

Article

# The Coexistence of Local and Global Food Supply Chains: The Lombardy Region Case Study

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**Abstract:** Over the last years, the trust of consumers in the quality and sustainability of the food system has weakened due to the disconnection between producers and consumers. Alternative Food Networks (AFNs) and Short Food Supply Chains (SFSCs), born out of the perceived loss of trust in the globalized food system, are trying to shorten the gap between farmers and consumers. Nowadays, many scholars agree that local and global food systems coexist, and consumers usually buy both in local and in global food chains. Our study aims to understand the factors that affect the development of AFNs with a specific focus on the interactions with small- and large-scale food retailing in the Lombardy region in the north of Italy. We employ an Ordinary Least Square (OLS) model, on a municipal scale, in which the dependent variable measures the number of participatory activities carried out by farmers and consumers in AFNs. The main results highlight that conventional large retailers and alternative food networks are linked, and that the coexistence of the two market channels may lead to the development for both of them. Contrarily, where small stores exist, they may compete with an alternative food channel, as they offer similar products and services.

**Keywords:** alternative food networks; consumers; food chain; local

## 1. Introduction

Over the last years, the trust of consumers in the quality and sustainability of the food system has weakened due to the disconnection between producers and consumers and the rise of food crises and scandals [1]. At the same time, consumers are more and more aware of the consequences of food production, processing and distribution and conscious of the role they play in the global dynamics of the food system.

This context facilitated the rise of Alternative Food Networks (AFNs) and Short Food Supply Chains (SFSCs), which are characterized by the proximity between producers and consumers, who can develop a personal relationship in contrast with the global food system anonymity [2,3] and have closer control over the different steps of the food chains. Nevertheless, some studies [4] suggested that it is not only the trust crisis in conventional food chains that stimulates the growth of AFNs but other factors have to be considered to better monitor this phenomenon. Local food purchasing has become a strategy for some consumers to try to keep control of the consequences of their choices [5,6], in the absence of reliable information that can lead to the information asymmetry issue [7]. Information asymmetry occurs when information is not fully shared among the individuals who are part of the economic process; therefore, knowledge of the information is not the same for everyone, leading to unsuccessful market decisions. In the global food chain, some information is known by producers but not by consumers, leading to inaccurate purchasing choices. The connection between consumers and producers can shorten the gap, creating new opportunities to build a new role both for consumers and producers in the food chain. The involvement of consumers in AFNs implies greater efforts to join the

market, higher awareness and often a higher willingness to pay for locally grown products. According to Corsi and Mazzocchi [3], the main benefit for farmers participating in AFNs is the opportunity to internalize larger margins and to have direct access to consumers by reducing intermediation, typical of conventional markets, as well by organizing themselves in small farmers' associations [8]. Thus, whether AFNs arose in opposition to the globalized food chain, nowadays many scholars [3,5,9] agree that "this does not allow for simple dichotomies in terms of local versus global or conventional versus alternative" [9], as local and global food systems coexist, and consumers usually buy both in local and in global food chains [7].

To our knowledge, few studies have analyzed the competition/coexistence between AFNs and large retailers. The present paper, developing from a previous study [3], aims to understand the relationship between AFN development and Short Food Supply Chain (SFSC) development with small- and large-scale food retailing in the Lombardy region, in the north of Italy, using an Ordinary Least Square (OLS) model. The methodology employs the number of participatory activities carried out by producers and consumers in AFNs as the dependent variable while testing several explanatory variables, among which is the presence of conventional retailers, to investigate their coexistence with AFNs.

#### *Alternative and Conventional Food Chains Coexistence*

The issues and motivations embodied by AFN consumers have had an impact on global food chains, as large retailers and multinational enterprises are now providing an increasing amount of information and broadened the range of claims about their products [5]. Hinrichs [10] comments that in USA the idea of local and place-based food has a large diffusion and includes both actors like farmers, coming from "the weekly farmers' market downtown" and large food retailers, as Wal-Mart, confirming the coexistence of sometimes contradictory perspectives around this issue. She warns about the real role of the local issue to re-think the global food system, inviting reflection and caution against any simplification [10].

Next to traditional advertising, retailers have focused their communications and marketing strategies on environmental, health and ethical themes, often introducing the "local" message. According to Brunori and Galli [5], the "local" issue has taken place in large retailers, with the result that, in the numerous selling points of the same large distribution chain located in different places in the country, it is possible to buy different agricultural products produced in the surrounding agricultural area where the retailer is located. Thus, while in the beginning the "local" issue was interpreted as small, sustainable, more healthy and fair, in opposition to the globalized food chain [11], nowadays, the large retailers also want to appear local and clean, selling, alongside the conventional products, "local" produce, with a strong link to the "terroir". This is even more true when the large distributions chains produce their "local" private label (Es. Ortoqui Coop, Naturaplan COOP), shortening the distance between global and local, and overturning the "small is good" paradigm. Consumers tend to link the perceived quality of private labels with their view of the retailer [12], and they become more and more confident when the retailer meets their beliefs. Moreover, the quality of private label products is essential for defining the retail brand and establishing its attractiveness [13]. From consumer's point of view, this renewed attention for the environmental, ethical and local issues can be seen as advantageous, because they can have more purchasing options and they can push for a positive change in the market attitude of large retailers. Nevertheless, for the SFSC producers, this can be quite different. In fact, large retailers make room in this market niche, and they can become strongly competitive with small and direct producers, at least for some products. Moreover, from the SFSC producers' point of view, with their power bargaining, large retailers seem to take the convenient aspects of local food without embracing all the risks of the "game".

Retailers have focused on communicating product characteristics through labels, and a considerable number of studies have analyzed 'consumer' behavior regarding certifications [14,15]. In the literature, in addition to many studies relating to AFNs, some studies relating to the relationship between large

retailers and AFNs begin to be published, often posing their attention on the assessment of the food chain sustainability [5,9,16,17]. Some scholars base their work on the 'consumer' behavior [16], taking into account the fact that people that are usually buying in AFNs can also purchase in conventional channels. Cicatiello [16] argues that the share of 'consumers' purchasing in AFNs, the so-called "quantity dilemma", can be an indicator of the sustainability of the AFNs themselves. She finds that consumers interested in purchasing environmentally sustainable products have a higher probability of using AFNs as the main channel for food provision.

Moreover, according to [18], the probability that consumers purchase food in AFNs increases for those individuals described as rational shoppers, sensitive to food quality, taste and price, that is, people that can also take into consideration purchasing in other kinds of market channels. Other studies [9] distinguish different interaction processes to illustrate the place-specific and complex nature of local–global interactions and interdependencies in the food chains, trying to highlight the relationship between this different food chains typology. They find that re-localization actions can be a response to globalizing chains, but also global chain actors may incorporate "local elements" in their business strategy, confirming the idea of interdependence and coexistence of global–local food chains.

## 2. Materials and Methods

The study analyzes the coexistence/competition between AFNs and globalized chains by investigating some determinants of 'consumer' and 'producer' involvement in AFNs, including the existence of small- and large-scale food stores in a territory. By "involvement of producers and consumers", we refer to the participation in AFNs of consumers, who purchase products sold in alternative market channels through various methods (e.g., Ethical Purchasing Groups (EPGs), Food assembly), and of producers, who sell their goods and services using various selling typologies, in alternative distribution channels.

This "involvement" represents the AFNs in a place, and our model aims to detect the influence of several territorial, agricultural and retailing structure factors on this variable, that is a proxy of AFNs existence in a place. Among the explanatory factors, we include the presence of conventional retailers, investigating their coexistence (or competition) with AFNs.

In order to understand this relationship, we employ an Ordinary Least Square (OLS) model, in which the dependent variable measures the number of participatory activities carried on by producers and consumers in AFNs, on a municipal scale. The explanatory variables describe some determinants of the producers and consumers' involvement in AFNs, grouped in Territorial (TER), Agricultural (AGRI) and Food Retailing system (FR) factors.

The analysis is carried out in the Lombardy region, one of the most populated regions of the Italian peninsula, which includes the Po plain and its intensive cultivations. Agriculture is mainly based on cereals, with corn and rice as top products [19], and on a crucial livestock sector, represented by cattle, poultry and pigs, even though a decreasing trend has been registered in the last ten years [19,20]. Although the importance of the primary sector is still recognized, the industrial and the third sectors are the backbone of the regional economy, mainly localized in the large metropolitan area of Milan. Thus, Lombardy is a regional case particularly suitable for this study, comprehending both the supply side, with rich agricultural productions, and the demand side, with the greater concentration of the population located in the Milan metropolitan zone. The analysis is carried out on a municipal scale, so the size of the municipality could influence the presence of AFN activities of the dependent variable; for this reason, we performed a parametrization on the dependent variable and on the explanatory factors using the municipality surface [21].

The dependent variable includes demand and supply factors. Consumers' involvement is described by the number of Ethical Purchasing Groups (EPGs), the number of Food Assembly (ALV) and the number of Farmers' Markets (FM), representing the demand side (ALV and FM represents both the demand and the supply side, as can be seen in the following paragraph). The EPGs are groups of individuals who decide to purchase mainly food products, but not only, directly from producers,

without intermediaries. This allows consumers to choose the product they want to buy personally and the producers they prefer. Moreover, in some cases, the absence of intermediation economically may favor consumers saving money and, most frequently, the producer's profit [3]. Since participation in an EPGs is voluntary, this variable perfectly embodies the consumer choice to participate in an AFNs network. Farmer's Markets (FM) and food assembly (ALV) can be a halfway between consumers and producers in AFN involvement because both the demand and the supply express an effort in converging in a common marketplace. In our study, Food Assembly is represented by the "L'Alveare che dice sì" stores. "L'Alveare che dice sì" is based on organized delivery points. At the delivery points of "L'Alveare che dice sì", farmers meet consumers once a week and deliver the products that consumers have previously ordered on their dedicated online platform. The term "food assembly" indicates the exchange that producers can have with consumers thanks to the "shared moments" that this purchasing system allows. In fact, during the delivery day, producers donate their time and expertise to consumers to stimulate discussion on the products purchased and the process followed to produce them, allowing consumers to deepen the direct relationship with the producers.

Producers involvement in AFNs is described by the involvement of producers in direct sales on and off farms (DS), the number of farms having agri-tourisms (AGR) and the number of educational farms (EF). These three factors are proxy of the diversification level of the farms [22] and the establishment of direct relationships between the producer and the consumer, corresponding to farmers involvement choice in AFNs. The farms' activation of agritourism (AGR) and educational activities (EF) indicate a greater farmer propensity to open his/her business to new experiences, through the expansion of his relationships and sociality networks [22].

In our case, EPGs and ALV can also be considered a proxy of box schemes, because in Lombardy many producers involved in EPGs and food assembly propose box schemes to their clients. Especially in the 2020 spring, during the COVID-19 lockdown, producers involved in food assemblies such as "L'alveare che dice sì" proposed to their clients the box schemes, in order to avoid direct contacts among persons.

The dependent variable (DEP) is:

$$DEP = EPGs + DS + AT + EF + FM + ALV \quad (1)$$

In Table 1, we show the dependent variable factors; all the factors included in the model are measured at the municipal scale.

**Table 1.** Description of the dependent variable.

Factors Included in the Dependent Variable	Indicator	Data Sources
ETPs— Ethical Purchasing Groups	= number of ETPs in a municipality/municipality surface	Economiasolidale.net, (2017)
DS— Direct Sale	= number of farms with direct sale activity in a municipality/municipality surface	ISTAT, CA, (2010)
AG— Agri-tourisms	= number of Agri-tourisms' farms in a municipality/municipality surface	ISTAT, CA, (2010)
DF— Didactic Farms	= number of didactic farms in a municipality/municipality surface	ISTAT, CA, (2010)
FM— Farmers' Markets	= number of farmers' markets in a municipality (during a year)/municipality surface	Campagna Amica (2016)
ALV— Food assembly	= number of "Alveare che dice sì" in a municipality/municipality surface	alvearechedicesi.it, (2019)

The explanatory variables are grouped into three sets (Table 2): Territorial (TER), Agricultural (AGR) and Food Chain (FC) parameters.

**Table 2.** Description of the explanatory variables.

Variable Name	Group Name	Indicator	Measure Unit	Data Sources
UAA— Utilized Agricultural Area of a municipality	Territorial variables Group (TER)	= surface of UAA in a municipality/municipality surface	Indicator (ha/ha)	ISTAT, Census of Agriculture (CA), 2010
WOM— Female farm managers of a municipality	Territorial variables Group (TER)	= number of female farm manager in a municipality/municipality surface	Indicator (number/ha)	ISTAT, CA, 2010
INC— Population's average income of a municipality	Territorial variables Group (TER)	= annual income of the municipality/population of the municipality	Indicator (€/number of inhabitants)	OD Lombardy region, 2012
AGE— Average population's age of a municipality	Territorial variables Group (TER)	= average age of the municipality population	Indicator (number)	ISTAT, CP, 2011
ORG— Organic farms of a municipality	Agricultural variables Group (AGRI)	= number of organic farms in the municipality/municipality surface	Indicator (number/ha)	ISTAT, CA, 2010
HORT— Horticultural surface of a municipality	Agricultural variables Group (AGRI)	= (horticultural surface of the municipality * 100/UAA of the municipality)/municipality surface	Indicator (%/ha)/ha)	ISTAT, CA, 2010
SMA— Small farms of a municipality	Agricultural variables Group (AGRI)	= number of farms in the municipality with less than 5 ha of UAA/municipality surface	Indicator (number/ha)	ISTAT, CA, 2010
MIXED— Farms with mixed production (vegetables and animals) in a municipality	Agricultural variables Group (AGRI)	= number of farms with both vegetable and animal production in the municipality/municipality surface	Indicator (number/ha)	ISTAT, CA, 2010
LARGE_RET— Large and medium-sized sales food structure in a municipality	Food Retailing variables Group (FR)	= large and medium-sized sales food structure surface/municipality surface	Indicator (mq/mq)	<a href="http://www.dati.lombardia.it">www.dati.lombardia.it</a> 2019
SMALL_ST— Small food stores in a municipality	Food Retailing variables Group (FR)	= total surface of small food stores/municipality surface	(mq/mq)	<a href="http://www.dati.lombardia.it">www.dati.lombardia.it</a> 2019

The TER group describes the socio-economic characteristics of the territory. These factors are the utilized agricultural area (UAA), the average population income of the municipality (INC) and the average population age (AGE) and the presence of female farm managers (WOM). Some authors found that higher rurality of municipalities may positively influence the involvement in AFNs, because there are usually numerous localized farms in rural areas that can participate in AFNs [3].

We hypothesized that INC positively influences consumers' involvement in AFNs; that is, they have more probabilities of participating in AFNs than people with lower income [23,24]. This does not mean that people with lower income cannot have access to AFNs, but only that municipality with a higher average income also has a higher share of the population involved in AFNs [3].

The AGE variable was chosen to test whether a younger population could foster the involvement in AFNs, because some authors [3] found a higher involvement of the older population in the development of AFNs. However, some others [25] demonstrate that young people are more inclined towards innovation, including alternative networks for purchasing food. A relationship between the

presence of women farm managers in an area and AFN involvement is investigated by the WOM variable, highlighting connections between gender and AFN activities [26].

The AGRI group includes parameters related to the presence of agricultural characteristics of an area. We take into consideration organic farms (ORG), because, regarding the demand side, consumers' participating in AFNs are usually more attentive to environmental and healthy aspects, and they could be attracted by the presence of organic farms in an area. At the same time, organic producers are often very interested in an alternative model of food product distribution. The horticultural surface of a municipality (HORT) represents the degree of horticultural crops in the municipality, which can foster producers' involvement in SFSCs, because fresh horticultural products are often requested by consumers in AFNs. In fact, the freshness of products is one of the main motivations declared by consumers to acquire in AFNs [27]. Moreover, several authors found that fruit and vegetables are typically included in the basket of AFN purchasers [16,28,29].

A lower degree of specialization and a higher level of diversification in farm production usually led to a more sustainable farm economic structure but also to less efficient production processes [22,30]. We hypothesize that MIXED variable has a positive impact on the dependent.

Farms practising livestock at the small scale (SMALL) are expected to influence farmers to participate in FM or to practice direct sale and, at the same time, could involve consumers in mechanisms of direct purchasing. The bargaining power of producers in agri-food chains is often questioned by retailing actors, such as large-scale distributors, which exerts a significant power on the whole chain [31]. Thus, small farms often opt for alternative solutions for selling their products [16], also to solve competitiveness problems they can meet in conventional channels [17]. As an example, in Lombardy, many small producers prefer to participate in FM and sell to EPG.

Lastly, we have included in the model a group of variables describing the conventional Food Retailing system (FR): the total surface of large and medium (LARGE\_RET) retailers, and the total surface of small food stores (SMALL\_ST). The presence of large/medium retailers in a municipality is expected to impact the development of AFNs negatively because they are able to catalyze the food demand of a place. Nevertheless, it might be possible to have the opposite result, that is, where large retailers are, alternative consumers may be more active in developing and participating in short/alternative food chains. We also tested the model including the number of retailers as an explanatory variable, but this variable resulted to be correlated with the surface of the retailers. Thus, we have chosen to use the surface of retailers variable rather than their number, because this variable can be a proxy both of the numerosity of this kind of structure—due to the correlation with the number of retailers variable—and of the presence of a large surface of retailers, typically represented by superstores. However, in the literature, variables related to conventional retailing systems have never been tested before so their impact on AFNs is still unknown.

We build an OLS regression model, with the general formula:

$$Y_{i\text{-th}} = \beta_1 x_{i\text{-th}} + \beta_2 x_{i\text{-th}} + \dots + \beta_n x_{i\text{-th}} + \varepsilon_{i\text{-th}} \quad (2)$$

where  $Y_{i\text{-th}}$  is the dependent variable that indicates consumers' and producers' involvement in AFNs in the  $i$ -th municipality,  $\beta$  is the coefficient of the variable  $n$  for the  $i$ -th municipality and  $\varepsilon$  is the error term. In more detail, our model specification is:

$$Y_{i\text{-th}} = \beta_{i\text{-th}} (UAA_{i\text{-th}}) + \beta_{i\text{-th}} (INC_{i\text{-th}}) + \beta_{i\text{-th}} (AGE_{i\text{-th}}) + \beta_{i\text{-th}} (WOM_{i\text{-th}}) + \beta_{i\text{-th}} (ORG_{i\text{-th}}) + \beta_{i\text{-th}} (HORT_{i\text{-th}}) + \beta_{i\text{-th}} (MIXED_{i\text{-th}}) + \beta_{i\text{-th}} (SMALL_{i\text{-th}}) + \beta_{i\text{-th}} (SMALL\_ST_{i\text{-th}}) + \beta_{i\text{-th}} (LARGE\_RET_{i\text{-th}}) + \varepsilon_{i\text{-th}} \quad (3)$$

Starting from the first group of variables, the Territorial group, the other variables were then added one by one to test the effect of each one on the regression. Tests based on the Akaike Information Criterion (AIC) [32] and Bayesian Information Criterion (BIC) [33] are used to gauge the goodness of fit of the models and to compare the performance of non-nested models. In both cases, a lower

value means that a model is more likely to be a true model. As a base model to compare the results against, the results is presented with the Territorial group variables. Model 1 represents the effect of the Territorial group variables on the dependent variable. Model 2 shows the results of the Territorial plus Agricultural explanatory variables on the dependent variable. Model 3 is the full model, including the Food Retailing group variables.

### 3. Results

Table 3 shows the descriptive statistics both of the dependent and the explanatory parameters. A correlation higher than 0.5 has been taken as a threshold to consider the variables in the analysis.

**Table 3.** Descriptive statistics of the variables.

Variable Name	Observations	Mean	Standard Deviation
DEP	1522	0.892	1.097
UAA	1522	45.422	59.057
WOM	1522	0.556	0.807
AGE	1522	42.924	3.170
ORG	1522	0.082	0.198
HORT	1522	0.645	2.588
SMALL	1522	0.875	1.043
MIXED	1522	0.142	0.226
INC	1522	22,580.43	3202.104
LARGE_RET	1522	132.751	345.075
SMALL_ST	1522	280.346	524.342

In our case study, variables are not correlated among them. Our discussion of the results focuses on the full model (Table 4). The full model with all the explanatory variables (Model 3) increased the measures of goodness of fit compared to the baseline models (Model 1). This suggests that the addition of the explanatory terms helps to improve the ability to explain the dependent variable of our model. As for  $R^2$  parameter, the full model (Model 3) significantly increase compared to the 1 and 2 models, reaching the considerable value of  $R^2 = 0.55$ . Besides, the majority of the coefficients and signs of the first group of variables (TER group) remains stable across the models, showing robust results.

**Table 4.** Regressions results.

Variables	Model 1 (Only TER Variables)	Model 2 (Only TER and AGRI Variables)	Model 3 (Full Model)
UAA (TER)	−0.001 ** (0.000)	−0.001 (0.000)	−0.002 *** (0.000)
WOM (TER)	0.823 *** (0.032)		0.408 *** (0.032)
AGE (TER)	−0.008 *** (0.007)		0.019 ** (0.006)
INC (TER)	0.000 *** (7.356)	0.000 *** (6.456)	0.000 *** (6.612)
ORG (AGRI)		1.494 *** (0.112)	1.122 *** (0.118)
HORT (AGRI)		0.005 (0.008)	0.000 (0.008)
SMALL (AGRI)		0.484 *** (0.023)	0.390 *** (0.023)
MIXED (AGRI)		0.805 *** (0.109)	0.535 *** (0.106)

Table 4. Cont.

Variables	Model 1 (Only TER Variables)	Model 2 (Only TER and AGRI Variables)	Model 3 (Full Model)
LARGE_RET (FR)			0.002 *** (0.000)
SMALL_ST (FR)			−0.002 ** (0.000)
constant	−0.407 (0.395)	−0.267 * (0.149)	−1.375 *** (0.340)
Obs	1522	1522	1522
R <sup>2</sup>	0.35	0.49	0.55
AIC	3959.77	3587.21	3404.42
BIC	3986.41	3624.52	3463.03

Legend: \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

Lastly, the reduction in the AIC and BIC statistics has been verified, highlighting that Model 3 is the best fitting models.

Concerning our full model (Model 4), nine of the ten explanatory terms result to be significant. All the Territorial parameters are significant and positively related to the dependent, except for the UAA variable, with a negative coefficient. Thus, municipalities with a higher rural area seem to have less involvement of consumers and producers to AFNs and SFSCs. At the same time, higher average income (INC) and higher average population age of a municipality are related to higher involvement of demand and supply actors to AFNs. Also of interest to the WOM sign, the greater the presence of women farm managers in an area, the more the consumers and producers are involved in AFNs.

Agricultural variables show a positive relationship with the dependent variable, except for HORT, representing the degree of horticultural surface in a municipality, which is not significant. Thus, the more organic farms (ORG), small farms (SMALL) and farms with both vegetable and animal products (MIXED) are present in a municipality, the more likely it is that consumers and producers contribute to developing AFNs.

Regarding Food Retailing variables, large and medium retailer surfaces (LARGE\_RET) are positively related to the dependent; contrastingly, the presence of small stores (SMALL\_ST) is negatively related to the number of consumers and producers involved in AFNs.

#### 4. Discussion

At first glance, the results confirm the impact of the parameters already investigated in AFN literature. As found by some authors [23,24], the higher the income of the population in the municipality under investigation, the greater the probabilities of the development of AFNs and therefore the higher the consumers and producers' involvement in alternative market channels. At the same time, the presence of women farm managers positively influences the involvement in AFNs, as we hypothesized in Section 3, because they are usually more prone to innovation and environmental issues [26]. The average age of the municipality is positively related to involvement in AFNs, as found by [3]. The result related to the rural degree of the municipality (UAA) is not entirely new for the literature, as Jarosz [34] demonstrated in the case of Washington State producers' markets, where the largest concentration of them is clustered around major metropolitan areas. Our analysis shows a negative influence of UAA variable on the dependent; thus, the lower the value of UAA in a municipality, the higher the consumers and producers involvement in AFNs. This may be explained by the fact that the demand generated by populated areas is higher [35], and this can lead to a high level of consumers involvement in alternative market channels, due to a high level of demand concentration. Agricultural variables included in the analysis have a positive relationship with the dependent variable, confirming that territories hosting organic and mixed farms, such as small farms, are more interested



in participating in AFNs due to their specific supply structure. Moreover, the SMALL variable result confirms the findings of Cicatiello [16], according to which small producers are always looking for alternative solutions for selling their products, which they often prefer to conventional channels.

The novelty of this paper lies in the analysis of the relationships between AFNs and conventional retailing system (LARGE\_RET and SMALL\_ST). Literature affirms that the business strategy of global retailers embeds several features of the local food systems [5]. Moreover, large retailers are now providing an increasing amount of information about food chains and food products features, as it occurs with labels and marks, to reduce the gap between consumers and producers. In analyzing our results related to the area of large retailers (LARGE\_RET), we note that this variable shows a positive relationship with the consumers and producers involved in AFNs, that is, the bigger the large retailers' area in municipalities is, the greater consumers and producers' involvement in AFNs. Thus, conventional and alternative food networks are strictly linked, and this result can be explained as a possible reaction to the conventional system by consumers and producers. This finding may be interpreted as the arising of an "antagonist synergy", where the coexistence of the conventional and alternative market channels leads to the development for both of them. In this sense, the sustainability of this relationship and the equilibrium between the two opposite food systems must be further investigated, in order to deepen these findings. Contrastingly, where the surface of small retailers is high, consumers and producers seem to participate less in alternative food networks, according to the negative relationship detected between the SMALL\_RET and dependent variables. This finding could be motivated by two considerations. First, AFNs and conventional small stores compete with each other, as they sell similar products, so where small stores already exist on the territory, it is more difficult for AFNs to develop. Effectively, other authors [6] affirm that AFNs offer an experience very similar to that of shops or traditional markets. Second, one of the most distinctive aspects of alternative food supply chains is the relationship between consumer and producer, which is considered very important [36]. Probably, while this relationship is absent in large distribution and therefore with large retailers, it is indeed present in small food stores, where the consumer builds a personal relationship with the shopkeeper, who "replaces" the direct contact that the consumer would have with the agricultural producer in SFCs.

## 5. Conclusions

In order to broaden the debate, some general policy recommendation can be inferred from our results. Urban and territorial planning usually devote several enormous land resources to the development of large retailers in terms of surfaces; a reflection should be made in terms of resources dedicated to AFNs, to allow the sustainable development of the territory to pay greater attention to these markets by the authorities. At the same time, it is necessary to ensure the persistence of small retailers' activities and spaces, which often provide the resilience of small urban and rural centres.

Although results are relatively specific for the Lombardy region, also because the territorial and agricultural characteristics are very typic and the study was conducted on a municipal scale, the model proposed is easily replicable in other regions, and this can become the next step of the research, together with a deeper investigation into the relationships between the AFNs' development and the conventional food chains. Moreover, further objectives will concern the development of qualitative analysis to detect better the influence and motivations of the different groups of actors included in AFNs.

Lastly, some reasoning on the role of AFNs in the context of a health emergency due to COVID-19 can be carried on. In Italy, food supply chains have proven to be vulnerable to various bottlenecks in different supply chain steps. In long supply chains, restrictions on transport and communications have created problems and prevented seasonal workers from reaching farms. The increase in demand for fresh products has led to temporary shortages while the necessary spatial distancing has forced customers to stand in long waiting lines at the stores. In short supply chains, restrictions have limited open markets and informal supply chains, mostly based on face-to-face meetings [37]. Finally,

the closure of restaurants and bars and the blocking of tourist flows have severely affected the Horeca market channel. The offer has quickly converted traditional distribution with innovative home delivery or takeaway mechanisms, with a formidable increase in online purchases [37]. From a social point of view, the most severe impact has been found on the poorest and most vulnerable segments of the population, but also on women on whom the burden of managing children has fallen the most. Companies, administrations, citizens, NGOs, and informal networks have implemented actions and explored alternative ways to guarantee food availability, but coordination between the various actors and institutions in the support and promotion of initiatives in some cases has been lacking.

The need to strengthen research to provide technical solutions and social innovations aimed at strengthening local supply chains is therefore called from many sides, so that, in this crisis, as with potential future emergencies, they may represent an alternative model. Under normal conditions, the definition of new/alternative models of food circulation may contribute to strengthen the local economies, employment, especially youth employment, connect urban centres, where food consumption is concentrated, and rural areas, where agricultural activity occurs [38].

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