Market structure and supply chain strategies in the global agricultural commodity industry: A comparison between EU and USA

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Abstract: Agriculture is peculiar among other industries because supply risk, either through weather or perishability, challenges vertical coordination between independent farmer suppliers and commodity buyers. Moreover, production of agricultural commodities is strictly focused in some regions while there are others who rely mainly on commodities imports. The objective of this study is to provide a comprehensive understanding of the commodity market structure and how its features impact the supply chain organisation and companies' strategies. Specifically, the main sources of risks relative to wheat, corn and soybean commodities markets are investigated and related to international trade and supply chain relationships. Furthermore, attention is given to strategies and capabilities that companies working in this market implement to hedge their risks. The evidence provided is based on the case studies of two intermediaries operating in the cereal supply chain, based in USA and Europe.

Keywords: agricultural commodities; balance sheets; biofuels; futures; food industry; hedging; international trade; price volatility; risk; self-sufficiency.

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1 Introduction

Since the beginning of the 21st century, agricultural trade changed following the economic growth of emerging economies (Galati et al., 2014). However, due to the uneven impacts of climate change across regions and countries worldwide, the comparative advantage of agriculture of some countries could be altered, consequently creating unbalanced wins and losses worldwide (FAO, 2018; Yawson et al., 2020). As a matter of fact, production of agricultural commodities is now strictly focused in some regions while there are others which rely mainly on commodities imports (Crescimanno et al., 2013). This element creates an imbalance between supply and demand. For this reason, the case studies investigated in this study are focused on two main countries, USA and European Union. The former is the main producer of many commodities with a high self-sufficiency level, while the European Union is one of the main commodities' importing country. This makes the two countries on a different position for what concerns these products, on one side the US relies on agricultural exports and on the other side the EU relies on imports. Furthermore, the market for

agricultural commodities is characterised by a high degree of uncertainty (Wu et al., 2018). Production risk (e.g., uncertainty related to weather conditions), price volatility, financial risk, institutional risk (e.g., governance and international agreement uncertainty) and human risk (e.g., human health and personal relationships) affect the supply and the demand for many commodities (Apergis et al., 2020). Among those, wheat, corn and soybeans are the most important groups, considering their share in global markets, even if with a heterogeneous geographical distribution. As far as wheat is concerned, Almost half of global production stems from the European Union, China and India. The European Union is the main producer of durum wheat (mainly used in the production of pasta), but its own production is not sufficient compared to the high internal demand. In this context, France and Spain export durum to other European countries and to North Africa. Italy, due to its historical high request of wheat for pasta production, is the main importer country. In the last few years Italy started to buy wheat from France, Kazakhstan and Russia lowering its imports from North America. On the contrary, the main global leading corn producers are the USA, China and Brazil. These countries, together with Argentina, are also the main exporters of corn worldwide, while on the other side the main importers seem to be the European Union, Mexico and Japan. Finally, a similar trend appears for the production of soybeans, considered to be the most important bean in the world, being the richest and cheapest source of protein for both human consumption and animal feeding worldwide. As a consequence of trade tensions and tariffs imposition between China and the USA, dated back to the beginning of 2018, the soybeans sector faced major changes. Part of this surplus production has been offset by the higher use of domestic supplies. Although China and South Asia are among the top producers of soybeans, they do not export high amounts, contrarily, China is the major importer of soybeans. On the other side, the USA, Brazil, Argentina, Latin America, and Canada are considered the world largest exporters. These changes in agricultural trade seem to be highly related to population growth and income changes worldwide (FAO, 2018). As a consequence, the prices of these commodities reflect the force of supply and demand and inevitably shape global trade. In the recent years, high demand for food and animal feed, a decline of stock-to-use ratios and an increasing production of biofuels have created market shocks and price volatility (Boere et al., 2015; Matesanz et al., 2014; Hossain and Serletis, 2020; Oladosu and Msangi, 2013; Persson, 2015). Food prices have experienced huge fluctuations in the last decade. Since 2000, thanks to structural changes in the global agricultural market, prices of agricultural commodities increased, especially between 2007 and 2008. At the end of 2008, instead, because of a series of market shocks, there was a fall of agricultural commodity prices (Cinar, 2018). Agricultural kept declining until 2010 when price slightly rose again. After that, in 2015 and 2016, world prices reflected the appreciation of the US dollar (FAO, 2018). Many researchers explained these huge fluctuations as a response to the fundamental drivers, demand and supply (Amrouk et al., 2020; Arnade et al., 2017; Balcilar and Bekun, 2020; Bentivoglio et al., 2016; Han et al., 2019). However according to other researchers' demand and supply were not able to explain by themselves the reason of these price movements. It was recognised that in the same period of these great fluctuations the commodity futures market changed. Trading volume and open interest positions increased and the market participants widened (Al-Fayoumi and Abuzayed, 2014). Commodities are heterogeneous and they often suffer of high storage and transportation costs, and possible other risks such as natural disasters have always made agricultural commodities very vulnerable and difficult to predict so it is normal for

companies to try hedging the risk of price movements through commodity contracts (Adanacioglu, 2011; Fernández-Olmos and Marín Vinuesa, 2009). At the same time, it is convenient for speculators to use futures contracts to have a profit from the future price movements. Speculators and hedgers use the same future contracts but for different purposes: the hedger wants to protect himself from price movements, the speculator wants to gain from price fluctuations (Guilleminot et al., 2014; Haase and Huss, 2018). The increased presence of speculators and hedgers in the commodity made this market more likely to a financial market and this is the reason why the phenomenon is also called 'financialisation' of commodity markets, ensuing from the increased speculative activity in this market (Gagnon et al., 2020). The main problem with this phenomenon is that it is not being used anymore as it was intended in the beginning. The purpose for the use of financial instruments was to help producers and other end users to deal with possible risk drivers related to their activity and with the physical market. Nowadays the term financialisation refers more to the wide use of speculative activity in commodities market provided by agents who do not have interest in a physical exchange of these goods. These people have no interest in a real physical exchange of commodities but they try to make a profit from the commodity prices movements. The objective of the paper is to provide a comprehensive understanding of the commodity market structure and how its features impact the supply chain organisation and companies' strategies. Specifically, the main sources of risks relative to wheat, corn and soybean commodities markets are investigated and related to international trade and supply chain relationships. Furthermore, the attention will be focused on strategies and capabilities that companies working in this market implement to hedge their risks.

2 Literature review

2.1 Commodity price volatility

The financialisation of commodity markets led many researches to wonder if this growing phenomenon could have been related to the rapid growth in commodity prices (Santeramo and Lamonaca, 2019; May, 2015). According to existing literature contributions there is evidence that speculators do not destabilise commodity spot prices in a large scale. Stoll and Whaley (1990) used 12 different commodity future contracts from US Commodity Future Trading Commission and they performed the Granger-causality test on return to determine the results of their studies. Bohl and Stephan (2013) analysed data from six agricultural and energy commodities and measured the return of each asset using an autoregressive conditional heteroscedasticity model. Both studies had the result that financialisation of commodity markets does not make them more volatile. Different outcome was found out by Cooke and Robles (2009). The focus of their work was to find out the possible reasons for the high price volatility of commodity markets from 2006 to 2008. They analysed all those factors which could have been the cause of this volatility, one of these elements was the increased number of contracts in the financial market. The study was performed looking at the volume of commodity futures, open interest of futures contracts and non-commercial to total trade ratio of four different agricultural commodities. They used Granger causality test to verify if there was a correlation between the commodities increased prices and the number of total futures commodities contracts. They found out that there was empirical evidence about a positive

relationship between these two factors. The results explained that financial activity and speculation in futures market can explain the behaviour of the commodity prices under the period taken into consideration. According to the results of their studies, the financial activity was the only factor under examination able to justify such prices movements.

2.2 Supply chain relationships in the agri-food industry

Basics of supply chain management consider relations between different actors and parties as transactions; this interpretation derives firstly by neoclassical economics, with Coase's theory and secondly and more precisely with Williamson's Transaction Cost Economics (TCE) theory. According to this theory, firms organise themselves and their relations in order to minimise the cost of transactions they sustain. Williamson (1979), showed how each transaction is defined by its asset specificity (the extent to which use of the asset its specific to precise purposes), frequency (how frequent the transaction takes place) and uncertainty (extent to which the occurring of the transaction is uncertain) (Havlík et al., 2005). As a consequence, depending on transaction attributes and behavioural factors pertaining human definition (bounded rationality and opportunistic behaviour of decision makers), firms organise their transactions with other parties using different governance structures. Agri-food supply chains have been widely studied through these theories (Ménard and Valceschini, 2005; Wever et al., 2010, 2012) and, among these, recent cereals supply chain dynamics drew particular attention. Kennett et al. (1998) showed through a case study from US wheat industry how quality of grain commercialised affected supply chain arrangements between actors. In particular, authors compared the US and Canadian wheat quality systems and what they found is that the more efficient Canadian quality system may partly explain the tendency for greater vertical integration between grain companies and flour mills in the USA than in Canada. This is because uncertainty due to 'greater functional quality variability within US grades than Canadian grades' is managed through vertical control over grain suppliers. Vertical coordination is referred to the means by which products move through the supply chain from producer to consumer. This means that strategic alliances, joint venture, and marketing contracts widened while the use of sport markets declined (Hilman and Mohamed, 2011). Factors leading through this process are changing in consumer preferences, information technology, environmental pressures and even more the reduction of global trade barriers (Camanzi and Giua, 2020; Sultan and Wong, 2011). In this light, Hobbs and Young (2000) assessed the same phenomenon in US grain industry; in their work closer vertical integration is studied as a consequence of many changes in socio-economic, regulatory or technological drivers. Within the latter category, 'new highly differentiated grain products' increased the vertical coordination since new grain varieties (e.g., varieties with enhanced traits) require specific production practices and identity-preserved marketing channels which are often specified through rigid contracts. In this sense, the biotechnology revolution and the differentiation of food products on the basis of intangible attributes have changed the agri-food market for two main reasons. First of all, it has motivated the identity presentation, branding and differentiation of agricultural products in response to increased demand for highly differentiated food products servicing different consumer segments (Tselempis et al., 2019). The second reason is that technological change has allowed to the protection of intellectual property rights. In the USA for example the private sector has introduced new input and output trait varieties leading to an increase in contracting between seed

companies, farmers and processors enabling those who have invested in the technology to benefit from that. Moreover, it is important to point out that the increased use of contracts might affect the viability and existence of a spot market price. On one side, contract production is associated to different costs and benefits to the producer relative to production for the spot market. On the other side, closer vertical linkages may provide producers with access to more and better information which can be positive since it reduces research costs for the producers, but at the same time the producer will be involved in long-term contractual obligations. In this respect, Fischer (2013) studied the role of information and trust at two supply chain stages (farmer-processor and processor-retailer) of European food commodities supply chains. They found that positive past collaboration experience together with effective communication among supply chain actors are important determinants of trust in business relations (Castellini et al., 2014). Since closing contracts or conducting negotiations with suppliers or buyers are more time consuming and costly options, trust is found to be a relevant factor which might reduce costs relative to contracting. Finally, it has to be mentioned that vertical integration might present some additional drawbacks; firstly, access to the market by producers may require investment in specific asset in order to follow proscribed cultivation of feeding methods or to do a periodic consultation inspection with downstream partners. In addition to that, a relevant issue common in the entire agricultural market has always been related to the relative bargaining disadvantage of producers resulting is an inefficient allocation of resources and a loss in social welfare. The consequence of a rationalisation and increasing concentration in the input supply processing and distribution sectors has always been a challenge for governments to ensure that the losses of welfare and an abuse of market power are avoided. For this reason, competition and antitrust regulations have a key role which is not easy due to the lack of market price information in a vertically linked system. Moreover, closer vertical linkages may lead to the possibility that large contractors will use their market power to depress prices paid for inputs, and to make other contract conditions disadvantageous for producers. For this reason, producers formed associations to bargain collectively with the processor, which act as labour unions. In the EU this role is covered by producer organisations while in the USA, the Agriculture Fair Practices Act offers protection to farmers and ranchers who form associations to deal with processors and handlers for better prices and contractual terms. In addition to these associations, commodity groups may have a key role contracting for fair negotiations. They are in charge of bringing together large and small producers, processor, attorneys and other relevant key players to deal with in order to have contracts that will serve the needs of all the parties involved.

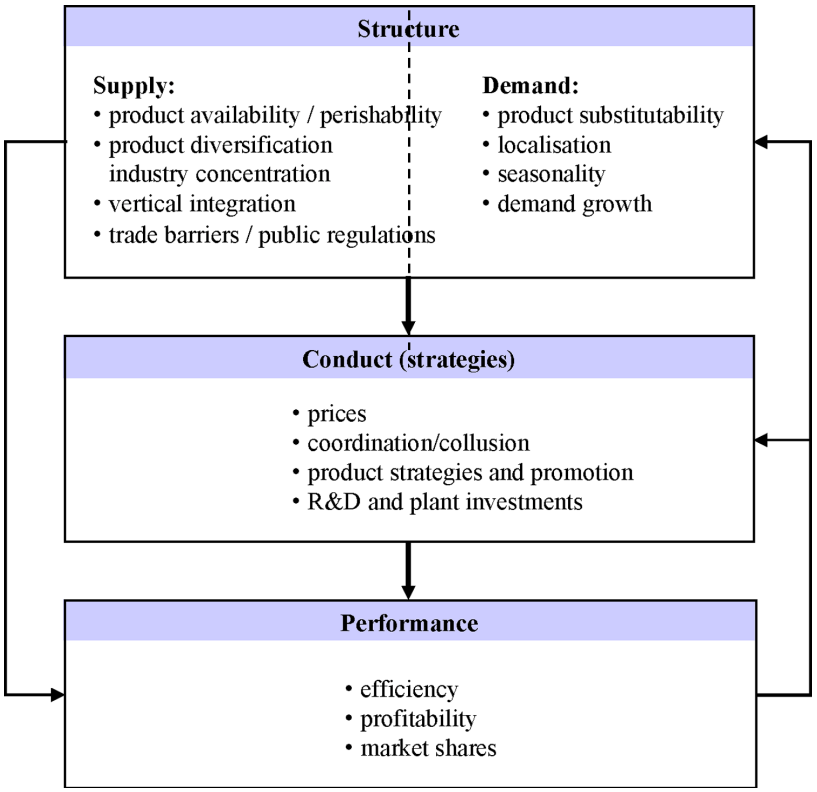
3 Theory

The research conducted draws from the Industrial Organisation (IO) and New Empirical Industrial Organisation (NEIO) theories with the aim to provide a realistic description of the characteristics of oligopolistic markets and firm strategies in the agricultural commodity industry. IO and NEIO studies are based on the concept of the company as a complex organisation of resources – not linked to the single market – which adopts diversified competition strategies in a logic of development and which, above all, is capable of influencing the surrounding economic environment (Bresnahan and Schmalensee, 1987). The conceptual structure used combines applications of

microeconomic theory (price theory specifically) with the one of well-being in order to study the behaviour of economic agents in alternative market conditions (structures) and evaluates the economic deriving results. The traditional paradigm of industrial economy is articulated in the various interpretations of processes of interaction between the market structure, the operating behaviour of companies and the results in economic and social terms within the industry. In other words, a firm's performance is connected to its conducts which, in turn, is believed to depend on the structure of that industry, from which it comes the name of 'Structure-Conduct-Performance (SCP) paradigm' (De Figueirêdo Junior et al., 2014). The SCP paradigm, which originally developed from empirical observations of markets and business behaviour, offers a flexible analysis tool that has evolved with the progress of theories and the economic system and it was supplemented by other ideas deriving from oligopoly theories and business theories (i.e., the 'neo-institutionalist' approach by Coase and Williamson), incorporating main elements characterising the studies on demand (Aoun and Omezzine, 2005; Caswell and Perloff, 1993). The market structure of a firm includes all those elements taken into consideration in order to determine his or her production and marketing policy. Tran and Tian (2012) identified some factors which can determine the organisational structure of a firm. These can be external such as economic factors like economic characteristics of a product (final or intermediate, durable or non-durable, differentiated or standardised), market concentration, demand conditions (e.g., sales performance, seasonal or cyclical fluctuations) or the nature of the distribution channels (e.g., B2B or B2C). The factors can also be internal such as organisational characteristics like mission statement of the organisation and organisational instruments. Other important structural factors concern the degree of diversification and productive integration, the minimum efficient operating dimension and the conditions of information and risk (Mahmood, 2010). With reference to economic behaviour, the role of price strategies, the level of cooperation achieved over time between economic agents and the use of differentiation and diversification strategies must be determined (De Figueirêdo Junior et al., 2014; Archer et al., 2008). The structure of an industry or market can be considered the most important, though not the only, determinant of business behaviour. Therefore, it will not be possible to adequately describe or fully understand the behaviour of a company without placing it in the context represented by the industrial structure in which it operates (Caswell and Perloff, 1993). However, it would be a mistake to assume the structure of an industry as an exogenous factor or as the assigned starting point of our analysis. Understanding how the current structure has evolved and identifying the existing forces that contribute to its stability or change is just as important as the description of the features currently found. Some changes in the structure of an industry can be intentionally introduced by companies with their behaviour (De Figueirêdo Junior et al., 2014). The clearest example is represented by the merger and acquisition activities. Even the barriers to entry for new businesses, considered among the most important structural determinants of an industry's conduct, can be 'natural' (as in the case of a scarcity of essential resources or important economies of scale in relation to the size of the market), but they can also be artificially induced by behaviours such as huge and persistent advertising campaigns, with which companies gain consumer loyalty to their brand (Ménard, 2005). At the same time, the economic performance of an industry is determined by the conduct of the companies included in that particular structural configuration (Ferraris et al., 2016) and therefore it is not

possible to identify the determinants of the results without studying both the market structure and the behaviour of the companies. All this considered, the conceptual framework adopted in this study is the one depicted in Figure 1.

Figure 1 Conceptual framework (see online version for colours)



4 Research methodology

The research is conducted by means of secondary data elaboration and case study analysis. First, the main regulatory frameworks and financial instruments adopted in the global agricultural commodity market are considered along with macroeconomic data (by means of supply balance sheets analysis) to highlight the distinctive structural features of the industry. Then two business cases, i.e., INTL FCStone and COFCO International, respectively from USA and European Union, are investigated to provide insights on different company strategies and performances.

4.1 Secondary data elaboration

Secondary data coming from both USA and EU have been analysed with the use of Supply Balance sheets. The Supply balance sheet is designed to compare resources and uses of a product or products in a reference area and over a reference time period (Eurostat, 2001). The supply balance sheet is composed by different elements, one of the

main important is the production at the national holding level. A second element present in the supply balance is defined as beginning stock, which refers to the amount of unused but stored quantities present at the beginning of the reference period at all levels from production to the retail stage. The third element which forms the supply balance is import value. By adding these three elements it is possible to determine the total supply of the commodity under examination in the defined country. After that it is important to compute the exports of the country under investigation and its ending stocks which refer to the final amount of stocks still present at the end of the reporting period. Subtracting to the total supply, exports and ending stock, the balance sheet gives as result the value of the domestic consumption (Eurostat, 2001). To summarise, supply balance sheets are produced in table forms showing for each commodity its total supply, import, export and domestic consumption for a given period in a reference territory. The data presented in balance sheets are necessary to analyse the structure and development of global markets and to provide statistical evidence for an oriented agricultural policy decision. After the different data have been included in the supply balance sheet, self-sufficiency and import and export propensities are be calculated. According to FAO (2016), self-sufficiency is defined as the extent to which a country can manage to satisfy its internal food needs from its own domestic production. More precisely, self-sufficiency is measured by the ratio of production over domestic consumption. Import propensity and export propensity of a country can also be calculated. Import propensity and export propensity are defined as the ratios between import and domestic consumption, and between export and production respectively. Hence, it is evident that higher values of these trade indicators for a country imply greater dependence on foreign markets.

4.2 Case study analysis

Two case studies were conducted through in-depth interviews with key actors from two companies: INTL FCStone in the USA called and the Italian branch of COFCO International. Both companies are multinational and work in the same field but they work under different input circumstances. INTL FCStone Inc. is a financial services organisation, providing integrated risk management services such as market intelligence and analysis to help commodity traders in industries like agriculture, renewable fuels, energy, food service, carbon credits, and forest products, to help them protect their margins and manage volatility. COFCO, China National Cereals, Oils and Foodstuffs Corporation is one of China's state-owned food processing holding companies, supplying agriculture products around the world through a global integrated supply chain. COFCO International Italy is a subsidy of the COFCO corporations operating in Ravenna. In this branch of the company the activities are mainly focused on three commodities which are wheat, corn and soybeans. On one side the American company, due to the high level of production in the USA, has a higher level of information about the production compared to the Italian company. On the other side the Italian company works basically on buying and selling commodities. The interviews have been administered through a direct approach with the respondents in both companies, by creating a dialogue with them. At COFCO International Italy the interview has been done with its CEO while at the INTL FCStone the respondents were representatives of the Market Intelligence division, the OTC Trader division, the Risk Management Consultant division and the Global Head of Customer Engagement. The interviews had the purpose to understand how these two companies use financial instruments to hedge possible risk related to the activity

performed and how these companies' advices their clients. The interview has been divided in five different macro categories. The first one has the aim to understand the services the companies offer to their clients and how many companies work in their same field. The second category aims to clarify companies' clients and their relationship. Along with the clients' information it is important to understand which are the main services the two companies provides and how they differentiate themselves from their competitors. Moving forward, the attention focused on the technique they use to evaluate the financial position of their customers and the methodologies employed to do their forecast and their financial evaluation. In the end, the interview focus shifted to the future of the company. Another relevant aspect it was related to how the companies remain current on the market due to the increasingly volatility of this market and its rising importance.

5 Results

5.1 Main regulatory aspects

The structure of the global commodity market is influenced by both public support policies and financial instruments adopted. EU and USA are two major players on the world food market and the main countries providing the highest economic and policy support to agriculture (OECD, 2019). Nevertheless, they differ when it comes to the allocation of this support. For instance, the USA provides huge support to specific sectors such as wheat, cotton, oilseeds, sugar and dairy while the European Union gives support to a broader range of farm and food products. Support to farm is slightly higher in USA than in Europe as well as for non-commodity programs where in USA it accounts for less than 0.7% of receipts and in Europe it accounts for less than 0.3% of receipts annually. Despite this, in terms of total spending, the European Union provides more support, in aggregate, than the USA for both production-based programs and non-commodity programs (OECD, 2019). As a further major structural issue, the global agricultural commodity is strongly linked to financial markets where actors trade financial securities and derivatives such as bonds, options and futures at low transaction costs. A major role in these markets is played by derivatives. *Derivatives* are securities that are derived by the prices of other securities. They are used for both hedging, speculation and reducing transaction costs purposes. The pay-off depends on the value of other securities considerate when settled the current price. The hedging activities can be summarised as the activity of a company or a person entering in a derivative contract to reduce the risk to which they are exposed. Speculation activity instead is based on the opportunity to make some profit investing in derivatives. The last purpose of using derivatives contract is to reduce transaction costs when involving in a financial transaction. The derivatives market is used especially for the first purpose so to hedge against possible risks. Financial markets are organised in two ways: the exchange and the over the counter. *Exchanges* can be done through stock market or derivatives exchange and began as physical places where trade took place. However, due to the technological advances nowadays exchanges in physical places have almost been completely eliminated. *Over the counter markets* are usually less formal, well organised and they usually are used by one or more dealers. In this case the dealer represents the market maker. They quote prices at which they will sell or they will buy a security, currency, or other financial products to other dealers and to

their clients. They are not obliged to offer the same price to all the other dealers or to all customers. Dealers in the OTC security have also the opportunity to back down from the market at any time. This opportunity makes the market riskier compared to the exchange since a withdraw can cause liquidity to dry up and cause trouble to the market participants to buy or sell. One of the main differences between the exchanges and the over the counter market is that the last one has never had a physical location.

Swaps are financial instruments belonging to the derivative category. According to a swap agreement two parties agree to exchange or swap a series of cash flows with an established frequency and on a specified time horizon. The swap contract which is signed up by both parties need to specify the terms of the swap which include the value of the cash flows, payments frequency and dates. Since swaps are highly customised and not easily standardised, the swap market is considered an over-the-counter market, meaning that swap contracts cannot typically be easily traded on an exchange. However, the swap market is one of the largest, most liquid and most competitive in the world. Another type of contract is the *future contract* which belongs to the derivatives products. It is a contract between two parties which force to buy or sell an asset for a price determined today with delivery and payment at a future date called delivery date. Hedging and speculation activities are deeply involved in the use of futures contracts. When the futures contract is established, the two players decide and lock in the future price. This price will be paid on the delivery date. According to the functioning of this speculative tool it does not matter what will happen in the future at the price of the asset in the contract because the price has already been locked in so the delivery price is fixed and it cannot change. A commodities futures price is the price of the commodity in relation to its current spot price, time until delivery, risk-free interest rate and storage costs at a future date. *Options* are financial contract belonging to the derivatives instruments. This kind of contract gives to an investor the right, but not the obligation, to buy or sell an asset at a pre-determined price defined as strike price on a specified date defined expiration date. Futures and Options are both derivatives instruments with their pros and cons. Considering the differences between the two tools it can be stated that futures are more liquid than the option and they are more used for day trading purposes.

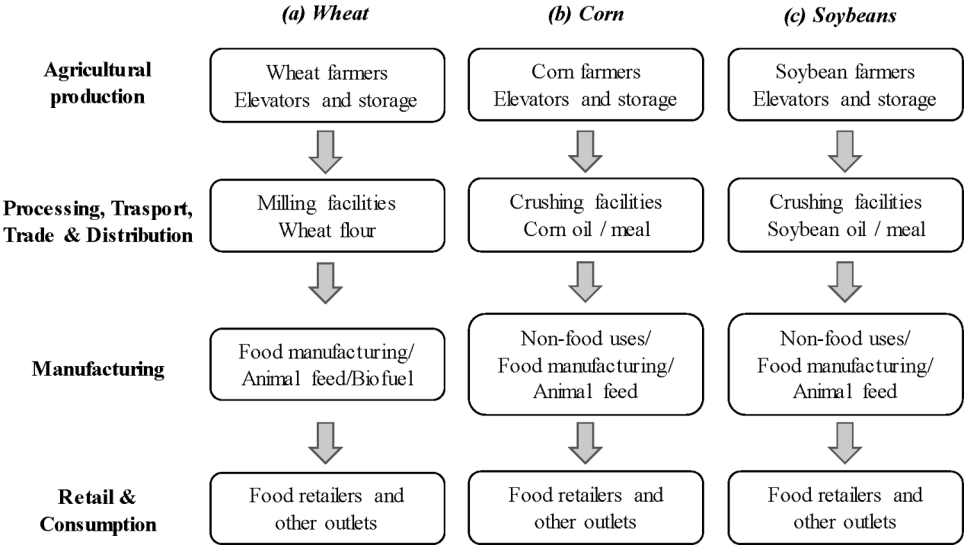
5.2 Supply chain structure of the main agricultural commodities: corn, soybeans and wheat

Wheat is the mostly widely grown cereal crop, farmed on more acres than any another commercial crop. Wheat is produced all around the world and its production tripled during the past 50 years. The top five producing nations are China, India, USA, Russia and France and together they account for about the 50% of the total global production. Worldwide wheat is mainly produced by smallholders which often face significant challenges to access the market. Moreover, due to their dimension it is also difficult for smallholders to be able to support productivity improvements which require technical and financial resources that they may not have. In order to face some of the issues caused by the intensive wheat production many players along the value chain are involved in alliance and agreements to provide support for continuous improvement efforts by farmers (Figure 2(a)). Another widely produced cereal is corn. In 2018–2019, the USA was the largest producer of corn followed by China and Brazil. Production of corn increased in the past years due to the always higher demand for corn for animal feed and biofuels production. The corn value chain is extremely complex because it is

made up by many players in the field and it also involves many sectors. As already said, it has three main uses: feed, seed and industrial. Many players such as producers, buyers, government and associations are collaborating to ensure a long-term sustainability of corn production (Figure 2(b)). Finally, another extremely important cereal in world agricultural trade is soybean. Its production increased more than the double over the past 20 years.

The demand growth for soybeans is related to the increase in meat consumption since soybeans are widely used in livestock feed. The main producers of soybeans are USA, Brazil and Argentina. Players involved in the soybean supply chain are getting more and more involved in the issues and risks underlying the increased soybeans production and are collaborating to promote improvements in row crop production practices (Figure 2(c)).

Figure 2 Simplified supply chains of (a) wheat; (b) corn and (c) soybeans



For each of the three above mentioned commodities, supply balance sheets of both the USA and the EU have been calculated (Tables 1 and 2). Starting with the case of the USA, evidence from Table 1 shows that corn seems to be the highest produced commodity in the USA, the most exported one as well as the major commodity for domestic consumption. Nevertheless, it is interesting to notice that soybean is the second most exported commodity, with a high level of internal consumption too. The commodity registering the highest level of imports is wheat, confirmed by the fact that internal US production of wheat is the lowest among the three commodity groups considered.

Moreover, from these balance sheets it is also possible to estimate country's self-sufficiency, its propensity to import and its propensity to export for the commodity under consideration at the specific reference period. For the US case, results of these ratios showed that the highest self-sufficiency among these cereals is registered for soybeans (212%) compared to wheat (165%) and corn (117%). Moving to import propensity,

the highest value has been found for wheat (12%), compared to soybeans (1%) and corn (0%). Finally, export propensity of the country has been calculated too. The highest export propensity of USA has been found for wheat (5.4%) compared to soybean (4.3%) and corn (1.6%). Moving to the case of the EU, evidence from Table 2 shows that wheat is the highest produced and exported cereal in the European community as well as the commodity with the highest level of domestic consumption. It is then followed by corn which seems to be the second highest produced and domestically consumed cereal, as well as the most imported commodity once compared to wheat and soybean.

Table 1 Wheat, corn and soybeans balance sheet in USA in 2018–2019 (1000 MT)

Commodity	*Beginning stocks*	*Production*	*Imports*	*Total supply*	*Exports*	*Ending stocks*	*Domestic consumption*
Corn	54,367	375,374	1,270	431,011	62,868	46,056	322,087
Soybean	11,923	127,631	680	140,234	56,064	24,088	60,082
Wheat	29,907	51,287	3,810	85,004	27,896	26,028	31,080

Table 2 Corn, soybeans and wheat balance sheet in EU in 2018–2019 (1000 MT)

Commodity	*Beginning stocks*	*Production*	*Imports*	*Total supply*	*Exports*	*Ending stocks*	*Domestic consumption*
Corn	9,510	61,000	19,500	90,010	1,500	6,010	82,500
Soybeans	1,873	2,700	15,800	20,373	300	1,823	18,250
Wheat	14,549	137,500	6,000	158,049	23,000	10,049	125,000

It is now possible to estimate also for the case of the EU its self-sufficiency and its propensity to import and to export for these commodities. Results of these ratios showed that the highest self-sufficiency among these cereals is registered for wheat (110%) compared to corn (74%) and soybeans (15%). Moving to import propensity, the highest value has been registered for soybeans (87%) compared to corn (24%) and wheat (5%), while the highest export propensity of the EU has been found for wheat (17%) compared to corn (2.4%) and soybean (1%).

5.3 Company strategies

INTL FCStone provides risk management products such as future hedging but at the same time it participates in the physical cash grain trade not as principal but as broker. The company works for his customers in order to mitigate their risks when buying grain from producers, showing them how to use futures market. FCStone operates also on the Over-the-Counter market by offering to their client what is lacking in the exchange market. On this market the company deals more with its domestic brokers but part of the work is done on the international market as well. The company deals with clients not only on the futures derivatives side but also on the physical market which enables the company to make recommendations when to hedge, when to sell forward and when to sell physical. The main focus of the company is on its customer trying to give them the best service possible and to respond to all their needs. FCStone has also a platform defined IRMP, Integrated Risk Management Program, where it is possible to access to

hedge records and monthly reports and customers can identify and quantify all commodity risk that they may have in their business. On the other hand, COFCO is mainly retail and trading company who buys agricultural commodities to sell them in the country in which it operates. In this case the company focus is on three main commodities which are: soybeans, wheat and corn. COFCO International Italy imports mainly from South America, North America and East Europe by ships to sell these commodities to Italian companies. The reason of their function is related to the fragmentation of the Italian market which is composed by small companies unable to afford the shipping cost by themselves and with no relation with commodities producers. COFCO buys from surplus regions and then stores the product in warehouse to sell it in the end to other companies. In Italy there are about 8 or 10 companies working in the same field and offering the same service. All these companies are multinational, there are no local companies providing the same service. One of the main determinants in this market is related to the price and to the service offered to buyers. Buyers usually require the just in time service, this is the reason why the punctuality is so important in this specific sector. Moreover, COFCO performs an advisor activity to its client helping to choose the right time to close a deal and to reduce the risk their client could incur in. In INTL FCStone, the customers are both producers and increasingly more consumers. Traditionally FCstone customers were mainly grain elevators and it is continuing to be like that. They have Brazilian customers who are especially farmers and producers while US customers are more ethanol processors, livestock feed and grain elevators. The producer segment of the company is called No Risk Program and it is primarily made up for larger consumers than for small producers. FCStone educates its client toward a more comprehensive knowledge about the base risk and how to manage their risk. This is one of the reasons why their clients are so loyal to them, by instructing them, the company ensures its clients' fidelity. The company provides to its clients a risk academy which is made up of two days of risk hedging seminars where clients start to understand what they can do and what FC provides to them. The customers' engagement team covers marketing sales support as well as some aspect of market intelligence creating awareness with potential clients from the formal introduction to the account openness. Differently, COFCO customers are divided in three different categories: animal feed companies, companies producing flour and the last group is composed by merchants who serve the country's smallest companies but working primarily with feed companies and feed compounders. COFCO builds the relationship with its client based on personal and professional connection. Traders go to Italian Commodity exchange where there are all multinational companies, businesses and brokers as well. At the exchange is where all these players meet each other and where relationships with clients begin. The majority of the clients uses the just in time method which requires COFCO services to be provided in a timely manner and with extreme professionalism. The relationship with client is based on a quality and timely service. In INTL FCStone, most of the work is done with corn, soybeans, sugar, coffee and wheat. Of these commodities about 30% of wheat is hedged and about 60% of world corn is hedged. Corn market is one of the most developed and it is widely used in hedging activities. The futures platform is the most used one and the most required by companies. On the international trade, instead, the physical arbitrage is widely used. According to their perspective producers do not use enough forward contract probably because the market left them behind. So, the company is involved in producers' education running schools and performing education program for their farmers. Similarly, COFCO performs a hedging activity in Chicago, for what concern

soybeans, and in Chicago and Matif for corn. The main financial instruments used are futures and options. The company does not use speculation and not even the Over-the-Counter market. Multinational companies are structured companies which work more or less in the same way and offer an equivalent service. What make the difference between companies working in the same field of COFCO is the structure and the timely response to customers' needs. COFCO is structured such as there is a decisional local power able to respond to customers' requests in a timely and efficient manner.

5.4 Company performance and market outlook

FCStone works on futures and options market but at the same time it is still involved on the physical market delivery. In order to do a better analysis of what they can and they cannot trade they need to watch at all possible scenarios which affect the production such as weather condition and other possible outcomes affecting it. In order to use their services, it is necessary for them to evaluate the company position related to company's' suitability for the product, if the company wants to use hedging or speculative services and which is the relationship with their bank. It is important to understand if the customer can afford what he or she wants to operate on a financial perspective. In some cases, especially in Europe, companies are family-based companies which are not willing to show to the FCStone their financial report. This, clearly, brings some restrictions to what FCStone can do for them. In these cases, they try to accommodate the client by opening an account for them but without all the required information it is not possible for the company to give them what they ask for. Hence, FCStone mitigates its risk by landing to these customers less than what they ask for. The main reason why it is important to be careful in this situation is to avoid being involved in a money laundry position. Besides, it needs to be said that FCStoen works under the CFTC, Commodity Futures Trading Commission, which has a very restrict requirement about what the company can and cannot do.

In the case of COFCO, in order to provide information and advices to its client, the company performs a fundamental analysis based on supply and demand. After that, analysis focus moves to macroeconomic, technical and graph analysis. In this market it is important to be updated on the global factors impacting the supply and demand as well as other factors impacting prices and commodities supplies. Another relevant factor is the position of speculative funds which create an imbalance between supply and demand. In FCStone, to be always updated on the industry development in this market, it is important to work seven days a week. They need to monitor national as well as international news for stories that might impact not only supply and demand fundamentals but also the money flow. Risk on the financial market derives not only by a frost or a freeze but also from a terroristic attack. The company needs to be updated everyday about possible turnovers of the market. The focus of the company is to be transparent for their customers, designing risk management programs around customers and by regularly report to them the results of their activity and showing how it is possible to improve their financial position. Moving to the Italian case, a different market analysis technique is implemented. In order to provide the best service to clients, multinational companies as COFCO are structured so that they have different research departments. Usually there is the fundamental department, macroeconomic research department,

technical and graph research department and statistic department. Analysis made by these goes to the strategy unit which connects all these data in order to decide the best choice and to best advice for their clients.

6 Discussion and conclusions

COFCO International as well as INTL FCStone work with commodities, in particular agricultural commodities. The main and more evident difference between these two companies that needs to be pointed out is that they are working with two different perspectives. If, on one side, INTL FCStone based in the USA works with a producer perspective, COFCO in Italy works as a buyer. In addition, INTL FCStone operates on the physical delivery of commodities but at the same time the company does much of its work as speculators. From this point of view, the company does not provide the physical delivery of products but simply uses financial instruments in the agricultural market to make a profit for their clients. On the contrary, COFCO is not used to speculate on this market but as said they use speculation only in extreme cases doing an over hedging or an under hedging. Another difference between the two companies is that while INTL FCSTone uses widely the Over-the-Counter market, COFCO does not use it at all. According to the INFTL FCStone using this market is fundamental for them since their customers require tailored financial contracts more than the simple and standardised ones provided by the financial market. These two companies make decision for their customers starting from two different perspectives. In addition, it is relevant to highlight that in this market it is not easy to have access to information. Vertical information flows are costly for buyers. The supply is variable all the time, either in terms of quantity and quality, for this reason the buy-side is hedged and needs to keep opening alternative supply sources. However, buying from a competitive market enables buyers to manage their price risk through stocks and futures market. Moreover, it is important to underline that US value is based on cheap production while Europe is based on small family farms, facing higher costs. In order to best perform their job and advice their client, both companies need to be always updated on everything that happens on the market. As the Representative of the Market Intelligence division at FCStone, said: “it is not enough to use the fundamental and technical analysis, but it is important to monitor the money flow”. This means that basically everything that happens in the market needs to be under control because everything can affect prices of agricultural commodities. Finally, both companies have an intermediary position between producers and buyers. Their role is fundamental in the market because producers as well as buyers need to have access to the market. This is because neither of them has the tools to be in touch without these international companies able to connect producers and buyers operating worldwide. The purpose of this work was to understand the main drivers in the international trade of agricultural commodities market and how companies working in this field try to hedge their risk though contracts and financial instruments. Another key issue has been to analyse the commodity market structure and how its features impact the supply chain organisation and companies’ strategies. By analysing the market structure, the work pointed out as agricultural commodities production is focused in some countries such as USA, Brazil and Argentina while countries such as the European Union are mainly focused on importing these products. Data shown demonstrate how USA is the main producer of corn as well as of soybeans and its level of self-sufficiency is by far higher

compared to the European self-sufficiency level. Even though production levels are really high in some countries, it has been proved that the growth rate of agriculture production is not anymore able to keep up with the growing population. This means that to keep up with the increased demand of agriculture commodities the agriculture sector will need to increase its efficiency. Looking at the features of the agricultural commodities market it is possible to say that participants in the agriculture value chain are subject to many risks that threaten their financial well-being and survivability. On one hand price variability introduces risks for companies working in this market such as growers, food companies and consumers. Price levels have a direct effect on crop decision and on production output for industry and, consequentially, on food price. On the other hand, product differentiation and increase in contracting lead to commodities supply chains to be increasingly vertically integrated. These trends can be observed, even to different extents, in both USA and Italy; although closer vertical integration may make supply chain transactions more efficient for grain industries, issues of bargaining power and market concentration might lead to some inefficiency due to unequal value distributions. Companies working in this field need to be able to deal with this volatility and with other mentioned risk related to the commodities supply chain in order to survive. Kennett et al. (1998) intuitive work forecasted that countries such as USA would have developed supply chain management more quickly, also for the traditional presence of private companies which carried out most of the trade. More in general, US comparative advantage in cereals production and handling (advanced grading system and grater quality variability) and the greater propensity to export make the entire supply chain management system more advanced, especially on international trade side. Indeed, *financialisation* of agri-food commodity trade contributes to control part of the risks which derive from these transactions, in particular exchange-rate risk (Santos, 2002). At the same time, European historical dependence on US cereal imports counterbalances its limited productive capacity. In the Italian case in particular, the strong presence of processing industry requires great imports of raw material. Due to these differences in both productive and commercial capabilities and orientations, actors which occupy similar positions within cereal supply chains reflect different specialisation in services offered. While INTL FCStone is more involved in financial services (included speculation) other than commercial transactions, COFCO Intl Italy offers services more oriented towards real economy, thus on organisational and managerial sides.

6.1 Managerial implications

The findings of the empirical study conducted are expected to provide useful insights for supply chain actors, particularly concerning the risks and opportunities arising from the intrinsic price volatility of global agricultural commodity markets. The evidence provided in this study pointed out that, despite the price volatility issues and supply chain dynamics characterising all the commodity groups considered and entailing relevant risks for all actors operating in the industry, differences in both productive, organisational and commercial comparative advantage are reflected in the business orientation of intermediaries of cereals supply chain.

6.2 Study limitations and future research directions

The empirical part of this work is composed by a case study of two trade intermediaries in the cereal supply chain. Although this qualitative methodology permits to thoroughly investigate strategies implemented within the supply chain, it presents important limits in extending and generalising results found by authors. Nonetheless, results found give interesting insights for future research; an interesting theme might be to further explore the relation between the supply chain governance and market strategies or business models of vertically integrated downstream actors, such as intermediaries, export agencies or international retailers. Moreover, the increasing role that financial tools are playing in agri-food commodity markets and the effects that this phenomenon will have on future industry dynamics is a topic which might lead to interesting results.

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