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Economic Impact of Short Food Supply Chains: A Case Study in Parma (Italy)

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Abstract: Short food supply chains (SFSCs) are advocated as strategies to improve the sustainability of the agro-food system. The recent literature claims that SFSCs are examples of social experimentation and innovation. By scaling up the positive elements of niche alternative food networks, SFSCs can serve as a basis for changing the overall agri-food system. However, their economic impact remains a matter of debate. Local multiplier methods have been used to measure the economic impact of economic sectors at a regional scale. In the case of SFSCs, multiplier methods need to be developed at a local scale and are highly data demanding. This analysis measures the local financial flow created by the MercaTiAmo project by applying the Local Multiplier 3 (LM3) method. MercaTiAmo is organized by a group of citizens and farmers and arranges farmers' markets three days per week in the city of Parma (northern Italy). To measure the financial flow created by the initiative, data were collected from 10 farmers representing 70% of the farmers participating in the project. The method takes into account the total annual turnover (Round 1), the local expenses of the farmers (Round 2), and the local expenses of the farmers' suppliers (Round 3). The results suggest that farmers with a higher turnover (Round 1) and percentage of direct expenses in the local area (Round 2) also show higher values of LM3, thus suggesting a higher economic impact, while Round 3 does not affect LM3. The novelty of the study relies on the fact that here the local multiplier method is applied for the first time at the farm level, providing precise information and data on farmers' upstream supply chain, which can be used to inform policymakers and initiators of SFSCs. Moreover, the study provides a detailed description of the main categories of costs for farmers and which categories of costs are more suited to be locally based. For this reason, the study contributes to the debate on the economic impact of SFSCs in the local area. The method can also be used to provide information to consumers on the economic impact of alternative food networks and local food production.

Keywords: local multiplier; farmers markets; social innovation; upstream supply chains

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1. Introduction

One of the earliest scientific conceptualizations of Short Food Supply Chains (SFSCs) was provided by Renting et al. [1]. Their paper made a clear distinction between Alternative Food Networks (AFNs) and SFSCs. An AFN was defined as a "broad embracing term to cover newly emerging networks of producers, consumers, and other actors that embody alternatives to the more standardized industrial mode of food supply". On the other hand, the term SFSC more specifically refers to the "interrelations" between the actors directly involved in the food chain. The use of the term "short" is justified since the aim is to shorten the "anonymous long industrial food supply chain" by restoring social relationships between consumers and producers. By restoring the social bonds between farmers and consumers, SFSCs have been recognized for their ability to enhance the role of farmers in the food supply chain, ultimately increasing their income [2]. Farmers can obtain

a higher share of the price and can have greater control over the food supply, in terms of provision, price definition, and promotion. On the other hand, consumers are able to choose how to spend their money and thus sustain specific agri-food and farming systems.

Since the 2000s, SFSCs have also been advocated as a tool for promoting the economic development of rural areas. The early literature associated SFSCs with their niche character and potential for transforming the rural economy. SFSCs were primarily targeted at farmers in marginal areas, or those excluded from conventional food chains. SFSCs were thus seen as a strategy to enable marginalized farmers to continue to work and make a profit [1]. In the recent literature, SFSCs are considered as examples of social innovation. The term 'social innovation' refers to the collective responses to community needs, from perceived problems to opportunities, where social processes and collective actions [3] develop novel solutions that are more efficient and sustainable or more equitable than existing solutions which primarily benefit society as a whole. Social innovation encompasses initiatives that address societal needs through collaboration and social participation. SFSCs are thus seen as the groundwork on which civil society can actively redesign the food system. By designing specific marketing projects which align with the specific needs, beliefs, and creativity of farmers and consumers, SFSCs can be used as an experiment to redesign the food system in a more sustainable way. The ultimate goal is to expand and integrate the positive elements of SFSCs within the overall food system, moving away from their niche status and also by including other actors of the upstream and downstream food value chains [4,5].

Among SFSCs, Farmers Market (FMs) can represent one of the preferred market destinations for small farmers [6]. One emerging research gap is to prove the real economic impact of FMs and SFSCs on the farm's profit and on rural areas, due to a lack of empirical evidence [7].

In the case of the impact on farms' profit, different case studies have yielded contrasted results, also because the studies are not homogenous in the methods applied and type of SFSCs analyzed [8]. Moreover, the study of the effective impact on farmers' profitability of SFSCs is often challenging because not all farms have a comprehensive cost accounting system [7], analyses mostly rely on the perception of farmers about their income [8]. Thus, the literature suggests that the improved economic performance perceived by farmers is primarily driven by personal satisfaction in enhancing their role within the food chain, rather than a substantial improvement in their financial statements [8]. Additionally, determining the contribution of public funding to SFSCs is not always straightforward [8]. Lastly, when SFSCs are established, Venn et al. [9] argue that their primary objective may not always be to ensure profitability for farmers, particularly when initiated by consumers. In the specific case of FM, according to literature farmers participate for different reasons, which are not always the economic profitability and maximization of profit. FMs are in fact also seen by farmers as a place for recreation and social connection with other farmers and consumers, or as a promotional space of the farm's activities to later attract consumers to the on-farm direct sale, as a possibility to be part of a community that promotes specific social values [10,11]. The research project Strength2Food investigated the economic impact of a specific FM in Italy and the preliminary results showed that only a few farmers reported a significant profit increase [12]. Thus, the real capacity of creating income of FMs is a matter of debate.

At the same time, the impact of SFSCs on rural economic development, by creating income for other local economic actors has been little investigated by the literature. Considering the downstream supply chain, literature has reported the frustration of retailers and processors when they relate to small farmers in SFSCs, because the commitment of small farmers is uncertain and ambiguous, in terms of the amount of food provided and definition of price [13]. Filippini et al. [11] investigated the engagement of farmers in SFSCs and found that if on the one hand, SFSCs increase the market power of farmers and allow them to establish fairer economic relationships, on the other hand, farmers still perceive SFSCs as still risky economic initiatives since they are too much based on the variable consumers and buyers demands and their individualistic initiative. Consequently,

farmers' economic commitment to such initiatives is uncertain and mainly driven by the individualistic strategy that hampers the possibility to create a positive economic impact also for other economic actors. According to the authors, while SFSCs may bring short-term benefits in terms of market power for farmers and consumers, the long-term resilience of SFSCs therefore relies on the coordination between farmers, consumers, and SFSC projects, especially in terms of ensuring the sustainability of SFSCs in the long run [11].

Considering the upstream supply chain, the literature has examined the ability of SFSCs to generate and sustain income at a territorial scale through new employment opportunities. The limited empirical evidence suggests that SFSCs have a more positive impact compared to long food supply chains [14]. Nevertheless, the quality and the persistence of the jobs remain a matter of debate, since the establishment of new economic activities can also lead farmers to the over-exploitation of existing workers [15]. To the best of our knowledge, no studies have been produced on the capacity of SFSCs to create income for the local input suppliers, such as the sellers of seeds, plants, fodders, etc. Thus, the question remains whether these farms actually contribute to a virtuous process of rural development by generating wealth that is distributed throughout at the local scale.

Clarifying the economic impact of SFSCs at local scale is essential to promote the widespread adoption of SFSCs and the development of a more sustainable agro-food system. In fact, the same niche character of SFSCs restricts their scalability and effectiveness as a rural development strategy. Since few farmers and strongly engaged consumers are involved in SFSCs, it is difficult to push a new agro-food system and thus to further support the market autonomy and the creation of income for farmers [4]. In other words, the territorial-level economic impact of SFSCs may be limited by their "niche" nature [4].

This study is based on the hypothesis that the contribution of SFSCs to the local economy and development is key for evaluating the level of economic sustainability and thus the opportunity to scale up SFSCs. The purpose of this study is to measure the economic impact in terms of financial flow produced at the local scale on the local upstream food value chain by the farmers participating in a specific FM organized by consumers and farmers in Parma, Italy.

To study the economic impact on rural areas, we applied the theoretical framework of local multipliers. The concept of the local multiplier derives from Keynesian multiplier models. It aims at understanding how much money generated by firms localized in a specific area remains in the same area and is thus spent by the firm. In this way, it generates income for other actors in the same local area [16]. When applied to SFSCs, the method allows the mapping and calculation of detailed economic flows connected to the purchases of farms participating in SFSCs [7]. In other words, it is possible to derive how much of the revenue of the farm becomes revenue for other actors in the same area. Thus, it helps in understanding the economic impact of the farm's economic activity in rural areas.

In the literature, several models have been developed to take into account the economic flow of the firms and of different sectors. Very few studies have been produced in rural areas and agri-food relationships [16]. To the best of our knowledge, there are no studies on the local multiplier effect of SFSCs.

To study the economic impact of rural firms compared to urban firms, Roberts et al. [17] developed a Social Accounting Matrix to highlight the input-output exchanges between rural and urban areas, identified as sub-regions of a wider region. The input-output approach, and especially the Social Accounting Matrix, provides a comprehensive view of the economic flow in rural areas [17,18]. The input-output matrix considers all the inputs that different outputs require, thus helping to understand the structure of the costs of a certain production. The SAM also includes the flow of money from and to households and government within the economy [18]. In this way, the method captures the full circular flow of income from production to factor incomes from household income to household consumption, providing a wider picture of the economic exchanges between different economic actors in the area.

However, SAM is applied at meso-scale, while a local approach is more suitable for SFSCs. Moreover, SAM is highly data demanding, but since it is applied at the regional scale, it can lean on national and regional databases [17,18] and does not need always primary data. In contrast, at a local level, it is not always possible to have the same accuracy in official databases [16]. Interviews with actors are necessary to fully understand their detailed spending.

The New Economic Foundation developed the Local Multiplier 3 (LM3) [19,20] to study the local economic flow of rural economic activities. The number 3 represents the three rounds considered in the method. Round 1 identifies the turnover generated by the economic activity of the firm; Round 2 (R2) identifies the direct spending of the farm, and Round 3 (R3) identifies the spending of the suppliers and the households whose members are hired by the farms. LM3 estimates the indirect expenses of the firm, providing a more comprehensive view of the economic flow in the overall agro-food supply chains. LM3 also includes the spending that goes out of the local area in R2 and comes back in R3 [19,20]. The LM3 has been tested in the case study analysis of the Strenght2food project [11]. Donati et al. [16] applied a version of LM3 to investigate the monetary flow of quality schemes compared to conventional foods. Following LM3 guidelines, they estimated R1 and R2 mainly with primary data collected through interviews, while R3 was estimated using secondary data and assumptions. The method is a further advance on SAM since it uses primary data in at least Round 2, making it simpler to apply at the local level and accurate in understanding the structure of the farm costs and the relationships of the farms with the rest of the world. Donati et al. [16] applied LM3 specifically to cheese factories and other processors, for which the farms represent the suppliers. From a methodological point of view, the present study aims to further develop the method by applying LM3-based approach to small farms that participate in SFSCs. A detailed description of the method is provided in Section 2.

2. Materials and Methods

2.1. Measuring the Economic Impact: The Local Multiplier

The method used in this analysis is based on the LM3 method developed by Wilkinson et al. [20] and is divided into three rounds (Figure 1). The first round (R1) establishes the total budget of the firm. In the second round (R2), the firm specifies how much of the budget is spent locally or outside the local area. For a detailed description of the firm's spending, four main cost categories are considered, which represent the money provided to the workforce and suppliers: (i) payroll, (ii) spending on core inputs, (iii) spending on non-core inputs and services, and (iv) other direct costs.

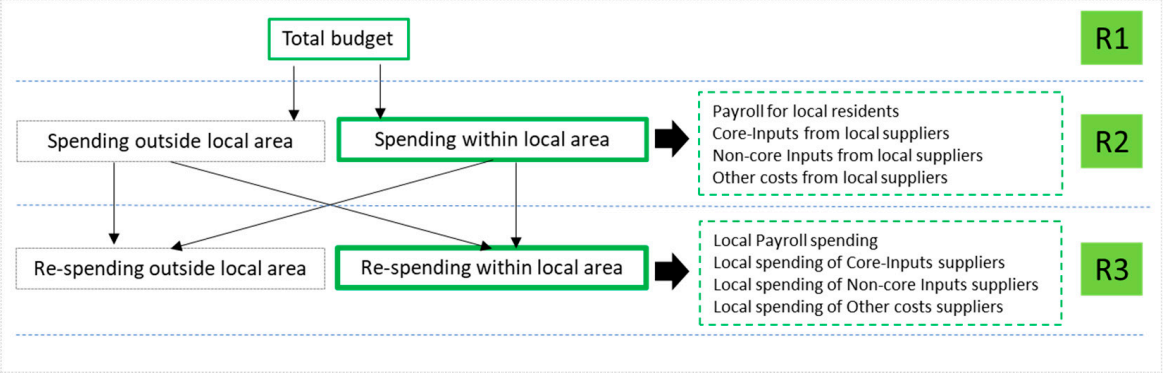

Figure 1. The LM3 methodology. R1 identifies Round 1, R2 identifies Round 2, and R3 identifies Round 3.

In the third round (R3), the method estimates how much money received by all the firm's workforce and suppliers is re-spent locally and outside the local area. Again, four main categories of costs are considered: (i) the spending on salaries, (ii) the supplier's local

spending on core inputs, (iii) the supplier's local spending on non-core inputs and services, and (iv) the supplier's local spending on other inputs. R3 identifies the local spending of all the workforce and suppliers identified in R2, both those within and outside of the local area. In other words, the money that goes outside in R2 may come back to the local area in R3. For example, the money that the firm spends on paying a supplier located outside the local area but who hires a worker living in the local area.

The method, thus, establishes the financial flow by adding the results of the three rounds. The Local Multiplier index is then calculated by (1)

$$LM = \frac{R1 + R2 + R3}{R1}, \quad (1)$$

where R1 is the total budget, R2 and R3 are the local spending resulting from R2 and R3. The formula thus returns the spillover effect of one euro spent in the local area which ranges from 1, which means that there is no local economic flow of money because R2 and R3 are equal to zero—and 3, which means that the budget is entirely retained within the local area throughout the three rounds.

In the literature, data on R1 and R2 are based on direct interviews with entrepreneurs, while data on R3 are based on secondary data [16]. In this study, given the size of the sample we used primary data also to estimate the part of R3 about the core-inputs, the no-core-inputs and services. This also enabled us to investigate the localness of the local food chain. Regarding the estimates of R3 about the payroll spent in local area and the other direct costs we use data and parameters suggested by LM3 methodology [21] and implemented by Arfini et al. [22] in evaluating the trickle-down effect of the monetary flows within rural economies triggered by food quality schemes.

In this study, the data collection aimed to satisfy two purposes: to obtain accurate data and to collect data through an online platform. The online platform was used to collect data on R2. As the purpose was to obtain data on the flow of money spent on different cost types, the online platform enabled farmers to consult balance sheets and invoices autonomously and at their convenience. Regarding R3 data, we opted for direct interviews with farmers to better explain the purpose of R3.

In spring 2022, the farmers were asked to complete an online survey provided through a Google form. After a brief description of the questionnaire's purpose and the research, the first part of the survey requested farmers to describe their main farming system, Utilised Agricultural Area (UAA), and farm location. Data on socio-demographic characteristics were provided by the manager of the farmers' market. The second part of the survey included questions on the Local Multiplier. Table 1 shows the survey questions.

Table 1. Questions related to the Local Multiplier R1 and R2.

#	Question	Unit of Measure
1	Turnover	€/year
2	Percentage of turnover spent in payroll	Percentage
3	Percentage of turnover spent in core-inputs costs	Percentage
4	Percentage of turnover spent in no core-inputs inputs	Percentage
5	Percentage of turnover spent in external services	Percentage
6	Percentage of turnover spent in other costs	Percentage
7	Percentage of payroll in the local area	Percentage
8	Percentace of core-inputs costs incurred within the local area	Percentage
9	Percentace of no core-inputs cost incurred within the local area out	Percentage
10	Percentace of external services cost incurred within the local area	Percentage
11	Percentace of other costs incurred within the local area	Percentage

In the first step, farmers were asked to define the turnover, which represents the production value for the year 2021, i.e., R1 of the methodology. In the second step, in questions 2–7, farmers were asked to identify costs according to five categories: payroll (labor costs),

core inputs, non-core inputs, external services, and other costs. This identified the flow of money that the farmer creates by production spending, represented as a percentage of the total production value. Finally, in questions 8–11, farmers had to identify for each cost category, the percentage allocated in the local area. The local area was identified as the Province of Parma. These last questions represented R2 of the LM3 methodology.

According to LM3, payroll is the cost incurred to pay workers. The determination of core-inputs and non-core inputs was based on the farm's main product. For livestock, core-inputs were forage and fodder used to feed the animals; while for horticultural production, the plants and seeds were considered as core-inputs. Fertilizers, phytosanitary products, and other plant treatments were considered as non-core inputs because they could be used for both livestock and horticultural production. Treatments for animals and bees were, thus, also considered non-core inputs. Among the core-inputs, farmers also included expenses for fuel and utilities, as well as expenses for materials used to process their primary products. Costs for external services are those used to buy professional services, such as agronomists, veterinarians, and other consultancies. It also includes payments to attend markets, fairs, and associations. Finally, the category "other costs" included payments for mortgages and other depreciations. Additionally, following the LM3 guidelines, it included the farmer's profit or salary resulting from the entrepreneurial activity [21].

The farms were then surveyed again to obtain qualitative information and clarifications regarding the data provided. This enabled the researchers to correctly interpret the figures. In addition, in relation to R3, farmers were asked to name the suppliers of their core inputs, non-core inputs, and services. A matrix was then built to identify the flow of money that went outside or remained within the local area. With this information, it was possible to determine which inputs sold to the farmers were produced locally and whether or not the flow of money went outside the local area.

2.2. Case Study: MercaTiAmo

The case study focused on the MercaTiAmo (literally: we love markets) project, promoted by the association Parma Sostenibile (Sustainable Parma). Parma Sostenibile was founded in 2017 with the aim of promoting lifestyles, production and business practices, services, and new economic models based on environmental and social sustainability criteria in order to address issues such as biodiversity loss, climate change, consumption of natural resources, pollution, poverty, social inequality, discrimination, and racism [23].

Among the association's activities, MercaTiAmo is a network of approximately 30 organic producers and consumers aimed at promoting a sustainable local economy through the organization of weekly markets. MercaTiAmo currently has three weekly markets in the city of Parma, and a fourth market will soon be launched in a neighboring city. The current three markets are held in different squares in the city to facilitate access for most residents.

The project is an example of social innovation, as its ultimate aim is not only to provide farmers and consumers with an alternative food environment but also to change the food system by creating a community through food. Farmers who wish to be part of the project and sell their products at the markets must be organically certified or follow the organic protocol. In both cases, they must be Participatory Guarantee System (PGS) certified. The network follows the principles of the circular economy, pursuing a zero-waste strategy and promoting its principles among all members. Members are encouraged to reduce packaging, sell bulk products, and use recyclable, reusable, and compostable packaging. Finally, it promotes nutrition education, respect for the environment, and social responsibility through outreach activities in schools.

For the purpose of this study, in February 2022, 15 farmers participated in the farmers' market. Of these, only 10 interviews provided exhaustive data. Table 2 shows the main characteristics of the sample.

Table 2. Main characteristics of the sample.

Farm	UAA	Distance from the Market (km)	Main Farming System	Production Sold in the FM	% of Family Workers	Age	Gender	Organic Certification
F1	15	5	horticulture	fresh vegetables, flour, jams and sauces	85	30	M	1
F2	8	40	livestock (dairy)	Cheese	100	28	F	0
F3	0	20	bees	Honey	100	50	M	0
F4	2.5	12	horticulture	fresh vegetables	85	55	F	0
F5	2	70	horticulture	fresh vegetables	80	49	M	0
F6	2.5	40	cereals	fresh vegetables, bread	50	58	F	1
F7	4	30	horticulture	jams and sauces	100	65	F	0
F8	7	100	horticulture	fresh vegetables, savory and sweet pies	80	43	M	0
F9	6	60	cereals, potatoes	Bread	100	40	M	1
F10	12	85	livestock (dairy)	Cheese	100	32	F	1

UAA indicates Utilized Agricultural Area; FM indicates Farmers Market MercaTiAmo; M indicates male; F indicates female; 1 and 0 indicate the presence or absence of organic certification.

The small farmers included in MercaTiAmo are mostly young farmers or people new do farming with a strong commitment to social responsibility and the environment. Only three of them have a long-standing family business (F1, F4, F6), while the rest are fairly new enterprises. Four are young farmers (F10, F9, F2, F1), and two have young family members involved in the farm's activities (F6, F6). The respondents were all family smallholders, with an average size of 5.8 hectares. In the sample, five out of ten farms produced mainly horticultural products and fruit, two were dairy farms, two produced cereals, and one honey. Four out of ten farms did not sell processed products and only sold fresh vegetables and fruit. Some had a limited turnover, where the farm's income represented only a fraction of the total family income (F2, F3, F7). Only one farm (F1) was located in the municipality of Parma, while most were located in the Province of Parma. The market thus represents an important arena for farmers to sell their products and to network. All the farms also participated in other SFSC and AFN initiatives, such as other farmers' markets, solidarity purchasing groups, or on-farm direct sales.

3. Results

In the following sections the results are presented in relation to Round 2 and Round 3 and the resulting LM3 is calculated.

3.1. Round 2

Table 3 shows the turnover destination among the different categories of costs. First, most of the farms declared a profit margin (Table 3). In other words, when declaring the percentage flow of money spent, they do not allocate all the turnover. For 2021, only F2 declared that they had spent more than their total turnover for 2021. When interviewed, the same farm later declared that investments had been made to process the product on the farm. On average, of the farmers who made a profit, it consisted of 25% (±19%), which took into account their wages as well as the wages of their spouses and sometimes other family workers. This is common on farms, especially the smallest ones, which usually deduct the salary of family members from the profit. As Table 3 shows, half of the farms did not declare to be paying wages, due to the fact that non-family workers were not hired. F6 is the only one with the highest percentage of wages (55%) in the total turnover. This is due to the fact that, in addition to the farming activity and selling in local markets, the farm has a bakery shop for which several non-family workers were hired. F6 also declared the highest percentage of other costs (25%), consisting of taxes and amortization. This is consistent with the farm's commitment to investing in order to differentiate both their products and where they sell them. F7, which declares one of the highest percentages of costs for services, shows that participation in markets may be expensive due to the need to join associations or share common costs. Moreover, the farm also spends on surveillance. Other services include agronomists, veterinarians, participation in producer organizations, food safety analysis, and promotion costs, such as labels and graphic designers. This result is interesting because

it provides a more complete picture of the different services that farming requires, which are not only related to primary production but also to the commercialization and promotion of the products. Even small farms may have a diversified framework of costs.

Table 3. Round 2—Turnover among the cost types.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Av. (%)
% of payroll on Turnover	17	0	0	15	20	55	0	20	0	0	13
% of core input costs on Turnover	23	40	3	9	20	10	20	10	20	51	22
% of non-core input costs on Turnover	20	10	34	10	5	15	20	30	5	20	18
% of services	10	30	4	18	3	5	25	5	30	8	14
% of other costs	17	20	0	10	10	25	15	20	30	20	17
farm profit (%)	13.33	0	58.43	37.96	42.00	−10.00	20.00	15.00	15.00	1.32	

When processing the primary product or packing the product for the final consumers, non-core inputs increase. This is the case for F3, which declared the highest percentage of non-core inputs. At the same time, there is a significant difference between non-core inputs and core-inputs (34% vs. 3%). F3 produces honey and declared only the wax sheets, used to help bees and manage the beehive, as core-inputs. Non-core inputs include pots, capsules, labels, rescue nutrition for bees, and other products for treating bees. Almost all the farms that process primary products have a higher percentage of costs for non-core inputs than core-inputs because they add ingredients, materials, or processing costs outside the farm. For example, F1 relies on an external mill because the investment needed to process cereals is too high for the amount of flour, they are willing to sell. F8 sells not only flour but also savory and sweet pies at the market. F2 and F10 are exceptions because, even though they process primary products, they show higher core-inputs. This is probably because they are both dairy farms. The relatively lower importance of core-inputs compared to non-core inputs also derives from the fact that some farms try to self-produce some of the inputs. For example, F9 self-produces some of the seeds for horticulture and grain, potatoes, and saffron. F2 and F10 use their own fodder.

Table 4 presents data on the percentage of money flow spent locally by farmers. As the table shows, only one farmer (F4) spends everything locally. Most farmers spend more than 50% of their money locally, while F6, F7, and F8 spend less locally. These latter farms are located on the border of the local area and have easier access to other markets in other provinces for purchasing inputs, such as hiring workers who are not residents of the Province of Parma. F5 hires seasonal workers. Farms that declared no wages (Table 3) because they do not hire non-family members have a value of zero in Table 4 (F2, F3, F7, F9, and F10).

Table 4. Round 2—Percentage of costs in local area.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Av. (%)
% of payroll for residents in local area	100	0	0	100	50	60	0	70	0	0	38
% of core input costs spent within local area	99	100	100	100	85	65	80	65	100	80	87
% of non-core input costs spent within local area	90	100	100	100	80	25	2	30	50	43	62
% of services spent within local area	90	100	100	100	100	10	10	10	100	100	72
% of other costs spent within local area	50	100	0	100	50	70	70	50	100	50	64
average per farm (%)	86	80	60	100	73	46	32	45	70	55	

"Av. (%)" indicates the average importance of each category costs for the total sample.

The percentage of other costs spent locally varies greatly among farms, as farmers have different insurance or mortgage contracts that can also be conducted online. Except for F6, F7, and F8, all farms recruit services locally. This result is interesting and suggests that at the local level, farmers may rely on a wide range of professionals, services, and associations to support them.

The category of costs that is mostly spent locally is core-inputs, with F6, F7, and F8 being the only farms with a lower percentage. There is no significant difference among the other farms. F10 declared that some of the alfalfa provided to the animals is bought in the Province of Mantua, representing about 20% of the core-inputs. Dairy farmers stated that they usually prefer local suppliers, especially for fodder. For example, F2 buys some of the forage from a neighbor because she knows and trusts them, and she also buys a specific organic fodder from a local supplier.

Regarding horticultural farms, all farmers declared that floor plants are bought from local plant nurseries, while seeds are mainly bought online. This is especially the case for organic farms which buy organically certified seeds exclusively online. This expense is, therefore, considered as outside the local area.

3.2. Round 3

Table 5 presents the estimates of Round 3. The table shows, for each farm, the percentage of money flow estimated as remaining local from Round 2 under the column "IN", and the percentage of money flow estimated as outside the local area in Round 2 but potentially coming back in Round 3 under the column "OUT". Farmers were specifically asked about the suppliers of core-inputs and no-core inputs and services to determine if the flow of money in Round 3 could be assumed as local. The percentage of payroll spent locally and the flow of money for other direct costs were taken from the literature and previous studies, given the complexity of data collection for this round.

Table 5. Round 3—Estimates of the local spending of the suppliers.

	F1		F2		F3		F4		F5		F6		F7		F8		F9		F10	
coming from	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Local Payroll spending (%)	70	0	70	0	70	0	70	0	70	0	70	0	70	0	70	0	70	0	70	0
Local spending of Core-Inputs by suppliers (%)	100	0	80	0	100	0	100	0	100	0	100	0	100	0	100	0	100	0	100	0
Local spending of Non-core Inputs by suppliers (%)	62	0	62	0	0	0	62	0	62	0	62	0	62	0	62	0	62	0	62	0
Local spending of other costs by suppliers (%)	67	0	67	0	67	0	67	0	67	0	67	0	67	0	67	0	67	0	67	0

As seen from Table 5, for all core-inputs, the flow of money in Round 3 remains local. For horticulture production, all suppliers self-produce the plants that they sell to farmers, so the flow of money that farmers pay to them remains local. This is the same case for dairy farms that buy fodder and forage locally (F2 and F10). At the same time, there is no information on the flow of money coming back to the local area.

Table 5 shows a common estimate for no-core inputs and services. We used the data derived from interviews to estimate the flow of money for no-core inputs and services. Given the difficulty of obtaining homogeneous data from all interviews and the complexity of the agro-food chain and the diversity of inputs included in the analysis, we estimated a common percentage of money that remains local (62%). This estimate includes all services that we can assume remain local in Round 3 because they are connected to local professionals, associations, and organizations. Conversely, some no-core inputs purchased by farmers at the local level in Round 2 are considered to go outside the local area in Round 3, such as fuel or materials for food processing. For example, F3 buys pots locally; however, the pots are purchased from a supplier elsewhere, so the farmer's money is used to buy the pots goes outside the local area.

3.3. LM3

Given the small sample, the description of the results from LM3 is mostly qualitative. Figures 2 and 3 show a threshold on the value of LM3 equal to 2. As LM3 ranges from

1—no local spending—to 3—everything is spent locally in the three Rounds—the value of LM3 = 2 is used here to validate the engagement of farms in the local food supply chains. The LM3 value ranges from 1.75 to 2.69, with an average value of 2.23 (±0.33).

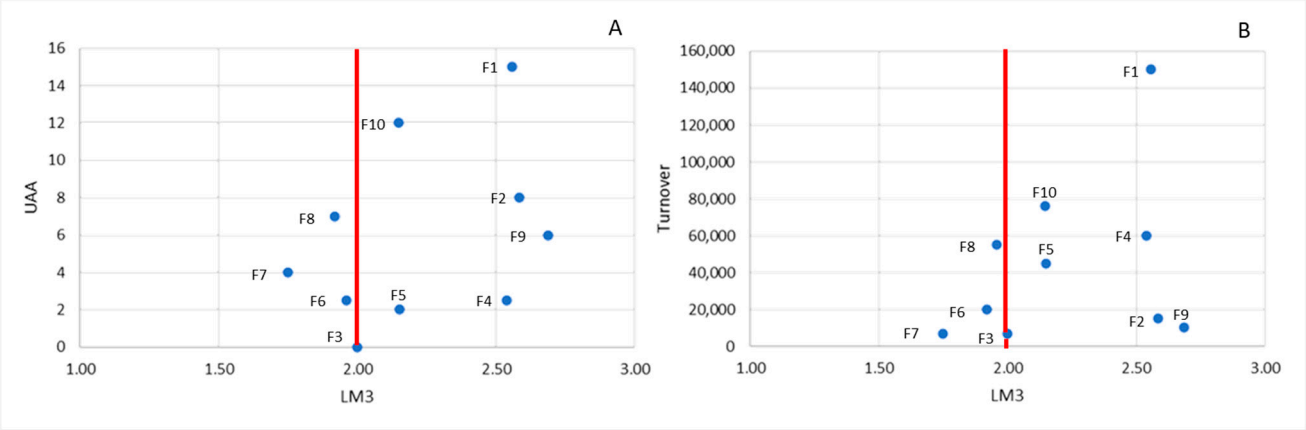

Figure 2. Values of LM3 and Utilised Agricultural Area (UAA) (**A**); Values of LM3 and Turnover declared (**B**).

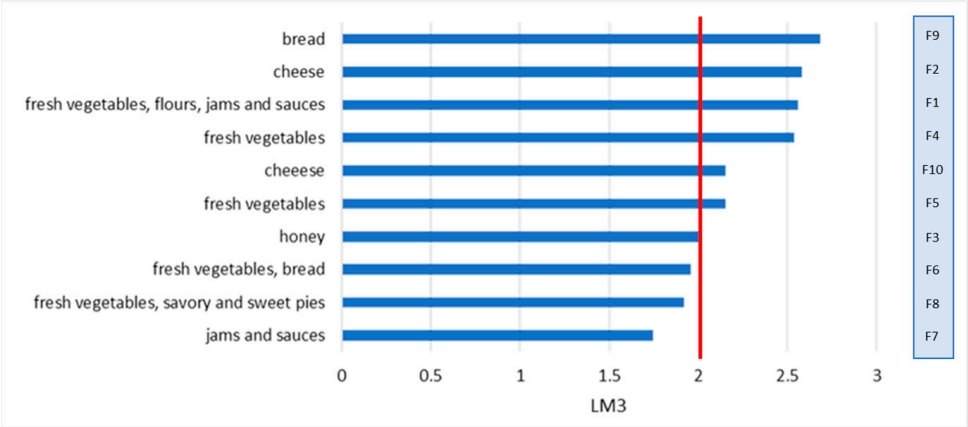

Figure 3. LM3 values depending on the products sold by farms at MercaTiAmo.

Figure 2 shows the final score of LM3 calculated for each farm, considering the UAA (Figure 2A) and the total turnover (Figure 2B). Figure 3 shows the results of LM3 considering the production the farm sells to the market.

LM3 does not seem to be related to the type of production sold by the farm in the market (Figure 3). Moreover, LM3 appears to be more correlated with turnover than with UAA. The higher the turnover, the larger the value of LM3, indicating that the flow of money tends to remain local when farms have a higher turnover. However, two exceptions are notable: F2 and F9, which are the farms with the highest LM3 score. These two farms also have one of the highest percentages of costs in the local area in Round 2 (see Table 3), and they process food. The three farmers—F6, F7, and F8—who were the least engaged in local food chains in Round 2 (Table 3) also have the lowest LM3 values. F3 does not exceed the threshold either. The farm produces and sells honey and had the lowest value of local expenses in R2. This can be explained by the fact that most of the purchased inputs are not locally specific, such as glass jars, resulting in supplier selection being driven by cost criteria rather than localness. Additionally, unlike milk or horticultural production, the low number of honey producers in the area hampers the development of a local supply chain and specialized local suppliers.

Figure 4 highlights the importance of R1, local R2, and local R3 on the total LM3 values. The second part of Figure 4 shows the incidence of local payroll, local expenses for

core-inputs, no-core inputs, and other R2 costs. Particularly, local R2 has an impact on the LM3 value. Among the local expenses in R2, the local expense in core-inputs is the most significant for LM3, while local payroll sometimes does not even exist, thus making it less relevant for LM3. This result is interesting for the application of the LM3 approach to a specific type of firm, such as rural farms.

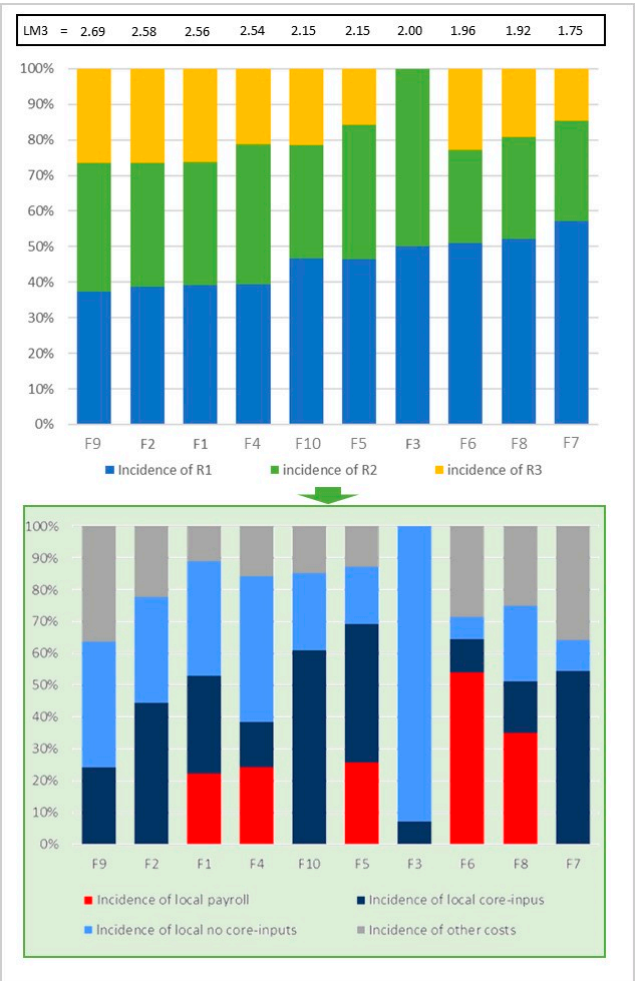

Figure 4. Incidence of R1, R2, and R3 for each farm. Incidence of local payroll, local expense for core-inputs, no core-inputs, and other costs in R2 for each farm and value of LM3.

4. Discussion and Conclusions

This study demonstrates that the LM3 method is a valuable tool for measuring the economic impacts on the local community resulting from the integration of social innovation initiatives, such as SFSCs. Especially the use of LM3 in studying the impact of SFSCs allows us to contribute to the debate on the economic impact on the upstream food supply chain.

Considering other local multiplier methods [17,18], up to now LM3 is the unique method developed by the literature that is designed specifically to analyze the economic impact at the local level [16,19,20]. SFSCs are based on individual local initiatives and no data are available at meso-scale. For this reason, methods such as SAM are not suitable to measure the economic impact of SFSCs [16,19]. The measure of the economic impact is one of the elements that should be assessed to understand its effective role in innovating the agro-food system [7]. This study wants to contribute to the debate on the economic impact of SFSC [8], providing a tool to measure the complete monetary flow created by farms at the local level considering the input suppliers. To the best of our knowledge, this is the first analysis that applies the local multiplier approach to SFSCs for detecting the economic spillover effects at the local level. The capacity of SFSC to impact the economy could be

used to promote SFSC, to raise awareness in civic society to further spread such initiatives and limit its niche character, usually criticized since it hampers its economic impact at the territorial level [4,5]. From a corporate social responsibility (CSR) perspective [24], LM3 provides farmers with an economic indicator that can be communicated to consumers and local stakeholders to raise awareness about the positive impacts of innovative projects on the local economy. LM3 can also be used by farmers and policy-makers as a decision-making tool [20]. Organizers of local marketplaces and public authorities could use this metric to showcase the positive effects of promoting and supporting local production. LM3 can potentially serve as a persuasive tool for securing government financial support within specific local development programs (e.g., rural development measures). LM3 can even aid in the design of policies that support the local economy, including sectors beyond agri-food, aimed at reducing depopulation in marginal regions (e.g., mountain areas) and preserving the social fabric of rural communities.

However, the reliability and accuracy of LM3 depend on the availability of appropriate information, which is often not readily accessible. As pointed out by several authors, this is a complex issue, especially when dealing with smallholders or part-time farmers, since they do not always have an analytical accounting system [7,8]. Gathering primary data required for LM3 parameters can be difficult, above all for the R3 stage of the methodology, where the distance from the target firm and the low or null level of downstream integration (e.g., collaboration among firms) hamper access to the expenditure information [16,25,26]. To address this issue, this study overcomes the reliance on secondary data by estimating most of the R3 stage through direct interviews with second-tier suppliers and farmers [16]. This is a novelty in the literature on LM3 [16].

In contrast to the usual application of LM3 [16,19,20], this study has showcased the farmers' profits, considering the specific nature of smallholder family farms. In such farms, the remuneration of family labor can vary significantly throughout the year due to market fluctuations and climatic conditions. Unfortunately, the LM3 method does not currently provide a methodology to separately account for the variable costs of family labor. Further studies should explore how to incorporate the payment of family labor within the local multiplier calculation, as it is crucial for the competitiveness and stability of SFSCs.

When applying LM3 to farms, it is important to consider the self-production of inputs by farmers. Self-produced inputs contribute to environmental sustainability and lower production costs but also result in a reduction in the potential financial flow directed toward local suppliers. However, the value of self-produced inputs is embedded in the farmers' profit. Future studies on farms' LM3 should place more emphasis on examining the economic impact of self-produced inputs.

The results of our LM3 study indicate that farms with the lowest percentage of local sales in R2 also have the lowest LM3 value. These farms, located near provincial borders, are likely drawn to other input markets. This does not necessarily mean they are less focused on local markets, but rather that they likely contribute to generating economic spillover effects in other local areas. Another hypothesis explaining this outcome is that farms with large turnover might have established more formal relationships with local suppliers than farms showing low local sales. The higher bargaining power associated with large turnover may result in a benefit for the farms in terms of price reduction. On the other hand, smaller farms can exhibit more flexibility in supplier choice.

Farmers, particularly those with organic certifications, typically have knowledge of the origin of their core inputs due to the traceability requirements mandated by organic agricultural production. The interviews conducted in this study demonstrate that participation in the "MercaTiAmo" project and regular interactions with consumers enhance farmers' awareness of the origin of their inputs. The trust-based relationships between consumers and producers, as analyzed by Renting et al. [1], can also be applied to the relationships between farmers and input suppliers. Further research could explore the local networks of relationships within the input supplier chain. Such an approach will benefit

the transaction costs of SFSC, further improving the economic impact of these initiatives, by creating partnerships and knowledge exchange.

While Filippini et al. [5] claimed for coordination in the marketing of the food, this study suggests the possibility to coordinate also the input markets for the benefit of a more efficient SFSC. This is possible because through the LM3 it was necessary to identify the supply chain of farmers and the economic importance of each supplier for the turnover of farmers. Therefore, LM3 can also suggest possible collaboration among the actors along the vertical supply chain with the aim of enhancing the socio-economic opportunities at the local level.

In addition, LM3 offers policymakers a tool to justify the support and preferential treatment of local markets involving small-scale farms and public opinion. Policymakers can use LM3 to demonstrate that farmers' markets contribute not only to the food security of urban areas but also to the profitability of farmers and the economic sustainability of the food chain. This is particularly relevant given the growing interest in urban food policies [27] and the role of local municipalities in the local food system.

In conclusion, the LM3 results indicate that farmers participating in alternative food networks (AFN) and SFSCs can have a positive impact on the local food system and rural development overall. In our study, such a positive impact is detectable especially in the farms' direct spending and along the core-input and service supply chain. LM3 confirms the engagement of farmers in the local inputs market within SFSCs. The methodology can also be used to assess the individual contributions of farmers and social innovation projects such as MercaTiAmo in their respective local areas. Bottom-up social innovation initiatives not only provide food but also aim to foster stable social interactions and transform the food system. LM3 aids in increasing awareness of the positive economic impacts of SFSCs. Future studies should expand the sample size to compare different food chains, farming systems, and products. Finally, projects of research action could use LM3 as a tool to raise awareness among farmers and design new supply chains, with a higher economic impact at territorial scale.

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