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FRAUDS IN THE ITALIAN AGRO-FOOD SECTOR:
AN INTRODUCTION

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The findings, interpretations, and conclusions expressed in the working paper series are those of the authors alone. They do not represent the view of Dipartimento di Scienze per l'Economia e l'Impresa, Università degli Studi di Firenze

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Frauds in the Italian Agro-Food Sector: An Introduction

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Abstract

The paper presents an introductory analysis of agro-food frauds (AFF) in Italy and aims to get some preliminary insights for the improvement of AFF monitoring system. To pursue this objective, we used explorative statistical analysis looking at AFF from various perspectives, analysing them over time, geographically and at the value chain level. The data used are taken exclusively from the Central Inspectorate for Quality Protection and Fraud Repression in Agro-Food Products (Ispettorato Centrale per la Qualità e la Repressioni delle Frodi, ICQRF) of the Italian Ministry of Agriculture, which is the major public body specialised in fraud repression in agro-food sector.

The analysis shows that the inspection activities carried out by ICQRF have significantly improved from 2007 to 2015 both in terms of sampling and fraud detection. However, there is still room for further improvement. The analysis shows that the ICQRF may consider further investments in Lazio and Lombardy, two regions that are under-covered by inspection activities as compared to the other regions. In addition, a reallocation of the inspection resources from smaller regions (generally featuring with low intensities of irregularity) to larger ones (with higher intensities of irregularity) is expected to further improve the inspection efficiency. The analysis at subsector level shows that wine and olive oil production are the most inspected agro-food activities, given their larger economic sizes and their higher exposure to frauds.

Differentiating products by their quality characteristics (organic, designation of origin, and conventional) do not show significant differences across regions, but they did show noticeable relevance across subsectors. Designation of origin products are extremely important for the wine subsector accounting for 66% of the total inspected products, while organic products are relatively more important than those of designation of origin for subsector mostly based on fresh/unprocessed products such as vegetables and cereals. In conclusion, the importance of quality products is dictated by the technical characteristics of each value chain, and these characteristics should be considered in designing inspection sampling.

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Acronyms

AFF	Agro-food fraud
UNIFI	University of Florence (Università degli Studi di Firenze)
DISEI	Department of Economics and Management (Dipartimento di Scienze per l'Economia e l'Impresa)
DOC	Controlled Denomination of Origin (denominazione di origine controllata)
DOCG	Guaranteed and Controlled Denomination of Origin (denominazione di origine controllata e garantita)
DOP	Protected Denomination of Origin (denominazione di origine protetta)
CREA	Council for Agricultural Research and Analysis of Agricultural Economics (Consiglio per la ricerca in agricoltura e analisi dell'economia agraria)
ICQRF	Central Inspectorate for Quality Protection and Fraud Repression in Agro-Food Products (Ispettorato centrale della tutela della qualità e della repressione frodi dei prodotti agroalimentari)
IGT	Typical Geographical Indication (indicazione geografica tipica)
IGP	Protected Geographical Indication (indicazione geografica protetta)
ISTAT	
ISMEA	the Institute for Services to Agro-Food Markets (Istituto di Servizi per il Mercato Agricolo Alimentare)
MIPAAF	Italian Ministry of Agriculture (Ministero delle politiche agricole, alimentari e forestali)
STG	Guaranteed Traditional Specialty (specialità tradizionale garantita)
VC	Value chain

1 Introduction

Evidence on food fraud has been found since the old ages. However, the scale of food frauds is now rapidly growing because modern food supply chains have been lengthened and complicated, expanding their scale and compounding the difficulty in detecting frauds (as well as their potentially negative impacts).

Food fraudsters do not comply with the rules regarding many aspects of production and marketing. This makes them a source of unfair competition to the regular producers. For example, they may evade taxes, they may use undeclared labour, they may not comply with product safety regulations and they may violate intellectual property rights, thus feeding a long chain of illegal activities. Of course, not all food fraudsters go through the whole chain of illegal activities; rather, they are involved at different degrees in such activities.

Organised crime benefits from this chain by making use of commerce channels opened up by trafficking, so they can take advantage of equally profitable but far less risky activities such as trade of counterfeit goods¹. The flourishing of this trade is made possible due to a significant demand created by self-interested consumers who think they are getting a deal in buying counterfeit products that are much cheaper than genuine ones.

When it comes to agro-food products, the problem is exacerbated by the complexity and the high levels of sophistication of many agro-food production processes that make more difficult the chance to spot counterfeiting activities. This is why the agro-food sector ranks as third among sectors most affected by counterfeiting (Censis, 2012)².

Considerable attention has been recently given to AFFs at the national level as well as EU level. At the national level, there is room for improving the effectiveness of inspection activities. For instance, only recently there have been attempts to build a unified data information system on inspection activities that could help to better understand and monitor this phenomenon³. There are indeed many bodies and agencies involved in these activities and each one has built his own data management system. Among those bodies, the ICQRF of the Italian Ministry of Agriculture (MIPAAF) is the only Italian inspection body that is specialized in the repression of agro-food frauds and in monitoring regulatory interventions. The ICQRF has an inspection system spanning over the whole country, with inspection activities performed in all value chains (VCs) of the agro-food sector from agricultural production through processing and distribution to retailing.

This study is based on ICQRF's monitoring activities database to carry out a descriptive analysis of frauds in the Italian agro-food sector. This is the overall objective of this paper, which will be pursued through two major paths using explorative statistical analysis: (1) analysing the evolution of the phenomenon over the period 2007-2015 by type of fraud and product characteristics, and (2) providing disaggregated analysis of the phenomenon by geographical location and by value chain. In doing this we hope to be able to shed some light on how to improve the ICQRF's monitoring system.

Given the above, the paper is organized as follows. Section 2 introduces the concepts of fraud and counterfeiting, in general and with specific reference to the agro-food sector, advancing the definitions adopted in this study. Section 3 aims at setting the stage from the regulatory viewpoint, recalling what are

¹ Counterfeit goods are products replicating aspect and packaging of a genuine product: they are a subset of frauds (cf. Section 2.1).

² According to Censis (2012), the most two affected sectors are clothing & accessories and audio-visual CD & DVD, respectively.

³ The Italian Ministry of Economic Development is making efforts to harmonise the data coming from various sources on seizures through setting up a database called IPERICO (Intellectual Property-Elaborated Report of the Investigation on Counterfeiting) that gathers data from various sources into an integrated database and carries out an initial harmonisation. However, a full-fledged integration of these sources is still far to come.

the main laws that regulate the production and distribution of agro-food products with specific reference to those issued to fight frauds and counterfeiting. Section 4 describes the data sources as well as data handling for the analysis carried out in this study. Section 5 presents some recent trends of frauds and counterfeiting in the whole Italian agro-food sector, which is further deepened in section 6, disaggregating the analysis by geographical location and by value chain. Section 7 provides an assessment of the major research findings, concluding with a discussion on policy implications as well as suggestions for further research.

2 The concepts of fraud and counterfeiting

2.1 General definitions

The terms fraud and counterfeiting are very close to each other and, in many cases, are used interchangeably by lay people. Linguistically, the term “fraud” means “deceit, trickery, sharp practice, or breach of confidence, perpetrated for profit or to gain some unfair or dishonest advantage” (Merriam Webster, 2016). Therefore, it is an intentional perversion of truth in order to induce another to part with something of value or to surrender a legal right. In summary, it is an act of deception and misrepresentation. On the other hand, the term “counterfeiting” refers to “actions that uses imitation so as to be passed off fraudulently or deceptively as genuine” (Merriam Webster, 2016). As such, counterfeiting is a subset of the broader fraud category.

The Chartered Institute of Management Accountants (CIMA, 2008) widens the definition of fraud to include activities such as theft, corruption, conspiracy, embezzlement, money laundering, bribery, and extortion, but emphasizes that the legal definition differs from country to country⁴. Moreover, some specialist organizations defines fraud to be “any intentional act or omission designed to deceive others that either result in the perpetrator making a gain or the victim suffering a loss” (IIA-AICPA-ACFE, 2009: p. 5)

These definitions imply that fraud and counterfeiting include a wide range of illegal activities across numerous sectors such as: employee fraud against employers (e.g. falsifying payroll and expense claims, theft of cash, etc.), crimes by business against investors, consumers, and employees (e.g. falsifying financial statements, selling counterfeit goods as genuine, etc.), crimes against financial institutions (e.g. stealing credit cards, falsification of cheques and insurance claims), crimes against government (e.g. tax evasion and falsification of grants and social security benefits), crimes by professional criminals (e.g. money laundering), electronic crimes (e.g. spamming, breaching copyrights, hacking, etc.). It is clear that crimes against consumers and clients in form of misrepresentation of the quality of goods and related crimes against government in the form of tax evasion, which represent the core benefits of fraud and counterfeiting in the agro-food sector, are only a subset of this broad category.

Most literature on fraud refers to the so-called “fraud triangle” as the most common analytical method for assessing and identifying potential risks of fraud. This concept was first introduced by the American penologist Donald R. Cressey while preparing his doctoral thesis, in which he tried to explain why people commit frauds (Cressey, 1953). The fraud triangle includes three elements: opportunity, motivation and rationalization. The first element defines the ability to commit the fraud since the fraudsters do not wish to be caught; the second element refers to the incentive, which comes from a financial pressure or need felt by the potential fraudster; while the third element involves the person in reconciling the fraudulent behaviour with the commonly accepted notions of trust. In other words, risks of fraud are more probable from individuals who are in a position that helps them to commit the fraud, coupled with feeling under pressure and having low moral standards.

The triangle model was extended to a diamond model by Wolfe and Hermanson (2004) adding a fourth element: the capability, which is the recognition of the potential fraudster of the opportunity and his/her ability to pull it off. However, the bulk of literature on the subject still uses the old model of fraud triangle. This can be justified by arguing that the capability element is largely implied in opportunity and motivation elements. We adhere to this view.

⁴ For instance, in England and Wales there was no legal definition of fraud until the Fraud Act was introduced in 2006 (CIMA, 2008).

2.2 Food and counterfeiting in the food sector

In the agro-food sector, the term food fraud is frequently perceived to be linked to the issue of food safety, although a food fraud does not necessarily have food safety implications. Moreover, stakeholders frequently use the term food fraud in combination with other terms such as food counterfeiting, adulteration, and falsification. Though the definition of food fraud differs between different authors, countries and contexts, it is possible to try to clarify the relationships between it and its closely related terms.

In this paper we adopt the definition of food frauds proposed by Spink and Moyer (2011) according to whom “*food fraud is any intentional act that encompasses the substitution, addition, tampering, or misrepresentation of foods, food ingredients, or/and food packaging; or false and/or misleading statements made for a product for the purpose of illegal economic gain.*” Therefore, a food fraud is an intentional illegal act made for sake of economic gain. This definition focuses on the legal aspect of the action that is “intentional”, i.e. it is done looking for economic gain, and may or may not cause a harm. The authors, in their classification of food risks (Tables 2.1 and 2.2), clearly distinguish food fraud issues from other concepts connected to food safety incidents (unintentional acts that result in harmful health consequences) and food defence issues (intentional acts with harmful health consequences). They emphasize the intentional economic motivation as the basis for a food fraud, which distinguishes it from the concept of food quality when the act is unintentional with no health implications although an economic gain is achieved.

Table 2.1. Food protection risk matrix

Motivation / (Actions)	(Unintentional)	(Intentional)
Gain: economic	Food quality	Food fraud*
Harm: public health, economic, terror	Food safety	Food defence

* This includes all the subsets of economically motivated adulteration and food counterfeiting.

Source: Spink and Moyer (2011: Figure 2).

Table 2.2. Risk cause and effects for the food disciplines

Discipline risk type	Example	Cause and motivation	Effect	Public health risk type
Food quality	<u>Accidental</u> bruising of fruit	Mishandling	Unsalable product or possible additional contamination with E. coli O157:H7	None or Food Safety
Food fraud	<u>Intentional</u> adulteration of milk with melamine	Increased margin	Toxic poisonings	Food Safety
Food safety	<u>Unintentional</u> contamination of raw vegetables with E. coli O157:H7	Limited field protection and control during harvesting and processing	Illnesses and/or deaths	Food Safety
Food defence	<u>Intentional</u> contamination of ground beef with nicotine	Revenge intent against the store/manager through injury to consumers	Nonlethal poisonings	Food Defence

Source: Spink and Moyer (2011: Table 2).

Given the above, food fraud as a collective term encompasses the deliberate and intentional substitution, addition, tampering, or misrepresentation of foods, food ingredients, or/and food packaging; or false or/and misleading statements made for a product, for the purpose of unauthorized economic gain (Table 2.3).

Table 2.3. A taxonomy of food frauds

Type	Definition	Example
Adulteration	A component of the finished product is fraudulent	Melamine added to milk
Tampering	Legitimate product and packaging are used in a fraudulent way	Changed expiry information, product up-labelling, and so on
Over-run	Legitimate product is made in excess of the production agreements	Under-reporting of production
Theft	Legitimate product is stolen and passed off as legitimately procured	Stolen products are co-mingled with legitimate products
Diversion	The sale or distribution of legitimate products outside of intended markets	Relief food redirected to markets where aid is not required
Simulation	Illegitimate product is designed to look like but not exactly copy of the legitimate products	“knock-offs” of popular foods not produced with same food safety assurances
Counterfeiting	All aspects of the fraudulent product and packaging are fully replicated	Copies of popular foods not produced with same food safety assurances

Source: Spink and Moyer (2013: Figure 2).

Whether the fraud occurs through adulteration or misbranding, it creates high potentials for the occurrence of public health incidents. This implies that although the motivation is economic, the consequence might probably be a serious public health risk. In some ways, food fraud threats are considered riskier than conventional food safety threats since the contaminants may be unknown (Spink and Moyer, 2011; Spink and Moyer, 2013).

This definition of fraud allows its decomposition into two broad groups, namely: physical modification and misrepresentation of the product. This goes in line with the definition of consumer food fraud provided by GMA & A.T. Kearney (2010) that refers to the two aspects of adulteration and counterfeiting. The former is defined as the intentional modification of the finished product or one of its ingredients for economic gain through unapproved enhancement, dilution with lesser value ingredient, concealment of damage or contamination, mislabelling of the product, substitution of a lesser-value ingredient or failing to disclose the necessary information on the product. On the other hand, counterfeiting refers to the unauthorized representation of a registered trademark carried on goods similar to goods for which the trademark is registered, with the intention of deceiving the purchaser into believing that he/she is buying the original good.

In Italy, researchers, practitioners and other stakeholders use more frequently the term counterfeiting (*contraffazione*) to refer to fraud (*frode*). Riccio *et al.* (2014) adopts the Antolisei’s (2008) definition of counterfeiting, which is to be essentially the act of giving a deceptive appearance on the authenticity of a product that is composed of substances that are totally or partially different in quantity or/and in quality from those used in the genuine product.

Calvani and Albertazzi (2011) define five main categories/typologies of food fraud (*contraffazione alimentare*) defining the scope of each typology as follows⁵:

- Alteration (*alterazione*) refers to the modifications of composition and/or of organoleptic characteristics of food products caused by deterioration or/and prolonged storage or bad storing conditions.
- Adulteration (*adulterazione*) consists of modifications of the organoleptic characteristics of food products through the addition or subtraction of some ingredients without modifying the product in a substantial way. Examples are the sale of skimmed milk as a whole-fat milk or the sale of olive oil mixed with vegetable oils as extra-virgin olive oil.
- Sophistication (*sofisticazione*) refers to the addition to the product a foreign substance aiming to improve some quality aspects, to conceal some deflections, or to facilitate the partial substitution of a

⁵ From the definitions below, it is clear that the first three categories refer to the “adulteration” category of Spink and Moyer (2011), while the last two refer to the “simulation” and “counterfeiting” categories of Spink and Moyer (2013) (cf. Table 2.3).

product for another. It also refers to the assured, but false, subtraction of some natural substances from the product with the aim of increasing its price. Examples are the chocolates without sugar, cookies without fat, and nuts without cholesterol.

- Falsification (*falsificazione*) refers to the total substitution of a product for another but sold as if it were the original one. Examples are vegetal oil sold as olive oil or margarine sold as butter.
- Counterfeiting/falsification (*contraffazione*) of trademark, the indication of geographical origin, or any other trademark of quality. This kind of counterfeiting exploits the quality reputation of Italian food products and the phenomenon is well-known as “Italian sounding” or “agro-piracy”. In other words, it attributes illegally to a counterfeit product the denomination of another that is famous of its appreciated organoleptic characteristics or of its high safety.

The importance of studying the counterfeiting and frauds generally in the food sector emerges from its apparent vulnerability to fraudulent behaviour for several reasons, which individually or collectively shed light on one or more of the of fraud triangle corners. The expansion of global markets causes the fraud risks to increase as companies have less control over production process and thus are less accountable for many essential processes along the supply chain⁶.

Dire economic conditions, such as adverse price changes and shortages if some ingredients, play also their role in fostering frauds. This encourages operators who are squeezed by higher costs to surrender to the opportunity temptation. Technological progress, which may play its role in combatting and containing such illegal activities, can in turn be used to enhance them. The rise of internet power as a retail channel for consumer products has added another complication to the scene especially that such channel is much more difficult to control and monitor. In addition, perpetrators are becoming more and more sophisticated in committing frauds taking advantage of the technological progress.

Last but not least, AFFs, especially adulteration, are closely related to global food crisis due to the imbalance created by food shortages and the rising demand. This will be exacerbated by world population growth that is expected to double by 2050, while crop production from arable land will remain relatively constant or grow at the lower speed.

⁶ This is very true especially when it comes to developing countries, where consumer health standards are lower, regulations are weak or absent, and a substantial number of the population lives below a certain poverty line (GMA & A.T. Kearney, 2010).

3 Laws and regulations to fight frauds in the Italian agro-food sector⁷

3.1 Background

To protect the agro-food sector from frequent crises, the European Union, including Italy as a member country, has adopted a comprehensive strategy to combat and prevent AFFs. Historically, national Italian food law dates back to 1925 when the R.D.L. no. 2033 that was issued (and was converted into Law No. 562 in 1926). The Law set up the general rules for the prevention of fraud in the preparation and trade in agro-food substances and products. In 1962, Law no. 283 was issued allowing the investigation of fraud and food adulteration with the aim of protecting the public health. Forty years later, the integrated strategy of the EU regarding food safety has identified the same objective as the primary one.

The initial assessments on this subject started in 1997 with the Commission's Green Paper on the general principles of food law in the EU. This led, in 2000, to the shared formulation of the White Paper on Food Safety. Both papers represented the will of policy makers to regulate this emerging subject, following numerous scandals of the eighties and nineties. In Italy, the scandal of the "methanol wine" in 1986 caused complaints and deaths, leading consequently to the foundation in 1986 (by Law no. 462) of the Central Inspectorate for Quality Protection and Fraud Prevention (Ispettorato Centrale della Tutela della Qualità e Repressione Frodi: ICQRF). The ICQRF was established as official body of the Ministry of Agriculture and Forestry (MIPAAF) to operate throughout the country aiming at combating fraud in the agro-food sector, playing an important role in protecting consumers and producers from unfair competition.

3.2 General legal framework

The actual formulation of the legislative and regulatory system governing the production, sale and consumption of food products began, however, with Reg. (EC) n. 178/2002 adopted by the European Parliament and Council. This Reg. has set up the general principles and requirements of a food law, establishing the European Food Safety Authority (EFSA) and laying down procedures regarding matters of food safety. In addition, it has set up a regulatory system according to the principles of subsidiarity principle and risk analysis. Its prominent features are the following:

- the definition of food law (art. 3, paragraph 1),
- the general principles of food law,
- compliance obligations on private operators,
- general rules on the role of Member States and their authorities,
- Establishment of the EFSA and of a regulatory framework in line with the needs of the common market,
- formalization of the Rapid Alert System for Food and Feed,
- framework for the adoption of emergency measures.

Consequently, the food law (Reg. (EC) no. 178/2002) has become the regulating framework for all activities involving food whether related to risk analysis (art. 6), to the precautionary principles (Art. 7), to consumer protection (Art. 8), to transparency (Art. 9 - 10) or to the free movement and anti-trust. From this Reg., a

⁷ This chapter was prepared by Veronica Manganiello consulting the following websites: www.normattiva.it and www.politicheagricole.it unless otherwise stated.

set of EU regulations has emerged under the so-called the "hygiene package", which are namely the following EC regulations: no. 852, no. 853, no. 854 and no. 882, all issued in 2004. The latter, i.e. Reg. no. 882, regards the official inspections that aim to verify compliance of feed and food products with the rules on the health and welfare of animals. Therefore, it is the standard framework for the organization of official inspections on food, feed, health and welfare whereas the inspection activities should be carried out periodically, based on a risk assessment with appropriate frequency to achieve the objectives defined in the Regulation.

The same Reg. also regulates the activities of the European institutions including the inspection in the Member States (art.45 through establishing the National Integrated Plan in Italy (PNI)), checking against third countries (art.46), establishing protective measures (art.56) imposing import conditions (art.47), and providing training to achieve safer foods. The PNI, under chapter V of the Reg., describes the Italian system of official inspections on food, feed, animal health and welfare as well as on plant health issues. It aims at improving the effectiveness of official inspections by streamlining activities through an appropriate consideration of risks and proper coordination of all the institutions involved. The coordinating institution according to the PNI is the Ministry of Health that plans inspection activities through an intense collaboration with different bodies, including the ICQRF of the MIPAAF (particularly for food quality issues), the Ministry for the Environment, their departments in the regions and in the province, as well as the Police and the Customs Department.

In 2008, following the preliminary consultation of stakeholders, the EC listed a proposal for a regulation on the provision of food information to consumers, from which the reg. (EU) No. 1169/2011 was passed. This Reg. regulates the provision of food information to consumers, harmonizing the various national laws and overcoming the requirements of the previous Directive 2000/13 /EC, which needed to be updated in response to changing market dynamics and new information requirements for consumers. So the Reg. aims on the one hand to adjust and standardize food products' labelling, presentation and advertising according to the food law (Reg. (EC) n. 178/2002), and on the other hand to be used as a general measure for application in the field of consumer information related to food products. The Regulation applies to food business operators at all stages of the food chain where their activities concern the provision of food information to consumers. It applies, therefore, to all foods destined for the final consumer, including foods delivered by mass caterers and foods intended for supply to mass caterers. The Reg. recently entered into force (on 13 Dec., 2014), except for the provisions on the nutrition declaration on the label (Art. 9) which shall be applied from 13 Dec., 2016.

At the national level, law no. 4 issued on Feb. 3rd, 2011, focused on details related to food labelling and food quality. The Parliament intended with this Law to guarantee that Italian consumers have complete and accurate information on the characteristics of commercialized food products, whether they are processed, partially processed or unprocessed. With this Law, the indication of place of origin on food labels became mandatory on both unprocessed and processed food products. For the latter, the reported information must include the place (country) where the last substantial transformation took place as well as the place of primary production (i.e. farming) of the first dominant ingredient.

The process of strengthening European policy on food quality matters has further evolved with the passing (in Nov., 2012) of reg. (EU) no. 1151 (by the European Parliament and Council) on quality schemes for agricultural products and foodstuffs produced with *designation of origin, geographical indication or traditional specialty*. This Reg., known as "Quality Package", replaced Reg. (EC) no. 509 and Reg. (EC) No. 510 of 2006. This new Reg. governs in a single text the PDO, PGI and TSG, simplifies and strengthens the system of protection and makes it possible to use, together with signs of quality (PDO and PGI) of graphical representations, texts and symbols of the origins and geographical collective marks. Then a decree (no. 14 of 2013) of MIPAAF was added to the Reg. regarding the provisions for the implementation and it was published in Oct., 2013 by the Official Gazette of the Italian Republic, which updates the procedures for registration and inspection regarding traditional products (Arfini, 2013).

3.3 Law enforcement framework

Enforcement of laws and regulations presented above is not possible without effective sanctions to deter the illegal actions. In Italy, the law on sanctioning administrative offenses is regulated by the Legislative decree no. 297 issued in 2004. The decree regards penalty arrangements in application of Regulation (EEC) No. 2081 of 1992 on the protection of geographical indications and designations of origin for agricultural products and foodstuffs. In the various paragraphs of Art. 2 of Legislative Decree 297/04, the legislature has guaranteed, alongside the administrative arrangements (which are the first bulwark to prevent offenses), the enforcement of criminal laws, giving space for simultaneous and combined implementation of administrative and penal sanctions.

To update the Italian legal system to the demands of criminal punishment for risk prevention in the context of certain corporate crimes, Legislative Decree 231/01 was issued. The decree regards the administrative liability of persons, companies and associations who does not perform functions of constitutional significance, allowing the assault of their assets and/or profits made with such offenses. These offenses cover the ones related to agribusiness particularly in the processing and marketing phases such as the sale of non-genuine foodstuffs as genuine, the sale of industrial products with misleading signs, manufacture and sale of goods made by illegal use of property rights, counterfeiting of geographical indications or origin of food products, and fraudulent trading.

In 2009, Law no. 99/2009 (widely known as Development Law) has introduced severer criminal penalties including mandatory confiscation of goods and machines used in the crimes involving counterfeiting, altering or using trademarks, distinguishing marks, patents, models and design, and introduction into the country and sale of goods bearing counterfeit signs. In addition, Development Law introduced two new types of crime designed to penalise the manufacture and sale of goods which infringe industrial property rights and the counterfeiting of Protected Geographical indications or designations of origin for food products.

4 Data sources and description

4.1 Sources of information

In Italy, there are several bodies and agencies involved in fighting AFFs, including counterfeiting. Two of them are specialized agencies of the ministry of Economy, namely the Tax Police (*Guardia di Finanza*) and the Custom Agency (*Agenzia delle Dogane*). There are also other bodies such as the National Police (*Polizia dello Stato*), the Local Police (*Polizie Municipali*), the Carabinieri. The Ministry of Agriculture, through the ICQRF, is the only organization operating at national level with a specific focus on the fight against fraud in the agro-food sector.

There is no clearcutting allocation of competencies among these agencies/bodies. Except for the Custom Agency, whose mandate is concentrated on border controls, all the others can make inspection to fight frauds on the national territory. Therefore, to have a comprehensive picture, data from each of those agencies/bodies must be collected and analysed. This is what has been done over the last few years under the supervision of Directorate-General for the Fight against Counterfeiting of the Ministry of Economic Development, creating the so-called Intellectual Property-Elaborated Report of the Investigation on Counterfeiting (IPERICO) database. The purpose of IPERICO is collect and harmonize data on the seizures made by all bodies/agencies⁸. Therefore, there is a potential to construct a unique dataset that can gather all relevant data on the phenomenon, collected by various bodies allowing a comprehensive analysis without the risk of double counting. However, such an objective can be only achieved through accessing the original datasets of the various inspection agencies, whose data are summarized the IPERICO project. In fact, only ICQRF dataset has been provided at the micro level while data of the other agencies have been obtained in summaries, and sometimes with varying degrees of details and disaggregation on temporal level as well as value chain level. For example, IPERICO does not include data other than seizures while the ICQRF provided an enormous database that is not limited to seizures but includes also detailed information on all inspected products and agents that are classified in terms of their subsectors and geographical locations.

Given the above, we rely in this paper exclusively on the ICQRF data, which includes detailed information on the inspection activities that are conducted systematically in all agro-food subsectors along the entire value chains from the producers/processors to the retailers. As the ICQRF system of records keep records not only of all types of frauds but also of the inspections that result in legal consequences for the inspected agents and their products, we believe that they are sufficiently good to provide an introductory analysis of the phenomenon, the major objective of this paper.

4.2 Description of ICQRF activities and database

The ICQRF activities can be categorized in two major types: inspections and reports. Inspections are the initial activities conducted by the ICQRF, while reporting is a possible consequence of inspections. We say possible because not all inspections are actually reported, while the latter is mandatory only if something irregular is detected. However, since a minimum number of reports is requested by every inspector regardless of irregularities, the total number of reports is larger than the number of detected irregularities, the latter being the ICQRF term used to describe what we defined as an agro-AFF in section 2.2.

Inspections and reports refer to two subjects: agents and products. Every inspection and report is identified through a unique ID code and is associated to only one agent, while it can be associated to more than one product. In other words, under each inspection and report, there is only one agent, but there might be

⁸ The main objective of IPERICO is the provision of integrated information to guarantee the maximum possible awareness of the actions against counterfeiting in Italy with as many details as possible on the data collection processes undertaken by the many involved agencies (Riccio *et al.*, 2014).

more than one product. However, some agents might be inspected and reported more than once, which means that agents can be associated with more than one inspection and report.

Inspections can be classified into two types according to how they are performed: inspections with physical access to firms, which we will call “inspections” (roughly accounting for 87% of all inspections over the period 2007-2015), and those done remotely, called and can be better described as monitoring activities. The latter occurs primarily when the inspection is not done directly on the product, but rather on its relevant documents such as labelling. Reports can be further broken down into five major types that determine the report objective, the inspection result, or the action taken by the ICQRF. These are verification, sample withdrawal, irregularity, warning and seizure. Another type of reports is added to classify reports that do not match any of the five major categories mentioned above.

The ICQRF monitoring activities are assembled in an enormous database that systematically records all ICQRF inspection activities disaggregated per geographic and at sub-sector level. This database, which is the dataset used in our research, includes all ICQRF inspection activities in the agro-food sector in Italy over the period 2007-2015. The data were provided by ICQRF as five separate datasets as follows: inspected products, inspected agents, reported products, reported agents and seizures⁹.

Inspected products: this dataset contains detailed information on each inspected product identifying its typology, its position in the value chain, its quality characteristics, the type of inspection, the inspection date and the number of products under each inspection. Every inspection is identified through a unique ID code, but might be associated to several products. These products may be of the same type, but may also be different. Therefore, under one inspection, there might be more than one type of product, and for each product type there might be more than one piece of the same product. In other words, an inspected product in the ICQRF’s terminology means a single piece of product in a sample of products that has been targeted by an ICQRF inspector¹⁰.

Inspected agents: this dataset includes the following information on the inspected agents: location (province and region), the main economic activities conducted (production, transformation, trade), and the subsector of the inspected products. In addition, two codes are provided to uniquely identify the inspected agent and the associated establishment unit respectively. The latter is a subset of the former in the sense that any agent must be associated with at least one establishment. However, in many cases, one agent could have more than one establishment. For example, one agent (company) may have two factories that are managed separately. In this case, the company is the agent while the two factories are two different establishments. No other socio-demographic information has been made available for privacy reasons. The data in this file are linked to the data of the *inspected products* dataset through the inspection ID.

Reported products: this dataset contains information only on the products that have been “reported”. As mentioned earlier, the activity of reporting is not performed for all inspected products and in regular cases it is up to the inspector to decide whether to report or not. However, whenever the inspector finds an irregularity, a report must be written. As in the case of inspections, a report includes data on one or more products, since each report is associated with an inspection. Every report is identified through an ID code that is unique for each report. In addition, the inspection ID is also reported in this dataset to link each report to its associated inspection in the *inspected products* dataset. The information included on each reported product identifies the product typology, its position in the value chain, its quality characteristics, the report type, the report date, and the product status, i.e. whether it is regular or not. In principle, there are two typologies of irregularities: one is criminal and the other is administrative. In both cases, references are made to the relevant criminal and administrative laws and articles that determine the nature of

⁹ In principle, seizures should be part of the reported products since a seizure is a consequence of reporting. However, data in seizures were provided in two files: in the file on reported products and in a separate file for reasons that are explained below.

¹⁰ For example, when an inspector performing his inspection activity in a supermarket selects for two pieces of the same brand and typology (e.g. two bottles of extra-virgin olive oil of the same brand and characteristics), they will be considered as two inspected products in the database (Dr. Placido Iudicello, ICQRF, personal communication).

violation. In addition, when irregularities are detected, there will be one report for each type of irregularity even for the same inspected product, resulting in more than one report for the same inspection in some cases. This is very relevant for us when the irregularity leads to a seizure. If the seizure is performed for more than one reason, there will be two reports for the same seizure, which may inflate the number of products that are reported irregular and consequently the value of seized products. In order to control for this, the ICQRF provided the data on seizures in a separate file to be used as a control file on seizures data.

Reported agents: this dataset contains the same information as the inspected agents' file but focusing only on the reported agents, i.e. those agents whose products have been reported as explained right above. In addition, the dataset includes four IDs: the inspection ID, the report ID, the agent ID as well as the establishment ID. One more thing to notice here is that, under the same inspection, the reported agent in some cases might be different from the inspected one. This may happen because when an irregularity is found the report is written about the agent responsible for the irregularity who may not be the inspected one¹¹.

Seizures: this dataset consists of detailed information on the seizures conducted by the ICQRF including the product typology, its quality characteristics and the quantity and value of the seized product as well as the region and provinces in which the product was seized and produced. These data are linked to the data on *reported products*, through the report ID, meaning that a seizure is one reason for reporting.

4.3 Data preparation

The only bridges across files are specific codes assigned to inspections, reports, agents, and establishments, which represent a unique ID for each inspection, report, agent or establishment. The database is huge whereas the file of inspected products includes more than 590 thousands records and other files include more than 358 thousands (reported products), 339 thousands (inspected agents), 271 thousands (reported agents) and 6.4 thousands (seizures) records.

An initial data cleaning was conducted aiming to understand the structure of the data and to discover problems or/and inconsistencies. Then the data were all transformed into Microsoft Access format to find a way of linking the five files together in order to have a single record connecting all data relating to one inspected (and eventually reported) product, inspected (and eventually reported) agent, and the relevant seizures. The objective was to have one single database including all the data, allowing a unified analysis of the data by value chain level, date, region, and economic activity, without losing information while avoiding repetitions.

This task has not been performed completely. It was easy to link inspected and reported products to inspected and reported agents respectively, through the ID codes of the inspections and reports, which assign a unique code to each conducted inspection and report¹². But when we tried to link inspections to reports, the resulting file was inflated. The reason for this can be better illustrated with an example. Let us assume that we have an inspection that includes many products, some of them are different and some are identical. Let us assume also that only two of these inspected products are reported. When we try to link them through the inspection ID, data of these two reported products get copied with all inspected products under the same inspection ID. Of course, the problem is exacerbated when the inspection is associated to more than one report, which is indeed the case for many inspections. This problem would not have been present if a unique ID had been assigned to each inspected product and not to each inspection.

The problem was partially solved by controlling other variables that identify the inspected products such as those determining its typology and quality. However, there are not enough information to control for all inspected products because many products have many identical characteristics, and it was too difficult to judge on the basis of the few available variables. Due to all these difficulties, we abandoned organizing all

¹¹ For example, when a product, inspected in a retail shop, is found to be mislabelled, the report is written about the agent responsible for mislabelling upstream the VC.

¹² This is because each inspected and reported agent has for sure an inspected and reported product.

the data in only one dataset, and preferred to seek other *ad hoc* solutions that enable us to perform the required analysis. Therefore, we organized the data in three files as follows:

- inspections: in which data on inspected products and data on inspected agents were linked;
- reports: in which data on reported products and data on reported agents are linked; and
- seizures: same as the original file on seizures that was provided as a control file.

When we examined the three datasets above, we noticed some inconsistencies between products and agents for both inspections and reports. Some products were not associated with agents, while some agents were not associated with products. The reasons provided by the ICQRF staff for these inconsistencies are related to the huge size of the dataset that may have caused some errors when data were extracted from the ICQRF archives¹³. After several attempts with no success to retrieve the full dataset, we had to give up, knowing that the missing data represent only 0.5% of the whole dataset.

We ended up with three datasets: inspections (products and agents) with about 588 thousands observations, reports (products and agents) with more than 350 thousands observations, from which about 6.4 thousands are reports of seizures. Data then were sorted according to the sector of the inspected (reported) products, since many products do not belong to the agro-food sector. The presence of non-food products in the dataset of the ICQRF is explained by two reasons. First, the ICQRF conducts also inspections on agricultural inputs such as fertilizers and chemicals that are beyond the scope of this research. Second, many “products” that have been inspected and/or reported, though belonging to agro-food value chains, are non-food items such as documents, machinery, land, etc. All observations on non-food products have been dropped, the relevant datasets were reduced to about 490 thousands of records on inspections, about 295 thousands of records on reports, from which about 5.1 thousands are reported as seizures.

The products in the ICQRF original dataset are also classified according to VCs through a code. However, the level of aggregation/disaggregation, which is suitable for the ICQRF inspection activities, is not convenient for our analysis. Therefore, we had to reclassify the products using as a reference the definition of agro-food sub-sectors applied by the Institute for Services to Agro-Food Markets (ISMEA, 2009). This is because we use the same classification for disaggregating the SAM model that is used for assessing the impact of frauds on the Italian economy in another working paper of this project (Rocchi *et al.*, 2018a). The resulting sub-sectors are the following:

- 1- Meat: Production, manufacturing and conservation of meat,
- 2- Fish: Manufacturing of fish and fish products that are transformed and conserved,
- 3- Olive oil: Production of olive oil, refined and unrefined,
- 4- Other foods: Production of other food products (vegetal oils, sugar, pasta and farinaceous products),
- 5- Horticultural products: Manufacturing of potatoes, other fruits and vegetables that are transformed and/or conserved, including fruit juices,
- 6- Dairy products: Hygienic treatment of milk and production of its derivatives
- 7- Cereals and starches: Manufacturing of cereals and production of starch products including rice milling,
- 8- Animal feed: Production of feed and fodder for animals
- 9- Wine: Production of wine
- 10- Other drinks: Industry of mineral water, non-alcoholic drinks and other alcoholic drinks.

In the following Section, we will use this dataset to analyse the phenomenon of agro-AFFs in general with focus on its evolution over time, before we turn to a more disaggregated analysis by region and by VC (Section 6).

¹³ Personal communication from Dr. Placido Iudicello, data manager at ICQRF.

5 An analysis of recent trends

In this section, we present the most recent trends of AFFs, relying exclusively on the ICQRF database. As clarified in section 2, in this study we adopt the definition proposed by Spink and Moyer (2011) according to which a food fraud is an intentional illegal act made for sake of economic gain. This definition implies that the alteration, adulteration, sophistication, and falsification of agro-food products as well as counterfeiting, that is the falsification of their trademarks including those related to the indication of geographical origin, are all variants of the broad definition of food fraud.

Operationally, with specific reference to the ICQRF database, according to this definition an AFF exists whenever the inspected product features any kind of irregularity no matter if it is of administrative or criminal nature, not matters whether it leads to the confiscation of the product or to other administrative penalties such as fines and warnings. However, considering that seizing a product is the highest penalty that ICQRF imposes, we analyse separately seizures from other irregularities.

5.1 General description of dataset

5.1.1 *Inspections: products and agents/establishments*

The ICQRF conducts most of its inspection activities in systematic manner attempting to achieve a reasonable degree of geographical coverage, taking into account the differences in the relative importance of specific subsectors in terms of their economic contribution and their likely exposure to fraudulent behaviour. Inspection activities are of two types: inspections, which are performed by physical access to the firms and monitoring activities that are conducted remotely at the ICQRF premises on the documentation of products, production machines and/or other things relevant to the production process¹⁴.

In most cases, an inspection is devoted to one product, but there are also many cases with more than one product under a single inspection (cf. section 4.2). The total number of agro-food products subject to inspection for the period 2007-2015 is 508,580, while the total number of inspections is 274,257, from which 36% include more than one product¹⁵. The presence of numerous products under one inspection usually reflects the economic scale of the business, meaning that the ICQRF increases the sample size for each inspection in relation to the economic size of the inspected establishment.

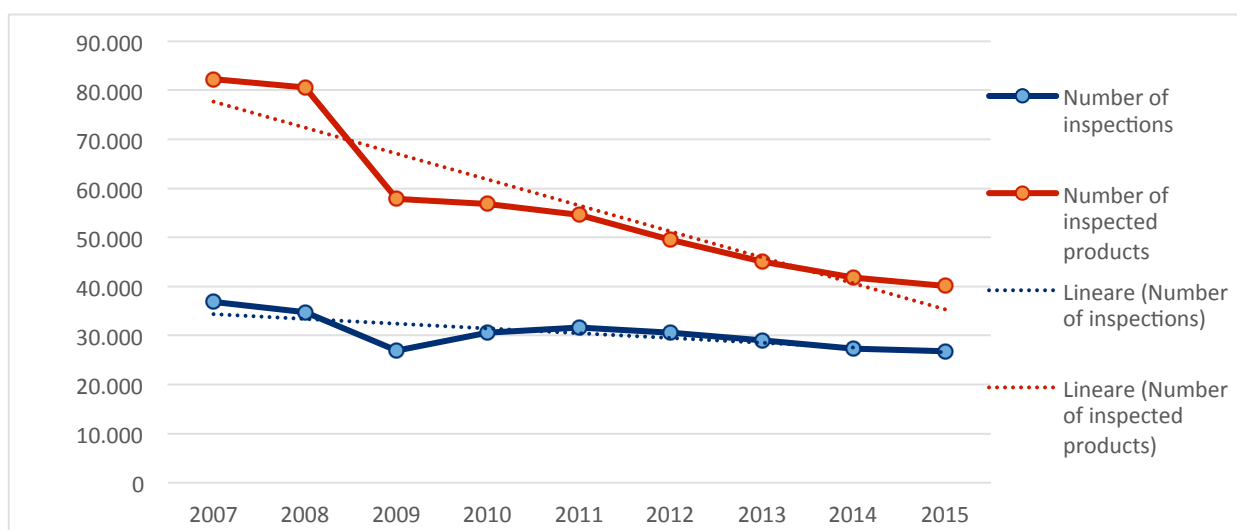
Figure 5.1 shows that both inspections and inspected products have been decreasing over time from 2007 to 2015, with the latter decreasing faster than the former. In fact, the ratio of inspected products number to that of inspections has decreased from 2.23 in 2007 to 1.50 in 2015, revealing that the ICQRF has also reduced the average sample sizes of its inspection activities. This can be attributed to more efficient operations of sampling and product selection gained from past experience¹⁶.

¹⁴ In fact, the share of monitoring activities in the entire dataset (588,011 observations) was more than 13%, although this share declines to about 9.5% when non-food products (which include machines and documents as reported in the datasets) are excluded. The remaining 9.5% of monitoring activities on agro-food items refer to inspections on product labelling and so they are relevant to our analysis.

¹⁵ It is worth recalling that “product” in ICQRF means any single product that is inspected regardless of its quality and/or brand characteristics, meaning that if two items from the same brand and same quality characteristics were selected for inspection, they will be counted as two different products in the ICQRF datasets (cf. section 4.2).

¹⁶ This conclusion is confirmed also by findings from the analysis of irregularities in section 5.2.

Figure 5.1. Evolution of number of inspections and inspected products for 2007-2015



Source: authors' elaboration on ICQRF (2016)

As mentioned before, products are differentiated in the dataset by their quality characteristics so that we can identify whether a product is conventional or organic and whether it has special characteristics related to designation of origin such as DOC, DOCG, DOP, IGT, IGP, and STG¹⁷. Some inspected products combine organic with one of the above characteristics. Therefore, we use in this paper the term “quality product” to refer to those classified as organic or/and DOC, DOCG, DOP, etc, while the others will be called “conventional” when quality issue is concerned. Table 5.1 presents a summary of inspected products by year and by quality characteristics. We can observe that the share of quality products is relatively high in the dataset accounting to 31% as an average over the period of 2007-2015. More important, however, is that while the number of both conventional and quality products has been decreasing (not shown in the table), the share of quality products has been steadily increasing from 22% in 2007 to reach 36% in 2015.

Table 5.1. Summary of inspected products by year and by quality characteristics

Year	Total No. of products	% conventional products	% organic products	% Other quality products	% All quality products
2007	82,234	77.9%	2.5%	19.6%	22.1%
2008	80,633	77.8%	3.0%	19.2%	22.2%
2009	57,798	69.9%	5.4%	24.8%	30.1%
2010	56,795	65.3%	3.1%	31.7%	34.7%
2011	54,540	64.0%	5.7%	30.3%	36.0%
2012	49,555	61.7%	5.2%	33.1%	38.3%
2013	45,074	66.7%	5.6%	27.7%	33.3%
2014	41,843	63.4%	5.6%	31.0%	36.6%
2015	40,108	63.9%	5.3%	30.8%	36.1%
Total	508,580	69.0%	4.3%	26.5%	30.8%

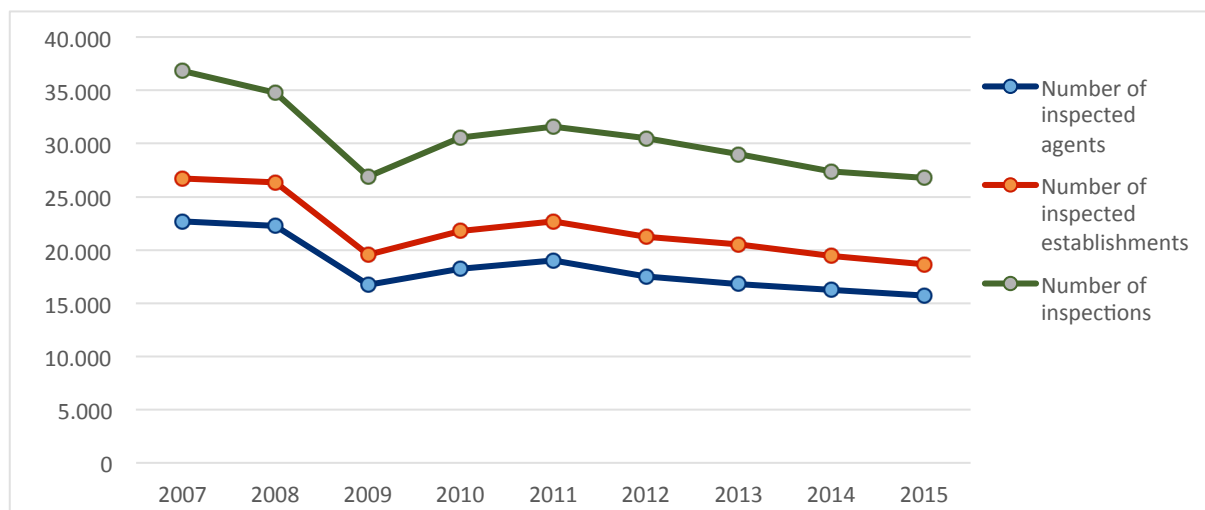
Source: authors' elaboration on ICQRF (2016)

Inspected agents/establishments show a trend similar to that of the number of inspections (Figure 5.2). In fact, the numbers of inspected agents and/or establishments have been decreasing at an almost equal pace of that of inspections: the ratios of annual number of inspected agents (establishments) to that of

¹⁷ These abbreviations can be translated as follows: controlled designation of origin (DOC), controlled and guaranteed designation of origin (DOCG) that apply to wine, while protected denomination of origin (DOP), typical geographical indication (IGT), protected geographical indication (IGP), and traditional specialty guaranteed (STG) apply to other food products.

inspections slightly decreased from 0.62 (0.73) in 2007 to 0.59 (0.70) in 2015 with a difference of only 0.03. Vice versa, a significant difference is observed in the ratio of annual number of inspected products to that of inspected products that decreased from 2.23 in 2007 to 1.5 in 2015, with a difference of 0.74 over the period.

Figure 5.2. Evolution of numbers of inspected agents and inspected establishments compared to number of inspections over the period 2007-2015



Source: authors' elaboration on ICQRF (2016)

It is worth noting that there are many agents and establishments that have been inspected more than once over the period of 2007-2015. The ratio of total number of inspections over that of agents (establishments) over the entire period of 2007-2015, is 3.15 (2.53). In other words, on average, every agent (establishment) was inspected more than three (two) times over the entire time span covered by the provided data. A further investigation of the data reveal that about 38% (37%) of the agents (establishments) were inspected more than one time over 2007-2015.

5.1.2 Reports: products and agents/establishments

Reporting is a fundamental part of the ICQRF activities, as they include crucial information about the result of inspections. As stated above, not every inspection is associated with a report, but the latter must be written when an irregularity is found while not all reports should imply irregularities¹⁸. Therefore, data on reported regular products and agents include the same information of those on inspected products and agents, plus the report type, which should state the report objective from the viewpoint of the ICQRF. When, however, an irregularity is detected, the report must in addition include details on the type of irregularity referring to relevant laws and regulations together with the consequences and actions taken by the ICQRF.

Reports can be classified into six types that determine the report objective, the inspection result, and action taken by the ICQRF if any (cf. section 4.2). These types are verification, sample withdrawal, warning, seizure, other irregularities, and others (the latter including relatively a few number of reports that do not fit in any of the other categories). The distribution of all reports by type is provided in Table 5.2. We see that verification reports make the majority with 55% of all reports over the period 2007-2015, followed by sample withdrawal reports. The former refers to the inspections that result regular, while latter records further inspection activities caused by suspicion that leads to sample withdrawal for analysis by ICQRF laboratories. Warning reports record the cases where the irregularity is not serious and the agent is usually given a time interval for correction. Reports of seizures record the cases when a seizure is enforced and it

¹⁸ Indeed, the rules of ICQRF demand that every inspector writes a minimum number of reports even of the inspection results did not include any irregularity (personal communication by Dr. Placido Iudicello, ICQRF staff).

includes other information on the seized quantity and an assessment of its value in monetary terms. Reports of other irregularities usually record serious cases of irregularity but not to a level causing a seizure. However, in many cases, borders between these types of irregularities and seizures are vague.

Table 5.2. Distribution of reports by year and report type

Year	No. Of reports	% verification	% sample withdrawal	% warning	% seizure	% other irregularity	%Other reports
2007	26,915	53%	31%	0.5%	1.8%	10.5%	3.4%
2008	22,804	49%	33%	0.4%	1.8%	12.8%	2.8%
2009	18,361	50%	34%	0.6%	1.6%	11.3%	2.0%
2010	24,079	56%	29%	0.8%	1.3%	10.9%	1.9%
2011	26,457	60%	26%	0.5%	1.2%	11.1%	1.8%
2012	25,430	58%	26%	0.8%	1.8%	10.7%	2.3%
2013	25,596	57%	29%	0.9%	1.5%	9.5%	2.8%
2014	26,527	58%	28%	2.1%	1.5%	7.5%	2.6%
2015	28,379	54%	27%	6.4%	1.4%	7.0%	3.4%
Total	224,548	55%	29%	1.5%	1.5%	10.0%	2.6%

Source: authors' elaboration on ICQRF (2016)

Data presented in Table 5.2 help us better understand some of the ICQRF operations with their overlapping as in many cases, one product may be associated to reports of different types. For example for one product, there might be verification and/or sample withdrawal reports as well as irregularity or seizure reports. This occurs when the verification leads to uncertain result calling for sample withdrawal for analysis, and when the product is found irregular, an irregularity report is also written. This overlapping makes it difficult to rely on the report classification for further analysis in terms of their relationships to inspections. To avoid these problems, we decided to rely on another variable in the dataset called "product irregularity flag", which tells whether the reported product was found to be regular or not. This simple variable was easy to validate relying on data and information given in the fields detailing the rules and regulations governing the ICQRF actions. Using this variable, we could isolate the records that reported irregular products from the rest of records and then we used ad hoc methods to match them with data on inspections.

5.2 The relationships between inspections, irregularities and seizures

5.2.1 Irregularities vs. inspections: a general outlook

Table 5.3 summarizes the results of matching the data on inspections with the data on irregularities per year. The number of irregularities noticeably increased over the period: products +28%, agents +33% and establishments +23%. The proportion of irregularities on total inspections increased even more, considering the decreasing trend in the number of inspections. This can be an indication of increasing fraudulent activities over time, but it can be an indication of improved efficiency of the inspection activities since the ICQRF's ability to detect irregularities has been increasing despite the steady decline in the absolute number of inspections.

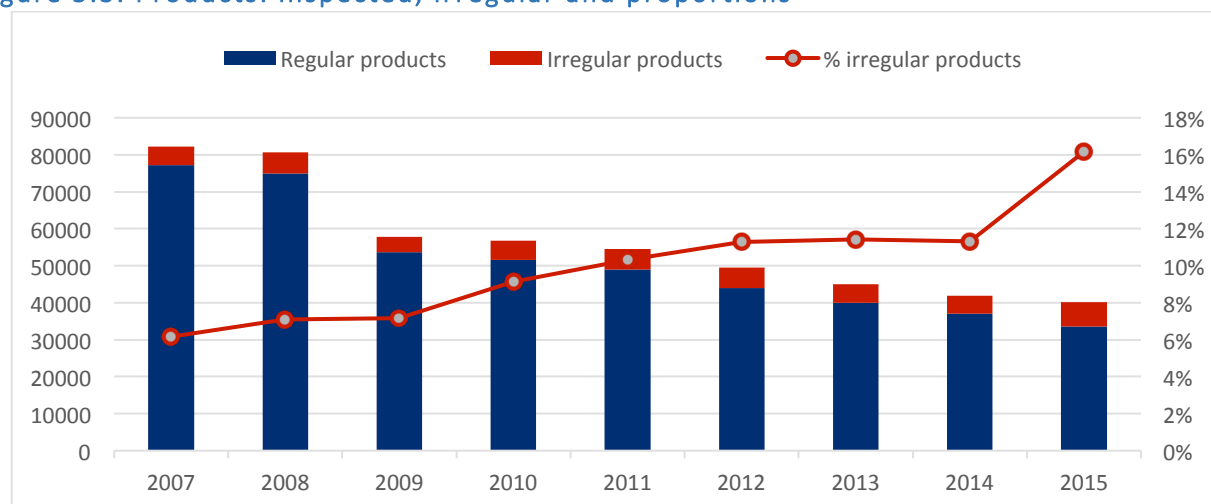
Figure 5.3 shows that the share of irregular products relative to all inspected products has been steadily increasing, with a noticeable jump starting from 2009 probably due to the crisis, which created economic pressure motivating more fraudulent behaviour (cf. section 2.1). From 2012, the pace becomes somehow stable until 2015 where the ratio jumped from 11% to 16%. Over the whole period, the ratio increased by about 10 percentage points (from 6% to 16%). The data for agents and establishments show similar results to those of products.

Table 5.3. Summary of inspections and irregularities by year

Years	Number of inspections			Irregular products		Irregular agents		Irregular establishments	
	Products	Agents	Establishments	Number	% of inspected products	Number	% of inspected agents	Number	% of inspected establishments
2007	82,234	22,685	26,710	5,071	6.2%	2,828	12.5%	3,219	12.1%
2008	80,633	22,270	26,338	5,726	7.1%	2,980	13.4%	3,344	12.7%
2009	57,798	16,710	19,583	4,151	7.2%	2,246	13.4%	2,476	12.6%
2010	56,795	18,238	21,777	5,193	9.1%	2,990	16.4%	3,342	15.3%
2011	54,540	19,020	22,687	5,619	10.3%	3,385	17.8%	3,754	16.5%
2012	49,555	17,532	21,233	5,598	11.3%	3,207	18.3%	3,487	16.4%
2013	45,074	16,770	20,504	5,157	11.4%	3,149	18.8%	3,437	16.8%
2014	41,843	16,271	19,420	4,742	11.3%	2,939	18.1%	3,173	16.3%
2015	40,108	15,721	18,661	6,487	16.2%	3,750	23.9%	3,967	21.3%
Pooled	508,580	87,195	108,203	47,744	9.4%	19,388	22.2%	22,793	21.1%

Source: authors' elaboration on ICQRF (2016)

Figure 5.3. Products: inspected, irregular and proportions

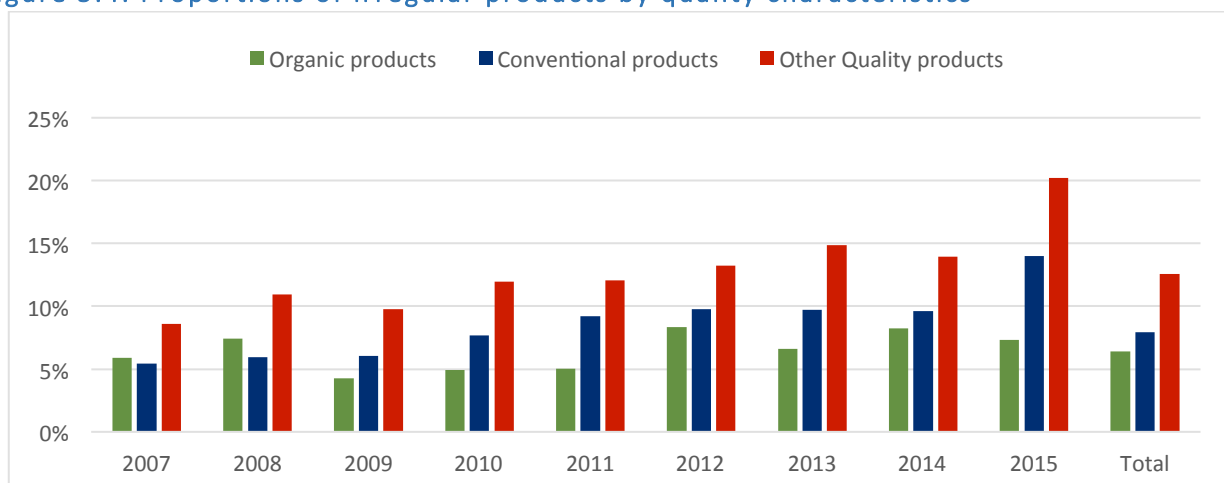


Source: authors' elaboration on ICQRF (2016)

5.2.2 Irregular and seized products: specific observations

Analysing the relationship between irregular and inspected products by their quality characteristics reveals some interesting findings. Non-organic quality products such as DOP, DOC, DOCG, etc., show a higher likelihood of being irregular than the conventional or organic products (Figure 5.4). This probably depends on the expected higher payoff of frauds in such categories than conventional and organic products. This explains, at least partly, the increased shares of these products in the inspections, which may be the consequence of the ICQRF evaluation of past results.

Figure 5.4. Proportions of irregular products by quality characteristics



Source: authors' elaboration on ICQRF (2016)

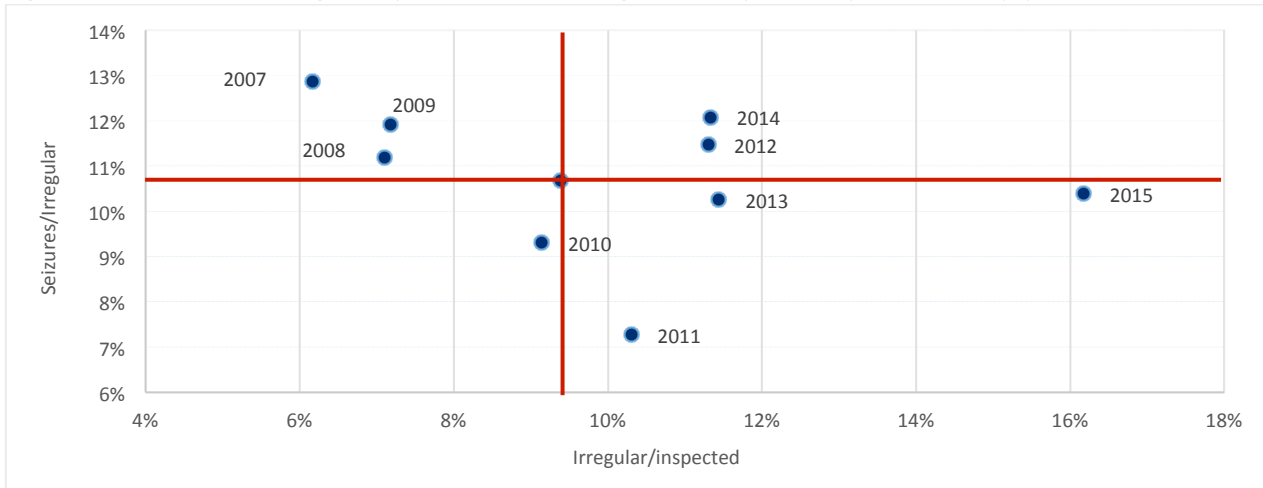
Table 5.4 shows the proportions of seized products relative to the numbers of irregular products. The proportion started at 13% in 2007 but decreased gradually to reach only 7% in 2011, after which it jumped to 11% to remain somehow stable since then. It is interesting that the sharp decline in this proportion between 2009 and 2010 is mainly caused by the increase in the number of irregular products rather than by a reduction in number of seizures. Vice versa, the sharp increase in 2011-2012 is mainly caused by a surge in the number of seizures, which recorded an increase by 57% in 2012 compared to 2011.

Table 5.4. Seized products: number, percentages and values

Year	Number of seizures	% of seizures vs irregular products	Value of seized products (million euro)
2007	652	12.9%	17.8
2008	641	11.2%	99.8
2009	495	11.9%	15.7
2010	483	9.3%	8.8
2011	409	7.3%	8.3
2012	643	11.5%	22.9
2013	529	10.3%	35.8
2014	573	12.1%	13.9
2015	674	10.4%	57.8
Total	5099	10.7%	280.8

Source: authors' elaboration on ICQRF (2016)

Figure 5.5. Seized/irregular products vs Irregular/inspected products by year

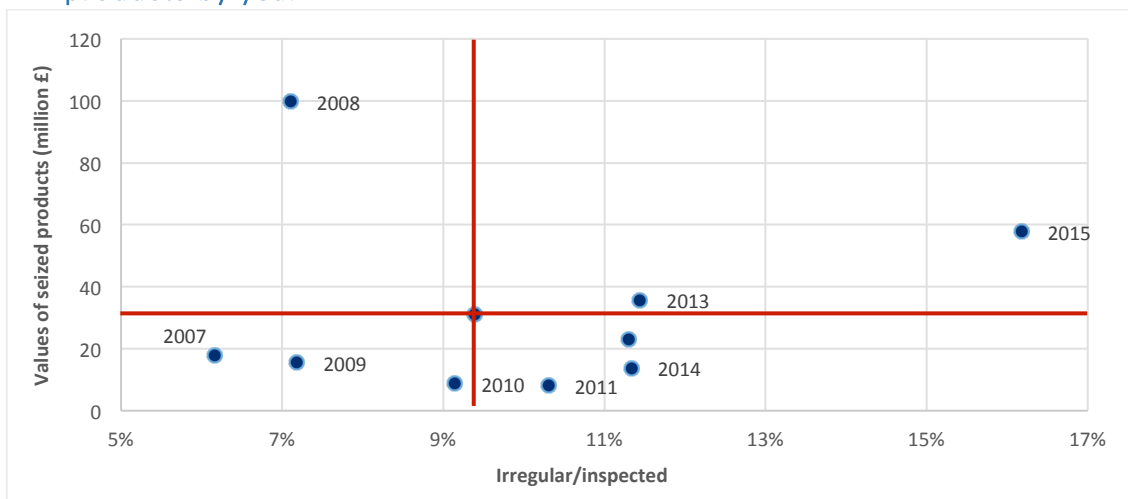


Source: authors' elaboration on ICQRF (2016)

The proportion of seizures on irregular products can give some insight about what can be called the intensity of irregularity when compared to the proportion of irregular products/inspected ones. These two proportions are plotted against each other in Figure 5.5 with the red lines representing the averages. The figure reads as the intensity of irregularity increases when both proportions go up together, meaning that years located on the top-right quadrant witnessed highest irregularities as 2012 and 2014, which have values above the averages, while 2010 showed the lowest intensity of irregularity.

Nevertheless, this picture considerably differs when we consider the values of seized products (Figure 5.6). For example, although the proportion of seizures to irregular products is 11% in both 2008 and 2012, the value of seized products is very different and account to more than four times in the former compared to the latter¹⁹. We see how extreme is the value of seized products recorded in 2008 while the associated proportion of irregular products to inspected ones is relatively small. In 2015, we witness also a high value of seized products associated with the highest proportion of irregular/inspected products.

Figure 5.6. Proportion of number of seizures/irregular products vs values of seized products by year



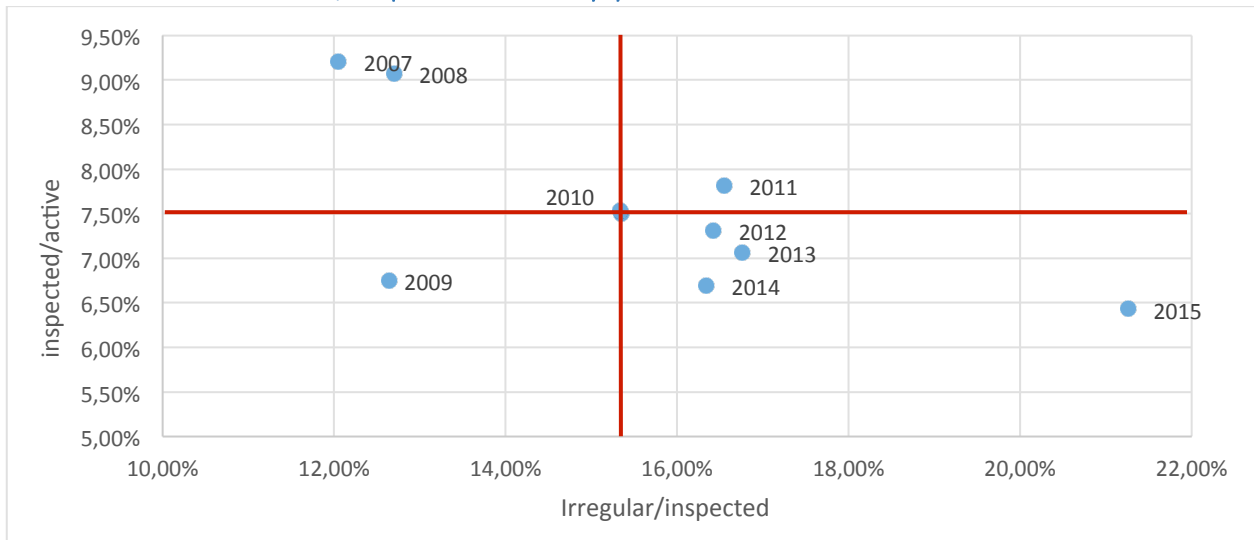
Source: authors' elaboration on ICQRF (2016)

¹⁹ This difference is because while inspection (i.e. reporting) is performed on a sample, the seizure is performed on the entire output.

5.2.3 Specific observations on irregular establishments

Figure 5.7 shows how the ratio of inspected establishments with respect to the total number of active establishments changed over the years in relation to the ratio of irregular establishments to the inspected ones. We see that 2010 is located at the crossing point of the averages for both ratios. Years 2012-2015 are all located above the average for proportion of irregular establishments/inspected ones while the proportions of inspected/active establishments are below average. Vice versa, years 2007 and 2008 are located in the opposite quadrant.

Figure 5.7. Proportions of inspected establishments/active ones vs irregular establishments/inspected ones by year



Source: our elaboration on ICQRF (2016) and ISTAT (2014)

Therefore, there is a pattern of ICQRF inspection activities over time confirming that the efficiency of inspections has increased over the years. At the beginning of the period of analysis (2007-2008), there were relatively fewer detected irregularities although the proportion of inspected establishments was relatively high. In the last four years of the period of analysis (2012-2015), although fewer establishments are inspected, the proportion of establishments detected as irregular was higher than the average, with the year 2015 showing an extreme case for the number of irregularities. This might be interpreted as an indicator of improved monitoring capacity by ICQRF as it was also emphasized in the case of products.

6 Disaggregated analysis of frauds in the agro-food sector

In this section, we perform a disaggregated analysis of the phenomenon of AFFs by geographical location and by value chain. We first show what the data tell us about the distribution of the inspected and irregular products and agents/establishments over the period of 2007-2015 among Italian regions. We then describe the phenomenon disaggregating the data across the ten agro-food value chains that are adopted by ISMEA and listed in section 4.3.

6.1 Geographical analysis of ICQRF data

6.1.1 Geographical distribution of inspections

ICQRF inspections are performed at the firm level, usually by physical access to the firms. There are two criteria usually used by ICQRF to identify firms for inspection: random selection and historical records. This implies that firms that were reported as irregular in the past have more chances to be selected for an inspection. This will probably lead to a sort of “path dependency” in choosing firms to be inspected that should be reflected in a pattern. Table 6.1 summarizes the distribution of inspections, inspected products and inspected agents and establishments by region.

Table 6.1. Distribution of inspections, inspected products, and inspected agents/establishments by region

Region	Inspections		Inspected products		Inspected agents/establishments		
	Number	%	Number	%	Number of agents	Number of establishments	% of establishments
Abruzzo	9,020	3.3%	16,824	3.3%	3,037	3,504	3.2%
Basilicata	3,831	1.4%	10,432	2.1%	1,717	1,902	1.8%
Calabria	16,043	5.8%	34,085	6.7%	5,433	6,273	5.8%
Campania	24,297	8.9%	52,118	10.2%	8,440	9,460	8.7%
E. Romagna	17,970	6.6%	36,072	7.1%	5,479	7,206	6.7%
F. V. Giulia	7,132	2.6%	14,870	2.9%	2,259	2,840	2.6%
Lazio	11,958	4.4%	22,205	4.4%	4,058	5,027	4.6%
Liguria	5,932	2.2%	10,412	2.0%	2,053	2,542	2.3%
Lombardy	18,617	6.8%	31,975	6.3%	6,424	8,493	7.8%
Marche	12,694	4.6%	22,887	4.5%	4,548	5,336	4.9%
Molise	3,329	1.2%	5,239	1.0%	1,473	1,618	1.5%
Piedmont	16,816	6.1%	38,274	7.5%	5,012	6,279	5.8%
Puglia	25,718	9.4%	34,943	6.9%	8,709	10,162	9.4%
Sardinia	13,908	5.1%	31,542	6.2%	4,588	5,593	5.2%
Sicily	31,595	11.5%	45,742	9.0%	9,077	10,972	10.1%
Tuscany	20,170	7.4%	38,979	7.7%	6,658	8,343	7.7%
T. A. Adige	4,071	1.5%	7,890	1.6%	1,180	1,480	1.4%
Umbria	10,568	3.9%	21,438	4.2%	2,654	3,226	3.0%
V. D'Aosta	374	0.1%	676	0.1%	184	195	0.2%
Veneto	20,214	7.4%	31,977	6.3%	5,966	7,752	7.2%
Total	274,257	100%	508,580	100%	87,195*	108,203	100%

* This is not the sum over regions because some agents operate in more than one region.

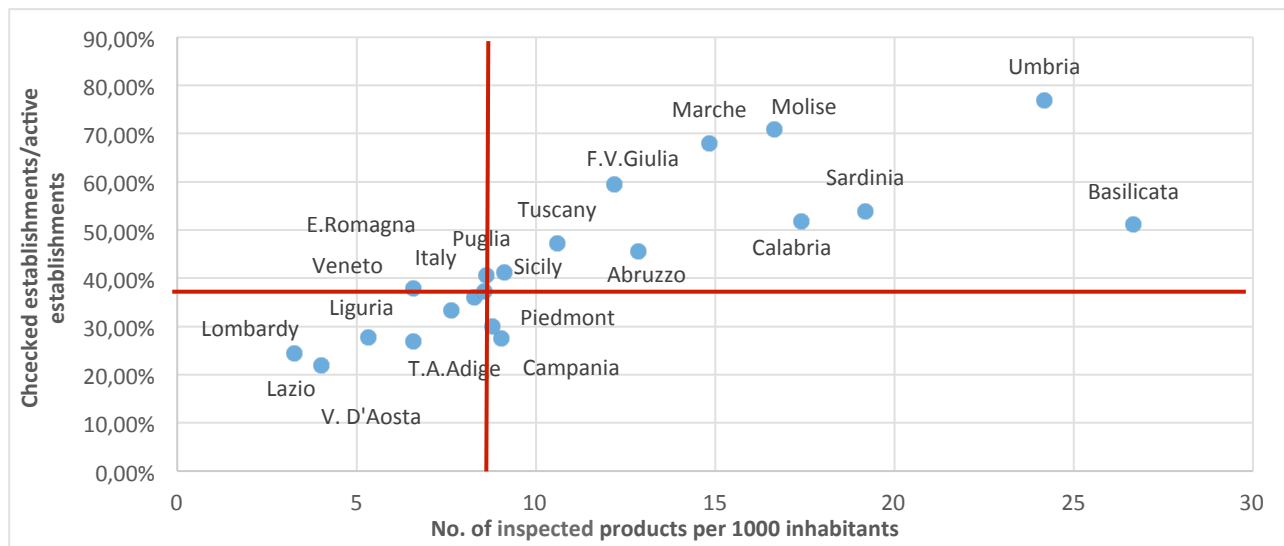
Source: authors' elaboration on ICQRF (2016)

It is important to recall that each inspection is associated only with one agent but the opposite is not necessarily true, meaning that many agents may be inspected more than one time. However, each inspection may include more than one product. This explains why the number of inspections in Table 6.1 is lower than that of inspected products but higher than that of inspected agents. ICQRF refers to an establishment as a sampling unit managed by an agent that may refer to factories, farms, shops and any other economic units. Each establishment is associated to one agent, but the latter may have more establishments that may be located in different regions. This is why the sum of inspected agents over regions is not equal to the number of inspected agents at the national level (last row of Table 6.1).

Table 6.1 shows that the highest number of inspections is in Sicily (11.5%), Puglia (9.4%) and Campania (8.9%); Tuscany and Veneto account both for 7.4% of the total inspections, while each remaining region accounts for a lower share of total inspections. The ranking changes when we look at the inspected products with Campania featuring the highest share (10.2%) followed by Sicily (9%). Puglia that comes second in terms of number of inspections has a relatively low number of inspected products (only 5.9%), while most regions show similar percentages. When we look at the numbers of inspected agents/establishments, Sicily ranks again first (10.1%), followed by Puglia (9.4%), Campania (8.7%) and Lombardy (7.8%). The latter shows a slightly higher percentage of inspected establishments compared to inspected products.

However, these data do not provide information on how evenly distributed inspection activities are across regions as they do not take into account the size of each region. Therefore, we calculated two ratios that together can be interpreted as a measure of ICQRF inspection intensity. These are number inspected establishments over number of active establishments, and number of inspected products per 1,000 inhabitants (consumers). The first indicates whether the regions are evenly covered in terms of inspected establishments, while the second indicates how even the coverage is in terms of inspected products. The two indicators are plotted against each other and shown in Figure 6.1.

Figure 6.1. ICQRF inspection intensity by region



Source: authors' elaboration on ICQRF (2016) and ISTAT (2015)

The figure shows a positive relationship between the two indicators. We can see that Emilia Romagna, Puglia, Sicily, T.A. Adige, Piedmont, Campania, and to some extent Tuscany and Veneto show inspection intensities close to the national averages. On the other hand, Umbria, Basilicata, Sardinia, Molise, Calabria, Abruzzo and F.V. Giulia have all higher inspection intensities, while the inspection intensities in remaining regions are below the national averages especially those of Lazio and Lombardy. This suggests a negative relationship between the size of the region (measured both in terms of establishments and inhabitants) and the inspection intensity, which might be explained by unbalanced staffing of inspectors among regional ICQRF offices. Moreover, irregularity history could matter too. In fact, large regions, like Lombardy and Lazio, have higher proportions of irregularities (cf. section 6.1.3 and 6.1.4 below). Sampling new inspections

depend, at least in part, on past behaviours of the firms; therefore, firms that in the past were found irregular, will have higher probabilities of being included again in the inspection samples. At the end, this leads to the situation where a relatively few firms are inspected several times while many others are not sampled.

6.1.2 Geographical analysis of irregularities and seizures

Table 6.2 provides a summary on how irregular products and agents/establishments are distributed across Italian regions. The table shows that Sicily and Piedmont account for the highest shares of irregular products (more than 11% each), followed by Lombardy, Veneto, Puglia, Tuscany and Campania with shares ranging in 8-9%. Results at the establishment level are not very different since the share of irregular establishments is very close to that of irregular products in most regions. The only exceptions are Piedmont and Puglia where the former drops to 7.8% and the latter rises to 9.4% for establishments.

Table 6.2. Distribution of irregularities for products, agents and establishments by region

Region	Irregular products		Irregular agents/establishments		
	Number	% of total	Number of agents	Number of establishments	% of total establishments
Abruzzi	1,503	3.2%	663	797	3.5%
Basilicata	329	0.7%	186	215	0.9%
Calabria	1,747	3.7%	1,031	1,192	5.2%
Campania	3,816	8.0%	1,616	1,816	8.0%
Emilia Romagna	2,387	5.0%	1,002	1,190	5.2%
F. V. Giulia	1,143	2.4%	412	456	2.0%
Lazio	2,842	6.0%	1,107	1,277	5.6%
Liguria	604	1.3%	305	349	1.5%
Lombardy	4,228	8.9%	1,508	1,883	8.3%
Marche	1,574	3.3%	751	829	3.6%
Molise	420	0.9%	216	236	1.0%
Piedmont	5,578	11.7%	1,595	1,796	7.9%
Puglia	3,929	8.2%	1,906	2,138	9.4%
Sardinia	1,833	3.8%	804	940	4.1%
Sicily	5,433	11.4%	2,291	2,636	11.6%
Tuscany	3,959	8.3%	1,908	2,134	9.4%
T. A. Adige	476	1.0%	223	248	1.1%
Umbria	1,743	3.7%	516	594	2.6%
V. D'Aosta	80	0.2%	34	35	0.2%
Veneto	4,119	8.6%	1,762	2,031	8.9%
Total	47,744	100%	19,388*	22,792	100%

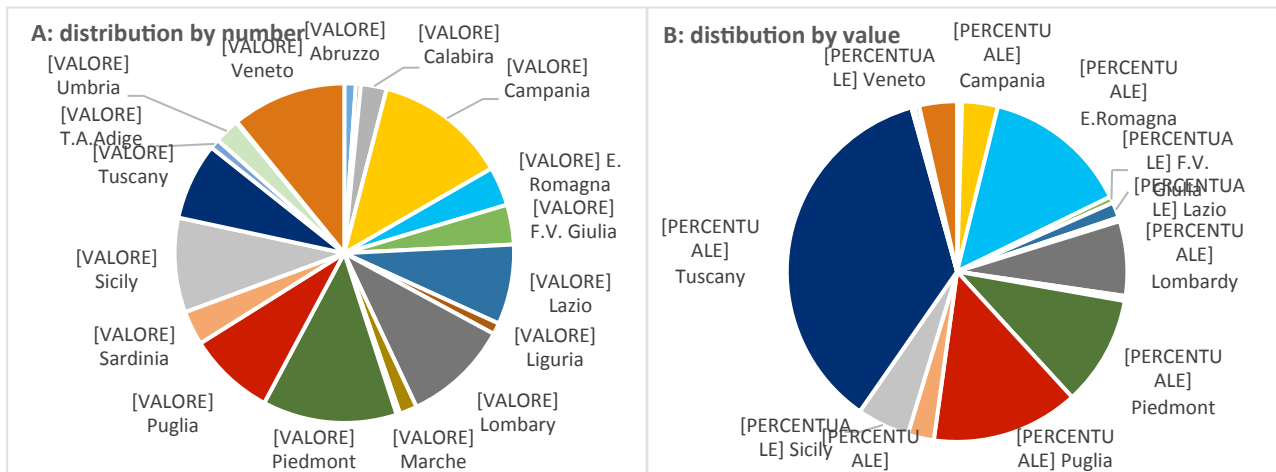
* This is not the sum over regions because some agents operate in more than one region.

Source: authors' elaboration on ICQRF (2016).

When we look at the distribution of seizures, things do change considerably. In fact, while the group of regions with highest shares of irregular products is virtually the same group with the highest shares of seizures²⁰, the ranking changes significantly when we consider the values of seized products (Figure 6.2/B) with Tuscany alone accounting for 36% of the total, followed by Puglia (14%), Emilia Romagna (13.9%) and Piedmont (10.4%).

²⁰ For example, Piedmont and Campania have the highest shares of seizures with more than 12% each, followed by Veneto, Lombardy, and Sicily with proportions ranging in 9-11%.

Figure 6.2. Distribution of seizures over regions by number and by value

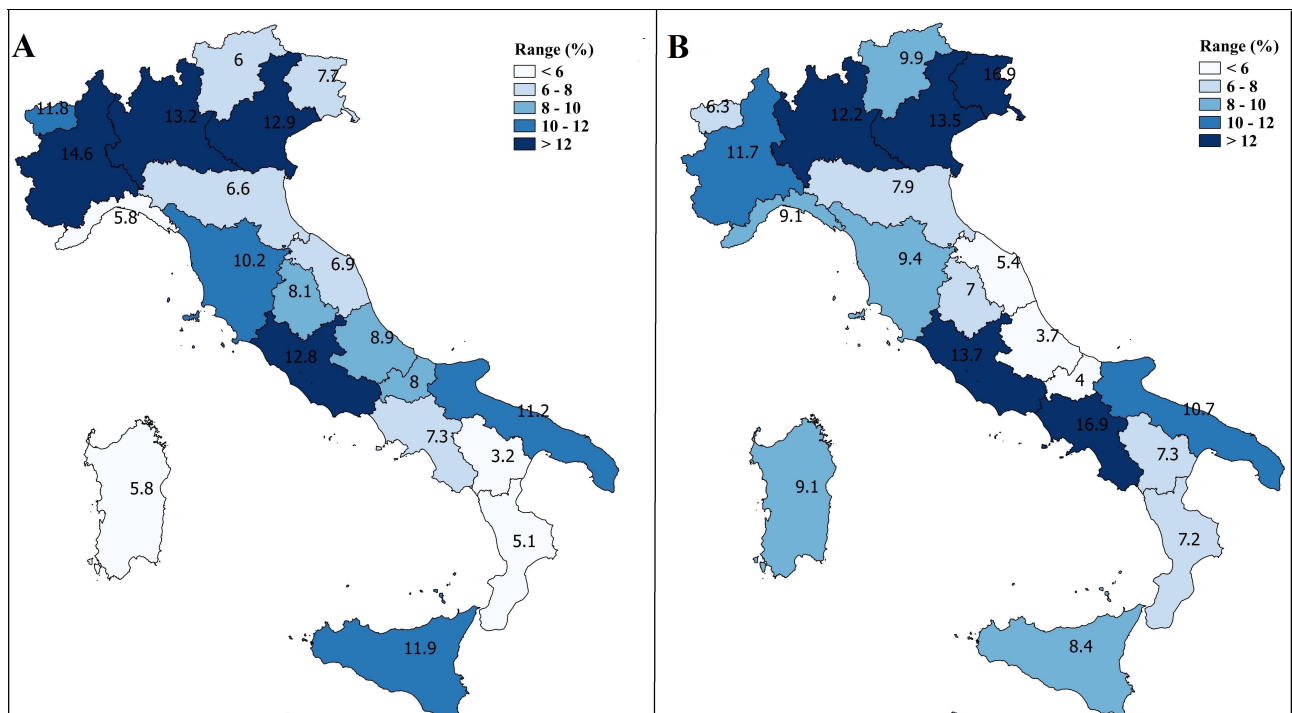


Source: authors' elaboration on ICQRF (2016)

6.1.3 Irregularities vs. inspections: products by region

To get some insights on the intensity of irregularities we look at the proportion of irregular products vs. inspected ones as well as the proportion of seized products (as seizures are the strongest sanctions imposed by the ICQRF) to irregular ones. These two proportions are presented in Figure 6.3 A and B, respectively.

Figure 6.3. Proportions of irregular products to inspected ones (A) and seized products to irregular ones (B) by region

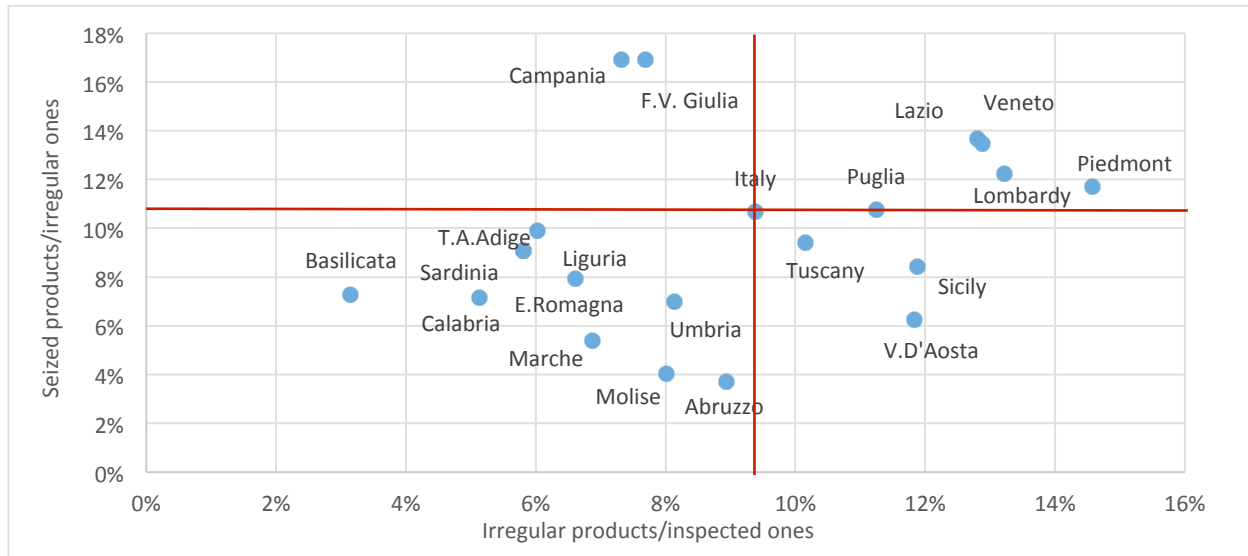


Source: authors' elaboration on ICQRF (2016)

The regions showing the highest proportions of irregular products/inspected ones are largely the same that have the highest proportions of seized products/irregular ones, namely Lazio, Lombardy and Veneto and, to a lesser extent, Piedmont and Tuscany. However, some other regions show considerable differences in the two proportions such as Campania and Sardinia, with much higher proportion of seizures compared to that

of irregularities. Small regions like Molise and Abruzzo, on the other hand, have the proportion of irregularities noticeably higher than that of seizures.

Figure 6.4. Proportions of irregular products to inspected ones vs proportions of seized products to irregular ones by region



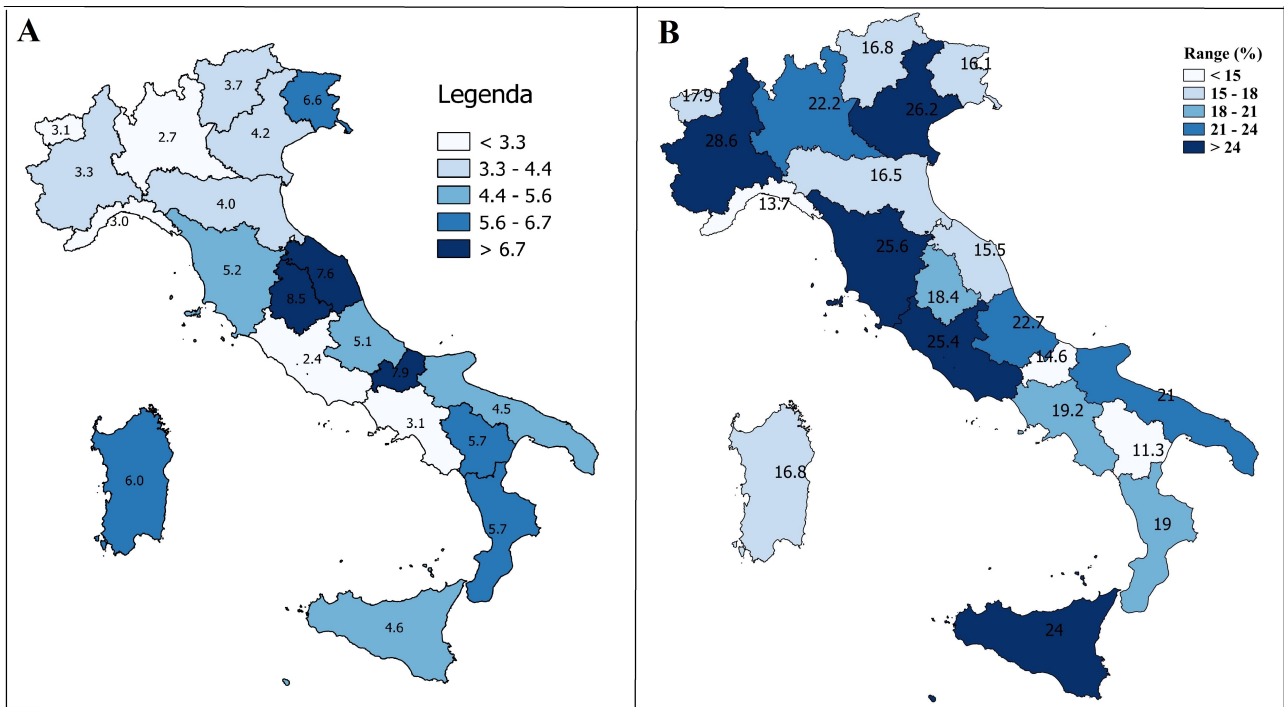
Source: authors' elaboration on ICQRF (2016)

Figure 6.4 plots the two ratios against each other with the red axis representing the national averages. Veneto, Lazio, Piedmont, Lombardy and Puglia are the regions where both proportions are higher than the national averages. On the other hand, Campania and Friuli V.G. show proportionately more seizures than irregularities, while the opposite is true for Sicily, Tuscany and Val d'Aosta. Most of the other regions, however, have both proportions lower than the national averages. Therefore, the figure shows that relying on numbers of irregular and seized products, frauds are more intense in Veneto, Lazio, Piedmont, Lombardy, and Puglia, followed by Sicily, Tuscany, Campania and Friuli V.G.

6.1.4 Irregularities vs inspections: establishments by region

Figure 6.5 shows two important proportions related to inspected establishments by region. Panel A represents the proportions of inspected establishments to active ones and therefore gives insight on where inspection activities are mostly concentrated. Panel B, on the other hand, represents the proportions of irregular establishments to inspected ones and so can provide information on where irregular establishments are mostly found. The most interesting observation is the asymmetry in the ranges between the two proportions, suggesting that regions with lower ratios of inspections are those found with higher ratios of irregularities such as the case for Lazio, Veneto, Lombardy, Piedmont, Sicily and Tuscany. On the other hand, regions such as Marche and Umbria have lower ratios of irregular establishments despite having higher proportions of inspections. Consequently, a redistribution of inspection activities may help further improve the ICQRF performance through reducing the inspections in the latter regions and increasing them in the former ones.

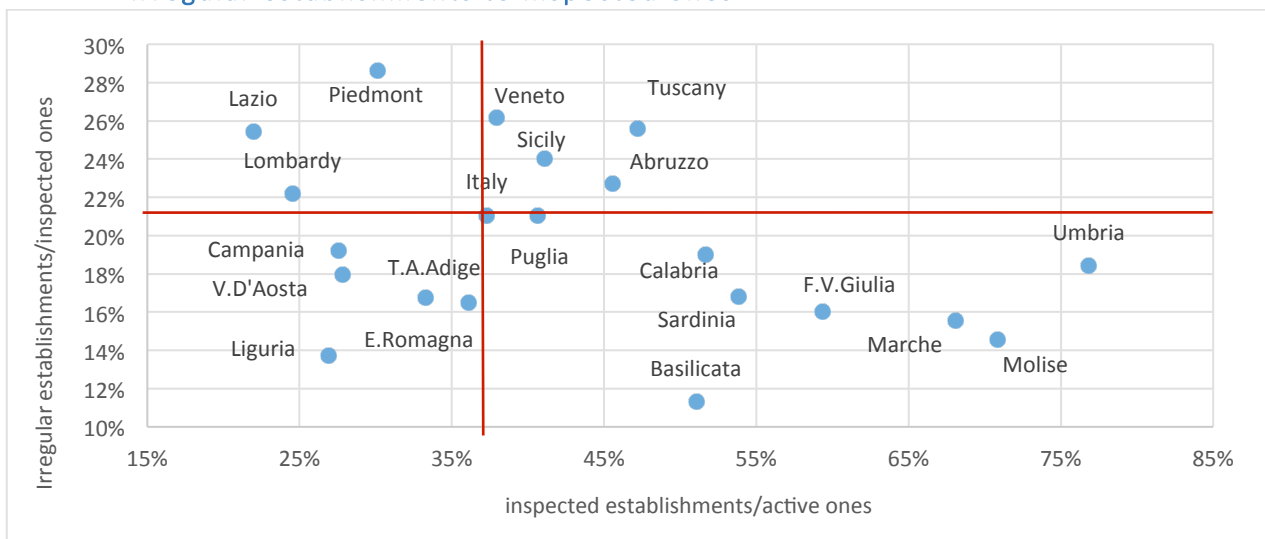
Figure 6.5. Proportions of inspected to active establishments (A) vs irregular to inspected establishments (B) by region



Source: authors' elaboration on ICQRF (2016) and ISTAT (2014)

Figure 6.6 provides a more consistent representation of two proportions plotting them against each other, while comparing them using the national averages as references. The Figure shows that Piedmont, Lazio and Lombardy have been noticeably under-inspected, while regions such as Molise, Marche, Sardinia Basilicata and Calabria are considerably over-inspected. On the other hand, regions such as Tuscany, Sicily, Abruzzo, Liguria, Campania and Emilia Romagna are inspected in a more balanced manner.

Figure 6.6. Proportions of inspected establishments to active ones vs proportions of irregular establishments to inspected ones



Source: authors' elaboration on ICQRF (2016) and ISTAT (2014)

6.2 Data analysis by subsector

6.2.1 General description of ICQRF data by subsector

To monitor its activities, the ICQRF classifies the agents, establishments and products into relatively broad subsectors that fit the purposes of the inspection activities. Then data on each subsector are singled out and published separately. The ICQRF data include information on the subsector of the products, agents and establishments. Considering that one agent/establishment may produce several products some of which may belong to different value chains, the ICQRF records the prevalent sector for each agent/establishment. In our subsector analysis, we focus only on products for two reasons. The first is pragmatic since considering products bypasses the problem of overlapping between subsectors existing in analysing agents/establishments. Second, focusing on products is consistent with future analysis, specifically with the disaggregation of SAM used for simulations to be performed as an exogenous injection in terms of values of the final products in each of the ten considered subsectors.

Table 6.3. Summary of inspection activities by subsector over the period 2007-2015

Subsectors*	Distribution of inspections by subsector			% of irregularities/inspections		
	Products	Agents	Establishments	Products	Agents	Establishments
Meat	5.8%	11.1%	12.0%	9.2%	15.9%	13.8%
Fish	0.3%	0.9%	0.8%	12.4%	12.8%	12.1%
Olive oil	13.8%	24.7%	24.8%	8.4%	14.6%	12.7%
Other foods	7.9%	16.1%	17.0%	7.7%	12.6%	11.4%
Horticultural products	13.4%	18.7%	20.0%	5.1%	11.2%	10.0%
Dairy products	11.3%	16.5%	18.1%	6.8%	13.7%	11.8%
Cereals and starch	9.3%	14.9%	16.4%	6.9%	12.1%	11.4%
Animal feed	5.7%	8.8%	8.3%	9.3%	11.2%	12.1%
Wine	29.7%	31.1%	31.0%	13.9%	28.7%	25.5%
Other drinks	2.7%	4.9%	5.4%	10.2%	16.6%	13.8%
Total	100.0%	147.7%	153.8%	9.4%	22.2%	21.1%

* For full definitions of the subsectors, refer to section 4.3.

Source: authors' elaboration on ICQRF (2016)

Table 6.3 summarizes the results of inspection activities conducted over the period 2007-2015 disaggregated by agro-food subsector. It shows that wine is the most inspected subsector accounting for about 30% of all inspected products, followed by olive oil, horticultural and dairy products, accounting for 14%, 13% and 11% respectively. When looking at agents and establishments the ranking changes a bit, but not for wine and olive oil that keep their first and second position respectively. However, it is interesting to notice that about 48% and 54% of the agents and the establishments respectively have products that belong to more than one subsector (cf. the last row of Table 6.3).

In terms of proportions of irregularities compared to the number of inspections, wine also ranks first irrespective of the adopted variable: 14% in terms of products, 29% in terms of agents, and 26% in terms of establishments. The fish subsector ranks second in terms of products followed by other drinks, animal feeds and olive oil with no noticeable differences however.

Looking at the values of seized products by subsector, we see that wine shows by far the highest value, followed by olive oil: these two subsectors account for more than 90% of total seizure value over the period of 2007-2015. However, this observation is largely valid also for each year. The data show an extreme value for wine in 2008, which makes by itself 48% of the value of all seized products over the entire period of

2007-2015 and 98% of the value of seized products in 2008. This extreme value is probably due to the so-called “Velenitaly” scandal when numerous violations in several regions were detected²¹.

Table 6.4. Values of seizures implemented by ICQRF by year and subsector (thousands of euro)

Subsectors *	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Meat	14	10	57	71	10	160	4	3	18	346
Fish	86	0	9	1	48	34	1	4	5	187
Olive oil	9,570	1,341	2,197	174	450	1,302	3,658	4,828	311	23,832
Other food	644	236	60	21	22	165	322	112	200	1,781
Horticultural products	315	2,136	1,073	1,175	499	468	424	80	46	6,217
Dairy products	14	199	755	896	6	41	360	164	292	2,729
Cereals and starch	24	37	34	54	151	106	786	2,345	173	3,711
Animal feed	1	7	0	26	94	12	430	48	25	643
Wine	6,981	95,747	11,507	6,353	6,976	20,241	29,588	6,115	56,521	240,028
Other drinks	109	104	4	11	12	417	185	204	260	1,305
Total	17,758	99,817	15,698	8,781	8,269	22,945	35,758	13,902	57,850	280,777

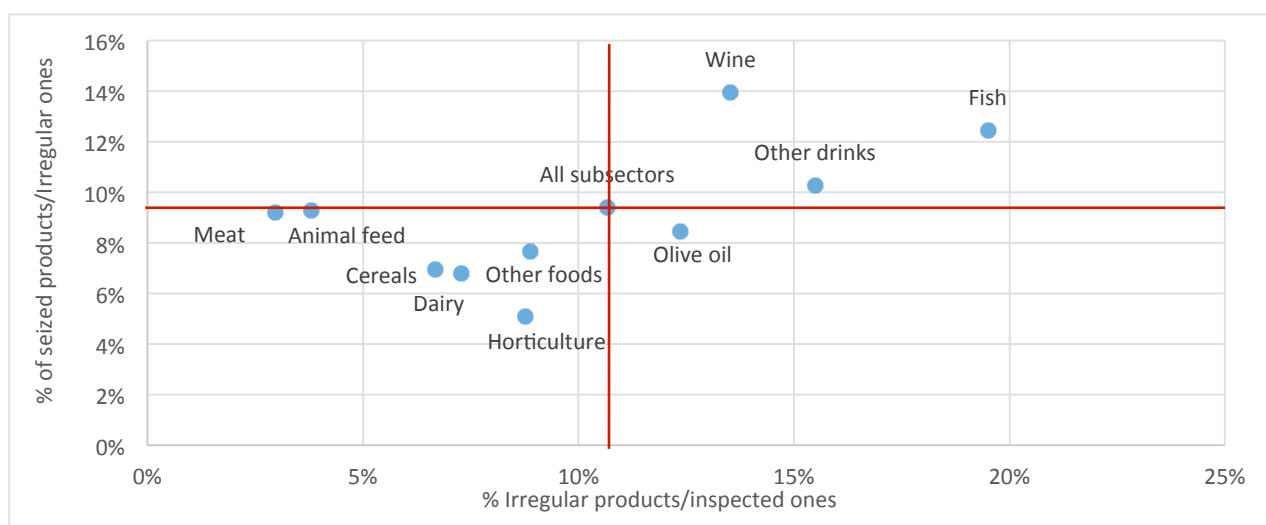
* For full definitions of the subsectors, refer to section 4.3.

Source: authors' elaboration on ICQRF (2016)

6.2.2 Specific observations on products by subsectors

We look at the relationships between seizures, irregularities and inspections for products in order to analyse the intensity of irregularity by subsector, comparing the proportion of seizures to numbers of irregular products and the proportion of irregular products/inspected ones (Figure 6.7). The intensity of irregularity is higher than the averages for wine, fish and other drinks. Olive oil is the only subsector whose intensity is higher than average in terms for the number of irregular products but lower than the average for the number if seizures. All the other subsectors show an intensity of irregularities lower than the average.

Figure 6.7. Proportions of irregular products to inspected ones vs proportions of seized products to irregular ones by VC



* For full definitions of the subsectors, refer to section 4.3.

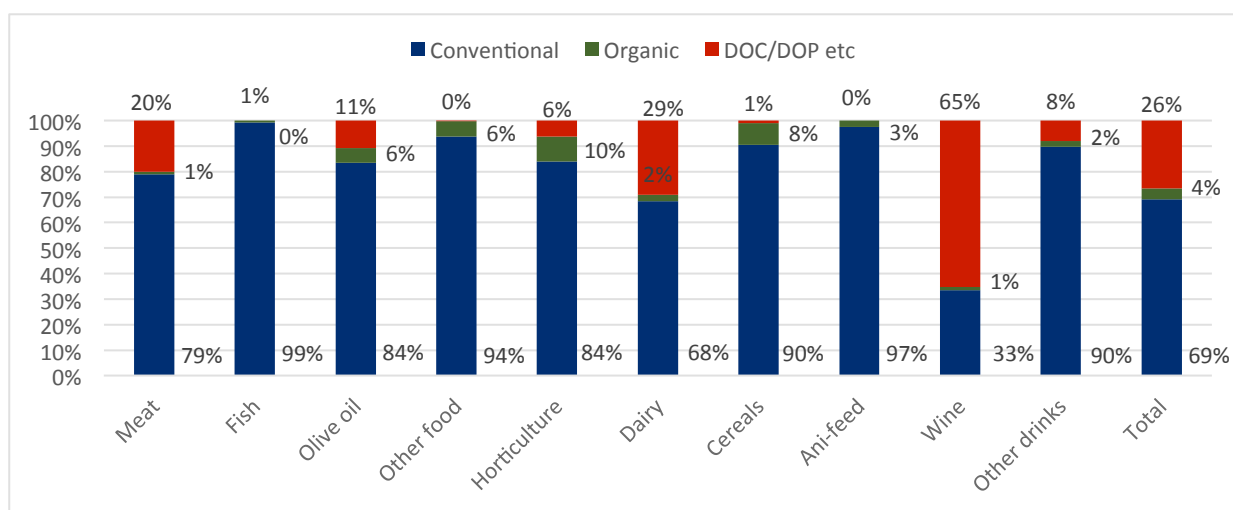
²¹ Source: Wikipedia: https://it.wikipedia.org/wiki/Scandalo_del_vino_al_metanolo_in_Italia.

Source: authors' elaboration on ICQRF (2016)

6.2.3 Specific observations on quality products

The importance of quality products differs by subsector and product typology within a given subsector. The importance of the product in household's budget and diet creates differences in consumer's perceptions of quality. Figure 6.8 shows that quality products are highly important for wine in which they account for 66% of the total inspected products, while they account for less than 1% and 3% in the fish and animal feed subsectors, respectively. Organic products appear relatively more important than those of designation of origin in subsectors characterized by fresh produce such as horticulture and cereals. On the other hand, wine, which has the highest share of quality products, includes only 1% of organic products.

Figure 6.8. Proportions of inspected products by quality characteristics and VC for the period 2007-2015

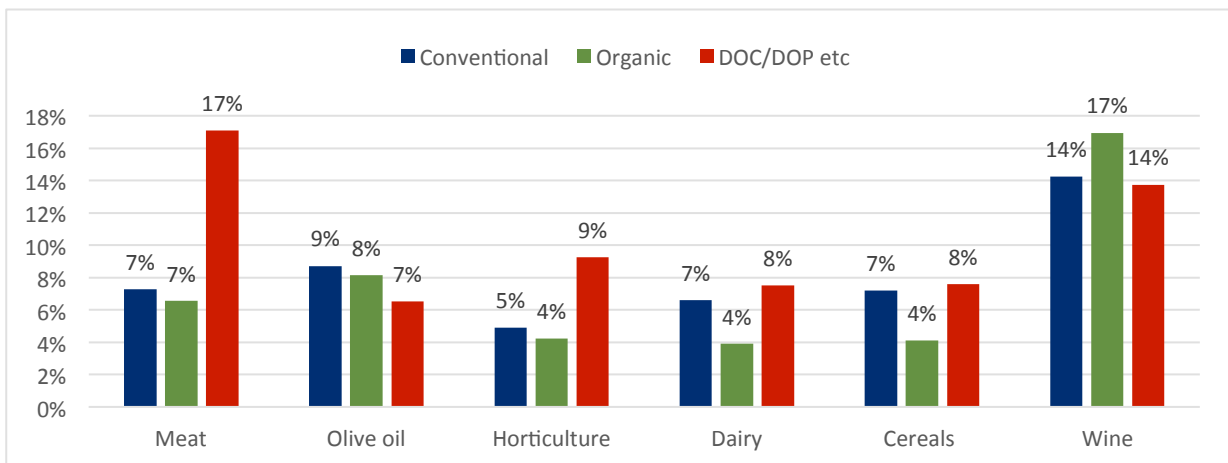


* For full definitions of the subsectors, refer to section 4.3.

Source: authors' elaboration on ICQRF (2016)

Figure 6.9 shows the proportions of irregular/inspected products for the VCs where quality products are relevant by quality group; therefore, it does not include fish, animal feed, other food and other drinks. The meat and horticulture subsectors show a similar pattern insofar that the proportions of irregular products with protected designation of origin are noticeably higher than the proportions in the other two groups (conventional and organic). Olive oil and wine subsectors show also a similar pattern as all commodity groups showing similar proportions of irregular/inspected products within each subsector. Finally, the dairy and cereal subsectors show an almost identical pattern, with the share of irregular organic products equal to roughly one half of the share of irregularities in the other two commodity categories.

Figure 6.9. Proportions of irregular/inspected products by quality characteristics and VC, 2007-2015



* For full definitions of the subsectors, refer to section 4.3.

Source: authors' elaboration on ICQRF (2016)

7 Concluding remarks

The analysis of AFFs over the period 2007-2015 reveals several important results. First, the trends of inspections and the numbers/proportions of detected frauds shows a noticeable improvement in the performance of the ICQRF as monitoring agency. In fact, while the ratio of the number inspected products to the number of inspections has decreased noticeably (from 2.23 in 2007 to 1.50 in 2015), detected irregularities rose over time for products, agents and establishments (by 28%, 33% and 23% respectively). Second, quality products such as DOC, DOCG, DOP, IGT, IGP, and STG show a rate of irregularities higher than that of organic and conventional products. This is probably linked to the higher expected payoff of frauds for these products, i.e. high economic opportunity (a characteristics shared with organic products), and more difficult detection due to more complicated standards (different from the case of organic products that have clearer characteristics). This explains, at least in part, the increased shares of these products in ICQRF inspections over the years.

The major result of geographical analysis is that the intensity of inspection activities seems to be unbalanced among regions (cf. section 6.1). This is confirmed by three different indicators. The first can be considered a measure of inspection intensity and it is based on two ratios: number of inspected products to that inhabitants and the ratio of inspected establishments to active establishments. These two ratios generally report lower values for large regions (e.g. Lazio and Lombardy). On the other hand, relatively small regions such as Umbria, Basilicata, Sardinia, Molise, Calabria, Abruzzo all show higher inspection intensities than the national averages, while the remaining regions (Tuscany, Emilia Romagna, Campania and Sicily) are closer to the national averages. This suggests that the ICQRF may consider, if resources are available, further investments in Lazio and Lombardy that experiencing relatively lower staffing with respect to their economic and demographic sizes.

The low inspection level for Lazio and Lombardy is confirmed by the second indicator based on cross-tabulating data on inspections with those on irregularities: these two regions have higher intensities of irregularities as compared to the national averages. We found also that Veneto, Piedmont, and Puglia show proportions higher than the national ones. On the other hand, many other regions (mostly Umbria, Basilicata, Sardinia, Molise, Calabria and Abruzzo) show low proportions. This is also confirmed by the third indicator, based on two ratios: irregular establishments/inspected ones compared to the ratio of inspected establishments/active ones. Therefore, the ICQRF may consider a redistribution of inspection activities reducing them in the regions with lower intensity of irregularities (mostly small regions) and increasing them in (larger) regions with higher intensities of irregularity such as Lazio and Lombardy, but also in Puglia, Veneto and Piedmont.

The analysis by subsector shows that wine and olive oil are the most inspected value chains: this is justified by their larger economic sizes and their higher exposure to frauds. Wine accounts for about 30% of all inspected products, while olive oil accounts for 14%. Wine is also by far the sub-sector with highest intensity of irregularities, while olive comes fifth (after fish, other drinks and animal feeds), but when looking at seizures, wine and olive oil are by far the two sectors recording the highest fraud intensity. The values of seized wine and olive oil over 2007-2015 are 240 and 23 million euro respectively, making together more than 95% of the total seizures in terms of value. Given these findings and given the economic importance of these two sub-sectors, we perform a VC in-depth analysis for both of them together with evaluating the economic impacts of frauds committed in each of them²².

While quality products do not show any differences from conventional products across regions, they did show noticeable differences across subsectors. In fact, quality products are extremely important for the wine subsector in which they account for 66% of the total inspected products. Furthermore, it is noticeable, though expected, that organic products are relatively more important than those of designation of origin for subsector mostly based on fresh/unprocessed products such as horticultural products and cereals.

²² For the paper on wine refer to Rocchi *et al.* (2018b). For paper on olive oil refer to Sadiddin *et al.* (2018).

In terms of proportion of irregular products/inspected products by type (i.e. quality vs. organic vs. conventional) it is possible to cluster the subsectors according to different patterns. The meat and horticulture subsectors show a similar pattern insofar irregularities are higher for quality products (i.e. DOC, DOP, etc.). Furthermore, olive oil and wine show a similar pattern, that is all three product typologies have similar proportions of irregular products within each value chain. Finally, dairy and cereal product show almost identical patterns where the proportions of irregular products are lower for organic products. In conclusion, it is evident that the importance of quality products relative to other product types is dictated by the technical characteristics of each value chain, and these characteristics should be considered when sampling for inspection. For example, organic products should be more inspected in the horticulture VC than in the wine VC, while products of designation of origin should have the priority in inspecting within the wine VC compared to all other VCs.

The above conclusions, though based on a general analysis of the phenomenon of AFFs provide useful preliminary insights for the monitoring activities of the ICQRF. Although ICQRF has improved its performance from 2007 to 2015, inspection efficiency can be further enhanced if ICQRF considers further investments in regions such as Lazio and Lombardy that are under-covered by inspection activities compared to the other regions. A reallocation of the inspection resources from smaller regions (with low intensities of irregularity) to larger ones (with higher intensities of irregularity) could help as well.

Nevertheless, in order to provide more specific advice to further increase efficiency, there is a need for more detailed research. A detailed analysis on some subsectors can help in identifying specific features in each value chain, that will prove useful in improving monitoring activities. This is what we will do in the third and fourth WPs of this project with reference to the wine and olive oil value chains.

Moreover, in order to perform a proper risk analysis additional data are needed. Variables describing the most important economic characteristics of agents such as the economic size of the firm, its production mix, and its juridical status. In addition, socio-demographic data are essential to characterise the firm behaviour such as the owner gender, the education level and the family size. Unfortunately, these data are not available at the moment.

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