2.3. Hypotheses Development

The effect of knowledge sharing within the specific context of the AFNs is still a largely underinvestigated topic in the literature. Knowledge has been considered as either a strategic asset or a driver of success within organisations from different perspectives [51–59]. According to [60], networks favour access to knowledge, but the way the knowledge is shared differs depending on the type of network. In their analysis of farmers' markets member connections, [21] argued that AFNs contribute not only to the visibility and availability of local food, but also to the mobilisation of knowledge for a wide range of stakeholders, addressing social and environmental aspects and contributing to the growth of the AFN. Many scholars have recognized the importance of face-to-face contacts in enhancing education and knowledge sharing among members [61,62]. As pointed out by [62], direct contacts allow farmers to build trust and transparency by explaining farm challenges, seeking feedback from customers and offering refunds or exchanges if a product does not satisfy their expectations. Based on these previous findings, we posited that:

Hypothesis 1 (H1). *The higher the level of knowledge sharing through on-site communications, the higher the self-reported sustainable behaviour change from AFN customers.*

Next, we investigated the relationship between online knowledge sharing and sustainable behaviour change. The growth of digitalisation and device use has in fact triggered a debate

on the nature of communities and how computer-mediated interaction affects social relationships. According to [19], a digital platform can enhance organisational cooperation among their members. Socially and environmentally driven community-oriented platforms, such as FAs, can benefit from online interactions since digital platforms facilitate the development of some collective rules leading to knowledge sharing and self-management based on individuals' ability to manage trust within a network. Previous studies on FAs have recognized that the co-existence of online and on-site communities can enable interaction and coordination across a network of actors [1,63] that otherwise would remain separated or incapable to actively contribute to the system, while [64] argued that knowledge exchange and sustainable value co-creation may be boosted by technological infrastructure allowing individuals to communicate and self-organise in a more transparent and less complex way. Based on these arguments, the following hypothesis was tested:

Hypothesis 2 (H2). *The higher the level of knowledge sharing through online communications, the higher the self-reported sustainable behaviour change from AFN customers.*

3. Research Design and Methodology

This research was developed following a multi-step approach. First, we conducted an initial literature review regarding AFNs, FAs, social capital theory and a knowledge-based view to identify the gaps in the literature and develop the research hypotheses, and consequently, the questionnaire items. As FA represents quite an innovative and underinvestigated field, a preliminary study—mainly based on focus groups and in-depth interviews—was conducted in order to provide a better understanding of FA business model and tune the questionnaire items. The following step was the empirical analysis, including the questionnaire administration, the data collection and the quantitative regression analysis.

3.1. Data Collection and Questionnaire Development

As previously mentioned, FAs are innovative communities that combine online and offline dimensions. Our study is focused on the Italian FAs as Italy is one of the EU Country with the highest number of FAs and active customers (180 food assemblies with 1805 farmers and 101,400 customers involved at December 2018). After the study of the literature, in order to better understand the FA business model, a set of six face-to-face semi-structured interviews was conducted with Italian FA managers. These interviews were followed by specific focus groups with FA customers (both active and non-active) in order to elicit more in-depth information through interactive discussions [65] about the community's collaborative and participatory behaviours. Focus groups were found to be useful for the issue under investigation, as both active and non-active customers could describe, using their own words, their experiences, perceptions, motivations, attitudes and habits [66,67].

According to the literature, the interviews, and the focus groups, the final questionnaire was finalised in order to collect specific data to test our hypotheses [68,69]. In September 2017, there were 10,194 active customers of the FAs in Italy. Clients who had made at least one purchase from the FA during the previous 12 months were considered "active customers." Among the active customers, those who purchased at least once per month during the previous year were considered "loyal customers" and represented the specific target of our research. Those 8497 FA loyal customers received an invitation to answer an online questionnaire that was previously tested through a preliminary pilot survey involving a sample of $N = 40$ customers randomly selected from the loyal customers, to observe patterns and ensure consistency and bias-free and representative results [70]. No significant changes to the original questionnaire were made after this preliminary test.

The questionnaire was composed of 48 closed questions (i.e., simple factual questions, rating scale and checklist-type questions), grouped into four major areas. We received, from September to December 2017, 2120 answers (a 25% return rate), of which five responses were excluded due to incompleteness, for a final sample of $N = 2115$.

3.2. Research Model and Data Analysis

Given the existing literature background, in order to study the knowledge-sharing process as a key success factor for FAs, we developed a simple model to be tested empirically (Figure 1).
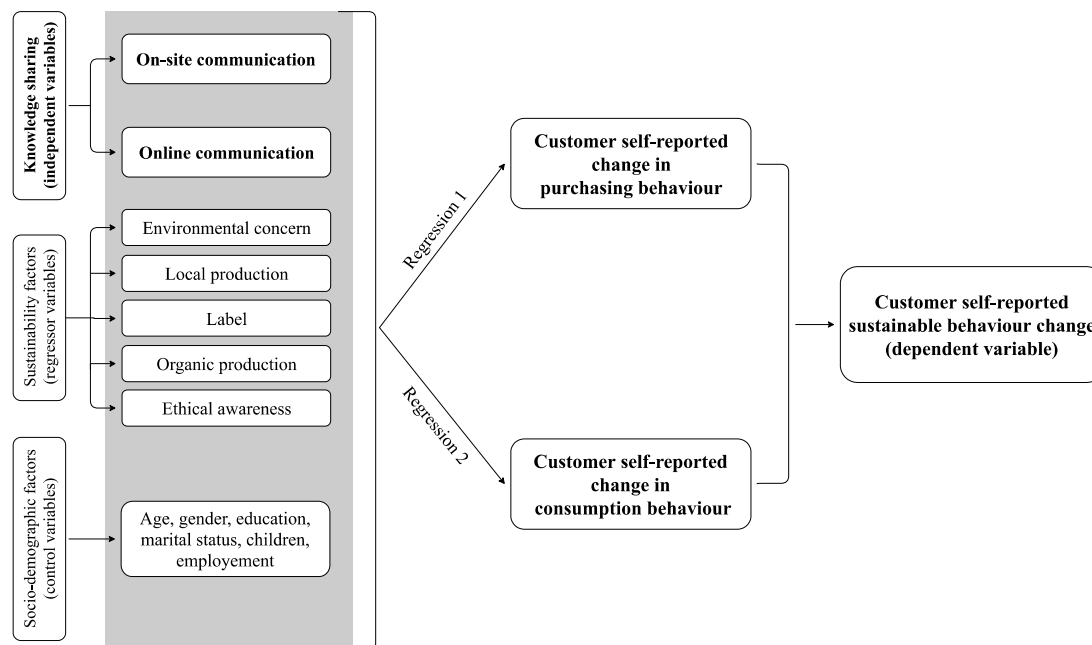

Figure 1. The research model.

According to the literature, one of the objectives of AFNs is to foster sustainable production and consumption [1,11]. Consequently, sustainable behaviour change (dependent variable of the model, Y) has been considered by the authors as the best construct to measure the success of the FA business model. This variable has been measured by the survey responses on two different aspects, capturing individual consumption and purchasing habits. These two aspects were the self-reported changes in the customer purchasing behaviour (shortly, purchase) and the self-reported changes in the customer consumption behaviour (shortly, consumption).

The key regressors (independent variables of the model, X) were two variables that measured the level of knowledge sharing through the customers' perceived effectiveness of different forms of communication (online or on-site) within the FA.

In order to analyse better the relationship, a set of five sustainability factors (i.e., environment, ethical awareness, label, local and organic) were added into the model as regressors, as they were found to be important according to the literature review [11,35,37,38,40,41].

The regression model was then controlled for the traditional socio-demographic variables [71–75].

The definitions and description of all the variables are detailed in the following sub-paragraph.

Variable Description

Almost all the variables of the model were intended to capture the perception of the FA customers. In fact, according to the authors' point of view, it is the member perception (and not their actual action) that has an influence on their behaviour and on their choices, leading, consequently, to a major engagement or disengagement, and finally, to a higher or lower level of success of a social enterprise business model.

The success of the FA was measured in terms of sustainable behaviour change with two dependent variables. These two variables, for which we conducted two separate regressions, were purchase and consumption. The purchase variable measures how much the customer declared to have changed his/her purchasing behaviour since he/she had become a FA member, on a Likert scale from 0 (no

change) to 5 (radical change). The consumption variable captures the customer's self-reported change in his/her own consumption behaviour by joining the FA. The customer was asked to choose from a list of possible changes in his/her consumption behaviour. If none was selected, then the variable would be 0, meaning that the behaviour of the customer has not changed at all. Each item selected (for a maximum of 5) scored 1 point.

The regressors on-site and online measure the effectiveness of the communications through face-to-face and digital contacts among FA customers, respectively. Both these means of communication are tools for sharing ideas, values and opinions, giving feedback and providing suggestions inside the community of the FA. In other words, online and on-site are two ways of sharing knowledge and values. In the questionnaire the customers were asked to express for each variable (on-site and online) the "level of perceived effectiveness" on a Likert scale from 0 (totally ineffective) to 5 (extremely important).

In the regressions, a set of sustainability factors was added as additional regressors. The idea is that a higher (or lower) customer sensitivity towards specific sustainability topics may affect the success of the business model. The variable "environment" measures the sensitivity to environmental issues (i.e., waste reduction, preservation of natural resources and climate change). In the questionnaire the respondents were asked to select from a list of items, the ones they perceived as relevant. If none was selected the variable was equal to 0; each item selected scored 1 point; if all five elements were selected, then the variable reached its maximum value of 5. The variable "ethical awareness" considers how important it is to fully understand the ethical implications of purchase and consumption decisions in the FA, while "label" refers to the relevance in the purchase and consumption process of the information on the origin of the product and its traceability. "Local" measures the relevance of the perceived support to the local economy in FA members, while "organic" measures the importance of the organic production system for the customer, without the use of pesticides and chemical fertilizers. Overall, for each variable, the respondent of the questionnaire was asked to express his perception about each topic on a Likert scale from 0 (not important) to 5 (extremely important).

Table 1 summarizes the variable names, while Table 2 reports the descriptive statistics.

Table 1. Variable names and description.

	Variable Name	Description
Y	Purchase	Change in purchasing behaviour perceived by customers
	Consumption	Change in consumption behaviour perceived by customers
X	On-site	Effectiveness of on-site communication through the direct contact between customers and producers
	Online	Effectiveness of online communication through the digital platform
Sustainability Factors	Environment	Relevance of environmental issues: waste reduction, preservation of natural resources and climate change mitigation
	Ethical awareness	Relevance of consumption awareness: food safety, human health and animal welfare
	Label	Relevance of the information on the product
	Local	Relevance of support for the local / regional economy
	Organic	Relevance of organic production
Socio-Demographic Control Variables	Age	4 age categories
	Gender	Dummy variable: male/female
	Education	4 categories for different levels of education
	Marital status	Dummy variable: single/couple
	Children	Number of children
	Employment	Student, unemployed, retired, employee, self-employed
	Income	Annual average family income (categories)

Table 2. Descriptive statistics.

Variables	Minimum Value	1st Quartile	Median Value	3rd Quartile	Maximum Value
Purchase	0	0	2	2	5
Consumption	0	0	1	2	5
On-site	0	2	3	3	5
Online	0	2	3	3	5
Environment	0	2	3	4	5
Ethical awareness	0	3	3	4	5
Label	0	3	3	4	5
Local	0	3	4	4	5
Organic	0	3	4	4	5
Age	0	1	1	2	3
Gender	0	0	0	0	1
Education	0	1	2	2	3
Marital status	0	1	1	1	1
Children	0	0	0	1	8
Employment	0	3	3	3	4
Income	0	1	1	1	3

3.3. The Regression Analysis

Formally, for each individual i in the sample of respondents, we collected the choices between $j = 1, \ldots, M$ alternatives ($M = 6$ for both purchase and consumption). Since there is a logical ordering in these alternatives, the ordered response model has been specified. This model is based on one underlying latent variable, say y_i^*, with a different match from y_i^* to the observed variable y_i ($i = 1, \ldots, N$); i.e.,

$$y_i^* = x_i^T \beta + \varepsilon_i, \; y_i = j, \quad if \; Y_{j-1} < y_i^* \leq Y_j$$

for unknown "cut points" j_s with $Y_0 = -\infty$ and $Y_{M+1} = \infty$. Precisely, the research question here is whether it is reasonable to assume the existence of a single index $x_i^T \beta$ such that higher values for this index correspond to, on average, larger values for y_i. Assuming that ε_i is independent identically distributed (i.i.d.) standard normal (with constrained variance equal to one) results in the well-known ordered probit model. Note that for $M = 2$ we are back to the binary probit model. As a consequence, the probability that alternative j will be chosen is the probability that the latent variable y_i^* is between two boundaries Y_{j-1} and Y_j; i.e.,

$$P\left\{y_i = j \mid x_i\right\} = \Phi\left(Y_j - x_i^T \beta\right) - \Phi\left(Y_{j-1} - x_i^T \beta\right),$$

where $\Phi(.)$ stands for the distribution function of the standard normal distribution.

We estimated one ordered probit model per each of the two-response variables (i.e., purchase and consumption) using maximum likelihood. Results are presented in the following section. Since the Y_j parameters can be shifted arbitrarily by adding a constant to $x_i^T \beta$, the model is under-identified if there is some linear combination of the explanatory variables, which is constant. The most obvious case in which this occurs is when the model contains a constant term: for this reason, we dropped the intercept.

In the following section the results of the two regression models are presented.

4. Findings

In this section, the major findings of the study are reported and highlighted.

According to the socio-demographic characteristics that emerged from the analysis, 65% of the loyal clients of FAs are younger than 50 years old, 77% are female, nearly half of them (47%) hold a bachelor's degree, and less than half (43%) have children. Figure 2 reports the statistics on gender and age.
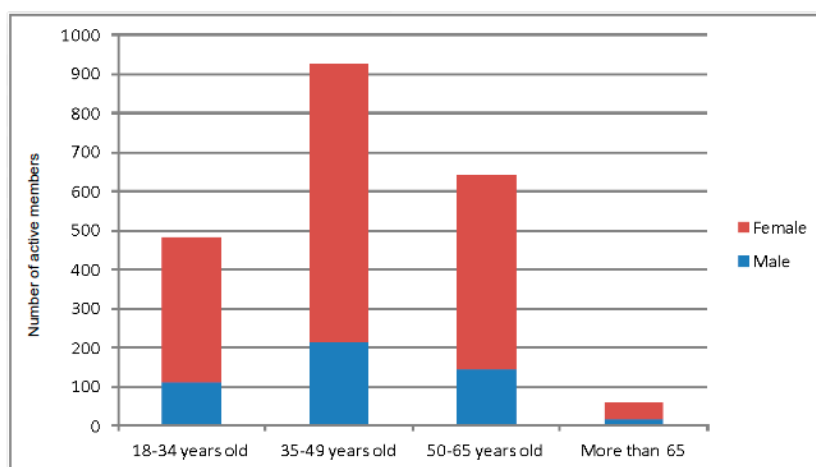

Figure 2. Number of active members of the FA by gender and age.

As shown in Tables 3 and 4, the ordered probit regression only partially supports the first hypothesis, while the second is fully confirmed. Tables 3 and 4 report the detailed results of the ordered probit regression analysis for both model 1 (purchase) and model 2 (consumption).

Table 3. Results of the regression analysis—Model 1 (Purchase).

Function evaluations: 104
Evaluations of gradient: 22

Model 1: Ordered Probit, using observations 1–2115 ($n = 2114$)
Missing or incomplete observations dropped: 1
Dependent variable: PURCHASE
QML standard errors

	Coefficient	STD. Error	Z	*p*-Value
On-site	0.082473	0.032028	2.575	0.0100 **
Online	0.020125	0.00153	0.656	0.0467 *
Environment	−0.00372	0.038982	−0.09544	0.924
Ethical awareness	0.17582	0.049122	3.579	0.0003 ***
Label	−0.02431	0.052305	−0.4648	0.642
Local	0.015164	0.044212	0.343	0.7316
Organic	0.062953	0.04296	1.465	0.1428
Age	−0.0931	0.036306	−2.564	0.0103 **
Gender	−0.06659	0.064761	−1.028	0.3038
Education	−0.12091	0.03889	−3.109	0.0019 ***
Marital status	−0.01217	0.07057	−0.1724	0.8631
Children	−0.02236	0.030198	−0.7404	0.4591
Employment	−0.01421	0.032984	−0.4309	0.6665
Income	0.033878	0.038475	0.8805	0.3786
cut1	0.096452	0.201918	0.4777	0.6329
cut2	0.350346	0.20201	1.734	0.0829 *

Mean dependent var 1.285241 S.D. dependent var 0.909278
Log-likelihood −1851.220 Akaike criterion 3734.440
Schwarz criterion 3824.942 Hannan-Quinn 3767.577

Number of cases 'correctly predicted' = 1262 (59.7%)

Likelihood ratio test: Chi-square(14) = 66.0663 [0.0000]
Test for normality of residual

Null hypothesis: error is normally distributed
Test statistic: Chi-square(2) = 1.72183
with *p*-value = 0.422776

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 4. Results of the regression analysis—Model 2 (Consumption).

Function evaluations: 114				
Evaluations of gradient: 26				
Model 2: Ordered Probit, using observations 1–2115 (*n* = 2114)				
Missing or incomplete observations dropped: 1				
Dependent variable: CONSUMPTION				
QML standard errors				
	Coefficient	**STD. Error**	**Z**	*p*-**Value**
On-site	0.0127237	0.0287319	0.4428	0.6579
Online	0.0556306	0.026753	2.079	0.0376 **
Environment	0.112482	0.0329485	3.414	0.0006 ***
Ethical awareness	0.127405	0.042649	2.987	0.0028 ***
Label	−0.0689592	0.0450986	−1.529	0.1262
Local	0.0677185	0.0384257	1.762	0.0780 *
Organic	0.0340062	0.0375313	0.9061	0.3649
Age	−0.138906	0.0313728	−4.428	0.0000 ***
Gender	0.0356686	0.0589472	0.6051	0.5451
Education	−0.106500	0.0332912	−3.199	0.0014 ***
Marital status	−0.0311640	0.0609833	−0.5110	0.6093
Children	−0.00100246	0.0264143	−0.03795	0.9697
Employment	−0.00356866	0.0306132	−0.1166	0.9072
Income	−0.00935615	0.0326454	−0.2866	0.7744
cut1	0.00253127	0.19254	0.01315	0.9895
cut2	0.785214	0.193088	4.067	0.0000 ***
cut3	1.57213	0.194268	8.093	0.0000 ***
cut4	2.3797	0.198271	12	0.0000 ***
cut5	2.6997	0.201577	13.39	0.0000 ***
Mean dependent var 1.385052 S.D. dependent var 1.200364				
Log-likelihood −3100.872 Akaike criterion 6239.743				
Schwarz criterion 6347.214 Hannan-Quinn 6279.094				
Number of cases 'correctly predicted' = 674 (31.9%)				
Likelihood ratio test: Chi-square(14) = 113.835 [0.0000]				
Test for normality of residual				
Null hypothesis: error is normally distributed				
Test statistic: Chi-square(2) = 7.41554				
with *p*-value = 0.0245322				

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

As in the binary probit model, the assumption of normality is crucial here for consistency of the estimators as well as the interpretation of the parameter estimates. A chi-squared asymptotically distributed test for normality was carried out within the Lagrange multiplier framework. A way to evaluate the goodness-of-fit of models consists of comparing correct and incorrect predictions. The overall proportion of correct predictions is quite high (60%) for the model 1 (purchase) and lower (32%) for the model 2 (consumption) in explaining changes in purchase behaviour and changes in consumption behaviour, respectively.

The results of both the regressions show that the tendency to change purchase and consumption behaviour significantly decreases with age (with a coefficient of −0.093 for purchase and −0.139 for consumption) and education (with a coefficient of −0.121 for purchase and −0.107 for consumption). On the other hand, there is neither statistical evidence of gender effects nor a significant impact on the number of children, the marital status or the level of income.

Both the variables online (i.e., effectiveness of communication through the digital platform) and on-site (i.e., effectiveness of communications through direct face-to-face contacts) are statistically significant in the regression model. More specifically, online is statistically significant both in the first regression model with purchase as dependent variable and in the second model with consumption. These results show that online knowledge sharing positively affects sustainable behaviour change both in purchasing and consumption practices. On-site knowledge sharing, instead, significantly affects only change towards more sustainable purchasing behaviour.

The analysis of some sustainability factors considered relevant for AFNs [11,35,37,38,40,41] shows that, despite their importance, some of these factors do not seem to be significant in affecting changes in the purchasing behaviour (e.g., only "ethical awareness" is significant with a positive coefficient equal to 0.17582). In the second regression, bigger changes in consumption behaviour are related to higher care for the environment (coefficient 0.112), higher ethical awareness (coefficient 0.127) and greater attention to local production (coefficient 0.068).

5. Discussion and Conclusions

While exploring the relationships between knowledge-sharing practices and sustainable behaviour change, we found a difference between on-site and online effects. Face-to-face contacts positively affect customer sustainable behaviour change in purchasing practices but not in consumption patterns. That result is partly explained by the fact that on-site interactions are more suitable for "practical" information, affecting only the final purchase decision, while not directly addressing the member consumption behaviour. Through physical contacts, for example, the farmer can receive an immediate feedback from customers, offering refunds or exchanges if a product does not satisfy their expectations [62]. On the other hand, online knowledge sharing has shown a positive impact on sustainable behaviour change both for purchasing and consumption. A possible explanation of the different impact of online and on-site interaction relies in the fact that these two ways of sharing knowledge and values act slightly differently and are bearers of different contents and meanings [8,28]. Shared information spread more rapidly through digital platforms and have a more profound effect on people's culture and behaviour, triggering mechanisms of idea-shaping and co-participation [19,27,63].

As for the sustainability factors, the level of ethical awareness of the customer is significantly and positively related with both changes in consumption and in purchasing behaviour. Food safety, human health and animal welfare have already been thoroughly discussed by previous studies recognizing their fundamental role in enhancing new forms of food production, distribution and consumption that facilitate connections between producers and consumers, triggering sustainable practices [5,11,40]. The level of sensitivity to environmental elements (i.e., waste reduction, preservation of natural resources and climate change mitigation) and the support to local economies positively affect only the change in consumption behaviour. These results are in line with [39], who individuated local and environmental concerns as one of the main factors of AFN growth. Although organic farming is considered one of the main characteristics of AFNs [1,10,13,35], it does not have a significant impact on either purchasing or consumption processes. Label does not show significance either; this could be explained by the fact that label information is less important during the direct and face-to-face pick-up process, since the customer can judge the quality of the produce on the basis of his interaction with the producer [11].

As mentioned before, the model was then controlled for the traditional socio-demographic variables [71–75], but the only variables that had an impact are age and education. In this case, higher age and higher education correspond to lower levels of sustainable behaviour change. With regards to the educational factor, this result may suggest that academia should manage sustainable development challenges by developing a new set of visions, paradigms, policies, methodological tools and applicable procedures [76].

Our paper presents an emerging and innovative picture of food networks, as it analyses the role played by knowledge sharing in affecting the success of AFN in terms of customer sustainable behaviour change. To do so we carried out a quantitative regression analysis on FA, a special model of AFN self-organising community that mixes online purchasing with on-site produce pick-up. This hybrid form of FA allowed us to investigate not just knowledge sharing through on-site communications, but also online interactions on the digital platform. The results show that online interactions positively affect sustainable behaviour change in terms of both purchasing and consumption practices. Knowledge sharing based on direct face-to-face contact with producers, instead, was found to significantly affect changes in sustainable purchasing but not in consumption behaviour.

There are some limitations and some possible further developments to this study. First, our research was conducted only on a national basis. Possible differences in cultures and food consumption habits may yield differing results in other countries; extending the data collection out of Italy could be a further development of this study. Second, since this research is based on all Italian FAs, controlling for regional differences could improve the significance of the regression and provide additional evidence on significant variables. Third, since this study is based on behaviour change, further studies could explore the data evolution over time. Another possible step may be to analyse knowledge sharing enhanced by blockchain within food systems [77].

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