Heterogeneity in international value chains: The economic function of French brokers in the fresh fruit and vegetables import industry

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Very Preliminary version – Please do not quote – All comments are welcome

Paper prepared for presentation at the 149th EAAE Seminar 'Structural change in agri-food chains: new relations between farm sector, food industry and retail sector' Rennes, France, October 27-28, 2016

Abstract

Using very original data in the import industry of fruits and vegetables, we consider the activity of trade intermediaries in an active way. To stick to recent developments of international economics literature and using the definitions provided by organizational economics, we argue that it worth considering brokers might have heterogeneous activities. Accounting for their heterogeneity we identify that differentiated value chains co-exist at the border point of the European Union market. We also highlight that French importers implement different safety strategies.

1. Introduction

In France, the 2013 “horse gate crisis” has received a large media coverage and has brought one very crucial information to public attention: global food supply chains do involve brokers. Their activities are supposed to reduce transactions and information costs on food items (and especially search costs on quality). They are also suspected to steal value added in the supply chains. However, it has been shown that brokers maintain and position their activity in international value chains. Both the resilience of intermediaries’ activities and the debate around their role in international value chain induce that there is a need to be interested in their economic functions. This article aims at a better understanding the economic function of brokers highlighting their heterogeneity in providing food safety.

Indeed, intermediaries are now playing a key role in "the safety world food supply" (Humphrey, 2007). Recent food safety crisis have led governments to increase food operators' safety efforts in handling and preventing food safety hazards. To our knowledge, few works have studied the determinants of safety efforts implemented by intermediaries. But, it is worth noting that import export and / or re-export strategies of food companies in developed countries are necessarily constrained by these new legal requirements. In a development perspective of international value chains, this question appears essential as strategies of importing / exporting companies in developed countries will potentially influence production and export strategies in both the developed and developing countries.

To study intermediation, several strands of literature can be considered but as far as we know these works consider trade intermediaries as homogeneous firms. In this article, we build an analytical framework upon this literature arguing that brokers might be heterogeneous in their economic function according to the type of supply chain they are involved in. The type of their supply chain will then explain their safety behavior. We test our analytical propositions using original data, not available elsewhere. This data comes from a survey that has been conducted among the exhaustive sample of French importers of fruit and vegetables during the 2014 summer. We adopt a two steps approach. First, we conduct a data analysis that allows us to provide a typology of supply chains depending on the products, the country of origin and the customer of intermediaries. Second, we run econometric analyses to qualify how individual safety behaviors are influenced by the different supply chains. We exacerbate differentiated

behavior among French brokers in their role of providing food safety in the sector of imports of fresh fruits and vegetables. We identify differentiated value chains that co-exist at the border point of the European market. We also highlight that French importers implement different safety strategies to guarantee the safety of products. Depending on their involvement in a supply chain, some of them are acting as safety gatekeeper at the domestic entry point.

The article proceeds as follows: The second section provides a literature review on the economic function the literature provides and the previously explored determinants of their safety efforts. Section 3 presents the data and results. The last section provides a discussion and concludes.

2. Importers as safety gatekeeper in the fresh produce industry

2.1. The role of intermediaries in the literature

One strand of literature shows the advantages of using brokers over direct exchange (in industrial economics or new developments of international economics) because brokers act as matchmakers by coordinating transactions between buyers and sellers. Another strand of literature shows that brokers can act as guarantors of quality and as experts and can monitor the performance of sellers. Because of this quality expertise, recent works also highlight that brokers can be used strategically as liability shield by upstream firms.

2.1.1 Intermediaries as match makers

First, the purpose of intermediation can be thought as fostering communication in the market place that will lead to transactions and exchanges in order to create economic value. The main function of market intermediation is in this case to disseminate information between buyers and sellers. However, while information is more and more available than it used to be, we can observe from the field that intermediaries maintain and even develop their activities in a lot of markets.

There are several strands of literature that have focused on the recourse of intermediaries, also called middlemen or brokers in transactions. These terms have been used interchangeably by authors to define their activities, leading to a very broad and vague definition of what is an intermediary. In transaction costs economics, some scholars have focused on the existence of brokers in transactions (Rindfleisch & Heide, 1997; Williamson, 1979). For instance, Weiss and Anderson (1992) analyzed the decision of manufacturers whether to vertically integrate the selling function or to use an outside selling organization. For some scholars, middlemen are more present in markets where there is a lack of information between buyers and sellers. For Spulber (1996), the type of information imperfection in markets will determine the activities of intermediaries: price setting and market clearing, providing liquidity and immediacy, matching and searching or guaranteeing and monitoring transactions.

Rubinstein and Wolinsky (1987) underlined that intermediaries act as matchmakers and reduce transaction costs between buyers and sellers. More recently, Antràs and Costinot

(2011) developed a theoretical model of trade with the presence of a technology of intermediation. They show that the presence of intermediaries facilitates the realization of the gains from trade. Moreover, intermediaries help to gain advantages over direct exchanges by pooling and diversifying risk (Spulber, 1996). Recent papers in the New New International Economics also explore this trend. There is a burgeoning literature that explores the great role played by intermediaries in the trade process using firm level data.

Authors mostly consider that intermediaries are "matching technology" and in this case they help less productive firms to access foreign markets. In Bernard et al. (2010a), intermediaries are non-producing or non-consuming firms and are thus sales intermediaries. Their study compares export modes of manufacturers in all Italian sectors. They show that low productivity firms choose the intermediation technology to export whereas more productive ones export directly. At the end, firm profits depend on the export mode chosen. The respective share of indirect (through intermediaries) vs. direct export will depend on the export destination, as more productive firms will be able to overcome higher trade costs. In the same trend, Ahn et al. (2011) modify a model with heterogeneous firms "à la Melitz" (Melitz, 2003) by introducing an intermediation technology. Firm choice to export would depend on the characteristics of the destination country (size of the foreign country, cultural distance, etc.) and on their own characteristics, namely their productivity. In their empirical setting, they consider intermediary as all Chinese firms which have "trade" in their name and consider that exports passing through these firms are indirect exports. Based on this assumption, they show that exports via the intermediation technology will be larger in countries with small market size, high variable and fixed costs of exporting. In these articles, the products are accounted for through fixed effects and quality characteristics of the products have not been introduced in the analysis.

2.1.2 Intermediaries as quality experts and liability shield

In the Law and Economics literature that deals with food industry, Hennessy et al. (2001) argue that there may be causes for regulators to assign liability for safety failures in order to modify the structure of the industry and make it safer. They argue that the allocation of liability would establish a leadership hierarchy in value chain. In others words, food operators who bear liability will provide monitoring effort in order to protect themselves against the liability burden. The enforcement of liability modifies firm behavior. Firms take more preventive actions to avoid the liability burden (Buzby et al, 2001). Loureiro (2008) empirically investigates the impact of the application of a liability regime in the decrease of food contaminations in the United States. She shows that the application of the liability decreases the number of foodborne outbreaks. In other words, the burden of liability enhances food quality and food safety. Pouliot and Sumner (2008) model the effect of an increase of liability-traceability for food safety as an incentive to provide safe food. They show that traceability allows food operators to establish they are not responsible for harm. To our knowledge, they are the first ones that consider that food operators can switch liability to upstream suppliers but they did not analyze this possibility. Most of the authors make the implicit assumption that the allocation of

liability and the structure of the supply chain are given. Pouliot and Sumner (2008) argue that upstream traceability will help food operators to transfer liability to their suppliers.

Applying this transfer of liability in international supply chains, Latouche and Rouvière (2016) and Rouvière and Latouche (2014) show that when the probability of quality failures is high, especially in the case of high information asymmetries and non-contractibility, and when liability is transferable, agents will prefer to transfer the liability burden rather than integrating the upstream transaction. In this case, agents who bears the liability are quality experts.

Some research consider trade intermediaries who act as "guarantors of quality" or "experts" when it is difficult to judge of the quality of the product (Biglaiser, 1993; Biglaiser and Friedman, 1994). Indeed, when search costs are not present (matching issues) asymmetries of information play a great role in a transaction between buyers and sellers. Trade intermediaries can solve moral hazard/adverse selection problems when gathering information is too costly for customers. In this strand of literature, middlemen arise for two reasons: the first lies in their capacity to develop means to discover the true quality of products; the second is linked to their reputation. They must preserve their activities on the market and are highly interested in identifying high quality products. Quality of goods may thus be the driving force behind intermediation in several markets. Intermediaries develop more expertise to track down poor quality products than any other simple customer. In real life, we find for instance middlemen in the market of used cars, of jewelry, of art (Biglaiser, 1993), in the tourism industry (e.g. Trip Advisor) as in food trade industry.

These different research highlight that intermediaries in supply chains might have different functions (matching, quality expert, liability shield, the three as the same time) in supply chains. This fact implies that they must be heterogeneous depending on the role they play in supply chains. However, as far as we know, the literature considers them as homogenous agents. In the current proposition, we argue that their functions depend on the organization of the supply chain they are involved in. In the following, we do provide arguments to identify how they differ one from each other's.

2.2. Determinants of intermediary safety behavior in the fruits and vegetables industry

In the industry of fresh fruits and vegetables, there exist a diversity of available means for importers to guarantee quality and safety of products. Fresh fruits and vegetables have been identified as a significant source of pathogens and chemical contaminants. As a result, there has been a wealth of identifying and controlling hazards at all stages in the supply chain.

For consumers, there is a common belief that locally produced food (and locally marketed and consumed) are safer. The demand for local food has increased through the development of short supply chains. According to Martinez et al. (2010), direct -to - consumer, direct -to-retail or direct-to-food service arrangements are commonly accepted features characterizing local food. Local food markets typically involve small farmers

and short supply chains. Shorter supply chains, driven by small local food businesses and/or by local farmers, would provide better quality/safer products than long supply chains. Their organization (small firms and limited length of food chains) would also allow consumers to obtain more and better information about the origin and the quality of their food. In others words, proximity and size of the chain (from producers to consumers) will influence quality and safety products.

The literature has widely explored the means available to ways of controlling fresh fruits and vegetables with techniques as HACCP, risk assessment and farm to table approaches, especially in long supply chains. Good agricultural practices in production, standards (either voluntary or mandatory) are also means to alleviate risk of contamination or safety failures.

It is worth noting that none of these techniques are specific to the import industry and specifically to intermediaries who operate at the entry point. However, we must observe that some techniques are now specifically dedicated to food brokers and intermediaries like IFS Brokers. IFS brokers is not specifically dedicated to fresh produce but it takes into account that raw materials and products are sourced from different countries of origin.

In France, voluntary safety agreements were implemented in the imports industry of fresh produce in the main import markets: Perpignan and Rungis. The goal of these voluntary programs is to achieve better levels of safety in the fresh produce entering the French market. As a condition of joining the voluntary program, importers must arrange individual laboratory analyses and must assign an employee to manage quality control.

As far as we know, Rouvière et al. (2010) provide a first attempt to highlight (theoretically and empirically) the relationship between safety efforts, the organization of transactions and intrinsic characteristics of brokers firms. They show the counter-intuitive link between size and importers safety efforts. They also find that reliance on a direct procurement system has a significant and positive influence on safety effort. They found that importers will be more likely to make a greater level of effort if their procurement is atomized. In their specific case, working with supermarkets and safety efforts are complementary in marketing safe produce although some studies show that French supermarkets are not explicitly asking for safety (Fulponi, 2006; Garcia Martinez and Poole, 2004).

3. Empirical strategy

In the previous section, we have shown on the one hand, that intermediaries in value chain might have different economic function from matchmakers to quality/safety gatekeepers or liability shield. On the other hand, we can observe that their safety efforts can depend both on their own characteristics but also on the organization of the supply chain they are involved in. In the following section we are interested in combining both of these two paths while asking how the structure of the supply chain influences the safety efforts controls brokers make their own characteristics being given. To do so, we first present our data and then our empirical strategy.

3.1. Data

There are three import markets in France: Perpignan, Rungis and Marseille that represent from 80 to 90% of French imports of fresh produce. A survey was conducted during the summer 2014 among all members of the two safety self-monitoring agreements in the Perpignan (58 importers) and Rungis imports markets (23 members).

Interviewees, owners and employees, were asked questions, face-to-face, about the firm situation in 2013, and particularly about characteristics such as total amount of sales, main produce, specialization, resources allocated to safety controls, and also about their operating environment (procurement and suppliers, customers). We merged our dataset with the French customs dataset for fresh fruits and vegetables. This sub-dataset documents all imports of fresh fruits and vegetables from foreign countries by French firms. For each firm, it provides the annual value and volume of imports disaggregated by country of origin at the product level (HS8-digit classification). For each importer in the survey, we then know their specific country/products flows.

In Table 1, we present descriptive statistics for importers identified in the custom dataset. Our data analysis is run over a final sample of 63 firms. Table 2 presents the main suppliers mentioned by the importers in the survey. 55% of the brokers import produce directly from producers. Table 3 presents the main buyers of the products imported by the brokers. As expected, 53% of brokers mainly sell produce to supermarkets. Supermarkets are the main sellers to final consumers of fresh fruits and vegetables.

Table 1: Descriptive statistics of the sample

Variable	Obs	Mean	Std. Dev.	Min	Max
Total sales	63	27825	32838	920	147100
Certification of suppliers	63	0.83	0.38	0	1
Certification of buyers	63	0.56	0.5	0	1
Certification of the broker	63	0.48	0.5	0	1
Retailer's label	63	0.37	0.49	0	1

Table 2: Main Suppliers of the importers

Suppliers	Freq.	Percent
Cooperatives	13	20.63
Direct production	35	55.56
Wholesaler	15	23.81
Total	63	100

Table 3: Main buyers of the importers

Buyers	Nb.	Percent

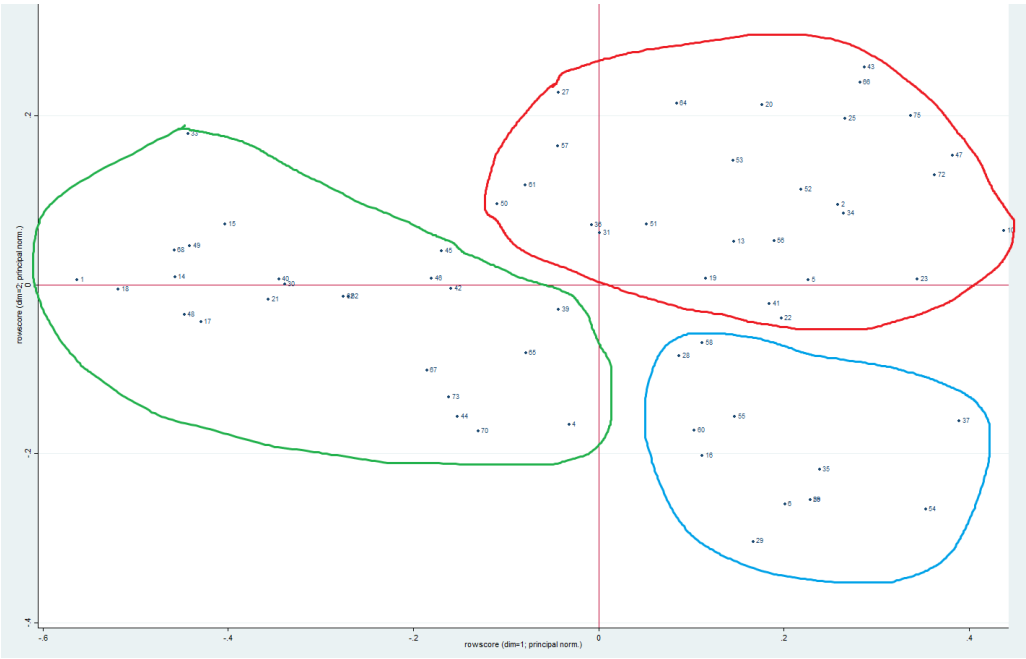
Supermarkets	33	53.23
Wholesalers	25	40.32
Other	4	6.45
Total	63	100

3.2. Empirical results : Typology of imports supply chains

Multiple correspondence analysis (MCA) is an extension of correspondence analysis (CA) which allows to analyze the pattern of relationships of several categorical dependent variables. MCA is obtained by using a standard correspondence analysis on an indicator matrix. MCA is used to analyze a set of observations described by a set of nominal variables.

We have kept only axes that represent 67% of the total inertia of data. The main variables that contribute to Dimension 1 are Sales and MDD (Ca4 and Ca3, MDD=1 on the left side) to (Ca2 and Ca1, MDD=0 to the right side). The main variables that contributes to Dimension 2 is Nb_Suppliers. The higher numbers of suppliers are down of axis two and the lower numbers of suppliers are up to axis 2.

Figure 1 gives the projection of importers/observation (63) according to the MCA and the two dimensions we kept.



We can see that three groups of importers appear. Group 1 (green) is opposed to Group 2 (red) and Group 3 (blue) according to Size and MDD. In others words, Group 1 is constituted of large importers that mainly sell retailers brands (MDD) that are more oriented on the domestic market . Group 2 and Group 3 are smaller importers that are not selling retailers brands. Group 2 and Group 3 are opposed according to the second axis. Group 2 have a lower number of suppliers than Group 3. We name Group 1,2,3 according to the supply chain they are involved in.

Table 4: Descriptive statistics for the three groups of importers.

		Group 1	Group 2	Group 3
Variables used in the typology	Number of importers	24 firms	27 firms	12 firms
	Sales (mean)	54967 K€	7966 K€	18222 K€
	Share of imports	55 %	72%	71%
	Nb Products	31	25	34
	Nb Countries	15	5	5
	Nb suppliers	90	28	149
	Share of sales with spmkts	74%	55%	8%
Other variables	Certification of suppliers	0.88	0.78	0.58
	Certification of buyers	0.71	0.37	0.17
	Retailer's label	0.63	0.26	0.08
	Certification of Brokers	0.38	0.19	0.17

From Table 4, we can see that firms that are included in Group 1 are larger than Group 2 and Group 3 with a mean sales of 54967 K€. Their share of imports is lower than the one of Group 2 and Group 3. Group 3 which are medium size firms work with more suppliers (149 at mean) than Group 1 and Group 2.

In others words, Group 3 are less specialized in products, they are country oriented but they don't work with supermarkets. They implement a diversification of their procurement. We have qualified Group 3 as the « traditional channel» and they supply wholesale markets (Table 5).

Table 5: Main buyers of the importers according to the group they belong to

Main buyers	Group 1 %(Nb)	Group 2 %(Nb)	Group 3 %(Nb)
Supermarkets	74 (17)	55 (15)	8 (1)
Wholesalers	13 (3)	41 (11)	92 (11)
Other	13 (3)	4 (1)	-
Total	100 (23)	100 (27)	100 (12)

As suggested by their market share with supermarkets and their opposition on axis 1, we have qualified Group 1 as the « retailers certified importers ». These importers are devoted to work with supermarkets and more oriented on the domestic market than the others; they are certified and provide fresh produce with retailers' brand. Doing so, they can be considered as importing in the name of retailers; this fact implies that the retailer bears the liability. Table 5 shows that in the group, supermarkets are the main buyers.

We have then qualified Group 2 as the « hybrid group » since they are not devoted to one of the main supply chains (55% of their activity are with supermarkets), they import a lot (72% of their Sales are imports) and they have few suppliers in few countries. We can interpret this as a mean to monitor the quality of a niche market. Table 5 shows that supermarkets are still the main buyers of the products they import (for 55% of brokers)

but they are less involved in retailer's private labels. In other words, they bear the liability for most of the produce they import. This group could be considered as the liability shields for supermarkets. We test this assumption is the following section.

3.3. The influence of the value chain on the safety effort of importers

French Liability rule is an important issue in considering supermarket import behavior. In French Law, the first supplier on the domestic market is liable under criminal law if products he imported do not comply with quality and safety regulations in force (Rouvière et al. 2010). The first supplier is considered as the producer of the imported product. As regards liability, when a supermarket imports directly, he is the first supplier to place a product on the domestic market. He then bears the criminal liability in case of failure (as regards quality or safety) of the imported product. When a broker imports for supermarkets, the broker is the first supplier and thus he bears the liability. He will be held liable under criminal law if some fresh produce he introduced are not compliant with French regulation. When unsafe product is found on the supermarkets' shelves, the traceability system allows identifying the one who first introduces the product on the domestic market. This one is then liable under criminal law.

At the entry point, punctual laboratory controls is one of the unique mean to check the safety of a product. We define (Safetyeffort) as the ratio of the number of pesticides analyses, firms conducted in 2013 over their Sales). This way of defining (Safetyeffort) allows us to capture the intensity of effort and to cancel out the effect of size.

In this section, we study the link between the supply chain and the safety effort provided by importers who participate in the voluntary program. We test the following model :

$$(\text{Safetyeffort}_i)=\theta_0+W'_i\theta_1+ Z'_i\theta 2 + \varepsilon_i$$

Where W_i will describe the group of firms and Z_i will be a set of variables for controls. As the group of firms already accounts for important variables, the only control variable we include is the localization of the firm. This variable catches for the local influence regarding safety efforts.

Results are presented in table 6 and show that in terms of safety efforts, group 1 « retailers certified importers » and 3 "traditional channel" are similar. Only group 2 « Hybrid group » has a significantly higher safety effort than the other.

Table 6: regression of the safety effort on the group of the firms

	(1) Safety effort	(2) Safety effort
Group 1	*reference*	*reference*
Group 2	2.128**	1.915**
	(0.862)	(0.944)
Group 3	-0.225	-0.491
	(1.098)	(1.200)
N	59	59
R2	0.13	0.13

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

These results are in line with the idea that as liability shield, the brokers in Group 2 have to show to public authorities the consistency of their safety strategy. As they do not sell retailer's private label, they are the only liable in case of safety failure. Hence they have to ensure the safety of their produce through their own analyses.

From these empirical results, we can distinguish at least 3 identified economic functions of brokers according to the value chain they are involved in. Group 1 plays the role of intermediaries as described by the international economics literature. They are used by supermarkets for their ability to import. Group 2 plays the role of liability shield as the law and economics literature suggests. They must implement their own safety measures. Group 3 plays the role of pure matchmaker like in the IO literature since they play as a platform between atomized supply and demand.

4. Policy implication and conclusions

In this article, we have aimed at showing that intermediaries in food supply chains are not homogenous agents. While the literature in its different strand has demonstrated this heterogeneity, this has not been really empirically shown yet. In this article we do so. Accounting for the heterogeneity among trade intermediaries we identify differentiated supply chains and differentiated behavior in the way they are providing safety efforts. We highlight that French importers implement different safety strategies. Depending on their involvement, they implement different safety strategies at the domestic entry point.

Our result is also interesting in the wide discussion on the competition between northern and southern exporting value chain in which private safety standards and controls will play as a barrier to trade. Our results can temperate this discussion. We have identified three specific value chain among which importers adopt differentiated behavior according to safety requirements. In others words, these intermediaries do have specific economic and market function in the market, they do provide a value added at least on safety requirements, which really question the idea of capture of value added from southern exporting countries by Northern agents. From our point of view, this is also why they do persist in this industry.

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