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Non-compliance in organic farming: A cross-country comparison of Italy and Germany

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ABSTRACT

This paper describes the Italian and German organic certification systems, including the institutions involved and the definitions of non-compliance and sanctions. Although they are both implementations of the same EU regulatory framework, these systems differ in many respects. Case study data from control bodies on non-compliance and sanctions are presented and analysed using binary choice models. This analysis shows that the occurrence of slight non-compliance and greater farm acreage are significant risk factors that explain severe non-compliance in both countries. However, to implement an efficient risk-based inspection system in the future, the data collection process must be improved and extended to examine personal attributes of farmers and operators.

Introduction

In recent years, the role of governments and public authorities in food safety regulation and compliance has grown substantially (Henson and Caswell, 1999). Food safety regulation may be understood as a process that defines common standards, their implementation and their enforcement, in addition to being a process with the power to sanction for non-compliance (Garcia Martinez et al., 2007).

Food safety concepts can be adapted and applied to organic farming (Henson and Caswell, 1999; Garcia Martinez et al., 2007). In the organic sector, we distinguish between European Union (EU) regulations (EC, 2007) and national/regional public regulations and guidelines that may be stricter than EU-level regulations. Organic certification should ensure that only compliant operators are eligible to use the EU organic logo, which has been compulsory on all pre-packaged organic food produced in the EU since 2010. There are other national and regional public labels that may be used in addition to the EU compulsory logo, the most respected of which is the German *BIO-Siegel*. Non-compliant behaviour does not necessarily lead to safety problems, but product liability is nevertheless relevant in the organic framework because of both criminal and civil legal provisions that are intended to prevent fraudulent claims. To ensure that products comply with the rules that allow them to be labelled as organic, a public inspection and certification system has been instituted in some member states (e.g., Denmark). By contrast, other states (including Germany and Italy) utilise private third-party inspections that operate under delegation from competent public authorities. Private organic certification systems also involve self-regulation, mainly through private standards set by private actors in the organic sector, such as growers' associations; private product labelling includes the voluntary use of labels associated with private organisations, such as the logos of organic farmers' associations (e.g., Demeter, Bio Suisse, Soil Association) and other private organisations (Janssen and Hamm, 2011).

Food safety regulation is increasingly associated with risk-based approaches aiming to ensure effective enforcement of food standards (Hutter and Amodu, 2008). Council Regulation No. 882/2004 (EC, 2004) defines the general rules for official controls to verify compliance with food and feed safety, with the aim of "guaranteeing fair practices in feed and food trade and protecting consumers' interests, including feed and food labelling and other forms of consumer information" (EC, 2004, Art. 1). It also states, "official controls are carried out regularly on a risk basis and with appropriate frequency" (EC, 2004 Art. 3(1)); thus, such regulation requires national authorities to implement risk-based controls. Van Asselt et al. (2012) provide a review of the methods for implementing risk-based controls in a framework of food safety regulation; for a discussion about risk-based auditing in the food sector, see also Albersmeier et al. (2009). Risk-based controls

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consist of two elements: risk categorisation and risk-based surveillance. The former concerns the measurement or ranking of risk and the latter defines the frequencies of inspections (Van Asselt et al., 2012). Hence, risk-based approaches should be based on the determination of probability and impact factors (see also Hutter, 2004). For a discussion about the advantages of a risk-based inspection system in organic certification, see Dabbert (2012) and Padel (2010). However, the scientific literature regarding the analysis of the probabilities of hazard with respect to risk-based control systems is scarce, particularly in the organic sector. Furthermore, attempts to provide an analysis of risk are often based on expert opinion (Van Asselt et al., 2012; Webster et al., 2010) or on spreadsheet tools that offer a simple and quick approach to relative risk (Ross and Sumner, 2002; Food Safety Centre, 2010). For the application of risk evaluation to non-compliance in the organic sector in particular, the approach has been generally based on simple methods that combine qualitative assessments when classifying operators into risk classes (Piva, 2010; SINCERT, 2009). Recent studies from Gambelli et al. (2012) and Zorn et al. (2013) provide an analysis of the risk of non-compliance respectively in Italy and Germany. Gambelli et al. (2014) consider a comparison of the main risk factors for non-compliance across five European countries.

A working document from the EC Directorate General for Agriculture and Rural Development has been developed in cooperation with member states (Commission of the European Communities, 2011), which includes, among other features, guidelines regarding the risk criteria to be taken into account in the risk assessment of organic operators. This document indicates that risk evaluation should be based on a list of risk factors: the results of previous controls; the quantity of products concerned; the risk of products being exchanged; the type of operator (producer, processor, importer, distributor); the structure of the operator (stages of production, type of staff, number of premises); whether the operator is new; whether there is mixed production and processing; the type and value of products; whether there has been a rapid increase in production; complaints received; suspicion of fraud; and other criteria. However, there is no guideline provided about the methodologies and approaches that should process this information.

The aim of this paper is to provide an analysis of the probability of non-compliance based on quantitative rather than qualitative methods, which will thus provide an empirical contribution to the categorisation of risk controls for organic farming. More specifically, we use discrete choice models to evaluate the likelihood of severe non-compliance depending on a set of risk factors. The analysis is based on data from the archives of the inspections of two main control bodies in Germany and Italy, which provide a basis for comparing the two systems. The implementation of organic regulations at the national level – including the role played by the different institutional actors in the system – may have a direct effect on the enforcement of food rules (Hutter and Amodu, 2008) that also apply to the organic food sector (Zorn et al., 2012). Thus, we provide a comparison of the regulatory framework of the certification systems in Germany and Italy. The Italian and German organic certification systems may be considered relevant cases. In 2010, Italy accounted for the greatest number of organic operators (41,807) in Europe, whereas Germany had the largest number of organic sales (6020 mil €) (Willer and Kilcher, 2012). The comparison of the two national systems considers two aspects. We first discuss how institutional factors influence the certification system and might affect the management of non-compliance, including its definition and sanctioning. We then analyse the determinants of non-compliance by focusing on the relevance of a set of risk factors. The analysis refers specifically to the probability of severe non-compliance in the two countries.

The structure of the paper is as follows. In the next section, we provide a brief overview of how the organic inspection and certification system functions in the EU, with specific reference to Germany and Italy, while introducing certain open issues regarding the determinants of regulatory compliance in the organic sector. In Section 'Conceptual and analytical framework', we discuss our approach to analysing the determinants of severe non-compliance. In Section 'Data', we describe the data used in the empirical analysis. In Section 'Results', we present the results of the analysis, which are then discussed in Section 'Discussion'. The paper ends with our conclusions.

Legal background

The production and marketing of organic food products in the EU are regulated by Council Regulation EC 834/2007 (EC, 2007). This EU legal framework defines the basic principles and rules of production, in addition to the control (inspection) and certification system for their enforcement. The organic legal framework (EC, 2007) is implemented by the European Commission through Council Regulation No 889/2008 (EC, 2008a), which defines the details of the organic production standards and controls (EC, 2007, Art. 38) that keep the legal requirements up to date with market, societal and technological developments. The Food and Veterinary Office of Europe is responsible for monitoring the compliance of member states with the EU organic regulations.

Each member state designates a competent authority to oversee and manage the correct implementation of European organic regulations. An overview of the specific implementation of the inspection and certification systems in Germany and in Italy is provided in Fig. 1.

The German federal states (Länder) are responsible for implementation of organic regulations. The German organic farming law ("Öko-Landbaugesetz", ÖLG) appoints the responsibilities of implementing the Community law, the duties of control bodies and fines. On a national level, the Federal Agency for Agriculture and Food (Bundesanstalt für Landwirtschaft und Ernährung, BLE) approves control bodies and inspectors according to the regulations for the approval of control bodies ("Verordnung über die Zulassung von Kontrollstellen nach dem Öko-Landbaugesetz"). The BLE is also responsible for reporting organic control data to the Federal Ministry of Food, Agriculture and Consumer Protection, which forwards these data to the European Commission.

Fifteen competent authorities of the federal states in Germany are entitled to delegate to or engage with private control bodies to implement the control system for organic foods, i.e., to perform official controls (inspections) in the field. The states are responsible for the supervision of private control bodies' organic control activities. Supervision is performed by accompanied controls (in which a representative of the competent authority attends a control, which is also called a witness audit), follow-up controls and self-administered controls. The competent authorities also perform audits of the control bodies and check control records to ensure objective and effective controls. They cooperate in the working group "Länderarbeitsgemeinschaft Ökologischer Landbau (LÖK)" (Bundesrepublik Deutschland, 2011) to ensure a harmonised implementation of the European legal framework.

According to EC (2007), Art. 27(5), each member state that delegates control tasks to private control bodies must ensure that the latter are accredited under European Standard EN 45011 (ISO guide 65). Accreditation is an impartial way of assessing the competency of control bodies and is regulated at the European level by Council Regulation No. 765/2008 (EC, 2008b). According to EC (2008b), Art. 4 (1, 7), each member state appoints a single national accreditation body; however, member states can also establish an agreed-upon collaboration with an accreditation body in another EU member state in some circumstances.

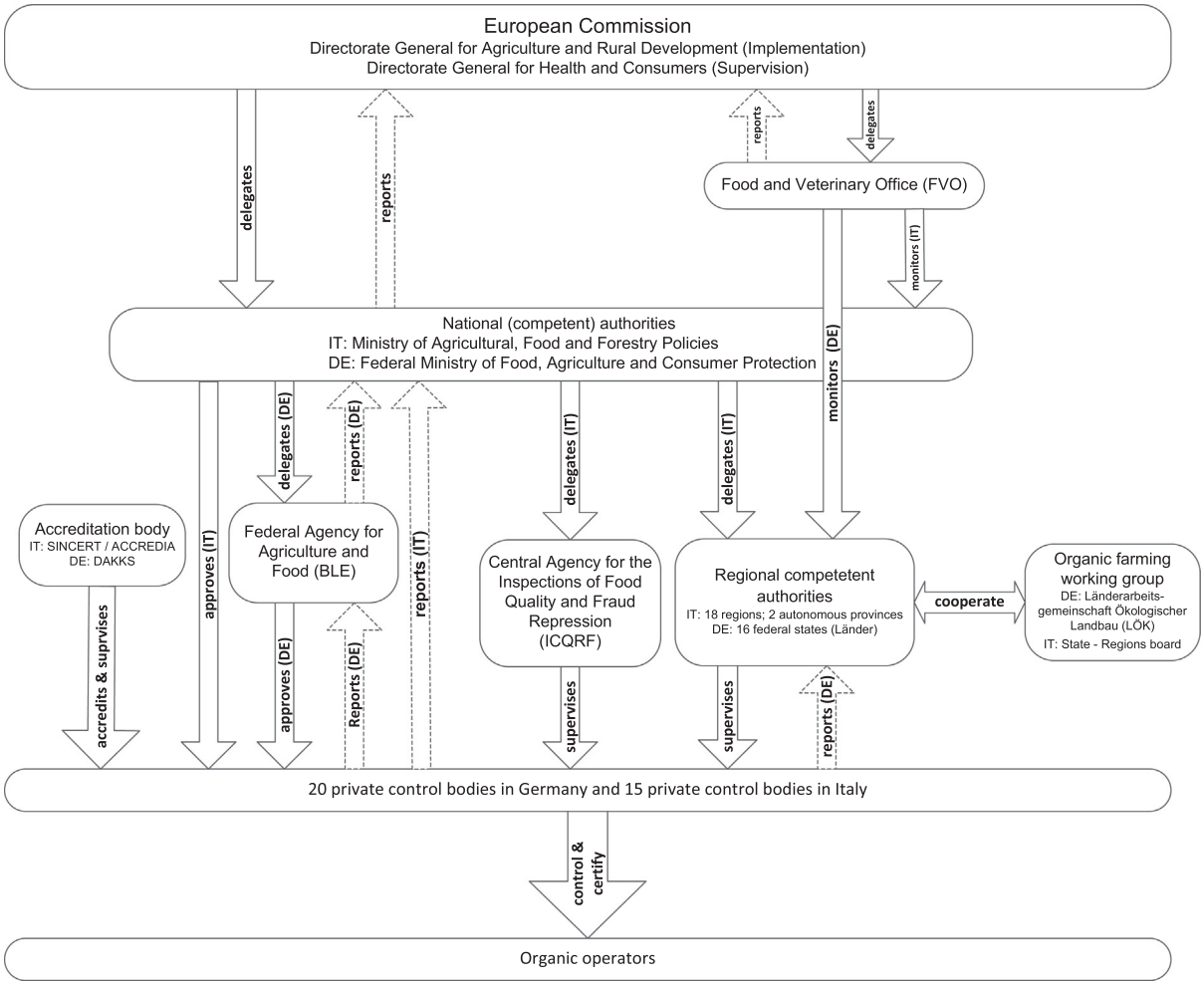

Fig. 1. Overview of the institutions involved and their functions in the organic certification systems in Germany (DE) and Italy (IT).

According to EC (2007) Art. 28(1), operators who produce, prepare, store, import or sell organic food products are subject to control activities. In 2012, 20 control bodies were registered in Germany (BLE, 2012) that inspect operators for compliance with organic food regulations. Organic operators are free to choose the control body that inspects them. Control and certification must be paid for by the operator; however, in Germany, some federal states provide control subsidies to farmers (Zorn, 2009). More private inspection bodies might confer a competitive advantage to the system, which may lead to lower inspection prices (see Jahn et al., 2005 for more details on this issue).

Each organic operator – with the exception of wholesalers doing business only in pre-packed products and operators selling to the final consumer – must be inspected at least once annually. Additional controls are required based on a risk analysis. However, neither the EC (2004) nor the EC (2008a) provide detailed rules regarding the frequency and nature of unannounced and follow-up inspections. With respect to Germany, at least 20% of the operations must have additional unannounced inspections (until 2009, this requirement amounted to 10% of the operations). Additional controls can also result from suspicious cases and as a consequence of previous and serious non-compliance (Bundesrepublik Deutschland, 2011). Non-compliance, once detected by the control body, is followed by appropriate sanctions. In Germany, an official harmonised catalogue of non-compliance matters and sanctions was formulated only in 2012, and a national ordinance was enacted at that time (BMELV, 2012).

The general structure of the Italian system is analogous to the German system, although there are certain differences. Italy has designated the Ministry of Agricultural, Food and Forestry Policies (MIPAAF) as the competent authority, and it has delegated inspection and certification responsibilities to accredited private control bodies, according to EC (2007) Art. 27. In Italy, accreditation must be renewed every four years (ACCREDIA, 2010). The competent national authority in Italy has delegated supervision of the private control bodies to regional competent authorities (18 regions and two autonomous provinces), which report information on the supervision system directly to the competent national authority. The main difference with the German framework is that the competent national authorities in Italy also delegate the supervision to the Central Inspectorate for the Control of Food Quality and Fraud Repression (ICQRF). The ICQRF supervises the activities of the control bodies independently of the regional competent authorities. Therefore, the Italian control bodies are subject to two distinct supervision procedures that do not necessarily employ identical criteria. In Italy, organic operators are free to choose one of the fifteen control bodies approved by the MIPAAF (SINAB, 2012). As in Germany, Italian producers also receive financial support for certification, but in many regions, such support is available only for farmers involved in supply chain programs.

In Germany, BMELV (2012) provides the official harmonised catalogue of what constitutes non-compliance and the sanctions for non-compliance, whereas in Italy the definition of non-compliance and sanctions – and how they must be associated

– are provided by the national accreditation body (ACCREDIA). The numbers and types of non-compliance and sanctions are therefore different between the two certification systems, which might account for the differences between Italy and Germany in reporting sanctions (see Section 'Data'). Another relevant difference in the Italian system concerns the rules regarding the frequency and nature of additional inspections. In Germany, such rules are provided by the competent national authority (Bundesrepublik Deutschland, 2011) and the control bodies must use some type of internal risk-based inspection approach, whereas in Italy additional inspections are based on risk evaluations of the operators defined on the basis of guidelines provided by the accreditation body (SINCERT, 2009). SINCERT (2009) comprises the technical guidelines provided by the Italian Accreditation body to support control bodies in the inspection procedures, and provides practical guidelines that are based on a simple checklist approach for the implementation of the risk-ranking procedures. The checklist considers a more detailed set of risk factors than the Commission of the European Communities (2011).

According to Zorn et al. (2012), lack of homogeneity about rules and the implementation of controls might generate different interpretations and lead to unfair competition among operators. For instance, a quantitative case study on the German certification system has shown that there are significant differences between control bodies with respect to sanctions imposed, control frequencies and share of unannounced controls (for more details see Zorn et al., 2012).

In both countries, public and private control systems are relatively well integrated and coordinated. According to Garcia Martinez et al. (2007), this may lead to incentives for compliant behaviour in the system, although non-compliance may occur even in the most efficient regulatory system. In the case of organic farming, not all instances of non-compliance represent illicit activities or actual fraud. However, because consumers have formed 'rational' expectations regarding the overall extent of fraud in the (organic) market, it is important that the level of fraud (or severe non-compliance) be limited to avoid damaging the collective reputation of compliant operators (Hamilton and Zilberman, 2006).

In the next section, we will discuss the potential determinants of non-compliance in organic farming. We seek to determine which risk factors are drivers of non-compliant behaviour at the farm level.

Conceptual and analytical framework

A theory of non-compliant behaviour in the organic system

At the centre of the organic certification system is the definition of non-compliance in EC (2007), which is not particularly precise[1] and leaves room for interpretation in the certification systems at the national level. As we have observed, certification in Italy and Germany is delegated to control bodies that are under the supervision and surveillance of competent national and local authorities. Variations in the implementation and interpretation of regulations (or by the introduction of specific laws at the national level) might affect the detection and evaluation of non-compliance. The recent approval in Germany of a national law (BMELV, 2012) that defines standards for non-compliance and sanctions is likely to have practical consequences for the relationship between non-compliance and sanctions. Additionally, the lack of a common standard for unannounced inspections until 2013[2] may have had a substantial effect on how non-compliance was measured. Because the likelihood of detecting non-compliance may be different when unannounced inspections are conducted, it is reasonable to assume that the way in which the operative rules in general are defined or modified (e.g., variations in the frequency of unannounced inspections) may have a direct effect on the number of instances of non-compliance that will be detected across control bodies over time. Another institutional feature that might affect the measurement of non-compliance is the way in which control bodies are supervised. The performance of control bodies may be influenced not only by the regulatory framework but also by the procedures that the control bodies must undergo. A change in surveillance procedures might affect reporting standards, the planning of controls and inspections, and other factors.

Although the structure of a certification system may affect the measurement and classification of non-compliance, non-compliance itself is mainly the result of the behaviour of organic operators. Here, we present an empirical analysis of the potential causes of non-compliance by analysing farm characteristics using the available datasets from two large control bodies. Our assumption is that non-compliance does not occur randomly and that it is instead caused by farmers' behaviour that depends on the characteristics of farms.

Enforcement is pivotal to the functioning of a certification system and includes penalties that are meted out in cases of non-compliance to strengthen truthful claims (Golan et al., 2001). However, the attitude toward compliance is a function not only of deterrence (or the expectation of penalties) but also of the illegal gains that one might expect to derive from non-compliant behaviour. The reasons to comply with a set of rules may be numerous and diversified (Hutter and Amodu, 2008; Gunningham et al., 2003); thus, the economic conditions of operators might affect food safety compliance (Yapp and Fairman, 2006). With respect to rule breaking in an economic context, Becker (1968) and Stigler (1970) originally proposed what is referred to as the economics of crime approach. Kagan and Scholtz (1984) argue that non-compliance with rules may be caused by more than rational calculation and consider that the ability of a farmer to comply with regulations "consists of knowledge of rules and of technical and financial capabilities to carry out requisite actions". Garoupa (2003) considers that the analysis of compliant economic behaviour should consider both rational and psychological and social matters. Non-compliance might also depend on the perceived legitimacy of the regulatory authority and on moral suasion (Sutinen and Kuperan, 1999; Winter and May, 2001), which could also be influenced by personal resistance to rule breaking (Hirschauer and Zwoll, 2008).

Given the dimension of the problem, we acknowledge that a fully comprehensive analysis of all relevant factors leading to non-compliance is beyond the scope of this study. Furthermore, a straightforward empirical application of this approach to real data would require a range of detailed information at the operator level, including social, economic and financial information such as prices, company liabilities and liquidity. This information is unfortunately unavailable in the archives of the control bodies. However, we can derive certain hypotheses about how the risks of non-compliance may depend on structural aspects of the farms, bearing in mind that attempts at a quantitative approach to risk assessment necessarily require simplifications of the problem (Hutter and Amodu, 2008). Following Hirschauer and Zwoll (2008), and Lippert et al. (2014) a farmer will infringe the underlying process standard if the expected utility of non-compliance exceeds the expected utility of compliance[3]. In this context one can suppose an opportunistic

[1] Council Regulation No 834/2007, Art. 30, refers to the actions to be taken when non-compliance is detected. Non-compliance is referred to as irregularities and infringements, although no clear definition of either of these terms is provided.

[2] In April 2013, the Commission determined (Reg. (EU) No. 392/2013, (EC, 2013)) minimum shares of operators which have to be inspected unannounced.

[3] Hirschauer and Zwoll (2008) distinguish between expected net utilities from material (i.e., economic) and immaterial (i.e., psychological and social) sources, whereas Lippert et al. (2014) also take into consideration the operator's evaluation of the probability of detection.

Table 1
Risk factors for German and Italian control bodies: relative frequencies/mean and standard deviation (2007–2009 average). *Source:* own calculations based on data from two control bodies.

	German control body (n = 5234)	Italian control body (n = 25,207)
Severe non-compliance	0.014	0.018
General risk factors		
Conventional land	0.035	0.10
Farmer's experience (years with the control body)	8.20 (mean) (s.d. 4.13)	6.80 (mean) (s.d. 3.88)
Other certification schemes besides EU organic	0.77	0.04
Processing activity	0.33	0.14
Utilised agricultural area (UAA) (ha)	39.58 (mean) (s.d. 75.82)	40.58 (mean) (s.d. 127.49)
Slight non-compliance	0.43	0.07
Managerial risk factors		
Crop production		
Cereals	0.48	0.32
Citrus	0.00	0.08
Dried pulses	0.11	0.03
Fresh vegetables	0.18	0.24
Fallow	0.18	0.21
Fruit	0.05	0.35
Grapes	0.01	0.29
Green fodder	0.46	0.27
Green manure	0.05	0.02
Industrial crops	0.13	0.12
Olives	0.00	0.58
Permanent grassland	0.87	0.28
Root crops	0.14	0.04
Livestock production		
Bovines	0.46	0.08
Goats	0.03	0.02
Pigs	0.11	0.03
Poultry	0.16	0.01
Sheep	0.07	0.06

All variables are dummy variables except farmer's experience and UAA. – s.d. = standard deviation: for a dummy variable with mean p, s.d. is: $(p\,(1-p))^{1/2}$ i.e., s.d. for dummy variables is higher the closer p is to 0.5.

organic farmer to implicitly compare expected penalties (along with further expected market related losses) when being detected with compliance costs saved when being non-compliant. Consequently, if the compliance costs saved are greater than the expected income losses (plus a risk premium in case of risk averse farmers) such an opportunistic farmer will infringe upon the underlying process standard. The *expected* losses in case of non-compliance are given by detection related losses times perceived detection probability. According to this theoretical reasoning the individual decision on whether to comply with a certain standard or not to comply is simultaneously determined by compliance cost, detection probability and income losses in case of non-compliance. It is reasonable to consider that these factors depend on different farm characteristics. For instance, per unit compliance costs may be higher in case of poultry farming or in case of producing grapes than in case of producing dried pulses. Thus, one can hypothesise that the probability of non-compliance depends on the occurrence of certain crop production or livestock activities on the farm (see the managerial risk factors mentioned in Table 1). Also the farmer's losses caused by a sanction involving batch suppression of a product depend on the type of product; the losses caused by a sanction leading to decertification may be dependent on both product type and farm size.

A model to measure the likelihood of severe non-compliance

On the basis of the considerations developed in Section 'A theory of non-compliant behaviour in the organic system' we define an empirical model for the evaluation of the likelihood of the occurrence of severe non-compliance for the German and Italian control bodies according to a set of measurable risk factors (Table 1). They are classified in general and managerial risk factors, i.e., respectively structural aspects of the farm and information on the farmers, and type of plant and livestock production. General risk factors are common for both datasets, whereas managerial risk factors may differ according to farming conditions (e.g., in the case of Mediterranean crops). We provide hypotheses below regarding the expected effects that risk factors may have in terms of the occurrence of non-compliance.

Farm size, which is measured below in terms of farm acreage, is used as a proxy for the economic size of a farm, which we cannot measure directly. It might affect compliance costs and expected detection related losses: on the one hand, the larger the farm, the more complex it will be and the more costly it will be to observe all organic rules; consequently, the probability of non-compliance would increase with farm size. On the other hand, decreasing compliance costs due to economies of scale and increasing non-compliance-related losses might lead to a reduced probability of non-compliance when the farm size increases. Thus, we posit here a two-sided hypothesis.

A farmer's organic farming experience, which is measured as years under the respective control body, is expected to reduce compliance costs and thus reduce the probability of non-compliance (one-sided hypothesis) because of the farmer's acquired competences. Although this variable might underestimate the farmer's actual experience, it nevertheless accounts for newly converted farms and for farmers that change certification bodies for some reason (possibly opportunism): for the purpose of our risk analysis, both options are relevant.

The participation of the farmer in other certification schemes besides the EU organic regulation[4] is also supposed to reduce compliance costs because it often involves the enforcement of even more restrictive standards. This leads, ceteris paribus, to a lower probability of non-compliance (one-sided hypothesis).

Two general risk factors that are supposed to increase the probability of non-compliance are processing activities (more rules to be observed) and the co-existence of land dedicated to conventional farming (higher costs to avoid commingling of organic and conventional produce, and costs to avoid contamination of machinery, seeds, etc. that are used in organic production).

Finally, we consider the occurrence of slight non-compliance among general risk factors. We consider whether there is a co-dependence effect between slight and severe non-compliance (see Section 'Data' for a discussion on the relationship between the two types of non-compliance). In particular, we suppose that the occurrence of slight non-compliance increases the probability of the severe one (one-sided hypothesis).

In addition to general risk factors, we also analyse a set of managerial risk factors related to crops and livestock products that consider certain differences between the farming systems of the two countries. Because we do not know the average compliance costs and expected detection-related losses for different farm types, we merely hypothesise that the probability of non-compliance depends on the structural characteristics of the farm (two-sided hypothesis).

All of the risk factors have been dichotomised with the exception of utilisable arable area and farmers' experience with the control body, which are continuous variables. Standard indicators such as condition numbers and variance inflation factors (VIF) show that

[4] There is a wide range of other certification schemes: Naturland, Bioland, Aiab, and Demeter, among others. Participation in other certification schemes is particularly frequent in Germany.

Table 2
Distribution of farms per year. *Source:* own illustration based on data from two control bodies.

German control body				Italian control body			
No. of farms	2007	2008	2009	No of farms	2007	2008	2009
1419	√	√	√	6436	√	√	√
490			√	1213	√	√	
157		√	√	782		√	√
69	√			775			√
47	√	√		738	√		
6		√		136		√	
2	√		√	130	√		√
Total farms	1537	1629	2068		8517	8567	8123

√Indicates the year(s) in which the corresponding farms were surveyed by the control body.

multicollinearity is not a relevant issue for both the German and Italian cases[5].

We limit our analysis to severe non-compliances because they are more relevant as they involve infringements that have an effect on essential aspects of the organic product and might lead to decertification or batch suppression. Furthermore, the definition of severe non-compliance is particularly similar for the two countries (see Table 3), which results in a more similar share of cases than with respect to those regarding slight non-compliance. We use a logit panel model with random-effects (Greene, 2008; Cameron and Trivedi, 2010) to analyse the probability of severe non-compliance that is conditioned on the set of risk factors listed in Table 1. The aim is to measure how the probability of severe non-compliance is affected by the presence of risk factors at the farm level, and the models are estimated separately for the German and Italian cases[6]. The panel formulation makes it possible to consider the potential role of unobserved individual effects at the farm level, which accounts for unobserved risk factors that could not explicitly be considered in the model. The probability of severe non-compliance is therefore defined as follows:

$$\text{Prob}\,(\text{NC}_{it} = \text{yes}|\mathbf{x}_{it}, u_i) = F(\beta, \mathbf{x}_{it}, u_i), \qquad i = 1, \ldots, N; \quad t = 1, \ldots, T$$

where NC_{it} (severe non-compliance) is the binary dependent variable for farm i at time t and where $\mathbf{x}_{it}$ and β are the vector of covariates (risk factors) for farm i at time t and the corresponding vector of coefficients, respectively. u_i is the unobserved farm-specific heterogeneity effect, which is assumed to follow a normal distribution. F is assumed to have a logistic distribution[7].

Data

The data are obtained from the archives of two large control bodies, one in Germany and one in Italy. Although our case-study data cannot be considered to be fully representative of the organic farming sector in the two countries, the two archives are representative of the type of information available at the control-body level. Our analysis is conducted at the farm level for operators with farming activity, livestock activity, or both; some of the farmers are also engaged in processing activity. For the 2007–2009 period, the Italian dataset includes 25,207 cases, whereas the German dataset includes 5234 cases. The difference in sample size is the result of the higher number of organic operators in Italy and because the Italian control body accounts for the largest share of organic farmers in Italy. The sample size is adequate for an econometric analysis for both the German and Italian case; however, the larger sample size for the Italian case may lead to a greater efficiency in the estimation procedures. The two datasets are treated separately and are structured as unbalanced panels. The distribution pattern for the farms across the period under study is shown in Table 2. In the Italian case, the number decreases over time with a 5% drop in the number of farmers surveyed when comparing 2009 to 2007. The opposite trend occurs in the German case, which witnessed a 35% increase in the number of farmers surveyed from 2007 to 2009. This increase in sample size is largely the result of the inclusion of farms with limited acreage and traditional extensive grassland orchards only in 2009.

In the comparative analysis, we paid particular attention to the homogenisation of the data because the archives of the two control bodies differ regarding the levels and units of their data. The archives contain a considerable amount of data from the farm level: for example, there are data that describe the structure of farms (i.e., the number of hectares assigned to the different crops and types of production, the type of livestock, and the processing activity) and some personal and managerial information about the operators. Data on crops and livestock have been reclassified based on the Eurostat classification. Unfortunately, no data are available regarding the economic or financial aspects of farms, including turnover, income, assets or liquidity.

We have used sanctions as a proxy for non-compliance for two reasons: the first is that information on non-compliance is not recorded by the Italian control body for all years and regions (whereas it is available for the German control body); the second reason is that, even when it is available, information on non-compliance is recorded in textual format, which does not allow a direct interpretation of the severity of the non-compliance. For the German case, non-compliances are classified according to the section of the organic regulation that was violated. This information allows classifying the non-compliance in the corresponding area of production (e.g., animal production or plant production) to which the legal text refers. The severity of non-compliance however, can only be approximated by the sanction that resulted. Here, we assume that every instance of non-compliance has been followed by a sanction with the appropriate level of severity. Thus, we have inferred the severity of instances of non-compliance from the severity of the corresponding sanctions. This approach, however, required us to homogenise the sanctions across control bodies because these bodies do not employ a univocal sanction scheme. Table 3 summarises the homogenisation and describes the relationship between sanctions and non-compliance for the two control bodies. We have distinguished between two types of non-compliance: slight non-compliance and severe non-compliance. Slight non-compliance in Germany includes four types of sanctions classified as written remarks or warnings; in Italy, it covers two types of sanctions. These are "minor" violations that do not preclude the marketing of a product as organic. Delay in the compilation of required documentation and minor violations concerning animal welfare conditions, for example, constitute instances of slight non-compliance. By contrast, severe non-compliance refers to violations that preclude marketing of the product as organic. Preclusions might concern a limited part of the production (batch suppression), or the production of an entire farm (de-certification). The use of conventional seeds or the use of hormones with

[5] The condition numbers are 14.07 and 8.13 for Germany and Italy, respectively (values above 30 are usually considered as indicators for multicollinearity problems, see Belsey et al., 1980); the average VIF values are also low: 1.28 and 1.14 for Germany and Italy, respectively (VIF may range between 1 and infinity, with higher values showing evidence for multicollinearity, see Greene, 2008).

[6] A common model based on a unified dataset was evaluated, but because of the large differences in the sample sizes, we concluded that this option was not feasible.

[7] The random-effects model approach assumes the independence of the farm effect and the covariates. This assumption might be theoretically eliminated with a fixed-effects estimator; however, a fixed-effects estimator requires the covariates to be time variable, and this condition is not met for most of the risk factors used in our models.

Table 3
Correspondence between non-compliance and sanction types. *Sources:* Bayerische Landesanstalt für Landwirtschaft (2010), SINCERT (2009).

Type of non-compliance	Type of sanction	Description	No. of corresponding sanctions:	
			Germany	Italy
Slight non-compliance	Written remark	Non-compliance is formally communicated by the control body and may require feedback from the operator or further inspections	3[a]	1[a]
	Warning	Non-compliance must be resolved within a specific time period established by the control body	1[b]	1[b]
Severe non-compliance	Batch Suppression	Prohibition to sell as organic the product for which the non-compliance has been detected	1[c]	1[c]
	Decertification	Prohibition to sell all farm products as organic due to non-compliance with short- or long-term effects	2[d]	2[d]

[a] Original wording: Schriftlicher Hinweis; Verstärkte Aufzeichnungs- und Mitteilungspflicht; Nachkontrolle (Germany); Richiamo (Italy).
[b] Original wording: Abmahnung (Germany); Diffida (Italy).
[c] Original wording: Entfernung des Hinweises auf den ökologischen Landbau von der Partie (Art. 30, Abs. (1), 1. Satz, VO (EG) 834/2007) (Germany); Soppressione (Italy).
[d] Original wording: Vorläufiges Vermarktungsverbot nach Art. 91, Abs. (2) VO (EG) 889/2008; Verbot der Vermarktung mit dem Hinweis auf den ökologischen Landbau für die Dauer einer von der kompetenten Behörde zu bestimmenden Frist nach Art. 30, Abs. (1), 2. Satz VO (EG) 834/2007 (Germany); Sospensione; Esclusione (Italy).

Table 4
Frequencies of non-compliance by type and year (relative frequencies in brackets; DE: German control body; IT: Italian control body). *Source:* own calculations based on data from two control bodies.

No. of non-compliances	Slight non-compliance						Severe non-compliance					
	2007		2008		2009		2007		2008		2009	
	DE	IT	DE	IT	DE	IT	DE	IT	DE	IT	DE	IT
0	785 (*51.07%*)	7793 (*91.50%*)	862 (*52.92%*)	8035 (*93.79%*)	1315 (*63.59%*)	7699 (*94.78%*)	1502 (*97.72%*)	8424 (*98.91%*)	1603 (*98.40%*)	8376 (*97.77%*)	2054 (*99.32%*)	7949 (*97.86%*)
1	398 (*25.89%*)	487 (*5.72%*)	396 (*24.31%*)	396 (*4.62%*)	386 (*18.67%*)	300 (*3.69%*)	25 (*1.63%*)	63 (*0.74%*)	25 (*1.53%*)	140 (*1.63%*)	13 (*0.63%*)	142 (*1.75%*)
2	177 (*11.52%*)	210 (*2.47%*)	177 (*10.87%*)	113 (*1.32%*)	191 (*9.24%*)	110 (*1.35%*)	8 (*0.52%*)	25 (*0.29%*)	1 (*0.06%*)	46 (*0.54%*)	0 (*0.00%*)	24 (*0.30%*)
> = 3	177 (*11.52%*)	27 (*0.32%*)	194 (*11.91%*)	23 (*0.27%*)	176 (*8.51%*)	14 (*0.17%*)	2 (*0.13%*)	5 (*0.06%*)	0 (*0.00%*)	5 (*0.06%*)	1 (*0.05%*)	8 (*0.10%*)
Total farms	1537	8517	1629	8567	2068	8123	1537	8517	1629	8567	2068	8123

livestock, for example, would constitute severe non-compliance. As shown in Table 3, the types of sanctions used by the two control bodies in Italy and Germany are similar, particularly for severe non-compliance; these include one type of sanction for "batch suppression" and two types of sanctions regarding "decertification" for both the Italian and German control bodies. The "written remarks" category is slightly different in the German case, however, because there is a higher number of corresponding sanctions.

Slight and severe non-compliance may occur in the same year for the same operator, and can be detected in the same inspection and/or during additional inspections an operator might undergo. The frequency of non-compliance that is found by the German and Italian control bodies is shown in Table 4. As expected for both control bodies, the number of cases with slight non-compliance is substantially higher than the number of cases with severe non-compliance. However, the differences between the German and Italian control bodies with respect to slight non-compliance are remarkable: the average share of farmers with no instances of non-compliance is approximately 94% for the Italian case and 55% for the German case. Conversely, the distribution of severe non-compliance is similar for the two control bodies. There is no obvious explanation for this discrepancy. One possible interpretation might be that in Italy negligible inaccuracies are only addressed verbally and yield written remarks only if they are not promptly solved. It is notable that the main distributional differences occur for slight non-compliance, in which we also find the main differences in the classification between the German and Italian certification systems. These data clearly show how differences in assessing non-compliance levels might depend on different implementation schemes of the certification system.

Results

Table 5 presents the results of the random-effects logit models on the dependent variable of severe non-compliance for the German and Italian cases[8]. A positive (negative) coefficient indicates that the effect increases (reduces) the probability of severe non-compliance; the coefficients' significance levels are indicated in brackets. The test of the individual effects shows that they are statistically significant in the Italian model but not in the German model. This finding does not invalidate the results. Instead, this finding shows that the estimates for the German case are equivalent to those from a model in which the German panel data have been pooled. The hypothesis that all the coefficients are simultaneously equal to zero (tested using the Wald-chi^2 test) is rejected for both models.

A direct comparison between the German and Italian models reveals certain common results. Slight non-compliance is a significant risk factor in both the German and the Italian models. Severe non-compliance may occur for operators who are also slightly non-compliant (see Section 'Data'), and there is a co-dependence effect between the two types of non-compliance in both cases. The high number of co-dependency cases for Germany is most likely also caused by the large share of farmers who commit slight non-compliance (Table 4). One of the general risk factors, farm size (UAA), is statistically significant for both the Italian and the German case. The coefficient is positive and shows an increase in the probability

[8] Balanced panel models have also been estimated; however, they are only minimally different from the unbalanced panel models, and, therefore, we show only the results for the unbalanced panels. The results in their entirety are available from the authors.

Table 5
Results of model estimations: logit random effects. *Source:* own estimations based on data from two control bodies.

Variables[a]	German control body (n= 5234)*Coef.* ($P > \|z\|$)	Italian control body (n = 25,207)*Coef.* ($P > \|z\|$)
Slight non-compliance	1.790 (0.000)	0.380 (0.020)
Conventional land	0.024 (0.982)	0.580 (0.000)
Farmer 's experience (years with the control body)	−0.089 (0.007)	−0.011 (0.419)
Other certification schemes besides EU organic	−0.023 (0.943)	0.274 (0.209)
Processing activity	0.190 (0.514)	0.069 (0.635)
Utilised agricultural area (UAA)[b]	1.762 (0.017)	0.376 (0.050)
Cereals	0.113 (0.768)	0.918 (0.000)
Citrus	–	0.144 (0.511)
Dried pulses	−0.285 (0.485)	0.064 (0.776)
Fresh vegetables	0.228 (0.465)	0.263 (0.023)
Fallow	0.418 (0.134)	0.225 (0.049)
Fruit	0.589 (0.166)	−0.339 (0.003)
Grapes	1.497 (0.011)	0.543 (0.000)
Green fodder	−0.401 (0.241)	0.200 (0.080)
Green manure	−0.391 (0.528)	−0.441 (0.128)
Industrial crops	−0.035 (0.918)	0.271 (0.043)
Olives	–	−0.346 (0.002)
Permanent grassland	0.315 (0.426)	0.305 (0.009)
Root crops	0.430 (0.211)	−0.047 (0.832)
Bovines	0.238 (0.418)	−0.226 (0.244)
Goats	−0.026 (0.972)	−0.314 (0.384)
Pigs	0.040 (0.913)	0.512 (0.064)
Poultry	0.628 (0.021)	0.629 (0.105)
Sheep	−0.163 (0.743)	−0.212 (0.351)
Constant	−5.574 (0.000)	−5.135 (0.000)
Mean of dependent variable (severe non-compliance)	0.014	0.018
Wald chi^2	75.920 (0.000)	238.260 (0.000)
Likelihood-ratio test for rho = 0: chi^2 (prob > chi^2)	8.2E-05 (0.496)	11.260 (0.000)
Log likelihood	−347.421	−2151.805

[a] All the variables are dummy variables except farmer's experience with the control body and UAA.
[b] Coefficients refer to 10 square kilometres.

of severe non-compliance as farm size grows. The factor conventional land carries the expected positive sign but is statistically significant only for the Italian model but not for the German model. Farmers' experience carries the expected negative sign but is statistically significant only for the German model. Processing activity and participation in other certification schemes are not statistically significant risk factors. The effects of the managerial risk factors vary more across the two countries, which is most likely also caused by the different farming environments.

In the German case, grape[9] and poultry production are managerial risk factors with a (positive) statistically significant effect on the probability of non-compliance. Grape and poultry production (poultry with a relatively lower significance level) also remain relevant risk factors in the Italian case, in which there are also a range of other relevant risk factors. The presence of cereals, industrial crops, fresh vegetables, permanent grassland, fallow land or pig production[10] significantly increases the probability of non-compliance. By contrast, the presence of fruit and olives reduces the probability of non-compliance.

Discussion

The key findings of the analysis show two common general risk factors for the German and Italian cases: a co-dependence effect for slight and severe non-compliance and a positive impact for farm size. Both risk factors are proxies for unmeasured factors that might influence non-compliance. The co-dependence effect might be interpreted as an indication of a farmer's "attitude" toward non-compliance, which should be measured using more detailed personal information such as age of the farmer, personal crime record, financial condition, and solvency. We defined a two-sided hypothesis concerning the possible effects of farm-size on the likelihood of non-compliance (Section 'Conceptual and analytical framework'). Our results indicate that the expected benefits from economies of scale seem to be overcompensated by the increased complexity of farm management. This conclusion is actually consistent with the conclusion of Gambelli et al. (2014); Zorn et al. (2013), the indications of SINCERT (2009) and of the Commission of the European Communities (2011).

A general conclusion that arises from the results of our analysis is that a risk analysis for the organic certification system cannot properly be performed with the data that are currently available in the control bodies' archives. Control bodies currently record diverse structural data about the farms but little about the farmers themselves. From our findings, it seems that structural information is not sufficient to delineate detailed profiles of risky operators. More information must be collected on these factors because a large part of the explanatory power of our models is conferred by risk factors that indirectly convey essential missing information about the financial and personal characteristics of the operators. More data are also required because the dataset should ideally cover a longer period, which would allow us to analyse the dynamics of non-compliant behaviour over time and in a wider set of control bodies and enhance the representativeness of the sample. Additionally, it is notable that if an Italian farmer changes control bodies, no information about his records and possible non-compliance is transferred to the new control body[11]. This limitation should be corrected; information on operators requesting organic

[9] The number of cases is particularly low: only four farms have grape production and severe non-compliance.
[10] The number of cases is particularly low: 23 farms have pig production and severe non-compliance.
[11] The recently enacted Commission Reg. (EU) No. 392/2013 requires the exchange of "relevant information" between control bodies when an operator changes control bodies (EC, 2013, Art. 1(5)).

certification should be made readily available so that all control bodies can implement more efficient inspection procedures.

Finally, the definitions of non-compliance and sanctions must be harmonised to ensure common sanctioning for analogous non-compliance across control bodies (Zorn et al., 2012). Such harmonised standards should also be instituted regarding the minimal set of information that is necessary for a proper risk-based analysis.

Conclusion

Our analysis of the certification systems in Germany and Italy has shown that there is room for improvement, particularly in terms of partial harmonisation. Two main aspects of the systems might be improved. First, there should be clearer and more exhaustive common standards for non-compliance. The absence of such a system may give rise to different interpretations and sanctions. Thus, the present situation is a significant shortcoming at the European level because it precludes proper supervision of the implementation of the certification system in the different EU member states. Common standards for non-compliance would make reporting by control bodies comparable and render the inspection system more transparent, which may ultimately ensure more meaningful supervision reports (Zorn et al., 2012). Additionally, a common standard might make the link between non-compliance and sanctions more precise and ensure consistent responses to analogous non-compliant behaviour across the EU. Homogenisation is also required with respect to collecting data about farm and operator characteristics to make the exchange of relevant information much easier (for instance, when an operator decides to change her control body) and ultimately make the certification system more efficient.

The second aspect concerns the type of data collected. The empirical analysis of the determinants of non-compliance has shown that a thorough risk analysis would require more detailed information, particularly at the farm level. At present, the archives of the control bodies mainly contain structural data on farms, with no information about the economic or financial aspects of the farms or about relevant personal characteristics of farmers. We are aware that management of some of this information requires caution because of data protection considerations, but it is also clear that these data represent the core of the crucial information required concerning the actual motivations for non-compliance.

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References

ACCREDIA, 2010. Regolamento per l'accreditamento degli Organismi di Certificazione. <http://www.accredia.it/UploadDocs/393_RG_01_Rev01.pdf> (Retrieved 20.07.12).

Albersmeier, F., Schulze, H., Jahn, G., Spiller, A., 2009. The reliability of third-party certification in the food chain: from checklists to risk-oriented auditing. Food Control 20 (10), 927–935. http://dx.doi.org/10.1016/j.foodcont.2009.01.010.

Bayerische Landesanstalt für Landwirtschaft, 2010. Gemeinsamer Sanktions- und Maßnahmenkatalog für Bayern. <http://www.lfl.bayern.de/iem/oeko/13408/linkurl_0_0_0_8.pdf> (Retrieved 05.07.12).

Becker, G.S., 1968. Crime and punishment: an economic approach. J. Polit. Econ. 76, 169–217.

Belsey, D., Kuh, E., Welsh, R., 1980. Regression Diagnostics: Identifying Influential Data and Sources of Collinearity. John Wiley and Sons, NY.

BLE (Bundesanstalt für Landwirtschaft und Ernährung), 2012. Verzeichnis der in der Bundesrepublik Deutschland zugelassenen Kontrollstellen gemäß Artikel 27 der Verordnung (EG) Nr. 834/2007 unter Berücksichtigung der Erfüllung der Bedingungen der EN 45011 (Stand 1.1.2012). Bonn: Referat 512, Bundesanstalt für Landwirtschaft und Ernährung.

BMELV (Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz), 2012. Verordnung über die Zulassung von Kontrollstellen nach dem Öko-Landbaugesetz. In BGBl Teil I Nr. 20: Bundesanzeiger Verlag.

Bundesrepublik Deutschland, 2011. Jahresbericht 2010 der Bundesrepublik Deutschland zum mehrjährigen nationalen Kontrollplan nach Verordnung (EG) Nr. 882/2004. Bonn: Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz.

Cameron, A.C., Trivedi, P.K., 2010. Microeconometrics Using Stata, Revised ed. Stata Press, College Station (Texas).

Commission of the European Communities, 2011. Working Document of the Commission Services on Official Controls in the Organic Sector. Version 8 July 2011.

Dabbert, S., 2012. Improving the organic certification system. Recommendations From the CERTCOST Project. <http://certcost.org/Lib/CERTCOST/Deliverable/D24.pdf> (Retrieved 15.02.13).

EC, 2004. Regulation (EC) No 882/2004 of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules. Off. J. Eur. Union L165, 1–141 (30.04.2004).

EC, 2007. Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91. Off. J. Eur. Union L189, 1–23 (20.7.2007).

EC, 2008a. Commission Regulation (EC) No 889/2008 of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control. Off. J. Eur. Union L250, 1–84 (18.9.2008).

EC, 2008b. Regulation (EC) No 765/2008 of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93. Off. J. Eur. Union L218, 30–47 (13.8.2008).

EC, 2013. Commission Implementing Regulation (EU) No 392/2013 of 29 April 2013 amending Regulation (EC) No 889/2008 as regards the control system for organic production. Off. J. Eur. Union L118, 5–14 (30.04.2013).

Food Safety Centre, 2010. Risk Ranger. <http://www.foodsafetycentre.com.au/riskranger.php> (Retrieved 15.02.13).

Gambelli, D., Solfanelli, F., Zanoli, R., 2012. Measuring the risk of non-compliance in Italian organic farms with parametric and non parametric models. New Medit 11 (4 special), 35–38.

Gambelli, D., Solfanelli, F., Zanoli, R., 2014. Feasibility of risk-based inspections in organic farming: results from a probabilistic model. Agr. Econ. 45 (3), 267–277. http://dx.doi.org/10.1111/agec.12063.

Garcia Martinez, M., Fearne, A., Caswell, J., Henson, S., 2007. Co-regulation as a possible model for food safety governance: opportunities for public-private partnerships. Food Policy 32, 299–314. http://dx.doi.org/10.1016/j.foodpol.2006.07.005.

Garoupa, N., 2003. Behavioural economic analysis of crime: a critical review. Eur. J. Law Econ. 15, 5–15. http://dx.doi.org/10.1023/A:1021152523137.

Golan, E., Kuchler, F., Mitchell, L., Jessup, A., 2001. Economics of food labelling. J. Consum. Policy 24 (2), 117–184. http://dx.doi.org/10.1023/A:1012272504846.

Greene, W.H., 2008. Econometric Analysis, 6th ed. Prentice Hall, Upper Saddle River N.J..

Gunningham, N., Thornton, D., Kagan, R., 2003. Shades of Green: Business, Regulation, and Environment. Stanford University Press Stanford, CA.

Hamilton, S.F., Zilberman, D., 2006. Green-markets, eco-certification, and equilibrium fraud. J. Environ. Econ. Manage. 52, 627–644. http://dx.doi.org/10.1016/j.jeem.2006.05.002.

Henson, S., Caswell, J., 1999. Food safety regulation: an overview of contemporary issues. Food Policy 24, 589–603. http://dx.doi.org/10.1016/S0306-9192(99)00072-X.

Hirschauer, N., Zwoll, S., 2008. Understanding and managing behavioural risks: the case of malpractice in poultry production. Eur. J. Law Econ. 26, 27–60. http://dx.doi.org/10.1007/s10657-008-9051-0.

Hutter, B.M., 2004. Risk management and governance. In: Eliadis, P., Hill, M.M., Howlett, M. (Eds.), Designing Government: From Instruments to Governance. McGill-Queen's University Press, pp. 303–321.

Hutter, B.M., Amodu, T., 2008. Risk Regulation and Compliance: Food Safety in the UK. LSE, London.

Jahn, G., Schramm, M., Spiller, A., 2005. The Reliability of Certification: Quality Labels as a Consumer Policy Tool. J. Con. Policy 28 (1), 53–73. http://dx.doi.org/10.1007/s10603-004-7298-6.

Janssen, M., Hamm, U., 2011. Consumer perception of different organic certification schemes in five European countries. Org. Agr. 1 (1), 31–43. http://dx.doi.org/10.1007/s13165-010-0003-.

Kagan, R., Scholtz, J., 1984. The 'criminology of the corporation' and regulatory enforcement strategies. In: Hawkins, K., Thomas, J. (Eds.), Enforcing Regulation. Kluwer-Nijhoff, Boston, pp. 67–95.

Lippert, C., Zorn, A., Dabbert, S., 2014. Econometric Analysis of Non-compliance with Organic Farming Standards in Switzerland. Agr. Econ. 45 (3), 313–325. http://dx.doi.org/10.1111/agec.12067.

Padel, S., 2010. The European Regulatory Framework and its Implementation in Influencing Organic Inspection and Certification Systems in the EU. <http://certcost.org/Lib/CERTCOST/Deliverable/D14_D11.pdf> (Retrieved 15.02.13).

Piva, F., 2010. Risk based inspections: from theory to practice. In: European Organic Congress, 21–22 June 2010, Rome.

Ross, T., Sumner, J., 2002. A simple, spreadsheet-based, food safety risk assessment tool. Int. J. Food Microbiol. 77 (02), 39–53. http://dx.doi.org/10.1016/S0168-1605(02)00061-2.

SINAB, 2012. Organismi di Controllo. <http://www.sinab.it/index.php?mod=regioni&smod=organismi_controllo&m2id=190&navId=205> (Retrieved 31.07.12).

SINCERT, 2009. Prescrizioni per l'accreditamento degli Organismi che rilasciano dichiarazioni di conformità di processi e prodotti agricoli e derrate alimentari ottenuti con metodo di agricoltura biologica ai sensi del Regolamento CE n. 834/2007 e sue successive integrazioni e modifiche. <http://www.accredia.it/UploadDocs/87_260RT_16rev_02.pdf> (Retrieved 20.07.12).

Stigler, J.G., 1970. The optimum enforcement of laws. J. Polit. Econ. 78, 526–536.

Sutinen, J.C., Kuperan, K., 1999. A socio-economic theory of regulatory compliance. Int. J. Soc. Econ. 26, 174–193. http://dx.doi.org/10.1108/03068299910229569.

Van Asselt, E.D., Sterrenburg, P., Noordam, M.Y., Van der Fels-Klerx, H.J., 2012. Overview of available methods for risk based control within the European Union. Trends Food Sci. Technol. 23, 51–58. http://dx.doi.org/10.1016/j.tifs.2011.08.009.

Webster, K., Jardine, C., Cash, S.B., McMullen, L.M., 2010. Risk ranking: investigating expert and public differences in evaluating food safety hazards. J. Food Prot. 73, 1875–1885.

Willer, H., Kilcher, L., 2012. The World of Organic Agriculture – Statistics and Emerging Trends 2012. Research Institute of Organic Agriculture (FiBL), Frick, and International Federation of Organic Agriculture Movements (IFOAM), Bonn.

Winter, S.C., May, P.J., 2001. Motivation for compliance with environmental regulations. J. Pol. Anal. Manage. 20, 675–698. http://dx.doi.org/10.1002/pam.1023.

Yapp, C., Fairman, R., 2006. Factors affecting food safety compliance within small and medium-sized enterprises: implications for regulatory and enforcement strategies. Food Control 17 (1), 42–51. http://dx.doi.org/10.1016/j.foodcont.2004.08.007.

Zorn, A., 2009. Certification overview, Germany, 2009. <http://organicrules.org/1750> (Retrieved 18.06.12).

Zorn, A., Lippert, C., Dabbert, S., 2012. Supervising a system of approved private control bodies for certification: the case of organic farming in Germany. Food Control 25 (2), 525–532. http://dx.doi.org/10.1016/j.foodcont.2011.11.013.

Zorn, A., Lippert, C., Dabbert, S., 2013. An analysis of the risks of non-compliance with the European organic standard: a categorical analysis of farm data from a German control body. Food Control 30 (2), 692–699. http://dx.doi.org/10.1016/j.foodcont.2012.08.020.