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Globalization and Local Trade in Agriculture: A Panel Data Analysis of the 27 European Union Countries

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Master in Political Economy

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Resumo

Na década que sucede à crise europeia da dívida soberana, o movimento da soberania alimentar ganhou proeminência na defesa da autonomia dos pequenos produtores num contexto de globalização económica e de domínio da indústria agrícola por multinacionais. A presente dissertação tem como objetivo avaliar os principais fatores que influenciaram o comércio agrícola local nos países da União Europeia (UE) no rescaldo da crise da dívida soberana.

Utilizando dados nacionais relativos à produção, exportação e importação de cereais e legumes, de 2011 a 2020, são obtidos três indicadores: rácio de autossuficiência, rácio de dependência de importações e índice de orientação para a exportação. Estes indicadores testam o nível de comércio regional e fornecem informações sobre a dinâmica da cadeia de abastecimento. Uma análise preliminar dos dados sugere um aumento global do comércio externo destes dois produtos agrícolas.

Adicionalmente, foi utilizado um modelo econométrico linear para examinar a relação entre variáveis económicas, sociais e ecológicas com os três indicadores em estudo. Os resultados sugerem que as variáveis relativas à exclusão social e instabilidade financeira apresentam a correlação mais significativa, indicando que um aumento da exclusão social e da instabilidade financeira está associado a um aumento do comércio local. Outros fatores, como a conjuntura económica e a área de agricultura biológica, apresentam resultados encorajadores no modelo inicial, mas não apresentam o mesmo grau de significância na análise de robustez. Finalmente, apenas a variável inflação de bens agrícolas apresenta uma fraca correlação com o nível de comércio local.

Palavras-Chave: Comércio Agrícola; Globalização; Comércio Local; Dados em Painel, União Europeia

Abstract

During the decade that succeeds the European sovereignty debt crisis, the food sovereignty movement has gained prominence in defending the autonomy of small producers amidst the globalized agricultural industry dominated by large corporations. This dissertation aims to assess the factors driving local agriculture trade in European Union countries in the aftermath of the European sovereignty debt crisis.

Using national data on the production, export, and import of cereals and vegetables, from 2011 and 2020, three indicators are derived: Self-Sufficiency Ratio, Import Dependency Ratio, and Export-Oriented Index. These indicators evaluate the level of regional trade and provide insights into supply chain dynamics. A preliminary analysis of the indicators suggests an overall increase in the external trade of these two agricultural commodities.

Furthermore, a linear econometric model has been used to examine the relationship between economic, social, and ecological variables with the three indicators under study. The findings suggest that variables pertaining to social exclusion and financial instability bear the most significant correlation, indicating that an increase in social exclusion and financial instability links to an increase in local trade. Other factors such as the economic conjuncture and the area of organic farming display encouraging outcomes in the initial model but fail to provide the same degree of significance in the robustness analysis. Finally, solely the food inflation variable exhibits a weak correlation with the level of local trade.

Keywords: Agricultural Trade; Globalization; Local Trade; Panel Data, European Union

Contents

Graph Listing

x

Table Listing

Glossary of Acronyms

Introduction

It is consensual among scholars and among police makers that the process of globalization in agriculture halted in the crisis of 2008. The Food and Agriculture Organization of the United Nations (FAO) (2022) report clearly states that from 2008 onwards globalization, in terms of trade flows, stagnated and originated an increased tendency of trade at a regional level. This coincides with the increasing literature of scholars such as Evola et al. (2022) pointing to the acceleration of alternative methods of production based on short food supply chains (SFSC) due to the sovereign debt crisis and the covid-19 pandemic. The goal of this dissertation is to, firstly, evaluate the significance of the increase of regionalization of food within the European Union and, secondly, to identify its main drivers.

To achieve these goals, a literature review is conducted by analysing the debate on food security and food sovereignty, as well as a theoretical framing based on Karl Polanyi's (1943) concept of embeddedness. An overview of the process of globalization is also provided by discussing its main characteristics, such as the role of transnational corporations, financialization, and the importance of family farming. In fact, and despite the recent marginalization due to the dominance of corporations, family farming is still responsible for feeding more than half of the world's population (ETC Group, 2017). Additionally, an overview of the Common Agricultural Policy (CAP) of the European Union is presented. The study focuses on Europe due to the liberal nature of the common market and the policy of farmer support. Finally, the increased popularity after the 2008 crisis of alternative methods of production is discussed, with reference to grassroot initiatives that gained political support in recent years.

The empirical study uses panel data of the 27 current European Union (EU) countries. The studied variables are the Self Sufficiency Ratio (SSR), the Import Dependency Ratio (IDR) and the Export Oriented Index (EOI), which are used as proxies to evaluate the tendency of trade regionalization. Using these variables, it is possible to ascertain the trade dynamics of the EU member states, namely, how much the country is dependent on its own production and imports to supply its internal demand and how much of the domestic production is distributed to the external market.

To investigate the main drivers of SSR, IDR and EOI, some of the most common variables discussed in the related are considered, such as output gap, annual variance of the European Bloomberg Commodity Agriculture Sub index, food inflation, social exclusion, and area under organic farming. The first three variables are used as proxies to evaluate the cyclical nature of

market economy. Social exclusion is a variable used to consider the level of marginalization of society. The area under organic farming is a proxy to measure the sustainability of agricultural production.

The dissertation is organized as follows: section 1 presents a literature review; section 2 presents the hypotheses tested in the empirical study; section 3 presents the methodology employed in the dissertation with an overview of the theoretical framework of panel data analysis; section 4 presents data used in the model; section 5 presents the empirical work; section 6 presents the discussion; and section 7 presents the conclusion.

Chapter 1 - Literature Review

1.1 - Food Security and Food Sovereignty

In times of inflation of food prices, there is an increasing focus on the debate surrounding the organisation of the global value chain of food commodities. During the 1970s, the international political actors attempted to create a strategy to ensure enough food supply that would take into consideration the boom in world population. The World Food Conference in 1975, organised by the United Nations, was the starting point of the international strategy to fight world hunger. The term "food security" was popularized and first defined as the constant availability of basic food supplies to sustain the expansion of food consumption, and thus controlling the fluctuation in prices and production (Maxwell, 1996, p.156). The discourse was focused on explaining the food problem with market mechanisms lenses. The cause was perceived to be due to a general food shortage which could not cope with the ever-increasing demand. Thus, a general consensus on this matter was that a greater effort on market liberalisation should be made in order to provide food availability to all countries and minimize the consequences of food shortages on a specific geographical location. Such argument motivated the 1984 Urugay round that initiated the liberalisation process of the food market (Jarosz, 2014).

After yet another rise in food prices during the 1990s, FAO organised, on the 13th of November 1996, a summit where a Declaration on World Food Security was summited (FAO, 1996). In this declaration a definition of food security was released based on four main principles: physical availability of food, economic and physical access to food, food utilization and stability of these three dimensions over time. In the availability and access principles, it is emphasised the relevance and need to increase food production and net trade between countries. In the food utilization principle, there is a reference on the need for a stable and adequate diet and an overall healthy nutritional eating habit. Finally, the stability of the mentioned principles has the intent for policy makers to consider the uncertainty of weather conditions and of future economic conjecture that might lead to unemployment and rising food prices.

Thus, this declaration reinforced the commitment from the United Nations and the international community to build production and distribution capacities to ensure food security on the basis of free-trade and market-oriented mechanisms. In the same days of the summit, another declaration was published, this time, not by political institutions and police makers but by Via Campesina, an international organisation of farmers. "The Right to Produce and Access to land" was the motto of the movement. Instead of appealing for food security, this movement

proclaimed food sovereignty as the solution for world hunger. This new concept drew on the right for each nation to produce its own food based on cultural, tradition and biological diversity (Via Campesina, 1996).

In the same line of thinking, Capone et al. (2014) focus on the linkages of nutrition with sustainability. The author notes that food insufficiencies are not necessarily a consequence of lacking food supply, but rather how food consumption patterns have become increasingly demanding, favouring animal-based diets. This shift in food preferences has had a significant negative impact on nutrition standards. Also, the author argues that globalization is a decisive factor in bad nutritional diets. Obesity has been a problem in developing countries since the moment such countries opened the borders to foreign investment and free trade in the food industry. In addition, the authors point out that the aggregate food production in the world would, by itself, be more than sufficient to allow the feeding of every person in the world. The ever-increasing extension of food value chains have had consequences in food waste. It is estimated that 30 to 50% food is lost in processing, transport, supermarkets, and home kitchens. Thus, the effort for food security would need to go beyond food production strategies and should also focus on nutrition standards to guarantee a transition towards a sustainable food supply chain.

The forces that drive the evolution of food consumption and food production is very well documented in Polanyi's (1943) work. The rapid expansion of production and trade in this sector is highly connected with the expansion of the industrial sector. Polanyi calls this association of both sectors as a form of subjection of agriculture to industry and, ultimately, a form of subjection of nature to humanity. The three main stages that created this association of both sectors are: 1) the commercialization of the soil; 2) production of food and raw materials to supply the needs of industry; 3) and the creation of surpluses to trade in the international arena. Before this process, land served many intrinsic purposes to humanity, "It invests man's life with stability; it is the site of his habitation; it is a condition of his physical safety; it is the landscape and the seasons." (Polanyi, 2001, p. 187). The process of commodification submitted land solely to its economic function.

The concept of embeddedness, first introduced by Polanyi (1943), describes this transition of cultural and traditional values to the market mechanism. Economic activity, in its core, is a combination of several social mechanisms where the market is just one of them. Historically speaking, the distribution of goods and services have been a result of other incentives other than self-interest. Reciprocity and redistribution are other two mechanisms that have been replaced by the market during the rise of modernity. Polanyi (1943) argues that social forces tend to

4

resist, in some form, to brutal market transformations, configurating in a process of double movement. This powerful idea has inspired many authors such as Winter (2003), which has been studying alternative ways of production in agriculture by arguing that nonindustrial production methods might be framed in the concept of embeddedness.

A fact remains that, as pointed out by Winter (2003), much food production remains locally based, and this fact has led some authors to conceptualize this dichotomy. Authors in the literature of the topic 'international agriculture' tend to separate two forms of organization for the production and distribution processes. Rausser, Kahn and Zilberman (2015) name the movement of international trade and industrialization as "Industrial Food and Agricultural Paradigm", while the more local and regional type is called "Naturalization Food and Agricultural Paradigm". Robinson (2018) also builds on this idea but frames the concepts slightly differently, separating the "productivist paradigm" from the "socio-ecological paradigm". The latter nomenclature is a better reflection of the two distinct drivers for agricultural production. Indeed, while the first one tends to be more production-focused, with the goal of maximizing output with minimum resources, the second reflects the surrounding dimensions of food production, as well as the sociological impact and nature's accountability.

In one hand, the "Productivist Paradigm" is an expression that highlights the backbone of modernity. Since the beginning of capitalism history, the main driver of societies has been to increase output trough the decrease of resources used. By seeking the maximization of productivity, several methods have been put to action such as the substitution of labour with capital, mechanization, application of biotechnology, concentration of land and the use of contract farming (Robinson, 2018). All of these have had major impacts on socioecological relations and the configuration of ecosystems by the control of nature by humanity (Amaro, 2017).

On the other hand, the socioecological paradigm reflects the alternative methods of economic relations. Despite the political and economic dominance of the productivist paradigm in international markets, it is also possible to find forms of production with an ecological and social focus that has a significant relevance in the global value chain. This corresponds to a diverse structure in the global value chain of agriculture, very much represented by the several movements defendants of the food sovereignty discourse. Robinson (2018) does not specify the nature of this paradigm, giving only a broad set of values, some of which are antagonistic to the productivist paradigm, such as decentralization, community participation, periphery-focused and diversification as opposed to centralization of power in enterprises, individualism, metropolitan focus, and standardization.

1.2 - Globalization and agriculture

Since the early age of classical globalization in 1850, together with improvements in maritime and land transportation, the sphere of international political economy turned to free trade as the common approach to international trade. This is not necessarily limited to a single sector. In fact, the year 1850 is historically regarded as the start of the classic globalization era, which was ushered in by the introduction of the gold standard in 1880. By researching the volume of international trade from 1870 to 2000 in agriculture, Aparicio et al. (2008) conclude that, despite the clear tendency for increasing trade, the growth of trade is not constant, suffering some breaks. Until the breakdown of the first world war, the average growth rate of international trade volume was around 3,7%. Following that, the inter-war period is defined by trade stagnation, primarily because of the Great Depression, and self-sufficiency policy trends.

Finally, the post Second World War is marked by unprecedent economic growth which is reflected on trade. Until the 1970s crisis it was observed an average growth rate of 5.6% in agricultural trade. However, during the "30 glorious years", agriculture does not have the same role to the globalization process as it did in the first stage of globalization. Despite consistent growth till the 1970s, the growth of overall international trade in the same period is 10%. The share of agricultural exports in total trade fell by 17,3 percentage points in volume and 25,5 percentage points in value. The fall in trade of agricultural products could be explained by the lower income elasticity of demand for agricultural products, that is, there is a tendency for consumers to spend less in food, in terms of income coefficient. Also, the post-world war period is marked by the protectionist nature of food products that were excluded from the successive General Agreement on Tariffs and Trade (GATT) meetings (Aparicio et al., 200, p. 10; Hertel et al., 2000). This exclusion ended with the 1970s' crises and subsequent turn from Keynesian policies to the era that is many times regarded as neoliberalism (Chang, 2002). In this sense, the Uruguay Round, organized by GATT, taking place from 1986 to 1994, was a decisive event that formally ended the consensual protectionist nature of agriculture.

Notwithstanding recent efforts to abolish barriers to trade, many other intervention policies remain which impact trade incentives. Anderson, Valenzuela and Mensbrugghe (2010) attempt at quantifying the impact that trade policies have on the global market in 2004. According to their data, tariffs have the most significant impact on price distortion in the global market, whereas other protectionist policies, such as export subsidies, production subsidies or taxes, have a residual effect. For agriculture and lightly processed food, the weighted average applied

tariff is 21.8% for developing countries and 22.3% for developed countries. Some developed and high-income countries stand out in these statistics, mainly South Korea with 319.4%, Japan with 151.7% and other western countries not part of the EU15 with 53.9%. Even though export tariffs are overall residual due to its costly nature, it is in Europe where it is most significant, having a market price distortion of 12.8% in the EU15 and 13.4% in the rest of western Europe.

Thus, the global effort for greater economic integration with a neoliberal mindset in not a homogenous process worldwide. Different regions in the globe preserve regional agricultural policies that, in one way or another, go against the values defended in the Uruguay Round and subsequent negotiations. Cordovil et al. (2004) made an overview of the government cost towards agricultural policy in OECD countries. Considering data from 1999 to 2001, the countries of Turkey and Korea spend around 5% of their GDP in agricultural policies, Switzerland and Iceland spend a little below 2%, while Japan, the EU, Norway, Mexico, and the USA spend over 1%. This can be translated in protectionist policies employed by these countries, such as farmers subsidising or trade tariffs to food commodities.

The subsequent Doha Round starting in 2004 was yet another attempt from the largest agricultural exporters to further cut tariffs and other protectionist barriers to trade. Kleimann and Guinan (2011) describe the clash in the negotiation process. In brief, the European Union and the United States of America aimed at negotiating reductions in developing countries' industrial tariffs in exchange for an opening in agricultural exports. Western African Countries, on the other hand, demanded a reduction in cotton subsidies from the USA. Furthermore, the emerging economies, such as China, India and Brazil, were very reluctant to further reduce their protectionist measures, arguing that in previous years they had already made huge cuts. All in all, the Doah Round officially ended in 2011, putting a stop to the tendency of liberalization in the agricultural sector.

Another spike in food prices occurred in 2008, prompting a debate about its causes. Headey (2011) agrees that financial speculation, depreciation of the US dollar, low interest rates, and reductions in grain stocks could have played a role in this price instability. However, the author argues that trade policies played a crucial role, with countries such as India and Thailand imposing export restrictions on rice out of fear of food shortages. Similar protectionist policies were implemented around the world. What is consensual (FAO, 2022) is that the 2008 subprime crisis is regarded as a turning point in the globalization process, marking the beginning of a stagnant period in the trade outflows between countries. It is noted that trade decentralization has been gradually implemented, with China rapidly expanding to become the second-most

important player, only second to the United States, and emerging economies such as Russia, South Africa, India, and Brazil gaining relevance in the international arena.

Afterwards, the pandemic crisis felt all around the world in 2020 prompted a change in the configuration of the food supply chain. Boyacı-Gündüz et al. (2021) analyse the changes occurring in the food system. In general, all players in the value chain, from the producer to the consumer, experienced numerous instances of food shortages, price increases, and, due to transportation restrictions, food loss and waste issues. The disruption of the food value chain changed its configuration, resulting in a transformation in the food system, with organic and essential foods being subjected to an increasing demand. As a result of great consumer speculation, in addition to an overall loss in household income, food donations and the ability for families to guarantee a nutritious meal became at risk. Some countries, such as Vietnam, turned to protectionist measures by banning rice export contracts, further intensifying the problem of food insecurity.

More recently, the war in Ukraine has drastically affected short-term food supplies all around the world. The consequences of this event are reflected in the historical increase in food and energy prices, which in turn have set inflation rates to historical highs. More importantly, as demonstrated by Jagtap et al. (2022), the disruption in supply value chains caused by a decrease in staple food supply is affecting the most vulnerable and triggering a chain of social instability.

1.3 - Food Value Chains

In its economic dimension, agriculture globalisation affected patterns of trade, industry structures and farming practices. Largely because of a relatively slow growth of trade in commodities and a much more rapid growth in the trade of processed foods, agriculture underwent a twin evolution of specialisation of production and concentration on quality and speciality commodities. This was accompanied by a change in agricultural structures leading to horizontal or vertical integration and high concentration levels, which led to new commercial alliances, mergers, and contractual arrangements (Garzon, 2006).

In the review of globalization of agriculture done by Robinson (2018) it is discussed how the supply chain is changing, from the evolution of farming techniques to the market shift in food processing and retailing. Therefore, Transnational Corporations (TNC) as well as the financial sector played an important role in the expansion of international trade in the last decades and have been major contributors to today's context of the agricultural value chain. On

the opposite side, family farming remains to be the major responsible for food production world-wide and its role on nutrition and natural preservation is relevant (ETC Group, 2017). In this regard, this section focuses on the role of these three actors in the global value-chain.

1.3.1 - The Role of Transnational Corporations

Agriculture is often interpreted by economists in the context of perfect competition, and, subsequently, much economics research on this sector tend to make this as one of their main assumptions (for example, Anderson, Valenzuela and Mensbrugghe, 2010). In its theoretical framework, perfect competition assumes a market where the players are price takers; in other words, many firms produce identical goods consumed by many buyers.

This might be an appealing representation of the food market because the fact is that most of the food production comes from a relative small-scale production. In fact, the ETC Group (2022) states that indigenous and peasant producers account for most of the food production in the world. Other authors such as Carbone (2017) argue that the concept of economies of scale is hard to come true in agriculture production. The nature of the soil prevents large machinery to circulate; entry barriers are relatively high, especially in high populated areas, further reducing the operational scale of farming; and compared to the industrial sector, farming is by its nature rooted in a geographical location impeding capital mobility to an area where labour is more efficient or external conditions are more favourable.

However, as we analyse the subsequent steps in the food value chain, it is clear the ever-greater firm concentration levels. In the report from the ETC Group (2022), it is shown that most agriculture-based industries, such as agrochemicals, commercial seeds, farm machinery, animal pharmaceuticals, and livestock genetics, are currently controlled by 4 to 6 companies. This clear oligopolistic market directly influences farming production by dictating what seeds are used and what livestock species are to be created. Moreover, TNC were favoured by the tendency of the liberal policies in the last three decades, which contributed not only to a reduction in trade tariffs but also to greater openness to foreign direct investment. This process has led to a greater fragmentation of the agro-food chain and increased the tendency for vertically integrated firms (Scoppola, 2021).

In addition, McCorriston (2002) considers that market retailers, especially in Europe, have had a growing influence in business of agricultural due to their increasing market power. The author supports the argument by showing the five firm concentration ratios, which shows the combined market power of the five biggest firms. Considering the biggest countries in Europe,

in the mid-1990s, Germany had a ratio of 75%, France of 65%, and the UK of 67%. Since an oligopoly is considered when a five firm ratio reaches 60%, it can be considered that the biggest economies of Europe have an oligopoly in the retailer's food market. Kaditi (2013) emphasises the role of multinationals retailers in entering foreign markets. The author studies the effect that multinationals have had in the Greek economy, but the same is generally applied in the European economy. Multinationals have a comparative advantage in data processing efficiency, which is difficult to match with for national companies. This oligopolistic control turns into a situation where, in a market with a large number of farmers, there are few firms that act as buyers, creating a situation of monopsony. Fuchs, Kalfagianni and Arentsen (2009) argue that large multinational retailers usually opt to buy food products from large producers abroad, imposing a problem for small farmers nationally, that lack scale, access to market and infrastructure investment.

1.3.2 - The Role of Financialisation

The process of financialisation is very much related to the growth of TNC and investment in Foreign Direct Investment. According to the definition put forward by Epstein (2001, p. 3), "Financialization refers to the increasing importance of financial markets, financial motives, financial institutions, and financial elites in the operation of the economy and its governing institutions, both at the national and international level". Clapp, Isakson and Ryan (2018) discuss the nature of the financial market in agriculture, which, like the remaining economic sectors, has been affected by the process of financialisation and changed the way investments interact with the market. At first, institutional investors started trading in the commodity market, trying to get a hedge of commodity pricing, that is, find an opportunity where the price of a commodity is about to increase.

Eventually, also discussed in Clapp, Isakson and Ryan (2018), it moved on to other sources of investment based on farmland and agrobusiness that can be translated to the concept of land grabbing (Rosset, 2011). This practise can be translated into an investor in a foreign country buying land to feed the international market or other national market. Usually, land grabbing is very common in the developing world with high-income investors buying many acres of land. However, some literature like van der Ploeg et al. (2015), who discuss this phenomenon within the European continent, argue that the main rationale behind land purchasing is that in a context of growing population, food would become scarcer, thus providing a great opportunity for investments in land.

10

Furthermore, it is agreed that financialisation contributed to the volatility of the agricultural market, by creating price surges. By studying the correlation between prices and agricultural stock, Girardi (2015) finds that there is an increase correlation during times of financial turmoil. The same author argues that the concept of financialisation and the several financial crises are very significant explanations to price variation on commodities, while global demand seems not to play a significant role. Other authors such as Moore (2010) also try to understand the relation of financial crises and the financialisation of agriculture. The author states that an increase in food prices usually is a good indication of a financial crisis that is about to come.

The last main consequence of financialisation is the marginalisation of small farmers. It is argued in Clapp, Isakson and Ryan (2018) that it is manly a twofold problem. First, as the shareholders of corporations related to agriculture gets more relevance, their power of lobbying increases, favouring the dominance of large corporations in relation to small firms. Second, the inclusion of market derivatives as a solution to risk management since the 1990s, brought, paradoxically, more risk, uncertainty, and instability to smaller farms. The system of market derivatives and market of futures tend to benefit wealthier farm owners and thus exacerbating inequalities in the farming sector.

1.3.3 - The Role of Family Farmers

Despite the huge overtake of international integrated food systems in the economic activity of the food sector, small farmers remain the world's greatest source of food. The ETC report of 2017 highlights the inefficient use of resources in industrial farming compared to peasant, small-scale, and family farming. The latter is responsible for feeding 70% of the world, using 25% of the resources, while industrial farming uses the remaining 75% of resources whilst feeding 30% of the world. Much of the food waste happens in the value chain, namely, during transportation, storage, processing, and food inefficiencies in animal feeding, leading to only 24% of food production being consumed.

Family farming is a diverse concept that is intrinsically connected to the plural landscape of rural regions. It is part of an economic network embedded in social relation, cultural conventions, and family relations. Woods and McDonagh (2011) point out that such context invariably leads to a high volatility to external pressures, as the ones typically generated by globalization, as is the case of price fluctuation, policy reform and environmental regulations. Notwithstanding, Woods (2014) argues that the neoliberal context in which many small-scale farmers became vulnerable to market competition provided an opportunity for farmers unity

with international movements like Via Campesina, but also national unions. It is true that specially in developed countries in Europe and the USA family farming still has cultural significance and, despite modernization pressures, it provided a demonstration of resilience and a great source for rural development.

Besides, poverty can be closely linked with family farming, and, more specifically, self-subsistence farming. Davidova et al. (2012) argue that, in the new member states of the EU, poverty is prevalent among subsistence farmers. It is suggested that poverty in self-subsistence farmers has a long-lasting effect due to the unproductive nature of the farming and the lack of income diversification. The authors suggest that policies to support small-scale farming and increase access to credit and technical assistance could help alleviate poverty and promote sustainable economic development in rural areas. The findings of this study have important implications for policymakers in the new member states of the EU who seek to address poverty and promote economic development in rural areas.

1.4 - The European Union and the process of globalization

The EU provides a great study case for the economy of agriculture. In one hand, its protectionist nature, especially regarding farmers subsiding, has always been a major component of the CAP. On the other hand, the common market started in 1992 as well as the productivist nature of the supply encompasses the liberal and market-oriented strategy of the EU.

Garzon (2006) overviews the CAP of the EU and provides a theoretical and analytical context for its changes. The development of CAP can be better understood in the historical institutionalism theory with the concept of path dependency (Pierson, 1993). The complex institution arrangement provides a slow and difficult change to the policies implemented in the European Union. Decision making is based on the principle of qualified majority, giving the power of veto to any member state. Thus, change in the EU occurs in an incremental manner instead of a radical one, always being constrained by political acceptance from all member states (Daugbjerg, 2003).

Garzon (2006) also goes through the main objectives of the CAP from the beginning. In short, it could be summarised to three main objectives: increase of agricultural productivity through technical progress, insurance of steady farming incomes in line with the general income growth, and availability of supplies to have stable market. Thus, the CAP since its inception in 1962 has a productivist nature, with a clear strategy of assuring food security to the members state under the value of freedom of trade, coming true with the creation of the Common Market

in 1992. To make these objectives come true, an economic system was put in place to support farmers. It provided farmers with a guaranteed price for their products, accompanied by strong protectionist policies based on tariffs and state intervention in case of price decline.

Overall, the CAP since its beginning was a massive influence in the change of the socio-economic landscape of agriculture production. By examining the development of CAP since its inception, Cordovil et al. (2004) demonstrated how the growth in productivity altered the production structure away from the predominately small family agriculture of the 1960s and towards large dimension farms. However, this small sized production has an important role as a complementary activity that still integrates the largest portion of labour dedicated to agriculture, having a great impact on the social sphere. Despite efforts from CAP to give preferential treatment to certain commodities such as meet, cereals and milk, a great production diversity still exists across countries, with, for instance, Spain and Portugal specialising in vegetables and wine. Such diversity is very much reflected in the concentration of land which is much more noticeable in the north than in the south (Portela and Guerry, 2017). The average farm size in 1990 of Greece, Portugal, Italy, and Spain was 4, 5, 6 and 14 hectares, respectively, whereas in Ireland, Denmark and the UK was 23, 32 and 64, respectively.

Only in 1992, with the MacSharry reform, a substantial change in CAP architecture was made, aiming to follow the Uruguay Round negotiations. Baptista (in Cordovil, 2021) argues that this reform is influenced by the neoliberal push with the objective of substituting state control policies by the market mechanism. Mainly, the MacSharry reform exchanges price control by directly transferring monetary amounts to farmers, which are calculated by the farm area and historical productivity data from each region. Thus, these payments were a source of great inequality. Specifically, in Portugal, it corresponds to 48% of the CAP budget, of which, 2% of the beneficiaries receive more than a third, where at the opposite end, 90% of the smallest farm explorations receive less than a third.

Notwithstanding the apparent push for a neoliberal reform, CAP in its concept is broadly viewed as a protectionist measure. Besides the farm income support, and before the Common Market achievement, the EU had strong market price support through tariffs, export refunds, and other subsidies. One main argument used by the European Union, as shown in 2009 in the "Paris declaration for a common agricultural and food policy", is that Europe should guarantee independence from food market volatility and other sources of external instability. This cry for food security, in Zahrnt's (2011) argument, can be perceived as an excessively protectionist behaviour. By being a developed superpower, Europe should have a moral responsibility to help feed the world and push for food security worldwide.

More recently, in 2020, as part of the Green New Deal, the European Union is developing a Farm to Fork Strategy (European Commission, 2020), which aims at bringing more diversity into agriculture production with the main goal of achieving food security. This set of policies from the European Union is not a radical change of the modus operandi in the CAP but can be perceived as an incremental change in order to follow the latest trends in agriculture production. Namely, one of the main pillars in this strategy is the goal of shortening food supply chain by empowering consumers to choose a more sustainable option and ultimately increase the power and responsibility of all supply chain actors to take part in the effort for environment sustainability.

1.5 - Regionalization of trade since the 2008 crisis

In FAO (2022) latest report on "The State of Agricultural Commodity Markets 2022", an analysis is made on the globalization pressures of the last few years. A significant finding of this research is that, since 2008, globalization has been static in terms of trade outflows and inflows, resulting in an increasing trend of regionalisation. As referred and highlighted in the FAO report, one major factor for the decrease in trade volume is the change of international trade policy in surplus countries that have intensified export restrictions. Additionally, recent literature of SFSC (Evola et al., 2022) point, in a similar way, to the consequences of the covid-19 crisis in the growth in alternative methods of production in Europe. The disruption on the food supply chain gave an incentive for regional and local supply chains to emerge and gain relevance in local communities.

Galli and Brunori (2013) provide an understanding of SFSC as a policy tool. The term SFSC is very broad and describes a general description of methods of production, distribution and consumption based on the involvement of few intermediaries, which also tend to translate in a physical and social proximity between the actors in the supply chain. Therefore, the actual organization of the supply chain depends on cultural, historical, and social conventions of each case. Many of these initiatives are characterized by a bottom-up approach where consumers and producers, which generally have little influence in the global value chain, have a central role in influencing its evolution and are crucial to the development of the local economy. In this sense, SFSC ensures food sovereignty by empowering producers and consumers in deciding how should food be produced and what food should be consumed.

It is clear from Galli and Brunori (2013) that the diverse nature of SFSC is influenced not only by tradition but also by a process of innovation and creativity. The forms of organisation

range from online shopping of farmer products in Russia, to basket delivery in Switzerland. The objective of these forms of management are also diverse and multiple. Guirado et al. (2017) show that social farming offers a great opportunity for social inclusion by building trust among the community and thus builds a resilient social network. It can be closely linked to communal management where the actors build a relation, not only with the community involved but also with the territory, contributing to ecological preservation.

Other forms of alternative methods in agriculture have also gained some notoriety in recent years. Wezel et al. (2018) refer agroecology as a farming approach that emphasizes the integration of ecological principles into agriculture, by promoting biodiversity and the use of locally adapted crops and animals, as well as minimizing external inputs. The authors argue that initiatives around agroecology have emerged because of a counter movement against the tendency of land concentration and land speculation. Similarly, Oliveira and Penha-Lopes (2020) describe the expansion of sustainable human settlements and food production systems in Portugal, emphasising the use of numerous interconnected and diverse systems to build an ecosystem that can sustain itself. This process, called permaculture, despite being considered as a socio-technological niche, represents a trend in recent years of young individuals that have the objective of changing their lifestyle towards a rural lifestyle in harmony with nature. The discussion around sustainability in SFSC is very much consensual in the literature, with all the cited authors arguing that local agriculture production tends to be more environmentally sustainable than longer supply options. Moon (2011) refers that farmers have generally two main incentives to preserve land health: if land deterioration affects his lifetime and if the farmer intends to pass down the land to his children. Additional pressures from international trade exacerbates the rhythm in which land is degraded. In this rationale, pressure from price competition puts pressure in increasing output on the short run, sacrificing land health and water usage. Other authors such as Evola et al. (2022) point to the association that is usually made between shorter supply chains and organic production. This has an impact, not only on the environmental sustainability, but on improving the dietary routine of consumers. As the relation between consumers and producers is closer, SFSC offer a space of learning for the consumer about food characteristics and how to have better eating habits.

All the grass root initiatives have been recognized and followed by policy support specially in Europe, where the several national and international institutions have been acting in support of agriculture production based on ecological diversity, soil health and local distribution. In a FAO report (2018) it is clearly stated that agroecology is a key part of the global response to this climate of instability and provide a systematic description of the social and ecological

factors surrounding it. The CAP, as mentioned before, is attempting with the Farm to Fork strategy at transitioning current agriculture practices to organic based production. Furthermore, at the national level, Germany has released a "National Action Plan on Sustainable Use of Plant Protection Products" (German Federal Ministry of Food and Agriculture, 2016) with the goal of protecting biodiversity and reducing food waste. In the "Spain's Common Agricultural policy Strategic plan" for 2023-2027, there is an attempt to incorporate agroecology in the policy making by adapting the criteria of farmers' remuneration. Finally, Italy approved a law in May of 2022 promoting the production of agricultural products at "kilometre zero" (Ministero dell'Economia e delle Finanze, 2022). In this legal framing, it is considered a "zero kilometre" product in a 70 km radius and the main aspect is that municipalities must reserve at least 30% of the area of agricultural land destined for farmers that trade under this regime (Rinnovabili, 2022).

All in all, the alternative production methods employed by grass root initiatives with a community focused goal are being recognised by national and international policymakers, aiming at shifting the current agricultural paradigm towards a more sustainable, locally based and more diverse production.

Chapter 2 - Hypotheses

The three stages of economic activity, consumption, trade and production, have been subjected to changes over the years as a result of policies supporting alternative methods of production or grass-root initiatives aiming at localizing such economic activity. FAO (2008) reports a clear stagnation in the globalization process since the 2008 crisis worldwide. It begs the question if such trade phenomenon has also been observed at the national level in the EU where free market policy remains unchanged, and countries are explicitly prohibited from directly constraining European trade.

To study the evolution of the supply trade structure in agriculture, several hypotheses are validated regarding the impact of social exclusion, economic conjuncture, area under organic production, financial instability and food inflation.

2.1 - Social Exclusion

Self-subsistence appears to have a strong relation with poverty and other forms of social exclusion. Davidova et al. (2012) suggest that self-subsistence farmers are dependent on farming for a great portion of the household income. Furthermore, it is referred in the literature (Guirado et al., 2017) that there are some episodes where community oriented agricultural production acts as an instrument to fight social exclusion in the context of the European Union.

Therefore, it is expected that an increase of social exclusion, mainly caused by the European sovereignty debt crisis, has had a significant impact in the growth of local agricultural production.

H1: A higher (lower) social exclusion level increases (decreases) local consumption of food.

2.2 - Economic Conjuncture

Economic crises have had substantial consequences in the food market and can be considered the causes of food shortages and price increases. Usually, economic crises represent turning points in international policy for agricultural trade. The 1970s crisis had a substantial effect on the ideas behind the framework of agricultural trade towards a liberal and market-based solution. One of the greater consequences was the concretization of the Uruguay round that had a world-wide impact on the liberalization of the agricultural sector. The impact of recent economic crises, such as the European sovereignty debt crisis and the covid-19 pandemic, have

been widely discussed in the literature as triggers that have halted the progress of globalization (FAO, 2022). These crises coincide with the implementation of policy reforms aimed at changing agriculture towards alternative production methods. Such reforms can be represented at the European level with the farm to fork strategy and at the national level several policies have been implemented.

Therefore, it is expected that economic conjuncture since the 2008 subprime crisis has had a direct impact on the commercialization of trade, halting the acceleration of international trade, and starting a movement on the way of regionalization in agricultural trade. The hypothesis developed is that during economic recession there is an increase in local consumption of food and during an economic boom there is a decrease in local consumption of food.

H2: A better (worse) economic conjuncture decreases (increases) local consumption of food.

2.3 - Organic Production

Alternative agricultural production methods encompass a wide range of approaches that are visible in various contexts. Despite their differences, these methods all emphasise ecological relationships as well as long-term incentives and objectives. As a result, organic production emerges as a critical pillar in the context of SFSC. The hypothesis studied is that, assuming the growth in the SFSC movement, the increase in organic production has a positive relation with the regionalization of trade in agriculture.

H3: A higher (lower) organic production increases (decreases) local consumption of food.

2.4 - Financial instability

Financialisation has become one key feature in the globalization process of agriculture. However, the dominance of finance in the agricultural sector deepened inequality in the access of credit for farmers. As a result, big farm corporations gained more notoriety and greater power, leaving small scale farmers more vulnerable and with fewer opportunities to invest in their farms (Clapp, Isakson and Ryan, 2018).

The hypothesis developed in this dissertation assumes that the increasing instability of the financial market creates pressure on farmers, more specifically, small and marginalized farmers, to look for solutions outside the international market. Thus, the increase of financial instability leads to an increase in the supply of the local market.

H4: A higher (lower) financial instability increases (decreases) local consumption of food.

2.5 - Food Inflation

Historically, the increase of food prices has been argued by Headey (2011) and acknowledged in the FAO report (2022) to have consequences in building up the sense of insecurity among countries and international players. Besides, as emphasized by Woods (2014), rises in food prices and overall market instability assumes particular significance within small-scale family farming to face external market pressures.

Therefore, one of the research hypotheses analysed is to examine potential correlation between food inflation and changes in a country's food trade structure. More specifically, whether an increase in food prices may impact countries in the EU to exhibit a greater tendency to change trade structure towards the domestic market.

H5: A higher (lower) food inflation increases (decreases) local consumption of food.

Chapter 3 - Methodology

This dissertation seeks to provide insight on the elements that affect the trend of alternative methods of agricultural production, especially regarding the tendency of shorter supply chains at the national level. The nature of the European Union is especially relevant for such an analysis considering the institutional consequences of the CAP and the common market. The common market forbids protectionist policies that might distort competition, while the CAP has shaped agricultural production within the EU. Due to these elements, the EU presents an intriguing case study for examining the dynamics of agricultural production and trade. The present methodology aims to shed light on the evolution of trade in the EU and what have been its main drivers.

The empirical study is based on an econometric study using a multivariate analysis in panel dataset which uses data from 2011 to 2020 in all 27 current EU countries. The use of this method has the benefit of offering many observations in the context of a short period of time with the use of many countries, and multiple independent and dependent variables, which can improve the effectiveness and precision of econometric estimates. Moreover, it offers capacity to track changes over time and it is able to measure the impacts of both country-level and time-specific factors on outcomes.

A panel data set contains several observations of various units (individuals, firms, and countries) while recording the evolution of a time series for each unit. In this way, it is possible to account for both cross-sectional and time series effects. Panel data is typically used at the microeconomic level to study individual behaviour, but it can also be implanted at the macroeconomic level using data from a group of industries or countries, as is the case in this dissertation.

3.1 - Linear model

The multiple linear regression model estimated by pooled OLS is a common approach in panel data regression analysis. Its flexibility in including multiple explanatory variables and the ability at capturing time and cross-sectional variations makes it a model easily adapted to different contexts. The standard linear model can be computed as the following:

$$y_{it} = \beta_0 + x_{it}\beta + \varepsilon_{it}, \tag{3.1}$$

where y_{it} is the dependent variable, ie. the object intended to be studied, for a certain unit (i) at a certain time period (t); x_{it} represents the independent or explanatory variables for a certain

unit (i) at a certain time period (t) that are used to explain the behaviour of the dependent variable; β is the vector of coefficients that measure the impact of the x_{it} on y_{it}; $β_0$ is the intercept term, or the constant variable, that represents the average value of y_{it} when all the independent variables (x_{it}) are at zero; and $ε_{it}$ is the error term, or the stochastic disturbance, which captures the impact on the dependent variable that is not explained by the independent variables inserted in the model (Verbeek, 2017).

This model may be estimated by pooled OLS (Ordinary Least Squares) method, which requires four assumptions, known as Gauss–Markov Assumptions, in order to be considered as the Best Linear Unbiased Estimators (BLUE): A1) the expected value of the error term is zero; A2) X and $ε$ are independent; A3) all error terms have the same variance, which is referred to as homoskedasticity and A4) zero correlation between different error terms. In panel data, some of these assumptions are not particularly realistic given that it is not appropriate to assume independence due to the several observations in the same unit (Verbeek, 2017). Nevertheless, although not BLUE, pooled OLS produces consistent estimators under the same conditions described below for the random effects estimator.

3.2 - Individual effects Model

Therefore, in panel data it is usually employed a model with individual effects, most commonly, the fixed effects model or within model. The problem of repeated observations on the same individuals is addressed by including individual-specific intercept terms in the model. It can be written as:

$$y_{it} = \alpha_i + x_{it}\beta + u_{it}, u_{it} \ IID(0, \sigma_u^2), \qquad (3.2)$$

where α_i (i = 1,...,N) are fixed unknown constants that may be discarded or estimated along with β and u_{it} is independently and identical distributed. The correct interpretation of the fixed effects method is conditional to the values of α_i, which makes sense if we consider that the individuals have special characteristics. The fixed effects model is usually applied to large units, such as industries or countries where individual specific factors are relevant (Verbeek, 2017).

The other option that could also be taken is to consider the random effects model. In this method, it is not considered that the individuals have special characteristics but that are simply drawn from a common pool. It is commonly assumed in regression analysis that all factors that influence the dependent variable, but are not included in the model, can be summarized by the error term. In the random effects model α_i is considered as a random factor, independently and identical distributed. The model can be written as:

$$y_{it} = \beta_0 + x_{it}\beta + \alpha_i + u_{it}, \; u_{it} \; \sim \; IID(0, \sigma_u^2); \; \alpha_i \; \sim \; IID(0, \sigma_\alpha^2) \qquad (3)$$

where $\alpha_i + u_{it}$ is treated as an error term consisting of two components: an individual specific component, which does not vary over time, and a remainder component, which is assumed to be uncorrelated over time (Verbeek, 2017).

3.3 - Hausman test

The choice between fixed and random effects is not straightforward and can be a hard decision. Hausman proposes a test where the null hypothesis is that x_{it} and α_i are uncorrelated. Two estimators are then compared, the random effects estimator, which is consistent only under the null hypothesis, and the fixed effects estimator, which is consistent under both the null and the alternative (x_{it} and α_i are correlated) hypotheses. To evaluate the significance of this difference, the Hausman test statistic can be computed as:

$$\xi_H = (\widehat{\beta_{FE}} - \widehat{\beta_{RE}})'\left[\hat{V}\{\widehat{\beta_{FE}}\} - \hat{V}\{\widehat{\beta_{FR}}\}\right]^{-1}(\widehat{\beta_{FE}} - \widehat{\beta_{RE}}) \qquad (3.4)$$

where the $\hat{V}$s denote estimates of the true covariance matrices. The statistic ξ_H has an asymptotic Chi-square distribution with K degrees of freedom, K being the number of parameters in the model. Thus, the Hausman test evaluates whether the fixed effects and random effects estimators are statistically different. A rejection of the null hypothesis means that the fixed effects should be preferred over the random effects (Verbeek, 2017). Otherwise, the random effects should be used, because it is efficient under the null hypothesis.

However, according to Verbeek (2017), the results from the Hausman test should be analysed with caution. The rejection of the null hypothesis should not mean necessarily that the fixed effects are preferred over the random effects. Moreover, the Hausman test does not apply if the model has signs of heteroskedastic or exhibits serial correlation.

3.4 - Autocorrelation and Heteroskedasticity

Autocorrelation and heteroskedasticity are two issues that could result from a regression analysis and indicate that the model is not BLUE, according to the Gauss-Markov assumptions A3 and A4. From the several tests that could be applied, in this dissertation the Wooldridge test for first order serial correlation and the Breusch-Pagan test for heteroskedasticity are going to be considered (Verbeek, 2017).

The Wooldridge test has the benefit of being easy to implement in fixed or random effects models and can be applied under general conditions. The test begins by obtaining the residuals from a regression in first differences, removing the individual-effect of the model:

$$y_{it} - y_{it-1} = (x_{it} - x_{it-1})\beta + \epsilon_{it} - \epsilon_{it-1} \tag{3.5}$$

$$\Delta y_{it} = \Delta x_{it}\beta + \Delta \epsilon_{it} \tag{3.6}$$

where Δ is the first-difference operator. It has been shown that if ϵ_{it} are not serially correlated, then the correlation between the first differences errors $\Delta \epsilon_{it}$ and their own first lag is approximately equal to -0.5, ie. $Corr(\Delta \epsilon_{it}, \Delta \epsilon_{it-1}) = -0.5$. Thus, to test the null hypothesis that ϵ_{it} is not serial correlated, the first differences residuals $\Delta \widehat{\epsilon_{it}}$ are regressed on $\Delta \widehat{\epsilon_{it-1}}$ and then it is tested if the coefficient associated to $\Delta \widehat{\epsilon_{it-1}}$ is equal to -0.5. If the null hypothesis is rejected, then there is evidence to suggest that ϵ_{it} is serial correlated. This test also benefits from being robust to conditional heteroskedasticity (Drukker, 2003).

The Breusch-Pagan test is a Lagrange multiplier test for heteroskedasticity. The main characteristics of Lagrange multiplier tests are that they do not require the model to be estimated under the alternative and are often simply computed from the R^2 of some auxiliary regression (Verbeek, 2017). In this case, the LM statistic is given by:

$$LM = n.R_{\hat{u}}^2, \tag{3.7}$$

where n is the number of observations and $R_{\hat{u}}^2$ is the R squared of the auxiliary regression that uses as dependent variable the estimated residuals of the original model and as independent variables the same variables considered in the original model. Under the null hypothesis, LM is distributed asymptotically as Chi squared (Wooldridge, 2015).

3.5 - Driscoll and Kraay standard errors

When certain assumptions are violated, as is the case for the presence of heteroskedasticity and serial correlation, it is common to apply robust standard errors to ensure a valid statistical inference. The method developed by Driscoll and Kraay modifies the nonparametric time series covariance matrix estimator, making the model robust to general forms of cross-sectional and temporal dependence (Hoechle, 2007).

The standard errors for the coefficient estimates are obtained as the square roots of the diagonal elements of the asymptotic (robust) covariance matrix:

$$V(\hat{\beta}) = (X'X)^{-1}\hat{S}_T(X'X)^{-1} \tag{3.8}$$

where $\hat{S}_T$ is defined as in Newey and West,

$$\hat{S}_T = \widehat{\Omega}_0 + \sum_{j=1}^{m(T)} w(j, m) \left[\widehat{\Omega}_j + \widehat{\Omega}_j{}' \right] \tag{3.9}$$

m(T) represents the lag length up to which the residuals may be autocorrelated and the modified Bartlett weights given by:

$$w(j, m(T)) = 1 - j/(m(T) + 1) \tag{3.10}$$

ensure positive semi-definiteness of $\hat{S}_T$ and smooth the sample autocovariance function such that higher order lags receive less weight. The matrix $\widehat{\Omega}_j$ is defined as

$$\widehat{\Omega}_j = \sum_{t=j+1}^{T} h_t\left(\hat{\beta}\right) h_{t-j}\left(\hat{\beta}\right), \tag{3.11}$$

where

$$h_t\left(\hat{\beta}\right) = \sum_{i=1}^{N(T)} h_{it}\left(\hat{\beta}\right) \tag{3.12}$$

The sum of the individual time t moment conditions $h_t\left(\hat{\beta}\right)$ runs from 1 to N(t) where N is allowed to vary with t. This adjustment to Driscoll and Kraay's (1998) original estimator suffices to make their estimator ready for use with unbalanced panels (Hoechle, 2007).

By using cross-sectional averages, the standard errors estimated through this approach remain consistent regardless of the panel's cross-sectional dimension N. Additionally, the estimation of the covariance matrix provides robust standard errors that account for a wide range of cross-sectional and temporal dependence patterns (Hoechle, 2007).

Chapter 4 - Data

This section is divided in two separate subsections. The subsection 4.1. is dedicated to the description of the variables used, namely it is discussed the data sources and definitions. The subsection 4.2. is devoted to the descriptive analysis of the variables where it is taken into consideration whether the variables present a linear or non-linear evolution and how they have evolved over time.

4.1 - Data Description

The current subsection presents the variables used for the empirical study, being divided in two distinct sections. The first part presents the data source of the dependent variables and the computation method used to create the indicators of Self Sufficiency Ratio (SSR), Import Dependency Ratio (IDR) and Export Oriented Index (EOI). The second part provides information related to the data source and characterization of the independent variables used in the model.

4.1.1 - Dependent Variables

To study the evolution of local trade in European Union countries, three different indicators are used as proxies to analyse the structure of trade at the national level. These indicators are derived from the data on imports, exports and domestic production, of a given food commodity. The commodities used for the purpose of this dissertation are cereals and vegetables, as they represent two important staple foods for European consumption. Both commodities aggregate every food commodity, either in raw state, or slightly processed as is the case of the various types of flour, for the cereal data, and sweet frozen corn, for the vegetables.

    The data is extracted from the FAOSTAT database in the Food Balances section. The data is expressed in weight, by 1000 tonnes, of the given commodity. The main advantage of using this data source is that the level of production is calculated using both commercial production and non-commercial forms of production such as the case of kitchen gardens. Having access to these three variables it is possible to formulate the indicators that provide different insights on the supply trade structure of each country, thus making it possible to assess if there was a tendency of regionalization of trade at the national level.

Firstly, SSR is an indicator that measures the level in which a country relies on its own production resources for a particular commodity or group of commodities (FAO, 2001). A high self-sufficiency ratio indicates that the country is producing more than it needs to supply the domestic consumption. This can suggest that a country with high self-sufficiency has much of the domestic consumption originated form the internal market. Thus, an increase in the SSR could indicate that there is an increase in local trade at the national level. It is also a good indicator to evaluate a country's ability to rely on its own production in times of external shocks.

$$SSR = \frac{PRODUCTION}{PRODUCTION + IMPORTS - EXPORTS} \cdot 100 \tag{4.1}$$

The IDR (FAO, 2001) and the export-oriented index (EOI) are complementary indicators that give insight on the portion of imports and exports relative to domestic production, respectively. The import dependency ratio measures the extent to which a country relies on imports to satisfy domestic demand of a particular commodity. The export-oriented index on the other hand indicates how much of the domestic production is channelled to the international market, not taking into consideration internal demand factors. A low level of IDR and EOI would indicate that the country in question does not rely heavily on the external market to supply its internal demand. A decrease in both indicators would translate in the increase of local trade at the national level.

$$IDR = \frac{IMPORT}{PRODUCTION + IMPORTS - EXPORTS} \cdot 100 \tag{4.2}$$

$$EOI = \frac{EXPORTS}{PRODUCTION} \cdot 100 \tag{4.3}$$

4.1.2 - Independent Variables

Table 4.1 describes the independent variables considered in the econometric models. The variable used to measure social exclusion is the Percentage of People in Risk of poverty or social exclusion, which was retrieved from the Eurostat database. This compost indicator represents the percentage of people of a given country that is either at risk of poverty or severely materially and socially deprived or living in a household with a very low work intensity. People at risk of poverty is defined as those who have an equivalised disposable income after social transfers that is less than 60% of the national median equivalised disposable income after social

transfers. By severely materially and socially deprived it refers to individuals that lack at least 7 out of 13 essential deprivation items. Finally, individuals living in households with very low work intensity is defined as the number of persons living in a household where the members of working age have a working time equal or less than 20% of their total work-time potential.

Table 4.1 - Proxies and sources of each independent variable

Variable	Proxy	Source
Social Exclusion	People in Risk of poverty or social exclusion	Eurostat
Economic Conjuncture	Cyclical component of expenditure	AMECO
Organic Production	Area under organic farming	Eurostat
Financial instability	Variance of the European Bloomberg Commodity Agriculture Subindex	Bloomberg
Food Inflation	Food Price Inflation	FAOSTAT

The variable used to measure the economic conjecture of EU countries is the Cyclical component of the expenditure indicator from the AMECO, an annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs. This indicator is calculated by dividing the potential GDP over the actual GDP and then subtracting one. Therefore, a positive value means that the potential GDP is higher that the real GDP, indicating some signs of economic recession. On the other hand, a negative value represents a potential GDP inferior to the actual GDP, signalizing an economic expansion.

In measuring the area of farmland used for organic farming in the EU countries it is used the Area under organic farming indicator from Eurostat. This indicator takes into consideration the share of total utilised agricultural area occupied by organic farming, including both existing organically farmed areas and areas in process of conversion. It is considered as an area of organic farming if it complies with Council Regulation No 834/2007, a legal framework that regulates organic production and labelling of organic products in the EU. The indicator is expressed as the percentage of the total's country land devoted to farming.

To achieve data from financial instability, it is used the variance of the European Bloomberg Commodity Agriculture Subindex. This index aggregates the price of nine agricultural commodities: corn, soybeans, wheat, cotton, sugar, coffee, cocoa, live cattle and lean hogs. The variance is calculated using the daily data of the closing value and then

calculating the variance each year. The variance of the Bloomberg Commodity Agriculture Subindex data differs from the other variables as it is jointly calculated for all countries.

Finally, the data used to measure food price variation is the Food Price Inflation extracted from FAOSTAT. This measures the year-on-year variation, on a monthly basis, of general food prices. It will be used the month of December from 2011 to 2020, to fit the annual panel dataset used in this dissertation.

4.2 - Descriptive and graphical analysis

In this subsection, using descriptive statistics, graphical representations and regression between the variable and the years in the sample, it will be made a preliminary analysis of the evolution of the data. Consequently, it will allow a better understanding of the data before developing the model. The subsection is divided in two parts, first part is dedicated to the dependent variables and the second to the independent variables. In the dependent variables, it is given an overview of the supply structure of trade at the EU level before going into the national data.

4.2.1 - Dependent Variables

Before looking at the indicators on SSR, IDR and EOI at the national level, it is also relevant to first consider data at the EU level, also available in FAOSTAT from 2011 to 2020. Generally, all three indicators exhibit an increase in the cereal and vegetable commodity (see Graph 1 and 2). On average, the EU was self-sufficient on cereals and vegetables in the order of 108% and 112%, respectively, meaning that the EU as whole produced more than enough of both commodities to meet domestic demand. The data also shows greater volatility in the evolution of the SSR in cereals compared to vegetables. In the latter case, the increase of the SSR is steadier and more consistent, growing from 109% in 2011 to 116% in 2020.

Graph 4.1- SSR, IDR and EOI of cereals at the EU level
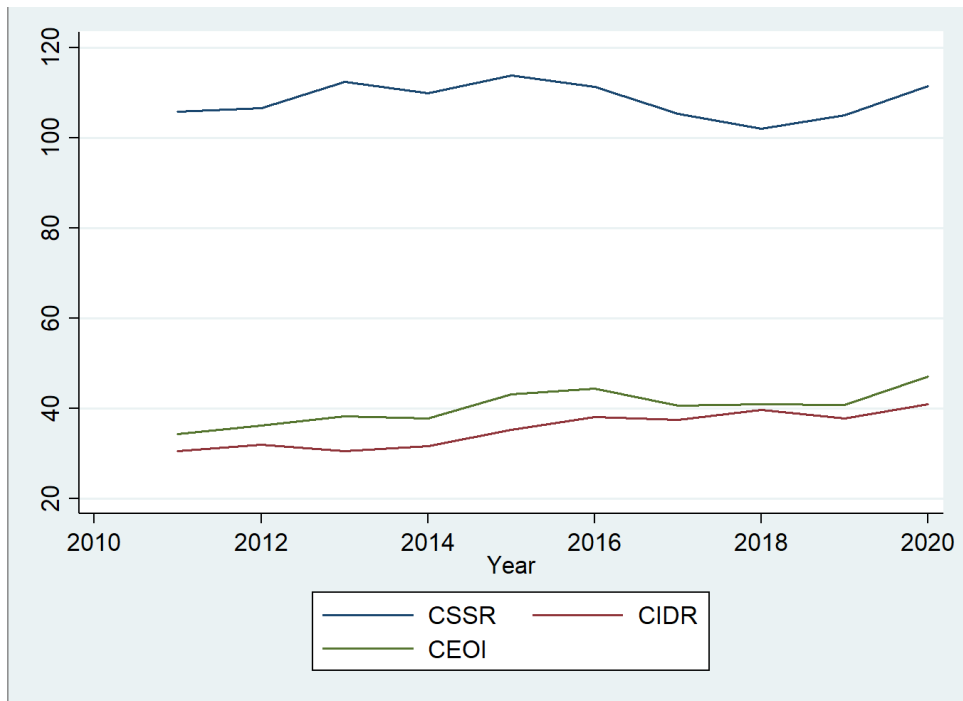
Graph 4.2 - SSR, IDR and EOI of vegetables at the EU level
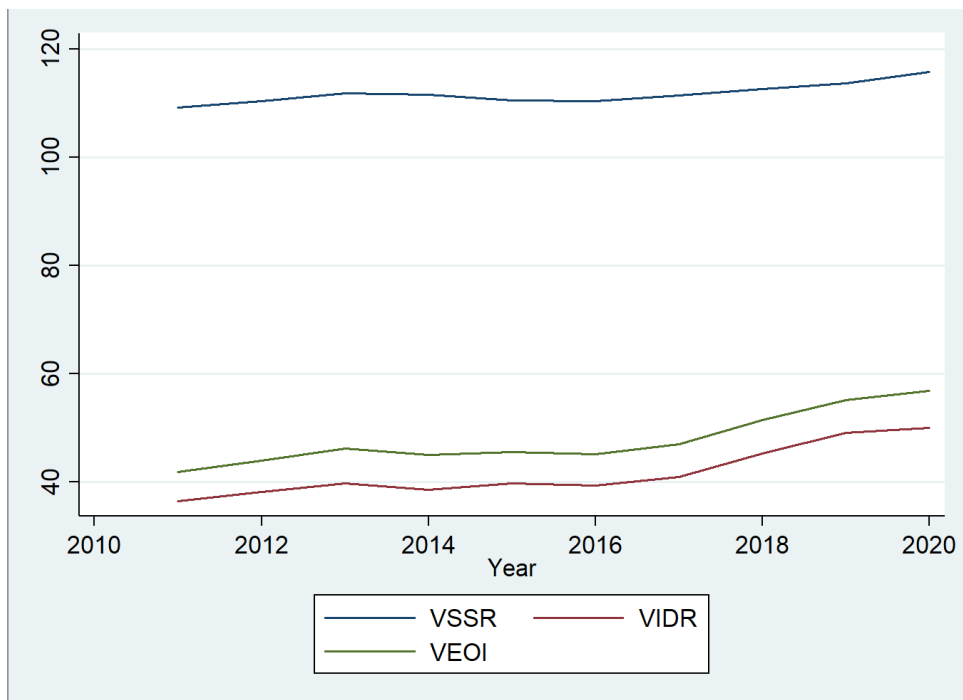
Regarding the evolution of the IDR, there is a clear tendency in the increase of the dependency on imports of both commodities in the EU. From 2011 to 2020 the dependency of imports grew 10 percentage points in cereals (from 31% to 41%) and 13 percentage points for cereals (from 37% to 50%). The average of the IDR of the 10-year period is 35% and 42% for cereals and vegetables, respectively. The indicator on the IDR suggests that more than a third of the cereals consumed at the EU comes outside the EU border and, in 2020, more than half of the vegetables consumed are also from abroad.

The last indicator, the EOI, also shows an upwards tendency in both analysed commodities. The growth of this indicator has been the most significant. In 2011 the share of exports in total domestic production represented 34% in cereals and 42% in vegetables. 10 years later, the EOI increased to 47% in cereals and 57% for vegetables. The average of the period is 40% for cereals and 47% for vegetables. The data shows that in 2020 almost half of cereals produced in the EU and more than half of the vegetables were distributed to the international market.

The data for the EU suggests that, during the analysed time period, there was a decrease in local consumption. Despite the SSR showing an increase of ability for domestic production meeting the demand of EU consumption, the IDR and EOI suggest that the EU is becoming more dependent on imports, while at the same time is directing more of the domestic production towards the external market.

Referring to the dataset at the national level, it is important to highlight the absence of two observations in the cereal commodity from the EOI, see Table 02. This occurs because in two years of the considered time period, Malta did not register its cereal production. Furthermore, the data indicates substantial heterogeneity in the dependent variables. Notably, countries like Latvia and Lithuania exhibited a SSR for cereals of approximately 400% in 2020, while the Netherlands reported a considerably lower value of 10%. Conversely, the Netherlands recorded an SSR of around 300% for vegetables. This wide range of values is expected since the level of trade and production is heavily influenced by each country's specific production capacity for a given commodity.

Table 4.2 - Descriptive statistics of the dependent variables

| Dependent Variable	Obs.	Mean	Std. Dev.	Min	Max
Cereal SSR	270	115.4%	79.56814	0%	405.2%
Cereal IDR	270	46.8%	38.56102	5.6%	144.1%
Cereal EOI	268	57.0%	49.06648	7.7%	353.8%
Vegetable SSR	270	88.2%	71.21414	1.9%	636.6%
Vegetable IDR	270	56.7%	38.05183	4.6%	336.7%
Vegetable EIO	270	47.0%	56.27036	0%	500%

In relation to the overall data, it can be observed a general decrease in the domestic trade of the EU countries. The SSR in cereals (see Graph 4.3) show a general upward trend. By doing a simple regression between the dependent variable and time, it is possible to validate the significance of the positive relation. In this case (Table A1 in the appendix), the time variable has 10% p-value in the t test showing a positive coefficient of 2.8. The data suggest, that, on average, countries increased the SSR on cereals by 2.8 percentage points every year, meaning that since 2011 to 2020, countries in the EU have increased the production of cereals in relative terms to the national demand. The data on the SSR of vegetables is more inconclusive.

Graph 4.4 shows a very slight increase in the indicator overtime. In doing a simple regression (Table A1 in the appendix), the time variable does appear to have no correlation to the SSR on vegetables, indicating that over time, there is no conclusive trend.

Graph 4.3 - SSR of cereals at every EU country with a linear trend line
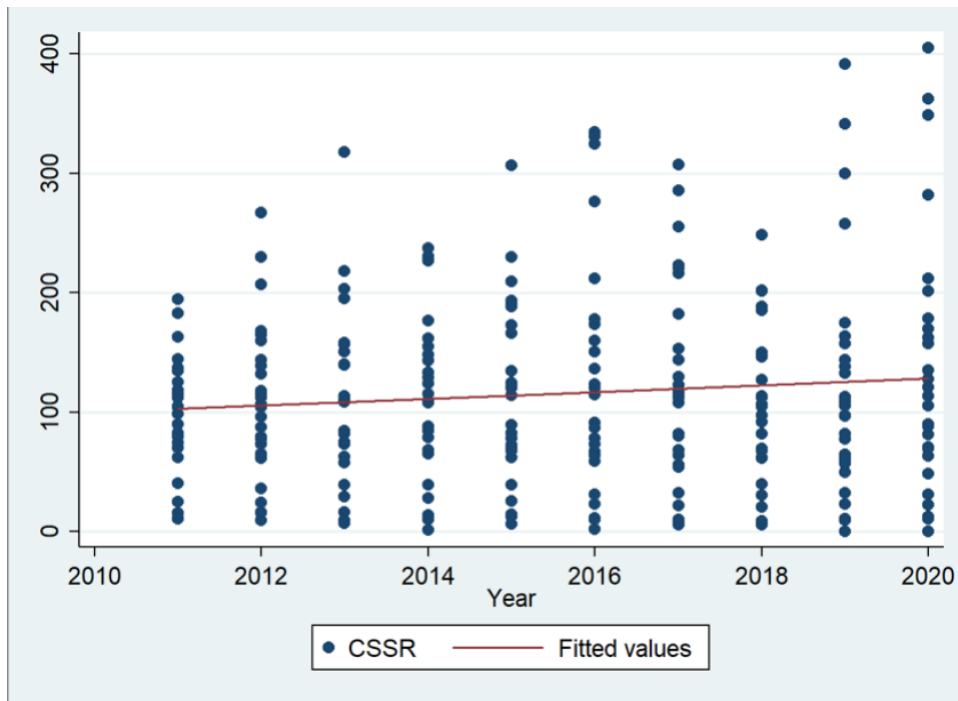
Graph 4.4 - SSR of vegetables at every EU country with a linear trend line
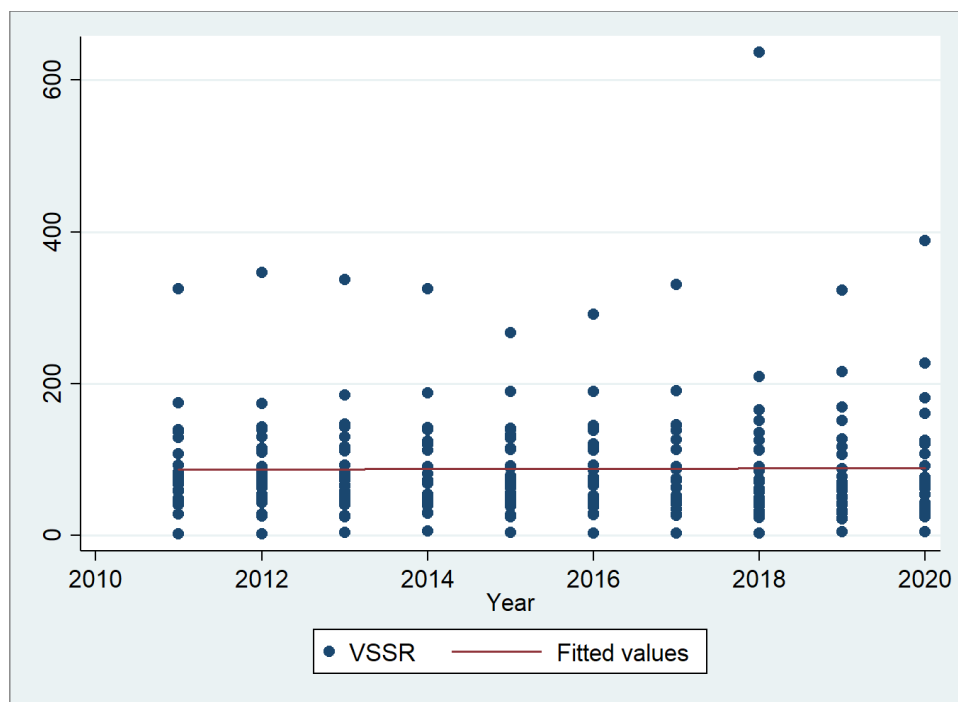
In the IDR, the graphic representation of data (Graph 4.5) suggests a general upward trend in the cereal commodity. The regression (Table A1 in the appendix) also confirms this evolution indicating a 1.8 coefficient with 2% p-value. Therefore, generally, countries in the EU have increased their import dependency relative to the domestic demand on cereals by 1.8 percentage point every year from 2011 to 2020. The data for the IDR on vegetables indicate a similar upward trend (Graph 4.6). However, the impact of time on the IDR is not statistically significant (see Table A1 in the appendix).

Graph 4.5 - IDR of cereals at every EU country with a linear trend line
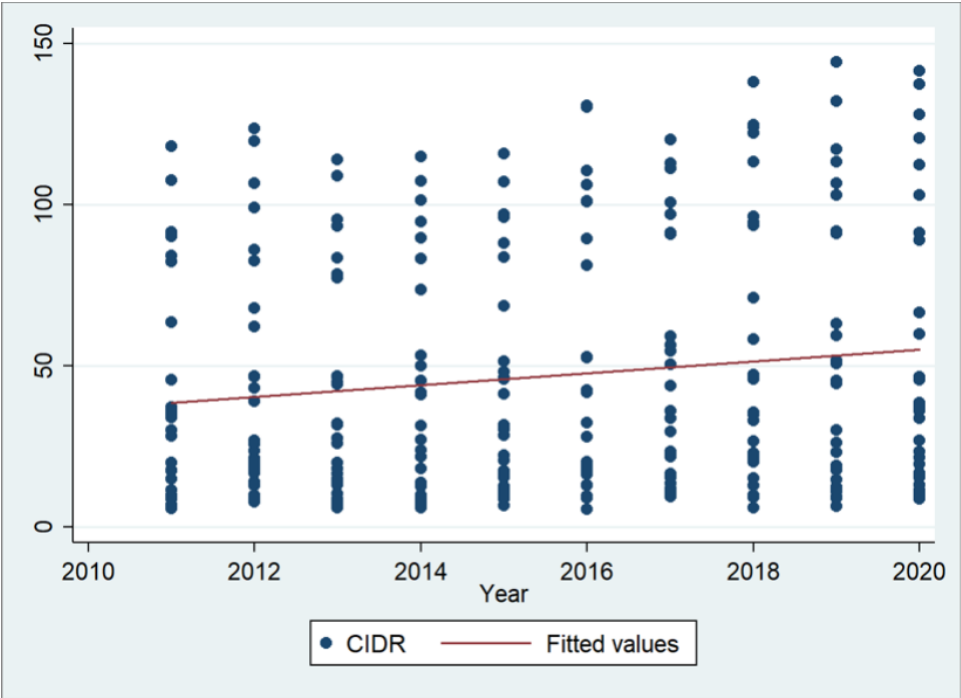
Graph 4.6 - IDR of vegetables at every EU country with a linear trend line
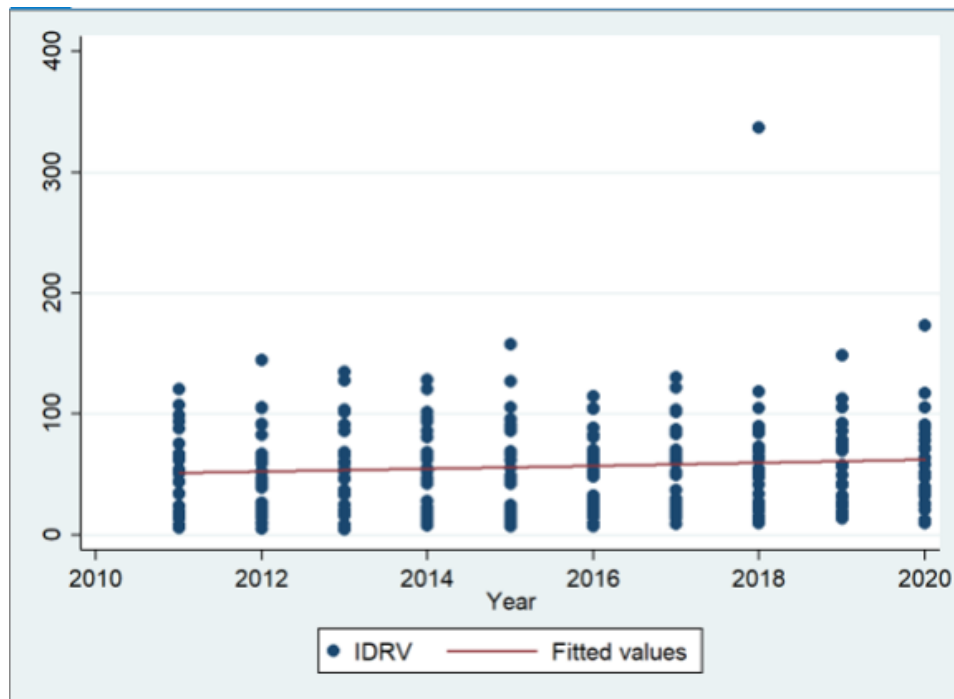
Finally, data on the EOI on the cereals show a similar trend to the IDR on cereals. Graph 4.7 indicates a general increase in the EOI over time and the regression (Table A1 in the appendix) shows a coefficient of 1 with a significance level in the t test of 3%. This suggests that from 2011 to 2020 the proportion of exports in relation to domestic production of cereal increased on average 1 percentage point in the EU countries. In the case of the vegetable commodity, it appears to have occurred a slight decrease in the EOI (see Graph 4.8). However, the correlation between time and the EOI in vegetables is not statistically significant, whereby nothing could be concluded based on this information.

Graph 4.7 - EOI of cereals at every EU country with a linear trend line

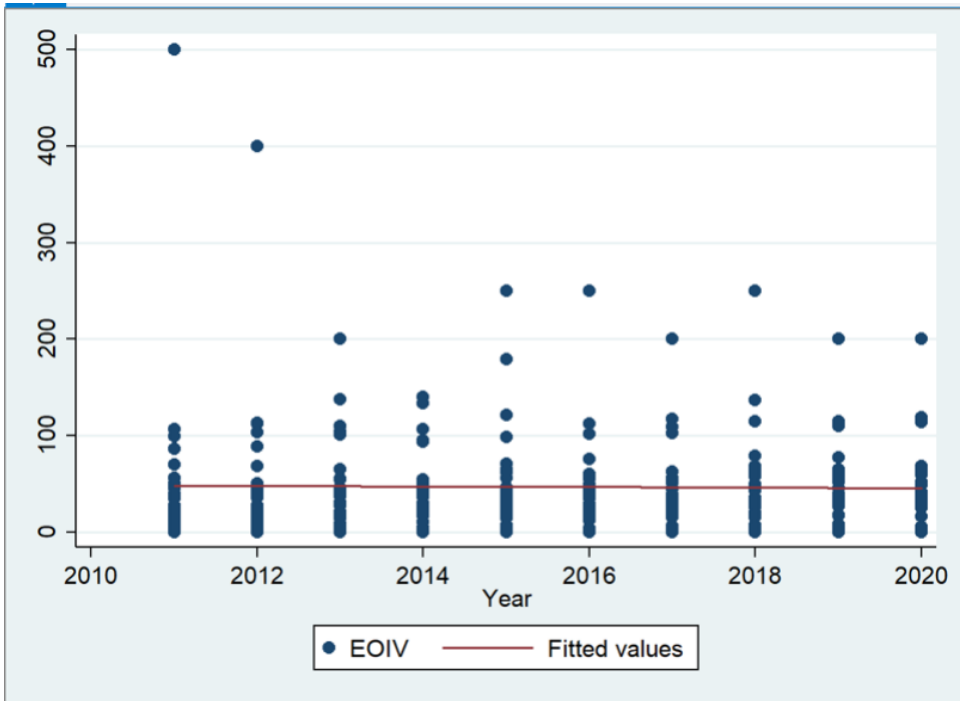Graph 4.8 - EOI of vegetables at every EU country with a linear trend line

Overall, the national level data show similar conclusion to the EU level data. The data on cereals shows a more expressive evolution than the data regarding the vegetables supply trade structure. Despite the increase on the SSR of cereals, both the IDR and EOI show expressive upward trends. This suggests that, generally, the EU countries have increased the production, in relation to domestic demand, of cereals, but much of such production has increasingly been directed to exports. At the same time, to compensate for the increase in exports, countries have become more import dependent. When it comes to the structure of trade in the vegetable commodity, no real conclusion could be made from the data, indicating that there has not been a significant change in the supply structure in the EU countries for vegetables.

4.2.2 - Independent variables

The data on social exclusion suggests the existence of great social inequalities within the EU countries (see Table 4.3). In 2011, in the midst of the sovereignty debt crisis, according to the Eurostat compost indicator for social exclusion, Bulgaria recorded a value of 49%, Romania 41% and Greece 31%, while Czechia, the Netherlands and Finland recorded values of 15%, 16% and 18%, respectively. Analysing the graphical representation of the values of social exclusion and the corresponding fitted linear line (Graph 4.9),it indicates a gradual decrease of social exclusion in general terms for the countries of the EU. A simple regression analysis of time and the variable in question (Table A1 in the appendix) shows a statistically significant average decrease of 0.6 percentage points every year. Meaning that on average there were a decrease of about 5 percentage points in social exclusion from 2011 to 2020. This decreasing momentum had no impact in 2020, the first year of the pandemic policies and the record-breaking year of GDP decrease (-5.7%, according to the World Bank).

Table 4.3 – Descriptive statistics of the independent variables

| Independent Variable	Obs.	Unit	Mean	Std. Dev.	Min	Max
Social Exclusion	270	Percentage of total population	23.6	7.1	11.9	49.3
Organic Production	269	Percentage of total cultivated area	7.8	5.4	0.1	25.3
Economic Conjuncture	270	Percentage of potential GDP at current prices	0.86	1.9	-2.2	10.1
Financial Instability	270	Squared USD	60.4	16.78	38.5	87.3
Food Inflation	270	Percentage	2.2	2.2	-6.2	9.5

Graph 4.9 - Evolution of social exclusion in the EU countries with a linear trend line
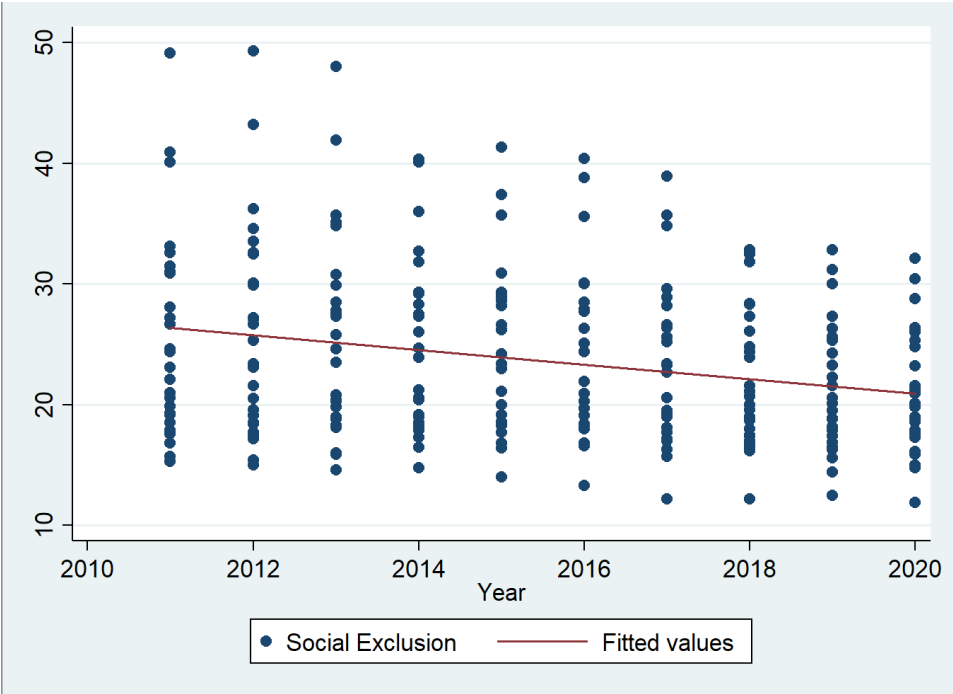
The data on economic conjuncture gives a good indication on the evolution of the economic cycle in the EU countries. As is the case for the inequality observed within EU countries in the social exclusion indicator, the data on the output gap shows some significant degree in the

asymmetry of economic shocks. As an example, in 2013, the year where the output gap was, on average, at its highest, Greece and Spain have a recorded value of 10 and 5.7, respectively, while Bulgaria and Latvia have recorded values of 0.2. One possible interpretation of these values is, for instance, the potential GDP of Greece is 10% higher than its real GDP and the potential GDP of Bulgaria is 0.2% higher than its actual GDP, showing both signs of an economic recession, but with a much greater expression in Greece. In a broad sense, the data on the output gap (see Graph 4.10) shows that this 10-year period is marked by the above zero output gaps as a consequence of the recovery from the sovereignty debt crisis and, in the final year 2020, there is another spike in the output gap, as expected by the economic consequences of the covid-19 pandemic.

Graph 4.10 - Evolution of economic conjuncture in the EU countries with a linear trend line
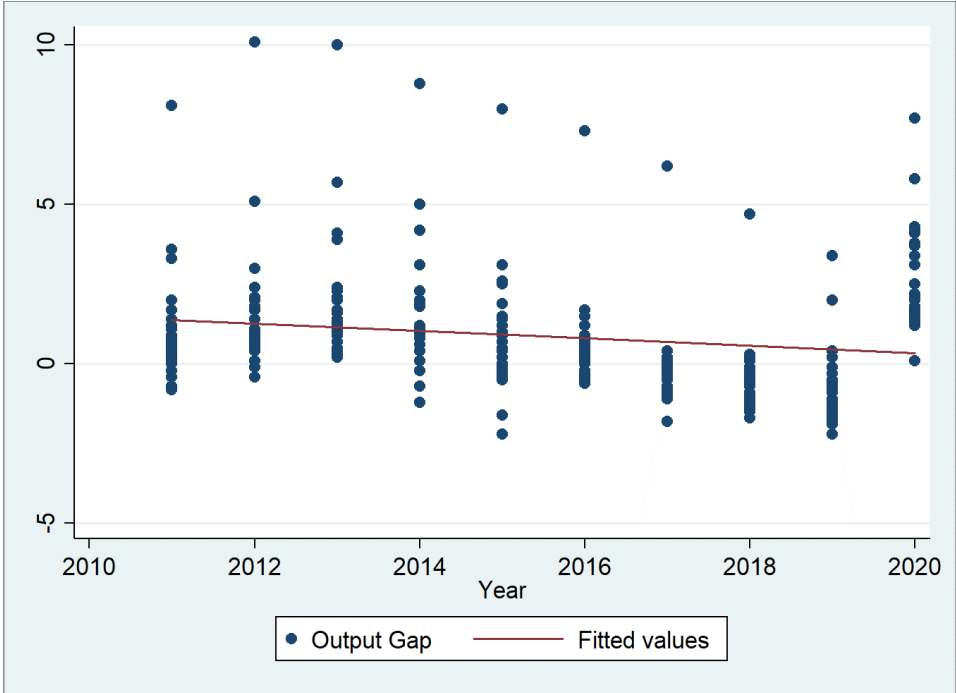
As for the organic production dataset (see Graph 4.11), it is relevant to note that there is a missing observation from Croatia on the year 2011because the data was not available. Concerning the overall evolution of the variable, it is presented a clear general upward tendency for the EU countries. In 2011 the average of area under organic production was 6.4%, increasing to 9.7% in 2020. A regression between the variable and time reveals (Table A1 in the appendix) a statistically significant average increase of 0.35 percentage points. The data confirms that the

effort of police makers in the EU in shifting agricultural production has come to some effect by the general increase in area under organic production.

Graph 4.11 - Evolution of the organic production in the EU countries with a linear trend line
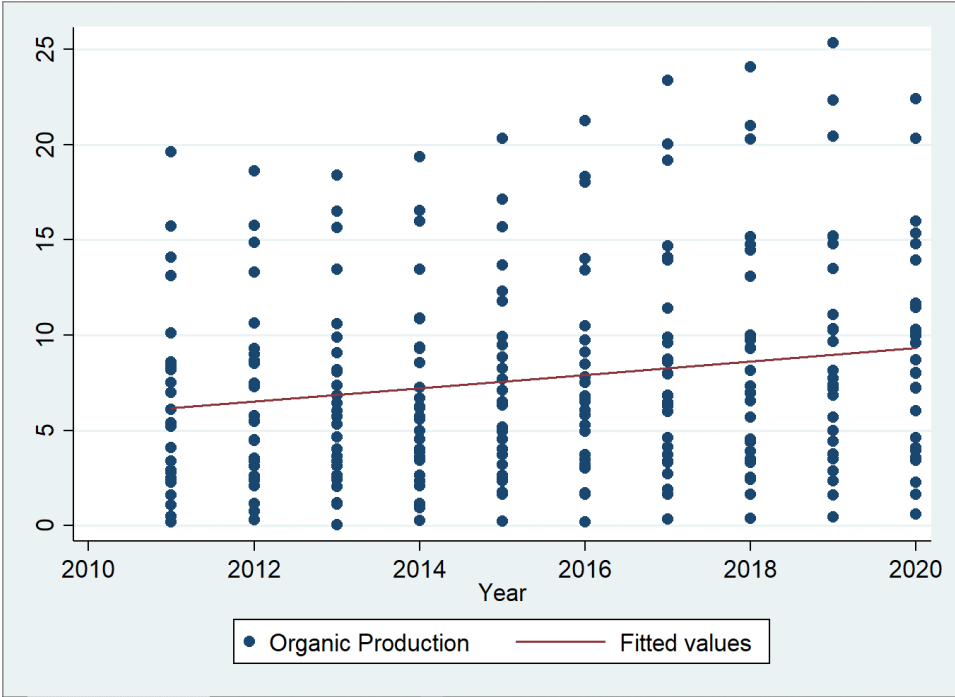
The graphical representation and table of the regression (see Graph 4.12 and Table A1 in the appendix) of the variance of the European Bloomberg Commodity Agriculture Subindex shows a clear downward linear trend in the financial instability. The fact that the first year of 2011 is the year of greatest financial instability is consistent with the literature. Instability in financial food indexes tend to start just previous to a crisis and decrease with the recovery. The surprise might be that during 2020, the first of the pandemic, while it was observed a crash in the financial markets, the variance of the Agriculture Subindex kept his trend from previous years.

Graph 4.12 - Evolution of financial instability with a linear trend line
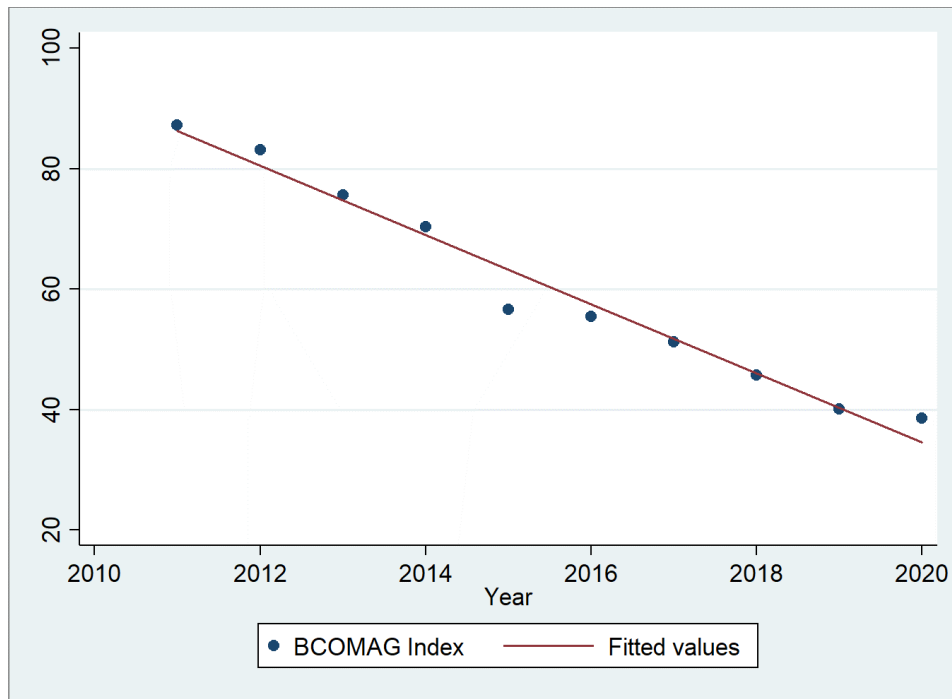
Finally, the general food inflation dataset presents itself (see Graph 4.13) with a slight downward trend. With a registered mean of 2.2% food inflation, this is a value that goes according to the target of 2% in medium run set by the European Central Bank for general inflation. Note that during 2014 the majority of countries experienced a situation of deflation in food. Also, in 2020, there was a slight deceleration in food prices compared to the previous year, despite the covid-19 pandemic.

Graph 4.13 - Evolution of food inflation with a linear trend line
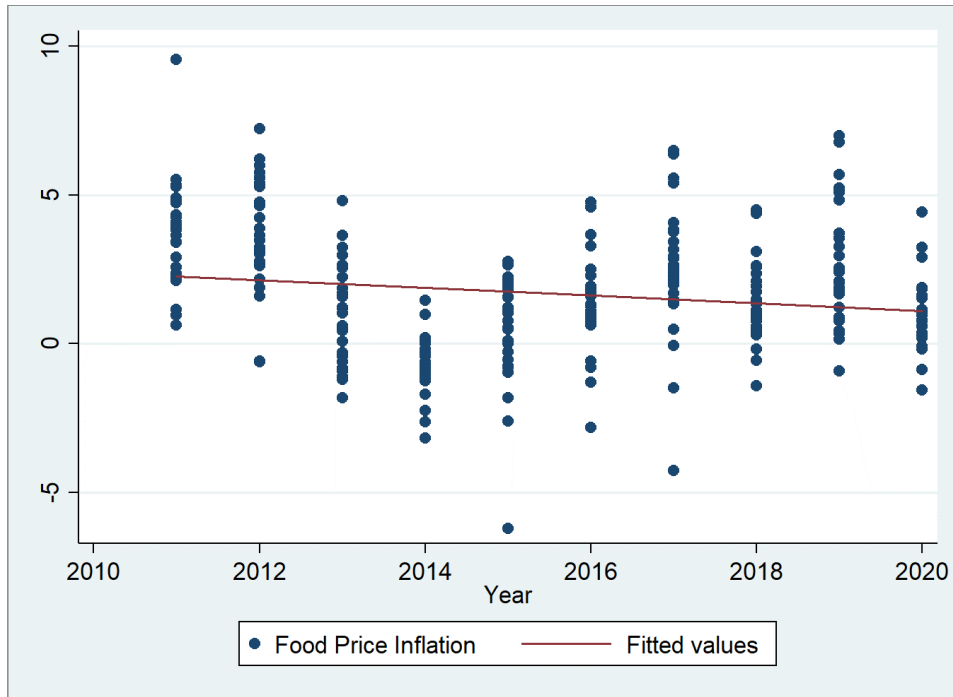
Chapter 5 - Empirical Study

The empirical analysis started by estimating a fixed effect and a random effect model for each of the six dependent variables and then applying the Hausman test to conclude what is the best regression model. To ensure validity of the results it is then computed the Wooldridge first order correlation to test for serial correlation and the Breusch-Pagan test to test for heteroskedasticity. The results of these two tests will ensure the validity of the fixed/random effects model as well as the Hausman test result and from then it will be decided whether a robust estimator such as the Driscoll and Kraay standard errors will be preferred. After the presentation of the results, it will be made an interpretation of the values accordingly to the hypotheses made in section 3.

5.1 - Results

The computation of the Hausman test produced the results presented in Table 5.1. For most of the dependent variables, except for the SSR of Cereals and the IDR of vegetables, the null hypothesis is not rejected, thus it appears to not exist significant differences between the random and fixed effects model, leading to the conclusion that the random effects model is more appropriate to model those dependent variables. As for the case of the SSR of Cereals and the IDR of vegetables, the p-value is inferior to the 5% mark, thus rejecting the null hypothesis, leading to conclusion that a fixed effect model is more appropriate.

Table 5.1 - Results from the Hausm Test and the respective conclusion

Variable	Chi-squared statistic	Prob>chi2	Conclusion
Cereal SSR	15.768	0.0075	FE
Cereal IDR	2.895	0.7161	RE
Cereal EOI	2.0873	0.8369	RE
Vegetable SSR	1.4239	0.9217	RE
Vegetable IDR	11.611	0.0405	FE
Vegetable EOI	2.112	0.8334	RE

The Wooldridge test for first order correlation is then computed to the resulting models from the Hausman test in Table 5.2. The results reported in Table 05 show a high chi-square

statistic, turning the p-value to an effective zero, leading to the rejection of the null hypothesis and thus concluding for the presence of serial correlation in the six models.

Table 5.2 - Results from the Wooldridge test for first order correlation and the respective conclusion

Variable	Chi-squared statistic	Prob>chi2	Conclusion
Cereal SSR	154.98	2.2e-16	Autocorrelation present in the model's residuals
Cereal IDR	200.88	2.2e-16	Autocorrelation present in the model's residuals
Cereal EOI	80.063	2.2e-16	Autocorrelation present in the model's residuals
Vegetable SSR	177.46	2.2e-16	Autocorrelation present in the model's residuals
Vegetable IDR	147.38	2.2e-16	Autocorrelation present in the model's residuals
Vegetable EOI	161.03	2.2e-16	Autocorrelation present in the model's residuals

At the same time, it is computed the Breusch-Pagan test for heteroskedasticity, with the results presented in Table 5.3. The results show an overall high chi-square statistic, followed by p-values lower than the conventional 5% mark, thus rejecting the null hypothesis and showing signs heteroscedasticity in the model. The model with the IDR of vegetables as the dependent variable shows a p-value of just over 10%. For the sake of consistency, it will be considered that this model may also suffer from heteroscedasticity.

Table 5.3 - Results from Breusch-Pagan test to test for heteroskedasticity and the respective conclusion

Variable	Chi-squared statistic	Prob>chi2	Conclusion
Cereal SSR	28.373	3.078e-05	Presence of heteroscedasticity in the model
Cereal IDR	47.1	5.421e-09	Presence of heteroscedasticity in the model
Cereal EOI	22.306	0.0004578	Presence of heteroscedasticity in the model
Vegetable SSR	15.493	0.008451	Presence of heteroscedasticity in the model
Vegetable IDR	8.7911	0.1177	No evidence of heteroscedasticity
Vegetable EOI	14.401	0.01325	Presence of heteroscedasticity in the model

Evidently, from the results of the Wooldridge test for first order correlation and the Breusch-Pagan test for heteroskedasticity, it is concluded that the estimators are not efficient and the standard errors are not correctly estimated by standard formulas and therefore a robust estimation method is needed. Moreover, the Hausman test loses validity in the presence of both serial correlation and heteroscedasticity, thus its results are dismissed. Hence, we proceed by estimating the model using the Pooled OLS robust Driscoll-Kraay standard errors. For robustness, fixed and random effects models will be also estimated later.

The results from the estimation (see Table 07) reveal that every variable has some degree of significance with respect to the dependent variables. The interpretation of the models is slightly different depending on the indicator. Referring to the SSR a positive coefficient would indicate that the variable in question contributes to the increase in local trade, at the domestic level. Concerning the IDR and the EOI, a negative coefficient indicates that the variable contributes positively to an increase in local trade.

Table 5.4 – Coefficient results from the regression with Driscoll-Kraay standard errors

Variables	CSSR	CIDR	CEOI	VSSR	VIDR	VEOI
Social Exclusion	5.28***	-1.31***	-1.27***	-0.94	-2.55***	-2.46***
Economic Conjuncture	-9.27***	0.45	-2.68***	5.42***	-3.22***	0.60
Organic Production	4.78***	-1.86***	-2.32***	-3.24***	-0.29*	-2.01**
Financial Instability	-0.61	-0.28***	-0.36**	-0.34**	0.13**	0.15**
Food Inflation	4.37	-0.20	1.61	0.67	-0.81*	0.81
Constant	-8.65***	109.08***	126.77***	130.20***	115.28***	109.78***

***, **, * denote the statistical significance at 1, 5 and 10% levels, respectively, for the t tests of the coefficients

5.1.1 - Social Exclusion

The variable of social exclusion is significant with a p-value under 1% in the t statistic in relation to all dependent variables except for the SSR of vegetables, where no significant statistic is observed. In all of the five models where the variable appears to be significant, there is a positive relation to the increase in domestic trade. This result confirms the H1 hypothesis referred in section 3 that an increase in social exclusion translates in the increase in local trade.

The positive correlation between social exclusion and local trade, at the national level, is consistent with the discussed authors of this matter. Davidova et al. (2012) mentions how poverty is prevalent among subsistence farmers. The lack of investment capabilities on farmers reduces the range and production capacity of the farm, invariably leading to a greater canalization of production into more local markets or even at a subsistence level. Moreover, Galli and Brunori (2013) discussed how many of the shorter food supply chains are created as a consequence of a bottom-up approach between farmers and consumers. In the international supply chain arena, small farmers have little to no power in negotiating prices and conditions. Shorter supply chains can be a compelling solution for marginalized farmers that for one reason or another cannot access the international market.

5.1.2 - Economic Conjuncture

The impact of the variable of output gap is significant in four of the six models, being consistent with the H2 in the cases of EOI of cereals and the SSR and IDR of vegetables and contradictory in the case of the SSR of cereals. The expected result would be that an increase in output gap, i.e., the potential GDP is proportionally greater than the real GDP, increases local trade. Therefore, the results generally confirm the hypothesis.

The conditions of the economic conjecture affect the trends in the supply chain in multiple ways. For once, it is expected that the globalisation pressures of multinationals and financial investors halts in times of economic and financial turmoil. As pointed out by Scoppola (2021), the liberalisation of markets benefits foreign investment, therefore a market contraction has a negative effect in investment flows. On the other hand, as pointed out by Woods (2014), the vulnerability of smaller farmers also creates opportunities for union among farmers or communities. In times of external shocks, it seems obvious that farmers opt to direct their production to the domestic market as an alternative for the highly unstable external market.

5.1.3 - Organic Production

The variable of organic production appears to have a significant impact in all six models. According to H3, the increase in area under organic production affects positively the degree of local trade. Five of the six models confirm the hypothesis, only the model of SSR in vegetables goes against it.

Such impact of the area under organic production on local consumption is coherent with the literature presented. Rausser, Kahn and Zilberman (2015) described the antagonist paradigm of "Industrial Food" as "Naturalization Food". Such nomenclature has to do with the effort of smaller scale institutions, farmers and consumers to shift the mainstream methods of agriculture with the inclusion of ecological and social values. The similar approach of Robinson (2018) puts an emphasis on the dichotomy between "productivist paradigm" and "socio-ecological paradigm", giving value to the social aspect. From these two authors, it is understood that the ecological and social factor are very much related. The ecological values of agriculture are inseparable from the individuals that take part in production and distribution processes. Shorter food supply chains are an obvious opposition from the industrial or productivism paradigm, giving that it aims at benefiting producers and consumers through the principle of communal management and solidarity (Galli and Brunori, 2013).

5.1.4 - Financial Instability

The variable related to the variance of the Bloomberg Agriculture Subindex has a significant coefficient value in five of the six models. However, only two of the models, containing the IDR and EOI of cereals, confirm H4 that states that an increase in financial instability leads to an increase in local trade. The results from the models with the vegetables indicators have a contradictory result.

In fact, it is a curious result that the models with the indicator related to cereal follows the H4 hypothesis while the models with the vegetable go against it. The foundation of the H4 hypothesis is that financial markets have become a key component in driving international trade (Clapp, Isakson and Ryan, 2018). The reasoning behind the asymmetric results in the cereal and vegetable indicators might have to do with the components of the Bloomberg Agriculture Subindex. This index includes the price of corn and wheat and the only vegetable in the index is the soybean which traditionally is not produced in Europe. The fact that the increase in instability in the index created a boost in international trade in the vegetable commodity might be due to a substitution effect. As the cereal commodity became more unstable in the international market, the vegetable commodity was seen as an opportunity.

5.1.5 - Food Inflation

The variable of food inflation is the variable with the least overall significance in the six models. The only model where the variable in question has a degree of significance under 10% is the model with the IDR of vegetables as the dependent variable. The coefficient of food in the referred model is negative, which is coherent with the H5 hypothesis but, due to the lack of significance on other variables, the results are not very conclusive.

The fact that the results are not very conclusive does not goes necessarily against the literature reviewed. Woods and McDonagh (2011) pointed to the vulnerability of farmers in the context of price fluctuations, but in fact, during the analysed time period, the level of inflation is relatively stable with a mean in the 10-year period of around 2%. The model would benefit if the recorded time period would capture a food inflation spike, but unfortunately that is not the case.

5.2 - Robustness

This subsection, through the estimation of both fixed and random effects with Driscoll-Kraay standard errors, aims at validating the robustness of the data from the Pooled OLS estimated in the previous subsection. Results are reported in Table 5.5 and Table 5.6.

Table 5.5 - Results from the regression with Driscoll-Kraay standard errors with fixed effects

Variables	CSSR	CIDR	CEOI	VSSR	VIDR	VEOI
Social Exclusion	-2.26	-0.31*	0.69	0.98**	-0.12	-1.99*
Economic Conjuncture	2.27	-0.73*	1.11	-0.88	0.10	0.66*
Organic Production	2.49**	0.50	0.54	-0.56	0.14	1.08*
Financial Instability	-0.16	-0.24***	-0.48***	-0.12	-0.20***	0.31
Food inflation	0.45	0.40	0.72	-0.13	0.06	-0.29
Constant	156.69***	64.49***	63.55***	77.52***	70.20***	67.30***

***, **, * denote the statistical significance at 1, 5 and 10% levels, respectively, for the t tests of the coefficients

Table 5.6 - Results from the regression with Driscoll-Kraay standard errors with random effects

Variables	CSSR	CIDR	CE\OI	VSSR	VIDR	VEOI
Social Exclusion	-1.02	-0.33	0.11	0.97***	-0.69*	-1.96*
Economic Conjuncture	1.88	-0.75*	0.48	-0.80	-0.15	0.56**
Organic Production	2.40***	0.32	-0.411	-0.80	0.23	0.45
Financial Instability	-0.30**	-0.24***	-0.46***	-0.13	-0.12	0.27
Food inflation	0.81	0.39	0.62	-0.12	-0.10	-0.27
Constant	136.00***	66.90***	84.24***	80.52***	78.82***	73.82***

***, **, * denote the statistical significance at 1, 5 and 10% levels, respectively, for the t tests of the coefficients

The results from both regressions show some of the variables may not exhibit the same relation with the dependent variables as the pooled OLS method suggests. Overall, both the fixed effects and random effects models demonstrate lower significance values in the coefficients with respect to the independent variables compared.

Notwithstanding, two of the variables still show high significance values, which is the case for the social exclusion and the financial instability. Considering the social exclusion variable, in the fixed effects model, three of the six models have a p-value significance under the 10% mark, namely the IDR for cereals, SSR and EOI for vegetables. For the random effects model, all three indicators for the vegetable commodity show strong significant values. All of the coefficient values mentioned are consistent with the H1 hypothesis, which states that an increase in social exclusion has a positive impact in local trade.

As for the financial instability, the fixed effect regression shows high levels of significance in the IDR and EOI of cereals and the IDR of vegetables. In the random effect regression, all of the coefficients in the cereal indicators have strong significance. The coefficient values show, in general terms, that there is a confirmation of H4, with only the SSR indicator contradicting the considered hypothesis.

With respect to the variables of organic production and output gap, most of the regression coefficients are not statistically significant, unlike what was found before for the pooled OLS case. In the fixed effects case, the organic production variable has a significant coefficient in two of the models (SSR of cereals and the EOI of vegetables), leading to a twofold conclusion with respect for H3, with SSR of cereals being consistent and the EOI of vegetables not. The random effects model shows the SSR of cereals as the only coefficient with a high degree of significance, which is in accordance with H3.

For the output gap variable, the same two regressions show similar results, with only the models of IDR of cereals and EOI of vegetables presenting a significant coefficient. However, concerning H2, only the IDR of cereals validates the hypothesis while the EOI of vegetable contradicts it. These results show that no conclusion could be taken concerning both variables.

Finally, the two regressions suggest that the variable of food inflation appears to have no significant impact on the six models, confirming the previous findings. The results suggest that food inflation during the observable time period played little to no importance concerning the structure of agricultural trade, specifically, the degree of local trade in the EU Countries.

Chapter 6 - Concluding Remarks

6.1 - Main findings

This dissertation serves the purpose of contributing to the ongoing debate surrounding food security and food sovereignty. The most resounding critique posed by the food sovereignty movement is related to the perceived lack of farmer's and consumer's autonomy in the decision-making processes. The expansion of agricultural globalization has resulted in the consolidation of market control by large corporations, thereby giving rise to a context characterized by market oligopoly within agriculture industries (ETC, 2022), as well as the retail sector (Jagtap et al., 2022). Through the integration of local actors into decision-making framework, fostering enduring producer and consumer relationships, the initiatives of SFSC distinctly emerge as a countermovement against the prevailing tide of globalization and corporate predominance within the agricultural domain.

In this regard, the EU offers a great study case to study the supply chain dynamics, due to its political nature highly prone to free trade, and at the same time possesses one of the most significant and symbolic agricultural policies worldwide, in the form of the CAP. In a preliminary look at the data, it was shown that the three studied indicators for the cereal and vegetable commodity (the SSR, IDR and EOI) show a general trend towards external trade (especially in the IDR and EOI indicators) as supposed to the increase regionalization of trade suggested by FAO (2022). This first conclusion is both applicable at the European level and at the national level. It is also consistent with Headey (2011) who argues that trade agreements, more than economic or financial instability, are the main drivers for stopping the international trade flows in agriculture.

Assuming the validity of the FAO (2022) report's conclusion, which indicates a trade outflow stagnation since 2008, this dissertation demonstrates that the EU appears to deviate from this norm. An insightful explanation for the trend toward external markets within the EU, particularly concerning cereal and vegetable commodities, lies in the resilience of the free trade policy. Since the inception of the CAP, the EU has strongly upheld the principle of free trade has one mechanism to ensure food security. In light of this, it is worth noting that, according to the data's evolution on SSR, the EU production is characterized by an increasing surplus of vegetable and cereal commodities in relation to its internal demand.

Nevertheless, despite not being verified the stagnation in trade outflows in this specific data, that does not exempt the fact that the economic and financial crisis contributed to a change

in the dynamics of trade. The results from the panel data regression showed that the economic conjuncture had some correlation to the three studied indicators. It suggested that the economic revery of the crisis contributed, in some degree, to an increase of goods traded in the external market, relative to the national production and national consumption. Despite the weaker results from the robustness subsection, economic conjuncture can be understood as a cyclical variable that can affect in the short term the supply chain dynamics.

Furthermore, the results from the financial instability variable show more resilient results. Specially, the results from the robustness subsection confirm that an increase of financial instability on a given year is correlated to an increase of local trade in the cereal commodity. The difference in results of the cereal and vegetable commodity might be attributed to the composition of the European Bloomberg Commodity Agriculture Subindex, which is more cereal biased. Still, there is a partial confirmation of H4 which states that an increase in financialization contributes to an increase in local trade, due to the increasing marginalization of farmers that have lower access to the external market (Clapp, Isakson and Ryan, 2018).

In the analysed models, it was also included another economic indicator given by the food inflation. The results suggest that there is no evidence for a relation between the level of food prices and the degree of local trade in agriculture. However, the relevance of food inflation should not be immediately dismissed as the considered period coincided with a period of relatively stable food prices. The mean of food inflation in the 27 member states from 2011 and 2020 is close to the 2% mark, which is coherent with the European Central Bank goal for overall inflation. Such result could well be different if it would be considered the food inflation rate from 2021 and 2022 in the context of the Ukraine war, where inflation in food commodities increased unexpectedly.

However, the variable with the strongest correlation with the three analysed indicators is social exclusion. The positive relation between social exclusion and local trade can be interpreted in the form of the double movement concept. According to Karl Polanyi (1943), there is a tension dynamic between the market forces and society itself. In this case, the market force can be expressed by the degree of dependence of external trade, translated by the SSR and IDR, and by the portion of production that is directed to the international market, given by the EOI. The social pressure can be given by the level of social exclusion, as it describes the portion of the population that is marginalized from the market economy.

Such concept resonates in the numerous SFSC movements which contradicts the expansion the market economy. Galli and Brunori (2013), in discussing the emergence of SFSC movements, argues that much of the initiatives are from bottom-up movement, based on

marginalized actors in society, mainly small-scale farmers. Also, Davidova et al. (2012) notes that there is a strong relation, in the European context, between poverty and family base farming since it contributes as a form of income compensation in poverty situations. Also, most notably, Guirado et al. (2017) mentions that farming can also be used as a form of social inclusion within people that might not have a previous relation to farming. The act of communal farming, based on the principles of solidarity, democracy and inclusion, is an initiative that can succeed in integrating individuals into a community.

Moreover, the inclusion of the variable of organic production in the model is an attempt at incorporating the ecological aspect as a possible explanation for the evolution of trade dynamics. The literature around the idea of SFSC is consistent on the relevance of ecology as one integrated part in the social and economic process. One major pillar in these initiatives is the use of alternative methods of production that ensure the preservation of the land for long term production. Therefore, using once again Polanyi's lenses, the effort by the EU countries in increasing the area under organic production might be a step to minimize the commodification of land and natural resources. Therefore, a strong relationship between local trade and organic production would indicate that the incentives around the SFSC might have had a significant impact in the trade dynamics. Despite the promising results from the first Pooled OLS model, which generally validated the previously laid down hypothesis, the robustness section showed that the variable has much lower significance. Such inconclusive result might indicate that despite the efforts of the EU to shift the production methods, there is no strong connection to the dynamics of trade between the area of organic production and trade dynamics.

Overall, the results show that evolution of the trade flows are a dynamic process evolving different variables, many of which were not discussed in the present dissertation. Still, the results show that the social component should not be totally dismissed when discussing the causes and effects of trade in agriculture. As showed by the food sovereignty movement, local farmers and consumers have a great influence in deciding what and how food should be produced. Many of the bottom-up movements of SFSC can provide a great economic impact to the local community and its study is relevant in the context of a transition to a more sustainable and ecological agriculture. Thus, the economic, social and ecological factors should always be considered as intrinsically dependent factors that influence the dynamics of agriculture.

6.2 - Limitations

The first main limitation of the empirical study carried out in this dissertation is the ability of the dependent variables to capture the reality of local trade and short food supply chains. The SSR, IDR and EOI are three indicators that can offer insights on the national trade of each country relative to domestic demand in the case of the SSR and IDR and of overall domestic production for the case of EOI. These indicators are only able to evaluate one dimension of the short food supply chain, which is the geographical level, thus we cannot make conclusions about the number of intermediaries or social relations that have affected food supply chains of the countries in the EU. Moreover, assuming geographical proximity at the national level might be reasonable in some smaller EU countries such as Luxemburg, Malta or Slovenia but it might not be so reasonable to assume the same in larger countries such as Germany or France.

Second, it is relevant to mention that the use of cereals and vegetables as the base data for the empirical study serve as a sample that is extrapolated to provide a better understanding of the overall food supply chain dynamics. The understanding of how the food market evolves over time is a complex matter where many variables may cause some influence. Therefore, generalizing its behaviour on the account of only two commodities will be always insufficient. A good example on this is that the variable of economic conjuncture revealed an asymmetric value on the robust section with the IDR of cereals confirming H2 and the EOI of vegetables contradicting the same hypothesis. Still, the results can shed some light on how the instability of the market, as well as social and ecological contexts, might alter the existing dynamics of supply chain dynamics in a free market economy.

The third limitation has to do with the nature of panel data analysis and the econometric method used. By its nature, the model and the respective coefficients presented are the result of averages and general trends. This empirical study fails to provide deeper insights on country specific characteristics. Therefore, the recorded impact of the independent variables on the dependent variables might provide a good understanding on the external trade characteristics on some countries, but it can also fail to provide any valid explanation to others.

Finally, one of the main goals of the present dissertation was to comprehensively capture the full-time frame of the European sovereignty debt crisis along with its subsequent recovery. The period considered for the empirical study, from 2011 to 2020, omits the period leading to the crisis. The results are, therefore, limited in showing the true effect of the economic crisis in the structure of trade in the EU countries.

56

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Appendix

Table A 1 - Regression Analysis of Variables over Time

Variable	Time Coefficient	P-value
Cereal SSR	2.81	0.095
Vegetable SSR	0.14	0.927
Cereal IDR	1.84	0.024
Vegetable IDR	1.24	0.124
Cereal EOI	2.25	0.031
Vegetable EOI	-0.27	0.821
Social Exclusion	-0.61	0.000
Economic Conjuncture	-0.11	0.006
Organic Production	0.35	0.002
Financial Instability	-5.75	0.000
Food Inflation	-0.13	0.005