

The Re-Emergence of Food Security in the Western World: Short Supply Chains in Portuguese Territorial Contexts

Cristina Sousa, Sofia Vale and Maria de Fátima Ferreiro

Iscte, Instituto Universitário de Lisboa, Portugal

cristina.sousa@iscte-iul.pt

sofia.vale@iscte-iul.pt

fatima.ferreiro@iscte-iul.pt

Abstract: In the context of growing concerns surrounding food security and sustainability, this paper examines the emergence of short food supply chains (SFSCs) as alternative food systems. Focusing on box schemes in Portugal, the study investigates the socioeconomic factors influencing the presence of SFSC actors, utilizing a quantitative approach. Drawing on data from 420 producers offering food boxes and secondary data on municipality-level variables, the analysis reveals nuanced relationships between factors such as average income, urbanization, education levels, gender composition, and the proliferation of SFSCs. Notably, the study uncovers differential patterns in the determinants of SFSC presence between metropolitan and non-metropolitan areas, highlighting the significance of territorial contexts. The findings contribute empirical insights to the evolving literature on SFSCs, informing strategies for fostering resilient and equitable food systems in diverse geographic settings.

Keywords: Food security, Sustainability, Innovation, Short supply chains

1. Introduction

The first decades of the XXI century assisted to a re-emergence of the concern with food safety in the Western world. This "back to basics" movement is due to systemic crises, starting with the financial and economic crisis of 2008, the pandemic crisis, and, more recently, the war in Ukraine, which has had a tremendous impact on food (e.g. grain) supply chains. The re-emergence is accompanied by conceptual, political, and entrepreneurial innovations that envisage a transition of food systems towards sustainability.

The food sector corresponds to "activities, infrastructures, and people involved in feeding the world population (e.g. agricultural production, processing, distribution, consumption and disposal of goods)" (Bock et al., 2022, p.6). The current system is characterized by the concentration of power, the simplification, homogenization, and impoverishment of landscapes, the degradation of diets and cultures, but also the importance of family farming. The combination of these multidimensional effects and the geopolitical instability of the XXI century justifies the need to reflect on the role and the approaches to a central sector of our societies.

The paper builds on the evolution of the concept of food security and relates this evolution to the emergence of short food supply chains (SFSCs) as alternative food systems. SFSCs offer alternative solutions to food production and consumption that are more in line with the principles of food security and sustainable development (El Bilali et al, 2019; Stein & Santini, 2022). The proximity of producers and consumers is one of the benefits of SFSC. At this regard, and from the customers perspective, the decrease of intermediaries diminishes the asymmetry of information (De Frazio, 2016). Other benefits mentioned by literature include the dynamization of local economies through job creation, skills development, job satisfaction and the adoption of more sustainable practices by increasing the agricultural biodiversity (Mundler&Laughrea, 2016; De Frazio, 2016).

FSCs have become increasingly popular in Europe (Gori & Castellini, 2023). The literature already provides some insights into the importance of the socioeconomic characteristics of the territory for the popularity of these alternative food systems. However, existing studies tend to be qualitative case studies on specific regions or producers.

This paper aims to contribute to the nascent literature on the determinants of the growth of one type of SFSC – box schemes. It combines information on local farmers with socioeconomic characteristics of their local markets, identified by the municipalities in which they are located. The farmers were identified through their participation in a government online platform that connects small local producers with their potential markets, giving them the scale they need to survive (Jia et al., 2023). The analysis considers some socio-demographic characteristics of the territories that may influence the number of producers offering food boxes, and distinguishes the metropolitan areas of Lisbon and Porto from the rest of the territory.

The remaining of the paper is organized as follows. Section 2 presents the state of the art on this topic. Section 3 describes the method and the data used in the analysis. Section 4 presents and discusses the paper's results. The last section concludes.

2. Literature Review

In the last two decades, the issue of food security and, in this context, short food supply chains (SFSC), has received increasing attention (e.g., Raftowicz et al, 2024; Gori & Castellini, 2023; Chiffoleau & Dourian, 2020, Ruskai et al, 2021). In addition to the concerns and public policies envisaging environmental and ecological purposes, this increase is explained by the crises that took place during the 21st century. This is the case of the 2008 crisis with the rise in the cereals' prices, the pandemic crisis and, more recently, the wars and the current geopolitical instability with huge implications for food security, namely the instability and dismantling of global food supply chains, with particular emphasis on cereals.

The renewed interest of Western countries in food security and food sovereignty has launched a debate on the difference between those concepts. In 1996, the World Food Summit presented the most widely accepted definition of food security: "At the individual, household, national, regional and global levels [food security is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". The 2021 World Food Summit consolidated this concept. In 2002, the World Food Summit presented a new definition of food sovereignty as "the true right to food and to produce food, which means that all people have the right to safe, nutritious, and culturally appropriate food and to food-producing resources and the ability to sustain themselves and their societies. Food sovereignty means the primacy of people's and community's rights to food and food production, over trade concerns" (LVC, 2002). The rights-based approach of food sovereignty is more clearly visible, and the rights no longer primarily accrue to nations, but to peoples and communities" (van Hemert, 2023, pp. 3-4).

SFSCs emerged as an alternative contributing to more economic, social, and environmentally sustainable food systems. SFSCs are presented in the literature as alternative food networks (AFN), that is, a system that "differ from the 'conventional' or is usually defined by what it is not, instead of what it is" (Michel-Villarreal et al., 2019, p. 3). In fact, the existing literature gives some insights into the role of SFSCs in food systems transition and resilience, namely concerning their up-scaling. Polita and Madureira (2021) address the transition to SFSC taking place in a Portuguese region by employing a multi-level perspective. Sousa and Ferreira (2023) analyze the role of social innovation in sustainable food transition, focusing on box schemes. Salavisa et al. (2021) address the transition of the agro-food system in Lisbon Metropolitan Area.

According to the definition of the EU Regulation No. 1305/2013 [3], a short supply chain is a supply chain involving a limited number of economic operators, committed to cooperation, local economic development, and close geographical and social relationships between producers, processors, and consumers. Other AFNs include farmers markets, community supported agriculture (CSA), on-farm direct sales, canteen or restaurant procurement schemes, digital platforms proposing well-identified farmers' products (Chiffoleau & Dourian, 2020), and box schemes, which is the type of SFSC considered in this paper for the Portuguese case. According to Gori & Castellini the most studied AFN is farmers' market, followed by CSA, and cooperative and community garden (Gori & Castellini, 2023). Box schemes are not so addressed in the literature. Moreover, the existing empirical studies tend to resort to multiple case studies method, to address countries in the Global North, particularly in Europe with Italy and the United Kingdom scoring highest, and to focus on the "motivation of actors; collaborative governance; sustainability; social relations and trust; boundary negotiation and resilience" (Gori & Castellini, 2023, p.2).

Research provides insights on the facilitating and blocking factors of SFSC implementation, especially in Europe (Hyland et al, 2023; Enthoven et al, 2023; Aouinait et al, 2022; Popp et al., 2018). Scholars stress the importance of the role of the consumer (engagement, motivation, and participation) (Enthoven et al, 2023; Hyland et al., 2023), specifically the aspects related to the accessibility and quality of products, their variability, the support to local economy, the expense, and trust (Hyland et al., 2023; Aouinait et al, 2022). Socioeconomic factors, such as age, gender, education, and income, in consumer's propensity to adhere to FSSC are relevant in consumer's motivation towards SFSC. Escobar-Lopez et al. (2021, pp. 12) mention that "several works have reported that women have more pro-environment attitudes and take a more active part in this type of initiatives"; and "some works have established a link between the higher educational level and the possibility of choosing alternative foods due to the information available". Popp et al. (2019: p.31) show that, in the case of new EU member states, the "relatively low propensity to pay for local products on the part of the

population (...) further decreases possibilities for short supply chain development". Relatedly, Sitaker et al (2020) found that communities with higher income have more food basket offer. The relevance of contextual and territorial factors, namely the role of LEADER action groups as promoters of SFSC in Europe, is also addressed by Ruszkai et al. (2021).

SFSC is built on relational and spatial proximity, as well as trust (Thorsøe & Kjeldsen, 2016.) and rooted in specific territorial contexts (Grando et al, 2017). Thus, unique characteristics of the territory can also affect the presence of SFSC in addition to socioeconomic factors. Urban areas in particular tend to attract a diverse range of consumers with varying income levels and preferences, which may represent a larger potential market but necessitate the use of specialty retail chains as market channels for small farmers. In this sense, the European Parliament distinguishes between neo-traditional SFSC, which is centered on cooperative networks of producers, consumers, and institutions and is typically found in urban areas, and traditional SFSC, which is based on farms (Augère-Granier, 2016).

The paper is in line with this research approach by considering socioeconomic variables of territorial contexts of the Portuguese SFSC in the model of box schemes. In the Portuguese case these contextual factors are very critical in the emergence, development and sustainability of SFSC (Polita & Madureira, 2021; Salavisa et al, 2021). The paper contributes to the scarce literature on box schemes by providing an exploratory quantitative study of the regional socioeconomic factors that may influence the demand for food boxes (local markets) and therefore may contribute to explain the number of producers offering food boxes in each region.

3. Data and Method

The empirical analysis focuses on food baskets delivered by farmers, a type of SFSC. According to the Portuguese law, a sustainable supply chain comprises producers and consumers who are far apart by up to 50 kilometres. The sample comprises 420 producers offering food boxes. They were identified from an online platform developed and updated by the Portuguese Ministry of Agriculture in partnership with other organizations¹. The goal of this platform is to promote and disseminate SFSC by bringing closer together producers and consumers and fostering both the consumption of local products and the use of proximity markets. On this platform, producers advertise their products and baskets, and consumers can search by type of product and place their orders for delivery. As stated by Jia et al. (2023), challenges to SFSC include information asymmetry, lack of infrastructure and market dynamics. Thus, the online platform operates as a key determinant of these businesses' success, building the necessary bridges between its main actors – farmers and consumers.

The search was narrowed down to fruit, vegetables, legumes and mushrooms, the most common types of products in the boxes. The analysis focuses on characterizing the local markets in which these SFSC are built, using the municipality as the unit of analysis and distinguishing the metropolitan areas of Lisbon and Porto from the rest of Portugal. As a result, the analysis intertwines three actors: the farmers who were kicked off the platform; the platform itself, which was created as a public policy to link farmers and consumers; and the consumers themselves, who are embodied by the municipality's general socioeconomic traits.

Portugal is located in southern Europe and consists of a continental part and two autonomous archipelagos: the Azores and Madeira. It is composed of 308 municipalities. Farmers are scattered throughout the country, although their presence is greatest in the northern continental part. The boxes are very diverse, ranging from one to thirteen categories of products, some of which are processed, such as olive oil, olive paste or jam.

To characterize the local markets, secondary data was collected, from Portuguese National Statistics and Ministry of Agriculture, on the following variables: gross income per tax aggregate, the number of cities, the total population, the share of women in the population, the total average age, and education levels, all by municipality. The descriptive statistics are displayed in Table 1.

¹ These organizations include the National Rural Network, the "Minha Terra" Federation, Local Action Groups and Municipalities. The Portal is called "Alimente quem o Alimenta" which stands for "Feed those who feed you".

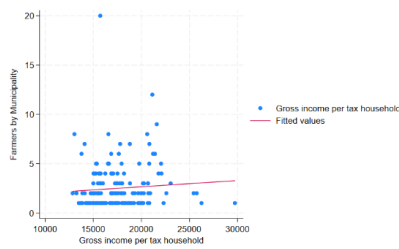
Table 1: Descriptive statistics by municipality

Variable	Mean	Std.dev.	Min	Max
Producers by municipality	2.497041	2.368253	1	20
Gross income per tax aggregate	17472.31	2659.18	12848	29727
Cities	0.727811	0.99247	0	9
Share of the population with secondary education	38.31757	8.12793	22.98	66.35
Share of women in total population	51.82154	0.7704134	49.37222	54.13592
Source: Author's calculations using data from Portuguese National Statistics and Ministry of Agriculture				

A descriptive analysis is performed using Stata software to identify patterns of association between the number of farmers per municipality and the variables listed in Table 1.

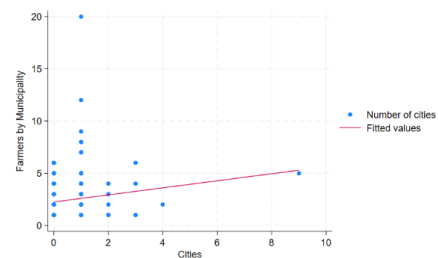
4. Results

There is a positive association between the number of producers and average income per tax aggregate by municipality as shown in Figure 1. However, Table 2 shows that the correlation between these two variables is not statistically significant. A similar but statistically significant relationship is observed with the average number of cities (Figure 2 and Table 2). Although not represented for the sake of space, a positive correlation was also found between the population and the number of villages. These data suggest that the scale (market size) at which these farmers operate is relevant to them, in line with the findings of Sitaker et al. (2020), possibly by facilitating their matching with consumers whose preferences are aligned with the products they supply, thus enabling them to take advantage of market opportunities.



Source: Authors' own elaboration

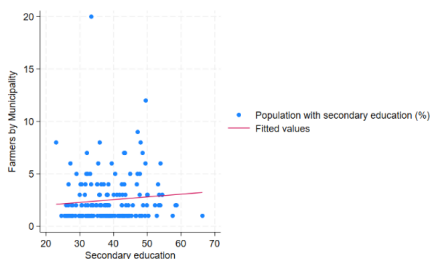
Figure 1: Number of farmers concerning gross income per tax aggregate



Source: Authors' own elaboration

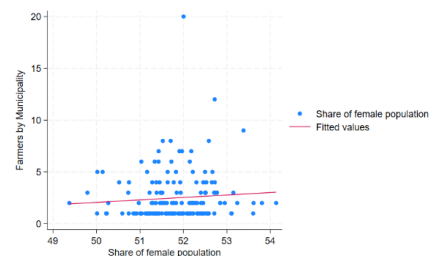
Figure 2: Number of farmers concerning the number of cities

The composition of the population also seems to be related to the presence of a greater number of farmers committed with SFSC as advanced by the literature. Figure 3, which depicts the relationship between the number of farmers and the proportion of the population with secondary education, indicates a positive association between these variables, whereas Figure 4 shows that a greater presence of women has a positive effect on the number of farmers in the municipality, both results in line with previous findings from Escobar-Lopez (2021). However, none of these associations is statistically significant (see Table 2).



Source: Authors' own elaboration

Figure 3: Number of farmers concerning the share of the population with secondary education



Source: Authors' own elaboration

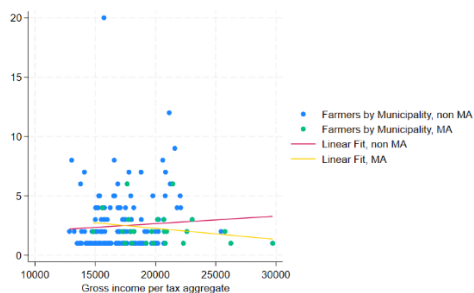
Figure 4: Number of farmers concerning the share of women in the total population

Table 2: Correlation matrix

	Farmers	Income	Cities	Education	Women
Farmers	1.0000				
Income	0.0709 (0.3595)	1.0000			
Cities	0.1415* (0.0665)	0.2041*** (0.0078)	1.0000		
Education	0.0895 (0.2473)	0.8877*** (0.0000)	0.2701*** (0.0004)	1.0000	
Women	0.0770 (0.3194)	0.3442*** (0.0000)	0.0485 (0.5310)	0.3655*** (0.0000)	1.0000
Notes: p-values between parentheses; * indicates p-value <0.01; *** indicates p-value <0.1					

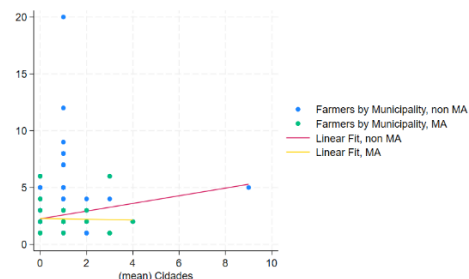
The statistical significance found in the correlation between farmers and population, as well as between these and the number of cities, might suggest that the urban concentration of population can act as a facilitator for these producers, making it easier for them to reach a larger number of consumers without having to use intermediaries, ensuring the profitability of their business.

To test if the degree of urbanization of the territory affects the presence of local producers and box suppliers, the number of farmers was regressed against gross income per tax aggregate for municipalities in the Lisbon and Porto metropolitan areas, as well as municipalities that are not in these metropolitan areas. The regressions shown in Figure 5 exhibit asymmetrical behavior for the two types of areas. While there is a positive correlation between the number of farmers and the average gross income per tax aggregate in less urbanized areas, this relationship turns negative in metropolitan areas. Figure 6 exhibits the same type of non-linearity for cities.



Source: Authors' own elaboration

Figure 5: Number of farmers concerning gross income per tax aggregate, distinguishing the metropolitan areas of Lisbon and Porto from the rest of the country



Source: Authors' own elaboration

Figure 6: Number of farmers concerning the number of cities, distinguishing the metropolitan areas of Lisbon and Porto from the rest of the country

These varying correlations by type of territory could be caused by a higher concentration of farmers in less affluent metropolitan municipalities since these typically have a higher proportion of available land. Owing to the existence of associated socioeconomic traits, these areas also have populations that are less educated and that appear to have smaller proportions of women.

Overall, the findings indicate that the characteristics that facilitate or impede the existence of these unique actors in Portuguese municipalities vary in their territorial expression and, specifically, alter in response to the level of urbanization. The correlations' reversal in sign raises the possibility that variables other than those found in conventional socioeconomic theories could influence farmers' willingness to sell their produce through SFSC. Specifically, the urban setting may help overcome obstacles noted in the literature, such as peers' inefficiency and lack of teamwork and producers' poor marketing and communication skills (Aouinaït et al, 2022).

5. Conclusion

This paper has examined the resurgence of food security and sustainability concerns in the wake of systemic crises, such as financial downturns, pandemics, and geopolitical instability. In this context, SFSCs have emerged as innovative alternatives to conventional food systems, aligning with principles of food security and sustainable development, by establishing direct relationships between producers and consumers.

Through a quantitative exploratory analysis focusing on box schemes in Portugal, the study sheds light on the socioeconomic factors influencing the growth of SFSCs, particularly to the number of producers offering food boxes. The findings reveal a nuanced relationship between various socioeconomic variables and the presence of SFSC actors, with factors such as average income, urbanization, education levels, and gender composition playing a significant role. In particular, the study uncovers distinct patterns in the determinants of SFSC presence between metropolitan and non-metropolitan areas.

As limitations, it should be noted that this study is an exploratory analysis and focuses solely on a group of farmers who produce and sell a specific type of agricultural product; thus, the results should be interpreted with caution because they may be sector-specific.

These findings suggest the importance of considering territorial contexts in understanding the dynamics of alternative food systems and have several implications for public policy. Firstly, policymakers should prioritize support for the development and expansion of SFSCs, which could include information campaigns aimed at different population profiles. Secondly, policymakers should recognize the nuanced relationship between socioeconomic factors and the presence of SFSCs, particularly the differences between metropolitan and non-metropolitan areas. Interventions and policies envisaging the promotion of SFSCs should be tailored to the specific contexts of different regions, considering factors such as income levels, urbanization, education, and gender composition.

References

- Aouinait, C., Christen, D., Carlen, C., Massri, C., Reipurth, M., Hieke, S., ... & Chang, B. (2022). Barriers and facilitators of purchasing from short food supply chains in Europe: insights from a stakeholder perspective. *International Journal of Food Studies*, 11.
- Augère-Granier, M. L. (2016). Short food supply chains and local food systems in the EU. EPRS: European Parliamentary Research Service. Belgium. Retrieved from <https://policycommons.net/artifacts/1340881/short-food-supply-chains-and-local-food-systems-in-the-eu/1951844/> on 08 May 2024. CID: 20.500.12592/c8n444.
- Bock, A. K., Bontoux, L., & Rudkin, J. E. (2022). Concepts for a sustainable EU food system.
- Chiffolleau, Y., & Dourian, T. (2020). Sustainable food supply chains: is shortening the answer? A literature review for a research and innovation agenda. *Sustainability*, 12(23), 9831.
- De Fazio, M. (2016). Agriculture and sustainability of the welfare: the role of the short supply chain. *Agriculture and agricultural science procedia*, 8, 461-466.
- El Bilali, H., Callenius, C., Strassner, C., & Probst, L. (2019). Food and nutrition security and sustainability transitions in food systems. *Food and energy security*, 8(2), e00154.
- Enthoven, L., Skambracks, M., & Van den Broeck, G. (2023). Improving the design of local short food supply chains: Farmers' views in Wallonia, Belgium. *Journal of Rural Studies*, 97, 573-582.
- Escobar-López, S.Y., Amaya-Corchuelo, S., & Espinoza-Ortega, A. (2021). Alternative food networks: Perceptions in short food supply chains in Spain. *Sustainability*, 13(5), 2578.
- Gori, F., & Castellini, A. (2023). Alternative food networks and short food supply chains: a systematic literature review based on a case study approach. *Sustainability*, 15(10), 8140.
- Grando, S., Carey, J., Hegger, E., Jahrl, I., & Ortolani, L. (2017). Short food supply chains in urban areas: Who takes the lead? Evidence from three cities across Europe. *Urban Agriculture & Regional Food Systems*, 2(1), 1-11.
- Hyland, J., Henchion, M.M., Olomo, O., Attard, J., & Gaffey, J. (2024). Sustainable and healthy food consumption in Europe: an analysis of consumer purchase patterns, motivations and barriers towards foods from SFSCs. *British Food Journal*.
- Jia, F., Shahzadi, G., Boursakis, M., & John, A. (2023). Promoting resilient and sustainable food systems: A systematic literature review on short food supply chains. *Journal of Cleaner Production*, 140364.
- Michel-Villarreal, R., Hingley, M., Canavari, M., & Bregoli, I. (2019). Sustainability in alternative food networks: A systematic literature review. *Sustainability*, 11(3), 859.
- Mundler, P., & Laughrea, S. (2016). The contributions of short food supply chains to territorial development: A study of three Quebec territories. *Journal of Rural Studies*, 45, 218-229.
- Polita, F.S., & Madureira, L. (2021). Evolution of short food supply chain innovation niches and its anchoring to the socio-technical regime: the case of direct selling through collective action in north-West Portugal. *Sustainability*, 13(24), 13598.
- Popp, J., Oláh, J., Kiss, A., Temesi, Á., Fogarassy, C., & Lakner, Z. (2018). The socio-economic force field of the creation of short food supply chains in Europe. *Journal of Food and Nutrition Research*, 58(1), 31-41.

- Raftowicz, M., Solarz, K., & Dradrach, A. (2024). Short Food Supply Chains as a Practical Implication of Sustainable Development Ideas. *Sustainability*, 16(7), 2910.
- Ruszkai, C., Pajtók Tari, I., & Patkós, C. (2021). Possible Actors in Local Foodscapes? LEADER Action Groups as Short Supply Chain Agents—A European Perspective. *Sustainability*, 13(4), 2080.
- Salavisa, I., Ferreira, M.F., & Bizarro, S. (2021). The transition of the agro-food system: lessons from organic farming in the Lisbon Metropolitan Area. *Sustainability*, 13(17), 9495.
- Sitaker, M., Kolodinsky, J., Wang, W., Chase, L. C., Kim, J. V. S., Smith, D., ... & Greco, L. (2020). Evaluation of farm fresh food boxes: A hybrid alternative food network market innovation. *Sustainability*, 12(24), 10406.
- Sousa, C. & Ferreira, M.F. (2024). Is short beautiful? Food supply chains and the promotion of sustainability through the lens of social innovation, in EMCEI conference proceedings (forthcoming).
- Stein, A. J., & Santini, F. (2022). The sustainability of “local” food: A review for policy-makers. *Review of Agricultural, Food and Environmental Studies*, 103(1), 77-89.
- Thorsøe, M. & Kjeldsen, C. (2016). The constitution of trust: Function, configuration and generation of trust in alternative food networks. *Sociologia Ruralis*, 56(2), 157-175.
- van Hemert, M. (2023). Food sovereignty. In *Oxford Research Encyclopedia of Environmental Science*.